



DIGITAL AND GREEN FINANCE AS DRIVERS OF ENTERPRISE RESILIENCE TO CLIMATE RISK: EXAMINING THEIR MITIGATING EFFECTS ON ENTERPRISE DEVELOPMENT

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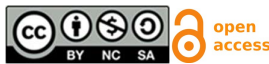
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Abstract

This study analysed the impact of digital finance and green finance on enterprise resilience and enterprise development in a climate-related uncertainty environment. The research method used in this study was quantitative. The research type adopted was design method and the data obtained were questionnaire-based data and five-point Likert scale data of 300 enterprises. Descriptive statistics, regression (Pearson correlation), and moderation analysis were used to analyse data. The results indicated that digital finance has significant positive influence on enterprise resilience ($\beta = 0.304$, $p < .001$), and green finance also has significant positive effect on enterprise resilience ($\beta = 0.357$, $p < .001$). A significant negative relationship existed between climate risk and enterprise development ($\beta = -0.331$, $p < .001$); enterprise resilience had a positive relationship with enterprise development ($\beta = 0.408$, $p < .001$). The regression model accounted for 55.9% of the variation in enterprise development ($R^2 = .559$). Moderation analysis results further showed that both the interaction between climate risk and digital finance ($\beta = 0.147$, $p = .002$) and the interaction between climate risk and green finance ($\beta = 0.176$, $p < .001$) were positive and significant. The results show that both digital finance and green finance can enhance the resilience of the enterprises and alleviate the negative effect of climate risk on enterprise development. The study brings together finance innovation, sustainable finance, resilience and enterprise development, thereby enriching the climate-finance literature.

Keywords: Climate Risk; Digital Finance; Enterprise Development; Enterprise Resilience; Green Finance; Sustainable Finance.

1. Introduction

Climate change is quickly putting business and financial risk on the agenda of companies as an important source of uncertainty. Firms faced four stressors in particular, namely extreme weather events, resource scarcity, supply chain disruption and environmental laws which affected production capacity, investment, liquidity and long-term growth of the firms. Climate hazards also added additional funding strain on businesses, including access to funds to run their operations, to invest in replacing the assets that were at climate risk, to adapt technologies, and to adjust their business models. In this context, enterprise resilience became a key part of sustainable development as it could help an enterprise withstand external shocks, restructure its resources, sustain necessary business operations and continue developing towards its goals. Evidence so far indicates that green corporate finance can contribute to improving the resilience of companies in terms of investments that support eco-friendly and protecting companies' ability to adapt to climate change (Wongsinhirun et al., 2026). Similarly, carbon risk reduction research in the field of green finance has shown that attaching a "green" thrust to financial instruments lowers the carbon risk of companies and increases their financial carbon risk management capacity (Zhong et al., 2024).



In an economy facing uncertainty, another key area of focus was digital finance and how it can help enhance the financial prowess of enterprises. They facilitated access to financial services, in particular payments, credits, investments services, financial information and alternative financial facilities, to enterprises timely and in a right manner through digital financial services. In addition, presenting conventional constraints to financial intermediation, which were reduced with the use of digital technologies, were information asymmetry and financing constraint. Empirical research also indicated that the digital financial services enabled the companies to enhance their financial resources, reduce financial obstacles and facilitate their green innovation efforts (Liu et al., 2022). In addition to a significant impact on value of corporate green innovations, digital finance also impacted the quality of the innovation, indicating that digital financial development is a vital piece of the technological and environmental transformation equation, not just an aspect of finance to improve access (Rao et al., 2022).

Another complementary contribution of green finance was its ability to draw financial flows to green activities, climate adaptation, clean technologies, energy efficiency and pollution reduction. Investment and financing opportunities emerged in the form of green bonds, green loans, sustainable financing and sustainable linked financing, which became avenues to invest in projects that concerned environmental issues and competitiveness of enterprises as well. The study further revealed that one way in which green finance decreased corporate carbon risk was the easing of financing constraints (Zhong et al., 2024); the other was in green-finance innovation increasing the corporate's resilience by mechanism with digital transformation and technological innovations (Yang et al., 2025).

1.1 Background of the Study

The background of the study was related to the growing effect of climate change on enterprises' finances. The climate risks that affected companies belonged to two categories: Physical Risk, Transition Risk. Physical risks comprised flood, drought, heatwave, storms and other climate events that would negatively impact infrastructure, production and supply chain. Risk factors for transition were related to the Environment, Carbon policy, Technologies, Investor expectations and Consumer preferences. The trends created strain on companies in terms of increased costs to adapt to and transform the environment.

In the context of this, digital finance became an important means to increase the financial accessibility and financial constraint. Digital platforms enabled accounts to take advantage of improved information processing and provided enterprises with access to financial services beyond the financial institutions. New financial data technologies were also instrumental in facilitating electronic payments, risk analysis based on technology, internet investment implementation, and data-centric credit. Financial pressure and R&D investment were found to be among of the positive effects of digital finance on green innovation at the corporate level by Liu et al. (2022). Based on the information asymmetry, consumer demand and factor-market conditions, Han and Zhang (2023) connected digital finance and enterprise green innovation, revealing that digital finance is a facilitator for enterprise green innovation.

These, together with the notions of Green Finance, further strengthened the synergy of financial systems and organization development with climate action. Green financial instruments channelled investments into infrastructure related to renewable energy, energy efficiency and environmental protection, low carbon production and climate adaptation. A study showed that digital technologies would enhance the efficiency and transparency of green-finance systems as well. If the technological application is successful to solve financing problem and improves the financial efficiency of green financing development, according to the above-mentioned study, the FinTech is helpful to bring the green finance development forward. The outcomes presented in more recent studies pointed out that the role of digital finance enabled us to push green innovation activities, but also revealed the existence of nonlinear effects induced by different phases of digital finance aspects (Wen et al., 2026).

The presence of resilience within the enterprise therefore made a real connection between climate risk and finance development possible. Resilience has meant the ability of enterprises to absorb external shocks, keep going, adjust strategies and bounce back to continue their enterprise developmental plans. Resilience may also be achieved with green corporate finance which can support investments in climate adaptation and



investment in environmentally friendly investments; digital finance may also help to strengthen financial flexibility and access to information and optimize resources use. Wongsinhirun et al. (2026) showed the possibility of green corporate finance for firm resilience to climate change risk and Ma et al. (2026) revealed the relationships between digital finance, green development and supply chain resilience with the climate change risk acting as a mediator between the first and the latter.

1.2 Objectives of the Study

1. To analyse the impact of digital finance on the resilience of enterprises to climate risks.
2. To explore the impact of green finance on enterprise resilience and enterprise development in the context of uncertainty due to climate change.
3. To evaluate the mitigating role of digital finance and green finance on climate risk's negative role on the enterprise development.

1.3 Research Questions

1. How did digital finance impact on enterprise resiliency for climate risk?
2. How did green finance affect enterprise resilience and enterprise development in the climate uncertainty?
3. How did the impact of climate risk on enterprise development get reduced by digital finance and green finance?

1.4 Significance of the Study

The study was important as it allowed for an integrated understanding of how digital finance and green finance can help to enhance enterprise resilience and minimize the negative impacts of climate risks on enterprise development. The study drew links between financial innovation and climate adaptation, sustainable investment, technological development and the continuity of enterprises by studying the availability of digital finance and mechanisms of environmental finance. The results potentially help enterprise managers to identify financial mechanisms that facilitated adaptation and sustainable investment, and finance institutions could employ the evidence in creating financial products that could help overcome enterprise needs and climate-related risks. The research could also help policy makers craft synergies digital-finance and green-finance policies, which would provide better access to capital, stimulate investment in the climate, and foster sustainable enterprise development. Among the study's benefits to the body of work, it linked digital finance, green finance, climate risk and enterprise resilience to offer a foundation for further study on the design of financial systems in the context of climate change and sustainability of finance and enterprise development.

1.5 Research Hypotheses

H1: Digital finance had a significant positive effect on enterprise resilience to climate risk.

H2: Green finance had a significant positive effect on enterprise resilience to climate risk.

H3: Digital finance and green finance significantly mitigated the negative effect of climate risk on enterprise development.

2. Literature Review

Digital finance was a key financial transformation because the new capacities of digital technologies brought a new way for enterprises to acquire, utilize and manage financial resources. Digital platforms has broken down the geographic and information limitations, and for enterprises, it helped them obtain credit, payment facilities and get investment, financial information with ease. In order to prove that digital finance indeed promotes companies' green innovation, the empirical results revealed that the financing constraints and information transparency channels were the two channels through which digital finance impacted enterprise-level innovation (Li & Zhou, 2024). Hence, based on the findings made by Chen et al. (2024), the positive role that digital finance can play in the field of the development of green innovation in companies lies in how it can leverage the financial flexibility and reduce financing constraints.

Digital finance also boosted the quality and sustainability of innovation in the relationship between this and enterprise development. The own results show that digital finance facilitated sustainable green innovation of corporations in terms of reduced financing costs and finance challenge, while ESG performance



influenced the link between the digitalisation of finance and the greening of innovation, in conformity with Yang and Hui (2024). Other than the channel of “capital availability”, Wang et al. (2024) pointed out a “product market mechanism”, finding that digital finance also played a significant role in fostering listed companies’ green innovation. These results suggest that digital finance could build a more inclusive financial system that will enable enterprises to choose environmentally friendly activities, adapt to market dynamics and innovate.

There was also relevance with digital finance relating to enterprise Climate Risk Management: Companies that can access timely and flexible financial resources might be more likely to bounce back from the climate related shocks. In investigating the connection between digital finance and corporate climate risks, Fang (2026) revealed that digital finance helped enterprises obtain funding and enhanced their climate adaptation and mitigation capacity. Furthermore, according to Ren et al. (2026) digital finance played a positive and significant role on the disclosure of the information about climate risks to the company considering the financing constraints and the environment responsibility and reputation incentives mechanisms.

Green Finance was a key financial instrument in promoting environmentally sustainable business development, it was related to financial support of energy efficiency, clean technologies, pollution reduction, renewable energy and adapting to climate change. With growing pressure on businesses from regulators, investors, and consumers, and a growing environmental pressure, it became more important. Zhu and Li (2024) asserted that the ESG performance of the companies was quite improved after green-finance policy was implemented, indicating green-finance policy would have an impact on any environmental performance by companies, as well as other sustainability practices. Zhang and Wei (2024) discovered that the internal technological innovation pathway and the external financing ability pathway were the mechanism of positive effects of green finance on enterprise ESG performance.

Zhang and Wei (2024) found a positive correlation between the number of green finance and the economic resilience of regions, with its enhancement further enhancing the correlation. On the enterprise side, Rahman and Amjad (2024) analysed Pakistani manufacturing companies and found that the competitiveness resiliency of the companies in the cases of economic and political uncertainty was affected by green finance, infrastructure and technological skills. That was particularly relevant given their results which showed this could be connected with resilience in a scenario where there were several financial and environmental uncertainties in emerging market companies. These results indicated that green finance could contribute to resilience beyond its role as a new financial source, by creating new technological capabilities, sustainable resources and so on, enhancing resilience to disturbances that can be caused by outside entities.

Recently, new research also confirmed the idea that green finance can be used to improve the resilience of the enterprises, since it can help in innovating and technological change and finance stability. According to Yang et al. (2025) and based on China data, the introduction of green-finance innovation policies had a dire impact on the resilience of the green-finance innovation zones’ companies in the field of green-finance reform. Their mechanism analysis indicates that these were the factors influencing the above relationship. Internet of things (IoT) finance further enhances the ability to withstand external economic shocks for firms, as discussed by Feng et al. (2025) for the manufacturing industry in China, and provides a link between green finance policy and firm’s resilience.

2.1 Climate Risk, Financial Mechanisms, and Enterprise Development

Climate risk was increasingly becoming a factor for enterprises developing, climate was expected to impact produce, investments, climate supply chains and supply times, financial security, and to impact markets. Damage to productive assets, interruption to business operations and cost implications may result from enterprises’ exposure to physical climate risk; transition risk may arise due to environmental regulation, technology developments and market demand changes. Based on this potential, Fang (2026) concluded that digital finance could play a part in the mitigation of corporate climate risk, as it improves capital access and can make the company less vulnerable to climate risk factors. This correlation indicated that access to financial services was an important part of climate resilience as companies needed the finance to keep going and adapt.



Green finance additionally supplied a vital remedy for companies to withstand climate risk and keep enhancing. The study found that green-finance policies would play a pivotal role in boosting the profitability and corporate resilience of the firms by fostering technology enhancement and financial conditions; also, strengthen the digital transformation (Yang et al., 2025). From the other direction another important finding was that there is an interaction between green finance and infrastructure and technological capabilities to further boost competitiveness resilience which was also supported by the results obtained from the manufacturing companies in Pakistan (Rahman & Amjad, 2024).

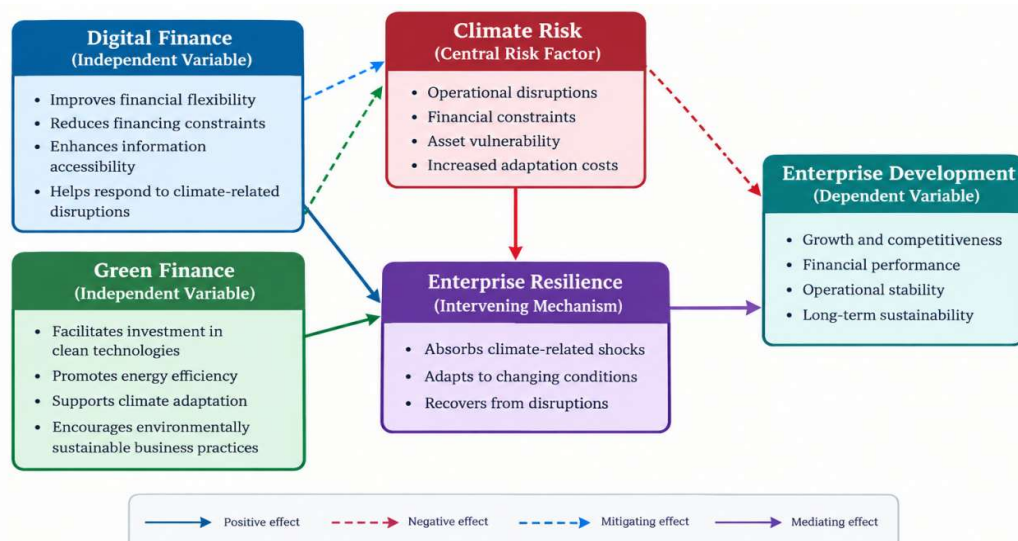
Literature thus indicated a significant relationship between Enterprise development and 4 key aspects of digital finance, green finance, climate risk and these aspects were largely studied separately. First, four topics - financing constraints, financial flexibility, innovation, and information transparency and climate-risk management - were key interests in digital finance research, whereas four topics - ESG performance, environmental transformation, innovation and resilience - were key interests in green finance research. Recent evidence shows that digital finance can mitigate the current situation of climate risk for companies (Fang, 2026); and that green-finance innovation can support the digital transformation of the company, increase its innovation potential and improve the financing environment for green finance projects (Yang et al., 2025).

2.2 Conceptual Framework Model

It was conceptualized based on the traditional quantitative study method. The conceptual structure of the study was based on the traditional quantitative research approach, which sees digital finance and green finance as independent variables, and then takes climate risk as an intervening variable and enterprise development as a dependent variable. A backdrop was put forward supporting that a higher level of financial flexibility, reduction of financial constraints, rendering more ease of obtaining financial information and facilitating information, and strengthening the climate shock adaptation of enterprises, would all be facilitated by increased access to digital finance technologies. Green finance can play a part in bringing investments in climate adaptation, environmental sustainability of business practice, energy efficient technology, and clean technologies to the market. In the light of this historic risk to climate, it was expected that negative pressures that enterprise development would experience include disruption of operations, financial constraints, vulnerability of assets, and an increase in adaptation costs. Enterprise resilience was mentioned as a means through which digital finance & green finance could support the enterprises to endure, adapt and recover from climate risks. The framework proposed that the digital and green finance can complement each other to counteract the negative effects of climate risk and that ultimately will support the sustainable development of companies.

Figure 1

Conceptual Framework Model





The figure presents the conceptual framework linking digital finance, green finance, climate risk, enterprise resilience, and enterprise development.

3. Research Methodology

3.1 Research Design

This study employed a quantitative study methodology to explore relationship between digital finance, green finance, enterprise climate risk, enterprise resilience and enterprise development. A quantitative method was fitted for the study that rooted mainly on the measurement of the relationships among known variables and the testing of the proposed hypotheses by using statistical methods. Based on previous empirical study on climate finance, the empirical design adopted the quantitative approach using panel or firm-level data, and employed methods of analyzing relationships between financial mechanisms and climate-resilience outcomes.

3.2 Population and Sample

The target population were enterprises where risks related to climate change have impacts on their finances and operations. Finally 300 enterprises were selected for inclusion in the sample for empirical analysis. The sample consisted of businesses from the manufacturing, services, agriculture related, energy, transportation, and other commercially active sectors that were impacted by the climate shifts. Purposive sampling was used to ensure adequate coverage in terms of knowledge about the financial approach, exposure to climate risks, activities undertaken with green finance, the use of digital finance, and development results of the enterprises. Companies that did not have a very full response were removed from the data set. The number of enterprises selected were nourished that considering 300 enterprises, sufficient observation were obtained for descriptive analysis, correlation analysis, regression estimation and hypothesis test.

3.3 Data Collection Procedure

In the study, primary quantitative data was collected by using a structured questionnaire which was administered to the selected businesses. The questionnaire was designed based on the constructs of the conceptual framework and segmented into Digital finance, Green finance, Climate risk, Enterprise resilience, and Enterprise development. Statements were presented and respondents were asked to indicate their opinion on each of these statements, where '1' was strongly disagree and '5' was strongly agree. The questionnaire was sent electronically or, if appropriate, directly from the organization. A number of respondents were drawn from managerial, financial, operational and administrative roles, because people in these roles were likely to be in possession of relevant knowledge of their enterprises' financial activities, relatable financial challenges and growth initiatives.

3.4 Data Analysis

All of the collected data were analysed on SPSS. Descriptive statistical data such as frequency, mean and standard deviations was first used to describe the characteristics of the respondents and frequency distribution of study variables. The Pearson coefficient correlation (PCC) is then established to explore the direction and level of association between digital finance and green finance, climate risk, enterprise resilience, and enterprise development. Multiple regression analysis was then used to validate the hypotheses. This analytical process yielded descriptive and inferential evidence for the relationships hypothesized in the conceptual framework.

4. Results and Analysis

4.1 Descriptive Statistics

The descriptive analysis was conducted to examine the central tendency and dispersion of the major study variables. The analysis included Digital Finance (DF), Green Finance (GF), Climate Risk (CR), Enterprise Resilience (ER), and Enterprise Development (ED).

Table 1

Descriptive Statistics of Study Variables (N = 300)

Variables	Mean	Std. Deviation
Digital Finance	3.72	0.68
Green Finance	3.65	0.71
Climate Risk	3.58	0.76



Enterprise Resilience	3.81	0.64
Enterprise Development	3.76	0.67

From the results presented in Table 1, it could be concluded that Enterprise Resilience had the highest mean ($M = 3.81$; $SD = 0.64$), followed by Enterprise Development ($M = 3.76$; $SD = 0.67$) and by Digital Finance ($M = 3.72$; $SD = 0.68$). As a whole, these values were relatively high level of digital-finance, ups and enterprise development, and good level of resilience among respondents. The mean value for Green Finance was 3.65 points ($SD = 0.71$) indicating a moderate level of availability/access to and use of environmentally oriented financial mechanisms. The mean score obtained by Climate Risk was 3.58 ($SD = 0.76$), indicating that the climate-related risks was a significant concern among the enterprises included in this study. This showed an average variation from 0.64 to 0.76 in responses to each question, which mean they were in the moderate range of standard deviations. However, Enterprise Resilience had the smallest SD (0.64), indicating lower variation among respondents in regard to how resilient their enterprises are to disruption. The differences between businesses are greatest within the Climate Risk ($SD = 0.76$), reflecting the highest variation.

4.2 Correlation Analysis

Pearson correlation analysis was conducted to determine the direction and strength of relationships among Digital Finance, Green Finance, Climate Risk, Enterprise Resilience, and Enterprise Development.

Table 2

Pearson Correlation Matrix of Study Variables

Variables	DF	GF	CR	ER	ED
Digital Finance (DF)	1				
Green Finance (GF)	.48	1			
Climate Risk (CR)	-.21	-.27	1		
Enterprise Resilience (ER)	.52	.55	-.38	1	
Enterprise Development (ED)	.49	.51	-.42	.63	1

Note. $p < .01$.

Table 2 revealed that the relationship between Digital Finance and both Enterprise Resilience and Enterprise Development was positive, $r = .52$ ($p < .01$) and $r = .49$ ($p < .01$) respectively. Green Finance also had positive relationships to Enterprise Resilience ($r = .55$, $p < .01$) and Enterprise Development ($r = .51$, $p < .01$). The results showed that enterprises with higher levels of digital finance and green finance showed higher resilience and development. The correlation between Digital Finance and Green Finance was positive-moderate, $r = .48$, $p < 0.01$, indicating that enterprises that are more involved with digital-finance were also more involved with green-finance. Climate Risk demonstrated negative relationships with Digital Finance ($r = -.21$, $p < .01$), Green Finance ($r = -.27$, $p < .01$), Enterprise Resilience ($r = -.38$, $p < .01$), and Enterprise Development ($r = -.42$, $p < .01$). The highest value in the matrix was in the correlation between Enterprise Resilience and Enterprise Development ($r = .63$, $p < .01$), which we considered as a significant positive association.

4.3 Regression Analysis: Digital Finance, Green Finance, and Enterprise Resilience

Table 3

Regression Results for Predictors of Enterprise Resilience

Predictor	B	Std. Error	Beta (β)	t	p
Constant	1.214	0.214	—	5.67	< .001
Digital Finance	0.286	0.052	0.304	5.50	< .001
Green Finance	0.331	0.049	0.357	6.76	< .001
Climate Risk	-0.218	0.047	-0.259	-4.64	< .001

Model Statistics: $R = 0.684$; $R^2 = 0.468$; Adjusted $R^2 = 0.463$; $F = 86.86$; $p < .001$.



The results showed that DIGITAL FINANCE was positively and statistically significantly related to Enterprise Resilience ($\beta = 0.304$, $p < .001$). In addition, Green Finance was found to be positively associated with Enterprise Resilience with a statistically significant effect size ($\beta = 0.357$, $p < .001$). In particular, the coefficient was slightly higher than for Digital Finance, showing a relatively high statistical association with Enterprise Resilience in this model. The Enterprise Resilience showed a significant negative association with Climate Risk ($\beta = -0.259$, $p < .001$) suggesting that increased exposure to climate related pressures was correlated with lower enterprise resilience. The overall regression model was statistically significant ($F = 86.86$, $p < .001$) accounting for 46.8% of the variance ($R^2 = 0.468$) in Enterprise Resilience. The adjusted R^2 was 0.463 showing that amount of predictive power of model remained significant after correction for the number of the predictors.

4.4 Regression Analysis: Enterprise Development

A second multiple regression model was estimated to investigate the impact of Digital Finance, Green Finance, Climate Risk and Enterprise Resilience on Enterprise Development.

Table 4

Regression Results for Enterprise Development

Predictor	B	Std. Error	Beta (β)	t	p
Constant	0.782	0.196	—	3.99	< .001
Digital Finance	0.214	0.047	0.226	4.55	< .001
Green Finance	0.251	0.045	0.276	5.58	< .001
Climate Risk	-0.287	0.044	-0.331	-6.52	< .001
Enterprise Resilience	0.391	0.051	0.408	7.67	< .001

Model Statistics: $R = 0.748$; $R^2 = 0.559$; Adjusted $R^2 = 0.553$; $F = 93.47$; $p < .001$.

The results showed that Digital Finance had a significant positive association with Enterprise Development $\beta = 0.226$, $p < .001$. Green Finance also showed positive and large relationships with Enterprise Development $\beta = 0.276$, $p < .001$. The results indicated a near-significant negative correlation between Climate Risk and Enterprise Development $\beta = -0.331$, $p < .001$ with higher climate pressures related to reduced outcomes in enterprise development. The most significant standardized coefficient in this model was the one for enterprise resilience $\beta = 0.408$, $p < .001$, suggesting strong positive relationship between enterprise resilience and enterprise development. The model's $R^2 = 0.559$ and the adjusted $R^2 = 0.553$ explained 55.9% of the variance in Enterprise Development. The overall model was statistically significant $F = 93.47$, $p < 0.001$, indicating that the predictors were able to provide considerable information for explaining the development of enterprises.

4.5 Moderating Effects of Digital Finance and Green Finance

Table 5

Moderating Effects of Digital Finance and Green Finance on the Climate Risk–Enterprise Development Relationship

Predictor	B	Std. Error	Beta (β)	t	p
Climate Risk	-0.362	0.058	-0.389	6.24	< .001
Digital Finance	0.198	0.049	0.209	4.04	< .001
Green Finance	0.237	0.047	0.253	5.04	< .001
Climate Risk $\times$ Digital Finance	0.126	0.041	0.147	3.07	.002
Climate Risk $\times$ Green Finance	0.159	0.043	0.176	3.70	< .001
Enterprise Resilience	0.348	0.052	0.361	6.69	< .001

Model Statistics: $R = 0.782$; $R^2 = 0.612$; Adjusted $R^2 = 0.605$; $F = 77.35$; $p < .001$.

The results indicated that there was a positive and statistically significant interaction between Climate Risk and Digital Finance $\beta = .147$, $p = .002$). The relationship of Climate Risk and Green Finance was also positive and statistically significant $\beta = 0.176$, $p < .001$). The results revealed that increased digital finance



and green finance dampened the adverse relationship between climate risk and enterprise development. This positive interaction coefficient was especially significant due to the negative direct coefficient for Climate Risk $\beta = -0.389$, $p < .001$). For Enterprise Development, the model accounted for 61.2% variance of the data $R^2 = 0.612$; an adjusted R^2 of 0.605. SME As continued to show a positive and significant relationship with Enterprise Resilience (beta = 0.361, $p < .001$). The results support H3, showing that digital finance and green finance had significant interaction effects when it came to climate risk and enterprise development.

4.6 Hypothesis Testing

Table 6

Summary of Hypothesis Testing

Hypothesis	Relationship	β	p-value	Decision
H1	Digital Finance $\rightarrow$ Enterprise Resilience	0.304	< .001	Supported
H2	Green Finance $\rightarrow$ Enterprise Resilience	0.357	< .001	Supported
H3	Digital Finance & Green Finance $\times$ Climate Risk $\rightarrow$	0.147 /	.002 /	Supported

The hypothesis testing results indicated statistical support for all three hypotheses that were proposed. The inclusion of H1 was supported as Digital Finance showed positive and significant relationship with Enterprise Resilience ($\beta = 0.304$, $p < .001$). The evidence regarding a Positive and Significant relationship for Green Finance with Enterprise Resilience ($r = 0.357$, $p < .001$) was further supporting evidence for the inclusion of H2. The findings suggested positive links between both types of financing and enterprises' adaptation to the crisis. Both interaction effects were statistically significant so H3 was supported. Climate Risk $\times$ Digital Finance had significant interaction of ($\beta = 0.147$, $p = .002$), and the Climate Risk $\times$ Green Finance had significant interaction of ($\beta = 0.176$, $p < .001$). The effects of digital finance and green finance on the negative relationship between climate risk and enterprise development showed that the effect was negative.

5. Discussion

The results revealed that digital finance is positively related to enterprise resilience, thus supporting the first hypothesis. The positive coefficient signified that enterprises having high exposure to digital financial services' showed higher capacity to face disruptions resulting from a changing climate situation. In addition, digital finance could help improve access to capital, reduce firms' financing constraints and accelerate decisions in the financial realm, leading to greater flexibility during times of uncertainty. This coincided with Fang (2026), who reported that digital finance can help businesses better counter corporate climate risk by gaining higher proportion of R&D investment and enhancing green finance. Ma et al. (2026) found that the digital finance has aided in improving the green credit allocation and green technological innovation to achieve supply-chain resilience.

The results were also in agreement with H2 so that the green finance was correlated positively with the resilience of enterprises. The higher coefficient for 'green finance' reflected the fact that green finance is an important lever for companies to respond to, manage and adapt to pressures stemming from climate change. Green financing might support the investment in cleaner technologies, energy efficiency, sustainable production, addressing impacts of climate change and continue business operations faced with external shocks. Green financing can enable investments in cleaner technologies, energy efficiency, sustainable production, and addressing the impacts of climate change, as well as help firms sustain business operations in times of external shock. Digital transformation, like the green-finance innovation policies of Yang et al. (2025), also leads to an increase in innovation ability and reduces the burden on financing, thereby increasing the resilience of the enterprises.

When explaining a negative climate risk-climate-enterprise development relationship, the idea is that the more the enterprise is exposed to climate risk, the lower the enterprise development results will be. The businesses could be affected in several ways, including operational disruption, cost of adaptation, disruption of their supply chains, restrictions on resources, and changing regulatory demands, as a result of climate risk. The discovery was happening in conjunction with a new study that showed business exposure to climate risks was considerable and was challenging each business's adaptation and mitigation capacity. Emancipation of



digital finance has been proven to lower the exposure of companies in climate-risks, though its impacts were larger on transition-risk compared with physical-risk, according to Fang (2026).

The correlations results confirmed the significance of enterprise resilience with enterprise development, that is, in enterprises with high resilience, enterprise development is found to be high as well. This finding was another affirmation that resilience is a skill and ability of the organisation that can help hold companies growing in an environment of uncertainty. Digital and green finance can contribute to this - access to better resources, new technologies and reinforcing of the resilience of firms to external shocks. Here are some recent evidences related to digital finance and green finance, which both confirmed that it improved resilience: Digital finance strengthened resilience by better resources allocation and financing availability while green finance strengthened corporate resilience by digitalisation, innovation and improvement of financing.

The interaction effect between Climate Risk $\times$ Digital Finance and Climate Risk $\times$ Green Finance showed a significant reduction of the negative correlations found, confirming that both financial mechanisms reduced the climate risk in both interaction effects. Positive interaction coefficients suggested that, while access to the green and digital finance tools and services were to be inversely related to development, the relation remained non intense and thus weak. Positive interaction coefficients suggested a negative, but slightly diminished, effect of the ability to access digital and green finance on enterprise development. This discovery echoed recent research that suggested digital finance could be a means to facilitate access to green finance, reduce exposure to climate risks, and that green-finance policies can boost the climate resilience through technology-based innovation and address financing constraints. Ma et al. (2026) found that climate risk had a significant impact on the resilience outcomes alongside digital finance.

6. Conclusion

The research in this paper was mainly focused on the implementation of the finance digital and green finance to improve the climate-resilient capacity of enterprises and assist sustainable development of enterprises. The study highlighted the role digital finance can play in making finance more accessible, making transactions more efficient, making it more flexible, improving the adaptability of enterprises to climate related disruptions; the role it can play in enabling sustainable investment; in enabling green technology; in any increase of energy efficiency and, in the field of business practices, in climate adaptive strategies; the role green finance can play in enabling all of these; and the role it can play in enabling sustainable finance. Climate risk may alter business operations, create an increase in adaptation costs, damage resources and limit enterprise development, the organizational strength of resilience will be essential for maintaining continuity and adapting to the changing climate. Digital finance and green finance can be complementarily used as financial instruments by enterprises to deal with uncertainty on climate change, adjust enterprises' climate change response and take measures toward sustainable development.

Author's Contributions

All authors participated in ideation, development, and writing the manuscript. All authors read and approved the final manuscript.

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Informed Consent

Informed consent was obtained from all participants prior to data collection. Participants were informed about the purpose of the study, the voluntary nature of their participation, and their right to withdraw at any time without any consequences. The confidentiality and anonymity of respondents were guaranteed throughout the research process.

Data Availability



The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request. The authors are committed to transparency and will provide detailed methodological information and analysis protocols upon request.

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