

Analysis of the Relationship between Financial Technology Development and Income Distribution

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Abstract: *China's economy has achieved rapid development, and its per capita income has officially entered the ranks of upper-middle-income countries. However, it should be noted that while my country's economy is growing rapidly, the people do not enjoy the fruits of development equally, and the gap between the rich and the poor in my country still remains. In a higher position. Whether the gap between the rich and the poor can be maintained within a reasonable range is related to whether we can adhere to the concept of shared development and lead the people to gradually achieve common prosperity. At present, the development of financial technology is booming and changing with each passing day. Relying on artificial intelligence, blockchain, cloud computing and big data technology has greatly improved the benefits of financial services, that is, reducing costs and improving efficiency. The development of financial technology does take into account the marginal long-tail distribution. So, can the development of financial technology improve my country's income inequality and narrow the gap between the rich and the poor? This paper selects China's panel data from 2008 to 2020, and empirically tests the linear relationship between fintech and income inequality within the sample interval. With the development of fintech, income inequality will worsen. This conclusion is consistent with the current development of fintech in my country. It is basically consistent with the reality of income disparity, and is closely related to the fact that my country's fintech is in its infancy and that with the vigorous development of the financial industry, financial assets have exacerbated income inequality.*

Keywords: *Fintech Development; Income Inequality; Robustness Analysis; Multiple Regression Model*

1. Introduction

Inequality has always been a problem for mankind, and everyone from Rousseau to Marx to Piketty has paid great attention to this problem. At the beginning of the last century, Italian economist Pareto proposed for the first time that 80% of human wealth was occupied by 20% of the people. 100 years later, the gap between the rich and the poor once again set a new record. Half of the world's wealth belongs to 26 people, and 1% of the wealthy families in the United States own 33.8% of the net wealth of the society. The "2015 Wealth Report" released by Credit Suisse Research Institute shows that China's middle class is 109 million people in absolute terms. , which is the largest in the world, but only accounts for 11% of the national adult population, which is lower than the global average of 15.9%. At present, 90% of China's population still lives below the level of the middle class. Our country's social structure is more like a pyramid than a well-balanced olive. Although an appropriate gap between the rich and the poor can arouse the enthusiasm of the people and improve the efficiency of resource allocation, an excessively large gap between the rich and the poor can easily lead to the spread of social dissatisfaction, intensify class conflicts and further inhibit the improvement of economic efficiency. In the "Proposal of the Central Committee of the Communist Party of China on Formulating the Fourteenth Five-Year Plan for National Economic and Social Development and the Long-term Goals for 2035", it is clearly stated that by 2035, the middle-income group will be significantly expanded, the development gap between urban and rural areas and the living standards of residents will be realized. The gap has narrowed significantly, people's well-being has reached a new level, and the distribution structure has been significantly improved.

From the perspective of financial function theory, finance has the function of gathering and allocating resources. At the Fifth Plenary Session of the 18th Central Committee, it was emphasized to improve the efficiency of financial services, the role of financial technology to improve the development efficiency of the financial industry, and the conditions for financial technology to have natural advantages. The development of financial technology can help improve the coverage and

availability of financial services. In the current environment of high-quality economic development and common prosperity, the country has formulated an important development strategy - the financial inclusion strategy. Fintech has improved the efficiency of our financial services and the financial industry, reduced costs, and expanded the breadth of the entire financial service. and depth, which can allow more people, especially the poor, to obtain financial services at a lower cost and more conveniently, and share more tangible reform results, but finance has the "departure from the real to the virtual and self-circulation" Even if the real economy is in recession, finance can still generate asset premiums through self-circulation. Therefore, the role of finance in income distribution deserves further study.

2. Literature review

Throughout the research on the impact of financial development on income inequality, there are currently three main theories. The first type of financial development can improve income inequality. Cui Shunwei and Li Yanan (2021) analyzed the impact on the credit market. The marketization of interest rates, the lowering of thresholds and the trickle-down model of capital are all conducive to increasing the income of low-income earners. Development to increase farmers' income ^[1]. Zhang Chenglei, Guo Zhongjin, and Li Wenxiu (2021) empirically study the impact of the development of digital financial inclusion on income inequality from the mechanism of entrepreneurial effect. The mediating effect analysis shows that the entrepreneurial effect of digital financial inclusion has a heterogeneous impact on income inequality: digital financial inclusion improves income inequality by promoting survival entrepreneurship, while digital financial inclusion promotes opportunistic entrepreneurship. To a certain extent, income inequality has been enlarged ^[2]. Based on the provincial panel data from 2011 to 2017, Li Muchen et al. (2020) focused on the impact of digital financial inclusion on the income gap between urban and rural areas in China, and the convergence of different businesses of digital financial inclusion from the perspective of financial exclusion theory and financial function. There are also large differences in the effects, and the digital inclusive finance business, which is a basic function and a dominant function, has the effect of narrowing the urban-rural income gap ^[3]. Liu Jinquan (2019) studied the impact of financial inclusion on income distribution from the perspective of economic growth and poverty alleviation. The study showed that financial inclusion can indirectly reduce the urban-rural income gap through the two transmission mechanisms of economic growth and poverty alleviation. Question ^[4].

The second type of financial development exacerbates income inequality. Yu Lingzheng and Wei Xiaohai (2012) used provincial panel data from 1996 to 2009 and Hansen's threshold model to study the direct and indirect effects of income inequality. To be improved, financial development will exacerbate income inequality, and financial development across certain threshold provinces has a greater impact on income inequality ^[5]. Li Muchen, Feng Sixian, and Xie Xing (2020) are studying the impact of digital inclusive finance on the urban-rural income gap. The research shows that the degree of digitization will widen the income gap, and businesses that belong to the derivative functions of digital inclusive finance will widen the urban-rural income gap.

The third type of financial development's impact on income inequality is an "inverted-U" relationship. Greenwood and Jovanovic (1990) started from the direct impact mechanism of financial development on income inequality, and considered that the cost of providing financial intermediary services for individuals has different effects on different income groups. Bear the service cost of financial intermediaries, so this part of the group cannot get the opportunity to obtain benefits through the services of financial intermediaries, but high-income earners will not be unable to obtain benefits due to financial intermediary service fees, so this group of people will benefit from it, so that income the gap will become larger. However, with the maturity and improvement of economic and financial development, the threshold for participation in the financial market and the reduction of costs, the group of financial intermediary services will also become larger and larger. At this time, those low-income groups will participate in financial services. In this way, the income gap is gradually narrowed ^[6]. On the basis of this model, Wang Junhe and Huang Xiaoyong (2019) conducted an empirical analysis based on panel data of 28 provinces in my country using a smooth transition regression model, and concluded that the development of the banking sector and the stock market has a nonlinear impact on income distribution, which also Supporting the impact of financial development on income inequality is an inverted U-shaped relationship ^[7].

Through the analysis of relevant literature, it can be seen that the current research on the relationship between financial development and income inequality is mainly from the perspective of

traditional financial development. For example, it is explained from the mechanism of financial development's influence on income inequality, based on credit market, financial intermediation, labor market and corporate behavior. There is also an explanation of income distribution from the degree of financial market development. Few consider the impact of financial technology and the comprehensive development level of Internet financial development on income inequality. Based on the above analysis, this paper mainly considers the impact of the development of Internet finance on income inequality, and is not limited to a specific Internet finance format, and explores the impact of Internet finance on income inequality, which will be narrowed due to the consideration of financial technology factors. The previous income gap will still exacerbate the gap between the rich and the poor.

3. Empirical Analysis

3.1 Model construction

Refer to the theoretical ideas in Zhang Yu and Wang Wenqian (2021) using cross-country panel data to study the impact of financial technology on income inequality^[8]. Fintech mainly affects income distribution by expanding marginal effects and intensive marginal effects. Relying on artificial intelligence, blockchain, cloud computing, big data and other technologies to promote the transformation of the traditional financial service industry, it can reduce the operating costs of financial institutions and improve efficiency. , lowering the threshold of financial services, so expanding the marginal effect can improve the availability and coverage of financial services and narrow the income gap, but due to the development of Internet technology, it has brought a series of problems of the digital divide, which makes it difficult for some people to share The dividends brought by the development of financial technology enable those groups with higher income, high education level, and strong ability to obtain information to enjoy the dividends brought by the development of financial technology in the early stage, which is the intensive marginal effect^[9]. When the intensive marginal effect of fintech development is greater than the expansion marginal effect, income inequality will be exacerbated, otherwise, it will narrow the income gap and promote a more fair, reasonable and equal income. Use these two transmission channels to study the "inverted U-shaped" relationship between fintech development and income inequality, select key indicators that reflect the level of fintech development and indicators that measure income equality to build models, and establish linear regression and polynomial regression respectively. model to analyze the relationship between fintech and income inequality using sample data during the sample period.

3.2 Indicator determination and data collection

3.2.1 Explained variable

Regarding the measurement of income inequality, this paper uses the Gini coefficient to measure it. The Gini coefficient generally ranges from 0 to 1, and the more it tends to 0, the more equal the income distribution is. The larger the value, the higher the degree of inequality. Internationally, the Gini coefficient is usually used to describe the difference in the income distribution of residents, and 0.4 is regarded as a warning line for the gap between the rich and the poor. When it is 0.2-0.3, the income is relatively average; When it is 0.5, the income gap is too large; when it exceeds 0.5, it indicates that the income distribution is seriously uneven.

This paper collects the Gini coefficient data from the National Bureau of Statistics, the Statistical Yearbook, and the official website of wind. The collected years are the data of the past 20 years. Since some years are missing, this paper uses the interpolation method to fill in the missing data.

3.2.2 Explanatory variables

The explanatory variables include core explanatory variables and control variables. The core explanatory variables in this paper are mainly considered from the perspective of the development of Internet finance. At the same time, it also draws on Wu Xiaoqi's evolution of the financial function view when he studies the development model of Internet finance. The sign of the financial informatization stage is the rise of "data application" and "online banking". Banks complete the centralized processing of business, use Internet technology and environment to innovate financial products, and develop online financial services. The first batch of third-party payment companies emerged around 2004. In 2012, the People's Bank of China issued payment licenses to 27 third-party payment companies, and private third-party payment companies such as Alipay, Tenpay and Kuaiqian

were licensed. It officially marks the beginning of the combination of Internet and finance. From 2004 to 2012, it was the "market start period" of financial technology development. The penetration of technology into the financial industry expanded from online Internet finance to offline retail payment. The utilization rate of online banking and the scale of third-party payment are representative of China's Internet development and technology-driven financial innovation, and can better measure the development of financial technology. Therefore, the core explanatory variables are selected from 2008 to 2020, the scale of third-party payment and the utilization rate of Internet banking users in my country, to measure the development of financial technology.

In order to improve the accuracy of the estimation results, other variables affecting income inequality were added as control variables. Including GDP growth rate, Internet penetration rate, education level, foreign trade level, inflation rate. Gross domestic product will directly affect the distribution of income. With the expansion of GDP, the "cake" will get bigger, and whether the "cake" should be distributed properly will affect the income gap of residents. Internet penetration rate. With the popularity of the Internet, more people can participate in the financial innovation of Internet finance development. Whether it is through online financial management or online lending services, it will affect the income problem to a certain extent. Education is a form of investment in human capital. There is a close relationship between human capital and income. The number of high school population aged 6 and above is selected as an indicator to measure my country's education level. According to the HO theory, international trade will also affect income distribution. The development of international trade is conducive to increasing the income of laborers in developing countries. my country is a developing country, and most of its exports are labor-intensive products. my country's trade surplus will increase labor costs. To narrow the income gap, my country's total import and export volume is used to measure the level of international trade. Inflation rate Inflation rate is measured using the consumer price index. The above data comes from the official website of the International Bureau of Statistics and the official website of the wind database.

3.2.3 Descriptive statistics of the data

Based on the data of the explanatory variables and the explained variables collected above, analyze the characteristics of the minimum value, maximum value, and average value of the data, and obtain the following table.

Table 1: Data Descriptive Statistical Analysis Table

Variable	Obs	Mean	Std. Dev.	Min	Max
Gini	13	0.28	0.034	0.23	0.33
Thirdpartypayment	13	86.278	106.064	0.02	297.7
Usagerate Intbank	13	41.058	11.173	19.3	51.7
Gdp	13	7.546	2.116	2.3	10.6
Int P	13	47.208	13.919	22.6	70.4
Edu	13	409943.85	856730.79	150648	3260972
Trade	13	249572.9	50749.153	150648.06	321556.94
Def	13	102.585	1.674	99.3	105.9

3.3 Benchmark regression results

This part mainly analyzes the impact of financial technology on income inequality, takes third-party payment as the core explanatory variable to measure the development of financial technology, and the Gini coefficient as the explained variable, and controls GDP, Internet penetration rate, education level, foreign trade level, Inflation rate and other factors, the benchmark regression results obtained are as follows.

Benchmark regression model:

$$GINI = 0.28 + 0.0013thirdparty + 0.003gdp + 0.002int p + 0.0005edu + 0.0007trade - 0.001def$$

Consider polynomial regression:

$$GINI = 0.28 + 0.0013thirdparty + 0.0013thirdparty^2 + 0.003gdp + 0.002int p + 0.0005edu + 0.0007trade - 0.001def$$

Table 2: Benchmark regression results table

Variable Name	Third-Party Payment Scale		Square Term of Third-Party Payment Scale	
	(1)	(2)	(3)	(4)
Thirdpartypayment	.0002946*** (.0000375)	.0001267* (.0000596)	9.51e-07 *** (2.07e-07)	1.68e-07 (2.37e-07)
Gdp		.003 (.0026716)		.0027082 (.0037311)
Int P		.002 (.0011165)		.0029572 (.0012696)
Edu		0.00054 (0.000031)		1.44e-09 (3.98e-09)
Trade		0.0007 (0.000021)		-1.50e-07 (2.72e-07)
Def		-.001 (.002)		-.0001653 (.0028776)
Constant	.255*** (.005)	.28 (0.299)		.1708918 (.2881005)
R2	0.849	0.972	0.6580	0.9551

*Note: Standard errors are in brackets, ***, **, and * represent the significant levels of 1%, 5%, and 10%, respectively.*

We verify the existence of the "Kuznets inverted U" by establishing a benchmark regression and considering the polynomial regression, that is, the square term of the third party's payment scale. From the regression results, the impact of financial technology development on the income gap is significant. The "inverted U" effect is not significant, and the Kuznets effect does not exist. Specifically, it can be seen from the above table that the current relationship between fintech and income inequality is mainly positive, that is, the faster the development of fintech, the increase in the Gini coefficient and the worsening of income inequality. There may be two reasons for further discussion. One is that China's fintech is still in the initial stage of development. In this stage, although the development of fintech has improved the availability of financial services, the participation of ordinary people is still low, so the development of fintech at this stage is beneficial to high-income earners, thus increasing the income gap. Finance has the characteristics of "departing from real to virtual and self-circulating". Even if the real economy is in recession, finance can still generate asset premiums through self-circulation. Second, the gap between the rich and the poor is a long-term phenomenon, and reversing inequality is a long-term plan. We cannot expect the development of financial technology to disappear soon. The rich and poor development in China will soon disappear. The range selected in this paper is small and the sample size is small, involving my country in a stage of economic and financial development, the relationship between financial technology development and income inequality is in the left-hand range of the inverted U shape. Especially in the 14th Five-Year Plan, "common prosperity" has also been included in the national strategic level, and the demand for common prosperity by all the people is gradually strong. The study found that the development of financial technology will exacerbate income inequality, so other channels should be used to control the development of inequality.

3.4 Robustness test

In order to test whether the above analysis results are reasonable, this part replaces the scale of third-party payment with the utilization rate of Internet banking netizens, conducts relevant analysis, and obtains the following table.

In this part, the use rate of Internet users of Internet banking is used to replace the scale of third-party payment, and the results are found to be the same as those of the benchmark regression, and the square term of Internet users' use rate of Internet banking is also considered, and the effect of fintech on income inequality. "Library Whether the Znets inverted U" effect exists, specific analysis shows that the linear relationship between financial technology and income inequality is more

significant, and the relationship is positive, that is, the faster the development of financial technology, the more serious income inequality. It can be further explained that the Kuznets curve describes the relationship between economic development and income inequality. In the early stage of economic development, income distribution tends to deteriorate first, but then gradually improves with economic development.

Table 3: Robustness Analysis Results

Variable Name	Internet Banking Netizens Utilization Rate		The Square Term Of The Usage Rate Of Internet Users	
	(1)	(2)	(3)	(4)
Usagerate_Intbank	.0028387*** (.0003239)	.0005144** (.0011333)	.0000388*** (3.44e-06)	.0000183 (.0000125)
Gdp		.0006186 (.003818)		-.0001598 (.0031336)
Int P		.0028808 (.001519)		.0020587 (.0013528)
Edu		-7.87e-10 (4.22e-09)		-2.31e-09 (3.61e-09)
Trade		-2.28e-07 (2.68e-07)		-2.06e-07 (2.31e-07)
Def		.0010676 (.0028606)		.0012709 (.0024026)
Constant	.1634482*** (.0137448)	.0658642 (.2859036)	.2101904*** (.0067958)	.0731272 (.2421327)
R2	0.8747	0.9059	0.9128	0.9281

Note: Standard errors are in brackets, ***, **, and * represent the significant levels of 1%, 5%, and 10%, respectively.

$$GINI = 0.066 + 0.0005usagerate + 0.006gdp + 0.003int\ p - 7.87 \times 10^{-10} edu - 2.28 \times 10^{-7} trade + 0.001def$$

Consider a polynomial regression model whose regression function is as follows:

$$GINI = 0.073 + 0.00002usagerate + 0.00002usagerate^2 - 0.0002gdp + 0.002int\ p - 2.31 \times 10^{-9} edu - 2.08 \times 10^{-7} trade + 0.001def$$

The income gap is explained by the Lewis inflection point, which is the point on the Kuznets curve where the gap is the largest. At the beginning, labor wages are given and cannot be increased. The income growth brought about by technological progress and efficiency improvement has become an increase in capital and scarce factors, resulting in an increasing income gap; after the Lewis turning point, when the income of workers is equal to their marginal productivity, the increase in labor productivity can become the income of workers, and the income gap will gradually narrow. This is the case in developed countries. In the 14th Five-Year Plan, my country has included "common prosperity" in the national strategic level, and all the people's demand for common prosperity has gradually increased. In the early stage of financial technology development, the development of financial technology will exacerbate income inequality, so it should be appropriate to control the development of inequality through other channels. For China, if capital continues to invest and labor grows further, labor wages will continue to increase along with the improvement of labor productivity, which can make the factors that lead to the widening income gap gradually disappear before reaching the Lewis turning point. And with the increase of income, social security will continue to improve. After the first distribution, the second distribution through taxation and the third distribution will make up the income gap of some low-income groups.

3.5 Further test of the impact effect

In the above analysis, income inequality is affected from the perspective of the expansion margin and the intensive margin of financial development. The expansion margin effect is mainly the inclusiveness of financial technology. The development of financial technology can improve the

coverage, availability, and financial services of financial services. There are certain thresholds, but due to the high efficiency and low cost of fintech, the threshold for ordinary people to enjoy financial services is lowered. Therefore, the development of fintech can take care of the long-tailed population, thereby narrowing the income gap ^[10]. The intensive marginal effect mainly contributes to the improvement of the efficiency of financial services, which shows that the intensive marginal effect will benefit the people who have already enjoyed financial services, whether it is high-income people or low-income people, but due to the existence of the digital divide, those who have received financial services often benefit. High-income earners with higher education levels and faster access to information benefit more than lower-income earners in the initial stage of fintech development. Therefore, in the small scale of financial development and the initial stage of fintech development, the marginal effect of intensification is greater than the marginal effect of expansion, will aggravate income inequality. In order to further verify the mechanism of this effect, the income groups are stratified, and the disposable income of urban residents with lower income and the disposable income of urban residents with higher income are selected as the explained variables. The utilization rate is used as an explanatory variable, and the utilization rate of Internet users in online banking is used as an explanatory variable because it has strong significance in the above benchmark regression and in the regression considering the quadratic term. Therefore, the logarithmic linear regression is performed on the utilization rate of online banking netizens and the urban lower-income people and the online banking netizen utilization rate and the urban high-income people respectively. The benchmark regression results are as follows:

Table 4: Extended Results Table

variable name	lnlow	lnhigh
lnu	.9387704*** (.0680432)	1.196106*** (.0680432)
constant	6.021537*** (.2507795)	6.417921*** (.1403486)
R2	0.9454	0.8685

Note: Standard errors are in brackets, ***, **, and * represent the significant levels of 1%, 5%, and 10%, respectively.

$$\ln low = 6,021537 + 0.9387704 \ln u$$

$$\ln high = 6.417921 + 1.196106 \ln u$$

According to the regression results, the use rate of online banking netizens has a positive relationship with both the urban lower-income group and the urban higher-income group. With the development of financial technology, both the higher-income group and the lower-income group are affected by It is significant and will promote the growth of income, which verifies the expansion of the marginal effect of the development of financial technology, the inclusiveness of financial technology, improves the availability of financial services, which will improve the income groups at different levels, but financial technology has an impact on The elasticity coefficient of urban lower-income earners is lower than that of financial technology for urban higher-income earners, which indicates that the current improvement effect of financial technology development on higher-income earners is greater than that of lower-income earners. Exacerbating income inequality, although basic financial services have been widely covered in urban and rural areas across the country, the role of financial technology needs to be further deepened. For example, facing the problem of the "digital divide", it is difficult to enjoy the convenience of financial technology development; some lower-income earners still lack the awareness of investment and wealth management, and their role in the realization of property preservation and appreciation for the general public needs to be further deepened. This illustrates the intensive marginal effect of fintech development on income inequality.

4. Conclusion

First, this paper is based on the panel data of the scale of third-party payment platforms and the utilization rate of online banking users in my country from 2008 to 2020, and in order to improve the accuracy of the estimation results, other variables that affect income inequality are added as control variables. Including GDP growth rate, Internet penetration rate, education level, foreign trade level, inflation rate. Univariate linear regression and polynomial regression were carried out respectively. The

empirical results show that there is a positive linear relationship between financial technology and income distribution. Polynomial regression verifies the existence of "Kuznets Inverted U", and the inverted U-shaped relationship does not exist. Significantly, this shows that within the sample interval, the development of financial technology will increase income inequality. In order to further verify the current positive relationship between financial technology and income inequality, the income groups are divided into urban residents with lower incomes and urban residents with higher incomes, and conduct linear regression on the utilization rate of online banking netizens respectively. From the regression results, we get the development of financial technology can indeed promote the improvement of overall income, but the improvement is greater for higher income groups. Therefore, in the early stage of financial technology development, income inequality will be exacerbated to a certain extent.

Due to the limitation of sample size and sample interval, this paper studies that the positive linear relationship between the development of financial technology and income inequality is actually the relationship between the left side of the inverted U shape. Consistent with the current relationship between my country's economic and financial development and income disparity, in different stages of economic development, income disparity has different characteristics. To achieve a relatively equal income distribution at this stage, the premise is to have equal opportunities and social welfare. Effective improvement of the system. It takes a fairly long historical process to cross the Lewis turning point where the income gap is the largest. The results of this study are helpful to recognize that at this stage, although the development of Internet finance and financial technology is conducive to improving efficiency and reducing costs, allowing more ordinary people to enjoy financial services, the development of financial technology at this stage mainly exerts an intensive marginal effect, which is conducive to the increase in the income of the high-income group, which in turn exacerbates the income gap. In order to make the factors leading to the widening income gap gradually disappear before the turning point as much as possible, with the increase of income, social security will continue to improve. Income gap; at the same time, we should focus on how the development of financial technology can better consolidate the achievements of mass entrepreneurship and innovation, continue to support the development of small and micro enterprises, and promote the implementation of the policy of giving priority to employment in the realization of high-quality development, thereby promoting the steady increase of people's income. ; Previously, China taxed labor wages, but no tax on personal capital income and no property tax, which may be an important factor leading to the widening income gap, as long as the growth rate of real estate market prices is higher than that of wages. , there will be polarization in wealth. At present, my country implements the collection of property tax, which is conducive to narrowing the income gap. In the process of financial technology development, the value and convenience of financial services should be more effective to benefit the general public, and at the same time We should also focus on solving the problem of the digital divide, and take various measures to narrow the income gap as early as possible in the early stage of financial technology development.

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