

Digital Transformation and Performance of Enterprises

-- Based on the theoretical perspective of manager learning

Zhongbao Tang

Department of Management, Anhui University of Finance and Economics, Bengbu City, CO233000, China

Abstract: Under the macro background of digital China construction, it is of great practical significance to explore how enterprises can achieve the improvement of ESG performance through effective digital transformation based on the perspective of managers' learning theory. This paper takes China's A-share listed companies in 2009-2021 as a research sample to empirically test the impact of digital transformation on the ESG performance of enterprises. The study found that the digital transformation of enterprises has significantly promoted the fulfillment of ESG responsibilities. The results of the mechanism of action show that the digital transformation of enterprises is through improving the management Sense perception and decision-making, thereby improving ESG performance. Further research based on the heterogeneity of management characteristics shows that the shadow of digital transformation on the ESG performance of enterprises is more significant among male CEOs, executives without academic background, no financial background and low management shareholding ratio. The research not only improves the learning theory of managers, but also provides empirical evidence for digital transformation to affect enterprise behavior, and provides new ideas for encouraging and guiding enterprises to fulfill ESG responsibilities.

Keywords: Digital transformation, ESG performance, Manager learning.

1. Introduction

The party's 20th annual report pointed out that we should accelerate the construction of a new development pattern and focus on promoting high-quality development. As the "ballast stone" of the capital market, it is crucial to promote their high-quality development to further improve the capital market and the optimization and upgrading of the industrial structure. As a comprehensive evaluation index [1] on the coordinated development of environment (Environment), society (Social) and governance (Governance) based on the concept of sustainable development, ESG is an important basis for [2] to measure the high-quality development of enterprises. ESG performance is particularly important for the development of the enterprise. On the one hand, it is conducive to guiding the enterprise to pursue and practice the development concept of "dark green" and achieve long-term development; on the other hand, it is conducive to enhancing the relationship between the company and stakeholders and establishing a good corporate image. For example, Huawei, CNPC and other top 100 enterprises have won the "face" of good social and environmental responsibility and the "inside" of economic value through the disclosure of sustainable development reports. However, due to the limitations of their own resources or external environment, enterprises cannot take into account ESG performance while seeking development. Therefore, in the context of high-quality development, the study of the internal driving factors of enterprise ESG performance has increasingly become the focus of the theoretical and practical circles.

In the existing research, some scholars on the enterprise digital transformation and ESG table now the relationship is discussed [3-4], but there is still a lack of research from the perspective of managers. Investigate the relationship between enterprise digital transformation and ESG performance. In fact, the managers of the No the perspective of learning is often ignored by most empirical studies. According to the

manager Xi believes that company managers can analyze stock price fluctuations, Get it from the development of corporate investment decisions owned by stock traders And other relevant private information to help them make more efficient investment decisions [5-6]. In addition, Zhang [7] further improved the learning theory of managers, believing that the stock price is an indirect aggregation signal and may not be enough for managers to learn. When managers have high needs, they seek more direct interactive access to information about industry trends and supply chain dynamics. Digital transformation has been improved with the efficiency of analyzing, collecting and processing information, managers can learn indirectly from the share price and communicate directly with investors.

Digital transformation can play a role in helping managers learn, but this role in promoting managers' learning is often ignored or seriously underestimated by the previous research on the advantages of digital transformation. On the one hand, digital transformation can help managers to improve the ability of information collection and analysis, pay attention to the demands of stakeholders, and improve the core competitiveness and sustainable development of the company; on the other hand, digital transformation can help the managers to make better decisions by improving the stock information and communicating with investors, thus affecting the ESG decision. Therefore, it is necessary to study how digital transformation can help listed companies practice the ESG concept from the perspective of managers.

In this paper, the companies listed in A-shares from 2009 to 2021 are selected The research object, based on the perspective of managers' learning theory, empirically examines the digitalization The impact of transformation on ESG performance can help companies understand digital transformation And to promote the management of enterprise ESG by managers in reality. The study of this paper Contribution: (1) studied the correlation between enterprise digital transformation and ESG, and enriched the theoretical research related to ESG investment motivation. (2) Enriched

the theoretical research of the digital transformation of enterprises. The influence of the digital transformation of enterprises on ESG investment decisions is studied, and the deep mechanism of this impact based on the characteristics of managers are further explored and confirmed, which is helpful to deepen the understanding and understanding of the public and the government on the digital transformation behavior of enterprises. (3) Rich Research on the impact of managers learning on corporate behavior. Will managers learn and enterprise Industry digital transformation and ESG performance are simultaneously put into the same research framework this paper discusses the relationship between digital transformation and ESG the influence of the department is also on the relationship between the previous digital transformation and ESG A supplement to the theoretical study.

2. Theoretical Analysis and Research Hypothesis

ESG is a more comprehensive, sustainable and coordinated development concept [8], It refers to the comprehensive integration of environmental, social and corporate governance issues between companies and investors Entering its business model represents the comprehensive performance of the enterprise in the market. Currently, The Company's ESG's practice has some negative externalities, but also faces the problem of insufficient investment. Firstly, due to the practice of ESG, the lack of performance of ESG and the cost of ESG; second, the investment in environmental protection and social projects will occupy the company's capital, increase the excess expenditure, increase the "negative effect" to the company, and thus reduce the strength of the company and damage the company's rights [2].

2.1. Enterprise Digital Transformation and ESG Performance

First, managers learn theories that the stock market can deliver effective information that affects corporate decisions. On the one hand, digital transformation is believed to effectively increase the amount of stock information by [9]. Enterprises undergoing digital transformation are often more likely to improve their own information transmission efficiency and innovation potential, and effectively optimize their own organizational structure [10], and the rising intrinsic value of enterprises will boost the increase of stock trading volume; stock price information can effectively help companies to allocate resources [11], high liquidity can bring richer enterprise quality information, managers can more quickly obtain information from market reaction and adjust their behavior, which helps managers to carry out market monitoring and better allocate enterprise resources, and then improve Enterprise overall ESG investment efficiency. At the same time, the digital transformation can make it much more Investors with private information involved in the company's stock trading can help Improve the incentive mechanism of enterprise information collection and improve the information environment of enterprises In order to better help executives improve ESG performance through learning and analysis of enterprise trait information. On the other hand, managers will use the information contained in the stock price (e. g., information about future investments and growth opportunities, future relationships with stakeholders, and future financing policies) when making ESG investments. At

the same time, stock prices serve as a discipline machine for managers System, more informative stock prices can better monitor managers [12], which alleviates Has caused construction problems, leading to more efficient ESG investments.

Secondly, Zhang [7] has further improved the theory of manager learning. Managers can communicate and learn directly with investors, and they can obtain relevant banks more quickly Information on industry trends and supply chain dynamics to be effective based on real-time information make policy. On the one hand, digital transformation promotes between managers and investors communication for information. Digital transformation enables companies to better manage and deliver an Effective signal, so as to ensure that the company and market investors for efficient and fast letter Communication promotes managers to industry trends and supply chain dynamic information Understand and make effective ESG investment decisions. On the other hand, when the enterprises of No When the digital transformation process gradually deepens, it can greatly improve the enterprise operation productiveness. Companies can not only get stock price information at a smaller cost Line analysis, direction grasp and process optimization, and enterprise digital transformation in better processing and output effective information, can help enterprises based on business sector and itself to promote ESG strategy and operation, actively to the market main body "push" enterprise information, this makes the enterprise external investors can master more fully available information, alleviate the double, the information asymmetry, also make investors in the development of sustainable quality confidence, from the side to promote the enterprise ESG investment.

Finally, the existing research has found that when the company effectively promotes its own digital reform, it means that the company can effectively use the data information technology to solve the internal massive, non-normative, unstructured data. Thus increasing the availability of data, optimizing the investment decisions of managers and guiding the company's product marketing. At the same time, the company can also make full use of this kind of information technology to serve the enterprise's product decision, market-oriented tracking, in order to connect the "supply-demand". The digital transformation of the company uses the enterprise digital technology to greatly enhance the enterprise information processing ability, improve the financial operation efficiency, so that the company can achieve the maximum capital use efficiency boundary under the restriction of limited financial resources, so as to increase the enterprise ESG investment. More importantly, ESG is becoming a hot spot of social construction and development in the new era and new stage. By increasing their investment in ESG, enterprises can send positive signals to the outside world that market investors will fulfill their ESG responsibilities Often to have a higher level of expectations, guiding investors to limited attention, this The "exposure effect" can increase the positive reputation image of the enterprise. With the enterprise to the society If the public will output these sustainable development information, enterprises will obtain more potential, commercial benefits, can improve the reputation and brand value, and get investors special It is not the recognition and favor of long-term funds such as institutional investors to obtain the capital market Support, so that enterprises to get sustainable development, but also get the public recognition. Therefore, In order to

increase the positive reputation image, enterprises will also further increase the investment in ESG.

Therefore, this paper holds that digital transformation indirectly promotes managers from Learning in the stock price and direct communication with investors can be acquired more quickly Information about industry trends and supply chain dynamics to improve managers' perception And decision-making ability to understand the stakeholders' green, low-carbon and sustainable development of enterprises To encourage managers to make timely and effective investment in ESG of enterprises Enhance the core competitiveness of the company, to achieve the sustainable development of the company.

Thus, the following assumptions are made:

H1: In other cases, enterprise digital transformation can significantly improve ESG performance.

2.2. Enterprise Digital Transformation, Manager Perception Ability and ESG Performance

This paper holds that the perception ability of managers represents the source of information channels and the amount of information content, that is, as the managers obtain information With the increase of source channels and information content, managers perceive risk and are private The ability to develop information and information related to market developments will be enhanced. Based on the perspective of managers' learning, the improvement of managers' perception ability is realized through managers' indirect learning from the stock price and direct communication and interactive learning with investors. On the one hand, managers' perception ability will increase with the improvement of stock price information content. Digital transformation enhances the equity liquidity of the company, increasing the information contained in the stock, so that managers can more efficiently learn and analyze the enterprise quality information contained in the stock liquidity to improve the enterprise ESG investment. ormat and save your graphic images using a suitable graphics processing program that will allow you to create the images as PostScript (PS), Encapsulated PostScript (EPS), or Tagged Image File Format (TIFF), sizes them, and adjusts the resolution settings. If you created your source files in one of the following you will be able to submit the graphics without converting to a PS, EPS, or TIFF file: Microsoft Word, Microsoft PowerPoint, Microsoft Excel, or Portable Document Format (PDF). On the other hand, digital transformation makes enterprises more closely connected with stakeholders, and any change in the enterprise will be passed on to stakeholders more quickly with the deepening of digital transformation. At the same time, the digital transformation enables the management through social media, websites and mobile applications, real-time interaction with investors, reduce the degree of information asymmetry between enterprises and investors, is conducive to management for effective information needed to make decisions, managers according to the information obtained from investors to adjust their ESG decisions.

Therefore, this paper speculated that the manager learning theory plays an important role in it through the indirect learning of the stock price and the direct interactive learning with the investors, the managers can improve the managers' perception ability and improve the efficiency of the enterprise ESG investment decision-making. Based on this, the following assumptions are made:

H2: Under the premise of other circumstances, the digital transformation of enterprises improves ESG performance by improving managers' perception ability.

2.3. Enterprise Digital Transformation, Managers' Decision-making Ability and ESG Performance

This paper holds that the decision-making ability of managers represents the investment decision quality of managers, that is, managers can accurately identify investment opportunities and make the actual investment level Similar to the optimal investment level, in order to improve the investment efficiency of enterprises. Manager every day all need to judge problems, analyze problems, solve problems, and achieve performance. Study Force, adaptability and agility are the essential competitors in the digital age implement. Learning requires methods and technology to get twice the result with half the effort, digital transformation Can help the management to improve the cognitive level, the Internet, virtual reality, new type Artificial intelligence, blockchain technology can help them restructure the economy and reengineer the organization, And refactoring the relationship between people and organizations.

In fact, digital transformation can enhance the mining of information value Ability to improve the enterprise ESG management decision-making level. On the one hand, the digital transformation it can effectively improve the efficiency of information conversion and reduce the difficulty of managers to make decisions Degrees and risks [13]. The fundamental information and investors brought about by the digital transformation The industry trends, product market peers and supply chain dynamic information provide an important reference value for company managers to make resource allocation and ESG decisions, and improve the overall ESG investment efficiency of enterprises. On the other hand, the information feedback brought by liquidity and the information feedback of direct communication with investors can become the way to test the operation status of enterprises, judge whether the future development direction is the most appropriate from the perspective of the market, and finally realize the systematic cycle of reference, decision-making and feedback of the stock market and investors. Based on this, this paper proposes the following assumptions:

H3: All the same, the digital transformation of enterprises can improve ESG performance by improving managers' decision-making ability.

3. Research Esign

3.1. Data Source and Sample Selection

In this paper, the data of a-share listed companies from 2009 to 2021 are selected as the research sample. Data processing according to the following standards: (1) excluding financial listed companies; (2) excluding ST and * ST companies; (3) excluding data abnormal and missing data, and finally obtaining 12,664 observed values. The sample data were obtained from China Securities Index and Guotai Taian database, and the continuous variables were reduced at the level of 1%.

3.2. Variable-Definition

3.2.1. Explained Variable

Enterprise ESG performance. Based on the study of Gao Yanyan and Huang Jianbo (2023), ESG rating was used as the

proxy variable of enterprise ESG performance. At present, many institutions have released the ESG rating data of Chinese listed companies, such as China Securities, Bloomberg, Business Road Ronglu, etc. Compared with other data sources, the ESG rating data has a wide coverage and a long time span. Therefore, this paper selects the CSI ESG rating data to measure the ESG performance of the sample company. The ESG rating is 1 to 9 according to 9 grades (C, CC, CCC, B, B, BB, BBB, A, AA, AAA). The higher the score, the better the ESG performance of the enterprise.

3.2.2. Explanatory Variable

Drawing on the practice of Wu Fei et al. [9], the digital transformation characteristics of enterprises are constructed related word library. Among them, the feature thesaurus of digital transformation includes the “underlying technology Application “and” technology practice application “two aspects. At the level of “underlying technology application” It also divides into four subdivided dimensions: artificial intelligence, blockchain, and cloud computing and big data linear measure.

3.2.3. Metavariable

Manager perception is measured by the opposite number of equity liquidity (Liu) and the logarithm (Analyst). On the one hand, the stock letter No Increasing interest content can

enhance managers' perception ability; on the other hand, the interaction between managers and investors and the information asymmetry between investors and enterprises enhance the perception ability. The decision-making ability of managers (FInv) calculates the investment efficiency of enterprises according to the investment expectation model proposed by Richardson [14]. The residuals and the absolute value of the investment of the enterprise, which is used as a negative index to measure the quality of the investment decision of enterprises. In addition, the opposite number of stock illiquid index is too small, so this paper takes it by 10.

3.2.4. Controlled Variable

In addition, in order to control the influence of the characteristics of the company, industry and region on ESG performance, referring to the existing research (Xia Yixin 2022) [15-16], this paper introduces the asset-liability ratio, asset value ratio, asset return rate, company age and other company level control variables, and at the same time to control the industry, year and region set virtual variables to control. Variables were defined and the measurements are shown in Table 1.

3.3. Model Specification

To verify H1, the following model is established:

Table 1. Variable-definition

Variable name	variable symbol	variable-definition
Enterprise ESG performance	ESG	China Securities Environment, Social and Governance (ESG) rating Index
Degree of digital transformation	DT	The word frequency obtained by summing is logarithmically normalized
Managers' perceived competence	Liqui	Is pressed by the opposite number of the stock iniquid indicator
	Analyst	The ln (analyst attention + 1)
Decision-making ability of managers	FInv	Enterprise investment efficiency is calculated according to the investment expectation model proposed by Richardson (2006), as a negative index to measure the quality of enterprise investment decision
Liabilities level	Lev	Total liabilities / total assets
Profitability	Roa	Net income / total assets
Cash holding level	Cash	Net cash flows from operating activities / total assets
Company growth	Growth	(Total assets at the end of this period-total assets at the end of the previous period) / total assets at the end of the last period
Enterprise value	Tobinq	(Market value of tradable shares + number of non-tradable shares net assets per share + book value of liabilities) / total assets
The largest shareholder shareholding ratio	Top1	The largest shareholder holds the percentage of the total number of shares
Two jobs in one	Dual	The chairman and the general manager are the same person as 1, otherwise it is 0
Industry variables	Ind	Industry virtual variables
Annual variable	Year	Annual virtual variable

$$ESG_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 Controls + \sum Year + \sum Ind + \epsilon_{i,t} \quad (1)$$

In model (1), ESG is the ESG performance of the company, DT is the level of digital transformation, Controls is the control variable, and also controls the fixed effect of year and industry.

To test H2 and H3, the following mediation effect model was constructed by reference the research results of Wen Zhonglin and Ye BaoJuan [17] according to the model (1):

$$Mediator_{i,t} = \beta_0 + \beta_1 DT_{i,t} + \beta_2 Controls + \sum Year + \sum Ind + \epsilon_{i,t} \quad (2)$$

4. Empirical Analysis

The manuscript should include a conclusion. In this section, summarize what was described in your paper. Future directions may also be included in this section. Authors are strongly encouraged not to reference multiple figures or tables in the conclusion; these should be referenced in the body of the paper.

4.1. Descriptive Statistics

Table 2 is the descriptive statistical results. The data results of enterprise ESG performance (ESG) are basically consistent

with the research of Hu Jie [3]. The minimum value is 1.000 and 8.000, which reflects the large difference in ESG performance among different enterprises in China and provides the entry point for the subsequent study on the influence of digital transformation. The minimum value of digital transformation (DT) is 0.000 and the maximum value is 6.301, reflecting the great difference in digital transformation among different enterprises in China. In addition, the growth of the sample enterprise and the company value differ greatly in the control variables.

4.2. Regression Results Analysis

4.2.1. Benchmark Regression

Table 3 presents the regression results of the digital transformation and ESG. Column (1), (2) and (3) are the regression results after adding no control variables, all control variables and further control years and industry fixed effects in the model (1), respectively. There is a significant positive correlation between digital transformation and ESG performance, and H1 is effectively verified, indicating that digital transformation significantly promotes the overall performance of enterprise ESG responsibilities, indicating that enterprises have the motivation and ability to count

Character transformation to promote ESG investment development and improve the company's ESG performance.

4.2.2. Endogeneity Test and Robustness Test

The choice of enterprises on whether to carry out digital transformation may be endogenous. Therefore, the following approach are used to test possible endogeneity problems. First, the Heckman two-stage method. In the first stage, drawing on the practice of Zhong Tingyong et al [18], the Probit model adopted digital transformation as the explained variable, With the fixed effect of industry and year, the average value (MDT) of the digital transformation of the same industry is added as an exogenous variable to the model, and the IMR is calculated by regression on this basis. In the second stage, the IMR is inserted into the model (1). The conclusion is shown in Table 2 columns (1) and (2). The regression coefficient of digital transformation variables is still positive, indicating that the research results of this paper remain unchanged. Second, the two-stage instrumental variable method (2 SLS). The tool variable is the mean value (MDT) of digital transformation in the same industry, so the tool variables selected in this paper have important influence and are exogenous. Through the weak tool variable test ($F > 10$), the results are shown in Table 2 in columns (3) and (4), indicating that the assumption in this paper is still reliable and the digital transformation can still promote enterprises to fulfill ESG responsibilities.

To ensure the authenticity of the research results, the robustness test is conducted as follows. One is the propensity score matching. In order to eliminate the selective bias of the sample, the relevant data was regressed out after PSM pairing. The specific approach is as follows: according to the comparison of digital transformation and its median of dumb variables, the tendency score is calculated by taking control variables as covariates, and 1:1 nearest neighbor matching is generally adopted. The regression results are shown in Table 3 column (1), with a clear positive correlation between the digital transition and ESG, and the conclusion remains unchanged.

The second is to change the explained variable. In this paper, the explanatory variable is replaced with the Bloomberg ESG index, and the Bloomberg ESG index is a comprehensive continuous score compared with the rating

score of most discontinuity (e. g., AAA, AA, A, B, etc.). Therefore, in order to strengthen the rationality of the conclusion, this paper uses the Bloomberg ESG index for the robustness test. The results in Table 3 show that the regression coefficient of the digital transformation is significantly positive and the study results remain unchanged.

Table 2. Descriptive statistics

	observ ed value	mean value	standard deviatio n	median	crest value
ESG	12 664	4.263	0.977	4.250	8.000
DT	12 664	1.556	1.470	1.386	6.301
Liqui	12 664	-0.004	0.020	-0.002	0.000
Analyst	12 664	2.036	0.915	2.079	4.331
FInv	12 664	0.039	0.100	0.021	7.249
Lev	12 664	0.404	0.193	0.398	0.998
Roa	12 664	0.050	0.066	0.047	0.550
Cash	12 664	0.041	0.058	0.037	0.483
Growth	12 664	0.204	0.521	0.117	23.820
Tobinq	12 664	2.187	1.604	1.713	29.170
Top1	12 664	34.680	14.710	32.760	89.990
Dual	12 664	0.309	0.462	0.000	1.000

4.2.3. Mechanism Test Analysis

Based on the existing research, this paper speculated that digital transformation can improve the efficiency of enterprise ESG investment by improving managers' perception ability and their decision-making ability. The development of digital transformation is beneficial to accelerate the internal and external information flow, the stock information content and promote investors interactive information exchange, reduce the information asymmetry between enterprises and investors, make the enterprise can better perception operation may face all kinds of risks, help enterprises to improve the accuracy of decision-making, ultimately improve enterprise ESG investment efficiency. According to the results of Table 3 columns (6) and columns (7), the digital transformation of enterprises will improve the decision-making ability of managers. The application of digital technology will help enterprises to identify the changes of customer needs more quickly, thus promoting the improvement of the decision-making ability of managers. Further, in the case of improved managers' decision-making ability, enterprises often act for maintenance

The sustainable growth of self-interests meets the low-carbon needs of stakeholders and provides an important and effective driving force for improving the investment efficiency of ESG of enterprises. Moreover, the regression coefficient of manager decision-making ability (FInv) is significantly negative, which also provides empirical evidence support for the theoretical analysis of this paper.

4.2.4. Analysis of Heterogeneity

Gender characteristics of the managers. Previous studies have found that compared with women, men have the psychological characteristics of overconfidence, which makes them more optimistic about the investment environment, higher evaluation of their own ability, and more likely to make aggressive investment decisions [19]. Therefore, this paper speculated that digital transformation can reduce the aggressive degree of male executive overconfidence to some extent, and thus improve corporate ESG performance. Based on this, this paper divides the

sample into male CEO enterprises and female CEO enterprises. The value of male CEO enterprises is 1, otherwise 0, and the regression results are shown in Table 3. The empirical results in Table 3 show that the digital transformation of enterprises with male CEOs has a more obvious effect on improving the performance of enterprise ESG than that of female CEOs.

Table 3. Benchmark regression results

	(1)	(2)	(3)
	ESG	ESG	ESG
DT	0.035*** (5.940)	0.053*** (9.042)	0.043*** (5.585)
Lev		-0.119** (-2.424)	-0.251*** (-4.849)
Roa		2.251*** (15.458)	2.111*** (14.846)
Cash		1.138*** (7.300)	1.135*** (7.328)
Growth		-0.053*** (-3.193)	-0.033** (-2.051)
Tobinq		-0.061*** (-10.844)	-0.048*** (-8.140)
Top1		0.004*** (6.013)	0.004*** (6.301)
Dual		-0.065*** (-3.497)	-0.059*** (-3.277)
cons	4.209*** (333.615)	4.112*** (111.700)	2.887*** (18.562)
Ind	No	No	Yes
Year	No	No	Yes
N	12 664	12 664	12 664
Adj.R ²	0.003	0.046	0.128
Note: *** and ** are significant at 1% and 5% levels, respectively, with t value in parentheses.			

Whether the manager has an academic background. Previous studies have found that, compared with executives with academic background, executives without academic background lack the grasp of innovative information, relevant understanding of research and development activities, and no accumulation of relevant knowledge and experience, it is difficult to establish information advantages for enterprises and promote enterprises to carry out [20] innovation activities, so as to help the development of enterprises. It can be seen that the coefficient of interaction items between digital transformation and executives without academic background is significantly positive, indicating that the effect of digital transformation on improving the ESG performance of enterprises is more obvious among executives without academic background.

The manager has a financial background. Previous studies have found that the more serious the degree of financing constraints of enterprises, the greater the development constraints, and the more likely it is to miss good investment opportunities. The characteristic of weak risk tolerance will make senior executives tend to have low risk tolerance in the project decision-making process, which will reduce the possibility of enterprises choosing projects with higher risk degree [21]. Therefore, this paper speculated that digital transformation can help executives without financial

background to ease their financing constraints and improve their risk tolerance through their digital technology advantages, so as to improve their positive impact on the ESG performance of enterprises. Based on this, this paper divides the sample enterprises into enterprises without financial background and enterprises with financial background, and the value of enterprises without financial background is 1, otherwise it is 0.

Management shareholding ratio. Existing research found that the management stake can effectively reduce the management and shareholders interest problems, with the increase of shareholding, management and shareholder interests binding, effectively reduce the principal-agent problem, as an effective supervision mechanism, reduce the management self-interest behavior, and thus reduce the management real to virtual behavior

Elective probability [22]. Therefore, this paper speculated that compared with enterprises with high management shareholding ratio, digital transformation can help enterprises with low management shareholding ratio improve corporate governance with their digital technology and information collection and processing advantages, and positively affect the ESG performance of enterprises. Based on this, this paper divides the sample enterprises into enterprises with low management shareholding ratio and high management shareholding ratio, and the low management shareholding ratio is 1, otherwise it is 0.

5. Conclusion and Revelation

Select Shanghai and Shenzhen a-share listed companies in 2012-2021 data for the research sample, theoretical analysis and empirical test the influence of open innovation on ESG performance, and the economic policy uncertainty regulating the relationship between the two, through the following conclusions: (1) and no open innovation, compared to open innovation enterprises have better ESG performance, and the higher the degree of open innovation, enterprise ESG performance is better.(2) Open innovation plays a positive role in promoting enterprise environment (E), society (S) and governance (G), among which it has the greatest impact on environmental responsibility, social responsibility is the second, and corporate governance is the least.(3) The rise of economic policy uncertainty will strengthen the impact of open innovation on corporate ESG performance. Enterprises participating in open innovation will gain the trust of stakeholders by increasing ESG investment and reduce operational risks when the degree of economic policy uncertainty increases.(4) The heterogeneity test results show that compared with non-state-owned enterprises in small and medium-sized enterprises and enterprises with high market-opening, open-scale enterprises in large-scale enterprises, enterprises with low market-opening and state-owned enterprises play a stronger role in promoting ESG performance.

Based on the research conclusion, the following policy recommendations are proposed:

First, Enterprises should scientifically formulate the open innovation strategy and appropriately improve the level of open innovation. Under the new development pattern of domestic big cycle and international and domestic double cycle, enterprises should break through the organizational boundary and actively integrate into the industrial chain and innovation chain to carry out joint innovation. Considering the potential "double-edged sword" effect of open innovation,

enterprises should moderately expand the level of open innovation, make full use of the resource advantages and cost-sharing advantages brought by open innovation, and reduce the R & D costs and risks. Second, enterprise managers should strengthen their own cognitive level and knowledge and experience, Take the initiative to pay attention to the development of digital technology and research and development innovation activities, and conform to the digital trend of enterprises. Third, In view of the fact that the uncertainty of economic policy will increase the external environmental risks faced by enterprises, bring difficulties to enterprise management decisions, and affect the investment and financing activities, business activities and innovation activities of enterprises. Therefore, the government should maintain the consistency and stability of economic policies as much as possible, and weaken the impact of external environmental risks on the development of enterprises. Fourth, the government should continue to improve the system related to digital transformation and the construction of the legal system of enterprise ESG responsibility. Standardize the digital transformation behavior of enterprises, and supervise the enterprises to strengthen the investment in ESG.

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