

Corporate Group Decision-making Authority Allocation and Digital Transformation

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Abstract. With the continuous development of digital technology, the digital economy has become an important direction for economic development. At the micro-level, how to promote corporate digital transformation is a topic of common concern for academia and practitioners. This paper empirically tests the logical relationship between corporate group decision-making authority allocation and digital transformation using samples of A-share listed companies from 2010 to 2021. The research finds that decentralization within corporate groups significantly promotes digital transformation. Furthermore, for non-state-owned enterprises, high-tech enterprises, and companies operating in periods of monetary policy tightening or high industry competition, decentralization has a more significant effect on promoting digital transformation. The results are of great significance for corporate groups in determining appropriate decision-making authority allocation patterns to achieve digital transformation.

Keywords: decision-making authority allocation; digital transformation; property rights nature; industry competition.

1. Introduction

Currently, with the rapid development of digital technologies such as big data, artificial intelligence, cloud computing, and blockchain, the world is undergoing a profound transformation from the “information age” to the “digital economy era”. Digitalization has become an important force accelerating socio-economic development. At the macro level, the report of the 20th National Congress of the Communist Party of China emphasizes “building a digital China, accelerating the development of the digital economy, and promoting deep integration of the digital economy and the real economy,” setting clear requirements for the development of China's digital economy. According to the “China Digital Economy Development Report (2022)”, as of 2021, the scale of China's digital economy has reached 45.5 trillion yuan, more than doubled from the early stages of the 13th Five-Year Plan, exceeding the nominal GDP growth rate by 3.4 percentage points, and accounting for 39.8% of GDP. Under the guidance of national policies, enterprises, as microeconomic entities, firmly grasp the opportunities brought by the digital age and actively promote digital transformation. Digital transformation has gradually become a necessary and sustainable evolutionary process for enterprises, with more and more companies transitioning from “forced transformation” to “actively seeking transformation”.

Against the backdrop of the flourishing digital economy, research related to digital transformation continues to emerge. Most studies focus on the economic consequences of corporate digital transformation, such as the disruptive effects of digital transformation on corporate governance models, and organizational structures, ultimately leading to improved corporate performance. However, there is limited research on the influencing factors of digital transformation. Currently studied influencing factors mainly fall into two categories: internal and external factors. Internal factors include corporate risk awareness (Kane et al., 2015 [1]; Dremel et al., 2017 [2]), characteristics of executive teams (Chen et al., 2021 [3]; Zhang & Chen, 2021 [4]; Wu et al., 2022 [5]), while external factors include government policy support (Wu et al., 2021 [6]), industry dynamics, and competitive environment (Verhoef et al., 2021 [7]). There has been little research on the impact of corporate group decision-making authority allocation on digital transformation.

Although scholars have studied the economic consequences and influencing factors of digital transformation, most existing research focuses on individual companies, overlooking the importance

of corporate groups in the economy. Statistics show that by the end of 2009, over 95% of listed companies controlled at least one subsidiary, with an average of 12 subsidiaries per company, indicating that the corporate group structure is becoming increasingly prevalent. As the core of the corporate group management system, the allocation of decision-making authority within corporate groups has gradually become one of the important issues of concern in academia (Liu et al., 2022 [8]; Pan et al., 2018 [9]). Corporate groups coordinate the behavior of subsidiaries through decision-making authority allocation, distribute power between parent and subsidiary companies, ensure the controllability of subsidiary company operations, and ultimately serve the development of the entire corporate group. Therefore, based on the dual perspectives of parent and subsidiary companies, this study explores the impact of group decision-making authority allocation on corporate digital transformation, which has strong theoretical and practical significance.

Based on the above analysis, this paper uses A-share listed companies from 2010 to 2021 as samples to examine the impact of corporate group decision-making authority allocation on digital transformation. The research finds that decentralization within corporate groups significantly promotes corporate digital transformation. Heterogeneity analysis results show that from the perspective of companies themselves, decentralization has a more significant effect on promoting digital transformation for non-state-owned enterprises and high-tech enterprises. From external factors, companies operating in periods of monetary policy tightening or high industry competition show a more significant effect of decentralization on promoting digital transformation.

The marginal contributions of this paper are mainly as follows: First, this paper links group decision-making authority allocation with the digitalization of enterprises in the new era, analyzes the relationship between group decision-making authority allocation and digital transformation and expands the research on influencing factors of corporate digital transformation. Second, this paper enriches the research on the economic consequences of group decision-making authority allocation, and selects digital transformation as a strategic decision characterized by distinctiveness, importance, and urgency in the era, providing new empirical evidence for research on how group decision-making authority allocation influences corporate behavior during transformative periods. Third, the research results of this paper provide empirical references for promoting corporate digital transformation. Currently, most companies face the inability to transform. We explore successful experiences of digital transformation from the perspective of internal power allocation within corporate groups, providing a decision-making basis for power allocation during transformational periods for enterprises.

2. Literature Review and Research Hypotheses

2.1 Literature Review

2.1.1 Literature Review on Decision-making Authority Allocation

As an important issue in the field of corporate governance, decision-making authority allocation has become a hot topic of research in academia, with its influencing factors and economic consequences being thoroughly discussed at the theoretical level (Aghion, 1997 [10]; Baiman, 1995 [11]). The research on decision-making authority allocation within corporate groups mainly focuses on two aspects: the allocation within individual companies and the allocation between parent and subsidiary companies. For individual companies, the main proxy variable for decision-making authority allocation is whether the CEO and chairman roles are combined (Daily, 1994 [12]). For corporate groups, the decision-making authority allocation between parent and subsidiary companies is defined from the perspective of the power hierarchy. Centralized management in corporate groups refers to a management model where decision-making authority, including personnel and operational rights, is concentrated in the parent company, while decentralized management refers to a management model where decision-making authority is dispersed among subsidiary companies (Pan et al., 2018 [9]).

Regarding the economic consequences of decision-making authority allocation within corporate groups, Pan et al. (2018) [9] found that centralized management can improve resource management efficiency but may lead to overinvestment, both of which ultimately affect company value. Tan et al. (2019) [13] explored the mechanism of the effect of decision-making authority allocation on corporate innovation from the perspectives of financial, operational, and personnel rights, finding that the concentration of financial rights has a positive impact on innovation, while the concentration of operational and personnel rights has a negative impact. Liu et al. (2021) [8] studied the impact of the degree of decision-making authority concentration in group-listed companies on the level of cash holdings and value of listed companies, finding that centralized financial rights allocation significantly improves enterprise value, while centralized personnel rights allocation only has a significant value enhancement effect when cash holdings are low. Wang et al. (2017) [14] examined the relationship between decision-making authority allocation and technological innovation, and investigated the moderating effect of mixed equity under different natures of actual controllers on the relationship between decision-making authority allocation and technological innovation, finding that the separation of decision control rights and decision-making rights is conducive to technological innovation. Wang et al. (2023) [15] found that with the increase in the degree of decision-making authority concentration within corporate groups, the actual tax burden significantly decreases. Hong et al. (2021) [16] found that centralized management in corporate groups reduces the number of innovations. Liu et al. (2020) [17] examined the impact of institutional investors and decision-making authority allocation on corporate overinvestment, finding a significant positive correlation between the combination of decision-making rights and decision control rights and overinvestment during decision-making authority allocation.

2.1.2 Literature Review on Digital Transformation

Digital transformation refers to the process of deep integration of digital technology with business processes, leading to innovation in business models and organizational changes (Fitzgerald et al., 2014 [18]). Based on internal governance structures of enterprises, existing literature indicates that characteristics of top management teams such as gender, age, social capital, and IT background can influence the implementation and effects of digital strategies (Chen et al., 2021 [3]; Wu et al., 2022 [5]). Higher social capital within top management teams and possessing IT backgrounds can facilitate digital transformation within enterprises. From an external factors perspective, Verhoef et al. (2021) [7] found that intensified industry competition can drive enterprises to actively undergo digital transformation. Wu et al. (2021) [6] examined the impact of government fiscal technology spending on enterprise digital transformation and found that fiscal technology spending can provide sufficient financial support to enterprises, thereby promoting digital transformation and improving enterprise economic performance. Yang et al. (2022) [19] found that policy uncertainty can drive enterprise digital transformation. Xiao and Yang (2022) [20] found that digital inclusive finance has a significant promoting effect on enterprise digitalization, and the breadth, depth of use, and degree of digitalization of digital inclusive finance all have significant promoting effects on enterprise digitalization.

In terms of the economic effects of digital transformation on micro-enterprises, existing studies have found that enterprise digital transformation has a significant empowering effect on corporate social responsibility, significantly improving corporate social responsibility performance (Xiao et al., 2021 [21]); digital transformation significantly enhances stock liquidity (Wu et al., 2021 [22]); digital transformation improves the level of specialization in enterprise division of labor, ultimately contributing to the improvement of total factor productivity (Yuan et al., 2021 [23]). In addition, some scholars have used case studies to explore typical practices of enterprise digitalization, providing useful guidance for selecting digital transformation approaches for enterprises (Qi et al., 2021 [24]).

From the above studies, it can be seen that the current literature on digital transformation mostly involves internal governance mechanisms and external support environments, focusing on the influence of internal managers' characteristics and external factors such as government expenditure and industry competition, while there is relatively little literature on the resource allocation of

enterprise groups. Furthermore, the current literature on decision-making authority allocation mainly focuses on its impact on company value, enterprise operational behavior, and innovation capabilities. There are very few studies that examine the impact on digital transformation from the perspective of enterprise group decision-making authority allocation, providing an opportunity for this study.

2.2 Research Hypotheses

Decision-making authority allocation, as a core component of internal governance mechanisms construction and strategic decision-making of companies, cannot be ignored for its impact on enterprise digital transformation. Enterprise group decision-making authority allocation refers to the distribution of power between parent and subsidiary companies, where decision-making authority, including personnel, financial, and operational rights, is concentrated in the parent company's organizational model for centralized management, and if the decision-making authority of enterprises is delegated to subsidiary companies in a certain authorized manner, it is called decentralized management. Centralized management is conducive to the centralized deployment of resources and the lack of supervision over managers, while decentralized management is conducive to constraining managerial self-interest behavior, but blindly delegating power may lead to the dilemma of "centralization without unity" in conglomerate enterprises, which is not conducive to the implementation of digital transformation decisions.

Therefore, group decision-making authority allocation has an uncertain impact on enterprise digital transformation. Existing research has found that group decision-making authority can directly or indirectly affect company value, actual tax burden, enterprise technological innovation capabilities, and other aspects (Pan et al., 2018 [9]; Hong et al., 2021 [16]). Also, digital transformation is closely related to enterprise innovation capabilities, to some extent, it is affected by decision-making authority allocation. Theoretical analysis suggests that the impact of decision-making authority allocation on digital transformation is uncertain, and it is currently inconclusive whether centralized management promotes digital transformation or decentralized management promotes digital transformation.

2.2.1 Centralized Management Promotion Theory

Due to the high risk and high investment characteristics of digital transformation, centralized management can coordinate enterprise resources, play the role of an internal market, improve the efficiency of existing resource management (Pan et al., 2018 [9]), and use the overall risk-bearing capacity of the group to fully exploit the advantages of centralized management power concentration and rapid decision-making. This is conducive to the unified shaping of corporate image, centralized response to crises and difficulties, and mandatory norms for sharing behavior, thereby ensuring the organizational efficiency of the entire group, to make timely decisions on digital transformation and actively promote enterprise digital transformation.

From the perspective of agency theory, decentralized management of corporate groups may lead to inconsistencies between the goals of subsidiary companies and the overall goals of the group or opportunistic behaviors. That is, due to the multiple influences of the internal and external environments in which subsidiary companies are located, subsidiary companies pursue the maximization of their value, which does not necessarily represent the maximization of the group's value. At this time, the group can adopt centralized management methods, strengthen the control of the parent company, reclaim the autonomous decision-making management rights of subsidiary companies, constrain the opportunistic behaviors of subsidiary companies, and ultimately align the goals of subsidiary companies with the value of the group.

In general, enterprises implementing centralized management can coordinate the activities of subsidiary companies, concentrate all the resource advantages of the group (Argyres et al., 2004) [25], and allocate resources among subsidiary companies by the overall strategy to achieve economies of scale. In this way, the group can effectively control the operating behavior of subsidiary companies, guide them towards the goal of group digital transformation, enhance the organizational efficiency

and resource allocation capabilities of the entire enterprise group, and apply resources to the key aspects of digital transformation.

Based on the above analysis, this study proposes the following research hypothesis.

Hypothesis H1a: Centralized management of corporate groups promotes digital transformation.

2.2.2 Decentralized Management Promotion Theory

High degrees of centralized decision-making authority allocation within corporate groups may inhibit digital transformation. Decentralization promotes digital transformation for the following three reasons.

Firstly, digital transformation requires specialized knowledge and has high demands for proprietary knowledge. Decentralized management can better promote the integration of proprietary knowledge with digital transformation opportunities, mobilize the initiative and vitality of subsidiary companies, and gather wisdom, thereby improving transformation efficiency. Therefore, based on agency theory, decentralized management is more conducive to digital transformation, and dynamic subsidiary companies can better serve digital transformation activities.

Secondly, subsidiary companies are closest to the market within corporate groups, and they are more sensitive to market changes, enabling them to capture future trends in market development. At the same time, subsidiary companies have a better understanding of their core capabilities and project potential and can adjust their operational activities according to their proprietary knowledge and specific development situations, seize new innovative opportunities, and quickly execute digital decisions, thereby promoting digital transformation more effectively.

Thirdly, under centralized management, overly concentrated decision-making authority may lead to serious agency problems (Fama and Jensen, 1983) [26], resulting in a lack of necessary supervision and control mechanisms in the process of decision-making by the parent company's management. Increased opacity of information may occur, and group managers may adopt a risk-averse attitude in the absence of knowledge and effective constraints (Khanna et al., 2010) [27], thereby adversely affecting digital transformation. Decentralized management, on the other hand, means relatively dispersed power, which can exert mutual constraints between different positions, avoid the problem of missing supervision and control mechanisms due to excessive centralization of management and reduce the phenomenon of centralized management's reluctance to undergo digital transformation due to opportunism.

Based on the above analysis, this study proposes the following research hypothesis.

Hypothesis H1b: Decentralized management of corporate groups promotes digital transformation.

3. Research Design

3.1 Sample Selection and Data Source

This paper takes the A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2010 to 2021 as the research objects and conducts the following screening process for the initial sample: (1) Exclude samples that have experienced major events such as ST or PT during the sample period; (2) Exclude samples from the financial industry; (3) Exclude samples with missing key data; (4) To eliminate the interference of extreme values, this paper truncates all continuous variables at the 1st percentile at both ends; (5) To reduce the influence of individual characteristics and time effects on regression results, the model controls for time and individual fixed effects, and adjusts the regression standard errors at the enterprise level. After the above data processing process, a total of 28,511 company-year observations are obtained. The data processing and analysis in this paper use Stata17 econometric analysis software, and the data in this paper are all from the CSMAR database.

3.2 Variable Definition

3.2.1 Decision-Making Authority Allocation

The explanatory variable of this paper is group decision-making authority allocation, which refers to the degree of centralization and decentralization of decision-making authority within an enterprise group between parent and subsidiary companies. This paper refers to the index construction by Pan et al. (2018) [9] to measure the degree of centralization of decision-making authority within an enterprise group based on the proportion of compensation paid by the enterprise group to employees. In enterprise management, enterprise groups mainly achieve overall centralized management by centralizing personnel rights, that is, the parent company exercises supervision and management over subsidiary companies by delegating directors, supervisors, or financial principals to subsidiary companies, while retaining the authority to determine the compensation of the delegated personnel, thereby controlling subsidiary companies. In addition, due to the existence of compensation contracts, compensation arrangements are usually more stable than other resource distributions and change less with the operating conditions of the enterprise group, making them suitable for measuring the degree of centralization of group decision-making authority.

Specifically, this paper regresses the model shown in Equation (1) by year and industry and uses the estimated residuals as the measure of the degree of centralization of decision-making authority, denoted as Cen. A larger value of the Cen indicator indicates a higher proportion of compensation paid by the parent company, a higher level of control over personnel rights and other decision-making rights, and a higher degree of centralization of group decision-making authority.

$$PSalary_{i,t} = \alpha_0 + \alpha_1 PAsset_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where PAsset is the ratio of the total assets of the parent company to total assets of the group, measured by dividing the total assets of the parent company by the total assets of the consolidated financial statements. The explained variable PSalary is the ratio of the compensation paid by the parent company to employees and the compensation paid by the group to employees, measured by the “cash paid to employees and for employees” item in the parent company's cash flow statement divided by the corresponding item in the consolidated financial statements. To avoid the influence of outliers on the regression results, PSalary and PAsset were truncated to the interval [0, 1] before regression.

3.2.2 Level of Digital Transformation

This paper refers to the research of Wu et al. (2021) [6] and uses the frequency of characteristic words related to “digital transformation” in the annual reports of listed companies to measure the level of enterprise digital transformation. The “China Digital Economy Research Database” in the CSMAR database adopts the method of Wu et al. (2021) [6] to divide digital transformation into “basic technology application” and “technology practice application” and constructs a feature word library for digital transformation. “Basic technology application” includes four mainstream technology directions: “big data technology,” “artificial intelligence technology,” “blockchain technology,” “cloud computing technology,” and “digital technology application”; The “technology practice application” focuses on specific digital business scenarios. The natural logarithm of the sum of the occurrence frequencies of these two levels of digital transformation characteristic words plus 1 is used as the measure of digital transformation.

3.2.3 Control Variables

Drawing on previous research (Wu et al., 2021 [6]; Zhao et al., 2021 [28]; Pan et al., 2018 [9]), the control variables selected in this paper include company size (Size), financial leverage (Lev), profitability (Roa), growth capability (Growth), board size (Boardsize), years listed (Listage), firm age (Firmage), cash holdings (Cashflow), dual roles (Dual), and equity concentration (Top1). To avoid the influence of unobservable factors, this paper controls for firm (Firm) and year (Year) fixed effects in the regression model.

The specific variable definitions are shown in Table 1. To ensure the robustness of the estimation results, the regression results are adjusted for standard errors clustered at the company level.

Table1: Variable Definition and Explanation

Variable Type	Variable Name	Variable Symbol	Variable Definition
Dependent Variable	Digital Transformation	Digital	The natural logarithm of the sum of the frequency of digital transformation-related terms appearing in the annual reports plus 1
Independent Variable	Degree of Centralization	Cen	Residuals obtained from annual and industry regressions (Equation 1)
Control Variables	Company Size	Size	Natural logarithm of total assets at the end of the year
	Financial Leverage	Lev	Total liabilities/Total assets
	Profitability	Roa	Net profit/Total assets
	Growth Capability	Growth	Revenue growth rate
	Board Size	Boardsize	Natural logarithm of the number of directors on the board
	Years Listed	Listage	Natural logarithm of the years listed
	Firm Age	Firmage	Natural logarithm of the firm's age
	Cash Holdings	Cashflow	Cash and cash equivalents/Total assets
	Dual Role	Dual	Dummy variable, takes the value of 1 if the chairman and CEO of the company are the same person, otherwise 0
	Equity Concentration	Top1	Proportion of shares held by the largest shareholder
	Firm Fixed Effects	Firm	Dummy variable for firms
	Year Fixed Effects	Year	Dummy variable for years

3.3 Model Establishment

To test the research hypotheses, this paper constructs the following models:

$$Digital_{i,t} = \beta_0 + \beta_1 Cen_{i,t} + Controls_{i,t} + \sum Firm + \sum Year + \varepsilon_{i,t} \quad (2)$$

Where i denotes the company, t denotes the year, the explained variable is enterprise digitalization (Digital), β_0 represents the intercept term, and β_1 is the parameter to be estimated for the explanatory variable group decision-making authority allocation (Cen). If β_1 is significantly positive, it indicates that centralization promotes digital transformation; if β_1 is significantly negative, it indicates that decentralization promotes digital transformation. Controls represent the control variable set, and Firm and Year respectively represent enterprise and year fixed effects, $\varepsilon_{i,t}$ is the random disturbance term.

4. Empirical Results and Analysis

4.1 Descriptive Statistical Analysis

Table 2 presents the descriptive statistics of the main variables. During the sample period, the average value of the dependent variable, digital transformation (Digital), is 1.349, with a standard deviation of 1.396. The minimum value is 0.000, and the maximum value is 5.130, indicating significant differences in digital transformation among different companies, with some companies yet to undergo digital transformation. The main explanatory variable, centralization degree (Cen), has an average value of -0.000, a median of 0.006, a standard deviation of 0.208, a minimum value of -0.508, and a maximum value of 0.472, showing substantial variation in centralization degree among different companies. Among the control variables, the average profitability of sample companies is

0.042, the average financial leverage is 0.426, the average asset size is 22.264, the average revenue growth rate is 0.190, the average number of years listed is 2.137, the average company age is 2.841, the average cash holdings is 0.047, the proportion of sample companies with dual roles is 27.9%, and the average shareholding of the largest shareholder is 34.9%, consistent with existing literature. The distribution of variables is reasonable and consistent with previous research findings (Li et al., 2021 [29]; Wu et al., 2021 [6]; Zhang and Chen, 2021 [4]).

Table 2 Descriptive Statistics

Variable	N	Mean	Median	Sd	Min	Max
Digital	28511	1.349	1.099	1.396	0.000	5.130
Cen	28511	-0.000	0.006	0.208	-0.508	0.472
Roa	28511	0.042	0.040	0.053	-0.177	0.198
Lev	28511	0.426	0.420	0.203	0.056	0.889
Size	28511	22.264	22.068	1.296	19.928	26.326
Growth	28511	0.190	0.125	0.388	-0.514	2.581
Boardsize	28511	2.132	2.197	0.197	1.609	2.708
Listage	28511	2.137	2.298	0.846	0.119	3.371
Firmage	28511	2.841	2.893	0.360	1.648	3.518
Cashflow	28511	0.047	0.047	0.068	-0.155	0.242
Dual	28511	0.279	0.000	0.449	0.000	1.000
Top1	28511	0.349	0.329	0.150	0.088	0.748

4.2 Baseline Regression

Table 3 presents the baseline regression results of Model (2). Columns (1) to (4) respectively represent the regression results of the relationship between group decision-making authority allocation and corporate digital transformation without adding control variables and fixed effects, with control variables added but without fixed effects, with fixed effects added but without control variables, and with both control variables and fixed effects added. In column (4), the estimated coefficient of decision-making authority allocation (Cen) is -0.218, significant at the 1% level, indicating that decentralization significantly promotes corporate digital transformation.

Regarding control variables, the regression coefficients of company size, board size, and years listed are significantly positive, indicating that companies with larger sizes, better board governance, and longer listing periods have higher levels of digital transformation. The regression coefficients of firm age, cash holdings, and the proportion of shares held by the largest shareholder are significantly negative, indicating that companies with longer establishment periods, higher cash holdings, and more concentrated equity have lower levels of digital transformation. Longer establishment periods imply relatively fixed management and development models, which are unfavorable for digital transformation. Weak profitability of cash assets and excessive cash holdings can reduce asset profitability and inhibit digital transformation.

Table 3 Impact of Group Decision-Making Authority Allocation on Digital Transformation

Variable	(1)	(2)	(3)	(4)
	Digital	Digital	Digital	Digital
Cen	-0.568*** (-6.51)	-0.404*** (-4.72)	-0.315*** (-4.79)	-0.218*** (-3.36)
Roa		-0.798** (-2.57)		-0.039 (-0.24)
Lev		-0.836*** (-7.23)		-0.114 (-1.23)
Size		0.212*** (12.44)		0.245*** (10.15)
Growth		0.097***		0.018

		(3.88)		(1.28)
Boardsize		-0.615*** (-6.61)		0.260*** (3.99)
Listage		-0.188*** (-6.88)		0.168*** (5.09)
Firmage		0.473*** (8.08)		-0.348** (-2.23)
Cashflow		-0.288 (-1.55)		-0.175* (-1.84)
Dual		0.250*** (6.30)		0.009 (0.38)
Top1		-1.225*** (-9.29)		-0.575*** (-3.79)
Constant	1.349*** (66.72)	-2.253*** (-5.91)	1.349*** (53490.78)	-3.775*** (-5.60)
Firm&Year	No	No	Yes	Yes
Observations	28511	28511	28511	28511
Adj.R2	0.01	0.07	0.77	0.77

4.3 Robustness Checks

4.3.1 Replacing the Measurement Method of the Dependent Variable

We replace the digital transformation indicators in this article with the Digital Transformation Index from the CSMAR database. The Digital Transformation Index is composed of strategic drive score, technological empowerment score, organizational empowerment score, environmental empowerment score, digital achievement score, and digital application score. These sub-indicators are weighted to obtain the digital transformation index of the enterprise. The regression results, as shown in the first column of Table 4, indicate that the coefficient of centralization degree Cen is -0.816, indicating that decentralization can better promote the digital transformation of the enterprise. The research results using the Digital Transformation Index are consistent with the conclusions of this article.

Moreover, considering that different digital feature words may lead to differences in the measurement of corporate digital transformation, this study adopts another feature word selection method, as proposed by Zhao et al. (2021) [28], decomposing corporate digital transformation into four dimensions: digital technology application, business internet model, intelligent manufacturing, and modern information system, totaling 99 digital-related word frequencies for statistics. The regression results in column (2) of Table 4 show that the coefficient of Cen is -0.195, significant at the 1% level, and changing the selection of digital feature words yields results consistent with the conclusions of this study.

4.3.2 Excluding the Influence of Specific Industries and Regions

Due to differences in the application of digital technology across different industries, the results of this study may be influenced by industry characteristics. For example, the information technology industry itself has a higher degree of digital technology application, which may affect the research results. To reduce the impact of industry factors, this study, based on the China Securities Regulatory Commission industry classification standards, excludes samples from the information technology industry (“C39 Computer, Communications, and Other Electronic Equipment Manufacturing” and “I Information Transmission, Software, and Information Technology Services”) and conducts regression analysis again. The regression results in column (3) of Table 4 show that the coefficient of Cen is -0.181, indicating that decentralization can still significantly promote corporate group digital transformation, consistent with the main test.

Since different regions have different levels of economic development, enterprises in economically developed regions generally have better conditions and support for digital transformation, resulting in higher transformation levels. To eliminate the influence of regional factors on the research results, this study excludes samples from Beijing, Shanghai, Guangzhou, and Shenzhen and conducts regression analysis again. The regression results in column (4) of Table 4 show that, even after excluding samples from specific regions, the coefficient of Cen remains significantly negative at the 1% level, consistent with the main test.

The results of robustness checks indicate that, overall, the impact of decision-making authority allocation on corporate digital transformation remains significantly negative, indicating that decentralization is conducive to corporate group digital transformation, and the conclusions of this study are robust.

4.4 Endogeneity Test

4.4.1 Instrumental Variable Test Results

Although Equation (2) has controlled for common influencing factors of digital transformation based on existing literature, there may still be issues with omitted variables. Additionally, measurement errors in decision-making authority allocation could also affect the research conclusions. Therefore, to avoid the influence of endogeneity issues on the research results, this paper conducts an endogeneity test using the two-stage least squares method with instrumental variables. The mean centralization degree of group decision-making authority allocation for other corporate groups in the same year and province is selected as the instrumental variable. The results of the two-stage regression are shown in columns (5) and (6) of Table 4. Column (5) reports the results of the first stage regression, with an instrumental variable regression coefficient of 0.101, significant at the 1% level. Column (6) reports the results of the second stage regression, with a regression coefficient of group decision-making authority of -4.466, significant at the 1% level, consistent with the main test results. In the weak instrumental variable test, the F-statistic value is 48.872, greater than 10, indicating that the instrumental variables selected in this study are not weak instruments.

4.4.2 Lagging Treatment of Core Explanatory Variables

Considering that corporate digital transformation is a long-term process, this paper lags the core explanatory variable by one period for endogeneity testing, examining the impact of decision-making authority allocation in the previous period on the current digital transformation. As shown in column (7) of Table 4, the regression coefficient of L.Cen is -0.197, significant at the 1% level, which is consistent with the research conclusions of this paper.

Table 4 Robustness Tests

Variable	(1) Digital_2	(2) Digital_3	(3) Digital	(4) Digital	(5) Cen	(6) Digital	(7) Digital
Cen	-0.816** (-2.02)	- 0.195*** (-3.40)	- 0.181*** (-2.74)	-0.196** (-2.56)		- 4.466*** (1.12)	
L.Cen							- 0.197*** (-2.97)
IV					0.101*** (0.01)		
Constant	5.176 (1.11)	- 2.566*** (-4.29)	- 3.076*** (-4.25)	- 3.381*** (-4.33)	0.059** (0.23)	- 1.905*** (0.23)	- 3.916*** (-5.20)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm& Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes

N	26469	27937	24002	20730	27442	27442	23583
Adj.R2	0.86	0.79	0.702	0.744	0.057		0.78

5. Heterogeneity Test

5.1 Heterogeneity Test Based on Internal Corporate Environment

5.1.1 Property Rights Nature

State-owned enterprises, due to their characteristics, on the one hand, have strong financial strength and are more likely to receive government subsidies, facing relatively fewer financing constraints and performance pressure, resulting in relatively insufficient motivation for digital transformation. On the other hand, the operating decisions of state-owned enterprises may be influenced by the government, making it difficult to fully realize the effects of digital transformation. Compared to state-owned enterprises, non-state-owned enterprises have higher autonomy in operating decisions. When decentralized management is adopted, subsidiaries are more active in digital transformation to enhance core competitiveness. As shown in columns (1) and (2) of Table 5, in non-state-owned enterprises, decentralized management significantly promotes digital transformation at the 1% level, while in state-owned enterprises, the role of decentralized management in digital transformation is not significant.

5.1.2 Whether the Enterprise is a High-Tech Enterprise

Compared to non-high-tech enterprises, high-tech enterprises driven by technological innovation are more likely to prioritize digital transformation as a core strategic initiative, with a higher level of digital technology application. Decentralized management expands the decision-making space for enterprise innovation transformation, enabling subsidiaries to make decisions on digital transformation using their proprietary knowledge, thereby enhancing enterprise competitiveness. Non-high-tech enterprises have a lower emphasis on innovation transformation. Even if subsidiaries have high decision-making autonomy, they may not necessarily position digital transformation as a business strategy, and the proportion of investment in digital projects may not be high. The results of the subgroup regression are shown in columns (3) and (4) of Table 5, where the promotion effect of decentralization on digital transformation is significant only in the high-tech group, with a significance level of 10%.

5.2 Heterogeneity Test Based on External Corporate Environment

5.2.1 Degree of Monetary Policy Accommodation

The construction of enterprise digital infrastructure requires significant financial support (Liu et al., 2021 [30]; Wu et al., 2021 [6]). Therefore, bank credit funds play an important role in the period of enterprise digital transformation. When monetary policy is accommodative, financing for enterprises is relatively easy, providing more financial support for digital transformation. Conversely, under a contractionary monetary policy, financing difficulties increase, making it challenging for enterprises to obtain funding support for development. Under centralized decision-making, group managers are more inclined to adopt a risk-averse attitude and are less willing to promote digital transformation decisions. This study uses the annual growth rate of M1 in the current year to measure the degree of monetary policy accommodation. Different years' average M1 growth rates are used as the grouping standard. If the current year's M1 growth rate is lower than the average M1 growth rate for all years, it indicates a period of monetary policy tightening; if the current year's M1 growth rate is higher than the average M1 growth rate for all years, it indicates a period of monetary policy accommodation. A larger value of this indicator indicates looser monetary policy. The regression results are shown in columns (1) and (2) of Table 6, indicating that during periods of monetary policy tightening, decentralization has a significant promoting effect on digital transformation.

5.2.2 Industry Competition Intensity

In the digital era, the application of digital technology is playing an increasingly important role in enterprise production and operation. When external industry competition is fierce, enterprises face greater pressure on profit compression (Song et al., 2021) [31]. To enhance their core competitiveness and market position, enterprise groups seek digital transformation as a means of urgent necessity. Under centralized management, resources are more efficiently allocated, facilitating transformation. Referring to existing literature (Yuan et al., 2021) [32], the Herfindahl-Hirschman Index (HHI) of the industry in which the enterprise operates is used to measure the intensity of industry competition, calculated as the square sum of the ratio of each company's main business income to the total main business income of the industry. A smaller value of this index indicates more intense competition in the industry. Using the annual average value of the Herfindahl-Hirschman Index as the grouping standard, if the industry's HHI in the current year is higher than the average HHI of all industries, it is classified as a group with lower industry competition intensity; if the industry's HHI in the current year is lower than the average HHI of all industries, it is classified as a group with higher industry competition intensity. The results of the subgroup regression are shown in columns (3) and (4) of Table 6. The regression results indicate that in industries with lower competition intensity, decentralization has a greater promoting effect on digital transformation because in highly competitive industries, there is a greater need to leverage centralized decision-making advantages to allocate resources, thus reducing the effectiveness of decentralization.

Table 5 Heterogeneity Test Based on Internal Environment

Variable	(1)	(2)	(3)	(4)
	SOE	Non-SOE	High-Tech	Non-High-Tech
Cen	0.053 (0.49)	-0.295*** (-3.70)	-0.257*** (-3.10)	-0.132 (-1.35)
Constant	-0.876 (-0.78)	-4.466*** (-5.23)	-2.829*** (-3.18)	-4.768*** (-5.06)
Controls	Yes	Yes	Yes	Yes
Firm&Year	Yes	Yes	Yes	Yes
N	10114	17748	16440	11444
R ²	0.779	0.814	0.833	0.752
Adj.R ²	0.75	0.78	0.81	0.72

Table 6 Heterogeneity Test Based on External Environment

Variable	(1)	(2)	(3)	(4)
	Monetary Policy Easing	Monetary Policy Tightening	Lower Industry Competition	Higher Industry Competition
Cen	-0.118 (-1.29)	-0.272*** (-3.44)	-0.241* (-1.95)	-0.197*** (-2.70)
Constant	-5.170*** (-5.38)	-3.325*** (-4.42)	-3.932*** (-3.22)	-3.678*** (-4.80)
Controls	Yes	Yes	Yes	Yes
Firm&Year	Yes	Yes	Yes	Yes
N	10109	17333	7026	19633
R ²	0.819	0.830	0.801	0.815
Adj.R ²	0.76	0.79	0.73	0.78

6. Research Conclusions and Implications

6.1 Research Conclusions

The innovation and application of digital technology have brought about profound changes in industrial structure and production organization. Digital transformation has improved production efficiency and has become an important measure for enterprises to enhance core competitiveness. Enterprises play a crucial role in the macro digital economy development and transformation, and digital transformation is gradually reflected in specific production behavior changes within enterprises. This paper takes A-share listed companies from 2010 to 2021 as samples to empirically test the relationship between group decision-making authority allocation and digital transformation. The research shows that decentralized management of enterprise groups can significantly promote digital transformation. Furthermore, when enterprises are non-state-owned, high-tech enterprises, during periods of monetary policy tightening, and in industries with higher competition intensity, the impact of decentralization on digital transformation is more pronounced.

6.2 Policy Implications

The research in this paper has important implications for exploring the impact of internal governance issues on enterprise digital transformation during China's economic transformation period. Based on the research conclusions, the following policy implications are derived:

Firstly, the corporate groups can reform and optimize corporate governance mechanisms to provide a good internal governance environment for enterprise technological innovation. During the economic transformation period, digital transformation as a disruptive strategic change is influenced by the organizational form and governance structure of enterprises. Since the research results indicate that decentralization generally promotes enterprise digital transformation, reasonable decentralization can enhance the scientificity of digital transformation decisions, improve transformation efficiency and effectiveness, and optimize enterprise decision-making mechanisms to provide decision support for implementing digital transformation strategies.

Secondly, the government should further deepen the mixed ownership reform of enterprises. State-owned equity is more likely to receive government support, with resource and technological advantages, facing lower financing constraints and operating pressures. However, state-owned enterprises often lack innovation incentives and have insufficient motivation for practicing digital transformation. On the other hand, non-state-owned equity owners generally have stronger competition awareness and innovation incentives but may face difficulties in obtaining sufficient financial support and have limited digital transformation capabilities. Therefore, in the process of mixed ownership reform, through equity allocation, enterprises can possess both resource advantages and innovation awareness, enhance their technological capabilities, and ensure their market competitiveness.

These policy implications provide valuable insights for policymakers and enterprise managers to better promote digital transformation and enhance enterprise competitiveness in the context of economic transformation.

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