# How Fintech Affects Economic Development

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**Abstract:** *Based on the annual provincial panel data from 2011 to 2020, this paper uses fixed-effect panel model and threshold-effect model to study the impact of fintech on economic development. The results show that fintech has a significant positive impact on economic development and heterogeneity, and the contribution of fintech to economic development is relatively high in the eastern region. Further using the threshold effect model, it is found that different levels of fintech have different effects on economic development.*

**Keywords:** *fintech, threshold effect, economic development*

## 1. Introduction

As the hottest topic in recent years, fintech has been widely discussed by scholars at home and abroad. In the 14th five-year plan, our country proposed to develop fintech to build a digital China. The development of finance has driven the flow of idle funds in the society, and the development of science and technology has accelerated the flow of funds, this is conducive to the promotion of financial efficiency and economic efficiency, science and technology to lead the economy to release new momentum, and then promote economic integration. The essence of fintech is that modern technology endows finance with power. Under the background of rapid development of science and technology, traditional financial institutions are seriously lack of growth momentum, so it is urgent to improve the level of fintech innovation and development[1].With the advent of big data, artificial intelligence, cloud computing and other technologies, innovative financial products and services continue to be introduced, accelerating the process of financial development. fintech"Empowers" traditional financial institutions, simplifies lending, investment and financial management processes, and attracts potential customers with low-cost, low-barrier-to-entry services through online payments, the use of the Internet to enhance existing scenario services or develop new scenario financial services to drive consumer spending expands the scope of the real economy of financial services; at the same time, fintech permeates all aspects of asset management, it forms a market-driven investment model, provides comprehensive financial services for investors, realizes the efficient connection between investors and financial management projects, and improves the efficiency of capital allocation while reducing costs, make asset management business to the real, and then promote economic development[2].

## 2. Literature Review and Research Hypothesis

In recent years, with the progress and development of science and Technology, emerging technology in the financial field has been widely used, fintech has quickly become a research hotspot. Although the study of fintech is relatively extensive, but the concept of fintech has not yet a unified and clear concept.As early as 1972, the vice-president of the Hanover Industrial Trust Corporation defined fintech as a combination of computer technology, modern management technology and bank expertise[3].Ba Shusong and Bai Haifeng (2016) argue that fintech is a technology that applies science and technology to the financial sector in order to reduce costs and improve the efficiency of the industry to serve the public[4].Yi Xianrong (2017) believes that fintech is the integration of finance and technology, namely the early"Internet finance"and"financial Internet" [5].The Financial Stability Board's definition of fintech is widely recognised as the financial Sunac that has been brought about by the development of science and technology, can create some new financial products, business models, technology applications, while the financial market, financial services, financial institutions have a major impact. Although not a unified concept, but the core content contains financial markets, innovation, technology, efficiency, cost and so on. Based on the study and analysis of the existing literature, this paper is more inclined to the financial stability board's definition of fintech. That is,

fintech (fintech) is brought about by the development of science and Technology. Sunac has been able to create new financial products, business models and technological applications, at the same time to the financial market, financial services, financial institutions have a major impact.

Song Min, Zhou Peng, Si Haitao (2021) by studying the relationship between fintech and corporate productivity, they found that "Enabling" can reduce the Information asymmetry between financial institutions and financiers, increasing credit and thus accelerating resource allocation[6]. Zhang Haijun and Wasp (2022) used a mixed regression model to find that fintech can improve the coordinated economic development of underdeveloped regions[7].Tian xiujuan, Li Rui, Yang Ge (2021) use text mining technology to build fintech development level measurement index, use SVAR model, get, fintech can promote the development of the real economy through both financial Sunac and scientific and technological innovation, especially from scientific and technological innovation[8]. Liu Yuan, Zheng Chenyang, Jiang Ping, and Liu Chao (2018) used factor analysis to construct fintech index and used investment efficiency model to explore the impact of fintech on investment in real economy enterprises. It is found that there is a U-shaped relationship between fintech and the investment efficiency of enterprises in real economy, that is, fintech will reduce the investment efficiency of enterprises in real economy at the initial stage of development, after financial supervision, it will help to improve the investment efficiency of enterprises in real economy[9].At present, the relationship between fintech and investment efficiency of enterprises in China is in the"U"-type rising stage, that is, fintech helps investment efficiency of real economy to be realized gradually. fintech reduces transaction costs, improves operational efficiency, and promotes more rational and efficient allocation of resources through big data blockchain, thus promoting the development of real economy. Based on this, the first hypothesis is presented in this paper.

Hypothesis 1: the development of fintech will promote economic development, that is, there is a positive relationship between the two.

While fintech has increased the convenience of financial services, it has also brought some hidden dangers. Information technology is characterized by cross-border operations and complex business models. While improving the quality and efficiency of financial services, it often leads to the constant renovation of the forms and connotations of financial risks, the difficulty of risk identification and the speed of risk propagation are increased[10].Zhou bin, Zhu Guibin, Mao Deyong, Chao Xianfeng (2017) found that the development of internet finance to a certain extent, there is the role of traditional finance on the flow of funds in the real economy, so that the original flow of funds to the real economy to financial institutions and other virtual industries, so as to restrain the real economy[11].Therefore, a second hypothesis is presented in this paper.

Hypothesis two: there is a threshold effect between fintech and economic development, that is, the impact of fintech development on economic development is different at different stages.

## 3. Research Design

### 3.1 Data Source, Variable Definition

The data in this article are mainly from the National Bureau of Statistics of the People's Republic of China China Statistical Yearbook, the Center for Digital Finance Research of Peking University, and the zero one think tank. Considering the availability and consistency of the data, this paper selects the annual data of 31 provinces and cities in China from 2011 to 2020 as a sample.Variables and definitions are shown in Table 1.

Explained variable: level of economic development ($\ln \text{GDPS}_{it}$), due to the different economic development situation of each region, the difference in the gross domestic product (GDP) of each region is large, in order to reduce the difference in the magnitude of the GDP of each region, in this paper, the gross domestic product of each region is treated by logarithm, and it is regarded as the core explanatory variable of economic development.

Explanatory variable: fintech index (FT), this paper refers to the practice of Fu Huimin and Jiang Shiyin (2022), the Digital Pratt & Whitney Financial Index, published by the Digital Finance Research Centre of Peking University, is used as a measure of fintech development in various provinces and cities, taking into account the depth and potential of fintech development.In order to eliminate the influence of different orders of magnitude, the logarithmic treatment of FT is carried out.

Control variables: (1) fiscal expenditure (CZ). It is expressed as the ratio of fiscal expenditure to

GDP in each region and country. The fiscal expenditure of local government will have a guiding influence on the adjustment of industrial structure and then affect the economic development. (2) the level of industrial structure (CS) . This is expressed in terms of the ratio of the output of each region's tertiary sector of the economy to its GDP. (3) the level of labor force (LS) , the population aged 15-64 years is generally defined as the labor force internationally, so the level of labor force is expressed by the ratio of the population aged 15-64 years in each region to the total population in each region. The level of labor force is one of the key factors of economic growth, which will affect economic growth directly. (4) Education level (JS) . With reference to Fu Huimin and Jiang Shiyin (2022) , first of all, the education level is divided into primary school, junior high school, Senior High School, Junior College and above, and the education period of primary school, Junior High School, Senior High School, Junior College and above is set at 6 years, 9 years, 12 years and 16 years respectively, finally, by multiplying the proportion of the population in each area and each level of education with the corresponding years of education, the average years of education per capita is obtained. Education level is the precondition of upgrading and optimizing the industrial structure of enterprises, and has a significant impact on economic development. (5) level of urbanization (CZS) . It is expressed by the ratio of the year-end population to the total population of cities and towns.

*Table 1: Variable selection and definition*

| type of variable | Variable name | variable-definition |
| --- | --- | --- |
| explained variable | Level of economic development: $(\ln GDPS_{it})$ | *GDP* |
| Core explanatory variables | The fintech Index, (FT) | fintech development level index |
| controlled variable | fiscal expenditure (CZ) | Ratio of fiscal expenditure to national GDP |
| | Industrial structure level is (CS) | The ratio of the output value of the tertiary industry to the GDP in each region |
| | Workforce level is (LS) | The ratio of the number of people aged 15-64 in each region to the total population of each region |
| | educational level (JS) | Years of years of education in each region |
| | Urbanization level is (CZS) | The ratio of the urban population at the end of the year to the total urban population |

### 3.2 Model Setting

#### 3.2.1 Descriptive Statistics

The research sample of this article is the data of 31 provinces (autonomous regions, municipalities directly under the central government, hereinafter referred to as provinces) from 2011 to 2020 in our country. Because of the large standard deviation of the data, this paper has carried on the winsor2 processing, the corresponding descriptive statistical analysis is shown in Table 2:

*Table 2: Descriptive statistics*

| variable | N | mean | std | min | max |
| --- | --- | --- | --- | --- | --- |
| $\ln GDPS_{it}$ | 310 | 97.500 | 9.792 | 68.250 | 115.400 |
| FT | 310 | 5.212 | 0.677 | 2.787 | 6.068 |
| CZ | 310 | 2.823 | 2.110 | 0.0224 | 13.791 |
| CS | 310 | 9.015 | 0.525 | 7.416 | 9.972 |
| LS | 310 | 7.292 | 0.375 | 6.338 | 8.385 |
| JS | 310 | 9.114 | 1.118 | 4.222 | 12.680 |
| CZS | 310 | 5.805 | 1.314 | 2.265 | 8.958 |

The maximum value of the explained variable is 115.400, the minimum value is 68.250, and the standard deviation is 9.792, indicating that there is a large economic gap between different regions, but the total value is within the acceptable range. In terms of the explanatory variable FT, the maximum value was 6.068, the minimum value was 2.787, and the standard deviation was 0.667, indicating that

although the fintech development index as a whole increased, however, there are still some differences among the provinces, and the difference is large. Observing the sample data, it is found that the largest value of fintech index appears in the eastern region, and the average value of fintech index in the eastern region is higher than the average value of the overall data, it shows that the overall level of fintech development in the eastern region is relatively high, and the minimum value of fintech Index appears in the Western Region, and the average fintech index for the western and central regions is lower than the average for the overall Midwestern Sectional Figure Skating Championships, indicating a slower pace of fintech development.

### 3.2.2 Multicollinearity Test

The variance expansion factor test (VIF) was performed in this paper because there may be high correlations among variables in the model that lead to the Multicollinearity of the model. The VIF values of the individual variables in Table 3 were all less than 10, and the VIF values of the model were less than 5, indicating that there was no Multicollinearity between the variables, and the model passed the Multicollinearity test.

*Table 3: Multicollinearity test*

| Variable | VIF | 1/VIF |
|---|---|---|
| CZS | 7.9 | 0.127 |
| JS | 6.3 | 0.159 |
| CZ | 2.13 | 0.469 |
| LS | 2.07 | 0.484 |
| FT | 1.93 | 0.519 |
| CS | 1.75 | 0.57 |
| Mean    VIF | | 3.68 |

### 3.2.3 Modeling

In this paper, we first do a mixed regression, the results show that the estimated coefficient of fintech is significantly positive, indicating that there is a positive relationship between fintech and economic development. Then the model was tested to determine whether the selected model is a fixed-effect model or a random-effect model, the test result value is less than 0.01, rejecting the original hypothesis, so this paper chooses the fixed-effect model for empirical study. The specific model is set as follows:

$$\ln \text{GDPS}_{it} = \alpha + \beta \text{FT}_{it} + \gamma x_{it} + \varepsilon_{it} + \varphi_i \qquad (1)$$

Among them, I represents our country 31 provinces and cities, T represents time (2011-2020) , represents our country each region economic development quantity, FT represents each region finance science and Technology Index, represents the control variable. Represents a random perturbation term. A fixed effect on behalf of an individual.

## 4. Empirical Results Analysis

### 4.1 Regression Analysis of Fixed Effects

*Table 4: Baseline regression of fintech and economic growth*

| Variable | (1) | (2) |
|---|---|---|
| FT | 2.931*** | 1.475*** |
| CZ | | −3.687*** |
| CS | | 0.743 |
| LS | | −3.536*** |
| JS | | 0.925** |
| CZS | | 2.087*** |
| Constant | 82.220*** | 98.756*** |
| $R^2$ | 0.5950 | 0.8669 |

Table 4 is the regression results of each model, and (1) and (2) are the fixed-effect regression estimates. Both models show that there is a significant positive relationship between fintech and economic development. Through the analysis of this article, this may be because fintech has used its

technology to solve problems such as Information asymmetry financing problems, while attracting potential customers by making it easier and cheaper to borrow, it broadens the financing channel, broadens the financing channel for the loan personnel, improves the efficiency of the financial market, and makes the finance serve the real economy with higher quality. On the other hand, the development of fintech promotes the optimization and upgrading of industry, reduces the production cost of industry, makes the utilization rate of capital increase, and provides a lower capital cost for the sustainable development of industry.

*4.2 Robustness Test*

In the robustness test, this paper excludes the data of Beijing, Zhejiang, Shanghai and Guangdong, where fintech has developed rapidly, and considers the rapid development of fintech in the selected regions, in order to avoid the influence of extreme value on the regression result, it is eliminated in this paper. As shown in Table 5, fintech still has a significant positive impact on economic development, and Hypothesis 1 is verified again.

*Table 5: Baseline regression of fintech and economic growth*

| Variable | Robustness test |
|---|---|
| FT | 1.201 *** |
| CZ | −3.775*** |
| CS | 0.669 |
| LS | −2.011 |
| JS | 0.096 |
| CZS | 3.327*** |
| Constant | 90.653*** |
| $R^2$ | 0.8839 |

*4.3 Heterogeneity Analysis*

Due to the uneven distribution of resources in China, the development level of fintech and the level of economic development are not the same between different regions, so this paper tests the regional heterogeneity of the model, the 31 provinces are geographically divided into the central, western and eastern regions. From Table 6, it can be seen that the regression coefficient of the influence of fintech on economic development in the central region is 0.820, that in the western region is 0.930, and that in the eastern region is 1.591, and the three regression coefficients are significant at the 5% confidence level, indicating that the effect of fintech on economic development in Dondo is significantly greater than that of Midwestern Sectional Figure Skating Championships, indicating that there is some regional heterogeneity.

*Table 6: Regional heterogeneity test*

| Variable | middle part | the west area | east |
|---|---|---|---|
| FT | 0.820*** | 0.930 *** | 1.591 ** |
| CZ | −3.514*** | −1.637*** | −6.397*** |
| CS | 0.209 | 1.376 | 0.132 |
| LS | -1.123 | −0.117 | −3.431** |
| JS | −0.574* | 0.156 | 3.335*** |
| CZS | 4.485*** | 4.001*** | 2.111** |
| Constant | 89.750*** | 60.426*** | 83.331*** |
| Observations | 90 | 110 | 110 |
| $R^2$ | 0.9611 | 0.9699 | 0.8590 |

**5. The Construction of Threshold Model**

*5.1 Threshold Effect Test*

Further analysis shows that there is a non-linear relationship between fintech and economic development, and the impact of fintech on economic development depends on the state of fintech

development because of the large economic gap between different regions, therefore, this paper believes that there is a threshold effect of fintech for economic development and threshold effect test.

In this paper, the critical values of 1%, 5%, 10% were calculated by bootstrap iteration for 300 times, and LR test was performed. Table 7 shows that the P value of the three-threshold model is 0.297, which is greater than the critical value of 10%, indicating that the model rejects the hypothesis of the existence of the three-threshold model, while the P value of the two-threshold model is 0, it shows that there is a threshold effect in this model, and the double threshold effect model should be chosen to study it.

*Table 7: Threshold effect and its test results*

| Threshold | Fstat | Prob | The 10% cut-off value | The 5% cutoff | The 1% cut-off value |
|---|---|---|---|---|---|
| single | 115.4*** | 0.000 | 22.6401 | 25.8623 | 32.5419 |
| double | 46.92*** | 0.000 | 21.0902 | 24.1671 | 31.3801 |
| triple | 36.36 | 0.297 | 48.4088 | 58.3516 | 71.2379 |

### 5.2 Threshold Model Construction

According to the results of the threshold effect test, this paper chooses the two-threshold model to analyze, and the model is established as follows:

$$\ln \text{GDPS}_{it} = \alpha_i + \beta_1 \text{FT}_{it} I(q_{it} \leq \gamma_1) + \beta_2 \text{FT}_{it} I(\gamma_1 < q_{it} \leq \gamma_2) + \beta_3 \text{FT}_{it} I(q_{it} > \gamma_2) + X_{it} + \varepsilon_{it} (2)$$

FT is the threshold variable selected in this paper, it is the threshold variable, the two threshold values in the model, and is a control variable, is a random disturbance term, I (*) is an indicative function.

### 5.3 Results Analysis

According to Table 8, the first threshold values of the two-threshold model are 4.9692 and 5.5036 respectively, and they are all within the 95% confidence interval, indicating that there is a nonlinear relationship between fintech and economic development, hypothesis 2 was tested.

*Table 8: Estimates of threshold values*

| | The threshold estimate | And 95% confidence intervals |
|---|---|---|
| $\gamma_1$ | 4.9692 | [4.9052,4.9714] |
| $\gamma_2$ | 5.5036 | [5.4700,5.5047] |

*Table 9: Results of threshold regression*

| Variable | GDPS | P |
|---|---|---|
| Interval 1:FT≤4.9692 | 1.2667*** | 0.001 |
| Interval 2:4.9692<FT≤5.5036 | 1.5181*** | 0.000 |
| Interval 3:FT>5.5036 | 1.6793*** | 0.000 |
| Constant | 108.8295*** | 0.000 |
| Observations | 310 | |
| $R^2$ | 0.8172 | |

Table 9 shows that there is a significant positive relationship between fintech and economic development, but different stages of fintech development have different effects on economic development. When the Index of fintech is less than 4.9692, the regression coefficient of fintech to economic development is 1.2667, when the Index of fintech is in the range (4.9692,5.5036) , the regression coefficient of fintech to economic development is 1.5181. When the Index of fintech is greater than 5.5036, the regression coefficient of fintech to economic development is 1.6793. The three regression coefficients are significant under the confidence level of 1% , and the regression coefficients become larger gradually. With the development of fintech, fintech to the greater contribution to economic development. Test hypothesis two: there is a non-linear relationship between fintech and economic development, which has threshold effect. When fintech develops to different level, it has different promoting effect on economic development. Taking Beijing as an example, in 2011, the fintech Index in Beijing was 4.3750 less than the first threshold value 4.9692, and the regression coefficient of fintech to economic development was 1.2667. From 2012 to 2014, the fintech Index in

Beijing was both greater than the first threshold value and less than the second threshold value, and fell in the second of the interval. The regression coefficient of fintech to economic development in this period was 1.5181.From 2015 to 2020, the fintech Index in Beijing was greater than the second threshold value 5.5036, and fell in the third of the interval. The regression coefficient of fintech to economic development in this period was 1.6793, indicating that the contribution of fintech to economic development was relatively large at this time.

## 6. Conclusion

This paper studies the impact of fintech on economic development by building a fixed panel model and analyzing regional heterogeneity and robustness. It is found that fintech has a significant positive effect on economic development, but its impact on different regions is not the same. The fintech in the Eastern Region has a greater impact on economic development, which may be due to the special geographical location and good business environment in the eastern region to bring higher economic effects, and for the development of fintech has laid a certain foundation, so the eastern region of fintech development faster. And because there is a threshold effect in the impact of fintech on economic development, the impact of Fintech Development Index on economic development is not the same in different regions, with the increase of fintech index from range 1 to range 2 to range 3, the contribution of fintech to economic development increases significantly. And the middle and western areas of the fintech development is slow, resulting in fintech to the economic development of the contribution is not as good as the eastern region. Accordingly, the following recommendations are made:

First, continue to implement front-end development for the eastern region. fintech institutions will be encouraged to develop new technologies and products. Make full use of big data, cloud computing, blockchain and other technologies to create new financial products and services to increase the diversity of financial markets and facilitate capital flows.

The second is to strengthen the construction of financial facilities for Midwestern Sectional Figure Skating Championships. To raise the public's awareness and learning about digital finance, fintech and other products. At the same time, we have made great efforts to develop Pratt & Whitney's financial sector and improve the services of its financial products. We have increased bank lending to micro, small and medium-sized enterprises (msmes) in order to increase financial coverage and promote the establishment of fintech institutions, thereby increasing financial depth.

Third, for the overall impact should reserve fintech professionals. fintech is a long-term accumulation process, so the reserve of professionals in promoting the development of fintech is particularly important. We can set up relevant courses and organize relevant competitions in colleges and universities to train the ability of future financial practitioners by combining theory with practice, and reserve a large number of professionals for fintech research and development.

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