

The Impact of Digital Finance on Corporate Export Resilience

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Abstract

Based on data from Chinese A-share listed companies from 2016 to 2023, this study examines how digital finance affects corporate export resilience. Using a two-way fixed effects model, we find that digital finance significantly enhances export resilience. This conclusion remains valid after robustness tests. Digital finance strengthens firms' capacity to resist external shocks, recover exports, and facilitate upgrading by easing financing constraints and improving resource allocation. We recommend further developing digital financial infrastructure, creating tailored financial services for exporters, and enhancing policy coordination to boost firms' risk resilience and international competitiveness, thereby supporting high-quality foreign trade development.

Keywords

Digital Finance; Export Resilience; Two-way Fixed Effects Model

1. Introduction

Against the backdrop of heightened global economic uncertainty, enhancing export resilience has become a crucial pathway for China to address trade risks and achieve high-quality development in foreign trade. Export resilience emphasizes the capacity of economic entities to withstand external shocks and maintain stable and sustainable export growth (Dai Xiang et al., 2023). In recent years, slowing external demand, restructuring of international supply chains, and frequent trade frictions have posed multiple challenges to China's exports. The report of the 20th CPC National Congress explicitly called for “promoting the optimization and upgrading of goods trade and accelerating the building of a trade powerhouse,” while the 14th Five-Year Plan for High-Quality Development of Foreign Trade further underscored the importance of enhancing trade risk response capabilities. In this process, digital finance, as a key component of the digital economy, is progressively demonstrating its potential to empower the real economy and the foreign trade sector.

According to the Action Plan for High-Quality Development of Digital Finance, China is accelerating the digital transformation of financial institutions and leveraging da-

ta elements and digital technologies to enhance the quality and efficiency of financial services. By the end of 2023, China's digital finance market had reached 41.7 trillion yuan, accounting for 15.6% of the global market. Digital finance not only encompasses diverse services such as payments, credit, investment, and insurance but also plays a positive role in supporting corporate innovation and improving resource allocation efficiency (Tang Song et al., 2020). Existing research indicates that digital finance can enhance enterprises' risk-coping capabilities through mechanisms like alleviating financing constraints, promoting technological innovation, and increasing information transparency (Liang Bang and Zhang Jianhua, 2019), thereby potentially exerting significant influence on export resilience.

Against this backdrop, examining whether and how digital finance and corporate innovation influence export resilience holds substantial theoretical and practical significance. While existing literature has separately addressed the role of digital finance in promoting corporate innovation (Zhang Yao et al., 2024) and the impact of digital transformation on enhancing corporate export resilience (Zhang Pengyang et al., 2023), no systematic investigation has yet been conducted on the effects of digital finance on corporate export resilience. This study aims to analyze the impact of digital finance on export resilience. Such analysis not only enriches academic discourse but also provides insights for policymakers, fostering higher levels of foreign trade security and development in the digital economy era.

2. Literature Review

2.1. Research on the Impact of Digital Finance

Existing literature on the impact of digital finance primarily focuses on two dimensions: macro and micro. At the macro level, research predominantly examines the role of digital finance in promoting economic growth and inclusive development. Zhang Xun et al. (2019) indicate that digital finance significantly drives inclusive growth, with greater income-boosting effects for low-income groups than high-income groups. Yi Xingjian and Zhou Li (2018) find that digital finance not only stimulates consumption through payment convenience but also alleviates liquidity constraints, thereby elevating household consumption levels. At the micro level, research centers on digital finance's impact on corporate sustainability and financing environments. Additionally, Liang Bang and Zhang Jianhua (2019) indicate that digital finance significantly promotes innovation and entrepreneurship by reducing debt financing costs and alleviating external financing constraints, exhibiting regional and scale heterogeneity as well as spatial spillover effects.

2.2. Research on Factors Affecting Export Resilience

Current research on export resilience primarily focuses on dimensions such as digital transformation, global value chain integration, product diversification, and technological innovation. Regarding digital transformation, Dai Xiang et al. (2023) and

Zhang Pengyang et al. (2023) indicate that digital transformation significantly enhances firms' risk resilience and export recovery capacity by increasing their participation in global value chains and promoting diversification of export products and markets. Jiang Shuaishuai and Liu Hui (2021) contend that global value chain integration exerts a dual impact on corporate export resilience. Regarding product diversification, Liu Hui and Qi Jianhong (2021) reveal a positive correlation between export product diversification levels and firms' capacity to withstand external shocks. Du Yunsou (2024), analyzing the 2008 financial crisis, demonstrates that importing intermediate goods in upstream industries can enhance firm resilience by promoting export upgrading and reducing costs. Conversely, He Canfei and Chen Dao (2019) propose that product-related diversification may increase vulnerability to demand shocks and suppress quality improvements, thereby weakening short-term resilience. Additionally, Sun, Pu Yang et al. (2015) emphasize that the "learning by doing" effect in foreign investment introduction facilitates technological advancement and crisis response. Jin, Ze Yang and Jin, Yu Ying (2020) point out that the political, cultural, and product characteristics of export destination countries are closely linked to firm export performance.

3. Theoretical Assumptions

In market economic activities, various market participants exist. The party with greater information can benefit by conveying reliable information to the less informed party. Consequently, the party with less information will strive to obtain it from the other. Whoever possesses relatively more information than the other holds an informational advantage, while the party with relatively less information is at an informational disadvantage. Information asymmetry is a systemic flaw in market economies, impacting all aspects of business operations, investment, financing, and R&D. Traditional financial institutions like banks struggle to fully grasp comprehensive and accurate corporate information, thereby failing to effectively guard against adverse selection and moral hazard issues. Within the digital economy context, information asymmetry theory offers a suitable theoretical lens for exploring how to enhance corporate export resilience. As digital technology and financial services deepen their integration, digital finance has emerged, poised to mitigate information barriers, financial risks, and financing challenges inherent in traditional finance. Digital finance leverages information technologies such as big data, cloud computing, blockchain, and artificial intelligence to mitigate the high risk premiums and operational costs stemming from information asymmetry in traditional finance (Huang Hao, 2018), providing stable technological support for expanding the scope and reach of financial services (Guo Feng et al., 2017).

Therefore, this paper proposes the following research hypothesis:

H1: As the level of digital finance development increases, corporate export resilience will continuously improve.

4. Research Design

4.1. Data Sources

The data used in this study are primarily sourced from the CSMAR, China Customs Import-Export Database, Tianyancha, and Baidu Index, covering the period from 2016 to 2023. Data on digital finance development are collected from Tianyancha and Baidu Index, while corporate export resilience metrics are derived from CSMAR. National export growth rates for counterfactual calculations are computed from the China Customs Database, based on overseas export values of Chinese listed companies from 2016 to 2023. Existing studies often rely on manually matched data from customs and industrial enterprise databases, which suffers from significant gaps and outliers, with the latest available data only up to 2016, constraining analysis on digital finance and export resilience. To ensure data completeness, this study adopts export data extracted from financial statement notes (Zhang Tianding and Lü Jinqiu, 2020). Data from Tibet and Xinjiang are excluded due to substantial missing values, which does not affect the empirical results. All other control variables are obtained from the CSMAR.

4.2. Variable Definitions

(1) Explanatory variable: Digital Finance Development Level

Existing research primarily employs the Peking University Digital Inclusive Finance Index as a proxy variable for digital finance. However, this index characterizes regional digital inclusive finance development from the demand side, emphasizing inclusive attributes over technological characteristics. Moreover, its data primarily originates from the Alipay ecosystem, making it difficult to reflect the situation of listed companies. Therefore, this index cannot be directly matched with listed company data (Guo Feng and Xiong Yunjun, 2021). To overcome this limitation, scholars have constructed digital finance development indices using Baidu Search Index (Chao Xiaojing et al., 2024; Feng Yongqi et al., 2024). This index adopts a dual perspective of financial functionality and technological attributes, thereby better reflecting regional digital finance development levels. Thus, this paper adopts the methodology of Zhao Xiaojing et al. (2024) and Feng Yongqi et al. (2024), utilizing Baidu Search Index to construct a digital finance development index for prefecture-level cities, thereby measuring their digital finance development levels.

(2) Dependent variable: Firm-Level Export Resilience

Based on the dynamic construction methodology for measuring firm-level export resilience indices by scholars such as Du Yunsu and Chen Xuelei (2024), this study incorporates spatial and temporal lag effects. Employing GMM-SL-SAR-RE estimation alongside counterfactual estimation, it identifies the divergence between actual export changes under real economic conditions and counterfactual

export changes in the absence of external shocks. The export resilience index (Res) calculated across different periods exhibits distinct characteristics: resistance during the risk-resistance phase, recovery resilience during the recovery-adjustment phase, and upgrading resilience during the structural transformation phase. This study divides the sample data from 2016 to 2023 into three time periods for measurement: 2017-2019 is designated as the risk-resistance period, where corporate export resilience reflects the ability to withstand negative economic shocks; 2019-2021 as the recovery and adjustment period, where export resilience reflects a firm's capacity to rebound from negative economic shocks; and 2021-2023 as the structural transformation period, where export resilience manifests as a firm's ability to adapt to post-shock economic structural changes and achieve upgrading and transformation. The rationale for dividing export resilience into these periods is as follows: First, designating 2017-2019 as the risk mitigation period allows for measuring resilience under external shocks. The choice of 2017 as the base year stems from the implementation of unilateral trade policies such as the Export Control Reform Act of 2018, which imposed targeted restrictions on China's high-tech products, structurally suppressing exports in sectors like ICT and semiconductors. The outbreak of the COVID-19 pandemic in late 2019 triggered a global economic downturn and severely disrupted trade supply chains. Additionally, calculating the 2017 export growth rate required using 2016 corporate export figures. Second, the 2020-2021 period is designated as the recovery and adjustment phase, with 2020 as its base year. This reflects the gradual economic recovery across regions from the pandemic in late 2020. Additionally, in April 2020, the People's Bank of China announced the first batch of digital yuan pilot cities, including Shenzhen, Chengdu, Suzhou, and Xiong'an New Area. When enterprises faced disruptions in logistics and shrinking orders, they relied on digital financial tools to achieve recovery. The digital yuan pilot program boosted the efficiency of cross-border payments, helping enterprises receive payments quickly. Third, the period from 2021 to 2023 is designated as the structural transformation phase, with 2021 serving as the benchmark year. This year marks the entry of the digital yuan pilot into a phase of institutional deepening, where resilience ultimately manifests as the system's capacity to adapt to a new steady state. The specific calculation method is as follows:

$$Resis_{ijt} = \left| \frac{\Delta \exp_i^c - \Delta \hat{\exp}_i^c}{\Delta \hat{\exp}_i^c} \right| = \frac{(\exp_{i,t} - \exp_{i,2016}) - (\hat{\exp}_{i,t} - \hat{\exp}_{i,2016})}{|\hat{\exp}_{i,t} - \hat{\exp}_{i,2016}|} \quad (1)$$

$$Rescov_{ijt} = \left| \frac{\Delta \exp_i^r - \Delta \hat{\exp}_i^r}{\Delta \hat{\exp}_i^r} \right| = \frac{(\exp_{i,t} - \exp_{i,2019}) - (\hat{\exp}_{i,t} - \hat{\exp}_{i,2019})}{|\hat{\exp}_{i,t} - \hat{\exp}_{i,2019}|} \quad (2)$$

$$Resup_{ijt} = \left| \frac{\Delta \exp_i^u - \Delta \hat{\exp}_i^u}{\Delta \hat{\exp}_i^u} \right| = \frac{(\exp_{i,t} - \exp_{i,2020}) - (\hat{\exp}_{i,t} - \hat{\exp}_{i,2020})}{|\hat{\exp}_{i,t} - \hat{\exp}_{i,2020}|} \quad (3)$$

Here, $Resis_{ijt}$ denotes resilience, while Δexp_i^c and $\Delta \hat{exp}_i^c$ represent the export changes and counterfactual export changes of firm i during the trade friction period between China and the United States, respectively. $Rescov_{ijt}$ denotes recovery capacity, with Δexp_i^r and $\Delta \hat{exp}_i^r$ indicating the export changes and counterfactual export changes of firm i during the recovery period. $Resup_{ijt}$ denotes upgrading capacity, with Δexp_i^u and $\Delta \hat{exp}_i^u$ reflecting the export changes and counterfactual. $exp_{i,t}$ denotes the export value of firm i in year t , $\hat{exp}_{i,t}$ denotes the counterfactual export value of firm i in year t . For the calculation of counterfactual export values in a given year, this paper adopts the method proposed by Du Yunsu and Chen Xuele (2024), which is based on a synthesis of prior literature and empirical data: $\hat{exp}_{i,t} = exp_{i,t-1} \times g_t^N$. g_t^N denotes the national export growth rate in year t . A higher positive value of export resilience indicates greater ability to withstand external systemic risks, better recovery after shocks, and faster transformation and upgrading. Conversely, a larger negative value signifies weaker crisis resilience, slower recovery, and slower upgrading.

(3) Control Variables

This study draws upon control variable data selected by Tang Song (2020), and Zhang Yao (2024). To mitigate the potential impact of omitted variables, multiple micro-level firm-level variables are incorporated. These include: ①Age, measured as the logarithm of the current year minus the year of establishment; ②ROE; ③ATO, measured as operating revenue divided by average total assets; ④PPE, measured as net fixed assets divided by total assets; ⑤Growth, measured as the logarithm of annual main business revenue; ⑥Board, measured as the logarithm of the total number of directors; ⑦SOE, a dummy variable for ownership structure where $soe=1$ for state-owned enterprises; ⑧FDI, measured as the logarithm of the total foreign capital utilized in the enterprise's region.

4.3. Model Setup

Based on the preceding analysis, we establish a fixed-effects model for digital finance and corporate export resilience, drawing on the work of Dai Xiang (2023) et al.:

$$Res_{i,j,t} = \alpha_0 + \alpha_1 DF_{j,t} + \alpha_2 Con_{i,t} + \eta_i + \theta_t + \mu_{i,t} \quad (4)$$

As shown in Equation (4), where the $DF_{j,t}$ variable represents the level of digital financial development in city j for listed company i in year t , $Res_{i,t}$ denotes the export resilience index of listed company i in year t , and α_1 is the core coefficient reflecting the impact of digital financial development on corporate export resilience. A positive value α_1 indicates that digital financial development enhances export resilience. $Con_{i,t}$ denotes a set of control variables, where η_i and θ_t represent individual fixed effects and time fixed effects, while $\mu_{i,t}$ is the error term.

5. Empirical Findings and Analysis

5.1. Analysis of Benchmark Regression Results

Table 1. Benchmark Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)
	Resis	Resis	Rescov	Rescov	Resup	Resup
DF	0.747*** (5.37)	0.509** (2.28)	0.094*** (3.21)	2.183* (1.68)	4.047*** (3.98)	5.627*** (4.09)
Age		-1.133** (-2.33)		-3.349 (-1.34)		-2.758 (-1.04)
ROE		-2.528* (-1.95)		-9.666 (-1.47)		-21.642** (-2.34)
ATO		0.032 (0.07)		-0.490 (-0.31)		-4.011 (-1.58)
Growth		6.428*** (7.93)		21.722*** (6.26)		0.898 (0.28)
Loss		0.031 (0.07)		3.402 (1.62)		7.210** (2.22)
Board		-0.326 (-0.54)		0.334 (0.12)		-3.557 (-0.88)
SOE		-0.311 (-1.17)		-1.894 (-1.30)		-1.018 (-0.54)
FDI		-0.111 (-1.16)		-0.784* (-1.82)		-2.008*** (-4.59)
Constant	-0.444 (-0.63)	4.535** (2.36)	2.054*** (6.87)	11.340 (0.88)	-4.184 (-0.62)	13.614 (0.95)
Observations	5,825	5,752	5,045	5,045	5,594	5,569
R-squared	0.055	0.049	0.127	0.043	0.094	0.087
Firm	YES	YES	YES	YES	YES	YES
Year	NO	YES	NO	YES	NO	YES

Table 1 demonstrates that digital finance significantly enhances firms' export resilience through three mechanisms: risk resistance, export recovery, and industrial upgrading. Enterprises in regions with advanced digital finance exhibit smaller export declines during external shocks, faster recovery, and improved post-shock structural transformation.

Specifically, Column (1) without controls or time fixed effects shows a digital finance coefficient of 0.747, indicating that digital finance helps mitigate export decline during crises by easing financing constraints and stabilizing capital flow. The coefficient remains positive and significant in Column (2) after including controls and fixed effects. In the recovery phase, Column (3) shows a coefficient of 0.094, reflecting digital finance's role in facilitating swift export recovery through improved financial matching and lower capital costs. Significance remains robust in Column (4) with full controls. For upgrading capacity, Column (5) reports a coefficient of 4.047, highlighting digital finance's effect on enabling post-shock industrial transformation by reducing transaction costs and breaking financial barriers. The result holds in Column (6) with all controls and fixed effects. Overall, digital finance strengthens resilience by enhancing risk buffering, accelerating rebound, and promoting structural adaptation.

5.2. Analysis of Robustness Test

Table 2. Endogeneity Tests for Instrumental Variables and Outlier Removal Procedures

	IV Method				Remove Outliers		
	Stage one	Stage two					
	(1) DF	(2) Resis	(3) Rescov	(4) Resup	(5) Resis	(6) Rescov	(7) Resup
DF		0.192*** (8.58)	0.518*** (10.06)	2.645*** (19.98)	1.583*** (7.08)	1.101** (2.25)	7.992*** (5.01)
bartik_DF	0.006*** (2.82)						
Constant					1.844** (1.82)	3.821*** (8.11)	16.056*** (7.12)
Control Var	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES
Industry	NO	NO	NO	NO	YES	YES	YES
Observations	15,311	5,319	4,591	5,485	4,775	4,211	4,623
R-squared	0.249	0.134	0.129	0.204	0.161	0.137	0.131
K-P rk LM	8569.87 [0.0000]	576.351 [0.0000]	1923.678 [0.0000]	3305.884 [0.0000]			
K-P rk Wald F	8248.76 {0.0000}	652.171 {16.38}	5826.605 {16.38}	1589.103 {16.38}			

To overcome endogeneity issues, this paper constructs the Bartik instrumental variable (bartik_DF) following the methodology of Yi Xingjian and Zhou Li (2018). Furthermore, outliers are controlled by excluding samples from the four municipalities of Beijing, Shanghai, Tianjin, and Chongqing. The instrumental variable test results in Table 2 indicate that bartik_DF is significantly correlated with the digital financial development levels across regions and satisfies the exogeneity requirement. The Kleibergen-Paap rk LM test rejects the unidentifiability null hypothesis, while the Kleibergen-Paap rk Wald F statistic exceeds 16.38, rejecting the weak instrumental variable hypothesis. In the second-stage regression, the digital finance coefficient remains significantly positive at the 1% level, indicating that after controlling for endogeneity, digital finance still significantly enhances corporate export resilience. Furthermore, excluding municipalities increases the coefficient but slightly reduces its significance, suggesting that municipalities may amplify the effects of digital finance due to policy and market advantages, while the resource allocation function of digital finance in non-municipal regions still needs strengthening.

6. Figures and Tables

6.1. Conclusion

This study examines the impact of digital finance on the export resilience of Chinese A-share listed firms from 2016 to 2023. The results show that digital finance significantly strengthens export resilience by enhancing firms' capacity to resist external shocks, accelerate recovery, and facilitate industrial upgrading. Specifically, digital finance improves post-shock rebound through better capital allocation and enables structural transformation by lowering transaction costs and mitigating financial barriers. These findings remain robust to robustness checks, confirming a sustained positive effect of digital finance on export resilience.

6.2. Research Implications

First, further deepen the development of digital financial infrastructure, promoting the deep integration of technologies such as artificial intelligence and blockchain with trade finance scenarios. Prioritize support for digital solutions in areas like cross-border payments and supply chain finance to enhance the inclusiveness and precision of financial services, helping enterprises manage international settlement and financing risks.

Second, financial institutions and cooperative platforms should be encouraged to develop differentiated digital financial products for export enterprises. Emphasis should be placed on financing support for SMEs and high-tech enterprises, establishing dynamic risk control models and credit assessment systems based on actual trade backgrounds to effectively alleviate the challenges of “difficult and expensive financing.”

Third, strengthen the synergistic linkage between digital finance and industrial innovation policies to encourage enterprises to utilize digital financial tools for technological R&D, supply chain management, and market diversification. This will enhance their adaptability and resilience within global value chains.

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