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ORIGINAL RESEARCH ARTICLE

Discussion on the impact of digital inclusive finance on high quality economic development: Empirical research based on cities in the Yangtze River Delta

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ABSTRACT

The article combines the two main development lines of digital inclusive finance and high-quality economic development in the new era, with 41 cities in the Yangtze River Delta region as the research object. The digital inclusive finance development index is used to measure the level of digital inclusive finance development in cities, and the entropy weight TOPSIS method is used to measure the level of high-quality economic development in cities. A panel model is used to analyze the impact of digital inclusive finance on high-quality economic development. The conclusion is that the development level of digital inclusive finance is on the rise in all cities, but the regional development imbalance is also very obvious. Digital inclusive development has a positive promoting effect on the high-quality economic development of the Yangtze River Delta region. In addition, there is regional heterogeneity in the promoting effect of digital inclusive finance on high-quality economic development. With the improvement of urban level in the Yangtze River Delta region, the promoting effect of digital inclusive finance on high-quality economic development continues to improve. To this end, relevant policy recommendations are proposed. Firstly, to accelerate the development of digital finance and promote high-quality economic development. Secondly, to increase government investment and strengthen new infrastructure construction. Thirdly, to focus on information technology construction and enhance the level of digital technology. Fourthly, to deepen regional coordinated development and improve the quality of economic development.

Keywords: Digital Inclusive Finance; High-Quality Economic Development; Panel Data Model

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1. Introduction

In the context of the new era's development pattern, digitization is becoming the core strategic direction of global scientific and technological change. Giving full play to digital resources and promoting digital transformation has become an important path for high-quality economic development[1]. With the introduction of the concept of digital inclusive finance, the relationship between digital inclusive finance and economic development has become a research hotspot[2]. In this situation, China urgently needs to accelerate the digitization of industries and promote new forms of industry. Utilize the effectiveness of digital resources to provide digital support for economic development and promote the application of smart governance in the economy. With advantages such as complete industrial varieties, abundant resources, and solid development foundation, the Yangtze River Delta Economic Belt, which holds a pivotal position in the Chinese economy, will undoubtedly become a demonstration zone for high-quality development

of the Chinese economy[3]. In building a new development pattern, the Yangtze River Delta region has the most comprehensive advantages. Firstly, the Yangtze River Delta region is one of the most active regions in China's economic development, accounting for about a quarter of the country's total economic output. The fact that the population of the Yangtze River Delta only accounts for about one tenth of the country's total indicates that it has strong market potential in China's economic development. Secondly, the Yangtze River Delta is the center of China's industrial development, with nearly a century of industrial development history. Thirdly, the Yangtze River Delta region has talent advantages and is a gathering place for first-class universities in China. It can be said that the Yangtze River Delta is one of China's intellectual centers. Finally, the Yangtze River Delta has become the core force for China's technological development. Up to now, the Yangtze River Delta region has gathered nearly 1/3 of the national R&D expenditure, 1/3 of major scientific and technological infrastructure, 1/5 of State Key Laboratory and national high-tech zones. In the context of dual circulation, China's Yangtze River Delta regional integration strategy provides a focus for the development of digital finance, creating more possibilities and new opportunities. Studying the impact mechanism of digital inclusive finance on the high-quality economic development of the Yangtze River Delta region can provide ideas for the construction of China's new development pattern. Can digital inclusive finance become a potential driving force for economic development, what impact will digital inclusive finance have on regional economies? To explore the above issues, the article will combine the two main development lines of digital inclusive finance and high-quality economic development in the new era, focusing on analyzing the relationship between digital inclusive finance and high-quality economic development in the Yangtze River Delta region, exploring the impact of digital inclusive finance on the development of the Yangtze River Delta region's economy, empowering the high-quality economic development of the Yangtze River Delta region, and constructing a development mechanism for digital finance in the Yangtze River Delta region, providing reference for the development of other similar regions.

2. Literature review

With the widespread recognition of the importance of inclusive financial systems in the political community, more and more countries are beginning to attach importance to inclusive finance, which has become a policy priority for many countries[4]. Digital inclusive finance is a comprehensive concept that is relatively new to China. It utilizes the advantages of mathematical finance sharing, convenience, and security, and combines big data, artificial intelligence, and other technologies to comprehensively improve financial level[5]. Therefore, it is necessary to measure the development level of digital inclusive finance from multiple dimensions and indicators. The inclusive finance indicator measurement system proposed at the 2013 G20 Summit in St. Petersburg, Russia includes three levels: availability, usage, and financial services. In response to the call of the G20 Hangzhou Summit in 2016 for the "G20 Advanced Principles of Digital Inclusive Finance"[6], the People's Bank of China established a set of China's Inclusive Finance Indicator System at the end of 2016, which measures the development level of inclusive finance from three dimensions: usage, availability, and quality. The digital era has attracted great attention to digital inclusive finance.

Before the concept of "high-quality economic development" was proposed, the economic community generally used the quality of economic growth to discuss the issue of "quality" of economic growth[7]. Based on economic growth theory, Mei and Chen[8] used total factor productivity or green total factor productivity to measure the level of high-quality economic development. For China, shifting from a more extensive development model to a green development model driven by total factor productivity to achieve high-quality economic development is an urgent issue[9]. Unlike other countries, China needs a development path that is suitable for its national conditions to meet the growing demand for a Chinese lifestyle[10]. To achieve high-quality economic development in China, it is necessary to comprehensively, accurately, and thoroughly implement the new development concept of "innovation, coordination, green, openness, and sharing" proposed by

the Chinese government[11]. Chen and Huo[12] first established an evaluation index system for the high-quality development level of China's economy based on the new development concept, and then used principal component analysis to measure the quality of economic development. Ru *et al.*[13] used the input-output efficiency of economic growth as the criterion for evaluating QEG and constructed a comprehensive indicator system for input-output evaluation of economic growth quality. Simultaneously using the GML index method to calculate the quality of the economic growth index (QEGI) for 30 provinces in China.

Since 2000, research has mainly focused on the issue between inclusive finance and economic development[14], Karim *et al.*[15] found that there is a threshold effect on the relationship between inclusive finance and economic growth. In recent years, research on the impact of digital inclusive finance on economic development has mainly focused on empowering high-quality economic development through pathways such as promoting employment, stimulating consumption, and narrowing economic disparities. Ethan and Mollick[16] verified that digital inclusive finance reduces the threshold and cost of financial services, effectively stimulating entrepreneurship and providing a wider range of employment opportunities for employees. As a result, residents' income has increased, providing more new opportunities for high-quality economic development. Ahmad *et al.*[17] found that digital inclusive finance improves the efficiency of financial factor resource allocation, increases personal consumption expenditure and investment expenditure of small and medium-sized enterprises, thereby improving the quality of economic development. Kapoor[18] believes that the development of inclusive finance can enable all citizens to benefit from economic and financial development, enhance social equity and harmony, and promote stable economic growth. Chen and Kinkyo[19] pointed out that inclusive finance has poverty alleviation characteristics, which can narrow economic disparities and improve the overall economic level of society. In addition, in the stage of high-quality economic development, sustainable economic growth is also worth paying attention to. Gao *et al.*[20] analyzed the panel data of 283 prefecture level cities and above in China, and found that financial development is conducive to economic growth, and the effects of different types of cities are somewhat different. Sun and Tang[21] conducted empirical analysis on the impact of digital inclusive finance on sustainable economic growth in China. The study showed that digital inclusive finance contributes to sustainable economic growth in China, and the breadth of coverage of digital inclusive finance is an important factor in promoting sustainable economic growth.

Based on the above literature, it is not difficult to see that there have been rich discussions and studies on digital inclusive finance and economic development. However, the impact of digital inclusive finance on high-quality economic development is still worth further exploration. Firstly, a unified and reliable evaluation system has not yet been established for building an evaluation system for high-quality economic development. The indicators selected by most scholars often focus on a certain aspect and cannot be further explored from a comprehensive and specific dimension. Secondly, current research on high-quality economic development is mainly concentrated at the provincial level, with less research on cities. Even if there is research on cities, most of them focus on cities in China. Few cities in the Yangtze River Delta region are taken as research objects. Thirdly, for the development of digital inclusive finance, most of them directly measure it using the digital inclusive finance development index. This article uses the digital inclusive finance development comprehensive index to comprehensively measure the development of digital inclusive finance[7].

This article focuses on the Yangtze River Delta region of China and considers multidimensional factors that promote high-quality economic development. The panel data model is used to explore the specific impact mechanism of digital inclusive finance and high-quality economic development in the Yangtze River Delta. The innovation of this article is: firstly, the innovation of the research object, selecting the Yangtze River Delta region as the research object, and focusing the research on this specific region. The second is to establish an evaluation system for high-quality economic development at the city

level, and use the entropy weight TOPSIS method to calculate the high-quality economic development index of each city. The third is to conduct heterogeneity analysis on cities in different provinces and levels in the Yangtze River Delta region.

3. Measurement of regional digital inclusive finance and high quality economic development level

3.1 Measurement of regional digital inclusive finance level

The digital inclusive finance index in this article selects the academically authoritative Peking University Digital Inclusive Finance Index, which mainly includes variables such as the total digital inclusive finance index, coverage breadth, depth of use, and digital technology support to comprehensively measure the development level of digital inclusive finance in all prefecture level cities of 31 provinces in China. This article selects the comprehensive index of digital inclusive finance from 41 cities in the Yangtze River Delta region from 2011 to 2020 as the data basis for the development level of digital finance in accordance with the research direction of the topic. The descriptive statistical results of the digital inclusive finance index are shown in **Table 1**.

Table 1. Descriptive statistical results of the digital inclusive finance index

Year	Sample	Minimum	Maximum	Mean	Variance
2011	41	27.08	86.51	63.93	15.68
2012	41	69.89	147.96	107.15	17.81
2013	41	104.04	189.27	145.74	19.59
2014	41	124.95	199.40	161.75	17.95
2015	41	153.13	231.13	189.39	19.28
2016	41	180.11	246.92	212.75	17.26
2017	41	206.39	285.43	240.90	19.07
2018	41	216.57	302.98	256.06	20.79
2019	41	229.73	321.65	270.48	21.84
2020	41	242.51	334.48	283.15	21.26

From the table, it can be seen that the development level of digital inclusive finance has been on the rise in all cities from 2011 to 2020, but the regional development imbalance is also very obvious.

3.2 Measurement of high-quality regional economic development index

3.2.1 The connotation and characteristics of high-quality economic development

High quality economic development means sustainable economic growth, coordinated regional development, green innovation development, and enhanced sense of gain for the people[22]. So, for the selection of indicators for high-quality economic development, this article will consider the hierarchical nature of the measurement indicators and whether the data is scientific and available. Finally, based on the meaning of high-quality economic development mentioned above, we will select four dimensions: development status, social response, ecological construction, and regional coordination level to measure the high-quality economic development index. Among them, we will select the total economic output of each region as the development status indicator. The three aspects of economic growth and economic openness are described as secondary indicators; we describe the social response indicators based on the education level, medical level, population mortality rate, and per capita consumption expenditure of each region; we use environmental pollution and urban greening as indicators for ecological construction; we use the regional coordination level and urban-rural coordination level to describe the level of regional coordination in various regions. The construction of the evaluation system for high-quality economic development level in this article is shown

in **Table 2**.

Table 2. Evaluation system for high-quality economic development level

Criteria layer	First level indicator	Second level indicator	Attribute
Economically high-quality development index (EQ)	Development situation (A_1)	Economic aggregate (B_1)	+
		Economic growth (B_2)	+
		Economic development (B_3)	+
	Social response (A_2)	Education level (B_4)	+
		Medical level (B_5)	+
		Population mortality rate (B_6)	-
		Per capita consumption expenditure (B_7)	+
	Ecological construction (A_3)	Environmental pollution (B_8)	-
		Urban greening (B_9)	+
	Regional coordination (A_4)	Regional coordination level (B_{10})	+
		Urban-rural coordination level (B_{11})	+

3.2.2 Measurement indicators and methods

This article uses the TOPSIS model based on entropy weight method to measure the level of high-quality economic development in the Yangtze River Delta region. The entropy method is a method to comprehensively evaluate the evaluation object by using objective evaluation. In the process of weighting the secondary indicators of the economic high-quality index in this paper, we use this method to obtain the entropy weight of each indicator based on the difference level between the indicators, and then use the calculated entropy weight to modify the weight of secondary indicators such as development, social response, ecological construction, and regional coordination level. Thus, obtaining more objective weights compared to other weighting methods. The weighting of each indicator is shown in **Table 3**.

3.2.3 Result analysis

After weighting each indicator, the TOPSIS method was used to calculate the high-quality development index of each city in the Yangtze River Delta region. The resulting high-quality economic development index of each city in the Yangtze River Delta region is shown in **Table 4**.

Comparing the economic high-quality index of each region in 2011 and 2020, it is found that the economic high-quality index of each region has increased from an average value of 0.22 to 0.25, and the economic development level of each city is on the rise, and the economic high-quality development index has improved to a certain extent. The main reason is that China has entered the stage of the economic New Normal, and the goal of economic development has achieved the transformation from quantity to quality, Shift from pursuing the quantity of economic growth to improving the quality and efficiency of economic growth.

4. Model settings

4.1 Model selection

Panel data models can generally take three forms. They are the Mixed Estimation Model (POOL-Model), Fixed Effects Model (FE-Model), and Random Effects Model (RE-Model). In current research, most use the Fixed Effects Model; but for the sake of rigor, this article chooses to determine the type of model through data testing. The specific inspection results are shown in **Table 5**.

Table 3. Comparison of evaluation system indicator weights.

Index	Specific measurement method	Weight of indicators	
		2011	2020
Economic aggregate	Real per capita GDP of the region	0.074	0.073
Economic growth	GDP average annual growth rate	0.039	0.047
Economic development	Total import and export volume of economic development/GDP	0.156	0.193
Education level	Number of students in universities per 10,000 population	0.136	0.134
Medical level	Number of doctors per 10,000 population	0.050	0.092
Population mortality rate	Population mortality rate	0.067	0.020
Per capita consumption expenditure	Annual per capita consumption expenditure of urban households	0.095	0.067
Environmental pollution	Total amount of wastewater discharge	0.008	0.008
Urban greening	Urban green space area	0.242	0.238
Regional coordination level	Per capita GDP/national per capita GDP	0.073	0.061
Urban-rural coordination level	per capita consumption expenditure in rural areas/per capita consumption expenditure in urban areas	0.061	0.046

Table 4. High-quality economic development index in the Yangtze River Delta region

Region	High-quality economic development index		Region	High-quality economic development index	
	2011	2020		2011	2020
Average value	0.22	0.25			
Shanghai	0.56	0.60	Zhoushan	0.40	0.41
Nanjing	0.67	0.62	Lishui	0.20	0.17
Wuxi	0.30	0.29	Quzhou	0.18	0.14
Xuzhou	0.17	0.14	Taizhou	0.26	0.20
Changzhou	0.31	0.26	Hefei	0.30	0.32
Suzhou	0.40	0.33	Wuhu	0.25	0.21
Nantong	0.19	0.20	Ma’anshan	0.23	0.21
Suqian	0.19	0.13	Tongling	0.53	0.42
Yangzhou	0.23	0.20	Anqing	0.11	0.12
Lianyungang	0.23	0.15	Chuzhou	0.16	0.14
Zhenjiang	0.25	0.22	Chizhou	0.17	0.14
Yancheng	0.16	0.12	Xuancheng	0.12	0.11
Huaian	0.16	0.13	Suzhou	0.12	0.08
Taizhou	0.20	0.18	Fuyang	0.08	0.08
Hangzhou	0.41	0.37	Lu’an	0.13	0.13
Ningbo	0.39	0.35	Bengbu	0.16	0.11
Wenzhou	0.23	0.22	Huainan	0.16	0.11
Huzhou	0.23	0.21	Huaibei	0.14	0.13
Jiaxing	0.30	0.27	huangshan	0.16	0.13
Shaoxing	0.30	0.26	Bozhou	0.11	0.09
Jinhua	0.26	0.34			

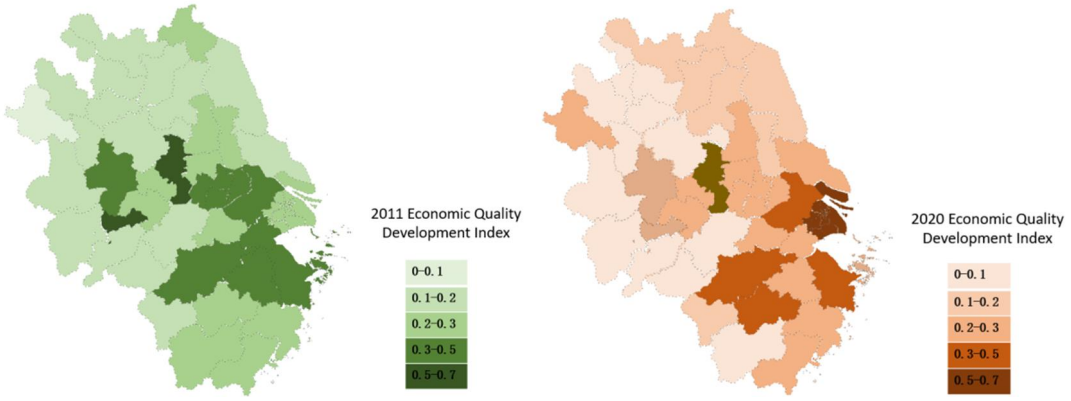

Figure 1. Spatial distribution of high-quality economic development level in the Yangtze River Delta region.

Table 5. Inspection results

Test type	Statistics	P	Better model
F-test	28.89	0.000***	FE-Model
Breusch-Pagan-test	30.97	0.000***	RE-Model
Hausman-test	23.74	0.000***	FE-Model

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

In terms of the selection method of panel data model form, we often use *F*-test to decide whether to choose POOL-Model or FE-Model, Brusch Pagan-test to decide RE-Model or POOL-Model, and Hausman-test to decide RE-Mode or FE-Model. According to the *F*-test, the significance *P*-value is 0.000^{***}, showing significance at the level, indicating that the FE-Model is better. According to the Breusch Pagan-test, the significance *P*-value is 0.000^{***}, showing significance at the level, indicating that the RE-Mode is better. According to the Hausman-test, the significance *P*-value is 0.000^{***}, showing significance at the level, indicating that the FE-Model is better. Therefore, in summary, it can be determined that the fixed effects model (FE) is more suitable. Based on theoretical analysis, we construct the following benchmark regression model for panel data:

$$EQ_{it} = \beta_i + \beta_t + \alpha_0 + \alpha_1 NF_{it} + \alpha_2 INF_{it} + \alpha_3 GOV_{it} + \alpha_4 TH_{it} + \alpha_5 LAB_{it} + \varepsilon_{it} \quad (1)$$

EQ_{it} is the dependent variable, which is the high-quality economic development index. NF_{it} is the core explanatory variable, which is the digital inclusive financial index. INF_{it} is the information technology level, GOV_{it} is the government investment, TH_{it} is the Theil index, and LAB_{it} is the labor investment. They are all control variables in the mechanism of digital inclusive finance affecting high-quality economic development. β_i is the individual fixed effects, β_t is the time fixed effects, and ε_{it} is the random perturbation terms.

4.2 Variable selection

4.2.1 Core explanatory variables

This article selects the core explanatory variable—the level of digital finance development. Regarding the level of digital finance development, many scholars choose to use the China Digital Inclusive Finance Index compiled by the Digital Finance Research Center of Peking University to measure the level of digital finance development. Our research also follows the research ideas of scholars in this regard, selecting the digital inclusive finance development index from 2011 to 2020 to measure the level of digital finance development in various cities in the Yangtze River Delta region from 2011 to 2020.

4.2.2 Explained variable

This article mainly explores the impact of digital finance development on the high-quality economic development of the Yangtze River Delta region, so the high-quality economic development index (EQ) constructed earlier is selected as the explanatory variable of the model. The higher the index of high-quality economic development, the better the quality of economic development.

4.2.3 Control variables

Information technology level (INF). We choose the logarithm of the number of mobile phone users at the end of the year as the indicator for measuring the level of informatization. With the rapid growth of the Chinese economy, there has been significant development and progress in China's informatization, and the continuous promotion of policies has led to a deeper development of informatization construction. On the one hand, the level of informatization reflects the high-quality development level of the economy, and on the other hand, informatization promotes the historical process of social and economic development towards efficiency and quality. A high level of informatization can promote the development of the economy towards efficiency and quality, and further promote high-quality economic development.

Government investment (GOV). We measure the proportion of government expenditure in the Yangtze River Delta region using the indicator of government investment. The government plays a very important role in economic development. On the one hand, it can formulate macro policies, which will to some extent promote the direction of economic development and promote the speed of economic development.

Theil index (TH). The Thiel index is a measure of income inequality. The income gap reflects the coordination of economic development, and the higher the coordination of economic development, the more conducive it is to high-quality economic development. Therefore, the Thiel index will have an impact on the size of the high-quality economic development index.

Labor investment (LAB). The indicator of labor input is measured as the logarithm of the number of employed people. The increase in employment opportunities and the increase in the number of employees can help improve people's livelihoods, promote harmonious social development, and contribute to sustained and healthy economic development. Therefore, the more labor input, the more it promotes high-quality economic development in the region.

4.3 Sample selection and data processing

Control variables for logarithmic processing. For the measurement of informatization level and labor input, we take logarithmic values for each indicator, which can to some extent reduce the calculation scale of the model and improve work efficiency. According to the expression of the Thiel index, combined with indicators to measure income inequality, we obtain the following expression:

$$\mathrm{TH} = \frac{1}{n} = \sum_{i=1}^{n} \frac{y_i}{\bar{y}} \ln\left(\frac{y_i}{\bar{y}}\right) \tag{2}$$

The Thiel index is a measure of the degree of income gap, representing the per capita income of the city and the average income of all cities from 2011 to 2020, respectively. Calculate the Thiel index according to the above Equation (2). We will integrate the processed data and use Stata software to perform descriptive statistics on variables. The specific descriptive statistical results are shown in **Table 6**.

5. Empirical analysis

5.1 Basic regression results

We conducted regression analysis based on the collected and calculated variable data, and analyzed the results of the non-added control variable column (1), the added control variable column (2), and the fixed effects columns (3) and (4) after adding time variables. The benchmark regression coefficient results are shown in **Table 7**.

Table 6. Descriptive statistics of variables

Variable	Observations	Mean	S.D.	Minimum	Maximum
High-quality economic development index	410	0.23	0.13	0.08	0.67
Digital inclusive finance index	410	0.54	0.23	0.00	1.00
Information technology level	410	6.10	0.79	4.07	8.30
Government investment	410	0.17	0.06	0.08	0.36
Theil index	410	0.02	0.00	0.02	0.02
Labor investment	410	5.66	0.62	3.82	7.40

Table 7. Regression coefficient results

Variable	(1)	(2)	(3)	(4)	(5)
Digital inclusive finance index (NF)	0.36^{***}	0.32^{***}	0.32^{***}	0.32^{***}	0.30^{***}
Information technology level (INF)	-	0.05^{***}	0.05^{**}	0.05^{**}	0.05^{**}
Government investment (GOV)	-	0.24^{***}	0.24^{**}	0.24^{**}	0.14^{**}
Theil index (TH)	-	-10.87^{*}	-20.54^{*}	0	-11.70^{*}
Labor investment (LAB)	-	0.04^{**}	0.02^{**}	0.05^{*}	0.03^{**}
Individual fixed effects	Yes	Yes	No	Yes	Yes
Fixed time effect	Yes	Yes	Yes	No	Yes
Observations	410	410	410	410	400
R^2	0.49	0.51	0.51	0.51	0.48

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

The model results show that the development level of digital inclusive finance in the Yangtze River Delta region has a significant positive impact on high-quality economic development, indicating that the development of digital inclusive finance can promote high-quality economic development in the region. The higher the development level of digital inclusive finance, the higher the high-quality economic development. Compared with traditional finance, digital finance can provide more comprehensive and convenient services. The development of digital inclusive finance can promote the development of high-tech industries and provide strong support for high-quality economic development. For the control variables, the coefficients of informatization level, government investment, and labor investment are significantly positive, that is, the higher the informatization level, the more government investment, and labor investment, the higher the level of high-quality economic development. Informatization construction can improve the level of digital technology in the region. Government investment is mainly used to strengthen infrastructure construction. More labor input can increase employment in the Yangtze River Delta, and all three can effectively promote economic development. The coefficient of the Theil index is significantly negative, and the Theil index reflects a negative correlation between regional economic differences and high-quality economic development. The greater the regional economic differences, the lower the level of economic development quality.

5.2 Robustness test

In the robustness test, this paper uses the method of changing the sample size to eliminate outliers in the sample. Then perform regression on the model. The specific regression results are shown in column (5) of **Table 7**. It can be seen that compared to column (2), the data of each variable in column (5) has slightly changed. However, there was no significant change in the sign and significance of each variable, indicating that the results of this study are robust.

5.3 Heterogeneity analysis

5.3.1 Urban level heterogeneity

This article divides the sample into provincial capital cities, Shanghai, and non-provincial capital cities for regression based on the different levels of cities in the Yangtze River Delta region. The empirical results are shown in **Table 8**. The regression results for non-provincial capital cities are shown in column (1), while the regression results for provincial capital cities and Shanghai are shown in column (2). The data shows that digital inclusive finance promotes high-quality economic development in cities of different levels. At the same time, with the improvement of urban level, the role of digital inclusive finance in promoting high-quality economic development continues to improve.

Table 8. Heterogeneity analysis

Variable	(1)	(2)	(3)	(4)	(5)
Digital inclusive finance index (NF)	0.95***	0.24***	0.33***	0.36***	0.42**
Information technology level (INF)	0.36**	0.01*	0.14*	0.08*	0.07**
Government investment (GOV)	0.07**	0.22***	0.08**	0.11**	0.10*
Theil index (TH)	−10.75**	−26.59**	−11.91*	−24.36*	−13.38**
Labor investment (LAB)	0.14*	0.04*	0.09***	0.24**	0.02**
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
Fixed time effect	Yes	Yes	Yes	Yes	Yes
Observations	40	370	160	110	130
R^2	0.49	0.51	0.59	0.39	0.60

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

5.3.2 Provincial heterogeneity

This article divides the sample into Anhui Province, Zhejiang Province, and Jiangsu Province for regression analysis based on the provinces where 40 cities are located in the Yangtze River Delta region. The empirical results are shown in columns (3) to (5) of **Table 8**, respectively. From the results, it can be seen that digital inclusive finance in various provinces has a promoting effect on the high-quality economic development of cities, and the order of promoting effect is: Anhui Province < Zhejiang Province < Jiangsu Province.

5.4 Endogeneity testing

As the exploration of the impact of digital inclusive finance on high-quality economic development is a relatively macro issue, there may be some endogeneity issues in the basic regression model. This can lead to biased or even invalid coefficient estimates. Therefore, in order to enhance the rigor of empirical results, this article constructs a lagged one period digital inclusive finance index for instrumental variable regression. The regression results are shown in **Table 9**.

The regression results based on instrumental variable method are shown in **Table 9**. The results indicate that the estimated coefficients of the instrumental variables in the first phase are significantly not zero. The regression results of the second phase indicate that the development of digital inclusive finance still promotes high-quality economic development. Therefore, the regression results of the model in this article are relatively reliable.

6. Conclusions, policy recommendations, research limitations and future research

6.1 Research conclusions

This paper mainly explores the impact of digital financial development on high-quality economic development in the Yangtze River Delta. Taking the panel data of cities in the Yangtze River Delta from 2011 to 2020 as the research sample, this paper establishes a panel data model to explore the impact

Table 9. Endogeneity testing

Variable	Phase 1 (dependent variable: NF)	Phase 2 (dependent variable: EQ)
Digital inclusive finance index	-	0.24**
L. digital inclusive finance index (lagging for one period)	0.86***	-
Control variable	Yes	Yes
Individual fixed effects	Yes	Yes
Fixed time effect	Yes	Yes
Observations	369	369
R^2	0.94	0.18

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

mechanism between the two, and draws the following conclusions:

Firstly, the development level of digital inclusive finance is on the rise in all cities, but regional development imbalances are also very evident.

Secondly, the core explanatory variable, the digital inclusive finance index, can be obtained from the model solution results, which has a positive promoting effect on high-quality economic development. The improvement of the development level of digital inclusive finance will drive high-quality economic development in the region, and digital inclusive finance has the potential to become an important source of driving force for high-quality economic development in the Yangtze River Delta region.

Thirdly, based on the heterogeneity results, we found that digital inclusive finance not only has a promoting effect on high-quality economic development, but also has regional heterogeneity in its promoting effect. With the improvement of urban level in the Yangtze River Delta region, the promoting role of digital inclusive finance in high-quality economic development continues to improve.

Fourthly, the control variable also has a certain effect on the dependent variable. For this article, the coefficient between informatization level and government investment is positive, which has a positive effect on high-quality economic development. The coefficient of the Thiel index is negative and has a negative impact on high-quality economic development. The Thiel index is mainly an income gap index. The larger the income gap, the weaker the coordination of regional economic development, and the lower the index of high-quality economic development in the region.

6.2 Policy recommendations

Based on the research results mentioned above, the following suggestions are proposed.

Firstly, to accelerate the development of digital finance and promote high-quality economic development. Digital finance transcends spatial and geographical barriers, improves capital liquidity, and accelerates the flow of capital between different industries. At the same time, the development of digital finance can optimize the industrial allocation of capital, promote the development of advanced industries, and shorten the time for capital to gather in inefficient industries. At the same time, we will assist in innovation and entrepreneurship activities in underdeveloped areas, reduce the gap between regions, enable more people to enjoy the development dividend, and promote harmonious social development. The improvement of social harmony promotes high-quality economic development.

Secondly, to increase government investment and strengthen new infrastructure construction. Increasing government investment and strengthening the development of new infrastructure requires local governments to further promote the transformation and upgrading of digital finance. The continuous development of digital inclusive finance can promote high-quality economic development, which in turn promotes the integration and development of digital industries, forming a virtuous cycle.

Thirdly, focusing on informatization construction and promoting the digital transformation model

shows that informatization level has a positive effect on high-quality economic development. Focusing on informatization level construction and enhancing the level of digital technology can empower social and economic development, thus contributing to high-quality economic development.

Fourthly, to deepen regional coordinated development and improve the quality of economic development. There is a negative correlation between the Thiel index, which measures the income structure gap, and high-quality economic development. The larger the Thiel index, the smaller the high-quality economic development index. The Thiel index selected in this article to some extent reflects the level of regional coordinated development in the Yangtze River Delta region. Therefore, deepening regional coordinated development can help improve the quality of economic development and promote high-quality economic development.

6.3 Research limitations, and future research

Although we have established an urban level economic high-quality development evaluation system to measure the economic high-quality development index of the Yangtze River Delta region, this evaluation system still has certain limitations. Firstly, some indicators for opening up to the outside world have not been taken into account, such as the total import and export volume and the actual amount of foreign investment utilized, which may result in a lack of comprehensiveness in the indicator system. In the future, it is necessary to further improve the indicator system, incorporate more comprehensive and targeted factors, and build a more scientific and complete evaluation system. Secondly, the paper analyzes the impact mechanism of digital inclusive finance on high-quality economic development in the Yangtze River Delta through panel data. However, the current work does not further explore the impact mechanism of digital inclusive finance in dimensions. Future work should focus on analyzing the impact of digital inclusive finance in different dimensions on high-quality economic development.

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Conflict of interest

The authors declare no conflict of interest.

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