

## Article

# Exploring the Impact of Digital Transformation on Corporate Violations in China's A-Share Market

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**Abstract:** Illegal and irregular behavior restricts the development of listed companies. Digital technology provides new opportunities for corporate governance, including the management of corporate violations, and companies are utilizing the “digital express” to achieve organizational restructuring and innovations in governance. In this study, the aim was to clarify whether digital transformation can disincentivize corporate violations in an environment where legal constraints remain inadequate. Therefore, samples of China's A-share-listed companies were used from 2013 to 2022, including a fixed-effects model to explore the impact of digital transformation on corporate violations. In this study, digital transformation is identified as significantly curbing the incidence of corporate violations. The moderating mechanism test shows that audit quality, analyst attention, and negative media reports all strengthen the inhibitory effect of digital transformation on corporate violations to varying degrees. Heterogeneity analysis identifies that the inhibitory effect of digital transformation on corporate violations is more pronounced in non-SOEs, large firms, and the manufacturing sector. In this study, the inhibitory effect of digital transformation on corporate violations is revealed, and the relevant literature on digital technology in the field of corporate governance is enriched, providing empirical references to promote the digital construction and healthy and compliant development of commercial enterprises.

**Keywords:** digital transformation; corporate violations; audit quality; analyst attention; negative media coverage



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## 1. Introduction

Among global science and technology innovations, digital technology is one of the areas with the most breakthroughs, driving the rapid growth of the digital economy. The data from the Global Digital Economy White Paper (2023) show that the digital economy accounted for 58% of global GDP in 2022, and digital technology is reshaping the dynamics of the global economy. The average annual growth rate of China's digital economy is 15.9%, which is significantly higher than the average GDP growth rate in the same period. Thus, digital technology is a major driver of national economic development. At present, the significant integration of digital technology and the real economy is accelerating the transformation and upgrading of traditional industries, giving rise to numerous new industries and business models. Commercial enterprises, as the microscopic main body of digital transformation, are the core driving force behind the construction of the digital economy [1]. Therefore, effectively empowering corporate governance using digital technology to drive high-quality corporate development is an important challenge in achieving China's sustainable economic development.

Illegal and irregular behavior has always been a “cancer” that restricts the high-quality development of listed companies. Traditional corporate governance aims to maximize economic benefits, and the excessive pursuit of growth in various indicators often ignores the organization's healthy development. This causes a variety of illegal and illicit behaviors

that not only undermine investor confidence and the interests of small and medium-sized shareholders, but also threaten the healthy development of the capital market [2,3]. The recent corporate violation scandals illustrate the major problems in the governance of listed companies and highlight the need to rectify illegal and irregular behavior [4]. Weak internal control is a major facilitator of corporate violations [5], especially in small and medium-sized enterprises [6]; therefore, improving the quality of internal controls can have a positive governance effect on potential violations [7]. Similarly, the penalties imposed by the securities regulatory authorities increase the cost of violations by listed companies, effectively curbing violations, especially in the context of state-owned property rights, a high degree of marketization, and a weak legal environment [8]. However, simply improving the internal systems and strengthening the external legal regulations is not completely effective, and the incidence of corporate violations continues to grow [9]. Therefore, improving the governance of listed companies and constraining corporate violations have become urgent issues in promoting capital market reform.

The rapid development and application of digital technologies have provided new possibilities for the governance of corporate violations. Enterprises have introduced digital technology into their existing management structure, dismantling the “pyramid” organizational structure created by the original industrialized management model and giving rise to a flat and networked “digital” organizational structure. This digital transformation has fundamentally changed the enterprise information structure, supervision efficiency, and management mechanisms, exerting a profound impact on corporate governance [10]. Digital transformation can significantly improve internal corporate governance, which, in turn, increases stock liquidity [11] and reduces the risk of stock price crashes [12]. Furthermore, digital transformation reduces transaction costs and information asymmetry, improving the enterprise’s ability to raise funds [13] and reducing operational risks, thus alleviating financial distress [14]. Additionally, digital transformation has a positive impact on corporate environmental performance [15], shaping corporate social responsibility [16], and enhancing corporate sustainability [17]. However, digital transformation is also a double-edged sword. In the context of the rapid iteration of digital technologies, corporate data rights have increased [18], the cost of violations has decreased [19], and the pressure of refinancing has risen [20], all of which contribute to managers’ opportunistic behavior, which has a negative impact on corporate governance [21]. In this context, it is particularly important to explore whether digital transformation has a governance effect on corporate violations.

External oversight mechanisms play an important role in corporate governance. In the managerial sense, external supervisors are any stakeholders in the external environment of the enterprise who are affected by the decisions and actions of the organization. They are generally divided into legal and social supervision, represented by the government and media, respectively, whose existence effectively compensates for internal governance deficiencies [22]. The strengthening of external oversight can improve the transparency and efficiency of corporate governance, reduce internal corruption and misconduct, and promote sustainable corporate development [23]. However, under the current conditions where legal constraints are still unsound, the effect of the regulatory authorities on the governance of violations is limited, and so the social supervision mechanism as the “third right” fills this governance loophole [24]. Giving full play to the disciplining role of social supervisory forces, such as the media, can effectively reduce the misuse of digital technology, thereby preventing potential corporate violations [25]. The promotion of corporate governance through digital transformation, independent auditing, the media, and analysts, as the three basic forces of social supervision, means these forces can potentially play extremely important roles, which should not be ignored.

To comprehensively understand the role of digital technology in corporate governance and further clarify the relationship between digital transformation and corporate irregularities, in this study, data from Chinese A-share-listed companies from 2013 to 2022 were selected as the sample. The digital transformation indicators were constructed using the

crawling function in relation to word frequencies, the impact of digital transformation on corporate violations were analyzed, and the three main external supervision forces were used as the moderating mechanisms to explore the effects of audit quality, analyst attention, and negative media coverage on the relationship between digital transformation and corporate violations.

The contributions of this study are as follows: First, in this study, research into digital technology in the field of corporate governance is promoted, and theoretical support is provided for improving corporate governance with the help of digital transformation. Second, the existing research on the factors influencing corporate violations is enriched, and a theoretical basis is added for the effective management of violations. Third, the study of external systems in which digital transformation exerts governance effects is expanded, revealing the mechanisms through which external supervision works to counteract violations. The conclusions of this study provide a reference for the relevant departments to formulate policies and strengthen management on the one hand and provide insights for enterprises to promote digitization and prevent corporate violations on the other hand.

## 2. Theoretical Background and Hypotheses

### 2.1. Digital Transformation and Corporate Violations

According to the fraud triangle theory, the element of “opportunity” is a key condition for the emergence of corporate violations. The existence of objective factors such as information asymmetry and weak internal controls creates a favorable time for enterprises to commit corporate violations, and enterprises are likely to act to the detriment of others in order to maximize their own interests. Combined with the principal agent theory, the governance model of the separation of powers will inevitably lead to internal governance conflicts and information asymmetry, which cannot be fundamentally resolved through institutional arrangements. The use of digital technology offers the possibility of easing agency conflicts [26]. The essence of digital transformation is the significant integration of all aspects of the enterprise elements with digital technology [27], leading to systematic structural innovation and the upgrading of governance, information structures, and operational mechanisms [28], and the realization of the sustainable transformation of the development model from industrialization to digitalization [29]. Studies have shown that the “corporate governance innovation” triggered by digital transformation can effectively curb violations and thus promote the high-quality development of enterprises [30]. In this study, it is argued that digital transformation can curb corporate violations through mechanisms that mainly concern two areas: organizational structure and information sharing.

Digital transformation reconfigures and optimizes the traditional corporate organizational form to achieve an improved level of corporate governance, thus indirectly reducing the probability of violations [31]. The existing literature focuses on the three following aspects of internal control quality, risk-taking, and governance structure: First, Zhao et al. identified, based on their study of the enterprise life cycle, that digital transformation enhances internal control effectiveness through reductions in agency costs, thus promoting the smooth operation of the enterprise [32]. Second, digital transformation improves operational flexibility and the availability of financing, which in turn facilitate corporate risk-taking [33] and significantly increase corporate resilience to external shocks [34]. And third, digital transformation has led to the redistribution of power within commercial enterprises, narrowing the unequal relationship between management and ordinary employees [35] and curbing executive corruption by mitigating agency conflicts [36].

However, digital transformation also realizes resource integration and information sharing, which alleviates enterprises’ information asymmetry and prevents potential violations [37]. The existing literature has focused on the efficiency of information utilization and the quality of information disclosure. The enterprises supported by digital technology strengthen the utilization efficiency of their information resources, adapt more effectively to the changing market environment and fragmented user needs, and essentially reduce the irrational decisions made by managers based on experience and intuition [38]. Digital

technologies increase corporate information transparency in the long run [39] and improve the quality of information disclosure by mitigating agency problems [40]. Consequently, the government, investors, and other stakeholders can more effectively monitor the business management and further improve the enterprise's learning ability, adaptability, and corrective capacity to achieve the effect of regulating improper behavior [41].

In this study, it is argued that digital transformation can help to optimize governance structures and reduce information asymmetry, thereby adequately curbing the conditions under which corporate violations arise. In summary, the following hypothesis is proposed:

**Hypothesis 1 (H1).** *Digital transformation can significantly curb corporate violations.*

## 2.2. Moderating Effect of External Oversight

According to the stakeholder theory, the survival and development of commercial enterprises depend on the quality of their responses to the requirements of various stakeholders, and their business behaviors must either consider their interests or be subject to their constraints. Therefore, whether enterprises can achieve successful digital transformation and empower corporate governance requires not only internal drivers but also the support of the external environment [42]. Among the external factors regulating enterprise behavior, in addition to the government, the securities regulators, exchanges, and other legally mandatory institutions, the media, analysts, and auditing institutions, as the other important external supervisory forces of the capital market, will implement more tracking, attention, and evaluation of enterprises in the process of digital transformation, and their interventions have become important factors in restraining the behavior of enterprises [43]. Strengthening the external supervision mechanisms has been proven to significantly curb certain violations and fraudulent behaviors and effectively empower corporate governance [44]. Based on the research perspective in this study, three main external monitoring factors—audit quality, analyst attention, and negative media coverage—were considered as the moderating mechanisms to explore whether they can play a positive role in curbing corporate violations in the context of digital transformation.

### 2.2.1. Moderating Effect of Audit Quality

Unlike internal audits, which are subject to management and shareholder constraints, external audits provide an objective and fair assessment and supervision of information quality from an independent third-party perspective, which effectively promotes enterprises' compliance. Zadeh found that external audit quality was positively related to audit costs and that high-quality audits significantly enhanced information transparency and promoted compliance in internal decision-making [45]. Simultaneously, companies audited by the Big Four accounting firms are more likely to reduce insider trading behavior, effectively protecting the rights of small and medium shareholders [46]. Additionally, ESG reports audited by third parties exhibit higher ratings, reflecting the role of the auditors in monitoring the quality of firms' nonfinancial information [47]. In this study, it is argued that high-quality external audits ensure the accuracy of disclosure and the effectiveness of internal controls and establish a favorable internal environment for digital transformation to curb corporate violations. Based on the above analysis, the following hypothesis is proposed:

**Hypothesis 2 (H2).** *Higher audit quality results in a more significant dampening effect of digital transformation on corporate violations.*

### 2.2.2. Moderating Effect of Analyst Attention

Because internal management and external demands are at opposite ends of the information asymmetry spectrum, analysts utilize their professional backgrounds to mine and analyze data on target firms, which strengthens the corporate governance and oversight of enterprises. Liu et al. identified that analyst coverage can deter corporate fraud

by influencing information transparency and investor attention, especially in the case of disclosure violations [48]. Simultaneously, firms with more analyst followers have a lower information asymmetry, which can create positive pressure on management and reduce misconduct [49]. In addition, analyst attention raises awareness of corporate social responsibility and mitigates the corporate behavior of purely pursuing economic benefits [50]. In this study, it is argued that analyst attention can generate positive messaging and monitoring effects, providing a good external environment for digital transformation to curb corporate violations. Digital transformation can improve analyst attention when data are easier and more open to access. Based on the above analysis, the following hypothesis is proposed:

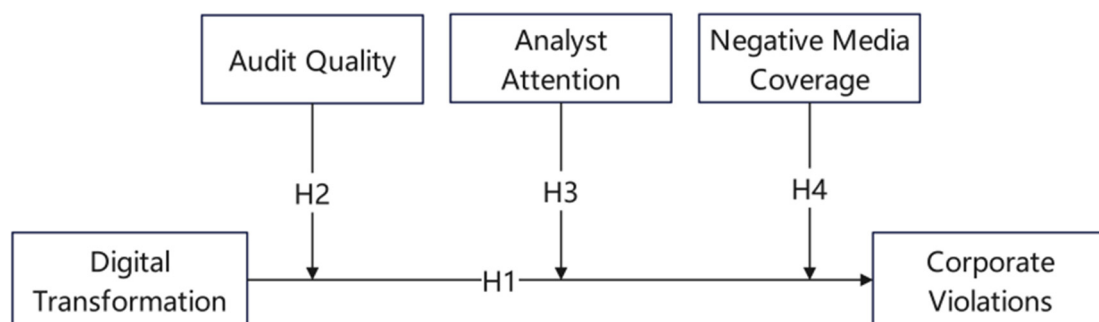
**Hypothesis 3 (H3).** *Greater analyst attention results in a more significant dampening effect of digital transformation on corporate violations.*

### 2.2.3. Moderating Effect of Negative Media Coverage

As an intermediary in the collection, processing, and dissemination of information, the disciplining effect of the media on corporate behavior stems mainly from the reputational mechanism, which creates public opinion pressure, forcing managers to reduce opportunistic behaviors. Jiang et al. discovered that in a tightly regulated market environment, corporate violations are accompanied by more negative news coverage and a higher risk of being investigated, indicating that media attention is an effective mechanism for the governance of corporate violations [51]. Simultaneously, the media exposure worsens financial performance in the short term, exacerbating the risk of stock crashes and increasing the subsequent costs of corporate reputation rebuilding, which in turn creates incentives for management to correct errors and reduce the incidence of misconduct [52,53]. In addition, negative media coverage can promote the construction of internal controls, thus reducing the level of corporate tax avoidance [54], while effectively restraining the corrupt behavior of major shareholders [55]. In this study, it is argued that negative media coverage can release deterrent signals, providing favorable conditions for digital transformation to curb corporate violations. Based on the above analysis, the following hypothesis is proposed:

**Hypothesis 4 (H4).** *Greater negative media coverage results in a more significant dampening effect of digital transformation on corporate violations.*

In Figure 1, the framework of this study is presented.



**Figure 1.** The research framework.

## 3. Research Methodology and Design

### 3.1. Samples and Data

The concept of digital transformation was first proposed by IBM in 2012, and since 2013, the wave of digital transformation has been rapidly expanding in China; therefore, 2013 was selected as the starting year of the sample. As the data measuring the indicators were only updated to 2022, the year 2022 was chosen as the termination year of the sample.

In this paper, the data of A-share-listed companies from 2013–2022 were used as the initial sample, and the data were screened according to the following criteria: First, the financial sector was excluded because the financial and non-financial sectors in China use different accounting standards. Second, the ST, ST\*, and PT samples were excluded because they were not in line with the actual situation due to abnormal financial conditions. Finally, the samples with grossly anomalous observations and large amounts of missing data were excluded to ensure the reliability of the findings. As a result, 18,740 “firm-year” observations were obtained. Referring to the practice of established studies and addressing possible cross-sectional correlation issues, we performed firm-level clustering of standard errors [56]. To mitigate the effects of extreme values, in this study, all variables were reduced at the upper and lower 1% levels [57]. In addition, some indicators were treated as natural logarithms to smooth the data distribution [58]. The data used in this paper to construct the digital transformation indicators were obtained from the “Management Discussion and Analysis” of the annual reports of listed companies; the data on negative media coverage were from the CNRDS database; and the data on corporate violations and other variables were from the CSMAR database. The data processing software was Stata 17.0.

### 3.2. Variable Definition

**Dependent variable:** In this study, announcements of penalties imposed on listed companies by the China Securities Regulatory Commission (CSRC) and other authorities were collected and defined by the existence of accounting violations, tax violations, and disclosure violations, within which they were further subdivided into 25 categories of violations, such as fictitious profits, misrepresentation of assets, and false records. Drawing on the work of Fei [59] et al., the number of annual violations was used to measure the extent of corporate violations. Owing to the long period of regulatory disclosure of violations, the year in which the violations actually occurred was taken as the violation year to ensure comparability between the samples. Table 1 summarizes the types of corporate violations.

**Table 1.** The types of corporate violations.

A	Fictitious profits	N	Guarantee irregularities
B	Misrepresentation of assets	O	Improper general accounting treatment
C	False records	P	Tax evasion
D	Delayed disclosure	Q	Evading collection of arrears
E	Major omission	R	Fraudulent export tax refunds
F	False disclosure	S	Tax resistance
G	Fraudulent listing	T	False VAT invoices
H	Funding irregularity	U	False general invoices
I	Unauthorized change in fund usage	V	Printed, forged or altered invoices
J	Occupation of assets	W	Fraudulent tax incentives
K	Insider trading	X	Tax arrears
L	Illegal trading of stocks	Y	Others
M	Manipulating stock prices		

**Independent variable:** There is no uniform metric in academia to calculate the true extent of a company’s digital transformation, and the textual analysis used by Elmarzouky et al. is commonly utilized [60–63]. The steps for constructing the digital transformation metrics in this study were as follows: First, a keyword thesaurus for digital transformation was constructed with reference to the existing research [64]. Second, the annual reports of the sample companies were assembled and collated using the crawler function of Python software 3.8, and all the text contents in the annual reports were extracted through Java PDFbox software 2.0.6. Finally, the extracted annual report text was searched, matched,

and counted based on a keyword thesaurus to obtain the word frequency of digital transformation as a measure of the degree of digital transformation of the enterprises. Table 2 shows the keyword thesaurus for digital transformation.

**Table 2.** The keyword thesaurus of digital transformation.

Classification of Indicators	Names of Indicators
Digital Technology	Mobile internet, Industrial internet, Mobile internet, Internet healthcare, E-commerce, Mobile payment, Third party payment, NFC payment, B2B, B2C, C2B, C2C, O2O, Internet connectivity, Smart wearable, Smart agriculture, Smart transport, Smart healthcare, Smart customer service, Smart home, Smart investment, Smart tourism, Smart environmental protection, Smart grid, Smart energy, Smart marketing, Digital marketing, Unmanned retail, Internet finance, Digital finance, Fintech, Quantitative finance, Open banking
Artificial intelligence technology	Artificial intelligence, Business intelligence, Image understanding, Investment decision aids, Intelligent data analytics, Intelligent robotics, Machine learning, Deep learning, Semantic search, Biometrics, Face recognition, Speech recognition, Identity verification, Autonomous driving, Natural language processing
Blockchain technology	Digital currency, Smart contracts, Distributed computing, Decentralization, Bitcoin, Coalition chains, Differential privacy technology, Consensus mechanisms
Cloud computing technology	Memory computing, Cloud computing, Streaming computing, Graph computing, Internet of things, Multi-party secure computing, Brain-like computing, Green computing, Cognitive computing, Converged architecture, Billion levels of concurrency, EB levels of storage, Information physical systems
Big data technology	Big data, Data mining, Text mining, Data visualization, Heterogeneous data, Credit, Augmented reality, Mixed reality, Virtual reality

**Moderating variables:** According to the existing studies, corporate audit quality is measured by whether the firm is audited by an international Big Four accounting firm [65], analyst attention is measured by the number of times the firm is tracked by analysts [66], and negative media coverage is measured by taking the natural logarithm of the number of negative media coverage plus one [67].

**Control variables:** To exclude the influence of other factors based on the established research [68], in this paper, the following variables were controlled: board size (BS), proportion of independent directors (PI), combined rights (CRs), management shareholding (MS), shareholding concentration (SC), enterprise size (ES), growth rate (GR), profitability (PF), managerial ability (MA), and financial leverage (FL). Additionally, industry and year dummy variables are included to ensure the reliability of this study. Table 3 presents the definitions and measurements of the variables.

**Table 3.** The definition and measurement of the variables.

Variables	Name	Symbol	Definition
Dependent variable	Corporate violations	CV	Number of violations disclosed annually
Independent variable	Digital transformation	DT	Number of keyword occurrences in the annual report
Moderating variables	Audit quality	QA	Taking 1 if audited by Big Four accounting firms and 0 otherwise
	Analyst attention	AT	Number of times tracked by analysts
	Negative media coverage	MF	Natural logarithm of the number of negative media coverage plus one

Table 3. Cont.

Variables	Name	Symbol	Definition
Control variables	Board size	BS	Number of board members
	Proportion of independent directors	PI	Number of independent directors/Number of board members
	Combined rights	CRs	Taking 1 if the chairman and CEO are the same person and 0 otherwise
	Management shareholding	MS	Proportion of management shareholding
	Shareholding concentration	SC	Proportion of shares held by major shareholders
	Enterprise size	ES	Natural logarithm of total assets
	Growth rate	GR	Revenue growth rate
	Profitability	PF	Return on total assets
	Managerial ability	MA	Total assets turnover
	Financial leverage	FL	Asset liability ratio
	Industry dummy variables	Ind	Belonging to the industry is 1 and 0 otherwise
	Year dummy variables	Year	Belonging to the year is 1 and 0 otherwise

### 3.3. Model Design

Referring to the established studies [69], we performed the Hausman test on the panel data and constructed four fixed-effects models to test the previous hypotheses. In the four models, CV is the dependent variable and DT is the independent variable; QA, AT, and MF are the moderating variables representing audit quality, analyst attention, and negative media coverage, respectively;  $\sum$ Controls are a set of control variables that affect corporate violations; Ind and Year are industry fixed-effect and year fixed-effect, respectively;  $\epsilon$  is the random perturbation term;  $\alpha_0$  is the constant term; and  $i$  and  $t$  represent individuals and years, respectively.

Model (1) tests the relationship between digital transformation and corporate violations.  $DT_{i,t}$  denotes the degree of digital transformation of company  $i$  in year  $t$ ; the larger the value, the higher the level of digitization of that company in that year. If  $\alpha_1$  is negative and passes the significance test, it means that the digital transformation can reverse the influence of corporate violations, which supports Hypothesis 1; if  $\alpha_1$  fails the test of significance or is positive and passes the test of significance, it means that the digital transformation cannot affect or positively affects corporate violations, thus invalidating Hypothesis 1.

Models (2)–(4) test the moderating effects of audit quality, analyst attention, and negative media coverage on the relationship between digital transformation and corporate violations, respectively. In Model (2), the interaction term between audit quality and digital transformation ( $DT_{i,t}QA_{i,t}$ ) is added to test the moderating effect of audit quality. If  $\alpha_3$  is negative and passes the test of significance and  $\alpha_1$  is negative and passes the test of significance, it means that the higher the quality of the auditing process, the more significant is the inhibitory effect of digital transformation on corporate violations, which supports Hypothesis 2; if  $\alpha_3$  is positive and passes the significance test and  $\alpha_1$  passes the significance test, it means that the audit quality has a negative moderating effect on the relationship between digital transformation and corporate violations, and Hypothesis 2 is not valid. Models (3) and (4) are similar to Model (2).

$$CV_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \sum Controls_{i,t} + Ind + Year + \epsilon_{i,t} \quad (1)$$

$$CV_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 QA_{i,t} + \alpha_3 DT_{i,t}QA_{i,t} + \sum Controls_{i,t} + Ind + Year + \epsilon_{i,t} \quad (2)$$



$$CV_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 AT_{i,t} + \alpha_3 DT_{i,t} AT_{i,t} + \sum \text{Controls}_{i,t} + \text{Ind} + \text{Year} + \varepsilon_{i,t} \quad (3)$$

$$CV_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 MF_{i,t} + \alpha_3 DT_{i,t} MF_{i,t} + \sum \text{Controls}_{i,t} + \text{Ind} + \text{Year} + \varepsilon_{i,t} \quad (4)$$

## 4. Empirical Analysis

### 4.1. Descriptive Statistics

Table 4 presents the descriptive statistics. The average value of corporate violations is 0.428, indicating that the proportion of A-share-listed companies with corporate violations during 2013–2022 was 42.8%, with an average of approximately 43 out of 100 companies experiencing corporate violations. The standard deviation is 1.040, which is a low level of dispersion and indicates that corporate violations are common across firms. The average value of digital transformation is 7.414, and the standard deviation is 13.681, indicating a significant difference in the level of digitization in different companies. It is worth noting that the median, minimum, and maximum values are 4, 0, and 428, respectively, reflecting that the digital transformation of most enterprises is still in its infancy; however, the wave of industrial digitization shows an accelerating development trend. Specific analyses of other variables will not be repeated. According to the results of the descriptive statistics, all sample data meet the criteria and can be analyzed empirically in the next step.

**Table 4.** The descriptive statistics.

Variables	Obs	Mean	Std. Dev.	Median	Min	Max
CV	18,740	0.428	1.040	0	0.000	15
DT	18,740	7.414	13.681	4	0.000	428
QA	18,740	0.250	0.433	0	0.000	1.000
AT	18,740	7.256	10.090	3.000	0.000	75.000
MF	18,740	4.131	1.887	3.970	0.000	12.425
BS	18,740	8.613	1.712	9.000	5.000	18.000
PI	18,740	0.377	0.058	0.036	0.333	0.800
CRs	18,740	0.232	0.422	0.000	0.000	1.000
MS	18,740	0.092	0.159	0.002	0.000	0.892
SC	18,740	0.334	0.150	0.310	0.003	0.900
ES	18,740	22.606	1.348	22.418	18.927	28.636
GR	18,740	0.008	0.338	0.001	−0.117	45.000
PF	18,740	0.048	0.072	0.046	−1.224	0.831
MA	18,740	0.630	0.576	0.516	0.003	13.914
FL	18,740	0.437	0.197	0.433	0.008	1.037

### 4.2. Correlation Analysis

Table 5 presents the results of the correlation analyses. Pearson’s correlation coefficient was used to analyze the correlations between all variables. The correlation coefficient between digital transformation and corporate violations is  $-0.024$  and is significant at the 1% level, with a high negative correlation between the two, which initially indicates that digital transformation has an inhibitory effect on corporate violations; however, the correlation coefficient alone is unreliable for judging the relationship between the two, and further regression analysis is needed. In addition, there is a significant correlation between most of the control variables and corporate violations. The maximum value of the variance inflation factor (VIF) among the variables is 0.9996, which is less than the empirical value of five. This indicates that there is no serious multicollinearity problem among the variables, and all variables can be included in the regression analysis model.

**Table 5.** The correlation analysis.

	CV	DT	QA	AT	MF	BS	PI	CRs	MS	SC	ES	GR	PF	MA	FL
CV	1														
DT	−0.024 ***	1													
QA	−0.125 ***	0.061 ***	1												
AT	−0.081 ***	0.047 ***	0.070 ***	1											
MF	−0.047 ***	−0.028 ***	0.036 ***	0.094 ***	1										
BS	−0.055 ***	−0.013 *	0.042 ***	0.093 ***	0.050 ***	1									
PI	0.014 **	0.029 ***	0.016 **	0.036 ***	0.024 ***	−0.484 ***	1								
CRs	0.039 ***	0.078 ***	−0.029 ***	0.027 ***	−0.018 **	−0.174 ***	0.112 ***	1							
MS	0.035 ***	0.081 ***	−0.052 ***	0.051 ***	−0.027 ***	−0.177 ***	0.048 ***	0.223 ***	1						
SC	−0.120 ***	−0.078 ***	0.074 ***	0.047 ***	0.059 ***	0.063 ***	0.033 ***	−0.101 ***	−0.149 ***	1					
ES	−0.077 ***	−0.00900	0.162 ***	0.359 ***	0.143 ***	0.267 ***	0.030 ***	−0.142 ***	−0.315 ***	0.235 ***	1				
GR	0	0.00400	0.013 *	−0.00900	0	−0.00300	0.00100	−0.00500	−0.00400	0.00800	0.00200	1			
PF	−0.156 ***	−0.028 ***	0.022 ***	0.339 ***	0.016 **	0.067 ***	−0.024 ***	−0.016 **	0.035 ***	0.137 ***	0.098 ***	0.00200	1		
MA	−0.032 ***	0.109 ***	0.0120	0.055 ***	0.00100	0.016 **	−0.017 **	−0.025 ***	−0.074 ***	0.066 ***	0.038 ***	0.00300	0.092 ***	1	
FL	0.020 ***	−0.031 ***	0.057 ***	−0.00300	0.053 ***	0.134 ***	0.00600	−0.093 ***	−0.284 ***	0.096 ***	0.514 ***	0.014 **	−0.192 ***	0.143 ***	1

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

### 4.3. Regression Analysis

Table 6 presents the regression analysis results. In the table, the first column shows the regression results of Model (1). The coefficient of digital transformation is  $-0.0054$  and passes the significance test at the 1% level, which indicates that digital transformation has a negative impact on corporate violations. The above results confirm that digital transformation has an actual governance effect that can significantly inhibit the occurrence of corporate violations, as evidenced by the fact that the higher the degree of digital transformation, the lower the number of corporate violations generated by the enterprise as a whole. Therefore, Hypothesis 1 is tested.

**Table 6.** The regression analysis.

	(1)	(2)	(3)	(4)
VARIABLES	CV	CV	CV	CV
Constant	0.8977 *** (3.66)	0.6779 *** (2.77)	0.6503 ** (2.44)	0.8247 *** (3.34)
DT	−0.0054 *** (−4.93)	−0.0039 *** (−4.24)	−0.0076 *** (−5.34)	0.0016 (0.55)
QA		−0.2515 *** (−17.22)		
DTQA		−0.0014 *** (−3.18)		

Table 6. Cont.

	(1)	(2)	(3)	(4)
VARIABLES	CV	CV	CV	CV
AT			−0.0049 *** (−3.58)	
DTAT			−0.0002 *** (2.75)	
MF				−0.0044 (−1.00)
MFDT				−0.0017 ** (−2.23)
BS	−0.0136 (−1.51)	−0.0139 (−1.54)	−0.0138 (−1.53)	−0.0136 (−1.52)
PI	0.1730 (0.78)	0.1642 (0.75)	0.1774 (0.80)	0.1894 (0.86)
CRs	0.0106 (0.39)	0.0082 (0.30)	0.0124 (0.45)	0.0112 (0.41)
MS	0.0030 (0.03)	−0.0080 (−0.08)	0.0357 (0.36)	0.0051 (0.05)
SC	−0.7155 *** (−8.26)	−0.6836 *** (−7.93)	−0.7371 *** (−8.49)	−0.7190 *** (−8.33)
ES	−0.0111 (−0.90)	0.0014 (0.11)	0.0025 (0.18)	−0.0071 (−0.57)
GR	−0.0157 (−0.94)	−0.0104 (−0.62)	−0.0165 (−0.99)	−0.0149 (−0.88)
PF	−1.4976 *** (−6.08)	−1.4878 *** (−6.09)	−1.4221 *** (−5.60)	−1.5020 *** (−6.09)
MA	−0.0009 (−0.03)	−0.0040 (−0.13)	0.0026 (0.08)	0.0023 (0.07)
FL	0.2056 ** (2.57)	0.1964 ** (2.46)	0.1784 ** (2.21)	0.2047 ** (2.57)
Observations	18,740	18,740	18,740	18,740
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
r <sup>2</sup>	0.0522	0.0635	0.0526	0.0516

Note: t-statistics are in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ .

The second, third, and fourth columns show the regression results for Models (2), (3), and (4), respectively. In the second column, the coefficient of the interaction term is  $-0.0014$  and passes the significance test, and the coefficient of digital transformation is significantly negative, indicating that the inhibitory effect of digital transformation on corporate violations is more pronounced as the audit quality improves, which supports Hypothesis 2. Similarly, the results in the third and fourth columns show that analyst attention and negative media coverage reinforce the inhibitory effect of digital transformation on corporate violations, supporting Hypothesis 3 and 4, respectively.

#### 4.4. Robustness Test

##### 4.4.1. Instrumental Variable Method

In the previous section, the dampening effect of digital transformation on corporate violations was verified; however, there may be reverse causality in this finding. That is, firms with fewer violations are able to drive digital transformation. To address the endogeneity issue, we have used two-stage least squares (2SLS) for the robustness test. Internet penetration is used as an instrumental variable for digital transformation by referring to existing practices [70]. On the one hand, Internet penetration in the region where the enterprise is located promotes digital transformation to a certain extent, which satisfies the relevance condition of the instrumental variable. However, the Internet as a tool for information exchange does not directly affect corporate violations, satisfying the exclusivity condition of the instrumental variable. The results of the first-stage regression show that the coefficient of Internet penetration is 0.1091 and is significant at the 1% level, which is positively related to the independent variable. The F-statistic is 41.0886, greater than the empirical value of 10, which rejects the original hypothesis of a weak instrumental variable and makes it more reasonable to select this instrumental variable. The results of the second-stage regression show that the coefficient of digital transformation is  $-0.0224$  and is significant at the 1% level, indicating that digital transformation has a significant inhibitory effect on corporate violations. Therefore, Hypothesis 1 remains valid after solving the endogeneity issue. Table 7 presents the test results of the instrumental variable method.

**Table 7.** The instrumental variable method.

VARIABLES	(1)	(2)
	DT	CV
	First Stage	Second Stage
Internet	0.1091 *** (3.85)	
DT		$-0.0224$ *** ( $-3.42$ )
Controls	YES	YES
Constant	$-26.6356$ *** ( $-2.67$ )	$1.4302$ *** ( $9.01$ )
Observations	18,740	18,740
Industry FE	YES	YES
Year FE	YES	YES
$r^2$	0.0382	.
F value	41.0886	

Note: t-statistics are in parentheses; \*\*\*  $p < 0.01$ .

##### 4.4.2. Replacing the Core Variable

In this study, the dependent variable is adjusted to a dummy variable that measures whether the firm has violations, taking the value of one if the firm has violations in the current year and zero otherwise. The regression results show that the coefficient of digital transformation is  $-0.0028$  and is significant at the 1% level; the test results of replacing the core variable are consistent with the previous conclusions, further verifying Hypothesis 1. Table 8 lists the test results of replacing the core variable.

**Table 8.** Replacing the core variable.

VARIABLES	R.CV
DT	−0.0028 *** (−4.95)
Controls	YES
Constant	0.6441 *** (6.64)
Observations	18,740
Industry FE	YES
Year FE	YES
$r^2$	0.0446

Note: t-statistics are in parentheses; \*\*\*  $p < 0.01$ .

#### 4.4.3. Lagged Variable

Considering the long cycle of digital transformation, there is an inevitable lag in the impact on corporate violations; therefore, the dependent variable is regressed with a one-period lag. The results show that the regression coefficient of digital transformation is  $-0.0018$  and is significant at the 1% level, indicating that the inhibitory effect of digital transformation on future-period violations still exists, further supporting Hypothesis 1. Table 9 presents the test results for the lagged variables.

**Table 9.** The lagged variables.

VARIABLES	CV
L.DT	−0.0018 ** (−2.49)
Controls	YES
Constant	0.6734 *** (2.68)
Observations	16,866
Industry FE	YES
Year FE	YES
$r^2$	0.0471

Note: t-statistics are in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ .

#### 4.4.4. Heterogeneity Analysis

The inhibitory effect of digital transformation on corporate violations may vary between firms with different property rights. The state-owned enterprises (SOEs) usually occupy an industry monopoly position, resulting in less competitive pressure, while their internal and external governance structure is more complete under the multiple supervision of the State-Owned Assets Supervision and Administration Commission (SASAC) and other departments; therefore, their tendency to violate the law is relatively weak. Non-SOEs have greater pressure to survive in a competitive market environment, and the governance model of over-centralization often results in irrational decision-making by the management, so their tendency to violate the law is stronger [71,72]. For this purpose, all samples were divided into two groups, SOEs and non-SOEs, according to the nature of property rights for heterogeneity analysis. Column (1) shows the regression results for the sample of non-SOEs, with a coefficient of  $-0.0061$  and significance at the 1% level, indicating that digital transformation has a significant inhibitory effect on non-SOE violations. Column (2)

shows the regression results for the sample of SOEs, with a coefficient of  $-0.0012$ , which is not significant, indicating that digital transformation is not effective in governing violations in SOEs. Evidently, digital transformation plays a more significant role in violation governance in non-SOEs compared to SOEs.

The inhibitory effect of digital transformation on violations may vary between firms of different sizes. Smaller firms are less liquid and receive relatively less external attention, leading to more serious information asymmetry and being less likely to be detected by regulators when corporate violations occur. Larger firms have high liquidity, better disclosure mechanisms, and more external attention, making fraud difficult to hide, and any corporate violations can be easily detected by the regulator [73]. For this purpose, all samples were divided into two groups, large enterprises and small and medium-sized enterprises (SMEs), according to their asset size for heterogeneity analysis. Similar to the analysis of property rights heterogeneity, the regression coefficients in columns (3) and (4) suggest that digital transformation exerts a better corporate violation governance effect in large firms compared to SMEs.

The inhibitory effect of digital transformation on violations may also vary between firms in different industries. China's manufacturing industry is still labor-intensive, and the weakening of the demographic dividend has forced manufacturers to massively increase the application of intelligent equipment, resulting in a significant degree of digital transformation. The non-manufacturing industries (excluding the financial sector) often lack strategic planning and financial support and can only carry out an intelligent transformation of some parts of their business activities; therefore, the degree of digital transformation is low. For this purpose, all the samples were divided into two groups, the manufacturing and non-manufacturing sectors, according to the industry category for heterogeneity analysis. Similar to the analysis of property rights heterogeneity, the regression coefficients in columns (5) and (6) suggest that digital transformation exerts a better violation governance effect in the manufacturing industry compared to non-manufacturing industries.

Table 10 presents the results of the heterogeneity analysis.

**Table 10.** The heterogeneity analysis.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	CV	CV	CV	CV	CV	CV
	NP = 0	NP = 1	ES = 0	ES = 1	IC = 0	IC = 1
DT	−0.0061 ***	−0.0012 *	−0.0039 ***	−0.0020 ***	−0.0169 ***	−0.0048 ***
	(−5.18)	(−1.80)	(−2.64)	(−3.36)	(−7.17)	(−3.49)
Controls	YES	YES	YES	YES	YES	YES
Constant	0.5340	0.6143 ***	−1.9998 ***	−0.4361 **	−1.9435 ***	−2.0179 **
	(1.29)	(3.93)	(−2.86)	(−2.43)	(−2.90)	(−2.21)
Observations	10,467	8273	9370	9370	11,727	7013
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
r <sup>2</sup>	0.0626	0.0257	0.0183	0.0131	0.0252	0.0213
p value	0.017		0.036		0.038	

Note: t-statistics are in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

## 5. Discussion

With the intensification of the industrial revolution's fourth round and the imminent changes in corporate governance structures, mere survival has become a significant challenge for enterprises. In this situation, effectively empowering corporate governance to drive sustainable development is a topic of widespread interest. The development

and application of digital technology has brought new opportunities for corporate governance. Some scholars have identified that digital transformation can significantly reduce corporate cash holdings [74], improve returns on financial assets [75], and mitigate tax “stickiness” [76]. Other scholars have found that digital transformation helps firms break down barriers to innovation [77], promote total factor productivity [78], and enhance internationalization levels [79].

The existing studies have mainly focused on the economic consequences of digital transformation, which are not conducive to a comprehensive understanding of the governance effects of digital technologies; therefore, the variable of corporate violations was chosen for this study. Unlike traditional governance indicators, corporate violations are mainly due to irrational behavior resulting from pervasive opportunism, reflecting the pursuit of short-term corporate interests and the inherent conflict with sustainable corporate development. In other words, the effective governance of corporate violations can promote the long-term development of enterprises. Therefore, including corporate violations as an outcome variable of digital transformation in sustainable development is conducive to fully understanding the governance effects of digital technologies on corporations.

Currently, research on factors influencing corporate violations has focused on both internal governance and legal regulations. However, few studies have examined the governance effects of digital transformation on corporate violations. For example, internal governance studies have found that increasing board independence [80], reducing management turnover [81], and strengthening employee equity incentives [82] all reduce the probability of corporate violations. The studies on external regulations have found that both strict tax enforcement and the deregulation of short-selling inhibit firms’ tendency to commit fraud violations [83–85]. Based on these previous findings, in this study, the factors inhibiting corporate violations were explored from the perspective of digital transformation, which complements the relevant academic research on the influencing factors of corporate violations and reveals the governance logic of sustainable corporate development in the digital economy era.

For a deeper analysis, we selected three major external monitoring mechanisms as moderating variables—audit quality, analyst attention, and negative media coverage—and explored their moderating roles in the relationship between digital transformation and corporate violations. All three factors were identified as reinforcing the inhibitory effect of digital transformation on corporate violations. This finding expands the applicable boundaries of digital transformation on violation governance and is conducive to guiding the external monitoring forces to give full play to firms’ governance. In addition, to increase the usefulness of the study, we also explored differences in the governance of corporate violations by digital transformation under different conditions. The inhibitory effect of digital transformation on corporate violations was found to be more pronounced in non-SOEs, large firms, and the manufacturing sector. This finding clarifies the applicability scenarios of digital transformation on violation governance and provides guidance for the targeted enhancement of corporate governance.

The research object of this study was limited to Chinese A-share-listed companies, and it is necessary to discuss whether the results are generalizable due to the many differences in the regulatory environments, market mechanisms, and corporate cultures in different countries and regions. We found evidence in the latest studies in the literature to support the conclusions of this study. For example, Renou explored the process of change in the Japanese corporate governance model and found that information management systems were able to optimize the internal control system and reduce certain types of fraud [86]. Tatomir studied the phenomenon of greenwashing in the US manufacturing sector and found that digital technology can improve the whitewashing of ESG disclosures and reduce misleading statements to investors [87]. As a case study, Lokanan investigated a large multinational company and found that AI can significantly reduce fraud in global supply chains, compensating for the lack of human oversight [88].

However, considering the different models of corporate governance in each country, there are bound to be differences in the governance of violations. For example, Schembera compared the governance of corruption in different institutional contexts and found that the Western countries, which focus on bureaucratic governance compliance, and the Eastern countries, which focus on pragmatic governance compliance, have very different ends, means, and effects of governing corruption [89]. Further, while the variability in governance models is an objective fact, the potential advantages offered by advances in digital technology are recognized. For example, Carmo argued that the corporate disclosure of integrated reports can alleviate the social pressures of fraud scandals, but the complexity of integrating information is a major obstacle to their diffusion [90], at which point the use of digital technologies can be considered to address these challenges.

## 6. Conclusions

This study used Chinese A-share-listed companies from 2013 to 2022 as a research sample, constructed digital transformation indicators by crawling the word frequency, and analyzed the impact of digital transformation on corporate violations using fixed-effects models. We found that the degree of digital transformation of most listed companies is low and varies greatly; however, the regression results show that, as the level of digitization of enterprises increases, the frequency and probability of corporate violations significantly decrease, and digital transformation can effectively inhibit those violations. The test results of the moderating mechanism show that audit quality, analyst attention, and negative media coverage strengthen the inhibitory effect of digital transformation on violations to varying degrees and that the existence of external supervision effectively empowers corporate governance. The heterogeneity analysis further reveals that the inhibitory effect of digital transformation on violations is more pronounced in non-SOEs, large firms, and the manufacturing sector.

This study validates the inhibitory effect of digital transformation on corporate violations at both the theoretical and practical levels. The theoretical contributions are as follows: First, research into digital technology in the field of corporate governance is promoted, the potential advantages of digital technology are explored, and theoretical support is provided for improving corporate governance using digital transformation. Second, in this study, the existing research on factors influencing corporate violations is enriched, helping in exploring the driving factors of the high-quality development of enterprises and supplementing the theoretical basis for the effective governance of violations. Finally, the study of the external system in which digital transformation exerts governance effects is expanded by the findings of this study, revealing the mechanism of external supervision and providing a more comprehensive understanding of the relationship between digital technology and corporate governance.

The practical contributions of this study are as follows: First, the findings support the correctness of digital transformation, and the government should accelerate the improvement of the top-level design of digital construction, especially strengthening the policy support for SOEs, SMEs, and non-manufacturing industries. Second, the findings affirm the importance of digital transformation and that enterprises should actively create an internal governance system based on digital technology to effectively realize early warning and corrective action against corporate violations. Finally, the findings also demonstrate the effectiveness of external monitoring, and the monitoring effect of social forces such as the media, analysts, and independent audits should be fully utilized to promote the development of corporate governance models towards diversification.

Due to the limited data, models, and methods used in this study, the results may have some limitations. To recommend a direction for future research and to further expand the scope of research in this area, the following shortcomings are pointed out in this paper: First, this study is limited to Chinese-listed firms, leading to a strong localization of the findings, and future research should incorporate the characteristics of firms in other countries and regions to enhance the generalizability of the findings. Second, the measure



of corporate violations is calculated from actual disclosed data, and undisclosed violations and potential violation tendencies are not taken into account, a shortcoming that can be remedied by subsequent research. Third, the measurement of digital transformation uses the method of crawling annual report word frequency, and subsequent research may consider incorporating more quantitative indicators (e.g., the proportion of IT investments or the number of digital technology employees) in order to provide a more realistic reflection of the digital level of the enterprise. Finally, in this study, the mechanisms of digital transformation on corporate violations were not analyzed, which are likely to be related to factors such as information transparency, management characteristics, and the level of internal control, and the mediating effect of such factors is an issue well worth exploring.

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