

# Research on the Impact of Digital Financial Inclusion on Residents' Consumption Level: Analysis Based on Intermediary Effect Model

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**Abstract.** This paper selects panel data of 31 provinces and cities in China from 2011 - 2020, constructs an intermediary effect model with income gap as the intermediary variable, and studies the impact and mechanism of digital inclusive finance on residents' consumption level. It is found that digital inclusive finance can significantly promote residents' consumption level. The intermediary effect stepwise regression model shows that digital inclusive finance has a significant contribution to the income gap, which further promotes the increase of residents' consumption level. Heterogeneity analyses show that digital inclusive finance has a more significant effect on promoting the consumption level of residents in the eastern and western regions.

**Keywords:** Digital financial inclusion; residents' consumption level; intermediary effect.

## 1. Introduction

The slowdown of the world economic recovery and the complex changes in the international situation reduced the volatility of the contribution of China's investment to economic growth, but increased the contribution of consumption to economic growth. This transition not only shows that China's economic growth has shifted from investment-and export-driven to consumption-driven, but also provides an opportunity for improving consumption demand for low level. Meanwhile, as an important part of the development of financial industry in China, digital financial inclusion provide convenience for low-income groups, combined with cloud computing in recent years, such as digital data, make payment, consumption, loans more convenient, meet the financing needs of low-income groups. So, combing with the financial inclusion and digital technology to discuss whether can financial inclusion promote consumer and economic development, is a worthy of research subject.

## 2. Literature Review

Currently, most scholars have found that digital financial inclusion has a promoting effect on residents' consumption level through impact gap. In general, the mainstream studies on can be divided into the direct effect and indirect effect.

For direct effect, Zhang et al. made a theoretical analysis of its mechanism from the perspective of "digital inclusive benefit" and argued that can narrow the urban-rural income gap through their analysis[1]. As regarding indirect effect, Ye et al. point out that the upgrading of industrial structure will further expand the urban-rural income gap in the short term, while in the long term, the industrial structure will further narrow the urban-rural income gap[2]. Dai and Xu used the panel data from 2005-Dubbin) of 31 provinces in China and found that with the increase of labor mobility, the upgrading of industrial structure will form an inverted "U" shaped effect on the urban-rural income gap[3]. Yi investigated how China "digital financial inclusion" development influence the urban and rural income gap, the studies show that "digital financial coverage" can improve the "availability", and reduce "urban and rural income difference", but this effect has regional differences and spatial differences[4]. The empirical analysis of Jiang et al. shows that the narrowing gap between urban and rural income plays an intermediary role with industrial upgrading during the process of digital financial inclusion to promote residents' consumption [5].

On the basis of combing the literature related to digital financial inclusion, we find that the current research on digital financial inclusion pays more attention to its impact on the family and the society. The former exhibit that the digital financial inclusion promotes the diversification of the proportion of labor income and household asset allocation[6]. And the latter on the social perspective, digital financial inclusion has promoted not only on the optimization and upgrading of the industrial structure, but also on the high-quality economic development and common prosperity. Therefore, this study seeks to explore the function mechanism of digital finance on residents' consumption from the perspective of income gap and by propose the intermediary effect of income gap, to expand the study of relationship between digital financial inclusion and residents 'consumption.

### 3. Theoretical Analysis and Research Hypotheses

At present, Chinese scholars have studied a lot on the impact of digital financial inclusion on the improvement of residents' consumption level, such as Yi Xingjian and Zhou Li[7]. It is believed that digital financial inclusion can significantly improve the consumption level of residents, among which the most obvious effect is to alleviate credit constraints. Based on this, the Hypothesis 1 was proposed.

Hypothesis 1 (H1). Digital financial inclusion promotes the improvement of residents' consumption level.

In addition, digital financial inclusion plays a particularly obvious role in promoting income growth for rural residents, which further narrates the income gap between urban and rural areas. Also, digital financial inclusion also promotes the improvement of infrastructure in backward areas and the emergence of mobile payment, which improves residents' lives and stimulates the consumption expenditure of rural residents. Thus, we propose Hypothesis 2.

Hypothesis 2 (H2). Digital financial inclusion narrates the income gap through the income growth effect, which can promote the improvement of residents' consumption level.

Moreover, the income gap between the eastern, central and western regions has gradually widened and there is a large gap in the per capita consumption expenditure of residents, which made the digital finance first emerged in the regions with rapid economic development in eastern China. Although it has been vigorously developed throughout the country in recent years due to its universality, there are still a few backward and remote areas in the central and western regions that have failed to share this development achievement. Therefore, the Hypothesis 3 as following.

Hypothesis 3 (H3). The impact of digital finance on the improvement of residents' consumption level is heterogeneous in the eastern, central and western regions.

### 4. Research Methodology

#### 4.1 Sample Selection and Data Source

The data studied in this paper are the household consumption panel in 31 provinces, municipalities and autonomous regions in China from 2011 to 2020, in which the core explanatory variable (Dig) is calculated and published by the Digital Finance Research Center of Peking University from 2011 to 2020, and the remaining variable data and the calculated basic data are from the annual statistical data of the National Bureau of Statistics, and the missing values are filled by linear interpolation method. Data were processed using Excel and Stata17.0.

#### 4.2 Variable Selection

##### (1) Explained variable

The explanatory variable in this paper is resident consumption level (RCL), which was measured by the relevant indicators of resident consumption level in the provincial statistical Yearbook, referring to Wu and Tang [8-9]. We considered both rural residents and urban residents in study, then the consumption level of residents is expressed by the per capita consumption expenditure of the total urban and rural population at the end of the year, and the consumption level of rural residents and

urban residents can be calculated according to the permanent resident population at the end of the year respectively.

(2) Explanatory variable

Considering the inevitable trend of the development of digital financial inclusion and make up for the defects of Chinese modern financial market, the digital financial inclusion was selected as the explanatory variable of this paper. This data is measured by the provincial level data of China Financial Inclusion Development Index 2011-2020 compiled by the Digital Finance Development Center of Peking University.

(3) Intermediary variable

The urban-rural income gap refers to the degree of inequality in income distribution among different individuals. By studying the income gap as an intermediary variable, the influence path of the income gap on consumption upgrading is studied. According to Jiang and Zhang [10-11], the variable was selected and measured by the ratio of per capita disposable income between urban and rural areas in each region.

(4) Control variables

In addition to digital financial inclusion, there are also other factors that affect the upgrading of residents' consumption. On this basis, combined with the existing research, refer to Li, Zhang, Xu and Cui et al. [12-15], we select the per capita disposable income level, economic development level, urbanization level, consumer price index, traditional financial development level, social security level, elderly dependency ratio, children dependency ratio, and eight factors affecting the consumption level of residents as the control variables.

Table 1. Description and definition of relevant variables

| Type of Variable      | Variable Name                                 | Variable Symbol | Variable Declaration                                                                     |
|-----------------------|-----------------------------------------------|-----------------|------------------------------------------------------------------------------------------|
| Explained variable    | Consumption level of residents                | RCL             | per capita consumption expenditure                                                       |
| Explanatory variable  | Digital financial inclusion consumption index | Dig             | Regional digital financial inclusion consumption index                                   |
| Intermediary variable | Urban-rural income gap                        | GAP             | The ratio of per capita disposable income between urban and rural areas in each region   |
| Controlled variable   | per capita disposable income                  | ADI             | Urban and rural residents' disposable income                                             |
|                       | Economic development                          | PGDP            | per capita gross domestic product                                                        |
|                       | Urbanization level                            | URB             | The proportion of the urban population in the total population                           |
|                       | consumer price index                          | CPI             | Price changes                                                                            |
|                       | Development level of traditional finance      | TFD             | The ratio of loan balance of regional financial institutions to regional GDP of the year |
|                       | Social security level                         | SECU            | Social Security and employment expenditure / GDP                                         |
|                       | Senior support ratio                          | AEDR            | (Population over 65 years / population aged 15-64 years) * 100%                          |
|                       | Child support ratio                           | AYDR            | (Population aged 0-14 / aged 15-64) * 100%                                               |

#### 4.1 Model Measurement and Testing

##### Benchmark measurement model

To find out the impact of digital financial inclusion on residents' consumption level, based on the selected variables, we construct the benchmark measurement model by using OLS as following:

$$RCL_{it} = \beta_0 + \beta_1 Dig_{it} + \sum_{j=2}^n \beta_j Control_{it} + \varepsilon_{it}$$

$$i = 1, 2, \dots, 31, t = 2011, 2012, \dots, 2020 \quad (1)$$

In Formula (1),  $i$  represents 31 regions and provinces in China,  $t$  represents the year,  $RCL_{it}$  represents the consumption level of the explained variables, and the  $Dig_{it}$  represents financial inclusion index,  $Control_{it}$  represents control variable,  $\varepsilon_{it}$  represents other variables that may affect the explained variables except the core explanatory variables are the error disturbance term.

##### Intermediary effect model

In order to further explore the function mechanism of digital financial inclusion on residents' consumption level, this paper selects the urban-rural income gap (GAP) as the intermediary variable and adopts the gradual regression method to verify the rationality of Hypothesis 3. The specific models are as follows:

$$RCL_{it} = \lambda_0 + \lambda_1 Dig_{it} + \sum_{j=2}^n \lambda_j Control_{it} + \eta_{it} \quad (2)$$

$$GAP_{it} = \gamma_0 + \gamma_1 dig_{it} + \sum_{j=2}^n \gamma_j Control_{it} + \omega_{it} \quad (3)$$

$$RCL_{it} = \lambda_0 + \lambda_1 Dig_{it} + \lambda_2 GAP_{it} + \sum_{j=2}^n \lambda_j Control_{it} + \eta_{it} \quad (4)$$

where GAP represents the urban-rural income gap,  $\omega_{ij}$  and  $\eta_{ij}$  respectively indicate the random disturbance term, and the remaining index interpretation is consistent with model 4-3. The stepwise regression method will gradually test the significance of the GAP coefficient of the core explained variable Big and the intermediary variable, and verify the intermediary effect.

Due to China's vast territory, there are great differences in economic development level and social resources among provinces and cities due to historical and natural factors. Therefore, the role of digital financial inclusion on residents' consumption level may also have some certain regional characteristics.

## 5. Empirical Test Results

### 5.1 Analysis of the Descriptive Statistical Results

Table 2 displays the results of the descriptive statistics for the variables.

Table2. Descriptive statistics

| Variable-Definition                   | Variable Symbol | Least Value | Crest Value | Average Value | Standard Deviation |
|---------------------------------------|-----------------|-------------|-------------|---------------|--------------------|
| Consumption level of residents        | RCL             | 5063.000    | 45605.000   | 16512.445     | 7150.938           |
| The Digital Financial inclusive index | DIG             | 16.220      | 431.928     | 216.235       | 97.030             |
| Per capita disposable income          | ADI             | 7510.000    | 72232.000   | 23190.694     | 11168.814          |
| Per capita GDP                        | PGDP            | 16024.000   | 164158.000  | 53223.890     | 26870.206          |

|                                                     |      |         |         |         |       |
|-----------------------------------------------------|------|---------|---------|---------|-------|
| Urbanization rate                                   | URB  | 0.227   | 0.896   | 0.580   | 0.131 |
| Consumer price index                                | CPI  | 100.600 | 106.300 | 102.512 | 1.171 |
| Development level of traditional finance            | TFD  | 0.188   | 3.827   | 1.267   | 0.457 |
| Social security level                               | SECU | 0.009   | 0.181   | 0.036   | 0.021 |
| Juvenile dependency ratio is * 100                  | AYDR | 9.880   | 38.380  | 23.174  | 6.458 |
| The elderly population dependency ratio<br>is * 100 | AEDR | 6.710   | 25.480  | 14.332  | 3.811 |

According to the data in the table, the standard deviation of residents' consumption level is 7150.938, indicating that there is a big difference in the consumption level of different regions of the country. The average number of digital financial inclusion index is 216.235, which means that digital financial inclusion has a great impact on all regions of the country, but the standard deviation is 97.030, indicating that there are great differences between digital financial inclusion and various regions of the country.

## 5.2 Basic Regression Analysis of the Impact of Digital Financial Inclusion on Residents' Consumption Level

Table 3. Baseline regression

| Variable           | (1)<br>Non con         | (2)<br>Con            |
|--------------------|------------------------|-----------------------|
| Dig                | 0.675 ***<br>(16.059)  | 0.040**<br>(2.169)    |
| ADI                |                        | 0.759 **<br>(21.181)  |
| PGDP               |                        | 0.055 *<br>(1.745)    |
| URB                |                        | 0.201 ***<br>(9.547)  |
| CPI                |                        | 0.004<br>(9.547)      |
| TFD                |                        | -0.005<br>(-0.484)    |
| SECU               |                        | 0.030 ***<br>(2.586)  |
| AYDR               |                        | 0.003<br>(0.227)      |
| AEDR               |                        | -0.027 ***            |
| (constant)         | 5754.316***<br>(7.839) | -4512.281<br>(-0.709) |
| Observed value     | 310                    | 310                   |
| adj.R <sup>2</sup> | 0.454                  | 0.982                 |

As the results in the above table show, digital financial inclusion does have a positive impact on household consumption. Table above (1) is the result of regression of the core explanatory variables against the explained variables before adding control variables. Through regression analysis, it was found that the coefficient of the core explanatory variables on the explained variables was 0.675, and showed a significance of 1%, indicating that the better the development of digital financial inclusion, the greater the promotion effect on residents' consumption, which is consistent with the theory. After adding the control variables, through the regression analysis of the explained variables, found that the core explanatory variables compared with the explained variables, but still significant at the level of 5%, and is still positive, this shows that the digital financial inclusion influence for residents' consumption level is still positive, consistent with H1 expected.

### 5.3 Regression Analysis of the Intermediary Effect of Urban-Rural Income Gap on Digital Financial Inclusion and Residents' Consumption Level

The stepwise regression method will gradually test the significance of the GAP coefficient of the core explained variable Big and the mediation variable, and verify the mediation effect. The results of the mediation effect regression obtained in this paper are shown in Table 4.

Table 4. Intermediate effect regression results

| Variable | (1)<br>RCL       | (2)<br>GAP        | (3)<br>RCL       |
|----------|------------------|-------------------|------------------|
| GAP      |                  |                   | 0.040*** (0.000) |
| Dig      | 0.040* (0.031)   | -0.306** (0.003)  | 0.053** (0.005)  |
| TFD      | -0.005 (0.629)   | 0.142 (0.021)     | -0.011 (0.312)   |
| SECU     | 0.030** (0.010)  | 0.207*** (0.001)  | 0.022 (0.062)    |
| AEDR     | -0.027** (0.009) | -0.069 (0.218)    | -0.024* (0.017)  |
| AYDR     | 0.003 (0.821)    | 0.142 (0.055)     | -0.0003 (0.839)  |
| ADI      | 0.759*** (0.000) | -0.153 (0.437)    | 0.766*** (0.000) |
| CPI      | 0.004 (0.711)    | -0.085 (0.131)    | 0.007 (0.472)    |
| URB      | 0.201*** (0.000) | -0.512*** (0.000) | 0.222*** (0.000) |
| PGDP     | 0.055 (0.080)    | 0.377* (0.029)    | 0.039 (0.202)    |
| N        | 310              | 310               | 310              |
| R2       | 0.982            | 0.471             | 0.983            |
| F        | 1851.926         | 29.664            | 1748.280         |

Note: \*\*\*, \*\*, \* are significant at the 1%, 5%, 10% levels, with p value in parentheses.

Column (1) is the regression of the controlling variable and the independent variable Dig on the dependent variable RCL, and column (3) is the mediation variable GAP added on the basis of column (1). Column (2) is the regression of the control variable on the mediating variable after the addition of the independent variable.

It can be found from the column (2) that the Dig obviously has an inhibitory effect on the GAP, and it is significant at the level of 1%. Thereby indicating that improve the digital financial inclusion can effectively decrease the urban-rural income gap. In other side, this also shows that the intermediary effect of urban and rural income gap is significant and there are some intermediary effects. As can be seen from column (3), the regression coefficient of the independent variables on the dependent variables is significantly positive, which indicates that there is a positive relationship between digital financial inclusion and the consumption level of residents, and digital financial inclusion indirectly affects residents' consumption through the intermediary mechanism of urban-rural income gap. In conclusion, the Hypothesis 3 proposed in this paper holds true.

Group regression of the data from 10 years from 2011 to 2020, and the regression results are shown in Table 5.

Table 5. Results of the regression of regional heterogeneity

| Variable       | East                   | Central section         | West                   |
|----------------|------------------------|-------------------------|------------------------|
| Dig            | 0.111***<br>(2.579)    | -0.218***<br>(2.912)    | 0.247***<br>(2.440)    |
| ADI            | 0.815***<br>(0.032)    | 1.544***<br>(-0.070)    | 0.588***<br>(0.058)    |
| PGDP           | -0.054<br>(0.013)      | -0.075<br>(0.014)       | -0.101*<br>(0.015)     |
| URB            | 0.231***<br>(2018.982) | -0.275***<br>(3402.835) | 0.340***<br>(1512.175) |
| CPI            | 0.012<br>(108.869)     | -0.004<br>(65.492)      | 0.042*<br>(73.749)     |
| TFD            | -0.046***<br>(258.585) | -0.131***<br>(236.190)  | -0.006<br>(230.214)    |
| SECU           | -0.003<br>(104.616)    | -0.061**<br>(21.408)    | 0.076***<br>(40.463)   |
| AEDR           | -0.033<br>(36.707)     | -0.353***<br>(21.408)   | -0.073***<br>(16.089)  |
| AYDR           | -0.084***<br>(32.448)  | 0.045<br>(34.966)       | 0.013<br>(20.482)      |
| N              | 80                     | 110                     | 120                    |
| R <sup>2</sup> | 0.989                  | 0.987                   | 0.971                  |

Note: \*\*\*, \*\*, \* are significant at 1%, 5%, 10% levels, with standard error in parentheses.

This paper is based on the division of the bureau of statistics, the 31 provinces are divided into three regions. From Table 5, the east, the digital financial inclusion consumption index (Dig) to the east and west residents' consumption level (RCL) have played a significant role in promoting. From among, the regression coefficient in the eastern region was 0.111, while the regression coefficient in the western region was 0.247, this shows that the improvement effect of the western region is better than the eastern region. The reason might be that the level of economic development in the eastern region is already at a higher level, the digital financial inclusion is widely accepted by the residents and its development is relatively mature, and consumption level has been raised to a certain level. However, the infrastructure and economic development in the west is at a relevant low level, the digital financial inclusion has not yet been widely used and the economy development still in an initial stage. In accord with research finding, the digital financial inclusion consumption index (Dig) of the central region has a negative impact on household consumption (RCL), and along with the continuous development of the regional economy and gradually reduced. Therefore, the impact of digital finance on the consumption level of residents is heterogeneous in the eastern, central and western regions, assuming empirical support for H4.

## 6. Robust Analysis

Testing the robustness of the empirical model is necessary to avoid the contingency of the study conclusions. This paper adopts replacing the core explanatory variables to test the model for its robustness.

In order to test the benchmark regression results is robust, through the core explanatory variable digital financial index with three secondary dimension index regression, respectively, digital financial inclusion use depth (Usage Depth), digital financial inclusion coverage breadth (Coverage Breadth)

and digital financial inclusion digital degree (Digitization Level) for benchmark regression results robustness test.

The following table shows the robust results of the replacement explanatory variables:

Table 6. Results of robustness results for explanatory variables

| Variable           | (1)<br>RCL               | (2)<br>RCL               | (3)<br>RCL               |
|--------------------|--------------------------|--------------------------|--------------------------|
| Usage Depth        | 3.291**<br>(2.562)       |                          |                          |
| Digitization Level |                          | 2.749***<br>(3.096)      |                          |
| Coverage Breadth   |                          |                          | 3.908***<br>(3.092)      |
| URB                | 14002.876***<br>(11.829) | 13780.147***<br>(11.689) | 13298.531***<br>(11.117) |
| TFD                | -181.626<br>(-1.078)     | -107.435<br>(-0.635)     | -167.053<br>(-0.996)     |
| SECU               | 11714.448***<br>(3.103)  | 10140.128***<br>(2.626)  | 10517.101***<br>(2.753)  |
| PGDP               | 0.003<br>(0.405)         | 0.005<br>(0.652)         | 0.004<br>(0.459)         |
| JOB                | 5020.248***<br>(3.740)   | 5338.189***<br>(3.988)   | 5663.943***<br>(4.196)   |
| GAP                | 858.971***<br>(4.411)    | 774.972***<br>(4.140)    | 797.654***<br>(4.243)    |
| CPI                | 7.357<br>(0.135)         | 84.046<br>(1.266)        | 34.155<br>(0.605)        |
| AYDR               | 15.924<br>(1.116)        | 17.765<br>(1.308)        | 10.175<br>(0.698)        |
| AEDR               | -42.938**<br>(-2.324)    | -38.559**<br>(-2.250)    | -45.888**<br>(-2.532)    |
| ADI                | 0.497***<br>(22.341)     | 0.501***<br>(23.395)     | 0.498***<br>(23.040)     |
| _cons              | -9724.108*<br>(-1.664)   | -1.790**<br>(-2.529)     | -1.220**<br>(-2.035)     |
| N                  | 310                      | 310                      | 310                      |
| r2_a               | 0.983                    | 0.983                    | 0.983                    |

Note: \*, \*\* and \*\*\* indicate significant levels of 1%, 5% and 10% respectively, with the robustness standard error in brackets

As can be seen from the above table, the coverage breadth and use depth of digital financial inclusion are at least at a significant level of 5%, which has a significant positive effect on promoting the consumption level of residents. In addition, the extension of the breadth of coverage increasing the mobile payment electronic account number, increasing, the gain of digital financial inclusion depth rising the increasing number of residents' financial transactions and amount through the Internet. In a word, the digital deepening and network coverage have provided convenience for residents 'consumption and promoted the residents' consumption level. Thus, the regression results show that digital financial inclusion plays a significant role in promoting the upgrading of residents' consumption level, which is consistent with the above conclusion, so it can prove that the results are robust.



## 7. Conclusion

Since recent years, digital inclusive finance has developed rapidly in China. This paper conducts an empirical study on the impact of the development of digital inclusive finance on the consumption level of residents. The results of the study show that the development of digital inclusive finance can significantly increase the consumption level of residents by narrowing the income gap, and the results of the robustness test indicate that the conclusions are robust and valid. In the part of heterogeneity test, it can be further concluded that digital inclusive finance can significantly improve the consumption level of residents in both the eastern and western regions, and the improvement effect on the western region is better than that on the eastern region.

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