Stock Incentive Schemes Spur Corporate Transformation

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Abstract. Corporate is the most active micro-subject in digital economy, and also the subject of research and development and application of digital technology. This article uses China's 2007-2021 Shanghai and Shenzhen A-share listed companies and macro-economic datasets to empirically test the impact of stock incentive plan on corporate digital transformation. The results show that stock incentive can significantly drive the digital transformation, and this conclusion is still valid after a series of robustness tests. The promotion effect of stock incentive on corporate digital transformation is more obvious in the group of corporate with high shareholding ratio of short-term institutional investors, high ratio of analyst downgrade research report to the total research report and the questioned corporate group. Mechanism analysis shows that stock incentive reduces managerial myopia and facilitate corporate digital transformation. The research conclusions of this paper not only enrich the literature achievements related to stock incentive and corporate digital transformation, but also provide empirical evidence for the corporate decision-making and effectively promote the development of digital economy.

Keywords: Stock Incentive, Corporate Digital Transformation, Managerial Myopia.

1. Introduction

Based on today's world, the new business form of digital economy is not only the core engine of high-quality economic development in the new stage, but also the leading force to build a national competitive advantage in the new era (Tang Song, 2022). The development of digital technology dominated by artificial intelligence, blockchain, cloud computing and big data (ABCD) is gradually transforming the business model and economic development mode. The report of the 19th National Congress of the Communist Party of China pointed out that it is necessary to "promote the deep integration of the Internet, artificial intelligence and the real economy." In the context of the development of digital economy, corporate, as the smallest component of macroeconomic operation, realize digital transformation is the basis for ensuring high-quality economic development. It can be seen that promoting the digital transformation of corporate is the key to driving the development of the digital economy into the fast lane. By the end of 2019, the added value of China's digital economy had reached 35.8 trillion yuan, accounting for 36.2 percent of GDP. According to the Research Report on Digital Transformation of Chinese corporate (2020), 60% of corporate have developed a clear strategic plan for digital transformation. This shows that under the big wave of digital economy, in order to meet their own business needs, Chinese corporate have a strong momentum of digital transformation. In 2020, the sudden COVID-19 epidemic led to a large number of corporate to shut down production lines, break capital chains and even go bankrupt, and digital transformation optimized the management and business processes of corporate, providing new ideas for corporate to resume work and production. It can be seen that in the context of the digital trend and the impact of the new coronavirus epidemic, in order to ensure the stability of the financial market, serve the physical managers, and achieve the high-quality development of the national economy, digital transformation is a magic weapon for corporate to turn the crisis into safety in the difficult situation.

How to advance corporate digital transformation? Specifically, corporate can achieve this by optimizing internal business processes, human resources training, financial management model innovation and other means. Wei Guochen et al. (2021) took retail corporate as the research object and found that corporate capability, corporate resources, entrepreneurs' innovative spirit and

corporate' sensitivity to the external environment are important factors affecting the development of corporate' digital transformation. This paper argues that effective corporate governance has an important impact on the financial investment mode and the digitalization degree of corporate. In the corporate governance system, executive stock incentive is a good institutional arrangement, and executive stock incentive is a long-term incentive for senior executives (Berle, 1932). This kind of long-term incentive ties executive compensation with corporate performance. In the process of formulating and implementing corporate innovation strategy, through active internal capital allocation, executives make corporate innovation decisions as shareholders, gain part of innovation profits, and bear higher innovation risks (Casavecchia, 2017) to achieve the purpose of effective incentive. Therefore, the study of stock incentive plans is helpful to better understand the influencing factors of corporate' digital transformation.

According to the agency theory, the separation of corporate ownership and management rights will lead to agency problems (Jensen., 1976; Eisenhardt, 1989). There are two competing views on The impact of executive stock incentives on agency problems, namely The Convergence of Interest Effect hypothesis and The Entrenchment Effect hypothesis. Theoretically, stock incentive can inhibit the digital transformation of corporate. The entrenchment hypothesis (Shleifer, 1997; Short, 1999) believes that stock management incentives will increase the power of executives, enhance their ability to resist external pressure, increase agency costs, reduce corporate value, and exacerbate agency problems. From the perspective of management power theory, the entrenchment effect hypothesis focuses on the problem of rent-seeking caused by the increase of management power. Executives will have greater incentives to pursue personal gain, leading to short-sighted management behavior and inhibiting the digital transformation of the corporate.

Executive stock incentive may also promote the digital transformation of corporate. According to the convergence of interests hypothesis (Eisenhardt, 1989; Morck, 1988, et al.), the executive stock incentive can reduce the agency cost between the principal and the agent, so that the agent can act from the point of view of the principal as much as possible and effectively operate the company; From the perspective of the best contract theory, the convergence of interests hypothesis focuses on the stock incentive mechanism as an effective means to solve the agency problem, that is, executives are more willing to tolerate risks, invest more resources, and actively reduce short-termism. Therefore, it can effectively explain the promotion role of executive stock incentive on the digital transformation of corporate.

Therefore, there is no consistent conclusion on the relationship between stock incentive plans and corporate digital transformation in the existing literature, and further empirical tests are needed. To this end, this paper selected A-share listed companies from 2007 to 2021 as samples for research. The research shows that executive stock incentive has A significant positive impact on corporate digital transformation, and this result is still robust after using different samples, different variable measurement methods and instrumental variable methods. Further research shows that this effect is larger in the sample of corporate with a high proportion of short-term institutional investors, a high proportion of analyst downgrades in the total research reports and a higher proportion of respondents, indicating that executive stock incentives do alleviate management short-sightedness. The above results are consistent with the hypothesis of convergence effect on the promotion of management short-sighted behavior to corporate digital transformation.

The contribution of this paper is mainly in three aspects: (1) It expands the research on the influencing factors of corporate' digital transformation. The existing literature on corporate' digital transformation mainly focuses on the research on economic after-effects (Liu Zheng et al., 2020; Chen Menggen & Zhou Yuanren, 2021; Liu Shuchun et al., 2021; Wu Fei et al., 2021b), and there are insufficient researches to answer the question "why corporate are transforming digitally". Based on the agency theory, this paper discusses whether stock incentives bring better risk tolerance and further affect the digital transformation of corporate. (2) Expand the research field on the impact of executive stock incentives on digital transformation. Some literatures have found that stock incentives reduce rent-seeking, thus promoting innovation and resource input (Tian Xuan et al., 2018). Some

literatures also hold that stock incentive can restrain the tendency of executives to seek quick success and quick profits (Zhao Shifang et al., 2020). Different from previous studies from the perspective of agency cost and optimal contract theory, this paper examines the impact of stock incentive on corporate digital transformation from the perspective of management behavior, and expands the understanding of the relationship between stock incentive and corporate digital transformation. (3) It has practical significance. The research of this paper guides executives to carry out stock incentives, so that they can take the initiative to reduce short-sighted, evaluate the strategic objectives of corporate investment more comprehensively, and make funds flow to more valuable long-term projects, so as to commit to the long-term innovation and development of corporate. It has important reference significance for corporate to develop digital economy, promote the development of digital economy and narrow the digital divide.

The structure of the remaining part of this paper is as follows: the first part is literature review and research hypothesis; The second part introduces the empirical model and relevant data. The third part is the main empirical results of this paper; The fourth part is the heterogeneity analysis. The fifth part is the mechanism inspection; At last, the research conclusions and policy recommendations are presented.

2. Literature References

2.1. Research on Stock Incentive Schemes.

In the corporate governance system, executive stock incentive is a good institutional arrangement. On the one hand, executive stock incentive, as a new governance structure and governance model, is a long-term incentive for senior executives in addition to traditional compensation systems such as basic salary and annual bonus (Berle, 1932). This kind of long-term incentive ties executive compensation with corporate performance. In the process of formulating and implementing corporate innovation strategy, through active internal capital allocation, senior executives make corporate innovation decisions as shareholders, gain part of innovation profits, and bear higher innovation risks (Casavecchia, 1932), so as to achieve effective incentives. On the other hand, executive stock incentives can help curb inefficient investment behaviors of listed companies (Lv Changjiang and Zhang Haiping, 2011) and encourage and stimulate senior executives to make better investment decisions (Steinbach, 1932).

According to the agency theory, the separation of corporate ownership and management rights will lead to agency problems (Jensen., 1976; Eisenhardt, 1989). There are two competing views on The impact of executive stock incentives on agency problems, namely The Convergence of Interest Effect hypothesis and The Entrenchment Effect hypothesis. According to the hypothesis of interest convergence effect, executive stock incentive can reduce the agency cost between the principal and the agent, make the interests of the executive and the shareholders converge, and help to solve the agency problem (Eisenhardt, 1989; Morck, 1988; Mcconnell, 1988); The entrenchment hypothesis holds that executive stock incentive will increase executive power, enhance their ability to resist external pressure, increase agency cost, reduce corporate value, and exacerbate agency problems (Shleifer, 1997; Shorte, 1988).

In the existing literature, some scholars believe that stock incentive can effectively combine short-term tolerance of failure, active reduction of short-sightedness and long-term rich returns, which can help solve the agency problem and promote corporate innovation. The utility difference between executives and shareholders stems from the mismatch between residual claim rights and control rights. stock incentive, compensation and performance reward and close supervision system are all important means to reduce agency problems. (Inouee, 1775-1801) stock incentive, as an alternative mechanism for direct supervision of managers, can prevent bad behaviors of executives, reduce accounting irregularities, strengthen internal control of corporate, and screen talented executives for talent attraction and retention (Westphal, 1994; Armstronge, 2010; Zong Wenlong et al., 2013) Ultimately improve corporate performance (Jensen, 1976). Morck et al. (1988) found that stock incentives

produce interest convergence effect. This hypothesis, starting from the perspective of optimal contract theory, focuses on stock incentive mechanism as an effective means to solve the agency problem. Among them, stock options mainly drive the performance growth of corporate in growth and recession stages through the risk taking effect, while restricted shares mainly drive the performance growth of corporate in mature stages through the benefit convergence effect (Chen Wenqiang and Wang Chengfang, 2021). With the evolution of corporate governance theory and the development of innovation economics system, scholars begin to pay attention to the relationship between executive stock incentive and corporate innovation. Based on the principal-agent theory or the management power theory, some scholars in the existing literature proposed that there is a positive or negative impact between executive stock incentive and corporate technological innovation (Holthausen, 1995). stock incentive plans may also have a positive impact on corporate innovation: Executives are more willing to invest more innovation resources when making innovation decisions, and executive stock incentive is positively correlated with corporate innovation investment; stock incentive can help reduce the tendency of executives to rush for quick success and instant gain, and motivate them to devote themselves to the long-term innovation and development of corporate (Zhao Shifang et al., 2020). The hypothesis of interest convergence effect can effectively explain the promoting effect of stock incentive on corporate innovation. (Tian Xuan, 2018; Zhao Shifang et al., 2020).

Some scholars also believe that stock incentive will increase the short-sighted behavior of the management, which will aggravate the agency problem to a certain extent. stock incentives increase the power of executives. The higher the voting power and bargaining power of executives, the stronger the motive of opportunistic behavior to use power for personal gain, which may lead to serious insider control and rent-seeking behavior, and the pursuit of their own profits at the expense of the company's interests. Under the dominance of the entrenchment effect, stock incentive will cause executives to seek their own interests more in the stage of utilizing innovation resources, which reduces the efficiency of transforming R&D input into innovation output. From the perspective of management power theory, the entrenchment effect hypothesis focuses on the problem of rent-seeking caused by the enhancement of management power (Shleifer, 1997; Short, 1988). There are some controversies about the implementation effect of stock incentive plan in China. Lv Changjiang et al. (2009) pointed out that China's stock incentive schemes have both incentive effect and welfare effect, that is, the stock incentive schemes of some listed companies in China may provide benefits for senior executives in disguise, but such incentive schemes are difficult to play a real incentive role.

2.2. Research on Digital Transformation.

In essence, digital transformation is a strategic choice made by corporate in accordance with economic laws in the context of the rapid development of the digital economy. By increasing digital technology innovation (Tang Song et al., 2020), it promotes the deep integration of data and other production factors, and promotes the optimization of production structure and model. Improve operational efficiency without changing the main core functions of the corporate (Wu Fei et al., 2021).

Digital transformation is a gradual and long-term process. Under the circumstances of financial constraints, corporate may tend to invest in "short and fast" projects, and divestify digital transformation projects with large risks and long cycles, in order to reduce the uncertain impact of financial constraints on corporate operations. In order to achieve the transformation goal, sustained and stable R&D funds and the ability to tolerate risks have become indispensable basic elements in the digital stage of corporate. corporate have the ability to tolerate risks in the short term, pursue long-term goals, strengthen the market competitiveness of corporate in digital projects, help corporate form an active trend of technological innovation research and development, and enhance the actness of corporate to capture cutting-edge technologies. Thus, it is convenient for corporate to seize the historical opportunity of the rapid development of a new generation of digital technology. (Wu Fei et al., 2021a).

The existing literature on digital technology mainly focuses on its economic effects and influencing factors. On the whole, scholars have basically reached a consensus on the view that

"corporate digital transformation can reshape product services and business processes, optimize organizational structure and business model" (Downes and Nunes, 2013; Matt et al., 2015; Clohessy et al., 2017). On this basis, some scholars also discussed the specific problems solved by digital transformation, and investigated the role of digital transformation in promoting corporate division of labor (Yuan Chun et al., 2021) and market competition (Liu et al., 2011; Zhang Xiao et al., 2019), Innovation Performance (Zhou Qing et al., 2020; Wang Fengzheng et al., 2022), Productivity (Verhoef et al., 2021; Zhao Chenyu et al., 2021) and other fields of economic effects. Most studies focus on the impact of digital transformation on the development of corporate. For example, Wu Fei et al. (2021) found that digital transformation of corporate significantly improves stock liquidity and improves the performance of corporate in the capital market. Liu Shuchun et al. (2021) believe that corporate digital transformation has a positive impact on the improvement of corporate input-output efficiency, and the elasticity of capital output in digital transformation is much higher than that of labor output. Shan Yu et al. (2021) also found that the digital transformation of corporate will improve the organizational resilience of corporate and reshape the operation and management mode of corporate. Zhao Chenyu et al. (2021) found that corporate digital transformation can significantly improve corporate total factor productivity.

In terms of the influencing factors of corporate digital transformation, relevant researches are mainly discussed from the perspectives of regional government governance, industrial transformation and corporate resource supply. For example, Verhoef et al. (2021) and Chen Yujiao et al. (2022) believe that a higher level of industrial digitalization creates new competition rules and market demands. In order to adapt to the competitive environment, corporate in the industrial chain are likely to adopt digital transformation following strategies to ensure their competitive advantages. Song Jing and Chen Jin (2022) pointed out that with the help of social network resources, entrepreneurs can quickly capture the latest technology, knowledge and other information to meet the needs of corporate digital construction. Wu Fei et al. (2021) found that the increase in government financial expenditure on science and technology has a positive effect on corporate' digital transformation. Lai Xiaobing et al. (2022) found that from a global perspective, the construction of smart cities can accelerate the process of digital transformation of corporate by promoting the effect of human capital accumulation and technological capital accumulation, strengthening the innovation strength of corporate and improving the hardware facilities of technological innovation of corporate. Tang Song et al. (2022) found that fintech can effectively alleviate the financing constraint dilemma of corporate, broaden financing channels and reduce financial costs, and provide a good financial stability foundation for digital transformation. And the way to increase corporate R&D investment and improve technology R&D capacity to increase corporate innovation output, and help corporate improve innovation momentum to drive corporate digital transformation.

In summary, the current literature mostly studies the impact of corporate digital transformation on corporate economic effect. However, unfortunately, the existing literature does not have in-depth discussion on the causes of corporate digital transformation, and the research results on the influencing factors of corporate digital transformation are still few. The literature on corporate digital transformation from the perspective of salary is still in a research gap, and few scholars pay attention to the impact of stock incentive on digital transformation.

3. Research Hypothesis and Empirical Design

3.1. Research Hypothesis.

The innovation motivation of senior executives has a great impact on the innovation behavior of corporate. The fundamental purpose of implementing stock incentive for senior executives is to stimulate the innovation enthusiasm of managers, so that senior executives can give full play to the important decision-making power when making innovation decisions. Therefore, an effective stock incentive mechanism is a necessary guarantee for corporate R&D investment and company operation.

Based on the existing literature, the positive promoting effect of executive stock incentive on corporate digital transformation can be understood from the following three aspects. First, the stock incentive plan can effectively combine the active reduction of short-sightedness and long-term rich returns, focusing on the long-term sustainable development ability of the corporate. Many stock incentive provisions (especially stock options) protect management from a fall in the share price after a certain price; Since the management can hold part of the company's stock after the performance reaches a certain standard, the gains from the stock price increase, innovation success and digital transformation are considerable (Tian Xuan and Meng Qingyang, 2018). Second, the stock incentive plan usually has a relatively long validity period, which can effectively motivate the company's strategic level and core technical staff to invest in the digital transformation work with a long cycle, and effectively retain senior executives and core talents. (Zong Wenlong et al., 2013) Third, by linking management compensation with the company's stock price fluctuations, stock incentive plans give executives stronger motivation to take risks (Armstrong, 2012; Core, 2000), is conducive to stimulating innovation (Holmstrom, 1989), enabling corporate to enhance innovation momentum, and thus promoting corporate digital transformation (Tang Song, 2022).

When the management wants to avoid the disclosure of high risks and give up long-term investment projects, they will turn to short-term projects with lower risks to avoid the negative impact on stock prices, and limited resources can only be invested in those capital projects with the highest short-term benefits. The digital transformation project has a long cycle and high risk, and will not become a priority choice for corporate. The pressure of senior executives to take the initiative to reduce short-termism is an important underlying guarantee for carrying out long-cycle and high-risk activities. Only in this environment can corporate focus on innovation rather than maintaining short-term improvement of corporate financial condition.

stock incentive will promote the digital transformation of corporate. For corporate, achieving the long-term strategic goal of digital transformation requires managers to have a high level of risk taking and actively reduce short-sighted behavior. stock incentives enable executives to actively adjust their myopia, and companies can increase investment in research and development and innovation to help their own digital transformation. Further, with the vigorous development of innovative research and development activities, the sensitivity of corporate to the forefront of science and technology has been significantly improved, which can better tap the internal and external available information of corporate, boost the information integration and processing ability, and seize the historical opportunity of the rapid development of the new generation of "ABCD" information technology. More importantly, the improvement of corporate technological innovation strength can provide sufficient hardware matching basic conditions for digital transformation, so as to drive the deep digital transformation of corporate. Thus, a positive path of "stock incentive → (reduce) management short-sighted behavior → (promote) corporate digital transformation" is formed.

Hypothesis: stock incentives promote corporate digital transformation.

3.2. Empirical Design.

In order to test the impact of executive stock incentives on corporate digital transformation, this paper establishes an OLS multiple linear regression model with reference to Zhao Shifang et al. (2020) and Wu Fei et al. (2021), and the benchmark model is designed as follows:

$$DLTN_{i,t} = \alpha + \beta ExeIncent_{i,t} + \gamma Controls_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (1)$$

DLTN for corporate digital transformation. Digital transformation is a sign for corporate to build a digital ecological community. However, there are few research literature on the degree of digital transformation, most of which focus on theoretical analysis. corporate digital transformation belongs to the focus of corporate business strategy and high-level decision-making. With reference to the practice of Ling Wufei et al. (2021), this paper evaluates the feasibility of the corporate's digital transformation degree according to the statistical frequency of the occurrence of sub-category keywords under the category of "digital transformation" in the annual reports of listed companies.

Specifically, through the corresponding keyword word frequency measurement in the annual reports published by listed corporate, as the proxy index of corporate digital transformation, the annual reports of all A-share listed corporate on Shanghai and Shenzhen exchanges are collected and sorted out with the help of Python crawler function, and all text content is extracted through Java PDF box library. Match the number of keyword word frequencies related to the corporate's "digital transformation". In terms of keyword confirmation, referring to the research of Chen Chunhua et al. (2019) and Chen Jian et al. (2020), the corporate digital transformation is subdivided into two categories: "underlying technology" and "practical application". In the underlying technology, it includes four typical underlying technologies of digital transformation, namely "ABCD" technology; In the practical application of technology, the application performance of this kind of technology in specific practice is sorted out, so as to distinguish the basic technology and the specific application of two types of situations. On this basis, these keywords are matched and classified with A-share listed corporate in Shanghai and Shenzhen to form the initial index of corporate digital transformation. Due to the typical "right-bias" characteristics of such data, logarithmic processing is carried out to obtain the overall and sub-index describing the digital transformation of corporate.

$ExeIncent_{i,t}$ for executives in year *t* of corporate *i*. Referring to the practice of existing literature (Zhao Shifang, 2020), the dummy variable "incentive or not" is used in this paper to indicate whether an corporate has conducted stock incentives for senior executives. If there is stock incentives, it is recorded as 1, and if there is not, it is recorded as 0. This paper mainly focuses on the estimated value of regression coefficient β. If its estimated value is significantly positive, it indicates that stock incentive for executives is conducive to promoting the digital transformation of corporate. The hypothesis in this paper is verified.

$Controls$ is the index of the defined control variable in year *t*, which includes total assets (*Size*), asset-liability ratio (*Lev*), return on assets (*ROA*), ownership concentration (*CONTL*), logarithm of business years (*Age*), property nature (*Soe*), board size (*Boadsiz*e), tangible assets ratio (*FAR*), and separation of two rights (*DOS*). Industry and Year represent the fixed effects of the industry and the year of the corporate, which control the time-invariant factors at the industry level and the impact at the annual level respectively, and are the random error terms of clustering to the micro-corporate level.

Table 1. Variable definition

Symbols	Name	Specification
DLTN	Corporate digital transformation	If a corporate is undergoing digital transformation, take 1, otherwise take 0
Exeincent	Executive stock incentive	For the executive stock incentive, take 1, otherwise take 0
Size	Total assets	Total assets at the end of the year
Lev	Asset-liability ratio	Ratio of total liabilities to total assets
ROA	Return on total assets	Net profit/total assets
Age	Corporate age	The logarithm of the age of establishment of the business
Boardsize	Board size	Number of directors
Far	Proportion of tangible assets	Proportion of tangible assets to total assets
Soe	Property nature	State-owned shares take 1, otherwise take 0
Dos	Separation of two rights	The difference between control and ownership
Contl	Ownership concentration	Shareholding ratio of the largest shareholder at the end of the year

3.3. Data Source and Sample Selection.

The data comes from the CSMAR Financial Database, including executive stock incentives, R&D investment, patents obtained by corporate, and corporate characteristics. The sample includes the non-financial insurance companies listed and traded in Shanghai and Shenzhen A-shares from 2007

to 2021, excluding the companies with special treatment and delisting such as ST and PT each year, and finally 37,067 sample observation points are obtained. The data processing and statistical software used in this paper are Excel and Stata14.0. In order to avoid the influence of outliers and extreme values on the test results, all continuous variables are adjusted at 1% level when estimating the model.

3.4. Descriptive Statistics.

Table 2 reports descriptive statistics for the main variables. As can be seen from Table 2, the mean value, standard deviation and maximum value of corporate' digitalization level are 1.164, 1.1346 and 4.927, indicating that there are large differences in the digitalization level of different sample companies and significant differences among corporate. The mean value of Exeincent was 0.210, indicating that the sample implementing stock incentive plan accounted for 21.0% of the total sample.

Table 2. Descriptive statistics

Variables	N	Mean	Sd	Min	Max
Dltn	37,067	1.164	1.346	0.000	4.927
Exeincent	37,067	0.210	0.408	0.000	1.000
Size	37,067	22.070	1.311	18.920	26.100
Lev	37,067	0.428	0.212	0.050	0.941
ROA	37,067	0.039	0.063	-0.267	0.214
Age	37,067	2.830	0.366	1.609	3.497
Boardsize	37,067	8.624	1.717	5.000	15.000
Far	37,067	0.217	0.165	0.002	0.711
Soe	37,067	0.378	0.485	0.000	1.000
Dos	37,067	5.713	8.246	0.000	30.670
Contl	37,067	34.920	14.990	8.780	75.100

4. Empirical Results and Analysis

4.1. Analysis of Regression results.

Table 3 reports the regression results of the benchmarking analysis of "stock Incentive Plans - corporate Digital Transformation". In column (2), only time and industry fixed effects are controlled. The results show that the $Exeincent$ coefficient is 0.306 and passes the significance test at 1% level. Columns (3) and (4) are further included in the control variable set, and the regression coefficient of the corresponding stock incentive index decreases somewhat, but still maintains a high degree of significance. This may be due to the inclusion of control variables and the absorption of the related unobservable effects of corporate digital transformation. The above results all show that stock incentive has a significant promoting effect on the process of corporate digital transformation while other factors remain unchanged, and the two show a significant positive correlation, which verifies the hypothesis of this paper.

Table 3. The impact of stock incentive on corporate digital transformation

Variables	(1)	(2)	(3)	(4)
	DLTN	*DLTN*	*DLTN*	*DLTN*
Exeincent	0.967***	0.306***	0.651***	0.237***
	(26.056)	(11.176)	(18.376)	(8.939)
Size			0.199***	0.149***
			(15.718)	(14.451)
Lev			-0.968***	-0.056
			(-12.297)	(-0.893)
ROA			-1.574***	-0.410***
			(-8.527)	(-2.872)
Age			0.373***	-0.021
			(9.472)	(-0.566)
Boardsize			-0.031***	0.005
			(-3.529)	(0.821)
Far			-1.964***	-1.011***
			(-21.124)	(-12.648)
Soe			-0.256***	-0.089***
			(-7.113)	(-3.252)
Dos			-0.007***	0.000
			(-4.313)	(0.263)
Contl			-0.005***	-0.001
			(-4.275)	(-1.519)
Constant	0.960***	0.031	-2.960***	-2.721***
	(57.319)	(0.324)	(-11.689)	(-11.266)
Observations	37,067	37,067	37,067	37,067
R^2	0.086	0.492	0.205	0.514
Industry FE	NO	YES	NO	YES
Year FE	NO	YES	NO	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.2. Robustness Tests.

In order to enhance the persuasiveness of the core conclusion, this part conducts a robustness test from three perspectives. First, change the calculation caliber of the variable, including changing the measure of the explained variable and the measure of the explained variable; Second, replace regression model and regression sample; Third, propensity score matching (PSM).

4.3. Alternate the Dependent Variable.

Tables 4 and 5 focus on changes to the core variable construction algorithm. Table 4 mainly changes the calculation method of the core explained variable (corporate digital transformation). After changing the calculation caliber of the core explained variables, the regression results did not change. In columns (1) to (5), based on the corporate digital transformation graph in Figure 1, the original explained variables are decomposed by caliber. In the regression of the four basic digital technologies, stock incentive has a significant role in promoting the transformation of artificial intelligence (AI), cloud computing (CC), big data technology (DA) and the specific application of corporate digital transformation (ADT), while the driving force of stock incentive in promoting the transformation of corporate blockchain technology (BL) is small. The possible reason is that the current homogenization of blockchain technology is prominent, and blockchain has not yet made outstanding contributions on a larger scale, especially the current blockchain technology still has a

certain paradox phenomenon, so that the breakthrough of technical bottlenecks is still not difficult. Based on this, the effectiveness of stock incentive behavior with certain "backward" characteristics to support this kind of digital transformation may be weakened.

Table 4. Alternate the dependent variable.

Variables	(1)	(2)	(3)	(4)	(5)
	AI	BL	CC	DA	ADT
Exeincent	0.105***	0.004*	0.130***	0.131***	0.154***
	(6.943)	(1.653)	(6.818)	(7.011)	(6.307)
Size	0.049***	0.002**	0.056***	0.077***	0.113***
	(9.878)	(2.430)	(7.791)	(12.145)	(12.049)
Lev	-0.063**	0.002	0.031	0.044	-0.025
	(-2.144)	(0.542)	(0.763)	(1.200)	(-0.437)
ROA	-0.289***	-0.007	-0.154	-0.409***	-0.311**
	(-3.599)	(-0.547)	(-1.579)	(-4.379)	(-2.393)
Age	-0.027	0.001	0.014	0.036*	-0.004
	(-1.499)	(0.290)	(0.528)	(1.672)	(-0.104)
Boardsize	0.000	-0.000	-0.005	-0.001	0.011*
	(0.048)	(-0.113)	(-1.233)	(-0.233)	(1.917)
Far	-0.279***	-0.019***	-0.465***	-0.447***	-0.760***
	(-8.433)	(-4.409)	(-8.948)	(-10.112)	(-10.744)
Soe	-0.020*	-0.004**	0.001	-0.037**	-0.085***
	(-1.740)	(-2.174)	(0.052)	(-2.416)	(-3.527)
Dos	-0.000	-0.000	0.000	-0.002**	0.002
	(-0.842)	(-0.006)	(0.011)	(-2.326)	(1.276)
Contl	-0.001***	-0.000***	-0.001**	-0.001**	-0.000
	(-2.900)	(-2.662)	(-2.089)	(-2.199)	(-0.628)
Constant	-0.940***	-0.039**	-1.100***	-1.678***	-2.134***
	(-8.592)	(-2.034)	(-6.223)	(-11.399)	(-9.357)
Observations	37,067	37,067	37,067	37,067	37,067
R^2	0.360	0.092	0.424	0.416	0.366
Industry FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.4. Alternate the Explanatory Variable.

Table 5 mainly changes the calculation method of the core explanatory variable ($Exeincent$). In baseline regression, we use the number of shares granted plus one logarithm (Exe_log) and the percentage of shares granted to total shares (Exe_ratio) as explanatory variables. As can be seen from columns (1) and (2), at this time, the coefficient of corporate digital transformation is still significantly positive, that is, it can promote corporate digital transformation and upgrading, and the conclusion of this paper is still robust.

Table 5. Alternate the explanatory variable

Variables	(1)	(2)
	DLTN	*DLTN*
Exe_log	0.015***	
	(9.068)	
Exe_ratio		0.050***
		(7.469)
Size	0.147***	0.152***
	(14.224)	(14.699)
Lev	-0.057	-0.063
	(-0.897)	(-0.997)
ROA	-0.404***	-0.371***
	(-2.833)	(-2.596)
Age	-0.023	-0.027
	(-0.598)	(-0.707)
Boardsize	0.005	0.005
	(0.819)	(0.720)
Far	-1.011***	-1.018***
	(-12.647)	(-12.689)
Soe	-0.087***	-0.097***
	(-3.189)	(-3.562)
Dos	0.000	0.000
	(0.258)	(0.194)
Contl	-0.001	-0.001
	(-1.463)	(-1.463)
Constant	-2.674***	-2.769***
	(-11.058)	(-11.450)
Observations	37,067	37,067
R^2	0.514	0.513
Industry FE	YES	YES
Year FE	YES	YES

4.5. Other Robustness Tests.

Although the overall distribution of corporate' digital transformation is distributed in a positive range, some corporate' financialization degree is concentrated at 0. Therefore, the sample in this paper can be applied to the truncated regression model, that is, the Tobit model. In this paper, Tobit model was used to replace the OLS model in the baseline regression, aiming to overcome the interference caused by the selection bias of the estimation method on the core conclusion. The results are shown in the first column of Table 6. It is found that after replacing the Tobit estimation model, the regression coefficient of $Exeincent$ in column (1) is still significantly positive at the 1% level, indicating that model selection bias will not interfere with the core conclusion of this paper. Column (2) Robustness test was performed by replacing regression samples. Column (3) removes uncertainty interference through propensity score matching. Specifically, firstly, the control variable group ($Contl$) is used as the matching variable to screen the research samples. Secondly, the control group was selected and matched by the nearest neighbor matching method. Finally, the regression test was conducted again according to the matched samples. Column (3) shows that the regression coefficient of $Exeincent$ is 0.187, and the 1% significance test is passed, indicating that after removing the sample bias factor, stock incentive still has a significant policy incentive effect on corporate digital transformation, which is consistent with the benchmark regression conclusion of this paper. That is, the conclusion that corporate digital transformation is affected by the positive incentive of stock incentive plan is robust.

Table 6. Other robustness tests

	Tobit	Alternate regression sample	PSM
Variables	(1)	(2)	(3)
	DLTN	*DLTN*	*DLTN*
Exeincent	0.237***	0.139***	0.187***
	(8.951)	(5.457)	(6.500)
Size	0.149***	0.130***	0.190***
	(14.472)	(10.541)	(11.222)
Lev	-0.056	-0.155*	-0.136
	(-0.894)	(-1.947)	(-1.338)
ROA	-0.410***	-0.645***	-0.931***
	(-2.876)	(-3.733)	(-4.154)
Age	-0.021	0.024	0.010
	(-0.567)	(0.524)	(0.165)
Boardsize	0.005	0.006	0.010
	(0.822)	(0.736)	(0.973)
Far	-1.011***	-1.199***	-1.695***
	(-12.666)	(-11.584)	(-12.097)
Soe	-0.089***	-0.117***	-0.138***
	(-3.257)	(-3.479)	(-2.656)
Dos	0.000	0.001	0.001
	(0.263)	(0.912)	(0.675)
Contl	-0.001	-0.002***	-0.002
	(-1.521)	(-2.807)	(-1.478)
Constant	-2.721***	-1.710***	-3.818***
	(-11.282)	(-5.873)	(-10.286)
Observations	37,067	20,774	13,508
PseudoR^2/R^2	0.210	0.412	0.519
Industry FE	YES	YES	YES
Year FE	YES	YES	YES

4.6. Endogeneity Test: Instrumental Variable Method.

In Table 7, this paper adopts the instrumental variable method to reduce the interference of endogenous problems, and adopts the mean value of industry and province as the instrumental variable. Under the adjustment of the two instrumental variables, the regression coefficients of stock incentive on corporate digital transformation are both positive and highly significant, which indicates that the original core conclusion is still reliable.

Table 7. Other robustness tests

	Industry IV		Province IV	
Variables	(1)	(2)	(3)	(4)
	Exeincent	*DLTN*	*Exeincent*	*DLTN*
Exeincent		1.385***		1.242***
		(10.284)		(5.301)
IND	0.936***			
	(22.407)			
PRO			0.674***	
			(12.762)	
Size	0.047***	0.096***	0.044***	0.102***
	(12.184)	(7.776)	(11.531)	(6.790)
Lev	0.050**	-0.123*	0.067***	-0.115*
	(2.445)	(-1.919)	(3.298)	(-1.755)
ROA	0.355***	-0.841***	0.360***	-0.788***
	(6.597)	(-5.544)	(6.696)	(-4.772)
Age	-0.048***	0.034	-0.045***	0.027
	(-3.586)	(0.879)	(-3.393)	(0.692)
Boardsize	-0.004	0.009	-0.003	0.009
	(-1.574)	(1.475)	(-1.328)	(1.380)
Far	-0.063**	-0.933***	-0.042	-0.943***
	(-2.378)	(-11.574)	(-1.559)	(-11.559)
Soe	-0.172***	0.114***	-0.166***	0.089*
	(-19.272)	(3.077)	(-18.660)	(1.810)
Dos	-0.001***	0.002	-0.001***	0.002
	(-2.920)	(1.487)	(-2.629)	(1.305)
Contl	-0.002***	0.001	-0.002***	0.001
	(-6.538)	(1.244)	(-6.982)	(0.816)
Constant	-0.662***	-1.884***	-0.680***	-1.988***
	(-7.337)	(-7.142)	(-7.648)	(-6.649)
Observations	37,067	37,067	37,067	37,067
R^2	0.209	0.512	0.204	0.511
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

5. Heterogeneity Analysis

5.1. Proportion of Shares Held by Short-term Institutional Investors for Less than One Year.

When short-term institutional investors hold a high proportion of shares, the management is faced with greater performance pressure from investors and has strong short-view motivation, which may make the management tend to actively adjust decision-making behavior and give up projects with long investment cycle and strong innovation in order to reduce the negative net present value of the investment (Zhong Yuxiang et al., 2017; Aghion et al., 2013). The high shareholding ratio of short-term institutional investors will also aggravate the concern of management about professional reputation, which makes them more inclined to improve the short-term performance of corporate in a relatively short period of time to gain investors' recognition, thus aggravating their myopia (Fan Haifeng, 2013). If corporate want to improve their exposure to digital technology and increase cooperation with digital technology platforms to promote digital transformation and upgrading of corporate, they need to have a stable capital chain and long-term investment tendency. Therefore, we expect that stock incentives for corporate with a high proportion of short-term institutional investors

will play a more obvious role in alleviating managers' short-sighted behavior, so stock incentives will have a stronger impact on corporate' digital transformation.

The results are reported in Table 8. In column (1), INS is used to represent the number of shares held by short-term institutional investors who have held shares for less than one year divided by the total number of shares in the company. The regression coefficient of the cross-multiplication term $Exeincent \times INS$ is 0.231, which is significantly positive at the 1% level, indicating that corporate with a high proportion of short-term institutional investors have a significantly higher degree of digital transformation after the implementation of stock incentive plans. The above test results show that for corporate with a low proportion of short-term institutional investors, executive stock incentive has a more obvious role in promoting digital transformation, which verifies the inference.

5.2. Ratio of Analyst Downgrades to Total Research Reports.

As one of the important information media, the analyst plays an important role in the capital market. Existing research has confirmed that analyst tracking behavior can promote the incorporation of company information into stock price, and the information provided by analyst reports will affect the price and trading volume of the company's stock, which also has certain reference value for investors' investment decisions. Cao Xinwei et al. (2020), the more analysts who make rating adjustments on the surface, the more serious the pre-trading behavior; Hu Weijia et al. (2016) believe that the higher the attention of analysts, the management is more inclined to lower expectations to guide analysts' forecasts, so as to meet the expectations of the capital market. Research by Lai et al. (2020) shows that one of the reasons for management myopia is the pressure from analysts. Therefore, if stock incentive can reduce management myopia and promote corporate digital transformation, it should be expected to be more obvious in corporate with a high proportion of analyst downgrade, because analyst downgrade will increase the downward pressure on the company's stock price. Management is under even greater pressure.

The results are reported in Table 8, and in column (2), ADR is used to indicate the ratio of analyst downgrades to total research reports. The regression coefficient of $Exeincent \times ADR$ is 0.217, which is significant at 1% level, indicating that corporate with lower ratio of analyst downgrade reports to total research reports after the implementation of stock incentive plans have a significantly higher degree of digital transformation. The above test results show that stock incentive plans can mitigate management short-sighted behavior and promote digital transformation.

5.3. Number of Queries.

Under the flexible regulatory means of inquiry letter, corporate and their management are faced with more attention and negative evaluation from exchanges, investors and even the media (Milly et al., 2019). The short-term performance of the corporate dropped significantly after the exchange inquiry; Annual report inquiry has a negative impact on corporate operation by intensifying corporate financing constraints and senior management changes, and puts pressure on short-term performance of corporate (He Ruzhen, 2022), which will lead to more short-sighted management. Because stock incentives can promote digital transformation by reducing short-sighted management behavior, we expect them to be more effective in companies that receive inquiries.

The results are reported in Table 8. In column (3), CL is used to indicate "whether the corporate has been asked", and the value of receiving the inquiry letter is 1, otherwise it is 0. The regression coefficient of $Exeincent \times CL$ is 0.197, which is significant at 1% level. The results show that the negative correlation between stock incentive and management short-sighted behavior is more significant when the company receives the letter. This suggests that stock incentives make management inclined to proactively reduce short-termism to promote corporate digital transformation.

Table 8. Heterogeneity analysis

Variables	(1)	(2)	(3)
	DLTN	*DLTN*	*DLTN*
Exeincent	0.231***	0.217***	0.197***
	(16.193)	(14.838)	(14.052)
Exeincent×INS	0.042***		
	(3.303)		
INS	-0.057***		
	(-5.875)		
Exeincent×ADR		0.547***	
		(2.832)	
ADR		-0.004	
		(-0.038)	
Exeincent×CL			0.070***
			(5.951)
CL			-0.022**
			(-2.094)
Size	0.151***	0.149***	0.149***
	(29.825)	(29.259)	(29.531)
Lev	-0.053*	-0.055*	-0.057*
	(-1.687)	(-1.751)	(-1.808)
ROA	-0.348***	-0.404***	-0.413***
	(-3.927)	(-4.588)	(-4.677)
Age	-0.024	-0.022	-0.020
	(-1.424)	(-1.286)	(-1.217)
Boardsize	0.005	0.005*	0.005
	(1.566)	(1.664)	(1.631)
Far	-1.012***	-1.011***	-1.007***
	(-25.645)	(-25.598)	(-25.525)
Soe	-0.092***	-0.089***	-0.091***
	(-7.129)	(-6.914)	(-7.039)
Dos	0.000	0.000	0.000
	(0.487)	(0.555)	(0.524)
Contl	-0.001***	-0.001***	-0.001***
	(-3.339)	(-3.113)	(-3.182)
Constant	-2.742***	-2.717***	-2.715***
	(-21.499)	(-21.267)	(-21.306)
Observations	37,067	37,067	37,067
R^2	0.514	0.514	0.515
Industry FE	YES	YES	YES
Year FE	YES	YES	YES

6. Mechanism Analysis

Stock incentives can promote digital transformation by "mitigating managerial myopia". The goal of stock incentive is to encourage the incentive object to actively take risks and actively reduce short-sighted behaviors, so that the management has reason and confidence to carry out long-term and high-risk investment activities such as research and development innovation in order to obtain long-term returns in the future. For corporate, realizing the long-term strategic goals of digital transformation requires managers to allocate funds rationally, evaluate the strategic goals of corporate investment more comprehensively, and allow funds to flow to more valuable long-term digital transformation

projects. stock incentives allow executives to reduce short-sighted behavior and companies to invest more in research and development and innovation to fuel their own digital transformation. Thus, the path of "stock incentive → (reduce) managerial myopia→ (promote) corporate digital transformation" is formed.

In line with the above logic, the management of listed companies may take short-sighted behaviors at the expense of the company's long-term interests for short-term profit goals. Compared with investment activities with long term and high risk such as R&D and innovation, the management is more willing to invest in projects with short term and low risk, which may reduce R&D expenditure. Based on the practice of Li Shihui (2022), this paper intends to test the economic mechanism of its path. A dummy variable $Myopia_1$ is set to be 1 if R&D spending is cut and current earnings are higher than the median analyst estimate, 0 if not. In addition, referring to Lai et al. (2020), Tian Lihui and Wang Kedi (2019) and other relevant literatures, research and development expenditure reduction (R&D) is taken as a measure of short-sighted behavior of the management, which is specifically the R&D expenditure of the company in year *t* minus the R&D expenditure in year *t*-1 and divided by the total assets at the end of *t* ($Myopia_2$). If R&D is less than 0, the $Myopia_2$ value is 1; otherwise, the $Myopia_2$ value is 0. The table reports the test results of the mechanism of stock incentive on corporate digital transformation. The results in columns (1) and (2) show that the regression coefficient of stock incentive on the level of management myopia is negative and passes the significance test, indicating that the short-sighted behavior of management is alleviated.

Table 9. Machanism analysis

Variables	(1)	(2)
	$Myopia_1$	$Myopia_2$
Exeincent	-0.320***	-0.322***
	(-7.105)	(-9.625)
Size	0.354***	0.167***
	(19.406)	(11.039)
Lev	0.032	0.311***
	(0.276)	(3.380)
ROA	1.962***	-0.688***
	(6.602)	(-3.217)
Age	-0.261***	-0.045
	(-4.516)	(-0.978)
Boardsize	0.001	-0.008
	(0.057)	(-0.858)
Far	-0.575***	-0.448***
	(-3.785)	(-3.822)
Soe	-0.117**	-0.055
	(-2.313)	(-1.404)
Dos	0.003	0.003
	(1.330)	(1.461)
Contl	-0.002	-0.001
	(-1.287)	(-1.139)
Constant	-11.822***	-7.100***
	(-20.725)	(-16.372)
Observations	37,067	37,044
Industry FE	YES	YES
Year FE	YES	YES

7. Conclusion

At present, China's economy is undergoing a transformation from high-speed to high-quality development, and accelerating the construction of digital economy has become an important development strategy of the country in the future. In this context, this paper studies the impact of stock incentive on the digital transformation and upgrading of corporate. The main conclusions are as follows: First, in general, stock incentive plays a significant role in promoting corporate digital transformation; Second, the stock incentive significantly stimulated the high proportion of short-term institutional investors holding less than one year, the high proportion of analyst downgrade research reports in the total research reports, and the digital transformation process of the questioned corporate; Third, fintech effectively improves the level of corporate risk taking and promotes the digital transformation of corporate by reducing the short-sighted behavior of investors.

The research of this paper has important theoretical and practical significance. In theory, this study has enriched the relevant literature on the actual impact of stock incentive plans and the influencing factors of corporate' digital transformation, and revealed the mechanism of China's stock incentive plans affecting corporate' digital transformation. In terms of policy implications, the following suggestions can be given through the research conclusions of this paper: First, we should guide and support more corporate to adopt effective stock incentive plans, enrich and improve the long-term incentive mechanism for Chinese corporate executives, and encourage corporate executives to devote more energy to enhance the long-term value of corporate. Second, we should further develop and improve the capital market, improve the transparency of the capital market, crack down on false disclosure, insider trading and other behaviors, so that the stock price fully reflects the value of the company, so as to better play the role of the stock incentive plan, so that the capital market can better support corporate innovation and serve the real economy. All in all, by guiding and encouraging more corporate to implement effective stock incentive plans, improving the corresponding supporting facilities and basic environment, it will help improve the long-term incentive mechanism of Chinese corporate, enhance the endogenous impetus of Chinese corporate innovation, and promote the sustainable and healthy development of the economy.

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