

Digital Transformation and Enterprise Financialization: The Role of Operating Capacity

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ABSTRACT

Digital Transformation (DT) is a new business model developed by adopting digital technologies. DT creates opportunities for enterprises to gain and collect information on operations for visible analysis. Due to the benefits of DT as well as the harms of Enterprise Financialization (EF), the impact of DT on EF and its mechanism are worthy of further investigation. In this paper, Chinese public enterprise observations of the panel data from 2011 to 2020 are adopted to investigate the impact and the mechanism of DT on EF. The results show that DT can restrain EF through enhancing Operating Capacity (OC). More specifically, this effect is much more pronounced in state-owned enterprises (SOEs), start-up enterprises, and board minor-size enterprises. The findings provide contributions for digital transformation policy enactment as well as suggestions for enterprises to improve OC and reduce EF tendencies.

Keywords: Corporate governance, Digital transformation, Enterprise financialization, Operating capacity.

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1. INTRODUCTION

In an environment of global economic downward pressure and accelerated economic structural transformation, enterprises tend to engage in investing in financial assets due to diminishing profits in main business income (Xu & Xuan, 2021). Researchers have pointed out that Enterprise Financialization (EF) may increase operation risks, tighten cash flow, cause earnings management dysfunctional tendency (Cupertino *et al.*, 2019; Li & Huang, 2022). In other words, EF is a current issue for many stakeholders to pay attention to and restrain.

Besides, at the micro level of economic development, Digital Transformation (DT) is a representation that digital technology and enterprise production are deeply integrated (Vial, 2019). It is also a mark that enterprises are transforming from a traditional production system to a digital system. At present, not a few firms have already begun to undergo DT globally due to its benefits (Frendiana & Soediantono, 2022). The benefits of DT can be summarized, including enhancing innovation ability, saving cost, narrowing information asymmetry, improving firm performance, and maintaining financial stability (Jardak & Ben Hamad, 2022; Guo & Xu, 2021; Wu *et al.*, 2022).

Thus, it is necessary and significant to conduct a study on the impact of Digital Transformation (DT) on

Enterprise Financialization (EF) to examine a further determinant to restrain EF due to the malignant economic consequences of EF. Specifically, taking into consideration the deep and wide development of DT in China, this institutional feature motivates taking the evidence from China to examine the impact of DT on EF and examines its mechanisms for providing further development agenda of DT in China and even globally.

Based on the discussion above, research questions in this study are proposed:

- RQ1: Does digital transformation influence enterprise financialization?
- RQ2: What is the role of operating capacity on the effect of digital transformation on enterprise financialization?
- RQ3: What is the role of enterprise characteristics on the effect of digital transformation on enterprise financialization?

By answering these three research questions, this paper is expected to make two contributions. One is that this study demonstrates the impact of DT on EF among Chinese public enterprises with sufficient robustness tests to make sure the results in this paper are robust enough to deal with the controversy from the literature. The other is that this paper investigates the mechanisms between DT and EF to



provide a further understanding of how DT influences EF. In other words, this study is expected to provide theoretical accordance for inhibiting current EF issues, as well as provide future policy enactment of DT for practitioners and policymakers.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Digital Transformation and Enterprise Financialization

Prior studies show controversies from Chinese evidence on the relationship between DT and EF. On the one hand, some argued that DT might facilitate EF (Wu & Lu, 2023; Xu *et al.*, 2023). On the other hand, however, some suggested that DT has a negative impact on EF (Zhang *et al.*, 2023; Sui & Yao, 2023; Fang & Ju, 2024). In short, the coefficient conflict result between DT and EF from prior studies is one of the literature gaps in this research topic.

Besides, regarding the causation between DT and EF, on one side, Zou (2023) argued that EF may restrain DT. On the flip side, Sui and Yao (2023) and Fang and Ju (2024) held a different opinion that DT can significantly restrain EF. To take into consideration the bidirectional causation problem in this research topic, one of the literature gaps in conducting this research topic is the impact of DT on EF.

According to the above analysis, it shows that there are still controversies, namely the relationship and causation between DT and EF are debatable. In other words, the gaps in the above literature need to be addressed. Based on this, this study combines the following two theories, Agency Theory and Information Asymmetry Theory, to propose the following five hypotheses and examine the impact of DT on EF.

2.2. Theoretical Analysis and Hypothesis Development

At present, Agency Problems are being staged in China (Jiang & Kim, 2020). Based on Agency Theory (Jensen & Meckling, 1976), Agency Problem Type I means the interest conflict between shareholders and managers. Managers are driven by their career advancement and compensation considerations, which typically aim for higher corporate profits to demonstrate their corporate governance ability to seek monetary incentives, stock rewards, and even favorable manager reputations. Consequently, when the figure for profit decreases in an enterprise, managers might resort to excessive investment in financial assets to earn profits. What is worse, not all enterprises possess robust internal control measures capable of curbing the trend toward EF. Therefore, it can be believed that due to profit-driven motives and the presence of Type I Agency Problems, enterprises exhibit inclinations toward EF. Furthermore, due to information asymmetry, managers can acquire and allocate resources to engage in opportunistic behaviors for excessive financialized investments (Arrow, 1978).

However, DT may mitigate information asymmetry by integrating business information and visualizing operational data (Kazantsev *et al.*, 2024). Then, those stakeholders who were in an information disadvantage situation prior to the enactment of DT, such as non-executive directors or external institutional shareholders, may control excessive financial investment currently according to

the information provided by DT. Therefore, DT can reduce information asymmetry, thereby inhibiting EF. Based on the above analysis, the first hypothesis in this study is proposed below:

- H1: There is a negative impact of Digital Transformation (DT) on Enterprise Financialization (EF).

To investigate the mediator effect between DT and EF, this study conducts a further analysis based on Agency Theory and Information Asymmetry Theory. DT aids enterprises in acquiring operation information, thereby reducing information asymmetry (Akerlof, 1978). This reduction in asymmetry leads to improved operational capabilities, which can help enterprises improve their governance ability. Meanwhile, as managers and shareholders can benefit from operational enhancement, enterprises are less inclined to engage in EF. Based on this analysis, the second hypothesis is proposed below:

- H2: The negative impact of Digital Transformation (DT) on Enterprise Financialization (EF) is through enhancing Operational Capacity (OC).

To examine the impact of DT on EF in different types of firms, Information Asymmetry Theory and Agency Theory are also both used to analyze the following issues. In Chinese SOEs, the managers are appointed to manage the firms on behalf of the State-owned Assets Supervision and Administration Commission (SASAC) (Lin *et al.*, 2020). However, there are currently more than 1,000 SOEs in China. In other words, due to the limited effect of regulations, Agency Problem Type I may be more serious than non-SOEs in China (Jin *et al.*, 2022). As a result, the impact of DT on EF may be much more pronounced in Chinese SOEs due to the corporate governance benefits of DT. Based on this analysis, the third hypothesis is proposed below:

- H3: The negative impact of Digital Transformation (DT) on Enterprise Financialization (EF) is much more pronounced in SOEs than in non-SOEs.

Among start-up enterprises, these enterprises generally face information asymmetry during the operational process due to weak commercial intelligence. This is because enterprises which are start-up have limited cash flow to purchase commercial intelligence from consultant institutions. However, a start-up enterprise with a high level of DT may collect operational information individually to enhance OC for reducing EF trend. Based on this analysis, the fourth hypothesis is proposed below:

- H4: The negative impact of Digital Transformation (DT) on Enterprise Financialization (EF) is much more pronounced in start-up enterprises than in non-start-up enterprises.

In board governance, a greater size of the board may benefit corporate governance (Alabdullah *et al.*, 2019). Whereas enterprises which are with a minor-size board may fail to inhibit irrational decision-making in an enterprise such as EF. Therefore, if there is a high level of DT, it is much more possible for board members from a minor-size board to collect more information to make

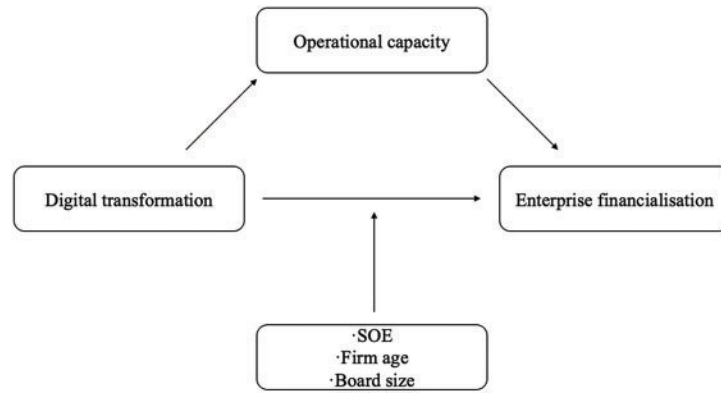


Fig. 1. Research framework.

decisions to restrain EF trend. Based on this analysis, the last hypothesis is proposed below:

- H5: The negative impact of Digital Transformation (DT) on Enterprise Financialization (EF) is much more pronounced in board minor-size enterprises than in board non-minor-size board enterprises.

In addition to the five hypotheses, the research framework in this study is also summarised in Fig. 1.

3. METHODOLOGY AND DATA

3.1. Sample

The observations in this study are from Chinese A-Share public enterprises between 2011 and 2020. To ensure the validity of the data and observations, the public enterprises are excluded based on the following three criteria. Firstly, public enterprises that are or were treated as Special Treatment (ST) by the China Securities Regulatory Commission (CSRC). This is because these kinds of enterprises generally have abnormal operation situations. Secondly, enterprises from the financial sectors are excluded because these observations make profits by financial leverage. Thirdly, the observations with incomplete data are excluded. Finally, 17,560 observations were obtained to form a balanced panel sample for linear regression from the CSMAR database and Wind Database.

3.2. Variables

Dependent Variable, the quantitative measurement of Enterprise Financialization (EF), prior studies generally adopted the ratio of financial assets to total assets to measure the level of EF. More specifically, financial assets include monetary funds, interest receivable, dividends receivable, trading financial assets, held-to-maturity investment, available-for-sale financial assets, long-term equity investment, investment properties, and derivative financial assets (Duchin et al., 2017). Thus, Enterprise Financialization (EF) is measured by the ratio of financial assets to total assets, as seen in the following (1).

$$EF = \ln(\text{Financial Assets} / \text{Total Assets}) \quad (1)$$

Independent Variable, the quantitative measurement of Digital Transformation (DT), Zhai et al. (2022) regarded that the times of keywords related to DT mentioned in

the enterprise annual report can be used to measure the level of DT. They use Python Code for the crawler in each firm's annual report and measure the level of DT according to the times Digital Technologies keywords appear in the annual report. Thus, Digital Transformation (DT), is measured by the times of digital keywords appearing in the annual report, including artificial intelligence technology, blockchain technology, cloud computing technology, big data technology, and digital technology application.

Mediator variable, Operating Capacity (OC), is measured by the ratio of assets turnover seen in (2). The ratio of assets turnover comprehensively reflects the operating capacity. Therefore, the asset turnover ratio can reflect the asset utilization, productivity, and other operational capabilities of an enterprise. Moderator variables and Control variables are described in Table I with other variables in this study altogether.

$$OC = \text{Revenue} / \text{Total Assets} \quad (2)$$

3.3. Research Model

To verify the five hypotheses in this study, the following five models are designed for empirical study. Model (3) and

TABLE I: VARIABLE DEFINITION

Variable type	Variable name	Definition
Dependent variable	EF	Ln (the ratio of financial assets to total assets)
Independent variable	DT	Ln (digital transformation keyword appearing times)
Mediator variable	OC	The ratio of assets turnover
Moderator variable	SOE	If it is a state-owned enterprise equals 1, else is 0
Moderator variable	AGE	Ln (firm age)
Moderator variable	BOARD	Ln (the number of board members)
Control variable	SIZE	Ln (total assets)
Control variable	LEV	Liabilities over assets
Control variable	GROWTH	Operating income growth rate
Control variable	TOP1	Proportion of the largest shareholding
Control variable	DUAL	If the firm is CEO duality equals 1, else is 0
Dummy variable	YEAR	Year
Dummy variable	IND	Enterprise individual

TABLE II: DESCRIPTIVE STATISTICS

Variables	Observation	Mean	Standard deviation	Minimum	Maximum
EF	17,560	-1.601	0.671	-3.519	-0.254
DT	17,560	0.092	0.194	0.010	1.250
OC	17,560	0.633	0.460	0.062	2.648
SOE	17,560	0.485	0.500	0	1
AGE	17,560	2.886	0.360	1.609	3.466
BOARD	17,560	2.154	0.197	1.609	2.708
SIZE	17,560	22.445	1.343	19.658	26.368
LEV	17,560	0.467	0.212	0.056	0.946
GROWTH	17,560	0.171	0.531	-0.592	3.864
TOP1	17,560	0.342	0.151	0.084	0.748
DUAL	17,560	0.207	0.405	0	1

Model (4) are for verifying H1. From Model (4) to Model (6) are for verifying H2. Additionally, H3, H4, and H5 are verified by heterogeneity analysis according to Model (4).

$$EF = \alpha_0 + \alpha_1 DT + \alpha_2 YEAR + \alpha_3 IND + \mu_0 \quad (3)$$

$$EF = \beta_0 + \beta_1 DT + \beta_2 Controls + \beta_3 YEAR + \beta_4 IND + \mu_1 \quad (4)$$

$$OC = \gamma_0 + \gamma_1 DT + \gamma_2 Controls + \gamma_3 YEAR + \gamma_4 IND + \mu_2 \quad (5)$$

$$EF = \varepsilon_0 + \varepsilon_1 DT + \varepsilon_2 OC + \varepsilon_3 Controls + \varepsilon_4 YEAR + \varepsilon_5 IND + \mu_4 \quad (6)$$

where *EF* represents to dependent variable, Enterprise Financialization. *DT* represents to independent variable, Digital Transformation. *Controls* represents to control variables. *YEAR* and *IND* represent to dummy variable year and industry, respectively.

4. RESULTS AND DISCUSSIONS

In this study, STATA 16.0 software is adopted for statistics. In the beginning, Variance Inflation Factor (VIF) diagnosis is adopted to check the multicollinearity issue. The VIF result shows that the figure for the maximum VIF value is 1.436, and the figure for the mean VIF value is 1.189, which means there is no multicollinearity problem in this study.

4.1. Descriptive Statistics

To gain an understanding of the impact of DT on EF among Chinese public enterprises, descriptive statistics are conducted and its findings are presented in Table II.

According to the result, the natural logarithm value of EF has an average of -1.601, indicating an average financial asset proportion of approximately 20% of the total assets for observations over the past decade. The minimum value of EF is -3.519 (4.25%). The maximum value of EF is -0.254 (77.57%), which demonstrates that there are some public enterprises in China experiencing excessive

financialization. Furthermore, through the quartile results, the figures for EF at the 75th percentile and 90th percentile are -1.111 (32.90%) and -0.745 (47.47%), respectively. This suggests that 25% of sample enterprises have a higher EF level than 32.90%, and 10% of observations have a higher level than 47.47%. In fact, having over half of the assets in financialization represents a higher risk ratio for non-financial enterprises. Thus, this proves that the issue of EF deserves attention among Chinese enterprises and warrants further research.

Additionally, to mitigate the impact of data distribution on model sensitivity and accuracy, the Shapiro-Wilk W test is conducted on the dependent variable, EF, for normal distribution assessment. The test result shows that the W value is 0.99, and the figure for Prof > z is 0.00, indicating a normal distribution pattern for the dependent variable.

Besides, regarding the descriptive statistics of DT, the minimum value of 0.01 indicates that all observations have initiated their DT. It is noteworthy that based on the standard deviation, there is a considerable disparity in the degree of digital transformation among sample enterprises.

4.2. Baseline Regressions

In the baseline regression in column (1) of Table III, it is evident that prior to the inclusion of control variables, DT had a significantly negative impact on EF at a level of 1%. In column (2) of Table III, furthermore, upon incorporating control variables influencing EF, it can be seen that DT remains a significantly negative impact on EF at a 1% level in Table III. Moreover, the model's goodness of fit improved from 64.6% to 67.6%. This indicates that the inclusion of control variables enhances the precision of the model. In other words, H1 is supported.

4.3. Robustness Check

To mitigate endogeneity issues such as measurement errors in ordinary least squares, bidirectional causality, sample self-selection bias, fixed effects model regression, time-lag regression, and propensity score matching (PSM) method are adopted in this section.

Prior to conducting the fixed effects model regression, a Hausman test is performed. The Hausman test result

TABLE III: BASELINE REGRESSION RESULT

Variables	EF (1)	EF (2)
DT	-0.187*** (0.029)	-0.098*** (0.028)
SIZE	-	-0.026** (0.011)
LEV	-	-1.064*** (0.044)
AGE	-	-0.217*** (0.054)
GROWTH	-	-0.002 (0.009)
BOARD	-	0.097*** (0.034)
TOP1	-	0.112* (0.067)
DUAL	-	0.045*** (0.012)
SOE	-	-0.090*** (0.028)
YEAR	Control	Control
IND	Control	Control
CONSTANT	-1.563*** (0.069)	0.367 (0.327)
N	17560	17560
R ²	0.646	0.677

Note: *, **, and *** represent significance levels of 10%, 5% and 1%, respectively.

TABLE IV: ROBUSTNESS TEST

Variables	EF (1)	EF (2)
DT	−0.098*** (0.027)	−0.093*** (0.030)
SIZE	−0.026* (0.013)	−0.027** (0.011)
LEV	−1.064*** (0.078)	−1.063*** (0.044)
AGE	−0.217 (0.198)	−0.218*** (0.054)
GROWTH	−0.002 (0.008)	−0.002 (0.009)
BOARD	0.097* (0.045)	0.095*** (0.034)
TOP1	0.112 (0.062)	0.112* (0.067)
DUAL	0.045** (0.014)	0.045*** (0.012)
SOE	−0.090*** (0.014)	−0.089*** (0.028)
YEAR	Control	Control
IND	Control	Control
CONSTANT	0.362 (0.688)	0.393 (0.327)
N	17560	17560
R ²	0.675	0.677

Note: *, **, and *** represent significance levels of 10%, 5% and 1%, respectively.

TABLE V: PSM

Variables	Matched bias	P > t
SIZE	2.80%	0.053
LEV	4.10%	0.004
AGE	−0.80%	0.565
GROWTH	1.30%	0.347
BOARD	0.40%	0.770
TOP1	0.30%	0.817
DUAL	0.40%	0.800
SOE	0	0.977
ATT	−1.508***	

Note: *, **, and *** represent significance levels of 10%, 5% and 1%, respectively.

displays a Prob > χ^2 value of 0, which means that the Hausman test outcome suggests employing the fixed effects model rather than the random effects model in the robustness test. The finding in Column (1) of Table IV shows that DT has a significant negative impact on EF at the 1% level, indicating the robustness of regression results.

Meanwhile, considering the controversies from previous studies, the possibility of bidirectional causality between DT and EF should be considered. A common robustness test to address bidirectional causality involves lagging the dependent variable and then conducting the regression. Therefore, the dependent variable is lagged by one year, and a regression analysis. Based on the regression results in Column (2) of Table IV, DT has a significantly negative impact on EF at the 1% level. In other words, it reveals that the existence of bidirectional causality between DT and EF is excluded.

What is more, considering the possibility of sample selection bias, the Propensity Score Matching (PSM) method is adopted, grouping the characteristics of high and low DT into two binary groups to conduct regression analysis. According to the regression results in Table V, it shows that DT has a significantly negative impact on EF at the 1% level. In other words, H1 is verified robustly.

4.4. Mechanisms

To figure out the mediator mechanism between DT and EF, as well as verify H2 in this study, Model (5) and Model

TABLE VI: MEDIATOR EFFECT

Variables	EF (1)	EF (2)
DT	0.072*** (0.019)	−0.095*** (0.030)
OC	—	−0.041*** (0.015)
SIZE	−0.084*** (0.008)	−0.030*** (0.008)
LEV	0.159*** (0.026)	−1.058*** (0.031)
AGE	0.171*** (0.027)	0.002 (0.006)
GROWTH	0.083*** (0.005)	0.099*** (0.031)
BOARD	0.054*** (0.019)	0.044*** (0.011)
TOP1	−0.077** (0.038)	−0.090*** (0.024)
DUAL	−0.013* (0.007)	−0.210*** (0.051)
SOE	−0.015 (0.016)	0.109** (0.053)
YEAR	Control	Control
IND	Control	Control
CONSTANT	1.722*** (0.202)	0.438 (0.285)
N	17560	17560
R ²	0.817	0.678

Note: *, **, and *** represent significance levels of 10%, 5% and 1%, respectively.

TABLE VII: SOBEL-GOODMAN MEDIATOR TEST

	Coef.	Z value	P > Z
Sobel	−0.003	−2.331	0.020**
Goodman-1 (Aroian)	−0.003	−2.293	0.022**
Goodman-2	−0.003	−2.372	0.018**

Note: *, **, and *** represent significance levels of 10%, 5% and 1%, respectively.

(6) are adopted for regression, which results shown in Column (1) and Column (2) of Table VI respectively, to testify to the mediator effect of Operating Capacity (OC) between DT and EF. According to the result of Table VI, H2 can be verified that the negative impact of Digital Transformation (DT) on Enterprise Financialization (EF) is through enhancing Operational Capacity (OC).

Similarly, for robustness concerns, the Sobel-Goodman Mediator Test is adopted to test the mediator effect as a robustness test. The result in Table VII reveals that the P-value is less than 0.05, which means that the mediator effect is robust. In other words, H2 is verified robustly.

To investigate the impact of DT on EF in different types of firms, six subgroups were divided according to ownership, firm age, and board size, respectively, to verify H3, H4, and H5.

Firstly, the regression results of SOE subgroups in Table VIII reveal that the negative impact of DT on EF is much more pronounced in SOEs than in non-SOEs. This is probably because the industries of SOEs are related to energy, transportation, and other vital infrastructures. In general, these kinds of industries are usually characterized by high costs and long payback periods (Li *et al.*, 2014), and SOEs may hold financial assets to obtain revenue to balance efficiency and social responsibilities. However, due to the enhancing effect of DT on revenue, DT can enhance OC to reduce operation costs and restrain financial assets held in SOEs. In other words, H3 is verified.

Secondly, the regression results of AGE subgroups in Table VIII demonstrate that DT only restrains EF in start-up enterprises. This is probably because start-up enterprises face competitive marketing pressure and tend to invest cash flows in financial assets to hedge the main

TABLE VIII: MODERATOR EFFECT

Variables	EF					
	SOE = 0	SOE = 1	AGE < Median	AGE > Median	BOARD < Mean	BOARD > Mean
DT	−0.061*	−0.142***	−0.088**	−0.063	−0.140***	−0.018
	(0.033)	(0.050)	(0.039)	(0.055)	(0.053)	(0.035)
Control variables	Control	Control	Control	Control	Control	Control
YEAR & IND	Control	Control	Control	Control	Control	Control
CONSTANT	0.089	0.133	0.719	−3.234***	−0.446	0.210
	(0.459)	(0.467)	(0.494)	(1.036)	(0.779)	(0.411)
N	9038	8522	9085	8475	5817	5817
R ²	0.611	0.765	0.715	0.742	0.714	0.714

Note: *, **, and *** represent significance levels of 10%, 5% and 1%, respectively.

business operation risks (De Araújo Lima *et al.*, 2020). However, start-up enterprises with a high digital transformation level can enhance their OC to lower the main business operation risks and restrain EF. Meanwhile, non-start-up enterprises generally have demand for M&A and controlling subsidiary corporations for Long-term Equity Investment. Therefore, this is the reason why the negative impact of DT on EF is much more pronounced in start-up enterprises than in non-start-up enterprises. In other words, H4 is verified.

Lastly, the regression results of BOARD subgroups in Table VIII show that the negative impact of DT on EF is much more pronounced in board-minor-size enterprises than in non-minor-size board enterprises. This is probably because DT can provide visible information for board members in board minor-size enterprises making informed decisions in financial asset holding (Alabdullah *et al.*, 2019). In other words, H5 is verified.

5. CONCLUSIONS

In this study, the impact of Digital Transformation (DT) and Enterprise Financialization (EF) and its mechanisms are examined by adopting balanced panel data from Chinese A-shares evidence from 2011 to 2020. The research findings show that there is a negative impact of DT on EF, and this negative impact is through enhancing the level of Operational Capacity (OC). And that, this negative impact is much more pronounced in SOEs, start-up enterprises, and board minor-size enterprises. The findings hold significant implications for sustainable development in the real economy and the quality of microeconomic development. It can provide accordance for policymakers to determine future digital economy policy in China and suggest guidance for corporate governance, especially for SOEs, start-up enterprises, and board minor-size enterprises.

Nevertheless, there are some limitations in this study. One is that apart from operational capabilities, some additional mediator effects warrant further investigation to better understand the mechanisms between DT and EF. The other is that the governance effect of DT on EF across different industries deserves more investigation. Therefore, in the future research agenda, additional mediator effects and industry effects should be deeply examined.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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