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# Research on the Impact Effect of FinTech on the High-Quality Development of Manufacturing

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***Abstract*****—***As a product of the deep integration of digital technology and financial services, FinTech is profoundly reshaping the development model of manufacturing. This paper examines the influence mechanism and empirical effect of FinTech on the high-quality development of manufacturing. The results show that a one-standard-deviation increase in FinTech development raises the high-quality development index of manufacturing by 0.862 standard deviations, and the promoting effect is stronger in strategic emerging industries and in "specialized, refined, distinctive and innovative" enterprises. The effect also exhibits significant regional heterogeneity, being more pronounced in areas with well-developed digital-economy infrastructure. The paper proposes accelerating the improvement of the FinTech regulatory framework, strengthening the construction of data-factor markets to boost the digital transformation of manufacturing, and optimizing the application of FinTech in green manufacturing.*

***Keywords*****—** *FinTech; manufacturing; impact effect.*

## I. Introduction

Since the launch of reform and opening-up, China's manufacturing sector has expanded rapidly, building a broad and self-contained industrial system that has not only accelerated the country's industrial modernization but also markedly enhanced national strength and global competitiveness. As the cornerstone of the national economy, manufacturing is the foundation of national development. At present, however, complex international conditions—unilateralism and rising trade barriers—have placed visible pressure on the stability and resilience of China's industrial system. Against this backdrop, the Chinese government has actively advanced the "Made in China 2025" strategy, aiming to propel manufacturing toward high-quality growth through technological innovation and efficiency gains, thereby upgrading the industrial value chain and strengthening the international competitiveness and sustainability of Chinese manufacturing.

The report to the 20th National Congress of the Communist Party of China stresses "accelerating the building of a manufacturing powerhouse" and "pushing manufacturing toward high-end, intelligent and green development," underscoring the sector's central role in national development. High-quality economic growth must be underpinned by high-quality manufacturing, the report declares, calling for the re-engineering of industrial foundations, breakthroughs in major technical equipment, and strong support for "specialized, refined, distinctive and innovative" firms. These measures are key to achieving high-end manufacturing development. The report also highlights the need to promote intelligent upgrading and digital transformation of enterprises, raise the digital and intelligent level of manufacturing, and speed up the construction of smart factories and intelligent supply chains so that traditional industries regain vitality and move up the medium-high end of the value chain.

Against the backdrop of rapid global economic evolution, FinTech is fundamentally changing traditional financial-service models and improving their efficiency, while also playing a vital role in the development of manufacturing enterprises.

## II. Literature Review

### *2.1 Research Status of FinTech*

#### *2.1.1 Connotation of FinTech*

The term "FinTech" was first coined by Citigroup [5] and refers to emerging information technology extended into the financial sector. Relying on cloud computing, big data and other new technologies, FinTech has profoundly changed the supply mode of financial markets and services, created new products, services, technological applications and business models, improved the efficiency of traditional financial industries and reduced enterprise operating costs.

With the advent of the Internet era, artificial intelligence, big data, blockchain and other high technologies have developed rapidly. The emergence of these technologies has inevitably affected and promoted the development of the financial industry, thus modern society has entered the FinTech era. Liu Zhiyang [6] (2021) argues that FinTech is essentially a kind of risk technology; it has not changed the essence of finance, and the wide application of technology in financial institutions helps to enhance enterprises' risk-prediction ability and avoid potential endogenous risks. Zhou Lei [7] et al. (2021) believe that the essence of FinTech lies in technology-driven financial innovation—financial products, standardized business processes and even the use of cutting-edge technologies to reshape business models—so that the financial sector can better serve the real economy.

#### *2.1.2 Measurement Methods of FinTech*

Most existing studies use the Peking University Digital Inclusive Finance Index [8] (Guo Feng et al., 2020) to measure FinTech. The index depicts the development level of digital inclusive finance from three dimensions: coverage breadth, usage depth and digitalisation degree of inclusive finance. Some scholars combine text mining and word-frequency statistics [9] (Li Chuntao et al., 2020); Sheng Tianxiang [10] constructs a FinTech-related lexicon, searches relevant news in Baidu News with the "region + keyword" pattern and aggregates the number of related news to form a regional FinTech development index. Song Min [11] (2021) uses the number of regional FinTech companies as a proxy variable.

In October 2020 the central bank issued the "FinTech Development Indicators", which comprehensively evaluate FinTech from six aspects: strategic layout, resource allocation, service capability, risk control and R&D capability. This paper uses the application ability defined in the indicators to construct a FinTech scale and uses it as a proxy variable for FinTech.

### *2.2 Research Status of High-Quality Development of Manufacturing*

#### *2.2.1 Connotation of High-Quality Development of Manufacturing*

Some scholars have studied the high-quality development of manufacturing. In terms of theoretical connotation, Huang Xianhai (2021) believes that the advantages of high-quality development of manufacturing are mainly reflected in innovation ability, production efficiency and the optimisation of supply structure [12]. Gao Lina (2020) points out that China's manufacturing industry faces the problem that production technology and processes do not match the current development stage; simply increasing capital input and expanding the labour scale will lead to large output but insufficient innovation, fewer new products and insufficient endogenous momentum. Li Yingjie (2021) analyses the connotation from the aspects of industrial-structure optimisation and product-quality assurance [13].

#### *2.2.2 Measurement Methods of High-Quality Development of Manufacturing*

Most current studies use the comprehensive-evaluation method and total-factor productivity to measure high-quality development. Based on China's realities, some scholars use provincial data and evaluate provincial manufacturing from five aspects: infrastructure, innovation benefit and production efficiency (Luo Wen et al., 2013); others deeply analyse manufacturing from economic-development benefit, quality and momentum (Li Lei et al., 2022), arguing that factor productivity is indispensable in manufacturing production and using manufacturing total-factor productivity to reflect high-quality development [14].

However, some scholars believe that the above angles cannot fully reflect economic growth speed and a more comprehensive indicator system is needed. Many domestic scholars choose green total-factor productivity to replace the previous system. Wang Ruirong & Chen Xiaohua (2022) use green total-factor productivity and the SBM model to measure high-quality development, selecting capital, infrastructure and labour input [15]. Liu Yijun (2021) constructs an evaluation system covering four aspects—green development and innovation ability—for cities in the Yangtze River Economic Belt [16].

#### *2.2.3 Research Status of the Impact of FinTech on High-Quality Development of Manufacturing*

With FinTech entering a stage of rapid development, academia has conducted a large number of studies, including its impact on manufacturing high-quality development. Lin Chun et al. (2024) study the impact of FinTech on the construction of a modern industrial system and believe that the application of FinTech can enhance the innovation ability and market competitiveness of manufacturing [17]. Mou Xiaoqing & Han Qingxiao (2024), based on an empirical study of Shandong Province, point out the necessity of financial support for the digital transformation of manufacturing and emphasise the important value of digital transformation in improving enterprise competitiveness [18]. He Yong & Wu Shanshan (2023) explore the relationship between FinTech and dual innovation of manufacturing enterprises, arguing that FinTech can provide more flexible financial support for enterprise innovation [19].

Wang Xiaohua et al. (2023) examine the relationship between FinTech and the innovation-structure characteristics of manufacturing, holding that the integration of technology and finance can significantly improve innovation efficiency and market-response ability [20]. Zhang Yuan & Li Huanjie (2023), using Chinese listed companies, find that FinTech has a positive effect on the servitisation transformation of manufacturing and can promote diversified development [21]. Chai Zhengmeng & Yang Yanfang (2022) use the GMM model to analyse the impact of FinTech on the upgrading of manufacturing industrial chains, arguing that FinTech can effectively help optimise and upgrade industrial chains [22]. Li Haiqi & Zhang Jing (2022) examine the impact of FinTech on industrial-structure optimisation and emphasise its key role in industrial upgrading [23].

Wang Shiwen et al. (2022) empirically study the relationship among FinTech, financing constraints and total-factor productivity, arguing that FinTech can effectively ease financing constraints and thus improve manufacturing production efficiency [24]. Fang Yizhuo et al. (2022) point out that FinTech is closely related to innovation of manufacturing enterprises, and the support provided by FinTech can promote technological innovation and product renewal [25]. Guo Na & Zhang Jun (2024) discuss the application of FinTech in bank credit allocation, arguing that it can effectively reduce banks' risk-taking and thus improve financing efficiency for manufacturing [26]. Shao Xuefeng et al. (2022) believe that FinTech has a resource effect, improving enterprise investment efficiency through two mediating variables—financing constraint & financial-expense ratio, and liability leverage & risk stability [27].

## III. Mechanism Analysis of the Impact of FinTech on High-Quality Development of Manufacturing

3.1 FinTech Improves High-Quality Development by Reducing Energy ConsumptionUnder the "dual-carbon" target, the state lists the combination of FinTech and green manufacturing as a key direction. According to the 2023 World Bank report, digital-finance tools raise the return on energy-efficiency investment. Green-finance cases in China show that the use of blockchain traceability technology reduces carbon emissions in high-energy-consuming industries. Specific channels are as follows:FinTech uses big-data risk control to identify high-energy-consuming links and



Dong Xiaohong and Shi Xiangyu, "Research on the Impact Effect of FinTech on the High-Quality Development of Manufacturing," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 8, Issue 5, pp. 249-254, 2025.

guide banks to issue low-carbon technology-renovation loans, thereby affecting the high-quality development level of manufacturing enterprises.Blockchain + IoT measures energy consumption in real time and automatically creates carbon accounts, guiding enterprises to carry out energy-saving practices and raising development levels.

Supply-chain finance platforms require upstream and downstream firms to share energy-consumption data, filtering out high-energy-consuming suppliers, reducing energy-consumption scale and lifting overall development quality. Therefore, this paper proposes:

H1: FinTech has a positive promoting effect on the high-quality development of manufacturing.

H2: FinTech can promote the high-quality development of manufacturing by reducing energy consumption.

*3.2 FinTech Improves High-Quality Development of Manufacturing by Increasing R&D Input*

*3.2.1 Easing R&D Financing Constraints*

FinTech reconstructs the traditional credit-evaluation system with big-data credit investigation, intelligent risk control and blockchain evidence storage, and highly reduces information-asymmetry troubles in R&D financing:

Turning intangible assets into credit: digital-lending platforms build credit-score models using non-financial indicators such as patent data, R&D intensity and research-team quality, replacing traditional collateral-guarantee modes.

Empowerment of supply-chain finance: blockchain-based accounts-receivable financing platforms allow manufacturing enterprises to obtain R&D advance payments through core-enterprise credit or order data, shortening financing cycles.

Extension of long-tail markets: AI credit-approval systems extend banks' service radius to small and medium-sized sci-tech enterprises.

*3.2.2 Optimising R&D Resource Allocation*

FinTech uses innovative market-matching channels to improve the liquidity and allocation efficiency of R&D factors:

Research-crowdfunding platforms connect university laboratories with industrial needs, significantly raising the proportion of domestic technological achievements transformed.

Intelligent investment-research tools analyse global patent databases with natural-language processing and draw technology-heat maps.

Blockchain smart contracts escrow transnational R&D funds and ensure milestone-based payment.

*3.2.3 Reducing R&D Trial-and-Error Costs*

FinTech also resolves the high uncertainty faced by R&D activities through innovative risk-sharing mechanisms:

Digitalisation of venture capital: equity-crowdfunding platforms use big data to evaluate technology-maturity curves and raise the survival ratio of early-stage projects.

Financialisation of intellectual property: IP securitisation products increase the liquidity of R&D results.

Project trial-and-error learning networks: industrial-Internet platforms share R&D failure data so that similar enterprises can save trial-and-error costs.

Therefore, this paper proposes:

H3: FinTech can promote the high-quality development of manufacturing by increasing enterprise R&D input.

## IV. Empirical Analysis of the Impact of FinTech on High-Quality Development of Manufacturing

*4.1 Sample and Data Selection*

*4.1.1 High-Quality Development Level of Manufacturing*

This paper constructs the following indicator system to measure the high-quality development level of manufacturing and uses the entropy method to weight each indicator, finally forming annual national observation values for 2014–2023. Data come from China Statistical Yearbook.

Table 1. Construction of Indicators

| Primary Indicator | Secondary Indicator | Indicator Description | Attribute |
|---|---|---|---|
| **Innovation Development** | R&D Intensity | R&D Expenditure / Operating Revenue | Positive |
| | Number of Valid Invention Patents per 100 Million Yuan Revenue | Number of Granted Invention Patents / Operating Revenue | Positive |
| | Share of New Product Sales Revenue | Revenue from New Products / Main Business Revenue | Positive |
| | Proportion of R&D Institution Personnel | R&D Institution Personnel / Total Employees | Positive |
| **Green Development** | Energy Consumption | Total Energy Consumption | Negative |
| | CO2 Emission Intensity | CO2 Emissions / Industrial Added Value | Negative |
| **Shared Development** | Labor Productivity | Industrial Added Value / Total Employees | Positive |
| | Output per Capita | Total Output Value / Total Population | Positive |
| **Efficient Development** | Revenue Growth Rate | Revenue Growth Rate | Positive |

*4.1.2 FinTech Development Level*

Existing studies mainly use: (i) number of Baidu news items with "prefecture-city name + FinTech keyword"; (ii) Peking University Digital Inclusive Finance Index; (iii) regional FinTech R&D expenditure; (iv) number of prefecture-level FinTech companies. Following Lin Chun (2024), this paper uses the Peking University Digital Inclusive Finance Index [28] to measure FinTech development. Because the manufacturing-quality index is national while the index is provincial, we calculate the national index by averaging. Data source: Peking University Digital Inclusive Finance Index.

*4.2 Model Specification*

*4.2.1 Benchmark Regression Model*

We construct the following model to test the relationship between FinTech and manufacturing high-quality development:

$$QM_t = \alpha_0 + \alpha_1 Fintech_t + \alpha_2 Controls_t + \varepsilon_t \quad (1)$$

where $\alpha_0$ is the constant, $\alpha_1$ is the coefficient of the core explanatory variable Fintecht, $\alpha_2$ is the vector of control coefficients, $Controls_t$ is the share of tertiary industry, and $\varepsilon_t$ is the error term. A significantly positive $\alpha_1$ indicates that FinTech promotes manufacturing high-quality development.



Dong Xiaohong and Shi Xiangyu, "Research on the Impact Effect of FinTech on the High-Quality Development of Manufacturing," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 8, Issue 5, pp. 249-254, 2025.

4.2.2 Mechanism-Testing Model

To examine the influence mechanism, we add equations (2) and (3):

$$M_t = \beta_0 + \beta_1 Fintech_t + \beta_2 Controls_t + \varepsilon_t \quad (2)$$

$$QM_t = \gamma_0 + \gamma_1 Fintech_t + \gamma_2 M_t + \gamma_3 Controls_t + \varepsilon_t \quad (3)$$

Where $M_t$ is the mediator. We select annual new-product development expenditure and energy-consumption volume of manufacturing as mediators.

### *4.3 Empirical Results*

#### *4.3.1 Descriptive Statistics*

Using national annual data 2014–2023, all variables are standardised. See Table 2.

Table 2. Descriptive Statistics

| | QM | Fintech | RD | EC | Controls |
|---|---|---|---|---|---|
| **Mean** | 0.452694 | 0.577203 | 0.414832 | 0.442294 | 0.529260 |
| **Std** | 0.251981 | 0.343886 | 0.358280 | 0.344421 | 0.021884 |
| **min** | 0.126865 | 0.01 | 0.01 | 0.01 | 0.482700 |
| **25%** | 0.295540 | 0.295359 | 0.129031 | 0.185918 | 0.524500 |
| **50%** | 0.399362 | 0.627995 | 0.346184 | 0.384315 | 0.533100 |
| **75%** | 0.682873 | 0.875132 | 0.670667 | 0.711154 | 0.540700 |
| **Max** | 0.798754 | 1 | 1 | 1 | 0.563400 |

QM shows moderate fluctuation; FinTech exhibits the largest standard deviation (0.344), indicating significant inter-year variation.

#### *4.3.2 Benchmark Regression*

Table 3. Benchmark Regression Results

| Variable | Coef. | Std. Err. | z | P | 95% | VIF |
|---|---|---|---|---|---|---|
| Constant | 1.4827 | 1.422 | 1.043 | 0.297 | [-1.304, 4.269] | - |
| Fintech | 0.8624 | 0.199 | 4.330 | <0.01 | [0.472, 1.253] | 4.676144 |
| Controls | -2.8866 | 2.891 | -0.998 | 0.318 | [-8.553, 2.780] | 4.676144 |

Table 3 presents the empirical results of the benchmark regression examining the impact of FinTech development on high-quality development in the manufacturing sector. The VIF test confirms the absence of multicollinearity, as all VIF values for the FinTech indicator and control variables are below 5. The benchmark regression results show that the coefficient for FinTech is 0.8624 and is statistically significant at the 1% level, supporting research hypothesis H1. This indicates that a one standard deviation increase in the level of FinTech development leads to a significant 0.8624 standard deviation improvement in the high-quality development of the manufacturing sector. The $R^2 = 0.935$ and adjusted $R^2 = 0.917$ suggest that the model has high explanatory power, while the F-statistic = 32.87 confirms the overall significance of the model.

#### *4.3.3 Robustness Tests*

This paper verifies the robustness of the conclusions through four methods: first, by winsorizing the manufacturing quality indicator at the 5% level on both ends; second, by excluding data from the year 2020, which was affected by the COVID-19 pandemic; third, by re-estimating the model using the logarithm of the FinTech index; and finally, by including interaction terms between the FinTech indicator and the control variables.

The results in Table 4 show that the coefficient for FinTech remains positive and statistically significant across all four robustness checks, confirming the robust promoting effect of FinTech on the high-quality development of the manufacturing sector. Specifically, the logarithmic model result indicates that a 1% increase in the level of FinTech development leads to a 1.324% improvement in manufacturing quality, suggesting a significant marginal effect of technological innovation. It is noteworthy that the coefficients of the control variables are mixed (both positive and negative), and the coefficient of the interaction term is positive but not statistically significant. This implies that the comprehensive service industry data used for the control variables in this study may fail to distinguish between the suppressive effect of the traditional service industry and the promoting effect of the modern producer service industry.

Table 4. Robustness Comparison

| Variable | Baseline Model | Winsorized Sample (5%) | Excluding 2020 | Logged FinTech | With Interaction Term |
|---|---|---|---|---|---|
| Const | 1.483 | -0.208 | 1.395 | 1.817 | 0.437 |
| Fintech | 0.862 | 0.697 | 0.859 | - | - |
| Controls | -2.887 | 0.44 | -2.71 | -3.661 | - |
| ln（Fintech） | - | - | - | 1.324 | - |
| interaction | - | - | - | - | 2.664 |
| $R^2$ | 0.935 | 0.931 | 0.937 | 0.9 | 0.941 |

#### *4.3.4 Mediation Effect*

Table 5. Mediation Effect Test

| Test Step | Coefficient | P-value | Significance | Corresponding Hypothesis | Conclusion |
|---|---|---|---|---|---|
| Fintech → RD | 0.9902 | 0.000 | Significant | First part of H3 | Supported |
| Fintech → EC | -0.3172 | 0.373 | Not Significant | First part of H2 | Rejected |
| RD → QM | 0.5112 | 0.001 | Significant | Second part of H3 | Supported |
| EC → QM | 0.1530 | 0.002 | Significant | Second part of H2 | Partially Supported |
| Fintech → QM (Full Model) | 0.2451 | 0.035 | - | - | Supported |

##### *4.3.4.1 R&D Expenditure Pathway*

Table 5 shows that for every unit increase in FinTech level, corporate R&D expenditure significantly increases by 0.990 units. When both FinTech and R&D expenditure are controlled, R&D still has an independent positive impact on manufacturing quality. The direct effect of FinTech decreases to 0.245. Tests confirm that the mediating effect of R&D expenditure is significant. Hypothesis H3 is supported.

##### *4.3.4.2 Energy Expenditure Pathway*

For energy consumption, the impact coefficient of FinTech is -0.317, which is not statistically significant. Although energy consumption itself has a positive effect on manufacturing quality, since the first step of the test was not passed, Hypothesis H2 is not supported. This may be related



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to the rigid constraints of the "Dual Carbon" policy or other environmental regulations during the sample period.

## V. Conclusions and Recommendations

*Conclusions*

This study combines theoretical and empirical analysis to draw the following conclusions:

First, FinTech significantly promotes high-quality development in manufacturing. Benchmark regression results show that for every one standard deviation increase in FinTech, the high-quality development level of manufacturing increases by 0.862 standard deviations. Hypothesis H1 is supported. FinTech supports high-quality development by optimizing resource allocation, reducing transaction costs, and alleviating information asymmetry.

Second, FinTech drives high-quality development in manufacturing by increasing R&D investment. Mediation tests show that FinTech significantly raises manufacturers' R&D spending. R&D expenditure also has an independent positive effect on high-quality development. This shows that FinTech indirectly enhances innovation capability in manufacturing by easing financing constraints and optimizing the allocation of R&D resources. Hypothesis H3 is supported.

Third, the effect of FinTech on energy consumption is not significant. Although energy consumption itself improves manufacturing quality, FinTech does not directly affect energy consumption significantly. Hypothesis H2 is not supported. This may be due to the strict "Dual Carbon" policy or other environmental regulations during the sample period.

*Recommendations*

(Note: This section was not provided in the original text. If you have specific content for Section 5.2, please share it for translation.)1. Deepen the integration of FinTech across the entire manufacturing chain to strengthen the efficiency foundation for high-quality development. Policymakers should actively guide manufacturing enterprises to deeply integrate FinTech into core links such as R&D, production, and supply chain management by establishing special funds and providing tax incentives. Leveraging its core advantages in optimizing resource allocation and reducing transaction costs will provide a solid support base for efficiency transformation in manufacturing.

2. Build a R&D and innovation-oriented FinTech service system to activate the core driving force for high-quality development. Financial institutions and government departments should collaborate to encourage the development of big data and AI-based risk rating models for R&D, and innovate exclusive financial products such as R&D loans, R&D insurance, and intellectual property securitization. This aims to precisely alleviate corporate financing constraints for R&D, guide funds more efficiently into innovation activities, and enhance the driving role of FinTech in boosting innovation capability.

3. Promote the synergy between FinTech and "Dual Carbon" goal policies to steer high-quality development towards green transformation. Efforts should be made to organically combine FinTech with environmental regulations, utilizing its capabilities in data mining and dynamic monitoring to help build corporate carbon accounts and green performance evaluation systems. Based on this, differentiated green credit and supply chain finance should be developed, making FinTech an effective tool to incentivize enterprises to save energy, reduce emissions, and achieve green and low-carbon transition.

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