

EMPOWERING SMALL AND MICRO ENTERPRISES IN LIAONING THROUGH FINTECH

YunWei Shen

International Business School, Dongbei University of Finance and Economics, Dalian 116025, Liaoning, China.

Abstract: This paper examines the current state and challenges of innovation and entrepreneurship among small and medium-sized enterprises (SMEs) in Liaoning Province, exploring pathways for high-quality development through fintech-enabled mechanisms. Research indicates that while Liaoning's SMEs have improved innovation metrics, their national rankings have generally declined, revealing three structural challenges: a disconnect between innovation and capital, diminished investment appeal, and market entities exhibiting "false prosperity". To address these issues, the study proposes leveraging fintech solutions such as establishing enterprise digital profiling platforms, promoting blockchain technology applications, and developing equity crowdfunding and big data-driven credit services. These measures aim to alleviate financing constraints, enhance information transparency, and facilitate resource integration, thereby providing actionable strategies for fostering innovation among SMEs and revitalizing the regional economy.

Keywords: Fintech; Small and medium-sized enterprises; Innovation and entrepreneurship; Digital economy

1 INTRODUCTION

The rapid expansion of the digital economy has become a central driver of global economic transformation, emphasizing the profound integration of digital technologies with the real economy. This synergy is increasingly recognized as essential for achieving sustainable and high-quality growth. As a pivotal segment of the digital economy, fintech has demonstrated significant potential in enhancing the efficiency of financial services and expanding their coverage. It has emerged as a key enabler for business innovation and structural economic upgrading. As a key sector of the digital economy, fintech has demonstrated significant potential in enhancing the efficiency of financial services and expanding service coverage, becoming a vital force in empowering the real economy and supporting innovation-driven development.

As a major industrial base in China, Liaoning's small and micro enterprises play a crucial role in promoting regional economic growth and absorbing employment. However, against the backdrop of the digital economy and the new round of revitalization strategy, Liaoning's SMEs still face structural challenges in innovation and entrepreneurship[1]. Data indicates that while Liaoning has consistently improved its absolute innovation metrics, its relative national rankings have generally declined. This reflects deep-seated issues such as the disconnect between innovation and capital, the hollowing-out of investment attractiveness, and the bloated nature of market entities.

Existing research predominantly focuses on the general promotional effects of fintech on corporate innovation. However, regarding the structural predicaments in traditional industrial regions like Liaoning, there is a lack of systematic exploration that integrates specific fintech tools with local realities[2]. Therefore, this paper aims to systematically diagnose the causes of innovation and entrepreneurship challenges faced by Liaoning's SMEs and micro-enterprises, and to construct a precision empowerment pathway centered on fintech, providing theoretical and practical references for the reconstruction of the regional innovation ecosystem.

2 METHODOLOGY

2.1 Research Design

This study employs a quantitative and comparative approach, benchmarking Liaoning's SME innovation and entrepreneurship performance (2010-2020) against the China Digital Economy Innovation and Entrepreneurship Index (IRIEDEC). The analysis centers on the "absolute growth versus relative ranking" paradox to uncover structural challenges. The research proceeds at three levels: overall performance evaluation, sub-dimensional analysis of key drivers (e.g., new ventures, investment, patents), and the alignment of diagnosed challenges with targeted fintech-enabled mechanisms[3].

2.2 Experimental Procedure

The research data, sourced from Peking University's Center for Enterprise Big Data Research (2010-2020), was processed to construct the China Digital Economy Innovation and Entrepreneurship Index (IRIEDEC) across eight indicators. Following Z-score standardization and quantile-weighted synthesis, provincial rankings were compared to

identify shifts in relative performance. These shifts were then analyzed alongside regional policies and economic data to diagnose structural constraints, forming the basis for designing targeted fintech empowerment pathways.

2.3 Data Source

The primary data sources for this study are as follows: National Industrial and Commercial Enterprise Registration Database: Used to obtain the number of newly established enterprises. Enterprise Shareholder and VC/PE Investment Database: Used to analyze foreign investment and venture capital activities. State Intellectual Property Office Patent Database: Covers granted invention patents, utility model patents, and design patents. Trademark Registration Database and Software Copyright Registration Database: used to measure corporate branding and software innovation achievements;

Supplementary data such as the China Regional Innovation Capacity Evaluation Report and China Provincial Business Environment Research Report: used for background analysis and challenge diagnosis.

All data underwent integration and validation through Peking University's Center for Enterprise Big Data Research to ensure its authority and consistency.

2.4 Tools or Models Used

Comprehensive Evaluation Model: Constructing the China Digital Economy Innovation and Entrepreneurship Index, which assesses regional innovation performance through a weighted composite evaluation based on six dimensions, as Tabel 1 shows: newly established enterprises, foreign investment, venture capital, patents, trademarks, and software copyrights.

Data Processing Method: Employing the Z-score method to standardize all indicators, eliminating differences in measurement units; utilizing quantile weighting to convert standardized values into index scores ranging from 0 to 100, facilitating cross-regional comparisons.

Comparative Analysis Framework: Conducts multidimensional comparisons of Liaoning Province's innovation performance against national averages and leading provinces like Guangdong and Zhejiang to identify relative strengths and weaknesses.

Mechanism Matching Model: Establishes a closed-loop “problem-tool-effect” analysis framework. Logically aligns fintech tools—such as digital profiling, blockchain, and equity crowdfunding—with regional structural challenges to design targeted empowerment pathways.

Table 1 China Digital Innovation and Entrepreneurship Index Indicators

Dimension Name	Sub-indicators	Weighting
Number of newly established enterprises	Number of newly registered enterprises	20%
Attract foreign investment	Number of new foreign corporate investments	15%
Attract venture capital	Number of enterprises newly receiving venture capital investment	25%
	Number of newly authorized invention patents	12.5%
Number of Patents Granted	New Utility Model Patent Publication Volume	5%
	Newly Published Design Patent Applications	2.5%
Number of Trademark Registrations	Number of New Trademark Registrations	10%
Number of Software Copyright Registrations	Number of New Software Copyright Registrations	10%

Note: Weights corresponding to the China Regional Innovation and Entrepreneurship Index

3 RESULTS & DISCUSSION

3.1 The Overall Level of Regional Innovation Lags Behind

The total innovation index has shown a sustained upward trend as Tabel 2 shows, rising from 73.88 in 2010 to 87.41 in 2020 (an increase of 18.3%). However, Liaoning Province's relative national ranking has remained stagnant between 17th and 18th place for an extended period. This indicates that despite improvements in absolute levels, its innovation competitiveness among provincial-level administrative regions has not achieved a substantive breakthrough.

Table 2 Trend in Total Innovation Index

Year	2010	2015	2020	Growth Rate(2010–2020)
Score	73.88	82.41	87.41	+18.3%
National Ranking	9	17	18	dropped 9 places in the ranking

3.2 Sub-indicators Show a Dynamic Decline

Table 3 Trends in the Dynamic Changes of Sub-Indicators[4]

Region	Year	Subdimension									
		Number of Newly Established Enterprises Score	Ranking of Newly Established Enterprises	Attracting Foreign Investment Score	Ranking in Attracting Foreign Investment	Attract Venture Capital Scores	Ranking of Attracting Venture Capital	Patent Grant Score	Ranking of Patent Grant Counts	Trademark Registration Volume Score	Ranking of Trademark Registration Volume
Liaoning Province	2010	73.88	9	74.19	7	73.78	9	64.62	14	75.98	11
	2012	74.92	11	72.22	10	79.40	9	68.26	15	78.15	14
	2013	73.36	12	67.64	15	75.75	10	69.51	15	79.38	14
	2014	75.34	16	68.89	16	75.65	13	72.11	16	80.53	15
	2015	77.63	17	81.69	13	75.86	17	68.57	21	79.99	16
	2016	81.58	16	80.96	16	78.98	17	82.10	17	81.79	17
	2017	85.02	15	86.26	16	84.81	19	83.47	17	82.62	17
	2018	89.39	13	88.97	17	86.26	20	83.43	17	84.29	17
	2019	89.80	16	89.80	17	83.66	21	85.10	18	88.66	17
	2020	90.95	16	88.45	20	78.36	22	85.44	18	90.53	18

3.2.1 Enterprises lack vitality in their establishment

As Table 3 we can know, from 2010 to 2020, Liaoning Province saw a significant increase in its score for newly established enterprises (73.88→90.01, +21.8%), yet its ranking declined year by year, falling from 9th to 17th place. This reflects a weakening of Liaoning's relative advantage in the number of entrepreneurial enterprises amid intensifying competition among provinces. Insufficient entrepreneurial dynamism hampers the discovery of new economic growth drivers, fundamentally diminishing economic vitality. This impedes leveraging innovation to transform heavy industries while exacerbating talent outflow.

3.2.2 Limited ability to attract capital

(1) Foreign investment scores continued to rise (74.19→89.28, +20.3%), as Table 3 shows, yet its ranking dropped significantly from 7th to 22nd. This reflects that amid the nationwide expansion of financing scale, Liaoning Province's share of venture capital funding has declined year by year. The weakening capital attractiveness makes it difficult for local innovative enterprises to obtain the resources needed for expansion, fundamentally constraining the emergence and growth of high-growth enterprises. This not only hinders the cultivation of new leading enterprises to replace traditional ones but also accelerates the outflow of innovative projects and entrepreneurial talent to regions with greater capital concentration.

(2) Venture capital investment followed an inverted U-shaped curve, peaking at 86.26 (20th place) in 2017 before declining to 78.67 (24th place) in 2020. This reflects that against the backdrop of a continuously heating national venture capital market, The weakening appeal of Liaoning's innovation capital has created financing bottlenecks for high-potential innovative enterprises. This fundamentally slows the incubation and growth of emerging industries while exacerbating the outflow of innovation and entrepreneurship projects due to funding shortages[1].

3.2.3 The efficiency of knowledge production remains relatively stable

(1) Patent authorization rates have steadily increased (64.62→86.94, +34.5%), maintaining a mid-tier ranking (14th-18th) despite fluctuations. The information from Table 3 reflects that amid intensifying regional innovation competition, while patent output has significantly expanded, its relative advantage has not improved accordingly. Patent conversion efficiency and innovation quality have failed to achieve breakthroughs, making it difficult to effectively drive industrial structure upgrades. This constrains the high-tech transformation of traditional industries and weakens overall economic competitiveness.

(2) Trademark registration saw the most significant growth (75.98→89.59, +17.9%), maintaining a stable ranking within the 11th to 18th position range. This reflects that the cultivation of trademark brands and their value conversion capabilities remain insufficient, making it difficult to form commercially influential brand clusters. This not only constrains the market competitiveness and value-added enhancement of local enterprises but also impacts the optimization and upgrading of the regional economic structure and the sustained accumulation of innovation-driven development momentum.

3.3 The Three Major Challenges Facing Innovation and Entrepreneurship Among Small and Medium-Sized Enterprises

As shown in Table 3, Liaoning Province has steadily improved its absolute scores across nearly all indicators. However, this represents a “rising tide lifts all boats” type of growth, accompanied by a significant decline in its national rankings. Consequently, Liaoning's progress pace lags far behind the national average. This reflects the contradictory reality of “false growth” in regional indicator scores and “real loss” of competitiveness, stemming from three major structural challenges.

3.3.1 The “disconnect” between innovation and capital

The patent authorization ranking (18th) significantly outranks the venture capital ranking (24th), indicating that while R&D activities yield certain outputs, they fail to effectively translate into commercially viable projects. Innovation achievements often remain confined to paper rather than reaching the market.

3.3.2 Investment attractiveness “hollowing out”

Foreign investment and venture capital rankings plummeted significantly from 7th and 9th to 22nd and 24th, respectively. This highlights capital's lack of confidence in Liaoning's business environment, legal safeguards, and growth potential, leading to a persistent weakening of the region's capital aggregation capabilities.

3.3.3 Market entities are “bloated” rather than “robust”

The rise in scores for newly established enterprises and trademark registrations coupled with declining rankings indicates that the growth in enterprise numbers has not been accompanied by improvements in quality. A large number of enterprises are concentrated in traditional service industries or low-end manufacturing sectors, lacking core technological capabilities and brand competitiveness, making it difficult to foster a sustainable innovation ecosystem.

3.4 Mechanism Analysis of Fintech Empowering Innovation in Small and Medium-sized Enterprises

As Figure 1 shows FinTech significantly influences corporate innovation by alleviating financing constraints and optimizing resource allocation. Studies show that it enables precise credit assessment and process automation, broadening funding channels and reducing costs for MSMEs, thereby boosting their innovation capacity[5]. Furthermore, FinTech enhances information transparency among firms, investors, and financial institutions, mitigating information asymmetry and fostering a conducive environment for high-risk innovation projects[6]. Finally, through the integration of technology, data, and application scenarios, FinTech drives the digital transformation of traditional finance, systematically improving the efficiency of innovation resource allocation.

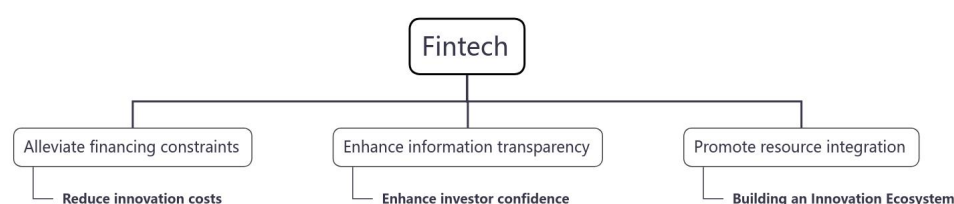


Figure 1 Mechanism Analysis of Fintech Empowering Innovation in Small and Medium-sized Enterprises

3.5 Policy Recommendations for Accelerating the Application of Fintech to Empower Innovation and Entrepreneurship Among Small and Micro Enterprises in Liaoning Province

To address these challenges, a multi-pronged FinTech approach is proposed. First, a digital corporate profiling platform integrating multi-source data can alleviate financing constraints through AI-powered credit assessment[7]. Second, applying blockchain technology[8] to government-guided funds and supply chains enhances investment transparency and rebuilds trust[9]. Third, developing data-driven equity crowdfunding and innovation platforms helps optimize resource allocation and fosters robust, collaborative innovation ecosystems[10].

4 CONCLUSION

Based on the China Digital Economy Innovation and Entrepreneurship Index (2010–2020), this study diagnoses innovation challenges among SMEs in Liaoning Province and designs a targeted FinTech-enabled pathway. Key findings reveal:

First, Liaoning's SMEs exhibit “absolute growth but relative decline”—while indicator scores improved overall, their national rankings fell, reflecting weakened competitive standing.

Second, three structural challenges are identified: a disconnection between innovation and capital, a hollowing-out of investment attractiveness, and a “bloated” structure of market entities, pointing to systemic flaws in the regional innovation ecosystem.

Third, a fintech empowerment strategy is proposed: using “digital profiling + credit scoring” to ease financing constraints, “blockchain + fund tracing” to enhance transparency, and “equity crowdfunding + data-driven credit” to streamline resources—shifting regional innovation from bloated to robust.

This research bridges regional diagnostic theory with fintech applications, integrates index evaluation with mechanism design, and offers actionable insights for revitalizing innovation in Liaoning and Northeast China.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

- [1] Zhang D J. Financing of Small and Medium Sized Enterprises in Liaoning and Zhejiang: Comparison and Enlightenment. *Journal of Liaodong University (Social Sciences Edition)*, 2010, 12(03): 68-72. DOI: 10.14168/j.issn.1672-8572.2010.03.032.
- [2] Jiang Hao, Guo Di. Application Research of New Supply Chain Finance Models in Financing for Small and Micro Enterprises. *Southwest Finance*, 2019(04): 46-52.

- [3] Dai Ruochun, Wang Aizhao, Chen Binkai. Innovation and Entrepreneurship in China's Core Digital Economy Industries: Empirical Findings and Index Development. *Economic Dynamics*, 2022(04): 29-48.
- [4] Zhongkun Zhu, Ruochun Dai, Xiaobo Zhang. Construction and Spatial Pattern of China's Regional Innovation and Entrepreneurship Index (1990–2020). *Economic Science*, 2024, 46(01): 6-33.
- [5] Krismailinda A D. Kinerja umkm dalam perspektif financial literacy dan financial inclusion yang dimoderasi oleh risk taking. 2022. <https://repository.unissula.ac.id/26521/>.
- [6] Umiati N. A model to increase Sme's performance: The moderating role of social capital (studi empiris pada UMKM provinsi jawa tengah). Universitas Islam Sultan Agung (Indonesia), 2022. <https://repository.unissula.ac.id/26954/>.
- [7] Song H, Chen S J. Development of Supply Chain Finance and Internet Supply Chain Finance:A Theoretical Framework. *Journal of Renmin University of China*, 2016, 30(5): 95-104.
- [8] Zhou Lei, Deng Yu, Zhang Yuyan. Analysis of Financing Game Theory for Small and Micro Enterprises in Supply Chain Finance Services Empowered by Blockchain Technology. *Financial Theory and Practice*, 2021(09): 21-31.
- [9] Gelsomino L M, Mangiaracina R, Perego A, et al. Supply chain finance: a literature review. *International Journal of Physical Distribution & Logistics Management*, 2016, 46(4): 348-366.
- [10] Liu Chunhui, Zhang Wanyue, Lu Hongjuan, et al. Exploring Pathways to Enhance Technology-Finance Service Capabilities in High-Tech Industrial Parks of the Southern Jiangsu Pilot Zone for Innovation and Entrepreneurship. *Modern Business*, 2020(14): 95-98.