Determinants of Digital Inclusive Financial Services in Anhui Province, China: The Mediating Role of Financial Performance

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Abstract. Digital inclusive financial service (DIFI) transcends spatial and temporal limits, aiding resource allocation between rural and urban areas, which is crucial for integrated urban-rural financial service systems. Anhui Province, in southern China, has seen rapid economic growth but lags in DIFI development, facing issues like urban-rural disintegration and exclusion from modern financial services. Most DIFI studies are macro-level or focus on a single factor, often overlooking regional financial service mechanisms. This study examines DIFI's spatial differentiation and contributing factors in Anhui using panel data from 16 cities (2011-2022). It finds varying economic and DIFI development across cities, with the gap in financial service accessibility narrowing in the past five years. Key factors influencing DIFI include economic growth, infrastructure, urban-rural incomes, and human resources; financial service performance significantly mediates DIFI development. DIFI promotes urban-rural equality, financial service allocation efficiency, and socio-economic sustainability by boosting GDP, fiscal expenditure, traffic density, Internet penetration, narrowing income gaps, and improving education. Challenges include rural digital divides, low digital financial literacy, mismatched financial products/services, and incomplete financial service guarantee systems. Recommendations include accelerating digital infrastructure, enhancing digital literacy, developing diverse DIFI products, improving financial service regulations/policies, and strengthening policy coordination to support urban-rural integrated development.

Keywords: Digital inclusive finance, Financial inclusion; Financial performance; Influencing factors; Panel data

1. Introduction

The notion "inclusive finance", first proposed by the United Nations in 2005, accounts for a new financial concept in Financial Geography Theory, and refers to establish a multi-level and comprehensive financial service system so that safe, convenient and affordable financial services can be available to less-developed and micro enterprises (Leyshon & Thrift, 1993).

Financial services are gaining momentum across China, as evidenced by a range of financial statistics. Anhui Province, located in the Yangtze River Delta area, boasts a fast-growing and promising sector of inclusive finance that goes beyond the national average (Becha et al., 2025). However, due to high labor costs and narrow coverage, traditional financial institutions in Anhui find it difficult to provide equal financial service opportunities and suitable financial products for vulnerable groups, which curbs the rapid economic and financial development in the province (Yang et al., 2025).

It was reported that the inclusive finance index of the Yangtze River Delta in 2019 was 0.3182, far above the national average, which sheds light on the impressive growth of inclusive finance in that area. The index for Anhui, however, was far smaller, standing at merely 0.0652 (Feng et al., 2025). The reasons behind and the specific factors are rarely studied and are worthy of in-depth investigations.

This paper reflects the current situation of inclusive finance development in China by studying the influencing factors of inclusive finance development in Anhui Province. ASEAN countries can learn from China's experience and gain a deeper understanding of the development mechanism of inclusive finance. ASEAN countries can formulate targeted policies based on the analysis of the influencing factors of inclusive finance development in Anhui Province and China, such as strengthening financial infrastructure construction, improving the accessibility and coverage of financial services, and optimizing the financial ecological environment. These policies will help ASEAN countries better leverage the role of inclusive finance, promote economic development and social progress. In addition, the cooperation between China and ASEAN in the financial field is increasingly strengthened, and inclusive finance is a very important part of it. By studying the factors influencing the development of inclusive finance in Anhui Province and China, ASEAN countries can gain a clearer understanding of the similarities and differences between the two sides in financial cooperation, thereby promoting exchanges and cooperation in financial policies, products, services, and other areas. This will help enhance the financial strength of ASEAN countries and promote regional financial stability and development. Finally, China has made significant achievements in the field of digital inclusive finance, improving the convenience and inclusiveness of financial services through digital technology. ASEAN countries can learn from China's innovative practices in digital inclusive finance, such as mobile payments, online lending, digital renminbi, etc., to promote the digital transformation of local financial services. This helps to reduce the cost of financial services, improve service efficiency, and better meet the financial needs of vulnerable groups. In summary, studying the influencing factors of inclusive finance development in Anhui Province has multiple benefits for the development of ASEAN. ASEAN countries can learn from China's experience and combine it with local conditions to promote the development of inclusive finance and overall economic and social progress.

2. Literature Review

A notion proposed by Leyshon A and Thrift N. in 1993, digital inclusive finance (DIFI) was defined as a financial model that provides all walks of life in society an efficient and convenient access to financial services. The definition by Morshadul Hasan et al. (Hasan et al., 2021) was a bit different: he defined DIFI as inclusive finance practices intended to promote inclusive growth in developing countries and emerging economies through digital financial means. Ozili has conducted in-depth research and exploration on DIFI. He believes that DIFI has greater advantages than traditional finance, making transactions more convenient and providing users with payment security protection (Ozili, 2018). Li et al. pointed out that DIFI involves financial services provided by Internet technology companies as well as those provided by traditional financial institutions using Internet digital technology (Li et al., 2024).

Lu & Cheng recognized DIFI as a novel model and new trend of inclusive finance that cuts the cost of traditional services of inclusive finance and alleviates financial exclusion issues via digital technologies (Lu & Cheng, 2024). Zhang L et al. (2025) mentions that DIFI expands financial coverage and cuts transaction costs between service providers to reach sustainability of inclusive finance via digital technologies.

Some researchers have put forth indicators and metrics to measure the development of DIFI: Leyshon A and Thrift N. (1993) constructed an inclusive finance index in the dimensions of geographic penetration, accessibility of financial services, and product utility to measure IDF development. This method is considered to comprehensively reflect the current status of inclusive finance development in a country or region. Later, many scholars continued to revise the dimensions of inclusive finance, until Mbodj & Laye (2025) and others introduced variable indicators such as Internet coverage, smartphone ownership, and network coverage to start a multi-dimensional evaluation of DIFI development in emerging countries. Chinese scholars have made further research and exploration in this regard: such as the G20 High Principles of Inclusive Finance and the China Inclusive Finance Index System. In 2016, the Digital Finance Research Center of Peking University launched the DIFI index of Peking University and built China's first DIFI index system based on Internet finance.

There have been substantial works on the influencing factors of DIFI. Research has found that in remote areas with average economic development and inconvenient transportation, there is often a lack of financial institution branches and infrastructure sinking, leading to uneven regional economic development (Liao et al., 2025). Sound transportation network and Internet facilities, on the one hand, cut the cost of financial institutions for business expansion (Dash & Mohanta, 2024), and encourage deeper penetration of financial services in rural regions; On the other hand, groups excluded from finance can access financial services faster and more conveniently, and their dependence on financial services is also increasing. From a micro perspective, the individual income level of residents affects their personal consumption structure, thereby changing the consumption level they can afford. According to Goswami et al. (2022) and Yang et al. (2022), the demand for financial services increases with income levels. The urban-rural income gap can be measured by the ratio of disposable income per capita of urban households to that of rural households. On the one hand, excessive urban-rural income inequality can prevent rural residents with lower initial wealth levels from investing in human capital, hindering economic growth. On the other hand, inclusive finance has inclusive effects, poverty reduction effects, and growth effects, and its role in solving the problems of financial service scarcity and income inequality in rural and low-income areas is becoming increasingly significant (Manyika et al., 2016), as it increases welfare more accessible to low-come groups and alleviate the poverty in economic backwaters. The impacts of human resource management on the development of inclusive finance have been extensively studied through the lens of population education (Hasan & Hoque, 2021). Education plays a role in the potential financial service customers' perception to financial services and affects the willingness of financial service providers to open branches or build new financial infrastructure. Qamruzzaman (2025) found that regions with higher levels of financial literacy have greater convenience in implementing inclusive finance, making it particularly important to strengthen financial education. Zhang & Jia (2025) demonstrated through empirical analysis that the level of education can determine the level of financial literacy. Of course, some scholars have also come to different conclusions. Stawska & Jabłońskaet al. (2021) found that when the national average education level is high, the marginal cost of continuing to promote inclusive finance will be higher than the marginal benefit, which will be detrimental to the growth and expansion of inclusive finance (Becha et al., 2025). By analyzing the indicator of the financial demand side, Del Sarto & Ozili, (2025) revealed the decline of DIFI with improved education.

Furthermore, early scholars mainly considered the data involved in traditional financial businesses such as banks and securities when building an inclusive financial indicator system. There was little research on the indicators used in digital infrastructure construction, Internet financial business and

other aspects. The main contributions of the present work are that it contributed to research on the factors that affect the development of inclusive finance in Anhui and would provide actionable suggestions to narrow the gap between different regions in Anhui in their development of inclusive finance.

3. Theoretical Analysis

Leyson and Thrift proposed the "Financial Exclusion Theory" in 1993, which is an important concept in the field of financial geography that focuses on the issue that some groups and individuals have no access to necessary financial services or are excluded from the mainstream financial markets. This theory reveals the social, economic, and geographical roots of financial exclusion and analyzes its impact on excluded groups. Digital inclusive finance (DIFI) comes as a solution to the problem by increasing the accessibility to financial services. Existing works have identified some factors that affect the development of DIFI, such as geographical location, economic conditions, social conditions, and other factors. It is imperative to examine whether DIFI can effectively resolve the financial exclusion problem to reveal the root cause of financial exclusion. First, in the study of financial geography, infrastructure construction affects the degree of financial exclusion geographically. Factors such as improved transportation infrastructure, proximity of residential areas to major transportation routes such as subways, and wide adoption of digital technologies and networks are all significantly negatively correlated with financial exclusion, indicating that areas with good infrastructure have relatively lower levels of financial exclusion. Second, education level refers to an individual's ability to acquire, understand, and apply financial know-how and skills, as well as their attitude to financial services. With improved financial literacy, individuals know better how to use financial resources and thus suffer less risks of financial exclusion. Finally, the urban-rural income gap is the socio-economic context for financial exclusion. This difference is not only reflected in the quantity of income, but also in the growth rate and income structure. Urban residents usually enjoy higher wage levels, more employment opportunities, and more comprehensive social security, so they have a higher disposable income per capita than their rural counterparts. The presence of this gap makes rural residents face more difficulties and obstacles in accessing financial services, thereby exacerbating the phenomenon of financial exclusion.

Bai & Jing (1998) "Financial Sustainability Theory" emphasizes using financial resources in a sustainable manner and protecting the financial ecosystem. DIFI, a critical direction for financial development, takes it as its core to provide all individuals and groups, regardless of their economic status, social status, or geographical location, a relatively equal access to financial services. This concept is highly aligned with the goal of financial sustainability theory, which is to achieve inclusiveness, sustainability, and stability in finance. Investigations on the factors that affect the development of DIFI not only enrich the content of the theory of financial sustainability and expand the research scope, but also promote the innovation of relevant theories. As digital technologies gain momentum, the service model, product innovation, and risk management of DIFI are witnessing constant changes as well (Nepal, 2023). The development of DIFI is subject to a range of factors including economic development level, government financial support, urban infrastructure construction, urban-rural income level, and population education level. In-depth examination of these factors will allow the financial sustainability theory to better adapt to new financial environments and technological changes, and drives theoretical innovation and development.

4. Development Level of Difi in Anhui

4.1.Analysis of Development Level of DIFI in Cities of Anhui

Table 1 displays the development index and ranking of DIFI in cities in Anhui in 2012–2022. As the table reveals, DIFI has gained substantial growth in the decade. From the perspective of ranking, Hefei, Tongling, Maanshan, Wuhu and Mount Huangshan ranked the top five cities in the DIFI development

index in 2012; in 2022, the top five cities were Hefei, Wuhu, Maanshan, Tongling and Chuzhou. The DIFI development index of each region has also increased significantly. Despite the significant difference between regions in the province in terms of DIFI development, the gap is narrowing.

Notably, in 2022, the Development Index of Digital Inclusive Finance in Chuzhou City jumped to the 5th place, six places up from the ranking in 2012, reaching 254.21%, which indicates that Chouzhu has witnessed an improved DIFI development and caught up with other cities ranking above it before. This also suggests the possibility of cities with less development DIFI to catch up, indicating a convergence in the DIFI development across cities in Anhui.

A comparison of the month-on-month growth rates of the 2022 Digital Inclusive Finance Development Index between these cities unveils a positive growth in these cities. The fastest growing city is Bozhou, with a growth rate of 937.76%. The growth rates of Lu'an, Suzhou, Fuyang, Anqing, Chuzhou, and Huaibei also exceed 500%. Although Hefei has the slowest growth rate, reaching 366.86%, its DIFI development index still ranks first in Anhui Province, indicating that regions with less-developed DIFI have more potential for growth, and this growth potential is inversely correlated with the DIFI development level.

Table1: Development Index and Ranking of Digital Inclusive Finance in Various Cities of Anhui Province in 2012 and 2022

2012			2022		
City	DIFI	Ranking	City	DIFI	Ranking
Hefei	114.66	1	Hefei	334.18	1
Huaibei	85.54	11	Huaibei	290.11	13
Bozhou	69.89	16	Bozhou	281.03	15
Suzhou	77.93	15	Suzhou	279.83	16
Bengbu	93.41	7	Bengbu	297.26	10
Fuyang	81.69	13	Fuyang	287.43	14
Huainan	99.57	6	Huainan	292.63	11
Chuzhou	85.67	10	Chuzhou	303.45	5
Lu'an	78.86	14	Lu'an	291.48	12
Ma'anshan	108.43	3	Ma'anshan	314.63	3
Wuhu	104.45	4	Wuhu	321.06	2
Xuancheng	92.70	8	Xuancheng	300.37	7
Tongling	113.18	2	Tongling	306.82	4
Chizhou	91.46	9	Chizhou	297.81	9
Anqing	85.25	12	Anqing	299.66	8
Huangshan	103.88	5	Huangshan	303.42	6

(Data source: Digital Finance Research Center of Peking University)

Table 2 shows the average distribution of DIFI index in 16 cities in Anhui Province from 2012 to 2022, including Hefei, Wuhu, Maanshan, Tongling, Mount Huangshan, Xuancheng, Chuzhou, Bengbu, Chizhou, Huainan, Huaibei, Anqing and Lu'an, had an average of more than 200 DIFI development indexes. Among them, 6 cities (Wuhu, Maanshan, Tongling, Mount Huangshan, Xuancheng and Chizhou) belong to southern Anhui, and the average difference between cities is obvious. This shows obvious differences in the DIFI development between cities in Anhui, suggesting uncoordinated and unbalanced development of DIFI across the province.

Comparison of the changes in the DIFI development index of 16 cities in Anhui from 2012 to 2022 reveals significant progress that these cities have made in DIFI development in the decade, reaching an average rate of growth of 227%. Eleven cities have a change rate of over 200%, including 5 in northern Anhui and 3 in central Anhui. This also provides evidence that in recent years, the problem of financing

difficulties for small and medium-sized enterprises in northern Anhui has been effectively solved. From the top three cities with varying degrees of change (Bozhou City, Lu'an City, and Suzhou City), it is not difficult to see that they all belong to the northern and central regions of Anhui Province. Therefore, it can be seen that in recent years, Anhui Province's DIFI policies have been relatively well implemented in the northern and central regions of Anhui Province.

Table 2: Average and Change Range of Inclusive Finance Development Index in Various Cities of Anhui Province from 2012 to 2022

City	Average value	Average ranking	Change amplitude (%)	Ranking of change amplitude
Hefei	240.65	1	191.45	14
Huaibei	206.14	11	239.15	7
Bozhou	190.50	16	302.10	1
Suzhou	191.93	15	259.08	3
Bengbu	208.99	8	218.23	10
Fuyang	196.20	14	251.86	5
Huainan	207.47	10	193.90	12
Chuzhou	209.70	7	254.21	4
Lu'an	202.01	13	269.62	2
Ma'anshan	223.39	3	190.17	15
Wuhu	227.14	2	207.38	11
Xuancheng	211.50	6	224.02	9
Tongling	217.78	4	171.09	16
Chizhou	207.78	9	225.62	8
Anqing	205.42	12	251.51	6
Huangshan	215.32	5	192.09	13

(Data source: Digital Finance Research Center of Peking University)

4.2. Analysis of DIFI Development Level in the Three Major Regions of Anhui Province: Northern Anhui, Central Anhui, and Southern Anhui

Anhui Province has two important rivers - the Yangtze River and the Huai River. These two rivers run from west to east and divide the province into three natural regions: the northern part of Anhui is north of the Huai River, the central part of Anhui is between the Yangtze River and the Huai River, and the southern part of Anhui is south of the Yangtze River. Figure 1.1 shows that the DIFI development index the northern, central, and southern Anhui showed an upward trend overall in the decade, reaching its highest point in 2022, indicating that the promotion of DIFI has allowed it to receive more attention and investment from different regions in the province.
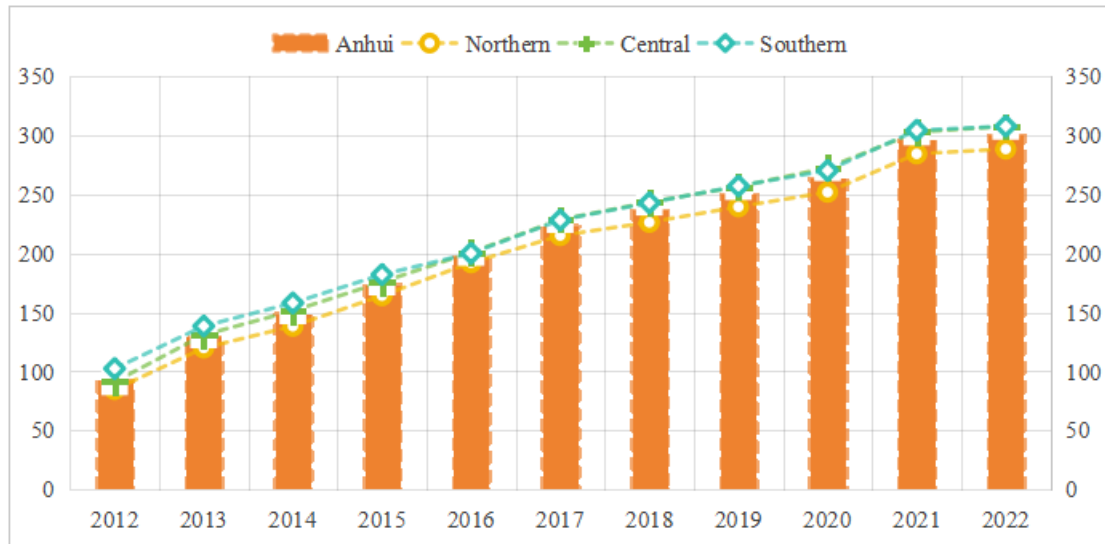
Fig. 1: shows the trend of DIFI development index in Anhui Province overall, and in its northern, central, and southern areas.
(Data source: Digital Finance Research Center of Peking University)

The average development index of DIFI in these cities in Anhui over the ten years of study is found to be 210.12. The index in northern, central, and southern regions of Anhui is 200.21, 214.44, and 217.15, respectively, suggesting a significant regional difference, where the southern area marked the highest index, followed by the central area, and at last, the northern area. The lower indices of DIFI development in the central and northern regions account for the main reasons for the low level of DIFI development in the province. In 2022, the growth rate of DIFI development index scores in Anhui overall, northern, central, and southern Anhui reached 222.97%, 240.20%, 237.16% and 200.29% compared to 2012. This comparison reveals rapid growth of DIFI in the province overall, and the large potential in northern and central areas of the province. The southern area of the province, however, witnessed slower development because of the high level of overall DIFI development there.

The month-on-month growth rates of DIFI development index in Anhui province overall, its northern, central, and southern areas are 1.35%, 1.43%, 1.57% and 1.14%, respectively. Central Anhui, as it reveals, witnessed a quick growth of DIFI in 2022, contributing to the high growth rate of DIFI in the province overall, whereas the lower growth rate in the southern part of Anhui contributed negatively to the DIFI development in the province. The less-developed regions in Anhui, including its central and northern parts, present high potential for DIFI development. Providing more favorable policies to DIFI development will enable the marginal growth effect and allow areas with less-developed DIFI to catch up with the central area of Anhui.

Figure 2 shows the growth rate trend of DIFI development indices in these four areas of study from 2012 to 2022.
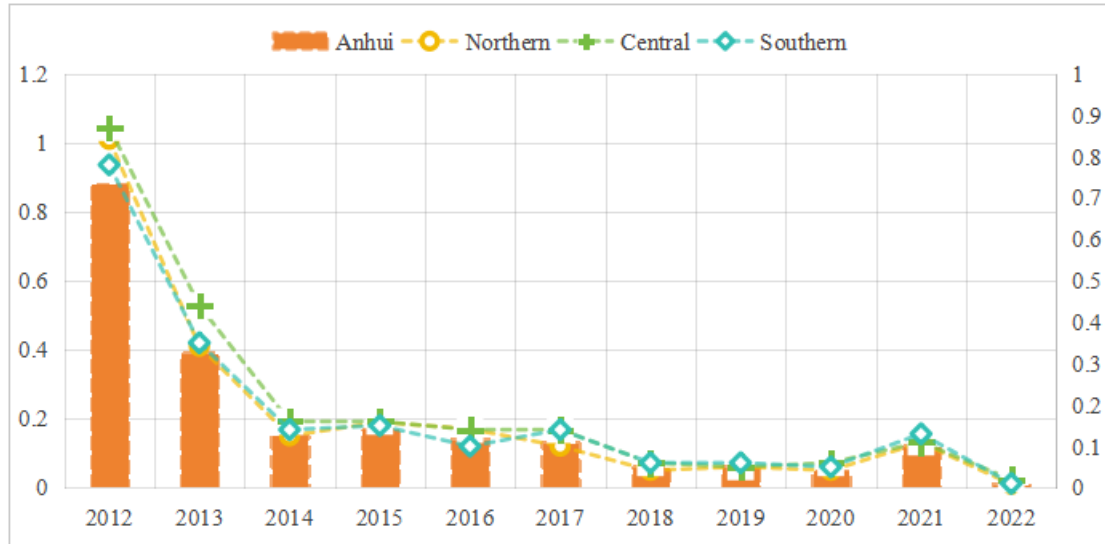
Fig. 2: Trend of Growth Rate of Inclusive Finance Development Index in Anhui Province and
Northern, Central and Southern Anhui Regions from 2012 to 2022
(Data source: Digital Finance Research Center of Peking University)

An overall downward trend is observed. The trend for Anhui Province overall moved upward in 2014–2015 and 2020–2021, while moved downward in 2012–2013, 2013–2014, 2015–2016, 2016–2017, 2017–2018, 2019–2020, and 2021–2022, with 2012–2014 marking the most significant decline. One possible cause is the spillover effects of global economic recession and macroeconomic regulation.

From a regional perspective, the three regions, i.e., northern, central, and southern areas of Anhui, witnessed a similar growth trend of the DIFI development index, with an overall fluctuation range between 0.01 and 1.01. There was a significant decline in 2012–2014, followed by a slight decline. In 2016–2017, the DIFI development index in northern Anhui also showed a slight decline, whereas the southern area grew, which can be partly attributed to the area's good economic groundwork. In 2018–2022, all these three areas displayed an alternating catch-up trend, implying the potential for DIFI development across all areas in Anhui.

4.3. Comprehensive Evaluation of Regional Differences in DIFI Development in Anhui

Comprehensive evaluations of the regional difference in the DIFI development will provide insights into the DIFI development status in Anhui and facilitate sustainable development of DIFI in the province. Though the previous sections have presented the DIFI index and growth trend of DIFI in Anhui, no detailed explanations for the regional differences as well as the degree of differences were provided. To explore further, the weighted averaged deviation method and the coefficient of variation method was employed here to parse the regional differences. This will allow us to unveil the root causes for the regional differences in DIFI development in Anhui.

First, the weighted average deviation method, which can identify the discrete trend of sample observations, was employed for DIFI development difference measurement. It is based on the average deviation coefficient, and its calculation formula is:

$$D = \sum_{i=1}^{n} \left| \frac{DIFI_i - \overline{DIFI}}{\overline{DIFI}} \right| \times \frac{P_i}{P}$$

where D is the weighted average deviation; $DIFI_i$ refers to the DIFI development index of region i; $\overline{DIFI}$ is the average DIFI development index in each region, n is the sample size, P_i is the added value of the financial industry in region i, and P is the added value of finance in Anhui.

Figure 3 shows the weighted average deviation value of Anhui Province overall and its three areas in 2012－2022.
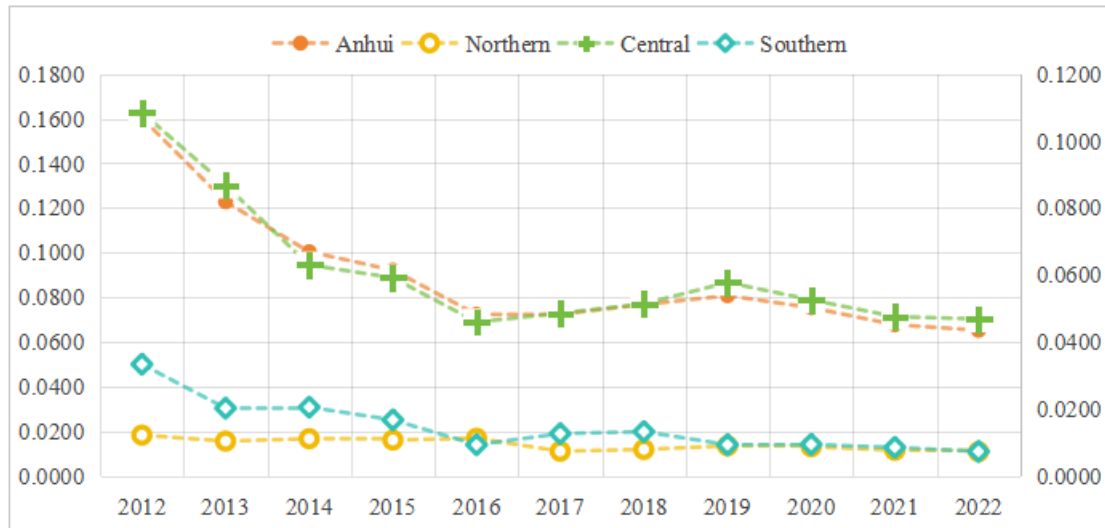
Fig. 3: Weighted average deviation values of northern, central, and southern Anhui provinces from 2012 to 2022

The trend of the weighted average deviation shows that from 2012 to 2022, the weighted average deviation of Anhui and its three regions moved downward despite fluctuations, with similar trends of changes. In 2012–2016, it showed a linear decline, followed by a slight upward trend from 2017 to 2019, and then remained stable at a low level from 2019 to 2022. This indicates that since 2012, the regional differences in the DIFI development in Anhui, as well as in the northern, central, and southern regions of Anhui, have gradually narrowed. Though the regional differences slightly expanded from 2017 to 2019, the overall trend was narrowing. The weighted average deviation between the southern and northern regions was smaller and remained relatively stable, with similar trends of changes. From 2017 to 2022, it showed a basically flat trend, indicating that the degree of regional differences in the DIFI development the southern and northern regions of the province was relatively stable.

The weighted average deviation values of Anhui and the northern, central, and southern regions of Anhui from 2012 to 2022 were 0.0897, 0.0142, 0.0608, and 0.0147, respectively. The largest deviation was seen in central Anhui, followed by the southern region, and at last the northern part of Anhui. Moreover, the northern and southern regions of the province showed similarity in the weighted average deviation value, indicating that the regional differences in the DIFI development were large in central Anhui, while the differences were weaker in northern and southern Anhui. This may be because of the strong economic foundation and rich financial resources in the central areas of Anhui, but the competition among financial institutions for financial resources is also more intense. This situation led to strongly imbalanced distribution of financial resources in the central area of Anhui, thus a significant difference in DIFI development in this area. From 2012 to 2022, the weighted average deviation values of Anhui Province, and its northern, central, and southern regions decreased by 0.0950, 0.0074, 0.0616 and 0.0260, respectively, indicating decreased regional differences in all these four regions of study, which hints at improved balance of DIFI development in each region. This indicates enhanced awareness of balanced development of DIFI in central Anhui and improved DIFI development in central and southern areas of the province.

Second, the coefficient of variation method is also one of the commonly used methods for measuring comprehensive differences. In the present work, the coefficient of variance method was employed to ensure robustness of the findings above. The coefficient of variation, also known as the standard deviation coefficient, is the ratio of the standard deviation to the mean. It is built on the basis of standard deviation to describe the degree of dispersion of indicators, and uses the ratio method to eliminate the influence of sample base differences based on considering the differences in sample base for each group. The specific calculation formula is：

$$CV = \frac{\sigma}{\overline{DIFI}} = \frac{1}{\overline{DIFI}} \sqrt{\sum_{i=1}^{n} \frac{(DIFI_i - \overline{DIFI})^2}{n}}$$

Among them, **CV** is the coefficient of variation, **σ** is the standard deviation, $DIFI_I$ is the DIFI development index for region **i**, $\overline{DIFI}$ is the average value DIFI development index for each region, and **n** is the sample size. A larger **CV** means a larger regional difference in DIFI development and more imbalanced development of DIFI.

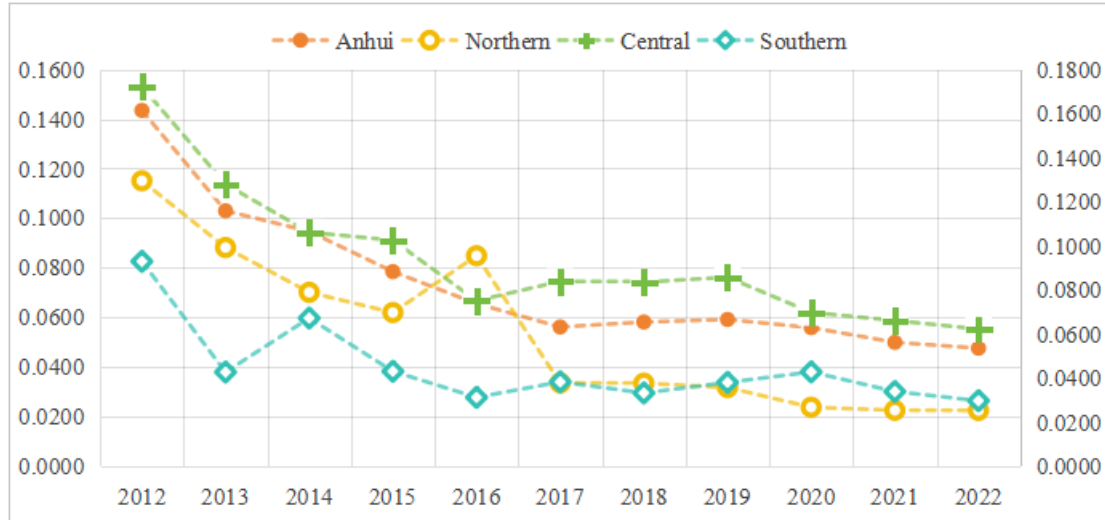Figure 4. visualizes the results obtained by the coefficient of variation method.

Fig. 4: Coefficient of variation in the northern, central, and southern regions of Anhui Province from 2012 to 2022

As Figure 4 shows, the coefficient of variation in these four regions of study showed a downward trend with fluctuations in 2012–2022. Among them, the coefficient of variation in Anhui Province and the central region of Anhui Province basically converged and showed an overall fluctuating downward trend, showing an "L" shape from 2012 to 2022. This indicates a narrowing difference in the DIFI development between Anhui Province and its central area and more balanced development across the regions. The northern Anhui region showed a linear downward trend from 2012 to 2015, followed by a narrow fluctuation upward trend from 2015 to 2016, an inverted "V" shape from 2015 to 2017, and then a slight decline after 2016. This indicates that the regional differences in the DIFI development in the northern Anhui region rapidly narrowed from 2012 to 2015, and stabilized after a significant decrease in regional differences after 2016; The southern Anhui region showed a "V" shape from 2012 to 2014, a narrow rise from 2018 to 2020, and a narrow decline before stabilizing after 2020. This indicates that the regional differences in DIFI development in the southern Anhui region are relatively small and stable at present.

The average coefficients of variation for Anhui Province and its three areas from 2012 to 2022 were 0.0738, 0.0534, 0.0941, and 0.0448, respectively. That is to say, the central area of Anhui had the highest coefficient of variance; then, its northern area, and at last, the southern area. The northern and central areas had similar coefficients, which suggests a small difference in the DIFI development in the southern area, while similar differences in DIFI development in northern and southern Anhui.

5. Research Design and Data Explanation

5.1.Variable Selection

5.1.1 Explained Variable

Digital Inclusive Finance Index (DIFI) is the dependent variable, which is the collection of DIFI indices of cities in Anhui. This index consists of three dimensions: coverage breadth, usage depth, and digitalization degree, and conducts detailed analysis through multiple scenarios of applications including digital payments, small insurance, and small wealth management to provide a comprehensive view of the DIFI development of cities in Anhui. Peking University Digital Inclusive Finance Index is considered the dependent variable in the present work for the sake of data objectivity and authenticity; and a higher index indicates more developed DIFI in the region in question.

5.1.2 Explanatory Variables

Economic development level. According to Levine's Financial Functional Theory, economic development has a strong correlation with financial development, playing a mutually beneficial role to each other's development. As regional economy, social welfare and residents' income increased and the enthusiasm for consumption and investment rose, more innovative financial products and services were invented and released. Conversely, a financial market with sufficient elasticity, depth, and breadth can promote the free flow of capital, market-oriented exchange rates and interest rates, internationalize the local currency, enhance its international status, attract foreign investment, and ultimately improve the economic level. Thus, the economic development level is considered to play a role in financial development; DIFI, which is a derivative of traditional finance models, will be inevitably affected by economic development. In the present work, the regional economic development level was measured by the overall GDP level and fiscal expenditure level.

Infrastructure construction. Infrastructure construction covers road transportation, network mobile communication, and other hardware facilities, effectively increasing the probability of exposure to financial products and services for people who were previously not easily covered by financial services (Lee et al., 2023), and shortening the gap between geographical and spatial location and financial development; On the other hand, infrastructure construction has strengthened the construction of Internet facilities. A higher rate of Internet penetration corresponds to better facilities for digital Internet technologies and broader adoption of DIFI. Here, the traffic density and Internet penetration rate were used as measures for infrastructure construction level.

Urban and rural income levels. This variable is a measure of the residents' ability to take part in financial development as the main body. Rural groups are the key participants in the DIFI development, and a lower income usually leads to lower financial participation, hindering the DIFI development in rural areas; a higher urban income per capita corresponds to a higher level of financial participation, wider exposure to financial products and services, and easier DIFI promotion and development (Fuster et al., 2024). The urban-rural income gap inevitably results to labor transfer, further resulting in the tilt and transfer of social resources, including financial resources, which is contrary to the original intention of "inclusiveness". In the long run, this will undermine the regional DIFI development. Zhang & Zhou (2025) method, we here measure the urban-rural income gap by dividing the disposable income per capita in urban areas by that in rural areas.

Human resource management. Education plays a pivotal role in the regional difference in DIFI development, and improving education will work positively to DIFI development (Goldstein & Yang, 2025). First, residents with higher education levels can better understand financial products and access financial services, which can allow them to avoid financial exclusion and increase their exposure to DIFI products and services. Second, improved education will cultivate more technological and entrepreneurial talents who will contribute to the DIFI innovation, increase the demand for DIFI products and services. In the present work, the human resource management is measured by the number of people with a college degree or above per 100,000 population.

5.1.3 Mediating Variables

Digital inclusive finance (DIFI) is a cross-over between traditional financial models and digital technology (Bhattacharya & Saha, 2023), and thus it is inevitably subject to the development of the

traditional finance industry. Moreover, financial development has a cumulative effect. Regions with more a developed traditional financial industry enjoy a richer reserve of financial resources and a more developed financial market, which is conducive to the DIFI development. Here, the development of the traditional financial industry is the intermediary variable that affects DIFI, and it is measured by the loan-to-deposit ratio; a higher loan-to-deposit ratio indicates a greater utilization rate of local funds.

Table 3 shows the variables used in the present work.

Table 3: List of Variables Used in This Study

	Variable		Indicator Code	Calculation Formula
Dependent Variables	Digital Inclusive Finance Index		DIFI	---
Independent Variables	Economic growth level	GDP	GDP	GDP=Value added of the primary industry+Va
	Infrastructure development	Fiscal expenditure	FE	FE=Regional fiscal expenditure
		Traffic density	TD	TD=Length of transport routes
		Internet penetration	IP	$IP=\dfrac{\text{Internet population}}{\text{Regional population}}$
	Urban and rural income level	Urban-rural income gap	GAP	$GAP=\dfrac{\text{Urban disposable income}}{\text{Rural disposable income}}$
	Human Resource Management	Education level	EL	EL=Population with college degree or above p
Mediating Variable	Financial Performance	Loan-to-deposit ratio	LD	$DP=\dfrac{\text{Loans in financial institutions}}{\text{Deposits in financial institutions}}$

5.2.Data Sources and Descriptive Statistical Analysis

The dependent variable here is the Digital Inclusive Finance Index (DIFI) in Anhui from 2012 to 2022, which mainly comes from the Peking University Digital Inclusive Finance Database. In addition, data for various regions in Anhui Province are sourced from statistical yearbooks, urban yearbooks, financial yearbooks, and statistical bulletins from 2012 to 2022, with relevant indicators calculated from raw data. Besides, the algorithms of indicators with large values such as DIFI and educated population are used here to alleviate the problem of heteroscedasticity. This study mainly used Stata17.0 to complete all data processing tasks. Firstly, conduct descriptive statistical analysis on all variables, as shown in Table 4.

Table 4: Descriptive Statistics

Variable		Obs	Mean	Std. Dev.	Min	Max
Dependent variable	LnDIFI	176	5.288	.364	4.25	5.81
	LnWid	176	5.21	.415	3.98	5.9
	LnDep	176	5.312	.322	4.51	5.77
	LnDig	176	5.45	.364	4.32	6.08
Independent	GDP	176	1915.009	1810.847	425.68	12013.08

variable	FE	176	332.833	212.766	92.9	1380.18
	TD	176	136.346	80.289	21.91	360.09
	IP	176	.163	.096	-.01	.49
	GAP	176	2.354	.277	1.76	3.2
	LnEL	176	9.225	.481	7.82	10.22
Mediator va riable	LD	176	.746	.14	.432	1.053

In the present work, the cities in Anhui were divided into three areas: northern, central, and southern Anhui, to provide an intuitive comparison of the variables between the three areas, and descriptive statistical analysis was performed, as shown in Table 5.

Table 5: Descriptive Statistics of Variables in This Study

Variable	Total			(1) Northern Anhui			(2) Central Anhui			(3) Southern Anhui		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
LnDIFI	176	5.288	.364	66	5.236	.378	44	5.305	.38	66	5.329	.337
LnWid	176	5.21	.415	66	5.141	.439	44	5.233	.435	66	5.264	.371
LnDep	176	5.312	.322	66	5.253	.334	44	5.329	.328	66	5.36	.302
LnDig	176	5.45	.364	66	5.449	.366	44	5.448	.388	66	5.453	.351
GDP	176	1915.01	1810.85	66	1477.575	575.598	44	3346.906	2949.995	66	1397.846	941.498
FE	176	332.833	212.766	66	302.221	140.08	44	523.906	287.915	66	236.064	110.659
TD	176	136.346	80.289	66	122.683	71.473	44	175.602	94.837	66	123.838	70.04
IP	176	.163	.096	66	.18	.107	44	.165	.087	66	.145	.088
GAP	176	2.354	.277	66	2.504	.23	44	2.376	.26	66	2.19	.241
LnEL	176	9.225	.481	66	8.934	.476	44	9.366	.505	66	9.423	.296
LD	176	.746	.14	66	.708	.142	44	.754	.157	66	.78	.118

Table 1-5 shows the overall data, with Group (1) for the northern Anhui region, Group (2) for the central Anhui region, and Group (3) for the southern Anhui region. Table 4-8 reveals that in terms of DIFI development, the three dimensions of DIFI (coverage breadth, usage depth, and digitalization level), the logarithm of the five variables of having a college degree or above per 100,000 population, and the loan-to-deposit ratio, the southern area of Anhui is slightly higher than the other two areas. In terms of GDP, fiscal expenditure, and transportation density, the central area has higher values than the other two areas. In terms of Internet population growth rate and urban-rural income gap, northern Anhui is slightly higher than central and southern Anhui. The reasons for these differences are related to the different levels of economic development, infrastructure construction, urban-rural income levels, and human resource management in different regions.

5.3.Measurement Model

5.3.1 Benchmark Regression Model
Based on theoretical analysis, this article establishes a regression model for the influencing factors of DIFI development:

$$LnDIFI_{it} = \alpha + \beta_1 GDP + \beta_2 FE + \beta_3 TD + \beta_4 IP + \beta_5 GAP + \beta_6 lnEL + \mu_i + \Phi_t + \epsilon_{it}$$

In the formula, i and t represent the region and year respectively, DIFI is the dependent variable, that is, the DIFI index, GDP is the total GDP, FE represents the total fiscal expenditure, TD represents the traffic density, IP represents the Internet penetration rate, GAP represents the urban-rural income

gap, EL represents the regional education level, and the logarithm of the DIFI index and education level, μ_i is the regional fixed effect, Φ_t is the time fixed effect, and ϵ_{it} is the random disturbance term.

F-test and Hausman tests were performed to identify the optimal model. Table 6 shows the results.

Table 6: F-test and Hausman test

Testing method	Statistical value	Freedom	P value	Conclusion
F test	62.12	(15, 153)	0.0000	Fixed effects models outperform mixed OLS models
Hausman test	70.72	7	0.0000	Fixed effects models outperform random effects models

As the table shows, the calculated sample F-value is 62.12, far greater than the critical value, and Prob>F is 0.0000, less than the 0.05 level, indicating that the combination of independent variables has an impact on the dependent variable. Therefore, this result shows the superiority of the fixed effects model to the mixed OLS model; Meanwhile, the Hausman test showed that the Prob value was also 0.0000, which was below the 0.05 level and significant. Therefore, this result indicates the superiority of the fixed effects model to the random effects model. Therefore, the fixed effects model is used in the present work.

For model selection, as shown in Table 1-6, all data passed the F-test and Hausman test when DIFI was set as the dependent variable. The model was tested using the same method for coverage breadth (Wid), depth of use (Dep), and degree of digitization (Dig) as dependent variables. It was found that coverage breadth and depth of use also passed these tests, while the degree of digitalization failed the Hausman test. Therefore, for the following regression tests, a fixed effects model was used for the overall index of DIFI, coverage breadth, and depth of use, while a random effects model was used for the degree of digitization. In the fixed effects test, as there were considerable differences in economic development, infrastructure construction, urban-rural income level, and other aspects between the cities in the province, and because of the large time span of study, the fixed effect tests were performed by a dual fixed effects model.

5.3.2 Intermediary Model

According to theoretical analysis and hypotheses, independent variables such as economic development level and infrastructure construction may affect DIFI development through financial performance level. The following mediation effect model was constructed to test this pathway empirically:

$$DIFI_{i,t} = \alpha + \beta_1 LD_{i,t} + \mu_i + \varphi_t + \epsilon_{it}$$
$$LD_{i,t} = \alpha + \beta_1 X_{i,t} + \mu_i + \varphi_t + \epsilon_{it}$$
$$DIFI_{i,t} = \alpha + \beta_1 LD_{i,t} + \beta_2 X_{i,t} + \mu_i + \varphi_t + \epsilon_{it}$$

Among them $LD_{i,t}$ is the level of financial performance, expressed here as the loan to deposit ratio; $X_{i,t}$ is for various influencing factors. In the mediation model, the first model measures the impact of the mediator variable financial performance level (LD) on DIFI level (DIFI); the second model measures the impact of six dependent variables on financial performance level (LD), and the third model measures the impact of six dependent variables on the independent variable DIFI development level (DIFI) under the influence of the mediator variable. Finally, a judgment is made on the test results β. If the sign of β the value remains consistent with the original test and after introducing the mediating variable, β is smaller than the original test, indicating that financial performance has played a certain mediating role; If β becomes insignificant and these variables are found to significantly affects the intermediary variables, it indicates that financial performance plays a fully mediating role.

6. Empirical Analysis

6.1.Benchmark Regression Analysis

Table 7 presents the benchmark regression results, where Columns 1, 2, 3, and 4 show the benchmark regression results obtained with DIFI, Wid, Dep, and Dig set as the dependent variable, respectively.

Table 7: Double fixed baseline regression

	(1)	(2)	(3)	(4)
	LnDIFI	LnWid	LnDep	LnDig
GDP	0.0000427***	0.0000410***	0.00000339	0.0218***
	(4.22)	(7.15)	(0.61)	(4.69)
FE	0.000389***	0.366***	0.145***	88.13***
	(3.82)	(6.47)	(2.65)	(3.71)
TD	0.0599***	0.131***	0.0766***	5.869
	(2.74)	(4.37)	(2.64)	(0.39)
IP	0.000251***	0.000387***	0.0000407	0.152***
	(5.89)	(7.40)	(0.80)	(3.90)
GAP	-0.0614**	-0.154***	-0.0447	-60.62***
	(-2.52)	(-5.39)	(-1.62)	(-3.19)
LnEL	0.0477**	0.0543**	0.0415*	61.07***
	(2.59)	(2.41)	(1.90)	(4.88)
_cons	5.516***	4.320***	4.725***	-567.0***
	(20.86)	(12.99)	(14.68)	(-3.12)
Fixed time	Yes	Yes	Yes	No
Fixed area	Yes	Yes	Yes	No
N	176	176	176	176
F	22.28***	45.21***	3.03***	28.11***
adj. R2	0.993	0.992	0.988	52

(t statistics in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01)

As the table shows, gross regional GDP, government financial expenditure (FE), traffic density (TD), Internet penetration rate (IP) and the total index of DIFI (LnDIFI) have positive correlation at the 1% level of significance, and population education level (LnEL) and the total index of DIFI (LnDIFI) are positively correlated at the 5% of significance, indicating that DIFI development is still limited by the economic development level, government fiscal policies, and traffic density. Improved Internet penetration rate and optimized population education structure will contribute positively to DIFI development. The bottom calculation of DIFI is Internet finance. Economic development can not only extend the reach of novel Internet technologies in the financial sector, but also create a large number of capital gaps, stimulate demands for financial products and services, and encourage financial service providers to invest more into the design of new financial rollouts, thereby promoting DIFI development. Improved transportation access will allow financial services to satisfy customer needs faster, and cut the costs of services. The growth in the number of Internet users will promote the networking of traditional financial products, make traditional financial products more accessible, and constantly improve DIFI development. Improved population education can effectively alleviate financial exclusion and enable more people to participate in the use of DIFI; it will also train more technological and entrepreneurial talents who will contribute to innovation and optimization of DIFI products and increase the demand for DIFI products and services.

The urban-rural income gap (GAP) has a negative correlation with the overall DIFI index (LnDIFI) at the 5% level of significance, and an increased GAP will hinder the DIFI development. The widening

income gap makes it harder to expand the reach of financial services, directs wealth to urban areas, and cuts the number of users of DIFI products; it will also hinder industry restructuring and upgrading, which reduces the need for financial services, hinders rural economic growth, and thus works against the DIFI development.

Regression of sub-indices shows that the GDP index is positively correlated with the coverage breadth and digitalization degree of DIFI at the 1% level of significance, while there is no significant impact on the depth of use index of DIFI. In other words, economic development level has not direct impacts on the use depth of DIFI. The fiscal expenditure indicator (FE) has a significant impact on the three sub-indices of coverage breadth, usage depth, and digitalization degree of DIFI; the reasons is that fiscal expenditure can increase DIFI coverage by way of favorable policies and financial support. More support for construction and upgrading of digital infrastructure will enhance the usage depth and digitalization of DIFI. The Traffic Density Index (TD) has a positive correlation at the 1% level of significance with the breadth of coverage and depth of use of DIFI, and a positive correlation with the degree of digitization of DIFI, but not significant. This is because though traffic density reflects the condition of regional transportation, no direct causal relations between traffic density and digitalization degree is absent. The Internet penetration rate (IP) has a positive correlation with the coverage of DIFI and the degree of digitalization at the 1% level of significance, and is positively correlated with the depth of DIFI usage, but not significant. This indicates that though the rich financial products and services on the Internet will stimulate users' needs, rural or remote areas have not really participated in the financial market due to poor infrastructure and other reasons, and also created a digital gap between urban and rural areas, but with no significant direct impacts on the usage depth of DIFI. The urban-rural income gap (GAP) has a negative impact on all three sub-indices, indicating that as rural residents' income increases and their demand for financial services increases, their demand and payment ability for financial services will also increase. Financial institutions will also be more motivated to invest resources in improving their digitalization level to satisfy the broad range of needs of rural residents. Population education has a significant impact on the three sub-indices of coverage breadth, usage depth, and digitalization degree of DIFI. This indicates that residents with higher education levels are not only more likely to master digital skills, but also able to better understand and utilize the various financial products and services provided by DIFI.

6.2.Mediation Effect Test

The loan-to-deposit ratio, an indicator broadly used by financial institutions, reflects the source and utilization of funds, and directly affecting the level of financial performance. Therefore, it is considered that financial performance affects the DIFI development through the intermediary variable of the loan-to-deposit ratio. Table 8 displays the regression results with the mediators introduced, where Columns 1 is the benchmark regression results with DIFI as the dependent variable and LD as the independent variable; in Column 2, LD is the dependent variable whereas other factors are independent variables; in Column 3, DIFI is the dependent variable and LD is the intermediary variable.

Table 8: Intermediary effect regression

	(1)	(2)	(3)
	LnDIFI	LD	LnDIFI
GDP		0.000150***	0.0000186
		(9.12)	(1.51)
FE		0.00157***	0.000137
		(9.47)	(1.09)
TD		0.173***	0.0322
		(4.85)	(1.41)
IP		0.0000695	0.000240***

		(1.00)	(5.79)
GAP		-0.0650	-0.0510**
		(-1.64)	(-2.14)
LnEL		0.161***	0.0218
		(5.37)	(1.12)
LD	0.306***		0.161***
	(8.73)		(3.23)
_cons	5.060***	0.786*	5.390***
	(192.83)	(1.83)	(20.80)
Fixed time	Yes	Yes	Yes
Fixed area	Yes	Yes	Yes
N	176	176	176
F	76.28***	39.52***	21.84***
adj. R2	0.992	0.879	0.994

(t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$)

As revealed in Table 1-8, financial performance has a positive correlation with the Digital Inclusive Finance Index (LnDIFI), significant at the 1% level, which means the DIFI development is subject to the financial performance. GDP output, fiscal expenditure level, transportation density, and population education level are all correlated to financial performance (LD), significant at the 1% level, which suggests that financial performance is limited by the level of economic development, fiscal expenditure level, and population education level. Although the improvement of Internet penetration has promoted the widespread application of financial technology, which can reduce the cost and risk of financial transactions, financial institutions are more inclined to conduct business in the traditional credit model, because the profitability of traditional credit business is higher than that of DIFI business. The completeness of financial markets, operational efficiency of financial institutions, innovation of financial products, and macroeconomic environment all have significant impacts on financial performance. Under the combined effects, the direct impact of urban-rural income gap on financial performance may be diluted or masked.

After the mediating effect is introduced, the tests showed that the impact of financial performance as a mediating variable is significant, which means that the impact of financial performance on DIFI is achieved through financial performance. However, from the perspective of the influence of other independent variables, since the four variables of economic development level, fiscal expenditure level, transportation density, and population education level are significantly positively correlated with financial performance at the 1% level, they are highly correlated. Therefore, after adding intermediary variables, the impact of DIFI is diluted and the impact is not significant. This indicates that the four variables of economic development level, fiscal expenditure level, transportation density, and population education level have a greater impact on financial performance. The Internet penetration rate is still significantly positively correlated with DIFI at the level of 1%, and the urban-rural income gap is significantly negatively correlated with DIFI at the level of 5%, which is consistent with the extent of impact when no variables are added, and intermediary variables have no interference impact.

6.3.Stability Test

To ensure the reliability of the regression results mentioned above, this paper adopts two methods for robustness testing. One is to change the individual capacity method. As Hefei is the most economically developed city in Anhui Province, its DIFI development index is also far ahead of other cities. The construction of financial facilities, number of financial institutions and Internet coverage of this city are significantly different from other cities. In order to reduce the interference of these specific factors and improve the robustness of the model, this paper decided to exclude data from the developed city of Hefei and observe whether our research results still hold true after excluding these special cases.

Therefore, panel regression was conducted on the DIFI development index of 15 other cities from 2012 to 2022, and Column 1 in Table 1-9 presents the regression results. The second is to adjust the sample period. The DIFI reflects the development status of DIFI. From 2012 to 2013, the growth rate of DIFI development in various cities across the country was relatively fast, and it began to stabilize in 2014. Therefore, to ensure the rigor of the research, the data from 2012 and 2013 were excluded, and only the data from 2014 to 2022 were retained. The fixed benefit model was used for analysis, and the regression results are shown in column (2).

Table 9: Robustness test output results

	Overall	(1)	(2)
	LnDIFI	LnDIFI	LnDIFI
GDP	0.0000427***	0.484***	0.593***
	(4.22)	(7.11)	(9.88)
FE	0.000389***	0.622***	0.368***
	(3.82)	(6.82)	(4.45)
TD	0.0599***	0.0000122**	0.00000298
	(2.74)	(2.08)	(0.54)
IP	0.000251***	0.000542***	0.166**
	(5.89)	(7.55)	(2.50)
GAP	-0.0614**	-0.196***	-0.102*
	(-2.52)	(-4.58)	(-1.80)
LnEL	0.0477**	0.170***	0.145***
	(2.59)	(4.15)	(3.61)
_cons	5.516***	-2.591***	-2.181***
	(20.86)	(-6.86)	(-6.01)
Fixed time	Yes	Yes	Yes
Fixed area	Yes	Yes	Yes
F test	22.28***	69.07***	96.58***
N	176	165	144
adj. R^2	0.993	0.958	0.941

(t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$)

It can be seen from the output results in Table 9 that, first, after excluding the data of Hefei, a developed city, the economic development level (GDP), financial expenditure (FE), Internet penetration rate (IP) and population education level (EL) are still significantly positively correlated with the development of DIFI at the level of 1% in the regression results, the traffic density (TD) is significantly positively correlated with the development of DIFI at the level of 5%, and the urban-rural income gap (GAP) shows a negative correlation with the DIFI development, with significance at the 1% level, which indicates that the conclusion is somewhat robust. Second, after excluding the data of 2012 and 2013, the economic development level (GDP), fiscal expenditure (FE) and population education level (EL) in the regression results are still significantly positively correlated with the development of DIFI at the level of 1%, the Internet penetration rate (IP) is significantly positively correlated with the development of DIFI at the level of 5%, and GAP has a positive correlation with the DIFI development, significant at the 10% level. These influencing factors are consistent with the results and signs of the previous study. Only traffic density (TD) maintains a positive impact after excluding the data of 2012 and 2013, but the results are not significant. Overall, through the testing of these two methods, the above influencing factors have passed the 1% significance test in the panel model, indicating that the previous analysis results are relatively robust.

6.4.Heterogeneity Test
Here, the 16 cities in Anhui were divided into three regions: northern, central, and southern areas, to examine the heterogeneity of influencing factors in the DIFI development in these regions through regressions on each variable separately. Table 10 shows the regression results.

Table 10: Benchmark regression and regional regression results

	(1)	(2)	(3)	(4)
	LnDIFI	LnDIFI	LnDIFI	LnDIFI
GDP	0.0000427***	0.751***	0.520***	0.792***
	(4.22)	(4.73)	(5.05)	(12.30)
FE	0.000389***	-0.000864**	0.000114	0.000183
	(3.82)	(-2.37)	(0.68)	(0.59)
TD	0.0599***	-0.573***	-0.340**	-0.205***
	(2.74)	(-5.12)	(-2.60)	(-5.13)
IP	0.000251***	0.000657***	0.000805***	0.000675***
	(5.89)	(3.77)	(8.87)	(6.57)
GAP	-0.0614**	-0.367***	-0.116	-0.246***
	(-2.52)	(-3.06)	(-1.33)	(-4.98)
LnEL	0.0477**	0.126	0.345***	0.172***
	(2.59)	(1.60)	(4.51)	(3.51)
_cons	5.516***	-5.400***	-5.096***	-3.164***
	(20.86)	(-5.10)	(-4.02)	(-6.07)
Fixed time	Yes	Yes	Yes	Yes
Fixed area	Yes	Yes	Yes	Yes
N	176	66	44	66
F test	22.28***	31.85***	80.98***	184.79***
adj. R2	0.993	0.946	0.973	0.973

(t statistics in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01)

Table 1.10 shows that the GDP and Internet penetration rate of the three regions are significantly positively correlated with the development of DIFI at the level of 1%, which is consistent with the benchmark regression results of Anhui Province, indicating that the development level of DIFI in the three regions is limited to the level of economic development (GDP) and Internet penetration rate, which further verifies that with the continuous development of Internet technology, all regions in Anhui Province have strengthened investment in digital infrastructure construction, improved Internet coverage and quality, and played a positive role in promoting the development of DIFI in all regions. Secondly, the education level of the population is significantly positively correlated with the development of DIFI at the 1% level in both the central and southern areas of Anhui Province. In the northern region of Anhui Province, the development of DIFI is still positively correlated, but the significance is not strong, indicating that the education level of the population in the central and southern areas of Anhui is relatively high, and residents' mastery of financial knowledge will also increase accordingly. Again, fiscal expenditure is significantly positively correlated with the development of DIFI at the 5% level in northern Anhui, and also positively correlated with the development of DIFI in central and southern Anhui, but the significance is not strong. This indicates that the northern Anhui region can further optimize the financial environment by increasing fiscal expenditures, strengthening financial infrastructure construction, and promoting the development of DIFI. However, the economy in the central and southern regions of Anhui is relatively developed, and the development in all aspects is relatively equal, which weakens the intervention role of the government to a certain extent. At the

same time, transportation density is significantly positively correlated with the development of DIFI in three regions to a certain extent, indicating that transportation density has a positive promoting effect on the development of DIFI in various regions of Anhui Province. Densely populated areas are often key areas for financial institutions to layout, and the increase in transportation density can further promote competition and innovation among financial institutions. Finally, the factor GAP has a negative impact in all three regions, which suggests that increased gap of income between urban and rural areas will undermine the DIFI development. Compared with the central Anhui region, the urban-rural income gap has a stronger obstacle to the development of DIFI in northern and southern Anhui regions.

6.5.Endogenous Test

Considering that the DIFI development may be affected by the previous period's development situation and have endogeneity issues, this article further selects the lagged one period index of the DIFI index as the instrumental variable, uses a dynamic panel regression model, and conducts regression through the SYS-GMM method. As shown in Table 11, the sequence correlation AR test results indicate that the random perturbation term exhibits first-order autocorrelation, but second-order autocorrelation. From this, it can be accepted that the null hypothesis is that "the random perturbation term has no autocorrelation" and the instrumental variable is valid. Secondly, this article uses the Hansen test method for over identification constraint testing. The regression results show that the P value of the Hansen test is greater than 0.1, accepting the null hypothesis that "instrumental variables are not correlated with random error terms", that is, instrumental variables are valid.

In the dynamic panel regression results, it can be seen that the lagged Digital Inclusive Finance Index (L.LnDIFI) is significantly positively correlated with the Digital Inclusive Finance Index (LnDIFI) at the 1% level, indicating that there is a certain inertia in the development of DIFI. Residents' understanding and use of DIFI services go from shallow to deep. Therefore, the DIFI industry needs to be steadily promoted and cannot be achieved overnight. In addition, the GMM regression results of the system are basically consistent with the benchmark regression and sub regression conclusions of the fixed effects model, and the robustness of the model has been further verified.

Table 11: Dynamic panel regression results

	LnDIFI
L.LnDIFI	0.746***
	(43.43)
GDP	0.116***
	(2.65)
FE	0.000250**
	(2.54)
TD	0.000000441
	(0.32)
IP	0.000325***
	(3.00)
GAP	-0.0485*
	(-1.77)
LnEL	0.0135
	(0.85)
_cons	0.429**
	(2.33)
AR（1）	0.001
AR（2）	0.166
Hansen	1.00

7. Conclusions and Recommendations

An in-depth analysis of the influencing factors of digital inclusive finance (DIFI) in Anhui Province was performed in the present work. With panel data from 16 cities in Anhui from 2012 to 2022, we empirically analyzed the constraints of regional economic development level, infrastructure construction, urban-rural income level, and residents' education level on the DIFI development. The main findings were as follows: first, the three core factors of economic development level, infrastructure construction, and residents' education level in various regions significantly promote the implementation and DIFI development. DIFI plays an important role in four aspects of inclusive, innovative, coordinated, and shared development with its penetrating advantages, greatly improving the coordinated development and economic innovation between urban and rural areas, and providing financial support and digital paths for promoting common prosperity of rural residents. Dividing DIFI into three dimensions, research has found that the breadth of coverage, depth of use, and degree of digitization of DIFI mutually influence and promote the high-quality development of regional economies. Secondly, regional heterogeneity indicates that the DIFI in northern, central, and southern Anhui is limited by several core indicators such as economic development level and infrastructure construction.

Based on the above research conclusions, this article proposes the following countermeasures and suggestions:

First, top-level design of DIFI needs to be strengthened. The government plays an indispensable role as the "chief designer" in the development of DIFI, which requires the government to accurately position the relationship between the government and the market, strengthen differentiated policy coordination, and implement effective supervision in the process of DIFI development. Meanwhile, we need to continuously improve the construction of the indicator system for the development of DIFI, regularly track and optimize the indicator system for DIFI development, so that the construction of the indicator system for the development of DIFI can reflect the characteristics of DIFI development in each period, and continuously add new indicators with the advancement of financial reform.

Second, a regional coordination strategy for the development of DIFI should be formulated. According to the heterogeneity test, although the current development pattern of DIFI in Anhui Province shows signs of improvement, regional heterogeneity is still prominent. To further solve the problem of uneven and uncoordinated development of DIFI, it is necessary to strengthen communication, cooperation, and information sharing between regions to achieve mutual benefit. It is necessary to formulate DIFI development strategies and policies tailored to local conditions and give full play to the radiating and driving role of financial center cities.

Third, we need to broaden the coverage and depth of DIFI services. To strengthen the stock reform and incremental innovation of financial institutions, we should further accelerate the approval speed of private banks, lower admission standards, and improve regulatory mechanisms, so that more private banks can become the "booster" for the development of DIFI. Innovate diversified DIFI products and services, enhance the integration of DIFI and digital informatization. For areas with low coverage of financial institution branches, such as rural areas, we should vigorously promote electronic financial products such as self-service terminals to improve the convenience of serving rural customers.

Moreover, it is imperative to optimize the ecological environment of the demand entities for DIFI development. We should further increase the education level of residents and enhance consumers' financial literacy, and vigorously promote DIFI education. In response to the lack of financial knowledge and low financial literacy among DIFI customers in agriculture, rural areas, and farmers, a comprehensive "Sending Financial Knowledge to the Countryside" campaign should be launched. Besides, we should establish and improve the corporate credit rating system. For enterprises of different types and sizes, different levels of credit rating standards should be established, and the final credit evaluation rating should be dynamically tracked to comprehensively grasp the direction of the enterprise's credit rating and ensure the authenticity and effectiveness of the enterprise's credit

evaluation.

In addition, we need to strengthen infrastructure construction and promote high-quality economic development. The government should increase investment in transportation infrastructure in remote areas, improve their transportation conditions, and strengthen the construction of communication facilities in remote areas to ensure the full coverage of Internet and mobile communication signals; administrators should also encourage financial institutions to establish branches in rural and remote areas to improve the accessibility of financial services. Financial institutions can be incentivized to establish branch offices in these areas by providing preferential policies such as fiscal subsidies and tax reductions, and promote the construction of digital infrastructure and facilitate the application of financial technology.

Furthermore, the income distribution system and increase residents' disposable income needs to be optimized. The government should formulate more fair and reasonable income distribution policies, regulate excessive income through taxation, social security and other means, ensure the basic living of low-income groups, and thus narrow the income gap between urban and rural residents. We need to accelerate agricultural technological innovation and promotion, improve agricultural production efficiency and product quality, encourage farmers to participate in the production and operation of characteristic industries, and increase their income level.

Finally, though a series of related research methods were used in this study to explore in detail the comprehensive situation and influencing factors of regional differences in DIFI development in China, the DIFI development is a multi-level and dynamic concept, involving a large number of indicator levels and quantities. Currently, the financial industry has not established special statistics on it. That is to say, although this article draws on previous research by experts, scholars, and authoritative institutions to construct an indicator system for the development of DIFI, there are still certain limitations and shortcomings. In addition, the author's knowledge accumulation is shallow, making it difficult to comprehensively and thoroughly evaluate the regional differences in the development of DIFI and analyze the influencing factors. Therefore, in future research, we need to innovative DIFI services and products, as well as rural digital infrastructure construction, will be the key research directions, and continuous attention will be paid to the development of DIFI in various regions, as well as its impact on high-quality economic development in rural areas.

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Data Availability Statement

The datasets adopted here were obtained from the China Bureau of Statistics and the CSMAR database. After obtaining permission from the Chinese government, these data can be available at https://www.stats.gov.cn or obtained from the corresponding author. Readers are required to comply with the Chinese government's regulations on the use of publicly available data when applying for data.

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