Research on the Impact of Digital Finance on Enterprise ESG Performance in China

Siwei Zhong[1,*], Yihao Deng [2],Jiaxiang Li[3]

{2202101915@stu.jxufe.edu.cn[1], 2202102502@stu.jxufe.edu.cn[2], 2202202607@stu.jxufe.edu.cn[3]}

Finance and Economics University Of Jiangxi, MA 330006, China

Abstract. Based on the data of all A-share listed companies from 2015 to 2021, this paper studies the influence between digital finance and enterprise ESG performance, which considers factors of environment, society and governance. What's more, this article also further studies the difference of digital finance's influence on Corporate ESG level under the background of different corporate attributes and environmental characteristics. The results show that digital finance can significantly improve the level of enterprises from the following three aspects, environment, society and governance, especially having a positive impact on the social performance.Further research finds that digital finance has a more obvious effect on improving ESG performance for non-technological enterprises and highly polluting enterprises. Besides, in central and western regions as well as the pilot areas of digital RMB, digital finance plays a more significant role in promoting ESG performance. Finally, we expand the research perspective of enterprise ESG performance, and provide some development suggestions and strategies: deepening the development of digital finance, perfecting the product system of digital finance and formulating the differentiated development direction of digital finance.

Keywords: digital finance; sustainable development; corporate ESG; corporate operation.

1 Introduction

Traditional financial development faces numerous issues, such as low investment and financing cost in capital, high systemic risk in risk control, high processing difficulty and cost and low transparency in information. In the new era, the development of digital finance can solve variouse dilemmas of traditional finance through the deep integration with emerging technologies such as artificial intelligence, blockchain, cloud computing, and big data[1]. For example, digital finance can effectively help enterprises significantly alleviate financing constraints (Rui Huang et al., 2021)[2], alleviate the risk of debt default (Zhai Shuping et al., 2022)[3], and bolster competitiveness and overall enterprise value(Zhang Jiajia, 2023; Li Xiaoling et al, 2020)[4,5].

The development of digital finance has had an important impact on the production and operation activities of micro-enterprises. Recently, ESG concept is becoming significant topic in the global business community with the global sustainable development goes. However, research in the field of ESG started late in China. The "2022 ESG Rating Analysis Report of China A-share Companies" shows that the overall score of ESG evaluation of domestic listed companies is low. Additionally, it is estimated that financial resources can only meet 10% to 15% of the demand for green investment. Therefore, guiding the market to increase green investment,

ICEMME 2023, November 17-19, Beijing, People's Republic of China

DOI 10.4108/eai.17-11-2023.2342740

encouraging enterprises to consider economic, social, and ecological benefits, and improving the ESG performance of enterprises has become an urgent and important issue to be addressed[6].

At present, the existing research in the field of ESG mainly takes enterprise ESG performance as an explanatory variable to explore its impact on enterprises, markets and investors, such as the relationship with enterprise surplus (Xi Longsheng and Zhao Hui, 2022)[7],enterprise value (Fatemi, A et al., 2018)[8], investment and financing (Gao Jieying et al., 2021; Qiu Muyuan and Yin Hong, 2019)[6,9].However, there are few researches on the topic of studying the enterprise's ESG problem, which is from the perspective of digital transformation basically[10]. Therefore, which impacts the digital finance could influence the level of enterprise's ESG changing, and which conditions could be considered in this relationship? And solve this problem could be attached in our paper.

In view of this, this paper select A-share listed companies from 2015 to 2021 as samples to study the influence of digital finance development on ESG performance of enterprises and the influence path and heterogeneity, aiming to enrich the research on promoting ESG performance of enterprises and put forward policy suggestions. This research contributes in several ways: To begin, different from the existing digital transformation perspective, our study explores the influence and driving mechanism of digital finance on ESG performance of enterprises based on the background of rapid development of digital finance. Additionally, we delve into the pathways through which digital finance drives enterprise ESG performance, focusing on environmental, societal, and governance aspects. Moreover, by examining both enterprise and regional characteristics, this research also analyze heterogeneity and discuss how digital finance's influence on ESG performance varies among enterprises.

2. Theoretical analysis and research hypothesis

2.1 Digital Finance and ESG Performance of Enterprises

The positive impact of digital finance on enterprise ESG manifests primarily in three key aspects. First, the marginal cost of digital technology is nearly negligible, enabling digital finance to transcend limitations in costs and technologies. This facilitates the provision of more affordable and diversified financing channels, effectively alleviating liquidity constraints for enterprises and reducing the costs associated with ESG practices. Secondly, digital inclusive finance is policy-oriented and targeted, expanding the service scope and reach of traditional finance. For instance, it proves beneficial for small and micro enterprises, particularly in the realms of agriculture, rural areas, and farmers. When the Central Bank reduces required reserve ratios, this encourages financial institutions to provide low-interest loans to economically disadvantaged groups, fostering sustainability. Moreover, this encourages the technological innovation of enterprises, particularly in the sphere of green technology, enhancing enterprises' contributions to the environment and sustainable development. Thirdly, digital finance significantly enhances information transparency in the market by integrating a wealth of enterprise behavioral data. By evaluating critical information such as enterprise credit and development abilities through financial innovation technologies like big data and cloud computing, it serves as the foundation for credit supply.

Furthermore, stakeholders[1] not only focus on the economic profitability of enterprises but also equally emphasize welfare and responsibility. This compels enterprises to fortify their environmental protection capabilities, fulfill social responsibilities, and improve governance. Enhanced ESG performance enables enterprises to further optimize the efficiency of obtaining and utilizing funds, gain social recognition, support from a sustainable financial system, and establish a virtuous cycle. Based on this, we puts forward hypothesis H1 and minor hypotheses H1a:

Hypothesis1(H1).Digital finance can significantly promote ESG performance of enterprises.

Hypothesis1(H1a).Digital finance can significantly improve ESG performance of enterprises from Environment Social and Governance three aspects.

2.2 Heterogeneity analysis of corporate attributes and environmental characteristics on digital finance and corporate ESG performance

Science-based enterprises and non-science-based enterprises exhibit varied corporate performance and social behavior. The former necessitates more efficient, accurate, and large-scale investments due to the characteristics of substantial investment, high risk, and extended cycles in technology research and development. Inadequate investment often leads science-based enterprises into the predicament of severe fund shortages, stalled projects, and a dearth of innovative outcomes[11]. Digital finance can significantly mitigate liquidity constraints and offer improved financial support for enterprise innovation. Building on this premise, H2a is proposed:

Hypothesis2(H2a). The promotion of digital finance to enterprise ESG performance is more obvious in technology-based enterprises.

As a crucial segment of the national economy and a primary source of environmental pollution, heavily polluting enterprises face an urgent need to navigate a high-quality development path that ensures sustained economic growth while protecting the environment. Driven by policy constraints and public pressure, these enterprises are compelled to establish more aggressive pollution reduction targets and exhibit a heightened need for greener innovation. Consequently, they display a greater inclination to enhance their investment in ESG infrastructure and pursue green transformations, necessitating more abundant funds and lower threshold financing support. Based on this, H2b is proposed:

Hypothesis2(H2b). The promotion of digital finance to ESG performance of enterprises is more obvious in polluting enterprises.

The development of digital finance displays marked spatial heterogeneity across the eastern, central, and western regions, presenting a declining gradient among these areas[12]. The eastern region boasts an abundant reservoir of digital talent, ample financial resources, and a well-established financial infrastructure, with traditional financial services reaching a commendable standard. In contrast, the central and western regions lag behind, requiring an uplift in digital technology levels and the advancement of diverse forms of digital financial services to better cater to enterprises and enhance their ESG performance. Additionally, marketization and legal

[1] According to stakeholder theory, a company's stakeholders not only include shareholders, creditors, etc., but also encompass pressure groups such as government departments and local residents.

system maturity in the central and western regions significantly trail that of the east, highlighting an urgent need for digital finance as a supplement to enhance enterprises' ESG performance. On this basis, H2c is proposed:

Hypothesis2(H2c). The role of digital finance in promoting ESG performance of enterprises is higher in the central and western regions than in the eastern regions.

At present, the pilot scenario of digital RMB is gradually expanding from the consumer realm to the industrial sector. The settlement and programmability of digital RMB have also had a profound impact on enterprises. Digital RMB itself is a set of digital financial infrastructure, which is easy to use and convenient. Using digital RMB can open up financial services in the upper, middle and lower reaches of the supply chain, enable enterprises to enjoy more convenient financial services, and improve capital utilization efficiency and payment security. In non-pilot areas, the infrastructure of digital finance is backward, especially in some third-and fourth-tier cities. The financial service reach is limited, leading to challenges such as cross-regional account openings, high operational costs, and reduced efficiency. Digital finance is needed as a supplement to traditional finance to improve the resource utilization efficiency of enterprises, and then enhance the ESG performance of enterprises. Based on this, H2d is proposed:

Hypothesis2(H2d). In the pilot areas of non-digital RMB, digital finance plays a more significant role in promoting ESG performance of enterprises.

3. Research Design

3.1 Data and Samples

Utilizing A-share firms from 2015 to 2021, this paper analyze ESG data from the Huazheng Database and digital finance index from Peking University. Company data is sourced from CSMAR, complemented by CNRDS for missing data. To ensure empirical reliability, we: (1) Exclude T-class samples like ST or *ST; (2) Omit finance and real estate industry samples; (3) Remove samples listed for under six years; (4) Fill gaps in the digital index with average growth rates. Missing ESG and company data are completed via the K-nearest neighbors (KNN) algorithm. Ultimately, our dataset comprises 2,012 companies with 14,084 annual observations.

3.2 Model Specification

Due to the insignificance of the Hausman test p-value (0.4542), in order to validate the hypothesis presented earlier, the mixed-effects regression model (1) is employed. In this model, ESG_{it} represents the overall ESG level of company i in year t, index_{it} denotes the financial index of company i in year t, Controls represent the control variables, and ε_{it} stands for the random interference term. If β_1 is significantly positive, then H1 is supported.

$$\mathrm{ESG}_{it} = \beta_0 + \beta_1 \mathrm{index}_{it} + \sum \mathrm{Controls} + \varepsilon_{it} \quad (1)$$

3.3 Variable Definitions

Independent Variable: Digital Financial Development Level. In order to measure the digital financial development level, the research uses digital inclusive finance index compiled by

Digital Finance Research Center of Peking University[13]. Province, city, and county are the three level that make up the index. In this paper, the city-level index data is assigned to individual stock of company belonging to that city for the main regression analysis.

Dependent Variable: Corporate ESG Level. The Huazheng ESG rating data utilized in this paper, referencing mainstream domestic and international rating frameworks, incorporates 26 key indicators. Leveraging big data technology and employing an industry-weighted average method, it computes environmental, social, as well as governance dimensions' key indicators, thematic indicators, scores, and the overall ESG score. It exhibits characteristics of quantitative and data-driven calculations, robust localization capabilities, and extensive coverage.

Control Variables. Drawing from relevant studies by scholars like Zhang Lin and Zhao Haitao (2019)[14], Li Jinglin (2021)[15], and Gao Jieying (2022)[9] we introduce the following control variables: firm age, intangible asset ratio, independent director proportion, equity concentration, and cash flow ratio. The specific variables are shown in Table 1 .

Table 1 Definition of major variables.

Variable Name	Symbol	Measurement
Corporate ESG performance	ESG	HuaZheng ESG Rating
Environmental performance	E	HuaZheng ESG Rating
Social performance	S	HuaZheng ESG Rating
Governance performance	G	HuaZheng ESG Rating
Digital finance	Index	Digital inclusive finance index(city level)
Company Age	Age	Company Establishment Years
Intangible Asset Proportion	Intan	Intangible Assets/Total Assets
Independent Director Ratio	Dir	Independent Directors/Total Board Members
Ownership Concentration	Shrcr1	Largest Shareholder's Ownership Percentage
Cash Flow Ratio	Cf	Operating Cash Flow/Total Equity

4.Empirical Results

4.1 Descriptive Statistics and Correlation Analysis

Following a correlation test (Table 2), the maximum correlation coefficient is -0.083, indicating no significant linear relationship between the explanatory variables.

Table 2 Correlation coefficient.

	ESG	**Index**	**Age**	**Intan**	**Dir**	**Shrcr1**	**Cf**
ESG	1						
Index	0.053***	1					
Age	0.028***	-0.028***	1				
Intan	-0.0100	-0.062***	0.031***	1			
Dir	0.065***	0.041***	-0.050***	-0.033***	1		
Shrcr1	0.016*	-0.067***	0.052***	0.028***	-0.040***	1	
Cf	-0.00300	-0.00100	-0.083***	0.024***	0	0.067***	1

Descriptive analysis, as shown in Table 3, reveals that the mean value of the dependent variable (ESG) is 72.81, suggesting that most companies exhibit a high level of concern for ESG, performing well in sustainability aspects. However, there are relatively high standard deviations and significant differences between the maximum and minimum values in the Environmental (E), Social (S), and Governance (G) dimensions, signifying noticeable disparities in the areas of emphasis and strengths and weaknesses among different companies, with the social (S) aspect exhibiting particularly significant variation.

The mean value of the digital finance (Index) is 261.3, indicating the pivotal role of digital finance in corporate operations. The substantial spread between the minimum and maximum values and the large standard deviation suggest considerable variations in the level of digital finance across different companies, potentially influenced by factors such as industry characteristics, management strategies, and geographical features.

Table 3 Descriptive statistical results.

Variable	Obs	Mean	Std. Dev.	Min	Max
ESG	14,084	72.81	5.721	36.62	90.93
E	14,084	60.78	8.348	31.08	95.16
S	14,084	74.40	10.45	4.880	100
G	14,084	78.06	7.835	19.60	97.33
Index	14,084	261.3	45.38	62.67	359.7
Age	14,084	22.60	4.846	13	35
Intan	14,084	0.0488	0.0533	0.000163	0.355
Dir	14,084	37.70	5.479	33.33	57.14
Shrcr1	14,084	32.42	14.67	0.286	89.99
Cf	14,084	0.156	0.334	-9.020	4.797

4.2 Basic Regression Analysis

Based on the data characteristics, this study employs a static panel model using a mixed-effects model, with the regression results presented in Table4. In column (1), the data demonstrates that the estimated coefficient of the core explanatory variable, Index, is significantly positive. Column (2) is the regression including control variables, reducing the interference of missing variables, and the results remain the same, which is indicating a significant positive impact of digital financial development on corporate ESG levels, supporting the hypothesis H1.

Based on basic regression, columns (3), (4), and (5) in Table 4 further investigate the impact of digital financial development on the Environmental (E), Social (S), and Corporate Governance (G) aspects. The results indicate a significant enhancement in the E and S, because that the development of digital finance. It is evident that the development of digital finance can reduce transaction costs and resource consumption for companies and promote corporate support for social projects and charitable activities. Moreover, the impact on the social dimension is more pronounced than the environmental dimension, possibly due to the influence of the pandemic. Most companies complied with national policy requirements and actively engaged in pandemic

control, fulfilling their social responsibilities. In comparison, the impact of the dual carbon policy (peak carbon and carbon neutrality) announced in September 2020 is weaker.

As for the Governance (G) dimension, the coefficient is significant but negative, possibly influenced by the economic downturn. Under loose policies, companies are more likely to face financial constraints, leading to operational difficulties. This results in increased costs for internal control and financial management governance activities. Thus, hypothesis H1a is inaccuracy. However, overall, the negative impact on the Governance dimension is weaker than the positive impact on the Environmental and Social dimensions. Consequently, digital finance significantly promotes the overall ESG level of companies.

Table 4 Basic Regression and Corporate Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ESG	ESG	E	S	G	Technology	Non-technology	High-pollution	Low-pollution
Index	0.00497***	0.00492***	0.0251***	0.0374***	-0.0261***	-0.00236	0.00565***	0.0109***	0.00261**
	(6.34)	(6.21)	(26.62)	(26.19)	(-21.63)	(-0.90)	(6.80)	(7.22)	(2.80)
Age		0.0349	-0.0193	-0.00990	0.0929***	0.175**	0.0238	-0.00808	0.0454
		(1.70)	(-0.59)	(-0.27)	(3.79)	(2.76)	(1.10)	(-0.21)	(1.90)
Intan		-0.349	2.747	1.389	-2.560	16.92**	-0.905	-1.772	-0.242
		(-0.30)	(1.84)	(0.66)	(-1.57)	(3.00)	(-0.76)	(-0.76)	(-0.18)
Dir		0.0506***	-0.00614	-0.0183	0.137***	0.0238	0.0530***	0.0577**	0.0489***
		(5.44)	(-0.54)	(-1.09)	(10.15)	(0.80)	(5.42)	(3.18)	(4.53)
Shrcr1		0.00517	-0.000830	-0.00594	0.0150*	0.0234	0.00375	-0.0109	0.0129*
		(1.04)	(-0.12)	(-0.66)	(2.24)	(1.37)	(0.72)	(-1.23)	(2.14)
Cf		-0.175	0.308	-0.284	-0.447	-0.00191	-0.196	-0.474	-0.0854
		(-1.06)	(1.54)	(-0.95)	(-1.81)	(-0.00)	(-1.13)	(-1.51)	(-0.44)
_cons	71.53***	68.72***	54.72***	65.78***	77.36***	68.12***	68.73***	68.67***	68.80***
	(313.75)	(105.03)	(58.13)	(55.57)	(89.21)	(33.62)	(99.45)	(54.83)	(90.20)
N	14084	14084	14084	14084	14084	1302	12782	4267	9817
R2	0.007	0.040	0.029	0.040	0.086	0.064	0.032	0.036	0.041

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively

5. Further Analysis

Despite the significant enhancement of corporate ESG performance by digital finance, the results are influenced by various differing factors. Therefore, this paper further examines the relationship between them in the context of different corporate attributes and environmental characteristics.

5.1 Corporate Attributes

To verify the differential impact of digital finance on ESG levels in different corporate attributes, we classified the sample companies into technology and non-technology groups, according to the "Industry Classification Guidelines for Listed Companies" revised by the China Securities Regulatory Commission in 2012. Moreover, we divided the sample into high-pollution and low-

pollution groups based on the "Environmental Information Disclosure Guidelines for Listed Companies" published by the Ministry of Ecology and Environment, the regression results of the sample groups mentioned above are presented in Table4 (6)(7)(8)(9).

The results show that digital finance has a significantly positive impact on ESG performance in non-technology companies, while it is not significant in the technology group, rejecting hypothesis H2a. The reason is that non-technology companies are predominantly small companies, micro-enterprises and individual businesses. Such companies typically have a lower starting point, fewer financing channels compared to technology companies, and a greater need for digital finance to make up for their shortcomings. Digital finance also helps them diversify their financing channels, improve the efficiency of capital utilization, and the quality of services, thus enhancing their ESG performance. In addition, non-technology companies often face more intense market competition, and digital finance is more beneficial for enhancing their competitiveness, thereby driving ESG improvement.

In both low-pollution and high-pollution corporate groups, digital finance significantly enhances corporate ESG performance, with the coefficient and significance level being higher in the high-pollution group compared to the low-pollution group, supporting hypothesis H2b. Influenced by strict regulations and higher social pressure, high-pollution companies have stronger pollution reduction and green innovation needs, focusing on improving environmental management and reducing environmental risks. Therefore, they invest more in ESG development and have a stronger transformation willingness. In the current environmental context that advocates green, low-carbon, and sustainable development, low-pollution companies also emphasize their performance in social responsibility and governance to maintain their good image and reputation.

5.2 Environmental Characteristics

To investigate the impact of corporate digital financial levels on ESG performance in the context of varying degrees of digital financial development across different regions, this paper utilizes the Digital inclusive finance index to match each listed company with its respective geographical region. The sample companies are then categorized into Eastern, Central, and Western regions based on their geographical location[2]. Additionally, based on the list of cities where the digital RMB pilot program is being implemented, the sample companies are divided into pilot and non-pilot groups. The regression results are presented in Table5(1)(2)(3)(4)(5).

[2] Eastern Group: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan. Central group: Shanxi, Jilin, Heilongjiang, Henan, Hubei, Hunan, Anhui, Jiangxi. Western Group: Inner Mongolia, Chongqing, Sichuan, Guangxi, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Tibet.

Table 5 Environmental Characteristics, Digital Finance, and ESG

	(1)	(2)	(3)	(4)	(5)
	Eastern	Central	Western	Pilot	Non-pilot
Index	0.00187*	0.00982***	0.0166***	0.00354***	0.00852***
	(2.01)	(4.93)	(6.90)	(3.77)	(5.64)
Age	0.0668**	0.00212	-0.0859	0.0534*	-0.0183
	(2.75)	(0.04)	(-1.48)	(2.25)	(-0.45)
Intan	0.701	-1.092	-2.905	0.481	-1.991
	(0.48)	(-0.40)	(-1.08)	(0.34)	(-0.97)
Dir	0.0457***	0.0431	0.0865***	0.0535***	0.0456**
	(4.05)	(1.89)	(3.67)	(4.83)	(2.68)
Shrcr1	0.00734	-0.00791	0.00423	0.00684	0.00123
	(1.25)	(-0.64)	(0.30)	(1.14)	(0.14)
Cf	-0.0452	-0.294	-0.998*	-0.342	0.256
	(-0.24)	(-0.67)	(-2.04)	(-1.76)	(0.82)
_cons	69.01***	68.90***	67.24***	68.50***	69.42***
	(88.82)	(42.49)	(37.07)	(89.02)	(55.94)
N	9758	2401	1925	9709	4375
R2	0.037	0.071	0.128	0.040	0.050

The regression results for the Eastern, Central, and Western regions are all significantly positive, with the coefficients increasing sequentially. Moreover, the regression results for the Central and Western regions are more statistically significant than those for the Eastern region, implying a stronger demand for digital financial services in these regions. Hypothesis H2c is supported. The Eastern region, especially the coastal areas, having a broader access to funding from domestic and international markets, a more mature market environment, better infrastructure, and advanced technological resources. Consequently, the digital finance effects on the enterprise are relatively lower.

In contrast, the Central and Western regions have lower levels of traditional financial development and clear shortcomings. These regions are characterized by industries such as wind energy, solar energy, and traditional livestock farming, which heavily rely on digital finance for financing and liquidity support. Digital finance contributes to improving the ESG performance of enterprises in these regions, enhancing their competitiveness and sustainability.

The regression results for both the pilot and non-pilot groups are significantly positive, with the non-pilot group having a larger coefficient. This reflects a more noticeable improvement in ESG levels due to digital finance in non-pilot cities, supporting Hypothesis H2d. Compared to pilot cities, non-pilot cities have a relatively lower starting point in the digital domain, and local companies have fewer resources, relying more on the support of traditional financial systems. The enhancement of digital financial levels improves the operational efficiency of traditional financial systems, mitigates information asymmetry. It also encourages local enterprises to increase resource utilization, reduce environmental impact, and enhance social responsibility.

Additionally, companies in non-pilot cities may actively seek the support of digital finance to alleviate ESG-related pressures, thereby improving their competitiveness.

5.3 Moving regression test

Considering the temporal nature of data and policy influences, this research further introduce 'Lindex' as one-period lag in the digital finance index. As depicted in Table 6, the impact of digital finance on ESG and its three dimensions is still significant at the 1% level, with coefficient differ little from Table2. This suggests the impact of digital finance on ESG is continuous and robust, and the impact of the previous period will continue into the current period.

Table 6 Regression performed with a lag period of digital finance index

	(1)	(2)	(3)	(4)	(5)
	ESG	ESG	E	S	G
Lindex	0.00561***	0.00551***	0.0296***	0.0356***	-0.0255***
	(5.67)	(5.53)	(25.68)	(19.86)	(-16.84)
Age		0.0410	-0.0167	-0.0156	0.108***
		(1.90)	(-0.49)	(-0.41)	(4.14)
Intan		-0.867	2.109	0.688	-2.922
		(-0.66)	(1.26)	(0.29)	(-1.60)
Dir0		0.0495***	-0.00276	-0.0254	0.141***
		(4.82)	(-0.22)	(-1.38)	(9.50)
shrcr1		0.00509	-0.00490	0.000105	0.0141
		(0.92)	(-0.66)	(0.01)	(1.90)
cf		-0.308	0.0516	-0.347	-0.542*
		(-1.71)	(0.24)	(-1.07)	(-2.02)
_cons	71.46***	68.62***	54.05***	67.28***	76.23***
	(264.27)	(96.71)	(54.20)	(53.05)	(80.15)
N	12072	12072	12072	12072	12072
R2	0.006	0.040	0.025	0.040	0.085

6. Conclusion and enlightenment

In the context of upholding the new development concept, new development patterns, and achieving the "double carbon" goal, investigating the impact of digital finance on the ESG performance of tech enterprises is crucial. Analyzing data from all A-share listed companies from 2015 to 2021 and Peking University's Digital Inclusive Finance Index, we delve into the influence of digital finance on enterprise ESG. Key findings reveal that digital finance alleviates financial constraints, ameliorates information asymmetry, and enhances performance across ESG dimensions. It significantly enhances ESG performance in non-tech and heavily polluting sectors, urging support in these areas. Also, regional analysis suggests constraints in ESG

development for firms in central, western regions, and non-digital RMB pilot areas due to underdeveloped traditional finance sectors, prompting a need for policy support. Based on the conclusion of this paper, the following enlightenment could be obtained:

Firstly, deepen the development of digital finance, promote the deep integration of digital finance and enterprise business, and help enterprises to build ESG. Relying on natural language processing, knowledge mapping, intelligent modeling, etc. digital finance will further assist in the construction of enterprise ESG data ecosystem, and play the important role of digital finance in data collection, verification, identification, evaluation, use and transaction, bring improvements in efficiency, cost, security and authenticity for enterprises to carry out ESG business,it can also provide more efficient support for financial supervision in ESG standard promotion and incentive assessment.

Secondly, improve the digital financial product system, adopt different digital financial policies for technological and non-technological, polluting and non-polluting enterprises. Enterprises engaged in pollution-intensive activities necessitate substantial funds for environmental technology innovation, research and development, and business transformation. On the other hand, non-technological enterprises generally commence from a lower starting point, constrained by limited financing channels and insufficient access to traditional financial services. Hence, more abundant digital financial products are needed to provide more targeted financial support with the sustainable development and social responsibility of such enterprises.

Thirdly, the formulation of a tailored digital finance development strategy can be actualized through a 'one city, one policy' approach,which involves expediting the establishment of regional digital financial infrastructure, facilitating easier access for enterprises as well as small to medium-sized entities in the central, western, and underdeveloped regions to acquire financial services. Leveraging digital technology to dismantle geographical barriers, diminish the level of information asymmetry among financial institutions, and enhance the precision and traceability of information systems and transactional data. Concurrently, enterprises in less developed regions are encouraged to foster innovation, improve ESG performance, bolster economic growth, and foster coordinated development within these areas.

References

[1]Demertzis, M., Merler, S., & Wolff, G. B. (2018) Capital Markets Union and the fintech opportunity. Journal of financial regulation, 4(1), 157-165.

[2]Huang, R., Lai, X.B., Zhao, D.N., et al. (2021) Can digital finance alleviate the financing dilemma of enterprises-utility identification, characteristic mechanism and regulatory evaluation? China Economic Issues, (01), 52.

[3]Zhai, S.P., Han, X., Zhang, X.L., Chen X. (2022) Can digital finance reduce the risk of corporate debt default? Accounting Research (02),117-131

[4]Zhang, J.J. (2023) Digital Finance, Technological Innovation and Enterprise Competitiveness-Empirical Evidence from China A-share Listed Companies. Southern Finance (01),23-36

[5]Li, X.L., Cui, S.L., Lai, X.B. (2020) Can digital finance enhance the value of listed companies? - theoretical mechanism analysis and empirical test. Modern Finance (Journal of Tianjin University of Finance and Economics) (09), 83-95

[6]Qiu, M.Y., Yin, H. (2019) ESG performance and financing cost of enterprises under the background of ecological civilization construction. Research on quantitative economy, technology and economy (03), 108-123
[7]Xi, L.S., Zhao, H. (2022) Mechanism and data test of ESG performance affecting earnings persistence. Management Review (09), 313-326
[8]Fatemi, A., Glaum, M., & Kaiser, S. (2018) ESG performance and firm value: The moderating role of disclosure. Global finance journal, 38, 45-64.
[9]Gao, J.Y., Chu, D.X., Lian, Y.H., et al. (2021) Can ESG performance improve the investment efficiency of enterprises? Securities market herald (11),24-34+72
[10]Hu, J., Han, Y.M., Zhong, Y. (2023) How does the digital transformation of enterprises affect the ESG performance of enterprises——Evidence from listed companies in China. review of industrial economics (01), 105-123
[11]Zhang, Y.T., Chang, Y.M. (2020) Empirical test of the impact of digital finance on the investment efficiency of science and technology enterprises. statistics and decision (16), 179-183
[12]Huang, D.P., Zhu, X.Y. (2022) Comprehensive evaluation and spatio-temporal evolution of China's digital economy development level. statistics and decision (16), 103-107
[13]Guo, F., Wang, J.Y., Wang, F., Kong, T., Cheng, Z.Y. (2020) “Measuring China’s Digital Financial Inclusion: Index Compilation and Spatial Characteristics”, China Economic Quarterly, 2020, 19(9), 1401-1418
[14]Zhang, L., Zhao, H.T. (2019) Does the performance of corporate environment, society and corporate governance (ESG) affect corporate value? -An empirical study based on A-share listed companies. Wuhan Finance (10),36-43
[15]Li, J.L., Yang, Z., Chen, J., Cui, W.Q. (2021) Research on the mechanism of ESG promoting enterprise performance-based on the perspective of enterprise innovation. Science of Science and Science and Technology Management (09),71-89