

# The Impact of Inclusive Finance on Regional Innovation Capability: An Empirical Analysis Based on the Pearl River-West River Economic Belt

Ying Wei

School of Economic & Management, Guangxi Normal University, Guilin, China  
18776830971@163.com

**Abstract:** The development of digital inclusive finance not only provides strong financial support for the improvement of regional innovation capabilities, but its digital and intelligent management methods also create favorable conditions for the development of regional innovation activities. The main analysis of this article is to explore the specific ways in which the development of digital inclusive finance affects regional innovation capabilities and how its impact will be effective. After sorting out and analyzing relevant research results at home and abroad, this paper clarifies the research ideas and contents. In the empirical part, it selects the panel data of 11 cities in the Pearl River-West River economic belt from 2011 to 2020, and constructs fixed effect models and panel regression models respectively. First, it conducts regression analysis on digital inclusive finance, and verifies the nonlinear relationship between digital inclusive finance and regional innovation capability. The empirical results show that there is an obvious positive correlation between digital inclusive finance and regional innovation capability in the Pearl River-West River economic belt; The digital inclusive finance within the Pearl River-West River economic belt has a single threshold effect in the process of promoting regional innovation and development, and its innovation incentive role is slightly weakened after crossing the single threshold. Finally, this article proposes targeted suggestions based on actual situations.

**Keywords:** Digital inclusive finance, Regional innovation capability, the Pearl River-West River economic belt

## 1. Introduction

Since the reform and opening up, China has actively engaged in exchanges and mutual learning with countries around the world, learned from advanced production technologies of other countries, and created a development path suitable for itself based on China's actual situation, ultimately achieving high-speed economic development. In the new era of world economic development, the improvement of innovation capability has become the primary factor for China to maintain high-quality development and achieve modernization. Only by emphasizing innovation driven development can we achieve high-quality economic development. However, the development of innovation activities cannot be separated from the support of funds. Due to the narrow coverage of traditional financial services, serious deviation of market asset prices from equilibrium pricing, and low efficiency of resource allocation, this greatly restricts the efficient development of regional innovation activities in China. With the rapid development of digital technology, the integration of inclusive finance and digital technology has given rise to "digital inclusive finance". The development of digital inclusive finance has great advantages in expanding channels for obtaining funds, reducing borrowing and lending costs, and is a breakthrough and improvement of the traditional financial system. It can be seen that the development of digital inclusive finance is of great significance for enhancing China's regional innovation capabilities.

Scholars generally believe that digital inclusive finance has a positive impact on innovation. The development of digital inclusive finance can optimize the allocation of regional credit resources, improve the availability of innovative financing for regional innovation entities<sup>[1]</sup>, reduce transaction costs such as financial expenses, and enable innovation entities to have more sufficient financial reserves<sup>[2]</sup>, thereby activating the driving force for innovation activities and ultimately improving the overall innovation level of the region<sup>[3]</sup>. In addition to reducing the financing costs of innovative entities, digital inclusive finance can also make up for the shortcomings of traditional finance in terms

of service coverage and financing channels, unleashing innovation potential and promoting regional innovation capacity improvement [4-5]. As research deepens, some scholars have found that the impact of digital inclusive finance on regional innovation capabilities is not linear. This impact is influenced internally by the level of development of digital inclusive finance, and externally by other factors such as government fiscal expenditure [6]. When the development of digital inclusive finance is at a low level, its impact on regional innovation is relatively weak, and the potential for innovation driven development still needs to be explored. After the development of digital inclusive finance reaches a certain level, it has a significant promoting effect on regional innovation, and its promoting effect on regional innovation continues to strengthen after breaking through bottlenecks [7]. Scholars have also come to different conclusions, that is, the positive promoting effect of digital inclusive finance on regional innovation efficiency shows a gradually decreasing non-linear characteristic after crossing the threshold [8].

Based on previous research, the positive impact of digital inclusive funding on regional innovation capabilities. On the basis of previous studies, this paper will take the Pearl River-West River economic belt as the research object, explore the impact of digital inclusive funds on regional innovation capability, and explore the nonlinear impact with digital inclusive finance as the threshold variable to enrich the existing research results. Based on the empirical results, this paper puts forward feasible suggestions for digital inclusive finance in the Pearl River-West River economic belt to enhance regional innovation capacity.

## 2. Research design

### 2.1 Indicator Selection

This article selects regional innovation capability (lnric) as the dependent variable. Considering the availability of data, this article refers to the approach of Li Xibao [9] and uses a single indicator to measure regional innovation capability, that is, the natural logarithm of the number of invention patent applications authorized is used to measure. When conducting robustness tests, use the natural number of invention patent applications as the proxy variable for regional innovation capability (lnpaq); This article selects digital inclusive finance (lnfdi) as the core explanatory variable and threshold variable, and refers to the approach of Guo Feng et al. to use the Peking University Digital Inclusive Finance Index at the prefecture level as a proxy indicator for digital inclusive finance.

### 2.2 Data sources

In view of the availability of data, this paper takes the panel data of 11 prefecture level cities in in the Pearl River-West River economic belt from 2011 to 2020 as the research sample. The Digital Inclusive Finance Index comes from the Peking University Digital Inclusive Finance Index, and the remaining data comes from the Statistical Yearbook of Each Province and City (2011-2020).

## 3. Empirical results and analysis

### 3.1 Panel regression analysis

Table 1: Panel Regression Results

|       | (1)                 | (2)                 | (3)                 | (4)                 |
|-------|---------------------|---------------------|---------------------|---------------------|
|       | lnric               | lnric               | lnric               | lnric               |
| lnfdi | 1.638***<br>(6.491) | 1.623***<br>(6.628) | 1.623***<br>(6.799) | 1.594***<br>(6.769) |
| open  |                     | 7.147**<br>(2.558)  | 8.549***<br>(3.069) | 8.771***<br>(3.195) |
| is    |                     |                     | 1.165**<br>(2.377)  | 1.557***<br>(2.973) |
| lndev |                     |                     |                     | -0.380*<br>(-1.928) |
| cons  | -1.078<br>(-0.842)  | -1.065<br>(-0.858)  | -1.584<br>(-1.288)  | 2.461<br>(1.016)    |
| N     | 110.000             | 110.000             | 110.000             | 110.000             |
| r2 a  | 0.991               | 0.991               | 0.992               | 0.992               |

Note: \*, \*\*, and \*\*\* respectively represent significant values at the levels of 0.1, 0.05, and 0.01, with t-values in parentheses.

This section of the regression analysis is based on a bidirectional fixed effects model to explore the correlation between the explanatory variable of digital inclusive finance and the dependent variable of regional innovation capability. Control variables such as industrial structure (is), degree of openness (open), and level of economic development (Indve) are gradually added to explore the correlation between the explanatory variable and the dependent variable under different numbers of control variables. The regression analysis results are shown in Table 1.

It can be seen that as the control variables are added one by one, the development of digital inclusive finance has a significant promoting effect on regional innovation capabilities. The coefficient of the total index of digital inclusive finance (Indfi) is 1.594, which indicates that the regional innovation capability (Inric) of in the Pearl River-West River economic belt will increase by 1.594 units for every unit of improvement in the development level of digital inclusive finance. Based on the regression results, research hypothesis 1 can be validated. The regression results show that the control variables have a positive promoting effect on the improvement of regional innovation capability. The coefficient of openness is significantly positive at the 0.01 level, and every time openness increases by one unit, regional innovation capability (Inric) increases by 8.771 units. This shows that the degree of openness outside in the Pearl River-West River economic belt has a significant role in promoting regional innovation capacity. A high degree of openness is conducive to attracting foreign investment and increasing financial support for innovation. The coefficient of industrial structure (is) is significantly positive at the 0.01 level, and every time the industrial structure improves by one unit, the regional innovation capability (Inric) increases by 1.557 units. This shows that the industrial structure of in the Pearl River-West River economic belt has a greater driving effect on the regional innovation capability. The rapid development of the secondary industry, the deepening of industrialization and the application of new industrial technologies can effectively improve the transformation capability of scientific and technological achievements in the region, thus accelerating the pace of upgrading the regional innovation capability. The coefficient of economic development level (Indve) is negative, which indicates that the improvement of economic development level of in the Pearl River-West River economic belt does not promote regional innovation capability.

### 3.2 Robustness testing

Table 2: Robustness Test Results

|                             |           |
|-----------------------------|-----------|
|                             | lnpaq     |
| Indfi                       | 1.213***  |
|                             | (3.393)   |
| open                        | 0.005     |
|                             | (0.108)   |
| is                          | 3.179***  |
|                             | (4.001)   |
| Indev                       | -0.814*** |
|                             | (-2.721)  |
| cons                        | 8.669**   |
|                             | (2.358)   |
| N                           | 110.000   |
| r <sup>2</sup> <sub>a</sub> | 0.980     |

Note: \*, \*\*, and \*\*\* respectively represent significant values at the levels of 0.1, 0.05, and 0.01, with t-values in parentheses.

Table 2 reports the robustness test regression results of replacing the dependent variable measurement method. In the benchmark regression, this paper uses the natural logarithm of the number of invention patent applications authorized (Inric) as the proxy variable for regional innovation capability. In the robustness test, this paper uses the natural logarithm of the number of invention patent applications (lnpaq) as the proxy variable for regional innovation capability. According to Table 2, the regression coefficient of the Digital Inclusive Finance Index (Indfi) is 1.213, which is significant at the 0.01 level ( $\beta = 0.022$ ,  $t = 3.393$ ), the degree of digitalization (Indig) is not significantly correlated with regional innovation capability. This result indicates that the conclusion of this article still holds after changing the measurement method of the dependent variable.

### 3.3 Threshold regression analysis

Based on the previous theoretical analysis, digital inclusive finance may have a non-linear impact on regional innovation capabilities. Therefore, this section tests this non-linear impact through threshold analysis. Firstly, this article tests the possibility of the threshold effect. Table 3 shows that a single threshold rejects the original hypothesis at a level of 0.01, but the F and P values of the double

threshold and triple threshold are 0.2633 and 0.816, respectively. Both are greater than 0.1, so the original hypothesis cannot be rejected. Therefore, it can be inferred that digital inclusive finance has a single threshold effect on regional innovation capability.

Table 3: Threshold Inspection Results

| Number of thresholds | F value | P value | bs  | critical value |         |         |
|----------------------|---------|---------|-----|----------------|---------|---------|
|                      |         |         |     | 10%            | 5%      | 1%      |
| Single               | 36.56   | 0.0033  | 300 | 18.9746        | 23.5882 | 32.1376 |
| Double               | 12.36   | 0.2633  | 300 | 27.1989        | 40.9854 | 60.2257 |
| Triple               | 4.05    | 0.8167  | 300 | 19.6448        | 26.0898 | 29.5021 |

The above threshold effect test can determine that the threshold number is 1, and a single threshold test can be conducted to obtain the threshold value and confidence interval of in the Pearl River-West River economic belt. As shown in Table 4, the single threshold value is 4.2292, and the confidence interval at the 95% level is (4.0857, 4.2592).

Table 4: Single threshold test results

| Number of thresholds | threshold variable | estimated value | confidence interval |
|----------------------|--------------------|-----------------|---------------------|
| single threshold     | Indfi              | 4.2292          | (4.0857,4.2592)     |

This paper takes 4.2292 as the critical value of the development level of digital inclusive finance in the Pearl River-West River economic belt and divides the interval into two. According to the threshold regression results shown in Table 5, it can be seen that when digital inclusive finance ( $\text{Indfi} \leq 4.2292$ ), the coefficient of digital inclusive finance is significantly positive at the 0.01 level, and below the critical value, every unit increase in digital inclusive finance will increase regional innovation capacity by 1.856 units. When digital inclusive finance ( $\text{Indfi} > 4.2292$ ), the coefficient of digital inclusive finance is significantly positive at the 0.01 level, but its coefficient is less than 1.856. When digital inclusive finance increases by one unit, it will increase regional innovation capacity by 1.649 units. The regression analysis shows that with the improvement of digital inclusive finance, its promoting effect on regional innovation capacity shows a non-linear effect of marginal decrease, indicating that the research hypothesis 3 proposed in this article is validated.

Table 5: Panel Threshold Regression Results

| variable                             | coefficient |
|--------------------------------------|-------------|
| Lndif ( $\text{Indfi} \leq 4.2292$ ) | 1.856***    |
|                                      | (8.32)      |
| Lndif ( $\text{Indfi} > 4.2292$ )    | 1.649***    |
|                                      | (8.28)      |
| open                                 | 0.123       |
|                                      | (0.75)      |
| Indev                                | 0.027       |
|                                      | (0.53)      |
| cons                                 | -1.857*     |
|                                      | (-0.86)     |

Note: \*, \*\*, and \*\*\* respectively indicate significance at the levels of 0.1, 0.05, and 0.01, with standard errors in parentheses.

#### 4. Conclusion and recommendations

Through analysis, it can be concluded that within in the Pearl River-West River economic belt, the development of digital inclusive finance can promote the improvement of regional innovation level, and the regional innovation ability can be improved by promoting the development of digital inclusive finance.

Therefore, this paper puts forward the following suggestions: the selection of differentiated digital inclusive financial development policies based on local conditions is conducive to the rational allocation of innovation resources among regions and the promotion of the overall innovation capacity of in the Pearl River-West River economic belt. In this regard, the government and other relevant departments can formulate different development policies based on the level of digital inclusive finance development in the region. The specific path includes: firstly, for cities with relatively backward development of digital inclusive finance, such as Chongzuo City and Baise City, support policies can be implemented to improve the construction of relevant digital infrastructure, strengthen publicity and education to increase residents' awareness of digital inclusive finance related products and services, promote digital inclusive finance to better serve low-income groups, small and micro enterprises and other "long tail groups", and effectively achieve uniform distribution of resources between regions to

narrow development differences. Given the significant mediating effect of human capital in promoting regional innovation capabilities through digital inclusive finance, underdeveloped regions can actively introduce high-end digital talents to promote local innovation and development. Secondly, for regions with relatively rapid development of digital inclusive finance, such as Guangzhou and Foshan, due to their advantageous geographical location, abundant resource endowments, and talent reserves, the quality and coverage of digital inclusive finance services are relatively high. Such regions can learn from and absorb development experience from each other, strengthen the incentive effect of digital inclusive finance on regional innovation capabilities, fully leverage the transmission role of resident consumption level in innovation driving, and promote high-quality regional economic development.

## References

- [1] Xu Ziyao, Zhang Lisha, Liu Yizhi. Does digital inclusive finance enhance regional innovation capabilities [J]. *Financial Science*, 2020 (11): 17-28.
- [2] Ozili P. K. Impact of digital finance on financial inclusion and stability [J]. *Borsa Istanbul Review*, 2018, 18 (04): 329-340.
- [3] Tang Song, Wu Xuchuan, Zhu Jia. Characteristics and Mechanism Identification of Digital Finance and Enterprise Technology Innovation Structure, and Differences in Effects under Financial Regulation [J]. *Management World*, 2020, 36 (05): 52-66+9.
- [4] Hasan M, Yajuan L, Khan S. Promoting China's inclusive finance through digital financial services [J]. *Global Business Review*, 2020 (06): 1-23.
- [5] Ren Biyun, Liu Jiabin. Development of Digital Inclusive Finance and Improvement of Regional Innovation Level: An Analysis from the Perspective of Internal Supply and External Demand [J]. *Journal of Southwest University for Nationalities (Humanities and Social Sciences Edition)*, 2021, 42 (02): 99-111.
- [6] Zheng Wanteng, Zhao Hongyan, Fan Hong. Research on the Incentive Effect of Digital Finance Development on Regional Innovation [J]. *Scientific Research Management*, 2021, 42 (04): 138-146.
- [7] Li Rongqiang. Research on the Impact of Digital Inclusive Finance Development on Regional Innovation Capacity [D]. Guiyang: Guizhou University of Finance and Economics, 2022.
- [8] Zou Huiwen, Huang You. Research on the Role of Digital Inclusive Finance Development on Regional Innovation Efficiency [J]. *Finance and Economy*, 2021 (01): 48-55.
- [9] Li Xibao. Empirical Study on the Impact of Regional Innovation Environment on Innovation Activity Efficiency [J]. *Quantitative Economic and Technological Economic Research*, 2007 (08): 13-24.