# FinTech and the Improvement of Total Factor Productivity in Enterprises: An Empirical Study Based on Big Data Analysis

**Zhongzhu Zhou**

North Highland, Houston, United States
DOI: 10.32629/memf.v5i4.2585

**Abstract:** Against the backdrop of global economic digital transformation, FinTech, as an emerging industry, is reshaping enterprise production and operational models. This paper explores the role of FinTech in enhancing total factor productivity (TFP) in enterprises through big data analysis. Based on macroeconomic data and micro data of enterprises, this study constructs a measurement index system of FinTech development level and enterprise total factor productivity. Using panel data models and econometric methods, we empirically analyze the mechanisms through which FinTech affects enterprise production efficiency. The study finds that the development of FinTech significantly enhances enterprise TFP, with this effect being particularly pronounced in high-tech industries and small and medium-sized enterprises (SMEs). The research results provide valuable insights for both enterprises and policymakers, suggesting increased investment and support for FinTech to further enhance enterprise competitiveness and economic development levels.

***Keywords*:** FinTech; total factor productivity; big data analysis; enterprise efficiency; resource allocation

## 1. Introduction

The rapid rise of FinTech has brought new opportunities for enterprise productivity improvement, and through technological innovation, resource allocation optimisation and transaction cost reduction, FinTech is gradually changing the operation mode of enterprises. Total factor productivity (TFP), as an important indicator for measuring the comprehensive productivity of enterprises, and its enhancement is of great significance for economic growth and competitiveness [1]. However, the current research on the impact of FinTech on TFP is still relatively limited. This study aims to explore how FinTech can enhance the total factor productivity of enterprises through big data analysis methods. To this end, we selected suitable big data analysis methods and conducted data processing and analysis through multiple data sources, with a view to revealing the specific path and effect of FinTech's impact on enterprises' TFP through empirical research.

## 2. Literature review

FinTech, as an emerging field that integrates finance and technology, covers the application of a variety of technologies in financial services, including blockchain, artificial intelligence, big data analytics, cloud computing and mobile payments. Its concept involves not only technological innovation, but also the change and optimisation of financial business models. The development history of FinTech can be traced back to the early stage of financial informatisation, and after the rapid development in the era of Internet finance, it has now entered the stage of smart finance, showing the characteristics of diversified technologies, extensive application scenarios and strong market demand. Currently, FinTech is developing rapidly around the world, changing the operation mode of traditional financial institutions and enhancing the efficiency and universality of financial services.

Total Factor Productivity (TFP), as an important indicator of a firm's overall productivity, reflects the increase in output achieved by the firm through technological progress and management optimisation, rather than relying solely on the increase in input factors [2].The definition of TFP relates to the increase in the efficiency of output achieved through innovation, technological progress, and management upgrading with a given set of inputs. Factors affecting TFP include, but are not limited to, technological progress, resource allocation efficiency, management level, degree of market competition and policy environment. A better understanding of the drivers of firms' productivity can be achieved through an in-depth study of these factors.

Existing literature shows that the impact mechanism of FinTech on enterprise TFP is mainly reflected in three aspects: first, FinTech promotes the optimization of enterprise production processes and procedures through technological progress and innovation to improve production efficiency and product quality; second, FinTech optimizes the efficiency of resource allocation, so that factors of production such as capital, labor and technology can be more effectively configured and utilized, thus enhancing

the overall enterprise operational efficiency; third, FinTech reduces transaction costs, simplifies transaction processes, and improves transaction transparency and security, thereby reducing the time and capital costs of enterprises in the transaction process. These mechanisms work together to significantly improve the total factor productivity of enterprises [3].

Taken together, FinTech has not only had a profound impact on the production and operation of enterprises at the technological level, but also brought about important changes at the management and market levels. The study of the relationship between FinTech and corporate TFP can provide policymakers and corporate managers with valuable theoretical basis and practical guidance, promote the further improvement of corporate productivity, and achieve higher quality economic growth.

# 3. Theoretical and analytical framework

The role of FinTech in enhancing the total factor productivity (TFP) of enterprises can be analysed through three main paths: technological innovation, resource allocation efficiency and transaction costs. Firstly, the development of FinTech promotes technological innovation, providing enterprises with more advanced production tools and management means. For example, big data analysis helps enterprises predict market demand more accurately and improve the accuracy and efficiency of production planning, while artificial intelligence technology optimises the production process, reduces human error, and improves the automation level of production lines, thus enhancing the productivity of enterprises [4]. FinTech helps companies optimise resource allocation by providing efficient financial services and tools. For example, blockchain technology improves the transparency and credibility of the supply chain, reduces intermediate links, and lowers logistics costs. FinTech platforms allocate capital, technology and human resources more efficiently to where they are most needed through intelligent matching mechanisms, enhancing resource utilisation and thus increasing the total factor productivity of enterprises. Finally, FinTech simplifies and optimises the transaction process, significantly reducing the transaction costs of enterprises. The popularity of mobile payment and e-commerce platforms enables enterprises to complete transactions quickly and reduce time costs. Blockchain technology, through decentralisation and smart contracts, reduces the cost of trust and compliance in the transaction process and improves the efficiency of transactions, thereby increasing the overall productivity of enterprises.

Based on the above analyses, this study proposes the following hypothesis: FinTech has a positive impact on enterprise TFP, and its influence mechanism includes three aspects: technological progress, resource allocation efficiency and transaction costs. The application of financial technology can significantly enhance the total factor productivity of enterprises, which is manifested in the improvement of production efficiency, product quality and market competitiveness. Through technological progress, FinTech promotes technological innovation, provides enterprises with advanced production tools and management means, and enhances production efficiency. Through the optimisation of resource allocation efficiency, FinTech uses intelligent matching mechanisms to improve resource utilisation and enhance the operational efficiency of enterprises. By reducing transaction costs, FinTech simplifies the transaction process, reduces time costs and trust costs, improves transaction efficiency and reduces the operating costs of enterprises [5]. By testing these hypotheses, the specific impact mechanism of FinTech on enterprise TFP can be understood in depth, providing theoretical support for relevant policy formulation and enterprise practice.

# 4. Data and research methodology

## 4.1 Data description

The data for this study comes from multiple sources, including big data platforms, corporate financial statements, and industry databases. Big data platforms provide detailed information about FinTech applications, corporate financial statements contain basic financial data about companies, and industry databases provide the overall economic conditions and market environment of the industry. In order to ensure the accuracy and consistency of the data, this study has rigorously processed and cleaned the raw data. Specific methods include steps such as removing missing values and outliers, standardisation and data integration to ensure data integrity and reliability.

## 4.2 Definition and description of variables

In this study, the main variables include firms' total factor productivity (TFP) and the FinTech adoption index.TFP is calculated through firms' output and input data, while the FinTech adoption index reflects the extent of firms' adoption of FinTech. In addition, the study introduces a number of control variables to reduce the interference of external factors. These control variables include firm size (e.g., number of employees and total assets), industry type (e.g., manufacturing, services, etc.), and market environment (e.g., degree of market competition and macroeconomic conditions).

### 4.3 Methods of empirical analysis

In order to test the impact of FinTech on firms' TFP, a regression analysis model was constructed in this study. The basic model form is as follows:

$$TFP_i = \alpha + \beta \times FinTech_i + \gamma \times Controls_i + \in_i$$

Where TFPi denotes the total factor productivity of the ith enterprise, FinTechi denotes the FinTech application index, Controlsi denotes a set of control variables, α is the intercept term, β is the regression coefficient, and ϵi is the random error term. After the model is constructed, the test and correction of the model are carried out to ensure the reliability and explanatory power of the model through a variety of robustness testing methods, such as heteroskedasticity test and covariance test. Ultimately, the results of the regression analysis are used to reveal the specific path and extent of the impact of FinTech on the total factor productivity of enterprises.

## 5. Empirical results and analyses

After cleaning and processing the data, this study conducted descriptive statistical analysis and regression analysis on the sample data to check the impact of FinTech on the total factor productivity (TFP) of enterprises. Figure 1 demonstrates the frequency distribution of firms' total factor productivity (TFP), Figure 2 demonstrates the frequency distribution of firms' FinTech adoption index, and Figure 3 demonstrates the relationship between firms' TFP and FinTech adoption index.

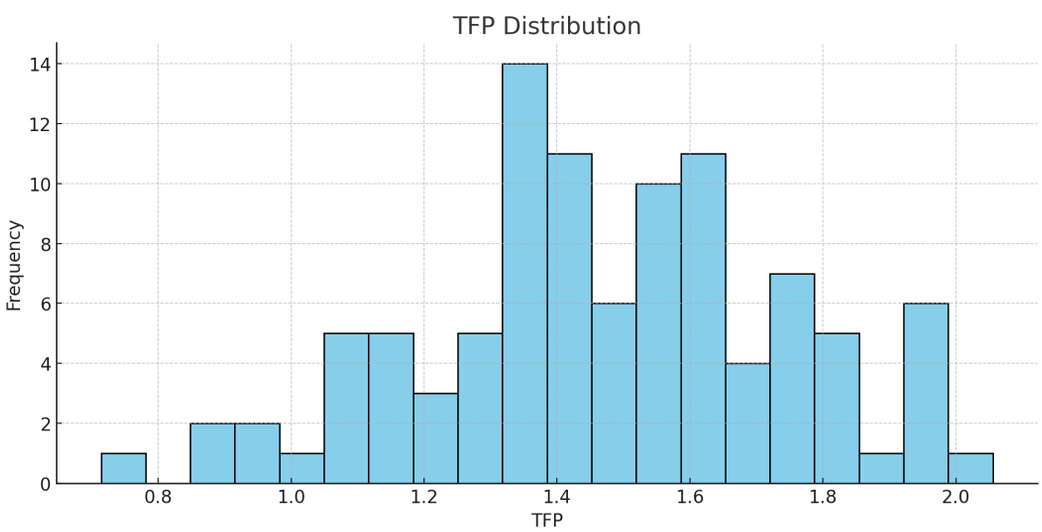


**Figure 1. TFP Distribution**

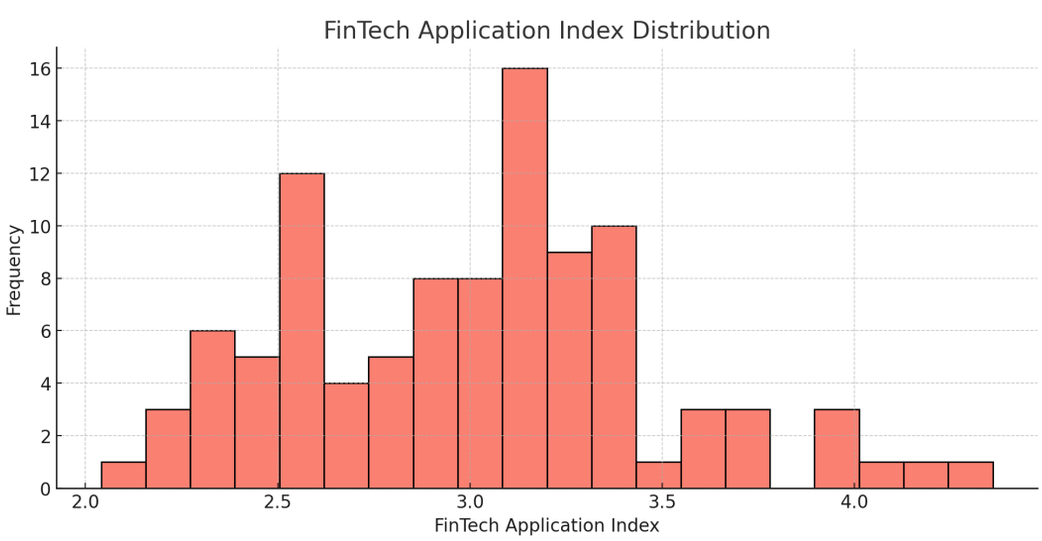


**Figure 2. FinTech Application Index Distribution**

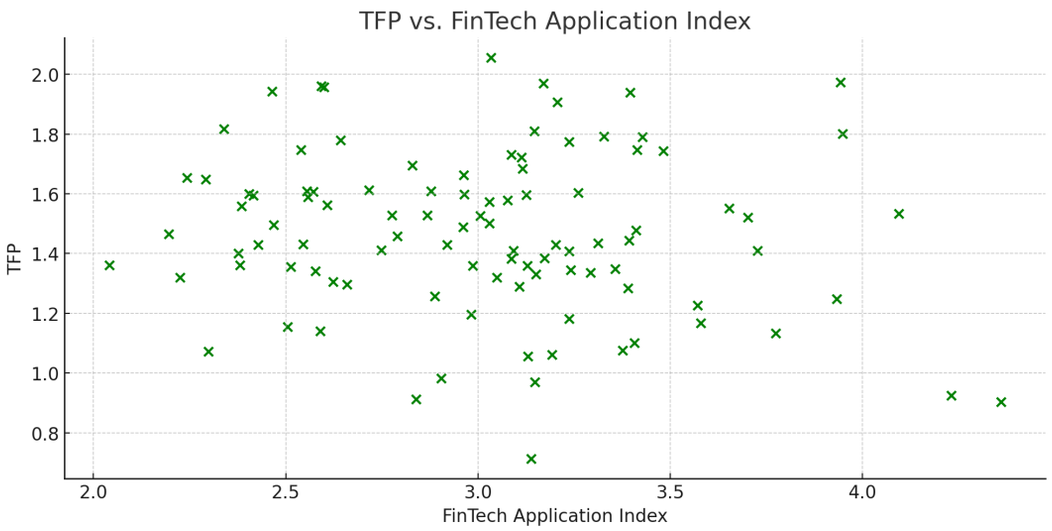


**Figure 3. TFP vs. FinTech Application Index**

As in Figure 1, the frequency distribution of firms' total factor productivity (TFP) is demonstrated. The horizontal axis represents the value of TFP and the vertical axis represents the frequency. It can be seen that the TFP of most enterprises is concentrated between 1.2 and 1.6, showing a relatively symmetrical distribution, suggesting that there is a certain amount of variability in the productivity of enterprises in the sample data.

As shown in Figure 2, the frequency distribution of firms' FinTech adoption index is demonstrated. The horizontal axis represents the value of the FinTech application index and the vertical axis represents the frequency. The data show that the FinTech application index of most enterprises is concentrated between 2.5 and 3.5, which indicates that there is a certain concentration trend in the sample data in terms of enterprises' investment in and use of FinTech applications.

As shown in Figure 3, the relationship between firms' TFP and the FinTech adoption index is demonstrated. The horizontal axis represents the FinTech adoption index and the vertical axis represents TFP.The scatterplot shows that there is a certain positive correlation between TFP and the FinTech adoption index, i.e. the higher the FinTech adoption index, the higher the TFP of the enterprise tends to increase, but the strength of this relationship is not particularly strong, suggesting that there are also other factors affecting the productivity of the enterprise.

## 6. Conclusion

This study finds through empirical analyses that FinTech significantly enhances the total factor productivity (TFP) of enterprises. The results of regression analysis show that there is a significant positive correlation between the FinTech application index and enterprise TFP, indicating that the higher the degree of FinTech application, the higher the productivity of enterprises. Specifically, FinTech positively affects enterprise TFP through technological innovation, resource allocation efficiency improvement and transaction cost reduction. Descriptive statistical analysis shows that the application of FinTech in enterprises has a certain degree of popularity, but there is still room for improvement. In addition, control variables such as enterprise size, industry type and degree of market competition also have an important impact on TFP. Based on this, it is recommended that policy makers and enterprise managers further promote the development and application of FinTech, and formulate targeted policies and strategies in light of the specific conditions of enterprises in order to comprehensively enhance their productivity. Future research should further explore the specific impact mechanisms of different types of FinTech on enterprise TFP to provide finer theoretical support for policy formulation.

## References

[1] Liu Yuanchu, Chen Yajun. How does financial technology enhance enterprise total factor productivity? --Based on the perspective of strategic emerging industries[J]. Modern Economic Discussion,2024(07):89-101.

[2] Wang Mengyi,Yuan Chenhui,Qiao Xiuhua. Research on the relationship between financial technology, enterprise innovation and total factor productivity[J]. Strait Science and Industry,2024,37(04):18-24.

[3] Lu Wenjie, Liu Donghua, Li Aixi. The Impact of Financial Technology on Total Factor Productivity of Enterprises in

China-Analysis Based on the Perspective of Enterprise Life Cycle[J]. Fujian Finance,2024(03):20-30.
[4] Wang Yuyan,Hu Wenjing. FinTech, intellectual property protection and corporate total factor productivity - Evidence from listed companies in China's manufacturing industry[J/OL]. Journal of Lanzhou University of Finance and Economics:1-16[2024-07-15].
[5] Song Qinghua,Zhou Xueqin. Can FinTech enhance urban inclusive green total factor productivity? [J]. Journal of Zhongnan University of Economics and Law,2024(02):67-80.

## Author Bio

Zhongzhu Zhou, born in 1996, native place of Changsha, Hunan province, Ethnic Han, master degree, currently north highland Data consultant (Houston Office, USA), research direction: Big Data Analysis.