RAJAPARK INTERNATIONAL JOURNAL
ISSN: 3056-9354 (Online)
Vol. 1 No. 3 September - December 2024

Analysis of the Poverty Reduction and Income Increase Effect of Digital Financial Inclusion—Evidence from 1736 counties of China

Hemin Wang[1], Shumin Wang[2], and Xingqi Zhao[3*]

[1]Henan Institute of Finance and Economics, Henan Polytechnic University, Jiaozuo 454003, China
[2]School of Business Administration, Henan Polytechnic University, Jiaozuo 454003, China
[3*]Institute of Chengdu-Chongqing Economic Zone Development, Chongqing Technology and Business University, Chongqing 400067, China

[*]*Corresponding Author.* E-mail: 279001893@qq.com

Received December 7, 2023; **Revised** August 23, 2024; **Accepted** August 30, 2024

Abstract

The third technological revolution based on the Internet that humanity is experiencing has a vast and far-reaching impact on efficiency and fairness. Under the powerful catalysis of the Internet revolution, China has rapidly developed a digital economy and finance. This paper combines the data of 1736 counties in China from 2014 to 2017 and the Peking University Digital Financial Inclusive County Index, using the panel instrumental variable quantile regression method to empirically analyze the effect of digital financial inclusive finance on poverty reduction and income increase of Chinese county residents. The research results show that, on the whole, Digital Financial Inclusion (DFI) has significantly promoted the income growth of residents in poor and non-poor counties; the panel instrumental variable quantile regression results show that DFI has a more obvious income increase effect on low-income groups. The further sub-sample regression of impoverished counties and non-poverty counties and the division of the sample into three major regions: East, middle, and west, the regression results show that the effect of DFI on low-income groups is more obvious; DFI can strengthen the role of traditional financial development and promotion, employment increase and industrial structure upgrading in promoting poverty reduction and income increase, but this conclusion is not valid in poor counties. Therefore, China should vigorously develop DFI as a way for low-income groups to reduce poverty and increase income.

Keywords: Digital Financial Inclusion (DFI); Poverty; Residents' Income; Instrumental et al. (IVQR)

Introduction

Since 2017, China's poverty alleviation has been in full swing. Reducing and even eliminating poverty is an important goal the Chinese government is committed to achieving. The principle of Digital Finance Inclusive (DIF) issued by the G20 summit in Hangzhou in 2016 proposes that DFI generally refers to all actions to promote inclusive finance through digital financial services, including various financial products and services (such as payment, transfer, savings, credit, insurance, securities, finance, bank statement services, etc.). Transactions are conducted through digital or electronic technologies, such as electronic currency, payment cards, or regular bank accounts. Low-income people can obtain formal financial services by lowering the threshold of financial services. 2016, the "G20 Advanced Principles of Digital Financial Inclusion" came out. DIF provides appropriate and effective financial services for all people who need financial services at affordable costs so that poor people can be self-reliant and ensure the expected benefits of financial institutions. However, there are significant differences in the types of services. In China, the essence of DIF, including traditional financial institutions and Internet financial companies, is to provide financial services to the poor people. With the help of digital technologies such as the Internet, big data, and cloud computing, the development of the rural financial market has been promoted, the great weakness of rural finance has been made up for, and the cost of financial services has been reduced. From the perspective of the micro-mechanism, DIF mainly achieves the effect of reducing poverty and increasing income through the following channels.

First and foremost, DIF realizes services through the network, without physical branches, integrates financial services into life scenarios, and reduces customer acquisition costs. DIF significantly decreases the transaction intermediate links and reduces the transaction costs. Relying on big data and cloud computing technology, DIF can portray the characteristic portraits of customers, provide reasonable financial services based on customer types, and reduce information search costs. At the same time, digital technology can effectively supervise customers and reduce the probability and extent of adverse selection or moral hazard caused by information asymmetry. Secondly, the price could be adjusted reasonably, and the threshold of DIF could be cut down because the cost of DFI is relatively low. More and more poor people and disadvantaged groups can obtain financial services and increase availability. The service objects of DIF include those who do not accept financial services. By providing targeted financial services to rural residents, guiding funds to flow to rural areas has eased rural financial restraint. Thirdly, the characteristics of low-cost DIF enable rural residents to afford financial products, and this can help the poor people who receive financial support to make long-term consumption and investment decisions to rationally allocate resource use, improve resource utilization efficiency, increase income, and alleviate poverty. Fourth, DIF reduces the transaction cost of transfers and remittances and can share risks among residents. DIF provides digital financial products with high liquidity and high yield and promotes the improvement of residents' self-insurance capabilities.

Although the functions of DIF in implementing the inclusive nature, serving disadvantaged groups, and enhancing rural residents' enjoyment of modern financial service dividends are becoming increasingly apparent, there are still many limitations in the development of DIF. On the one hand, DIF relies on digital media, and the use of digital technology itself has certain thresholds. On the other hand, poor people cannot accept digital technology because of the shortage of education; they need the ability to use digital media and do not trust online lending. Financial services may be subjectively excluded, even if they have enough financial knowledge. In addition, poor people in rural areas need help paying for fixed expenditures such as smartphone bills and network fees, which will also cause digital exclusion

of DFI. Urban residents are more likely to grasp the concept of inclusive digital financial services with complex designs and are more able to accept financial support. Based on digital technology, DFI will inevitably create a “digital divide." The continuous innovation of financial technology and the deepening of DFI may intensify the self-exclusion of disadvantaged groups. The threshold of digital technology and the need for more financial knowledge have made using financial services such as online wealth management and online lending by low-income people using digital technology minimal.

At present, a small number of researchers have addressed the relationship between DIF and poverty alleviation. For example, Chen Yang and Zhao Bingqi (2019) found that DIF can reduce poverty. Liu Jinyi and Liu Chunyang (2020) found that DIF has promoted local economic and industrial development to a certain extent, created more economic opportunities for peasants, and directly or indirectly alleviated rural poverty. Huang Qian et al. (2019) addressed that the development of DIF is generally conducive to poverty alleviation. Increasing income and improving income distribution are essential for digital financial inclusion to promote poverty reduction. In addition, some documents have studied the Impact of DIF on the income of peasants. Liu Dan et al. (2019) found that the development of DIF plays a vital role in increasing the non-agricultural income of farmers in rural areas, and it has a positive spillover effect on neighboring provinces. Zhang Xun et al. (2019) analyzed the Impact of DIF on residents’ income from a micro level. The study found that China's digital finance has developed faster in backward areas and significantly increased the income of rural low-income groups.

The need for more data is the primary problem faced by digital financial inclusion research. Previous studies have mainly used provincial-level data to study DIF issues. The data between provinces tend to ignore regional differences, and the data sample size needs to be increased, affecting the empirical results' validity. This paper systematically sorts out the DIF and economic data of 1,736 counties in China from 2014 to 2017. It provides empirical evidence from the county level for analyzing the Impact of digital financial inclusion on residents' income growth. My research avoids endogenous issues, which are overcome using significant example dates and panel quantile regression. The quantile regression method is less susceptible to extreme values and can provide more comprehensive information from the perspective of sample stratification. At the same time, this paper introduces instrumental variables in the empirical study to ensure the robustness of the results.

The rest of this paper is arranged as follows: The second part mainly introduces the model setting and data sources. The third part is empirical analysis, mainly through quantile regression, to explore the Impact of digital Inclusive Finance on Residents’ income. The fourth part focuses on the regulatory effect of digital Inclusive Finance on Residents’ income. The fifth part is the conclusion.

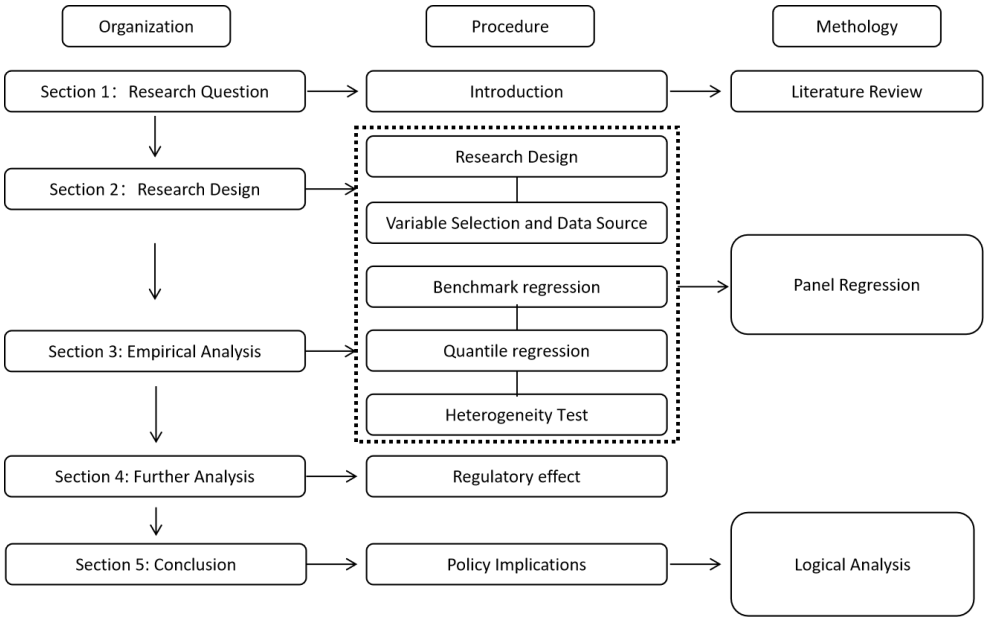

Figure 1. The logical organization of this paper

Literature Review

DFI remains the essence of traditional finance; only through internet technology can offline services be realized online. At the same time, it overcomes the disadvantages of traditional inclusive finance and boosts the growth of residents' incomes.

1. Weaken information barrier and ease information asymmetry

Traditional inclusive finance is often faced with information barriers, inability to accurately identify the assistance objectives, inability to effectively evaluate the assistance objectives, and lack of fairness and sustainability. Applying digital technology in inclusive finance can avoid the defects of traditional inclusive finance. For example, big data can help inclusive finance evaluate individuals' credit and micro-enterprises to provide corresponding financial services to some individuals who have been excluded by finance and accurately meet users' needs. The application of information technology and financial institutions can realize the comprehensive coverage of financial assistance and accurately grasp the relevant information and data of low-income people, vulnerable groups, and small and micro-enterprises.

2. Break through the limitation of time and space and reduce transaction cost

Financial technology innovation has gradually penetrated all aspects of the financial field. With the help of big data, blockchain, and other digital technologies, inclusive finance injects Internet thinking into traditional inclusive financial services, innovating business models, simplifying business processes, spanning time, spanning distance, integrating online and offline, integrating resources fully, and improving financial service efficiency, while reducing financing cost. The expansion of service scope also reduces the per capita management cost to a certain extent, which is based on the popularization of paperless electronic payment, reduces the transportation and management costs for financial institutions, and also makes consumer users feel convenient so that DFI has sustainable development momentum, improves economic efficiency and increases residents' income.

3. Convenient payment and improved availability of financial services

The payment function is the function that DFI can benefit the most groups and is also the most basic function. Mobile payment greatly facilitates individual life. As the infrastructure

of DFI, its convenience expands the coverage of financial services. The advantages of convenience, rapidity, low transportation and storage cost, and high efficiency make it more widely applicable, making up for the traditional Inclusive Finance. The network payment function is convenient for promoting and improving the financial availability in remote and economically underdeveloped areas, thus affecting their production and living and increasing income.

4. Optimize the precision and width of financial services

The data connection between multiple organizations can be constructed by digital technology. After collecting and sorting out these real-time, diversified, and valuable data and then analyzing and mining them, we can quickly evaluate small and micro enterprises and their owners' credit. Some problems of micro-enterprises, such as incomplete credit information and high credit risk, can also be solved by DFI to help them obtain financing support. In order to make the DFI in rural areas more available, expand the scope of services, and broaden the service channels, industry financial institutions actively build a comprehensive platform of DFI with "agriculture, rural areas, and farmers" as the object and construct using mobile internet technology, electronic machines and other terminals and convenient service points. Internet financing platforms' "innovative products" have not changed substantially compared to traditional financial products. However, the rise of network platform technology dramatically impacts the sales channels and methods of financial products, improving customer acquisition efficiency. The financial threshold and service cost have decreased, and the number of users who can enjoy financial services is gradually increasing.

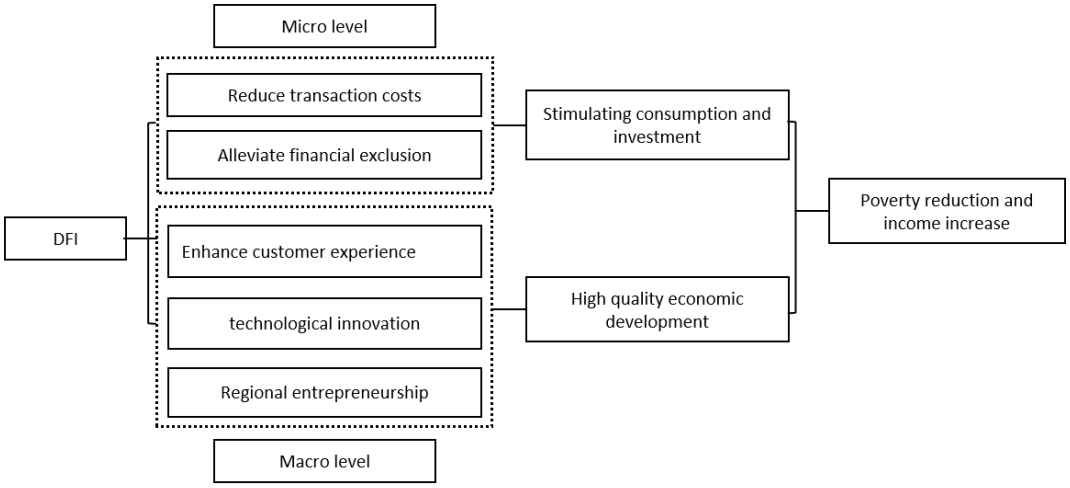

Figure 2. Logical relationship diagram between DFI and poverty reduction

Research Method and Research Design

The model between digital Inclusive Finance and residents' income is established.

$$LNFCIit=\alpha 0+\alpha 1DFI_{it}+\alpha 2CONTROLS+\phi_i+\varphi_t+\mu_{it} \quad (2.1)$$

In the formula (2.1), $LNFCI_{it}$ represents the income level, i represents the year, t represents the individual, α_0 is the intercept term, $CONTROLS$ is all the control variables

selected in this paper, ϕ_i represents the individual fixed effect, φ_t represents the time fixed effect, and μ_{it} is the random interference item.

Model (2.1), α1 indicates the overall Impact of the development of DFI on residents' income. Referring to the practice of Zhang Xun and Wan Guanghua (2019), quantiles were added to discuss the effect of digital financial inclusion on different income classes. Previous studies used mean regression, which is easily disturbed by extreme values. In contrast, quantile regression is a weighted average of the sum of absolute deviations, which can yield more effective and reliable results. Moreover, quantile estimation can stratify the sample for more comprehensive and directional information.

This paper selects the panel data of 1736 counties in China as the sample. The data mainly comes from the counties and various provinces' statistical yearbooks. Due to the difficulty of obtaining county-level data, individual years still need to be included. To ensure the integrity of the data, the interpolation method is used to complete the data, and the statistical description is shown in Table 1.

Table 1. Descriptive statistics

Variable	Non-poor County			National Poverty County			Full Sample		
	Number of samples	Mean	Standard deviation	Number of samples	Mean	Standard deviation	Number of samples	Mean	Standard deviation
CI	5128	4.4691	0.2844	1816	4.4665	0.3492	6944	4.4684	0.3027
DFL	5128	76.7865	23.8052	1816	74.1418	23.8556	6944	76.095	23.845
FL	5128	0.6897	0.4386	1816	0.6751	0.4834	6944	0.6859	0.4507
GIL	5128	0.279	0.214	1816	0.2847	0.2665	6944	0.2805	0.2289
IS	5128	0.1925	0.1026	1816	0.197	0.1098	6944	0.1937	0.1045
EL	5128	0.2832	0.1778	1816	0.2714	0.1526	6944	0.2801	0.1716
CFL	5128	2.884	0.3519	1816	2.8994	0.3426	6944	2.8881	0.3495
AML	5128	0.9966	0.7037	1816	1.1103	0.8849	6944	1.0263	0.7569
ML	5128	38.9746	16.1938	1816	39.2216	16.9658	6944	39.039	16.3983

Results

This paper divides the sample of county residents into national poverty counties and non-poverty counties. The main reasons are as follows: firstly, learning from the control group in natural experiments and stratified comparison makes the results more convincing; secondly, the sample size of the county is vast, and there is an imbalance in the development of each sample. There are also differences in the economic development levels of China's north and south, East, middle, and West. In order to ensure the reasonableness of the research, the difference needs to be discussed.

Table 2. Test results of the Fixed effects and GMM model

Variable	Full Sample		National Poverty County		Non-poor County	
	Fixed effects	GMM	Fixed effects	GMM	Fixed effects	GMM
DFI	0.00153***	0.00848***	0.00342***	0.00652***	0.00117***	0.00918***
	[0.0003]	[0.0004]	[0.0008]	[0.0009]	[0.0001]	[0.0005]
FL	-0.0404	-0.145***	-0.0881	-0.132***	-0.0281	-0.150***
	[0.0209]	[0.0075]	[0.0483]	[0.0147]	[0.0167]	[0.0087]
GIL	-0.0831	-0.234***	-0.433***	-0.167***	-0.271***	-0.281***
	[0.0677]	[0.0145]	[0.0855]	[0.0268]	[0.0551]	[0.0174]
IS	-1.276***	-0.636***	-0.897***	-0.771***	-1.172***	-0.561***
	[0.1059]	[0.0354]	[0.2361]	[0.0693]	[0.0981]	[0.0414]
EL	0.0186	0.0316	0.0152	-0.00560	0.0153	0.0478*
	[0.0118]	[0.0187]	[0.0435]	[0.0483]	[0.0141]	[0.0200]
CFL	0.175*	0.275***	0.684**	0.392***	0.0421	0.235***
	[0.0737]	[0.0088]	[0.2291]	[0.0193]	[0.0327]	[0.0097]
AML	0.0194	0.103***	-0.00104	0.100***	0.0313**	0.104***
	[0.0138]	[0.0037]	[0.0299]	[0.0070]	[0.0102]	[0.0045]
ML	0.00136***	0.00104***	0.00215**	0.000750	0.00130*	0.00111***
	[0.0138]	[0.0002]	[0.0008]	[0.0004]	[0.0005]	[0.0002]
Constant	4.067***	3.162***	2.504***	2.997***	4.492***	3.215***
	[0.2257]	[0.0412]	[0.7132]	[0.0848]	[0.1054]	[0.0471]
Obs	6944	6944	1816	1816	5128	5128
adj.R-sq	0.2060	0.44	0.3781	0.4828	0.3851	0.4146

Note: The "***", "**" and "*" indicate significant at the 1%, 5% and 10% levels, respectively.

Table 2 shows DFI's Impact on residents' income in poverty and non-poverty counties. According to model 3.1, fixed effects regression and GMM dynamic effects regression were performed on the sample data. Judging from the complete sample data, DFI is significantly positive at the 1% level, indicating that the development of DFI has raised residents' income levels and helped achieve inclusive income growth. Under the dynamic panel regression, most control variables are significant at the 1% level. This indicates that the DFI and government intervention can help increase residents' income and promote inclusive income growth in poverty and non-poverty counties. At the same time, the total sample is divided into poverty counties and non-poverty counties. From the data of both samples, DFI is significantly positive at the level of 1%, indicating that DFI can effectively promote inclusive income growth in both poverty and non-poverty counties..; in terms of financial development level, the fixed effect model is not significant, and there is a significant negative correlation at the 1% level under the dynamic panel effect of GMM, indicating that the level of financial development can reduce the income gap between poverty and non-poverty counties, and the effect is more evident in poverty counties; government intervention significantly narrows the gap between the poverty and non-poverty counties and promotes income growth in poverty and non-poverty counties; in terms of employment levels, EL shows non-statistical significance in poverty countries, and shows statistical significance at the 0.1 level in non-poverty countries, indicating that in poverty counties, the level of employment is lower, and the economic development is slower than non-poverty counties. It also indicates that there is significant room for an increase in the employment rate in poverty counties, thereby promoting residents' income growth; in poverty counties, communication facilities are more robust than in non-poverty counties, and the effect of poverty reduction and income increase is more prominent.

Conclusions

This paper combines the data of 1,743 counties in China from 2014 to 2017 and the Peking University Digital Financial Inclusive County Index and uses the panel instrumental variable quantile regression method to empirically analyze the effects of DFI on poverty reduction and income increase. The research results show that, on the whole, DFI has significantly promoted the income growth of residents in poverty-stricken and non-poor counties; the results of panel instrumental variable quantile regression show that DFI has a more obvious income increase effect on low-income groups. The regression results of sub-samples of poverty and non-poverty counties and the regression results of dividing the sample into the three major regions of the East, Central, and West indicate that digital financial inclusion has the most apparent effect on low-income groups. Digital inclusive finance can reduce poverty and increase income by improving the development level of traditional finance, promoting employment, and upgrading industrial structures. Based on what we have discussed above, this article proposes the following recommendations: Improve the infrastructure construction of digital finance in poor and remote areas, actively integrate information technology, and empower financial innovation and development. Relying on big data, cloud computing, the Internet of things, blockchain, and other information technologies, we can improve efficiency and reduce costs, more accurately serve target groups, extend their financial availability, ensure the effective operation of digital finance, and realize leapfrog development.

References

Chen, Y., & Zhao, B. (2019). Research on the poverty reduction effect of China's digital Financial inclusion. *Science Technology and Management, 21*(4), 63-68.

Ding, R., Liu, R., & Zhang, Q. (2019). Research on the Impact and mechanism of digital financial inclusion on the development of service industry——Based on the empirical analysis of provincial panel data. *Finance and Economy,* (7), 4-10.

Guo, F., & Wang, Y. (2020). Traditional financial foundation, knowledge threshold, and digital finance going to the countryside. *Financial Research, 46*(1), 19-33.

He, D. (2019). *Research on the Impact of digital financial inclusion development on the income gap between urban and rural China.* Shandong University, China.

Huang, Q., Li, Z., & Xiong, D. (2019). The effect of digital financial inclusion in poverty reduction and its transmission mechanism. *Reform,* (11), 90-101.

Huang, Y., & Huang, Z. (2018). China's digital finance development: Present and future. *Economics (Quarterly), 17*(4), 1489-1502.

Liu, D., Fang, R., & Tang, Y. (2019). The spatial spillover effect of the development of Digital financial inclusion on farmers' non-agricultural income. Research in Financial Economics, 34(3), 57-66.

Liu, J., & Liu, C. (2020). The effect of digital financial inclusion in poverty reduction in rural areas: Effects and mechanisms. *Collected Essays on Finance and Economics,* (1), 43-53.

Li, M., Feng, S, & Xie, X. (2020). Research on the heterogeneity of digital financial inclusion on urban-rural income gap. *Journal of Nanjing Agricultural University (Social Science Edition), 20*(3), 132-145.

Liang, S., & Liu, P. (2018). Digital financial inclusion, education constraints and the effect of urban and rural income convergence. *Sankei Review, 9*(2),128-138.

Meng, N., Su, Q., & Lei, H. (2020). How does financial technology affect banking competition. *Finance and Trade Economics, 41*(3), 66-79.

Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review, 18*(4), 329-340.

Sutherland, W., & Jarrahi, M. H. (2018). The sharing economy and digital platforms: A review and research agenda. *International Journal of Information Management, 43,* 328-341.

Ren, B., & Li, L. (2019). Does digital financial inclusion promote inclusive growth in rural areas——Based on the survey data of 2114 rural residents in Beijing, Tianjin and Hebei. *Modern Finance (Journal of Tianjin University of Finance and Economics), 39*(4), 3-14.

Tang, W., Li, S., & Tao, Y. (2019). Digital financial inclusion development and industrial structure upgrading: empirical evidence from 283 cities. *Journal of Guangdong University of Finance and Economics, 34*(6), 35-49.

Tao, J., & Tian, J. (2011). Analysis of the income effect of my country's rural financial Development from the perspective of county-level rural areas: an empirical study from
panel data of 1772 counties (cities). *Journal of Huazhong Agricultural University (Social Science Edition),* (6), 24-28.

Wang, J., Yao, S., & Wang, W. (2020). Research on the defects of digital financial inclusion Moreover, the generation of new financial exclusion——Based on the rural perspective. *Agricultural Economy,* (2), 94-97.

Xia, Y. (2018). *Research on the Impact of China's digital financial inclusion development on narrowing the urban-rural income gap*. Yunnan University of Finance and Economics, China.

Xing, Y. (2017). Inclusive finance: A basic theoretical framework. *Social Science Digest,* (1), 61-62.

Zhang, X., Wan, G.H., Zhang J.J., & He, Z.Y. (2019). Digital economy, inclusive finance and inclusive growth. *Economic Research, 54*(8), 71-86.