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The Impact of Financial Development on the
Income and Consumption Levels of China's Rural
Residents

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The Impact of Financial Development on the Income and Consumption Levels of China's Rural Residents[*]

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Abstract

In this paper, we investigate the impact of financial development on rural residents' income and consumption levels in China. We discover that the development of traditional financial services has little impact on the income and consumption levels of rural residents. In contrast, the development of emerging financial services has a significant positive impact on the income and consumption levels of rural residents. Traditional financial services, as is well known, require collateral and high expected future cash flows from customers, making financial inclusion difficult. Emerging financial services in China are special financial services promoted by financial regulators to support technological innovation, cultural development, environmental protection, and rural development. Our findings suggest that these emerging financial services are effective in increasing the income and consumption levels of rural residents. Interestingly, while emerging financial services that directly target rural development have no significant impact on rural residents' income and consumption, financial support for technological advancement and cultural development appears to be more effective in increasing rural residents' income and consumption.

Keywords: Financial development; Income and consumption level of rural residents; China
JEL Classification: E24, G2, O11

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1. Introduction

In this paper, we investigate the impact of financial development on the income and consumption levels of rural residents in China. We contribute to the literature by improving the measurement of financial development and delving deeper into the relationship between financial development, income, and consumption level.

Many previous studies in this field define financial development narrowly by the level of development of the banking sector. Financial development was measured using indicators, such as the credit-to-GDP ratio (Levine *et al.* 2000), the ratio of deposits to GDP (Rajan and Zingales, 2003), loans of the financial system to GDP (Lu and Yao, 2009). The shortcomings of such indicators are twofold. First, it only considers indirect financing channels, neglecting the rapid development of China's capital market. Second, it makes no distinction between various areas of financial development, thereby neglecting fundamental structural changes in China's financial industry.

In recent years, Chinese financial regulators have promoted financial development in a few specific areas, leading to structural changes in the financial industry. More specifically, regulators encourage the financial sector to support technological innovation, environmental protection, cultural development and rural development. These financial services are respectively referred to as 'technological finance', 'green finance', 'cultural finance' and 'rural finance'. In this paper, we will refer to these new financial services areas as 'emerging finance'. One important difference between traditional and emerging finance is that the objective of emerging finance is not only making profits for financial institutions, but also supporting national development targets. For the specific targets it serves, emerging finance businesses could be supported by complementary government policies, which are not available for traditional financial businesses.

The government promotes emerging financial services because traditional financial services are concentrated in sectors with less uncertainty in future cash flows and/or high growth rates. Such financial services are consistent with China's traditional growth model, which promotes and sustains high GDP growth rates through investment in capital-intensive manufacturing. However, China is changing its development strategy to promote a more balanced growth model that considers not only the importance of income growth rate but also environmental protection, cultural development and income distribution. Furthermore, the new development strategy emphasizes technological innovations as the primary source of economic growth rather than capital investment. The recent developments in emerging finance are in line with the new growth model.

Existing studies paid limited attention to the above mentioned transformation of the Chinese growth model and accompanying structural changes in the financial industry. Therefore, it is necessary to investigate the implications of those structural changes on various aspects of economic development. This paper focuses on one particular aspect. More specifically, it studies the effect of those structural changes, which we call emerging finance development, on the income and consumption levels of rural residents. Unfortunately, traditional finance development indicators only capture the overall development level of China's financial sector, particularly the banking sector, and are completely silent on the development of emerging financial businesses. This paper uses a newly developed index of financial development to solve this problem. The index is called the Tianfu financial index (TFFI). The

advantage of this index is that besides the development of traditional finance, it also measures the development of the emerging finance.

The TFFI was developed by the Renmin University of China's TFFI Research Group (2017; 2018; 2019; 2020). It includes not only banking-related indicators but also capital market-related indicators, which complements the traditional finance development indicators by considering the development of direct financing. Furthermore, whereas traditional measures of financial development only measure the scale of financial services, the TFFI covers the scale of financial services, the quality and supporting facilities of financial services, human resources, etc. It distinguishes between traditional and emerging finance, allowing us to investigate the potentially heterogeneous impact of financial development in different areas on the income and consumption levels of rural residents. Our empirical findings suggest that such distinction is important. More specifically, we find that traditional finance has no significant impact on rural residents' per capita income and consumption. In contrast, emerging finance has a significant positive impact on rural residents per capita income and consumption. Technological finance and cultural finance, in particular, have a significant positive impact on the rural residents' per capita income and consumption.

The remaining sections of this paper are structured as follows: Section 2 briefly reviews the literature. Section 3 introduces the Tianfu financial index. Section 4 provides the theoretical analysis. Section 5 introduces our methodology and describes the data. Section 6 presents the empirical results. Section 7 concludes.

2. Literature review

This paper is related to the literature on the differences between traditional finance and emerging finance. Compared with traditional finance, emerging finance has specific supporting areas that traditional financial institutions are often reluctant or unable to enter.

Take green finance as an example. While traditional finance focuses mainly on profits, green finance considers financial, social and environmental returns in combination (Schoenmaker, 2017; Okyere-Kwakye and Md Nor, 2021). Generally, financial institutions tend to show more interest in fossil fuel projects as opposed to green projects (Benincasa, 2021). This is primarily due to several risks that are prevalent among green technologies, as well as a relatively lower rate of return (Sachs *et al*., 2019). Green projects also require large borrowings, as they are capital-intensive (Peimani, 2019). At the same time, these projects are usually associated with high risks and low returns at the initial research and development stage (Noh, 2018). Therefore, green projects have difficulties in accessing finance from banks. Generally, traditional finance cannot provide enough funding for green projects. Therefore, it is necessary to establish a green finance system to fill this gap (Taghizadeh-Hesary *et al*., 2021).

Technological entrepreneurs face a similar problem. Innovation and commercialization of new technology are usually accompanied by high uncertainty and risks, thus financial institutions usually invest in technological innovation cautiously to avoid potential losses. In addition, information asymmetries may make raising external capital expensive for entrepreneurs (Myers and Majluf, 1984; Greenwald *et al*., 1984). Giudici and Paleari (2000) conduct an empirical analysis on a survey of 46 small high-tech Italian firms, arguing that traditional financial sources are inadequate to finance innovative projects. To support technological innovation of

the firms, governments in many countries have taken on the role of venture capital investors to solve these problems (Jang and Chang, 2008).

Cultural enterprises are also confronted with financing difficulties due to the comparatively large initial investment and the unpredictability of future return. While traditional enterprises rely on tangible collateral for debt financing from banks, cultural enterprises mainly rely on intellectual property rights and human capital which are difficult to assess under the current evaluation system (Liu *et al*., 2021). The implementation of cultural finance policy is beneficial to reduce the financing cost of cultural enterprises by alleviating problems of information asymmetry with more specialized financial products.

The small and complex rural economic structure makes the rural financial market in China small, dispersed and seasonal. Generally, the commercial banks' penetration in rural areas was restrained due to the limited collateral or guarantee capacity and high-transaction costs (Guo and Jia, 2009). Lin (2003) points out that the lack of suitable and effective financial institutions is one of the main reasons hindering the growth of farmers' income. In this background, China has implemented rural financial reforms, including lifting barriers on access to rural financial markets and promoting diversification of rural financial institutions. There are different evaluations in the existing literature on the effect of China's rural financial development or reform. Guo and Jia (2009) argue that the formal financial institutions in rural areas mainly function as a payment window and can hardly provide balanced and full services. From the perspective of industrial integration, Tian *et al*. (2020) point out that rural finance has a significant and positive effect on promoting farmers' participation in new agricultural management organizations.

This paper also contributes to the literature on the effect of financial development on the income and consumption level of rural residents. The existing empirical studies generate mixed results.

Some find that financial development increases the income or consumption level of residents in rural areas. Holden and Prokopenko (2001) suggest that financial development can help the poor to deal with fluctuations of income in the future, and promote the financial system to provide better services and capital support to poor family. Inoue (2018) finds that financial development and remittance inflows help increase income of the poor in developing countries. Ding *et al*. (2011) point out that financial development has a positive effect on the income of rural residents. Cui and Sun (2012) find that financial development can increase poor people's consumption. Uddin *et al*. (2014) show that financial development helps enhance private household consumption per capita in Bangladesh. Rewilak (2017) argues that financial deepening help reduce the proportion of people below the poverty line.

Other studies argue that financial development does not contribute to the increase in rural residents' income and may even have a negative impact on rural residents' income. Haber (2005) indicates that financial development has not increased poor people's income. Wen *et al*. (2005) even find that the financial development in China has negative effects on farmer's income growth. Similarly, Yu *et al*. (2010) and Ye *et al*. (2011) also find a negative relationship between financial development and rural residents' income.

The third body of literature investigates the relationship between financial development and income distribution and poverty. Sun (2012) finds that financial development promotes urbanization and, as a result, narrows the urban–rural income distribution gap. Beck *et al*. (2007) suggest that the Gini index fell sharply after the

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state relaxed regional commercial banking restrictions. The research of Alshubiri (2021) shows that the financial depth has a positive and significant impact on income inequality in the OECD and ASIAN countries. Some studies find that the effect of financial development on poverty has an inverted U-shape (Aghion and Bolton, 1997; Townsend and Ueda, 2006; Chakraborty and Lahiri, 2007). Greenwood and Jovanovic (1990) propose a theory to explain the inverted U-shape relationship between poverty and financial developments. In particular, in the early stages of financial development, the poor cannot afford the cost of financial services, causing the income gap to widen. When financial development reaches a certain level, the poor gain access to financial services, and financial development begins to aid in poverty alleviation. This result is known as the Kuznets effect (Kuznets, 1955).

The existing literature has a limitation in that it ignores the distinction mentioned in the introduction between traditional and emerging finance. There has been little research on the relationship between emerging finance and rural residents' income and consumption. This paper fills that void.

3. The Tianfu Financial Index

Finance plays a positive role in accelerating capital formation, expanding output scale, optimizing resource allocation, and increasing income and consumption. China has long had a bank-dominated financial system in which the proportion of direct financing is relatively low but rising rapidly. However, traditional finance mainly serves cities, state-owned enterprises and large enterprises, which can neither adequately adapt to the requirements of the economic transformation, nor reflect the requirements of new development concepts and high-quality development.

Since the 18th National Congress of CPC, China has attached greater importance to supply-side reform of the financial sector, and promoted finance to support technological innovation, sustainable development, cultural development, and rural revitalization, forming emerging finance including technological finance, green finance, cultural finance, and rural finance.

One important difference between traditional and emerging finance is that the objective of emerging finance is not only making profits for financial institutions, but also supporting national development targets. Compared with traditional finance, emerging finance has more accurate market position and specific service targets. For example, in the fields of green finance, green bonds are issued to finance specific environmental sustainability and energy transition projects, such as projects related to renewables, public transportation, energy efficient building and waste management. For the specific targets it serves, emerging finance businesses could be supported by complementary government policies (Song, et al., 2021), which are not available for traditional financial businesses. Moreover, as emerging finance often supports fields that traditional financial institutions are reluctant to enter, the operation of emerging finance is more personalized in terms of functions, standards, products features and risk management.

The Tianfu Financial Index (TFFI) takes both the traditional and emerging finance into account, systematically and comprehensively reflecting the financial

development of 35 sample cities.[1] In the field of traditional finance, TFFI considers financial market size, the strength of financial institutions, supporting facilities for the financial sector's full functioning, and human resources that are essential for the financial sector development. TFFI measures not only the development of traditional finance but also four emerging financial industries, namely technological finance, green finance, cultural finance and rural finance. As a result, the index system includes one index of average financial development (TFFI), one index of traditional finance development (TFI), one index of emerging finance development (EFI) and eight sub-indices (see Fig. 1 for details).
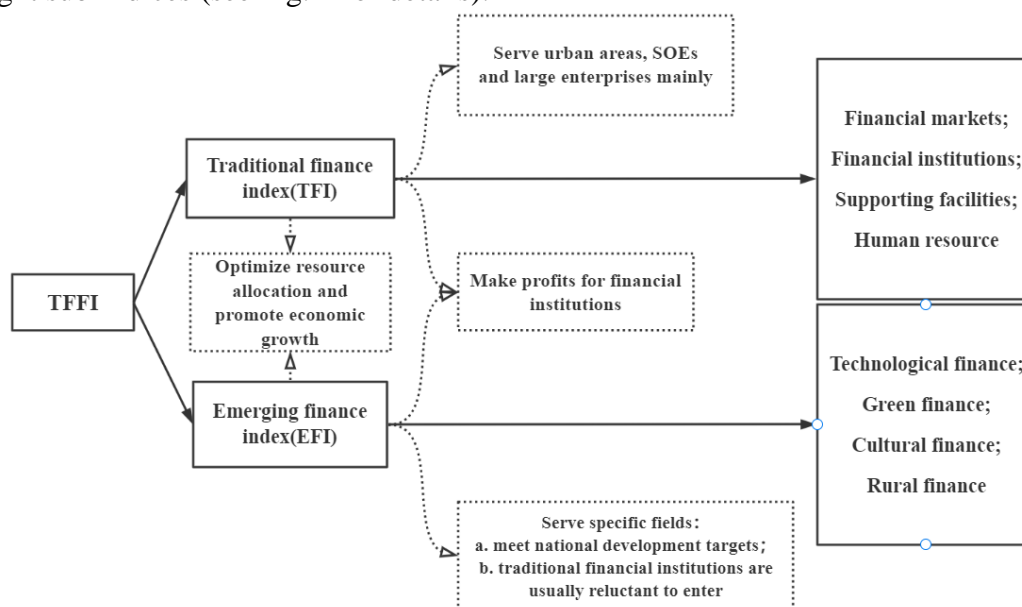
Fig. 1. The index system of TFFI.

There are four sub-indices for traditional finance development: financial market, financial institution, supporting facilities and human resources. There are also four sub-indices for emerging finance development: technological finance, green finance, cultural finance and rural finance. The financial market sub-index measures different financial markets' development level. The financial institution sub-index is designed to reflect the scale, operation quality, risk management and social reputation of financial institutions. The supporting facilities sub-index is evaluated from four aspects: infrastructure, urban environment, institutional environment and economic environment. The human resource sub-index is designed to reflect human resource quantity, quality, foundation and potential. The technological finance sub-index is designed to capture two aspects of financial services that support technological

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[1] Beijing, Shanghai, Shenzhen, Guangzhou, Hangzhou, Chengdu, Chongqing, Nanjing, Tianjin, Wuhan, Xian,

Changsha, Hefei, Zhengzhou, Jinan, Ningbo, Qingdao, Dalian, Xiamen, Fuzhou, Kunming, Taiyuan, Shenyang,

Guiyang, Nanchang, Nanning, Urumqi, Shijiazhuang, Harbin, Changchun, Lanzhou, Hohhot, Yinchuan, Haikou,

Xining.

innovation. The first is the environment in which technology is being developed. The second factor is the quality and quantity of financial services available to help technological innovation. The green finance sub-index is mainly evaluated based on two aspects: the current level of environmental protection and the quality and quantity of green finance services. The cultural finance sub-index reflects the current level of cultural development as well as the quality and quantity of financial services available for cultural development. The rural finance sub-index mainly reflects the current rural area development level and quality and quantity of financial services provided for rural area development.

TFFI employs the max–min method on the original data for data normalization, after which the dimensionality is eliminated so that the standardized indicator variables are all within the interval of [0 100]. We sort the indicators to follow the rule that the higher value of an indicator indicates stronger financial competitiveness. TFFI is a weighted average of the sub-index, where the weights are calculated using the principal components analysis. For further technical details, please refer to the Renmin University of China's TFFI Research Group (2017, 2018, 2019, 2020).

4. Theoretical analysis

Given the availability of more detailed indicators of financial development, we can investigate the disparate roles of various types of financial development in increasing rural residents' income and consumption levels. In this paper, we focus on the roles of traditional and emerging finance.

Traditional finance's ability to increase the income and consumption of rural residents may be limited for the following reasons. First, it necessitates collateral and high expected future cash flows from borrowers, making financial inclusion difficult. Rural residents are viewed as high-risk borrowers by creditors and investors owing to a lack of pledgeable assets, low capitalization and vulnerability to market fluctuations (Wang, 2005). Furthermore, the lack of adequate financial statements or business plans makes it difficult for investors to assess their creditworthiness. Second, some researches suggest that the poor primarily rely on informal family connections for capital, so improvements in the formal financial sector benefit the wealthy (Bourguignon and Verdier, 2000; Haber *et al.*, 2003).

In China, emerging financial services are special financial services that are promoted by financial regulators to support technological innovation, cultural development, environmental protection and rural development. By design, those emerging financial services not only have clear goals but also alleviate the problems caused by borrowers' weak financial backgrounds. Fig. 2 summarizes the mechanisms by which different types of emerging finance affect rural residents' income and consumption levels. As we can see from this figure, technological finance and cultural finance may have positive effects on the income and consumption levels of rural residents, but the direction of the impact of rural finance is uncertain.

Technological finance primarily refers to financial assistance for the development of technology businesses. By reducing the financing costs of technological enterprises, it promotes technological innovation, which may increase total factor productivity in the rural area and thus increase rural residents' income and consumption level. Furthermore, technological advancements help to improve financial inclusion (Huang and Huang, 2018). Big data, artificial intelligence and blockchain technology enable finance to innovate financial products and services, cultivate market-leading enterprises and then promote the construction and development of agricultural

industries, which can increase rural residents' income through more job opportunities and sales revenue.

The development of cultural finance may help increase rural income and consumption in three ways. First, cultural development can help change the poor's inherent concept of poverty from the perspective of poverty culture and then promote the income level. Second, improved cultural infrastructure can promote high-quality education, which improves rural residents' human capital. Third, financial supports can transform cultural resources into cultural assets in rural areas and then develop cultural industries, which is particularly important for poor areas lacking production conditions. The development of cultural industries can provide local residents with new employment opportunities and cultural product sales income.

Rural finance aims to match financial resources for agricultural development, and lower the barrier to financial services for rural residents. Rural financial development has increased the availability of financial resources in rural areas. In recent years, various financial institutions have broadened their business in rural areas. Financial sources such as micro-credit and credit card can effectively alleviate the problem of household liquidity constraints, helping rural households realize the inter-temporal allocation of small amounts of funds in the short term and thereby increasing consumption (Zhao *et al*., 2022). Moreover, rural capital investment has the potential to increase the amount of capital per capita of rural residents, potentially leading to an increase in per capita output and income (Xu and Gao, 2005). Furthermore, rural finance has a significant and positive effect on rural industrial integration by providing channels of financing and managing risks (Tian *et al*., 2020), and thus promoting the income and consumption level of rural residents. As a result, it is natural to believe that the development of rural finance contributes to an increase in rural residents' income and consumption. However, there are still existing difficulties in the practice of rural finance, such as inefficient credit markets due to the lack of qualified collateral and credit records (Li, 2018; Li *et al*., 2013; Yeung *et al*., 2017), insufficient technical monitoring and supervision, as well as inadequate rural financial products and services innovation. With these constraints, it is an empirical question whether the current development of rural finance is adequate to support rural residents' income and consumption growth.
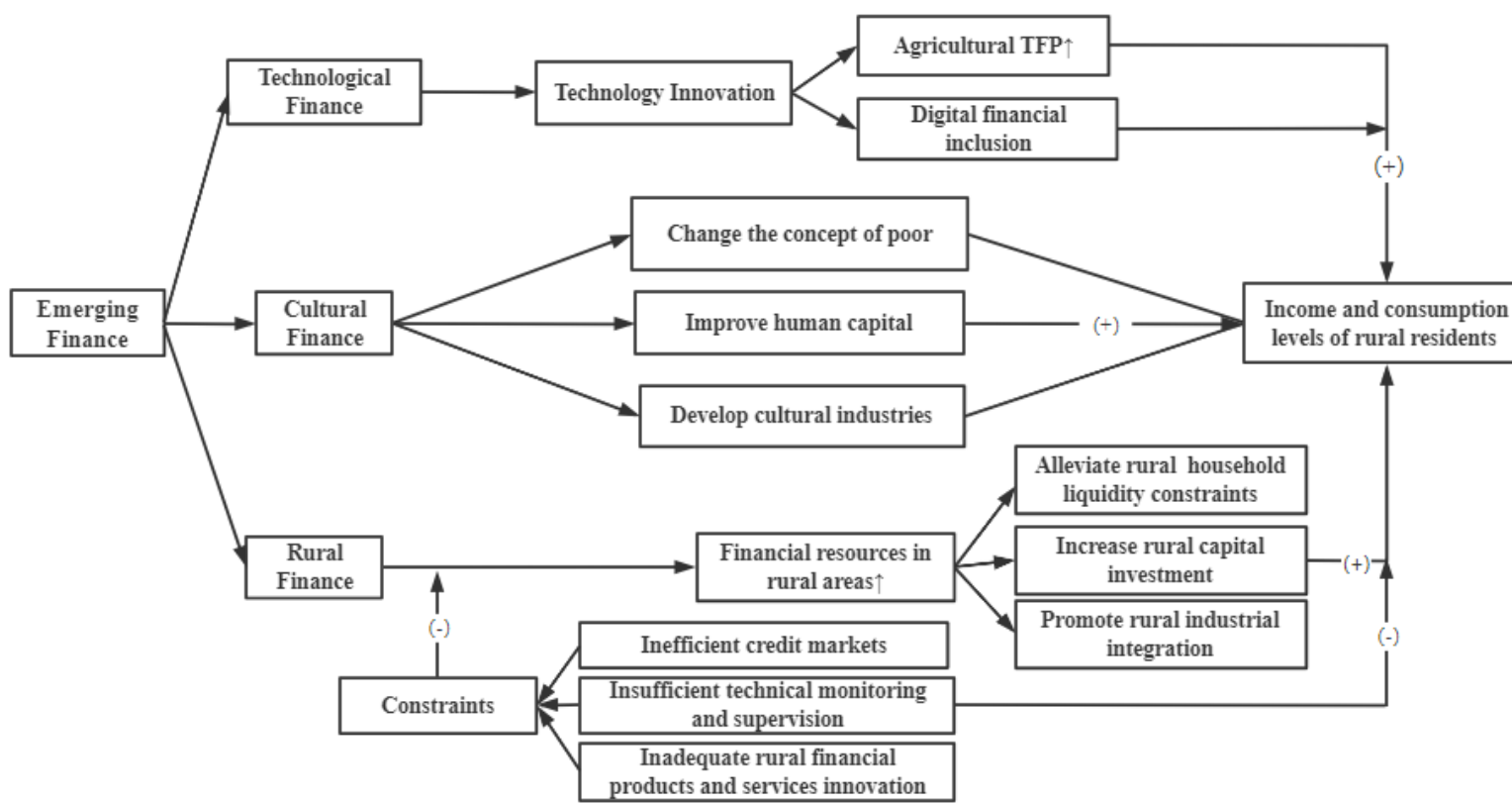
Fig. 2. Mechanisms of emerging finance influencing rural residents' income and consumption levels.

5. Empirical model

5.1 The effect of financial development on the income level of China's rural residents

We first estimate the following panel regression:

$$ICM_{i,t} = \alpha_0 + \alpha_1 TFFI_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \tag{1}$$

We use $ICM_{i,t}$, which represents the per capita disposable annual income of rural residents in year t and city i, as the dependent variable. The independent variable $TFFI_{i,t}$ measures financial development for city i in year t. If the regression coefficient α_1 is significantly positive, financial development significantly increases the rural income level. $X_{i,t}$ is the vector of control variables containing economic development, urbanization, inflation, degree of openness, fiscal support and industrial structure. α_0, α_1 and γ are coefficients to be estimated. μ_i represents city-fixed effect, and $\varepsilon_{i,t}$ is the error term. The sample period is from 2016 to 2019.

We also further investigate the impact of traditional and emerging finance development on rural residents' income. The key explanatory variable in Eq. (1) is replaced by the traditional finance development index (TFI) and emerging finance development index (EFI), as shown in model (2) below.

$$ICM_{i,t} = \alpha_0 + \alpha_1 TFI_{i,t} + \alpha_2 EFI_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \tag{2}$$

We explain our choice of control variables below:

Economic development. Economic development brings benefits to all people, including the poor. According to the 'trickle-down effect', economic growth can increase total wealth and ultimately benefit the poor through channels of consumption, employment and transfer payment. Our proxy for economic development is the log of real GDP per capita (Barro, 2000; Deininger and Squire,1998).

Urbanization rate. The urbanization rate is calculated as the ratio of urban residents to total residents. First, urbanization can increase rural residents' non-agricultural income (especially wage income) by absorbing rural surplus labor force. Second, the rural land circulation can promote property income of rural residents. Third, urbanization produces positive spillover effects on rural areas by improving human capital, production technology and knowledge accessibility, which enhances the productivity of rural labor. Thus, we expect a positive sign of the coefficient of urbanization rate.

Degree of openness. We use the ratio of overall value of export and import to GDP to measure degree of openness. With a higher degree of openness, imported agricultural products from more advanced countries may squeeze the market share of local agricultural products, causing prices to fall. Furthermore, as foreign trade develops, demand for technology and capital-intensive products rises, potentially decreases the price of traditional labor-intensive products and slowing the income growth of rural migrant workers. As a result, we anticipate a negative sign for the coefficient of trade openness.

Fiscal support. We measure fiscal support by fiscal expenditure on agriculture. In general, the relationship between agricultural fiscal expenditure and rural residents' income can be either substitutive or complementary. Fiscal expenditure on agriculture can reduce the cost of agricultural production and increase the income of rural residents. However, an increase in fiscal expenditure may crowd out productive private investment in the rural areas, reducing rural residents' disposable income. As a result, the sign of regression coefficient on agricultural expenditure is determined by the combined effect.

Industrial structure. We use the primary industry-to-GDP ratio as a proxy for industrial structure. In general, while the primary industry's share of GDP gradually decreases, there is an increasing tendency in rural residents' income from non-agricultural activities, thereby improving rural income levels. However, sometimes the impact is the opposite. Because agriculture is the traditional source of income for rural residents, a decrease in primary industry share would result in a decrease in agricultural income. However, because non-agricultural industries are primarily concentrated in urban areas, migration may have a negative impact on the rural economy and income level. As a result, the sign of the industry structure coefficient is ambiguous.

5.2 The effect of financial development on the consumption level of China's rural residents

Regression models for rural residents' consumption levels are similar to those for income levels, with overall financial development, traditional finance development and emerging finance development included as independent variables:

$$CSPT_{i,t} = \alpha_0 + \alpha_1 TFFI_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (3)$$

$$CSPT_{i,t} = \alpha_0 + \alpha_1 TFI_{i,t} + \alpha_2 EFI_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (4)$$

We use $CSPT_{i,t}$, which represents the log of real per capita consumption of rural residents in year t and city i, as the dependent variable. In addition, we add the urban–rural income gap into $X_{i,t}$, considering income is an important factor for consumption.

5.3 Data description

Table 1 summarizes the variable definitions. For per capita GDP, income and consumption, we calculate the real value (based on 2015 price) and take natural logarithm to reduce heteroscedasticity. Except for the TFFI, all variables are calculated using data from the wind database and statistical bureaus.

Table 1 Variable definitions

Variable	Definition	Source
lrincome_rural	Log of real per capita income of rural residents	Wind database
lrconsmpt_rural	Log of real per capita consumption of rural residents	Wind database
IFFI	Average financial development index	TFFI Research Group
TFI	Traditional finance development index	TFFI Research Group
EFI	Emerging finance development index	TFFI Research Group
tech	Technological finance sub-index	TFFI Research Group
green	Green finance sub-index	TFFI Research Group
culture	Cultural finance sub-index	TFFI Research Group
rural	Rural finance sub-index	TFFI Research Group
lrpgdp	Log of real per capita GDP	Bureau of statistics

		(city-level)
urban	Ratio of urban residents to total residents	Wind database, Statistical yearbook (provincial-level)
CPI	Inflation rate	Wind database
openness	Ratio of value of import and export to GDP	Wind database
agri_support	Share of fiscal expenditure on agriculture, forestry and water conservancy	Wind database
share_primary	Ratio of primary industry to GDP	Wind database

The descriptive statistics for all variables are shown in Table 2. The sample size for a few variables is less than 140 because of missing data in some cities. It is obvious that the level of financial development has large differences in cross-section. Specifically, the maximum value of TFFI is 79 and the minimum value is close to 13, indicating large differences of the financial development levels of sample cities. Among the components of TFFI, the traditional financial development index (TFI) of sample cities is between 12 and 81, and the emerging financial development index (EFI) is between 13 and 80, also showing great differences. For the four emerging finance sub-indices, we find that the sample cities are less dispersed in green finance and rural finance than in technological finance and cultural finance.

Table 2 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lrincome_rural	136	9.764	.285	9.157	10.419
lrconsmpt_rural	131	9.485	.280	8.958	10.074
TFFI	140	35.23	13.290	13.041	79.147
TFI	140	36.779	13.786	12.452	81.024
EFI	140	33.275	13.355	13.336	80.051
tech	140	27.531	17.852	2.14	84.079
green	140	42.213	9.497	21.863	80.313
culture	140	27.497	16.604	3.416	90.762
rural	140	49.648	12.530	20.291	84.302
lrpgdp	137	11.444	.309	10.858	12.101
urban	134	75.435	10.152	48.565	100.000
CPI	140	2.165	.608	.500	3.400

openness	140	33.715	31.787	1.986	134.959
agri_support	127	6.540	2.299	1.455	13.551
share_primary	140	3.677	2.612	0.000	11.300

6. Econometric analysis and results

6.1 Regressions for the income level of rural residents

Table 3 summarizes the results of model (1). The TFFI coefficient is positively and statistically significant in all specifications, indicating that financial development increases rural residents' income.

For control variables, economic development and the rate of urbanization have significantly positive effects on the income of rural residents, which is consistent with our expectations. In the case of trade openness, we find a negative and significant effect on rural residents' income, which is also consistent with our expectations. The effect of inflation, primary industry share and fiscal support are all statistically indistinguishable from zero.

Table 3 The effect of TFFI on real per capita income of rural residents

	(1) lrincome_rural	(2) lrincome_rural	(3) lrincome_rural	(4) lrincome_rural	(5) lrincome_rural	(6) lrincome_rural	(7) lrincome_rural
TFFI	.026***	.016***	.012***	.012***	.011***	.011***	.011***
	(.002)	(.003)	(.003)	(.003)	(.003)	(.003)	(.002)
lrpgdp		.523***	.406***	.374***	.416***	.423***	.428***
		(.096)	(.102)	(.101)	(.091)	(.087)	(.099)
urban			.016**	.014*	.015**	.013*	.013*
			(.008)	(.007)	(.007)	(.007)	(.007)
CPI				.016	.013	.012	.012
				(.011)	(.011)	(.012)	(.015)
openness					-.003**	-.003**	-.003*
					(.001)	(.001)	(.001)
agri_support						-.006	-.006
						(.004)	(.004)
share_primary							.003
							(.022)
_cons	8.856***	3.25***	3.49***	4.011***	3.573***	3.705***	3.622***
	(.079)	(1.022)	(.861)	(.947)	(.871)	(.881)	(1.18)
Observations	136	133	127	127	127	115	115
R-squared	.459	.721	.746	.756	.776	.763	.763

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

We further compare the effects of traditional finance and emerging finance development on rural residents' income. The results of model (2) are shown in the first column in Table 4. We obtain a point estimate of the TFI coefficient of 0.003, which is not significantly different from zero. Interestingly, the EFI is significant at 1%. The estimated coefficient is 0.006, implying that increasing the emerging development index by 1 unit increases per capita rural resident income by 0.6%. The cross-sectional difference in the index is large, as shown in Table 2, implying that income differences caused by differences in emerging finance development could also be large.

The finding that traditional finance development has no significant impact on rural residents' income reflects the difficulty for poorer households in the traditional financial service model to access financial resources. Productive activities in rural areas have long cycles and low returns, and agricultural products are vulnerable to natural disasters. Furthermore, rural areas have a low level of economic development, and rural residents usually lack high-quality collateral. In addition, developing a credit system for rural residents is difficult. For these reasons, profit-driven financial resources would flow to more developed areas. Therefore, traditional finance is inefficient in providing financial services to rural areas, making it difficult to increase rural residents' income.

In contrast to traditional finance, emerging finance is born from changes in a country's development strategy. It is intended to help areas that have historically been overlooked by traditional finance. Our findings imply that financial policies which promote the development of emerging finance help increase rural residents' income.

Table 4 Effects of traditional and emerging finances on real per capita income of rural residents

	(1) lrincome_ rural	(2) lrincome_ rural	(3) lrincome_ rural	(4) lrincome_ rural	(5) lrincome_ rural
TFI	.003 (.003)				
EFI	.006*** (.001)				
tech		.003*** (.001)			
culture			.002** (.001)		
green				.002 (.002)	
rural					0 (.001)
lrpgdp	.41*** (.103)	.388*** (.116)	.428*** (.117)	.473*** (.109)	.492*** (.116)
urban	.013* (.007)	.018** (.007)	.017* (.009)	.019* (.009)	.02** (.009)
CPI	.015 (.015)	.015 (.015)	.013 (.015)	.011 (.014)	.009 (.014)
openness	-.003**	-.003*	-.003**	-.003**	-.003**

	(.001)	(.001)	(.001)	(.001)	(.001)
agri_support	-.006	-.009*	-.008*	-.011**	-.009*
	(.004)	(.005)	(.004)	(.005)	(.005)
share_primary	.007	.008	-.005	-.008	-.007
	(.022)	(.022)	(.024)	(.023)	(.024)
_cons	3.9***	3.989***	3.648***	3.085**	2.829**
	(1.234)	(1.343)	(1.318)	(1.178)	(1.242)
Observations	115	115	115	115	115
R-squared	.767	.743	.73	.717	.712

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Since the emerging finance index consists of four sub-indices, we consider a more detailed study on the effects of emerging finance on rural residents' income levels. We regress rural residents' income on the four sub-indices of the EFI respectively. Columns (2)-(5) in Table 4 show that the technological finance and cultural finance have positive effects on the income level of rural residents with significance level of 1% and 5% respectively, while the rural finance has a negligible and insignificant impact on rural residents' income, which is consistent with some related literature (Xu and Gao, 2005; Wen *et al.*, 2005, Yu *et al.*, 2010) . The literature explains the ineffectiveness of rural finance by inefficient credit markets due to the lack of qualified collateral and credit records (Li, 2018; Li *et al.*, 2013; Yeung *et al.*, 2017), insufficient technical monitoring and supervision, as well as inadequate rural financial products and services innovation. There are two further explanations for the inability of rural finance to increase rural residents' income. First, large-scale rural financial institutions lack an effective competition mechanism and the motivation for business innovation and thus are unable to meet the multi-level and diverse financial demands of rural economies. Small rural financial institutions' ability to support rural credit and control risks is limited owing to disadvantages in terms of capital scale and information acquisition. As a result, rural finance may have a limited impact on rural economic development and income growth among rural residents. Second, most sample cities have relatively high levels of economic development; thus, credit funds from local rural financial institutions may primarily flow to other extra-poor regions rather than the local rural residents.

The technological finance index in TFFI system measures the demand and current conditions of local technological finance business, and the cultural finance has a similar logic. It can be seen that there is few overlaps between the sub-indices of technological finance, cultural finance and rural finance, since the former two don't directly measure the financial supports for rural residents or enterprises. However, technological finance and cultural finance can indirectly promote rural economic development and promote rural residents' income through technological innovation and cultural infrastructure construction respectively.

More specifically, technological finance can contribute to rural residents' income through increasing the productivity of rural residents and improving digital financial inclusions in rural areas. Technological finance encourages risky investment in R&D and promotes technological innovation. Technological innovation has the potential to not only increase the productivity of rural residents but also improve financial

inclusion (Huang and Huang, 2018), which is beneficial for rural economic development. For example, advances in big data, artificial intelligence and blockchain technology have opened up new opportunities in rural areas. It promotes the development of market-leading enterprises, new industries and business forms in rural areas, which can increase rural residents' income through more job opportunities and sales revenue. It can also encourage the innovative provision of rural public services and the improvement of rural governance efficiency. Moreover, advanced technology can contributes to financing for rural areas by reducing information asymmetry and transaction costs.

For cultural finance, we give three main explanations for its positive effects on rural residents' income. First, cultural development can help change the poor's inherent concept of poverty from the perspective of poverty culture[2] and then promote the income level. Using institutional construction, conceptual transformation and educational resource supply, we can foster the concept of rural residents' modern development, improve the rural public culture service system, improve population quality and develop the agricultural economy, all of which help to increase rural residents' income.

Second, improved cultural infrastructure promotes high-quality education, which improves rural residents' human capital. For example, with the popularization of the Internet in rural areas, rural residents can now access high-quality public resources in cities. The development of online classes, distance education and 'Internet +' medical care, provides new channels for rural residents to accumulate human capital.

Third, financial support for the prosperity of cultural industry can help expand economic resources and thus increase the income of rural residents. We can promote the integrated development of cultural resources with agriculture, eco-tourism and other industries; accelerate the transformation of cultural capital into economic capital; and finally realize cultural enrichment by investing in cultural industries and supporting cultural enterprises to go public. For example, the cultural industry can increase rural residents' income through online media publicity, rural e-commerce, and cultural and tourism integration.

The index of green finance development has no significant impact on the income of rural residents. This is not surprising given that green finance services are not directly related to rural development.

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[2] The culture of poverty was first proposed by the anthropologist Lewis (1959). Poverty culture is a social subculture produced by poor groups with common values and behaviours. It reflects the self-adaptation of poor people to economic deprivation and social marginalisation. From the perspective of poverty culture, even if the initial conditions of poverty change, it is difficult for the poor to get out of poverty.

6.2 Regressions for the consumption level of rural residents

Aside from rural residents' income, we investigate whether traditional and emerging finance development are effective in improving rural residents' consumption levels. The main results are shown in Table 5. The main regression results of consumption levels are similar to those of income levels, which is understandable given that income level is a significant factor influencing consumption (Keynes, 1936; Friedman, 1957; Duesenberry, 1949). We obtain a point estimate of the semi-elasticity of rural residents' consumption with respect to the financial development of 0.006, which is significant at the 5% level. Emerging finance has a significantly positive effect on rural residents' consumption, whereas traditional finance has no significant effect on rural residents' consumption. Furthermore, technological finance and cultural finance continue to have a positive and significant impact on consumption levels of rural residents.

Table 5 Effects of financial development on real per capita consumption of rural residents

	(1) lrconsmpt_rural	(2) lrconsmpt_rural	(3) lrconsmpt_rural	(4) lrconsmpt_rural	(5) lrconsmpt_rural	(6) lrconsmpt_rural
TFFI	.006**					
	(.003)					
TFI		-.003				
		(.003)				
EFI		.004***				
		(.001)				
tech			.001*			
			(.001)			
culture				.002**		
				(.001)		
green					.002	
					(.001)	
rural						.001
						(.001)
lrpgdp	.427***	.391***	.412***	.405***	.443***	.453***
	(.141)	(.133)	(.148)	(.138)	(.141)	(.148)
urban	.013**	.013**	.015**	.014*	.015**	.016**
	(.006)	(.006)	(.006)	(.007)	(.007)	(.007)
CPI	.014	.021**	.015	.017	.013	.012
	(.011)	(.009)	(.01)	(.01)	(.011)	(.011)
openness	-.002*	-.002*	-.002	-.002*	-.003**	-.002*
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
rgap	-.111	-.141	-.137	-.156	-.11	-.147
	(.145)	(.143)	(.151)	(.159)	(.165)	(.165)
agri_support	-.012	-.012	-.013	-.013	-.016**	-.014*
	(.008)	(.008)	(.008)	(.007)	(.008)	(.008)
share_primary	-.018	-.011	-.016	-.022	-.024	-.027
	(.019)	(.019)	(.021)	(.019)	(.019)	(.021)
_cons	3.699**	4.267***	3.868**	4.066**	3.546**	3.425**
	(1.54)	(1.414)	(1.587)	(1.522)	(1.57)	(1.631)
Observations	111	111	111	111	111	111
R-squared	.789	.803	.784	.791	.784	.776

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

6.3 Discussions about the possibility of endogeneity

We consider the possibility of endogeneity in two aspects. On the one hand, in the regression we've controlled the per capita GDP, which represents the level of regional development and thus deals with the proposed problem of missing variable.

On the other hand, we think that there is little possibility of reverse causality, as the income or consumption level of rural residents can hardly influence the technological finance, green finance and cultural finance of the whole city (particularly after controlling GDP per capita). For rural finance, one may argue that the low level of rural residents' income and consumption would lead to an increase in rural finance supply. In this regard, we've tried to alleviate this potential reverse causality problem by replacing the explanatory variable with the rural finance lagged one-period. The regression results show that the coefficients of rural finance lagged one-period remain insignificant, which provides an additional evidence for our conclusions (see Table 6).

Table 6 Regression results for rural finance lagged one-period

	(1) lrincome_rural	(2) lrconsmpt_rural
l.rural	0.000	0.000
	(.001)	(.001)
lrpgdp	.21***	.237**
	(.063)	(.097)
urban	.03***	.042***
	(.009)	(.009)
CPI	.031***	.011
	(.01)	(.011)
openness	-.003***	-.002*
	(.001)	(.001)
agri_support	-.007*	-.016*
	(.004)	(.008)
share_primary	.022	.008
	(.025)	(.016)
rgap		-.107
		(.12)
_cons	5.138***	3.794***
	(.915)	(1.264)
Observations	84	81
R-squared	.674	.779

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

7. Conclusions

This paper studies the effects of financial development on rural residents income and consumption levels. By distinguishing between traditional and emerging financial services, we attempt to extend the analysis of the existing literature. While traditional financial services focus on making profits for financial institutions, emerging financial services are designed to promote technological innovation, cultural

development, environmental protection and rural development. We discover that, while traditional finance development has little impact on rural residents' income or consumption levels, the development of emerging financial services has a significant positive impact on rural residents' income and consumption levels. Financial support for technological innovation and cultural development, in particular, helps increase rural residents' income and consumption levels.

Declaration of Competing Interest
The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Zongxin Qian reports financial support was provided by National Natural Science Foundation of China.

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