

Internet penetration, Inclusive Financial Development and the Growth in Per Capita Income

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Abstract. The emergence of internet finance provides the inclusive finance with a broader connotation and more abundant development approaches. In this article, we use the panel data of the 31 provinces in Chinese mainland from 2010 to 2014 to calculate the inclusive finance development indexes in various regions, and apply the fixed effects regression model of panel data to empirically analyze the influence of internet and inclusive finance development on the per capita income level. Researches show that the development of internet and inclusive finance can improve the per capita income level effectively. In the control variables, local per capita public finance expenditure and per capita fixed investments are also positively related to the per capita income level. China shall continue to play the positive role of internet technology and closely be integrated with the inclusive finance so as to jointly improve the per capita income level in urban and rural areas.

Literature Review

The concept of inclusive finance

The United Nations called on all countries to establish the Inclusive Financial Sectors for the first time in the International Year of Microcredit 2005 in order to realize the Millennium Development Goals. According to the definition on www.gov.cn, inclusive finance means to provide all sectors and groups of society who have financial service needs with appropriate and effective financial services with affordable costs and determine farmers, small and micro enterprises, urban low-income groups, the disabled, the aged and other special groups as the service objects of inclusive finance based on the equality of opportunity and sustainable business principle through increasing policy guidance and support, strengthening financial system construction and improving financial infrastructure. Inclusive finance emphasizes the availability of financial services rather than that requiring all eligible people to use financial services. Availability refers to that people can use these financial services if they need (Kodan and Chhikara, 2013).

Financial exclusion and inclusive finance are the two aspects of an issue: the former refers to the phenomenon that the social vulnerable groups (such as the people who are unemployed, poor or have low education degree) are unable to obtain financial services from formal financial institutions, but the purpose of the latter is to eliminate the former.

Du Xiaoshan (2006) was the first people to introduce the idea to China, who looked upon the micro-credit by the perspective of inclusive financial sectors, and put forward the content and requirements of the framework of the inclusive financial sectors.

The emergence of internet finance provides a broader scope for the inclusive finance. Yang Guang (2015) divided the inclusive finance into narrow and generalized inclusive finance. The narrow inclusive finance refers to provide the available financial services for vast low and medium income classes and small and micro enterprises, or even poor people, except the traditional or formal financial institutions. The generalized inclusive finance means that every people or organization has a fair opportunity to obtain enough financial products and effective financial service channels. In this article, we mainly research the influence of inclusive finance on per capita income and the income gap between urban and rural residents from a generalized perspective.

The measure of inclusive finance

In order to establish and perfect the inclusive financial theory system, we must determine the measure of inclusive financial development indexes firstly. Only the establishment of a long-term observation system of inclusive financial indexes can make us quantitatively analyze the inclusive finance and related influencing factors. Sarma (2008) measured the inclusive financial development level from three dimensionalities: penetration, availability and usage of financing institutions referring to the construction method of UN's Human Development Index (HDI), who used the number of bank accounts owned by every 1000 adults as the penetration, the number of financing institutions and automatic teller machines (ATM) owned by every 100000 persons as the availability and the proportion of total loans and deposits accounting for GDP as the usage. However, Arora (2010) considered more indexes, who divided the financing institution service into three dimensionalities: scope, convenience and cost, in which, she measured the service scope with the number of the financing institutions and ATM in every 1000km² (geographic cover degree) and the number of the financing institutions and ATM owned by every 100000 persons (population cover degree), measured the convenience with the institution location for applying for a deposit account and loan, the minimum deposit and balance lower limit of a deposit account, the balance lower limit of a check account, the respective file number required for applying for a deposit account and a check account, loan lower limit of a consumer and the day number required for applying and the day number required for applying for the lower limit of mortgage loan, and calculated the financial service cost with the rate of the loan and mortgage loan of a consumer, the annual fee of deposit account and check account and the rate of every USD100 taken from ATM.

The influence of financial development on residents' incomes

Some domestic scholars researched the relation between the financial development and the income distribution and pointed out that the financial development in China has widened the income gap between urban and rural areas. Sun Yongqiang et al (2011) made an empirical analysis of the long-term and stable relation between the financial development and opening to the outside world and the income gap between urban and rural residents in China and the influence of short-term fluctuation based on the panel data of 31 provinces in China from 1978 to 2008 through the establishment of panel co-integration and error correction model, and the result showed that, for the whole country, both long-term financial development and opening to the outside world have significantly expanded the income gap between urban and rural residents.

However, in the index selection, Sun Yongqiang et al (2011) adopted the proportion of the balance of loans and deposits in the financing institutions of all regions accounting for GDP to measure the financial development, Zhong Hongyan et al (2013) adopted the total amount of the deposit value of Chinese farmers and agricultural loan value to measure the Chinese rural finance development level, and Li Zhijun and Xi Junyang (2012) adopted the Chinese financial development indexes, and all above people didn't introduce the idea and measure index of inclusive finance, so they were unable to fully explain the influence of the inclusive finance development on the income of urban and rural residents and the urban-rural income gap.

Internet and inclusive finance development

In June, 2013, Alipay, the on-line payment system of Alibaba, launched Yu Ebao. Zhou Xiaoming, the vice-general manager of Tianhong Asset Management pointed out that, as an open-ended fund which could be purchased with a starting price of RMB1, its account users has been more than 295 million in short three years, which was a most successful practical case in internet finance at present. The very success of Yu Ebao has triggered the domestic internet finance boom since 2013.

In this article, we draft an inclusive finance index system to calculate the inclusive finance indexes in Chinese 31 provinces (including autonomous regions and municipalities directly under the Central Government, and hereinafter referred to as 31 provinces), and to further make an empirical analysis of the influence of inclusive finance and internet development on per capita income level.

Analysis of the Establishment and Measure Results of Inclusive Finance Index System

Establish the inclusive finance index system

Based on the researches of Sarma, Arora and Gupte mentioned above and Wang Jing, Hu Guohui, Tian Jie, Tao Jianping and other domestic and overseas scholars, considering the availability of Chinese financial data and focusing on the influence of inclusive finance and internet on the urban and rural income level, we select 10 indexes from three dimensionalities to establish the measure index system of inclusive finance in this article, as shown in Table 1.

Table 1. Development index system of inclusive finance

Measure dimensionality	Descriptive index	Definite index (d _i)
Financial service scope	Service penetration from geographical dimensionality	(d1) The number of banking financial institutions every 1km ²
		(d2) The number of employees of banking financial institutions every 1km ²
	Service availability from population dimensionality	(d3) The number of banking financial institutions every 10000 persons
		(d4) The number of employees of banking financial institutions every 10000 persons
Financial service usage	Deposit service usage	(d5) The proportion of per capita financing institutions accounting for per capita GDP
	Loan service usage	(d6) The proportion of per capita loans of financing institutions accounting for per capita GDP
	Insurance	(d7) Insurance density
		(d8) Insurance penetration
Financial service quality	For the financing difficulty of agriculture, rural areas and farmers and small and medium-sized enterprises	(d9) The proportion of loan balance of small loan companies accounting for all loan balance
		(d10) The proportion of agriculture-related loan balance accounting for all loan balance

Computing method for the inclusive finance development index

In this article, we follow Sarma's computing method (2008) of HDI prepared by United Nations Development Program for establishing inclusive finance development indexes.

In this article, there are 10 indexes for measuring inclusive finance, d_i refers to the ith index, and the development state of inclusive finance is the point of in 10 Cartesian space: D=(d₁, d₂, d₃, , d₁₀). The point in this space O=(0, 0, 0, , 0) is the possible worst situation, namely, complete financial exclusion, and the point W=(w₁, w₂, w₃, , w₁₀) means all levels in inclusive finance development reach the highest level. During the computational process, we need to make a normalization processing of the indexes with different dimensions to make all index data become the dimensionless scalars.

Measure results of the inclusive finance development indexes in the 31 provinces of Chinese mainland from 2010 to 2014

In this article, we have the gathered related data of the 10 indexes in the 31 provinces of Chinese mainland from 2010 to 2014 obtained from Wind data (Wind Information), *Financial Operation Report in China Region* published by People's Bank of China, *Almanac of China's Finance and Banking* and National Bureau of Statistics of the People's Republic of China. There are 155 observed values for every index. The weight and descriptive statistics of every index are as shown in table 2.

Table 2. Descriptive statistics of development index variables of inclusive finance

Index	Observed value (Obs)	Mean value (Mean)	Standard deviation (Std. Dev.)	Minimum value (Min)	Maximum value (Max)	Variable coefficient (Vi)	Weight (Wi)
d1	155	0.0704	0.1076	0.0005	0.6447	1.5288	0.213
d2	155	1.5317	3.3485	0.005	21.9445	2.1861	0.3046
d3	155	1.5948	0.2704	1.1042	2.2329	0.1695	0.0236
d4	155	26.8011	8.9427	13.7471	57.3472	0.3337	0.0465
d5	155	1.6638	0.6967	0.8401	4.5668	0.4187	0.0583
d6	155	1.1225	0.3446	0.5941	2.1311	0.307	0.0428
d7	155	1237.159	984.4454	12.1	6310	0.7957	0.1109
d8	155	2.7957	0.8419	10	7	0.3011	0.042
d9	155	0.0092	0.0069	0.0004	0.0371	0.7494	0.1044
d10	155	0.2919	0.1131	0.0274	0.4631	0.3875	0.054

Standardize the original data of these indexes and calculate the development indexes and ranking of inclusive finance in all provinces, as shown in table 3.

Table 3. The development indexes and ranking of inclusive finance of the 31 provinces in Chinese mainland

Province	2010		2014		Province	2010		2014	
	Index	Ranking	Index	Ranking		Index	Ranking	Index	Ranking
Shanghai	0.6193	1	0.7158	1	Hubei	0.0548	17	0.0810	15
Beijing	0.2979	2	0.3548	2	Shaanxi	0.0546	18	0.0749	20
Tianjin	0.2305	3	0.2791	3	Ningxia	0.0676	19	0.0746	17
Zhejiang	0.1479	4	0.1833	4	Hainan	0.0549	20	0.0744	18
Jiangsu	0.1376	5	0.1724	5	Guangxi	0.0365	21	0.0704	16
Guangdong	0.1087	6	0.1393	6	Jilin	0.0525	22	0.0650	22
Shandong	0.0838	7	0.1220	9	Hunan	0.0497	23	0.0630	23
Chongqing	0.0763	8	0.1162	7	Inner Mongolia	0.0579	24	0.0628	26
Liaoning	0.0875	9	0.1123	13	Xinjiang	0.0369	25	0.0601	27
Fujian	0.0688	10	0.0992	11	Heilongjiang	0.0426	26	0.0600	29
Henan	0.0770	11	0.0988	12	Guizhou	0.0418	27	0.0574	28
Anhui	0.0764	12	0.0979	14	Gansu	0.0371	28	0.0572	25
Hebei	0.0785	13	0.0948	8	Yunnan	0.0402	29	0.0552	21
Shanxi	0.0763	14	0.0919	10	Qinghai	0.0269	30	0.0525	30
Sichuan	0.0568	15	0.0870	19	Xizang	0.0206	31	0.0331	31
Jiangxi	0.0540	16	0.0834	24					

When the numerical value of inclusive finance development index is closer to 1, it means the development level is higher in measure time and region; when the numerical value is closer to 0, it means the development level is lower in measure time and region. As shown in table 3, the inclusive finance development indexes in all regions from 2010 to 2014 have gone up, which means the inclusive finance development level in all regions has been improved continuously, and the ranking of the inclusive finance development level in all provinces in 2010 is similar to that in 2014, in which, the rankings of the four municipalities directly under the Central Government and east provinces keep at the top.

Variable Definition, Index Selection, Data Sources and Processing

Variable definition and index selection

Explained variable

The explained variable is the local per capita GDP (PGDP), referring to the practice of most scholars to use local per GDP to represent it.

Explanatory variable

Firstly, the inclusive finance development index (IFI) is the main explanatory variable, and in this article, we mainly research the influence of inclusive finance development level on per capita income level, and the expected coefficient symbol is positive. Secondly, it is internet penetration (N_rate), which is used to research the influence of internet on income level, and the expected coefficient symbol is positive.

Control variable

Local per capita public finance expenditure (PFin), urbanization level (UR), and per capita fixed investments (Invst) influence the income level observably, and all the expected coefficient symbols of above three are positive.

Data sources and processing

In view of the availability and timeliness of the data, the sample period of the researches in this article is from 2010 to 2014. The inclusive finance indexes are calculated in the first part of this article. The other data are obtained from the finance terminal of Wind Information and the website of National Bureau of Statistics.

Panel Data Model Test and Regression Analysis

Unit root test and co-integration test

Firstly, we take the unit root test of panel data of the explained variable, explanatory variable and control variable, and except the sequence of urbanization level (UR) is the stable original sequence (it is possibly because time span selected is small, the urbanization level changes in most regions are not obvious), the other sequences are integrated of order, that is I (1). After that, we take the co-integration test of all variables and observe that whether there are long and stable proportional relations among these variables. The test results show that there are co-integration relationships among these sequences under 1% of significance level, so we can conduct co-integration regression for original sequences directly on this basis.

Panel co-integration regression

The panel model is set as follows:

Because the number of cross sections is more than that of timing sequences, we adopt the way of cross-section weights. Take a Hausman test for the model and select the fixed effect model. See the regression results in table 4.

Table 4. The generalized least square estimation results of panel (cross-section weights)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.094358	0.024339	-3.876858	0.0002
IFI	1.399993	0.250153	5.596555	0.0000
N_RATE	0.377743	0.069333	5.448251	0.0000
PFIN	0.254832	0.057594	4.424623	0.0000
INVST	0.182654	0.023432	7.795213	0.0000
Effects Specification:	Cross-section fixed (dummy variables)			
	Weighted Statistics			
R-squared	0.992599	F-statistic		473.3229
Adjusted R-squared	0.990501	Prob(F-statistic)		0.000000

Seen from the t statistic and adjoint probability of all explanatory variables and control variables,

all are significant above the 1% of significance level. R^2 , the coefficient of determination of the regression equation and that after adjustment are very high, which shows the goodness of fit of the equation is very high. Reviewing the parameters of explanatory variables, all coefficients of IFI, N_rate, PFin and Invst are positive, which is consistent with expectations, namely, the inclusive finance development and internet penetration are positively correlated with local income level in a region.

Conclusion and Policy Suggestion

The data statistical results in the 31 provinces (including autonomous regions and municipalities directly under the Central Government) of China from 2010 to 2014 show that the inclusive finance development level in all regions in these five years is improved stably. Meanwhile, it is observed that the inclusive finance development level is positively correlated with local economic development level. The development of inclusive finance to let all sectors and groups of society including farmers, urban low-income groups and small and micro enterprises have a fair opportunity to get appropriate and effective financial services must be based on economy development.

The modeling analysis of inclusive finance development level and the per capita income level have verified the improvement of inclusive finance development and intent level will promote the per capita income level obviously. China shall continue to play the role of internet technology and be closely integrated with inclusive finance to promote the growth of total per capita income level in urban and rural areas. In the control variables, local per capita public finance expenditure and per capita fixed investments are also positively related to the per capita income level. We shall strengthen public financial support and investment support force for urban and rural economic development to promote the per capita income level and sustainable development in all regions.

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References

- [1] Arora, R. (2010). Measuring Financial Access, Griffith University, Discussion Paper Economics 7, ISSN1837-7750.
- [2] Kempson, E, Whyley, C. (1999). Kept out or opted out? Understanding and combating financial exclusion, (pp.86), Bristol: Policy Press.
- [3] Kodan, Anand S. & Chhikara, Kuldip S. (2013). A Theoretical and Quantitative Analysis of Financial Inclusion and Economic Growth. *Management and Labour Studies*, 38(1), pp.103-133.
- [4] Leyshon, A., & Thrift, N. (1995). Geographies of financial inclusion—Financial abandonment in Britain and the United States, *Transactions of the Institute of British Geographers*, 20(3), pp.312–341.
- [5] Sarma, M. (2008). Index of financial inclusion. Working paper 215, Indian Council for Research on International Economic Relations.
- [6] Gupte, R., Venkataramani B., & Gupta. D. (2012). Computation of Financial Inclusion Index for India, *Social and Behavioral Sciences*, (37).
- [7] Du Xiaoshan, Micro-credit Development and Inclusive Finance Sectors Framework, *Chinese Rural Economy*, (8), pp.70-73.
- [8] Jiao Jinpu, the Importance of Establishing Inclusive Finance Sectors, *China Finance*, 2010, (10),

pp.12.

- [9] Jiao Jinpu, Huang Tingting, Wang Tian Du, Zhang Shaohua and Wang Zhen, the Development Course and Empirical Research of Chinese Inclusive Finance, *Shanghai Finance*, 2015, (4), pp.12-22.
- [10] Li Zhijun, Xi Junyang, Analysis of Inverted U Relation between Chinese Financial Development and Income Gap, *Shanghai Journal of Economics*, 2012(9), pp.12-18.
- [11] Lin Hongshan, Discussion on the Assistance of Internet Finance in Inclusive Finance Development, *Shanghai Finance*, 2014, (12), pp.38-40.
- [12] Sun Yongqiang, Wan Yulin, Empirical Analysis of Financial Development, Opening to the Outside World and Income Gap between Urban and Rural Residents --- Based on the Panel Data of Provinces from 1978 to 2008, *Journal of Financial Research*, 2011, (1), pp.28-39.
- [13] Tian Jie, Tao Jianping, the Influence of Rural Inclusive Finance Development on the Income of Chinese Rural Households --- from the Empirical Analysis of Panel Data in 1877 Counties (Cities), *Collected Essays on Finance and Economics*, 2012, (2), pp.57-63.
- [14] Wang Jing, Hu Guohui, Development Evaluation and Influence Factors Analysis of Chinese Inclusive Finance, *Finance Forum*, 2013, (6), pp.31-36.
- [15] Xing Yan, Effectiveness and Realization of Inclusive Finance: Summary and Enlightenment, *Studies of International Finance*, 2015, (11), pp.24-36.
- [16] Yang Guang, Research on Inclusive Finance Development in the Background of Internet Finance, *Credit Investigation*, 2015, (2), pp.21-24.
- [17] Zhang Hongyan, he Qing, Yu Qian, Empirical Research on the Influence of Chinese Rural Financial Development on Urban-rural Income Gap, *Journal of Zhongnan University of Economics and Law*, 2013, (1), pp.83-88.