

## Article

# Is the Development of China's Financial Inclusion Sustainable? Evidence from a Perspective of Balance

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**Abstract:** Balance plays an important role in the sustainable development of China's financial inclusion. First, this paper reports the entropy weight method used to construct a financial inclusion index (*FII*) and measure the level of development of financial inclusion in China's regions. Second, the concept of the Gini coefficient of financial inclusion is proposed and the structural balance of China's financial inclusion is shown, as calculated by using this Gini coefficient. Third, we report the use of a dynamic shift-share model to further discuss the development balance of the financial inclusion of China's regions. The results show that there is an imbalance in the development of financial inclusion in China's regions. For 2006–2016, the Gini coefficient and the structural balance of China's financial inclusion show a significant downward trend. The gap of the financial inclusion development between regions is narrowing and the structure of China's financial inclusion tends to be reasonable. The penetration dimension is at a structural disadvantage. Availability and usage dimension are at a structural advantage, which can effectively promote the development of China's financial inclusion. In the future, the government should establish a more balanced financial inclusion development mechanism, making full use of structural advantages of the availability and usage of financial services to promote the sustainable development of China's financial inclusion.

**Keywords:** financial inclusion; sustainable development; Gini coefficient; development balance; structural balance; dynamic shift-share model

## 1. Introduction

Financial inclusion originates from microcredit and microfinance, which emerges in the context of global financial exclusion. In 2005, the United Nations first proposed establishing a unified financial inclusion system around the world, and this concept gradually became popular. At the G20 summit in September 2016, governments proposed to use digital technology to reduce the cost of financial services, expanding the coverage of financial services and ultimately enhancing financial inclusion. As an important part of China's financial reform, financial inclusion plays a crucial role in promoting economic development. Financial inclusion can be understood as providing formal financial services to vulnerable groups, such as low-income people, farmers, disabled persons, and so on. At the same time, it solves the problem of financing difficulties of small and medium-sized enterprises. Most studies show that when countries have better formal financial services, poverty rates and inequality in those countries are lower [1–3]. According to the latest Global Findex database released by The World Bank, the penetration rate of China's formal financial account in 2014 was 78.9%, which has a significant gap from the level of 94% in developed countries. In terms of credit availability, the proportion of people in China who can obtain loans from formal financial institutions is 9.5%, which is only about half the level of it in developed countries. The proportion of people in China's remote regions that receive loans from formal financial institutions is 7.5%, and the 40% of the poorest population

who get loans from formal financial institutions is 5.9%. The relevant index values of developed countries are 17.2% and 17.3%. In particular, some remote and backward regions lack formal financial services, resulting in imbalance of financial supply and demand. The sustainability of China's financial inclusion is still a matter of concern. Since China's economic reform and opening up, the unbalanced development strategy was adopted, which helped China to achieve relatively fast economic growth but also resulted in obvious regional economic and financial disparity. The eastern coastal region has experienced high economic growth; however, the central and western regions have become relatively underdeveloped areas. The spatial distribution of economic activity and financial development has been the subject of considerable interest both to policy-makers and to academic researchers. Concerns about the regional disparity have been regularly expressed and policies designed to reduce this disparity have been implemented for social stability and growth sustainability. In China, the key to the sustainable development of financial inclusion lies in balance, which includes both the development balance of different regions in China and the development balance of different dimensions in financial inclusion (that is, structural balance). Therefore, this paper describes the sustainable development of China's financial inclusion from the perspective of balance and provides some policy suggestions for the government.

The contribution of this paper is shown below. First, there is little (or even a lack of) empirical evidence on the sustainability of financial inclusion development based on the perspective of balance. The study of China's financial inclusion problems is of great significance to other emerging markets and developing countries. Second, to study the development of financial inclusion in regions more comprehensively and accurately, we have added insurance and securities indicators to the financial inclusion index (*FII*) based on References [2,4], improving the *FII* system. Third, this paper first proposes the concept on the Gini coefficient of financial inclusion and measures it. Further, the structural balance of financial inclusion in China is calculated by using the Gini coefficient of financial inclusion dimensions. In general, the gap between financial inclusion developments of regions is gradually narrowing and the structure of China's financial inclusion tends to be reasonable. Finally, this paper applies a dynamic shift-share model of industrial economics to conduct an empirical analysis. We used this model first to research problems in financial fields and analyze the sustainable development of regions' financial inclusion.

The rest of this paper is organized as follows. Section 2 includes literature review. Section 3 includes the development balance of financial inclusion in China's regions. Section 4 presents the Gini coefficient of China's financial inclusion. In Section 5, empirical analyses are provided. Section 6 presents the conclusions and policy implications.

## 2. Literature Review

The current research literature about financial inclusion focuses on the following topics. The first research topic focuses on the basic theory and the evaluation of financial inclusion. Financial inclusion is an evolving concept and is a combination of financial development and financial deepening. It has the attributes of being a public good, which can not only help more vulnerable groups to access financial services, but it can also emphasize the affordability of costs [5–7]. Digital-based financial inclusion as a form gradually develops, and the digital revolution adds new layers to the material cultures of financial inclusion [8]. At the same time, financial inclusion should be integrated with economic transformation and upgrading, providing everyone with opportunities for sharing benefits of economic development and improving labor productivity [9]. In fact, the development of financial inclusion can also enhance an individual's financial capabilities [10]. Effective financial inclusion needs to encourage a diversity of institutions (public development banks, community banks, and cooperative banks) to serve the poor [11]. Certainly, there are still some shortcomings in the theoretical analysis of financial inclusion, especially as the weight of the indicator is more subjective [12]. Most studies on the evaluation of financial inclusion have mainly measured the development of financial inclusion in different countries or regions by constructing a financial inclusion index [2,4]. Chakravarty and Pal

developed an axiomatic measure to research financial inclusion in India [13]. India's financial inclusion policies allow poor people to open zero-deposit "no-frill" bank accounts and endeavors to take banking to the doorstep of customers [14]. Rosengard and Prasetyantoko studied constraints to financial inclusion in Indonesia based on two paradoxes of Indonesia's financial sector [15]. Fifty percent of adults in 148 countries are "banked"—that is, have an account at a formal financial institution—and half of all adults remain unbanked. Systematic indicators of the use of different formal and informal financial services were found lacking for most countries [16]. However, it is more difficult to achieve progress in financial inclusion in rural than in urban areas because of higher transaction costs and higher risks [17].

Second, prior research has studied the influence factors of financial inclusion. Lower account costs, stronger legal guarantees, and stable political environment can enhance financial inclusion in a region [18]. In El Salvador, remittances have a positive impact on financial inclusion by promoting the use of deposit accounts [19]. Barriers to financial inclusion differ with individual characteristics. Higher income, better education, being a man, and being older are associated with greater use of formal accounts and formal credit [6,20,21]. Households with female heads are less inclined to access formal finance and more inclined to access informal finance [22]. On the other hand, in enterprise, female entrepreneurs are no less likely to be financially included in the informal financial markets than their male counterparts [23]. The GDP per capita, income inequality, adult literacy, and urbanization are also important factors to explain a country's level of financial inclusion [24]. Through the example of Community Development Finance Institutions (CDFIs) in US and UK, Appleyard studied how their activities promote financial inclusion and the impact of geography on financial inclusion [25].

Finally, the third general research topic is the effect of financial inclusion. Fan and Zhang investigated the relationship between financial inclusion and the formation of entrepreneurs, both theoretically and empirically [26]. Sharma used the VAR model and Granger causality test to analyze the relationship between economic development and financial inclusion in India [27]. His results showed that both are positively correlated. Meanwhile, financial inclusion offers incremental and complementary solutions to tackle poverty, to promote inclusive development, and to address Millennium Development Goals [28]. In particular, economic development is associated with the financial inclusion services provided by banks. Financial inclusion contributes positively to financial stability and decreases income inequality in MENA [29]. Financial inclusion also increased the schooling level of daughters and the educational aspirations and expectations parents have for them [30]. Wang and Qiu showed that creating a financial inclusion system and developing inclusive rural financial institutions can further narrow the urban–rural income gap and promote the development of rural finance [31].

### 3. Development Balance of Financial Inclusion in China's Regions

#### 3.1. Constructing the Financial Inclusion Index (FII)

According to the region division of China's national bureau of statistics and considering the geographical and economic factors, this paper divides China into three regions (excluding Hong Kong, Macao, and Taiwan). The eastern region includes provinces such as Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan, Beijing, and Tianjin. The central region includes provinces of Heilongjiang, Anhui, Jiangxi, Henan, Shanxi, Jilin, Hubei, and Hunan. The western region includes provinces like Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Inner Mongolia, Guangxi, Ningxia, Tibet, and Xinjiang (See Figure 1). Before measuring the development of financial inclusion in China's three regions, we needed to construct an *FII*. The construction of the *FII* needs to reflect the complete connotation and characteristics of financial inclusion, while also facilitating a space–time comparison and dynamic analysis. Beck, Demircuc-Kunt, and Martinez Peria used eight population and geographical dimensions to measure *FII* [2]. Sarma constructed an *FII* based on the Human Development Index (HDI) to compare the financial inclusion

development of 49 countries [4]. However, the financial service supplier in this *FII* is single and Sarma does not consider insurance, securities, and other financial services [4]. Moreover, the ratio of bank accounts to population, the size of average deposits, and the ratio of GDP to capital can also be used to measure financial inclusion [32].



Figure 1. The three regions in China.

Based on existing research, this paper constructs an *FII* mainly from three dimensions: penetration, availability, and usage. The penetration dimension refers to the coverage of financial institutions and employees and it can be one of the indicators of financial inclusion [33]. It includes both geographic penetration and population penetration. The availability dimension refers to the accessibility of an inclusive financial system to its users. Savings deposit per capita and loans per capita can be used to measure the availability dimension [13]. The usage dimension can be defined as how an inclusive financial system is utilized by its users. Individuals and enterprises engaged in daily financial activities need both banking services and other financial services, such as insurance and securities. As such, this paper adds the insurance and securities indicators to the *FII*. Table 1 shows the *FII*. All the data including 2006–2016 are from the regional financial operation report: China Statistical Yearbook, Report on the Development of China's Securities Industry.

Table 1. Financial inclusion index.

Dimensions	Indicators	Calculation Method
Penetration	Number of banking institutions per 10,000 people	Total number of banking institutions/population
	Number of bank employees per 10,000 people	Total number of bank employees/population
	Number of securities per 10,000 people	Total number of securities/population
	Number of insurance institutions per 10,000 people	Total number of insurance institutions/population
	Number of banking institutions per 10,000 square km	Total number of banking institutions/area
	Number of bank employees per 10,000 square km	Total number of bank employees/area
	Number of securities per 10,000 square km	Total number of securities/area
	Number of insurance institutions per 10,000 square km	Total number of insurance institutions/area

Table 1. Cont.

Dimensions	Indicators	Calculation Method
Availability	Savings deposit per capita	Savings deposit/population
	Loans per capita	Loan/population
	Securities trading per capita	Securities trading/population
Usage	Insurance density	Premium income/population
	Deposit ratio	Deposit/GDP
	Loan ratio proportion of securities trading amount to GDP	Loan/GDP
	Insurance depth	Premium income/GDP

### 3.2. Method of Measurement

This paper divides the *FII* into three dimensions:  $d_j$  represents the  $j$  dimension,  $j = 1, 2, 3$ .

$$d_j = \frac{x_j - m_j}{M_j - m_j} \quad (1)$$

In this expression,  $x_j$  represents the actual value of the  $j$  dimension. The minimum value of the  $j$  dimension is  $m_j$  and the maximum value of the  $j$  dimension is  $M_j$ .  $0 \leq d_j \leq 1$ . When  $d_j = 1$ , it shows that the  $j$  dimension of financial inclusion develops better in this region.

$$FII = \sum_{j=1}^k w_j d_j \quad (2)$$

where  $w_j$  represents the weight of the  $j$  dimension.

When constructing the *FII*, the weights should be objective and accurate. Previous studies about weight-setting have used three main approaches: equal weight, the variation coefficient method, and the entropy weight method. In mathematical theory, entropy represents uncertainty. In general, the higher the order degree of the system, the smaller the entropy, and the more contained the information. The entropy weight method is a more scientific and an objective way to calculate weight, and is, therefore, used to measure the weights associated with the *FII*. The weights are calculated as follows:

$$G_j = -\frac{1}{\ln n} \sum_{i=1}^n y_{ij} \ln y_{ij}, \quad y_{ij} = \frac{d_{ij}}{\sum_{i=1}^n d_{ij}} \quad (3)$$

where  $n$  is the number of regions.

Weight:

$$w_j = \frac{1 - G_j}{\sum_{j=1}^k (1 - G_j)} \quad (4)$$

After calculating the weight of each dimension, Formula (2) is used to obtain the *FII* for each region.

### 3.3. FII: A Weight Analysis

The entropy weight method is used to measure the weight of all *FII* dimensions. Table 2 presents the results, revealing that the penetration and availability weights are relatively large; the usage weight is the smallest. The mean value of the penetration and availability weights are 0.644 and 0.213; the mean value of the usage weight is only 0.143. The penetration weight increased from 0.402 in 2006 to 0.645 in 2016, showing that the indicators of penetration dimension have an enhanced effect on the development of financial inclusion. The availability and usage weight decreased from 0.379 and 0.219

in 2006 to 0.225 and 0.129 in 2016. In particular, the drop in the weight of the availability dimension is more obvious. The impact of availability and usage on the development of financial inclusion is gradually declining.

**Table 2.** The weight of the financial inclusion index (*FII*) dimensions.

Dimensions	2006	2007	2008	2009	2010	2011
Penetration	0.402	0.583	0.657	0.676	0.729	0.655
Availability	0.379	0.266	0.186	0.231	0.171	0.178
Usage	0.219	0.152	0.157	0.093	0.099	0.167
Dimensions	2012	2013	2014	2015	2016	Mean
Penetration	0.642	0.663	0.691	0.737	0.645	0.644
Availability	0.178	0.182	0.183	0.167	0.225	0.213
Usage	0.181	0.155	0.126	0.095	0.129	0.143

When reviewing the specific indicators within three dimensions, the weights associated with the number of banking institutions and securities institutions per 10,000 km<sup>2</sup> exceed 0.1 each year, which is higher than other specific indicators. These values show that these two indicators significantly influence financial inclusion. The mean value of the insurance depth weight is the smallest among all the indicators and the drop in it is obvious. Therefore, it has little impact on the development of financial inclusion.

### 3.4. Comparative Analysis of the *FII* Dimensions between the Three Regions

Table 3 shows the values of the three dimensions of the *FII* in China's eastern, central, and western regions. The development of the penetration dimension in the eastern region is obviously better than that in the central and western regions. In the research period, the financial services penetration in three regions showed an upward trend. Although the development of the financial services availability in the eastern region is better than that in the central and western regions, its development in the central and western regions has been rapid. The development of the usage dimension in the central region is relatively weak, and its development in the western region is better than the central region.

**Table 3.** The values of the *FII* dimensions between the three regions\*.

Penetration	2006	2009	2012	2014	2016	Mean
Eastern	0.380	0.411	0.365	0.496	0.548	0.426
Central	0.158	0.180	0.108	0.181	0.219	0.153
Western	0.045	0.075	0.056	0.075	0.121	0.067
Availability	2006	2009	2012	2014	2016	Mean
Eastern	0.021	0.054	0.077	0.120	0.207	0.088
Central	0.001	0.013	0.025	0.040	0.066	0.027
Western	0.001	0.013	0.028	0.040	0.065	0.027
Usage	2006	2009	2012	2014	2016	Mean
Eastern	0.037	0.067	0.059	0.081	0.136	0.072
Central	0.006	0.022	0.013	0.026	0.052	0.022
Western	0.019	0.039	0.032	0.045	0.072	0.039

\* Due to space limitations, Table 3 only gives results for 5 years. Readers can ask the corresponding author for results on the other years.

### 3.5. Comparative Analysis of the Financial Inclusion of the Three Regions

The methods introduced above were used to calculate the *FII* of the three regions from 2006 to 2016. Table 4 shows the results.



**Table 4.** *FII* of three regions in 2006–2016.

	2006	2007	2008	2009	2010	2011
Eastern	0.438	0.504	0.479	0.532	0.483	0.471
Central	0.165	0.167	0.176	0.215	0.129	0.136
Western	0.065	0.092	0.086	0.128	0.102	0.100
	2012	2013	2014	2015	2016	Mean
Eastern	0.501	0.564	0.697	0.893	0.891	0.587
Central	0.146	0.175	0.247	0.313	0.338	0.201
Western	0.115	0.146	0.160	0.208	0.259	0.133

The overall development of China's financial inclusion significantly improved over time with an upward trend. The mean value of China's *FII* was 0.223 in 2006; the *FII* value increased to 0.496 in 2016. The average growth rate of China's *FII* was 8.32% in 2006–2016. From 2006 to 2011, the growth rate of China's financial inclusion was relatively slow, with an average growth rate of 1.14%. From 2011 to 2016, its growth rate was gradually increasing, with an average growth rate of 16.05%, which is closely related to the strong support given by the Chinese government to financial inclusion. China's financial inclusion has improved, but the current development level remains low. In 2016, the *FII* value of 0.496 indicates that there is room for improvement.

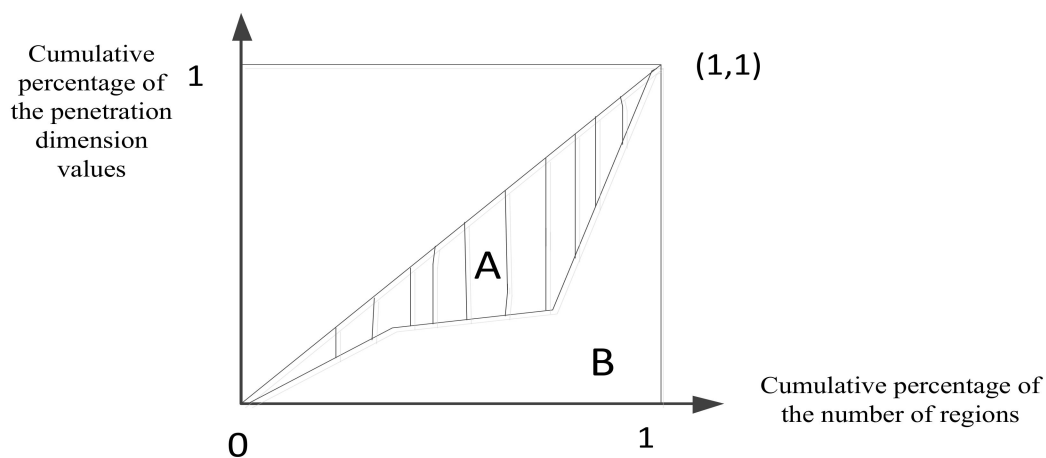
At a regional level, the development of financial inclusion was better in the eastern region than in the central and western regions. In 2006, the *FII* of the eastern region was 0.438; this level was 2.65 times and 6.74 times the *FII* levels in the central and western regions, respectively. The gap between the eastern and western region was very large. In 2016, the *FII* of the eastern region was 0.891; this level was 2.64 times and 3.44 times the *FII* values of the central and western regions, respectively. These results show that the gap gradually decreased from east to west. The provinces and cities with high financial inclusion development are mainly concentrated in the eastern region. The *FII* values of the eastern region have been high for a long time. The *FII* of the eastern region reached 0.438 in 2006 and 0.891 in 2016. The average growth rate of financial inclusion in the eastern region was 7.36%, which is lower than the average growth rate of China's financial inclusion. In 2006, the *FII*s of the central and western regions were 0.165 and 0.065, respectively. By 2016, the *FII* of the central and western regions reached 0.338 and 0.259, respectively. During the same period, the average growth rates of the *FII* of the central and western regions were 7.43% and 14.83%, respectively. The financial inclusion development of the western region was particularly fast and well above the average level.

#### 4. Structural Balance of China's Financial Inclusion

##### 4.1. Method

Before studying the structural balance of China's financial inclusion, we first needed to calculate the Gini coefficient of financial inclusion, which objectively reflects the development gap of financial inclusion between regions. The formula for calculating the Gini coefficient of equal groups and nonequal groups has been reported [34,35]. In order to match the calculation results, the Gini coefficient was calculated based on the ratio of the unequal area and the total unequal area in the Lorentz curve. According to the method used by Reference [36], we needed to calculate the Gini coefficient of all the dimensions of financial inclusion before calculating the structural balance of financial inclusion. In the eastern, central, and western regions of China, the development of financial inclusion includes three aspects: financial service penetration, financial service availability, and the usage of financial service. They are represented by  $P_i$ ,  $A_i$ ,  $U_i$ ,  $i = 1, 2, 3$ , respectively. Taking the penetration of financial services as an example, this paper reports the penetration dimension values of three regions from low to high. The cumulative percentage of the number of regions is the X-axis and the cumulative percentage of penetration dimension values is the Y-axis. We started at the origin and connected each

point in order to draw the Lorenz curve, which represents the penetration dimension of financial inclusion (see Figure 2).



**Figure 2.** The Gini coefficient of the penetration dimension in financial inclusion.

The ratio of the area between the Lorenz curve and the 45° line to the area under the 45° line is the Gini coefficient of the penetration dimension. The Gini coefficient is expressed as follows:

$$G_p = \frac{A_p}{A_p + B_p} \quad (5)$$

$$C_i = \sum_{j=1}^i P_j \quad (i = 1, 2, 3) \quad (6)$$

$$B_i = \frac{C_i}{C_3} \quad (i = 1, 2, 3), B_0 = 0 \quad (7)$$

$$\begin{aligned} G_p &= \frac{A_p}{A_p + B_p} = \frac{0.5 - A_p}{0.5} = 1 - 2A_p = 1 - 2 \sum_{i=1}^3 \frac{B_{i-1} + B_i}{6} \\ &= 1 - \frac{1}{3} (2 \sum_{i=1}^3 B_i - B_3) = 1 - \frac{1}{3} (2 \sum_{i=1}^3 \frac{C_i}{C_3} - 1) = 1 - \frac{1}{3C_3} (2 \sum_{i=1}^3 C_i - C_3) \end{aligned} \quad (8)$$

After using Formula (8) to calculate the Gini coefficient of the penetration dimension  $G_p$ , the availability dimension  $G_A$ , and the usage dimension  $G_U$ , the structural balance of China's financial inclusion is defined as:

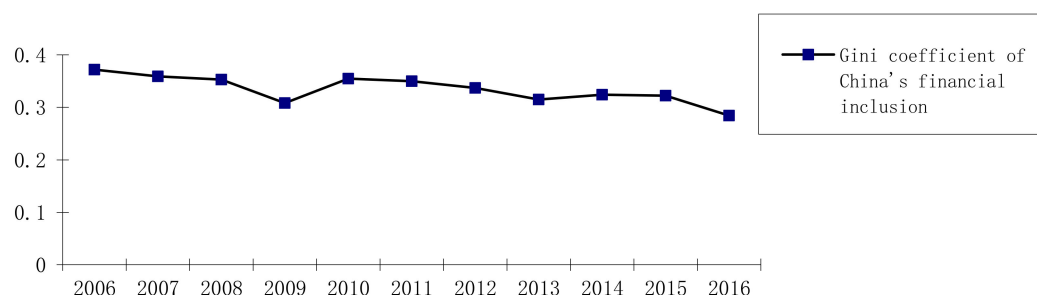
$$G = \alpha_p G_p + \alpha_A G_A + \alpha_U G_U \quad (9)$$

where  $\alpha$  represents the weight of each dimension.

#### 4.2. Calculation Results

Using the above method, the Gini coefficient of China's financial inclusion from 2006 to 2016 was measured and the results are shown in Figure 3. It can be seen that the Gini coefficient of China's financial inclusion shows a significant downward trend in addition to the temporary increases in 2009–2010 and 2013–2014. The Gini coefficient of financial inclusion in China dropped from 0.372 in 2006 to 0.284 in 2016, with a decline of 23.66%. The mean value of it is 0.334, which is within a relatively reasonable and safe range. The shrinking of the Gini coefficient of China's financial inclusion indicates that the development gap between China's regions is narrowing gradually and the distribution of financial inclusion resources is reasonable.





**Figure 3.** The Gini coefficient of financial inclusion in China.

We continued to measure the Gini coefficient of the penetration, availability, and usage dimensions in the eastern, central, and western regions. The results are shown in Table 5.

**Table 5.** The Gini coefficients of the different dimensions of financial inclusion.

Dimension	2006	2007	2008	2009	2010	2011	2012	2013
Penetration	0.383	0.372	0.371	0.336	0.426	0.402	0.390	0.365
Availability	0.597	0.460	0.383	0.340	0.297	0.278	0.265	0.265
Usage	0.334	0.326	0.324	0.233	0.238	0.303	0.295	0.266
Dimension	2014	2015	2016	Max	Min	Median	Mean	Standard Deviation
Penetration	0.373	0.381	0.321	0.426	0.321	0.373	0.374	0.029
Availability	0.267	0.281	0.279	0.597	0.265	0.281	0.337	0.106
Usage	0.239	0.219	0.215	0.334	0.215	0.266	0.272	0.046

Table 5 shows that the mean value of the Gini coefficient of the usage dimension is the smallest, which indicates that the unbalanced development degree of the usage dimension in the three regions is relatively small and the development of the usage dimension is more balanced. In terms of specific indicators, the insurance depth of the three regions is similar. The mean value of the Gini coefficient of the penetration dimension is largest, which indicates that the development of the penetration dimension in the three regions is unbalanced. Especially the development of the penetration dimension in the eastern region is much higher than that in the central and western regions. In terms of specific indicators, the number of banking institutions and securities institutions in each region is very different, especially in the eastern and western regions. The development of the availability dimension in the central and western regions is similar and, in these regions, the savings deposit per capita and insurance density indicators are similar. The mean value of the Gini coefficient of the three dimensions is within the range of 0.2–0.4, which is relatively safe.

In the research period, the Gini coefficients of the penetration, availability, and usage dimensions have been decreasing. Among three dimensions, the Gini coefficient of the availability dimension decreased most obviously from 0.597 in 2006 to 0.279 in 2016, with a decline of 53.27%. This shows that the development of the availability dimension in China's regions is gradually balanced. The development trend of the Gini coefficient of the penetration dimension and the usage dimension are similar. The Gini coefficients of the two dimensions from 2006 to 2008 were relatively stable, but they fell sharply from 2008 to 2009. The Gini coefficients of the two dimensions have increased since 2009, but by 2011 they began to decline gradually until 2016. In general, the development of the different dimensions in China's regional financial inclusion is more balanced.

Table 6 shows the results of the structural balance of China's financial inclusion. If the structural balance is higher, this means that the development of China's financial inclusion is unbalanced. There may be a region that only pays attention to the penetration of the financial service and ignores the availability of the financial service. Meanwhile, another region may only be focused on the availability of the financial service, ignoring the penetration of the financial service, resulting in the development

of China's overall financial inclusion being unscientific and imperfect. Seen from Table 6, the structural balance of China's financial inclusion has declined from 0.406 in 2006 to 0.300 in 2016, with a decrease of 26.11% and an average annual decline of 2.98%. In 2009–2010 and 2013–2015, the structural balance of China's financial inclusion increased slightly, but the overall trend declined significantly. This situation indicates that the structure of China's financial inclusion tends to be reasonable and that the development of the three dimensions of financial inclusion in each region is also gradually balanced.

**Table 6.** The structural balance of China's financial inclusion.

	2006	2007	2008	2009	2010	2011
Structural balance	0.406	0.378	0.366	0.322	0.382	0.371
	2012	2013	2014	2015	2016	Mean
Structural balance	0.359	0.337	0.340	0.344	0.300	0.355

## 5. Empirical Analysis

### 5.1. Dynamic Shift-Share Model

In this paper, the dynamic shift-share model is used to further discuss the development balance of China's regional financial inclusion. This model was first proposed by Daniel and Creamer. Dunn summarizes and perfects this model in [37]. First, the research period is divided into  $L$  phases; each phase is expressed as  $m$ , where  $m = 0, 1, 2, \dots, L - 1$ . The variables  $FII$  and  $fii$  represent the financial inclusion development of China and China's regions, respectively. The variables  $FII_i^{m+1}$  and  $fii_i^{m+1}$  ( $i = 1, 2, 3$ ) represent the  $i$  dimension of  $FII$  of China and #13; China's regions in the  $m + 1$  period, respectively.  $\Delta fii_i^{m+1}$  represents the actual growth.  $\Delta fii_i^{m+1} = fii_i^{m+1} - fii_i^m$ . The dynamic shift-share model can be divided into three components: the reference regional component, the structural component, and the competitive component. The model can be expressed as follows:

$$\Delta fii_i^{m+1} = fii_i^m \times R^{m+1} + fii_i^m \times (R_i^{m+1} - R^{m+1}) + fii_i^m \times (r_i^{m+1} - R_i^{m+1}) \quad (10)$$

In Formula (10), the variable  $R^{m+1}$  represents the growth rate of the  $FII$  of China during the  $m + 1$  period;  $R_i^{m+1}$  represents the growth rate of the  $i$  dimension of China's  $FII$  during the  $m + 1$  period, and  $r_i^{m+1}$  represents the growth rate of the  $i$  dimension of the regions'  $FII$  during the  $m + 1$  period.

$$R_i^{m+1} = \frac{FII_i^{m+1} - FII_i^m}{FII_i^m}, R^{m+1} = \frac{FII^{m+1} - FII^m}{FII^m}, r_i^{m+1} = \frac{fii_i^{m+1} - fii_i^m}{fii_i^m} \quad (11)$$

$$\Delta fii_i^{m+1} - fii_i^m \times R^{m+1} = fii_i^m \times (R_i^{m+1} - R^{m+1}) + fii_i^m \times (r_i^{m+1} - R_i^{m+1}) \quad (12)$$

Based on Formula (12), the left side of the equation is the total shift component, which is equal to the sum of the structure and competitiveness components. The expression  $fii_i^m \times R^{m+1}$  refers to the reference regional component and also represents the value added. The expression  $fii_i^m \times (R_i^{m+1} - R^{m+1})$  represents the structural component and the expression  $fii_i^m \times (r_i^{m+1} - R_i^{m+1})$  represents the competitive component.

### 5.2. Empirical Results

We put three regions' FIIs, which were already measured from 2006 to 2016, into the dynamic shift-share model. The model results are shown in Tables 7–9 (Due to space limitations, Tables 7–9 only gives results for 6 years. Readers can ask the corresponding author for results on the other years.).

**Table 7.** The results of the dynamic shift-share model in the eastern region. Unit ( $\times 10^2$ ).

Dimensions	Component	2008	2010	2012	2014	2015	2016
Penetration	Actual growth	−1.876	−5.877	1.736	9.849	7.816	−2.569
	Total shift	3.912	−1.202	−5.138	−4.491	−10.904	−8.707
	Reference	−5.788	−4.675	6.874	14.340	18.720	6.138
	Structure	0.273	−4.647	0.189	1.439	−8.394	0.916
	Competitiveness	3.639	3.445	−5.327	−5.930	−2.510	−9.623
Availability	Actual growth	0.269	0.994	0.906	2.274	6.793	1.965
	Total shift	0.776	1.607	−0.438	−1.224	2.275	−0.041
	Reference	−0.507	−0.613	1.344	3.498	4.518	2.006
	Structure	1.361	2.501	−0.012	−0.794	3.562	−0.133
	Competitiveness	−0.585	−0.894	−0.426	−0.430	−1.287	0.092
Usage	Actual growth	−0.836	0.013	0.342	1.109	4.993	0.498
	Total shift	−0.119	0.772	−0.76	−1.411	1.937	−0.901
	Reference	−0.717	−0.759	1.102	2.520	3.056	1.399
	Structure	−1.568	0.657	−0.168	−0.508	4.662	−0.693
	Competitiveness	1.449	0.115	−0.592	−0.903	−2.725	−0.208

**Table 8.** The results of the dynamic shift-share model in the central region. Unit ( $\times 10^2$ ).

Dimensions	Component	2008	2010	2012	2014	2015	2016
Penetration	Actual growth	0.823	−9.066	0.424	5.607	2.363	1.530
	Total shift	2.940	−7.016	−1.627	1.115	−4.453	−0.653
	Reference	−2.117	−2.050	2.052	4.492	6.816	2.183
	Structure	0.100	−2.037	0.057	0.451	−3.056	0.326
	Competitiveness	2.840	−4.979	−1.684	0.664	−1.397	−0.979
Availability	Actual growth	0.298	0.528	0.409	0.844	1.946	0.667
	Total shift	0.373	0.679	−0.013	−0.306	0.424	0.028
	Reference	−0.075	−0.151	0.422	1.150	1.522	0.639
	Structure	0.202	0.615	−0.004	−0.261	1.200	−0.042
	Competitiveness	0.171	0.064	−0.009	−0.045	−0.776	0.070
Usage	Actual growth	−0.229	−0.083	0.151	0.747	2.317	0.259
	Total shift	−0.094	0.167	−0.002	0.066	1.323	−0.271
	Reference	−0.135	−0.250	0.227	0.681	0.994	0.530
	Structure	−0.295	0.217	−0.035	−0.137	1.517	−0.262
	Competitiveness	0.201	−0.050	−0.041	0.203	−0.194	−0.009

**Table 9.** The results of the dynamic shift-share model in the western region. Unit ( $\times 10^2$ ).

Dimensions	Component	2008	2010	2012	2014	2015	2016
Penetration	Actual growth	−0.770	−3.270	0.850	0.303	0.690	3.904
	Total shift	0.115	−2.412	−0.081	−2.297	−2.145	3.027
	Reference	−0.885	−0.858	0.931	2.600	2.835	0.877
	Structure	0.042	−0.853	0.026	0.261	−1.271	0.131
	Competitiveness	0.073	−1.559	−0.107	−2.558	−0.874	2.896
Availability	Actual growth	0.305	0.619	0.480	0.457	1.911	0.657
	Total shift	0.367	0.767	0.030	−0.808	0.415	0.029
	Reference	−0.062	−0.148	0.450	1.265	1.496	0.628
	Structure	0.167	0.604	−0.004	−0.287	1.180	−0.042
	Competitiveness	0.200	0.163	0.034	−0.521	−0.765	0.071
Usage	Actual growth	−0.124	0.099	0.167	0.621	2.235	0.448
	Total shift	0.214	0.545	−0.431	−0.791	0.524	−0.276
	Reference	−0.338	−0.446	0.598	1.412	1.711	0.724
	Structure	−0.739	0.386	−0.091	−0.284	2.610	−0.358
	Competitiveness	0.953	0.159	−0.340	−0.507	−2.086	0.082

### 5.3. Results

Overall, the average actual growth of the financial service penetration in China's eastern, central, and western regions are positive, indicating that the financial service penetration of three regions shows a better development trend. In particular, the average actual growth of the financial service penetration in the eastern region is the largest, followed by the western region and the central region. Furthermore, the growth path of the penetration dimension in the eastern and western regions was similar from 2006 to 2013. From 2013 to 2016, the growth path in the eastern and central regions was similar. Looking at the structural components of the three regions, we find that the mean values of the structural components of the penetration dimensions in the three regions are negative. This means that the penetration dimension is at a structural disadvantage. The growth rate of the penetration dimension is lower than the overall growth rate of China's *FII*, which has not played a positive role in promoting the development of financial inclusion. To observe the competitive component, the mean value of the penetration dimension in the western region is the largest, while the eastern region has the smallest competitive component. Financial service penetration in the western region has a certain competitive advantage over the central and eastern regions. Compared with the absolute value of the structural component and the competitive component, the competitive component is larger than the structural component, showing that the competitive factor is the main factor that determines the development of the financial service penetration.

In the availability dimension, the development of the financial service availability in the central and western regions is relatively close. At the same time, the average structural component of the availability dimension in the three regions is positive, suggesting that the availability dimension is at a structural advantage and that it can play a positive role in promoting the development of financial inclusion. Besides, the structural factors contribute more to the growth of the availability dimension than competitive factors. The development of the availability dimension in the three regions mainly benefits from the growth effect of the structural components. Compared with the eastern region, the availability dimension in the central and western regions has a certain competitive advantage.

Compared with the financial service penetration and the financial service availability, the development gap of the financial service usage in the three regions is small and they present a similar development path, which is similar to the shape of the letter "M". The average actual growth of the usage dimension in the eastern region is the largest, and the average actual growth in the central and western regions is close. In the structural components, the mean values of the structural components in the three regions are all positive. The average structural component of the eastern region is the highest, followed by the western region and the central region. The usage and availability of financial services are at structural advantages, which can promote the development of financial inclusion. The usage dimension in the central region developed relatively smoothly and there was no great fluctuation, but the volatility of the usage dimension in the eastern and western regions is fluctuating.

### 5.4. Robustness Test

Table 10 shows the chi-squared test to compare differences in the development of financial inclusion's dimensions between regions. Table 11 shows the chi-squared test to compare differences in each region's components. Table 12 shows spatial correlation between the developments of region's financial inclusion. It can be seen that the actual growth and competitive components of penetration dimension between regions are significantly different. The development of penetration dimension of financial inclusion differs in three regions. The structural components of eastern region's three dimensions are significantly different. The developments of three dimensions of eastern region's financial inclusion are quite different. The results are consistent with the previous analysis. Furthermore, there is no spatial correlation between the developments of financial inclusion in three regions at 0.01 significant levels. The interdependence of the development between regions' financial inclusion is not obvious. The results are shown below.

**Table 10.** Chi-square test results in three region's dimensions.

<b>Actual Growth</b>	<b>Chi-Square</b>	<b>Asymp.sig</b>
Penetration	26.324	0.05
Availability	4.717	0.999
Usage	1.784	1.000
<b>Reference component</b>	<b>Chi-Square</b>	<b>Asymp.sig</b>
Penetration	1.828	1.000
Availability	3.529	1.000
Usage	5.091	0.985
<b>Structural component</b>	<b>Chi-Square</b>	<b>Asymp.sig</b>
Penetration	0.735	0.999
Availability	2.489	0.991
Usage	1.286	0.996
<b>Competitive component</b>	<b>Chi-Square</b>	<b>Asymp.sig</b>
Penetration	19.898	0.03
Availability	0.000	1.000
Usage	0.75	1.000

**Table 11.** Chi-square test results in each region's components.

<b>Eastern Region</b>	<b>Chi-Square</b>	<b>Asymp.sig</b>
Actual growth	15.533	0.625
Reference component	4.412	0.992
Structural component	49.848	0.000
Competitive component	4.371	0.627
<b>Central region</b>	<b>Chi-Square</b>	<b>Asymp.sig</b>
Actual growth	9.394	0.95
Reference component	10.128	0.753
Structural component	12.267	0.833
Competitive component	0.000	1.000
<b>Western region</b>	<b>Chi-Square</b>	<b>Asymp.sig</b>
Actual growth	12.272	0.833
Reference component	3.653	0.997
Structural component	21.795	0.241
Competitive component	5.000	0.958

**Table 12.** Spatial correlation of the development of financial inclusion between regions.

<b>Penetration</b>					
<b>Moran'I</b>	<b>I</b>	<b>E(I)</b>	<b>Sd(I)</b>	<b>z</b>	<b>p-value</b>
Actual growth	−0.007	−0.034	0.045	0.620	0.535
Reference component	−0.020	−0.034	0.046	0.308	0.758
Structural component	−0.002	−0.034	0.045	0.717	0.474
Competitive component	−0.018	−0.034	0.046	0.359	0.720
<b>Availability</b>					
<b>Moran'I</b>	<b>I</b>	<b>E(I)</b>	<b>Sd(I)</b>	<b>z</b>	<b>p-value</b>
Actual growth	−0.053	−0.034	0.036	−0.519	0.604
Reference component	−0.060	−0.034	0.045	−0.565	0.572
Structural component	−0.04	−0.034	0.044	−0.126	0.900
Competitive component	−0.090	−0.034	0.043	−1.296	0.195

Table 12. Cont.

Moran'I	Usage				
	I	E(I)	Sd(I)	z	p-value
Actual growth	−0.013	−0.034	0.044	0.479	0.632
Reference component	−0.126	−0.034	0.046	−1.967	0.049
Structural component	−0.025	−0.034	0.044	0.217	0.829
Competitive component	−0.069	−0.034	0.042	0.835	0.404

## 6. Conclusions and Policy Implications

In recent years, research on financial inclusion has attracted more attention. This paper discusses the sustainable development of China's financial inclusion from the perspective of balance. First, in order to comprehensively reflect the level of development of financial inclusion in different regions, financial services such as securities and insurance were added to the construction of the *FII*, and we used the entropy weight method to calculate the *FII* in these regions from 2006 to 2016. The results showed that China's *FII* has increased greatly, presenting a rising trend. From east to west, *FII* is declining and the development level of financial inclusion in the eastern region is better than that of the central and western regions. However, the development speed of financial inclusion in the central and western regions was relatively fast, especially in the western region, with an average growth rate of 14.83%. In terms of the dimensions, there are some differences in the three regions. In the penetration dimension, the eastern region is developing well, and the western region develops relatively weak. In the availability dimension, the development paths of the central and western regions are similar and they are in a "catch-up" situation. In the usage dimension, the central region is relatively weak, which is inferior to the western region. The gap between the usage dimensions in the three regions is narrowing.

Second, this paper defines the concept of the Gini coefficient of financial inclusion and uses it to calculate the structural balance of China's financial inclusion. From 2006 to 2016 there was a significant decline in the Gini coefficient of China's financial inclusion, from 0.372 in 2006 to 0.284 in 2016, with a decline of 23.66% and the mean value of 0.334. The decline of the Gini coefficient indicates that the development of financial inclusion in China is gradually balanced and the gap between regions' financial inclusion is narrowing. At the same time, the Gini coefficients of the three dimensions in financial inclusion are also slowly declining in the research period and the decline of the availability dimension's Gini coefficient was the most obvious. The Gini coefficient of the usage dimension is the least and the Gini coefficient of the penetration dimension is the largest, suggesting that financial service penetration is the most unbalanced development among China's regions. The structural balance of China's financial inclusion decreased from 0.406 in 2006 to 0.300 in 2016. Although there was a slight increase in 2009–2010 and 2013–2015, overall, the structural balance of China's financial inclusion is gradually decreasing, and the structure of China's financial inclusion tends to be reasonable.

In the end, this paper uses the dynamic shift-share model to make an empirical analysis. The results show that in the eastern, central, and western regions, the penetration dimension is at a structural disadvantage and the availability and usage dimensions are at a structural advantage. The availability and usage of the financial services play an important role in promoting the development of financial inclusion. In the penetration dimension, the competitive factor contributes more to the development of financial service penetration than the structural factor. In the availability dimension, the structural factor contributes more to the growth of the financial service availability than the competitive factor. Compared with the eastern region, the financial service availability in the central and western regions has competitive advantages and, in the meantime, the development gap of the financial service usage is the smallest and the development path is similar to the shape of the letter "M".



In terms of policy implications, this paper shows that, at present, there is an imbalance in the development of China's financial inclusion, in both the regional and dimensional aspects. This imbalance will cause some harm to the sustainable development of China's financial inclusion. However, this imbalance is gradually being eliminated and the unbalanced development gap is also gradually narrowing. The structure of China's financial inclusion is becoming more reasonable. In the future, starting from the availability and usage of financial service, the government can make full use of their structural advantages and establish a more balanced and scientific development mechanism about financial inclusion. This will eventually improve the financial inclusion system and promote the sustainable development of China's financial inclusion.

The study used regional data to measure the balance of China's financial inclusion. In the future, to further understand sustainable development of China's financial inclusion, more studies need to be carried out to expand the data scope and use data that includes provinces and cities. Furthermore, the influence factors of Gini coefficient of financial inclusion and the effect of financial inclusion policy on the development of financial inclusion can be analyzed.

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## References

1. Jeanneney, S.G.; Kpodar, K. Financial development and poverty reduction: Can there be a benefit without a cost? *J. Dev. Stud.* **2011**, *47*, 143–163. [\[CrossRef\]](#)
2. Beck, T.; Demirguc-Kunt, A.; Martinez Peria, M.S. Reaching out: Access to and use of banking services across countries. *J. Financ. Econ.* **2007**, *85*, 234–266. [\[CrossRef\]](#)
3. Beck, T.; Demirguc-Kunt, A.; Levine, R. Finance, Inequality, and the Poor. *J. Econ. Growth* **2007**, *12*, 27–49. [\[CrossRef\]](#)
4. Sarma, M. *Index of Financial Inclusion*; ICRIER Working Paper, No. 215; ICRIER: New Delhi, India, 2008.
5. Beck, T.; Senbet, L.; Simbanegavi, W. Financial Inclusion and Innovation in Africa: An Overview. *J. Afr. Econ.* **2015**, *24*, i3–i11. [\[CrossRef\]](#)
6. Cnaan, R.A.; Moodithaya, M.S.; Handy, F. Financial Inclusion: Lessons from Rural South India. *J. Soc. Policy* **2012**, *41*, 183–205. [\[CrossRef\]](#)
7. Peachey, S.; Roe, A. *Access to Finance: What Does it Mean and How Do Savings Banks Foster Access?* No. 49; World Savings Banks Institute: Amsterdam, The Netherlands, 2006.
8. Gabor, D.; Brooks, S. The digital revolution in financial inclusion: international development in the fintech era. *New Political Econ.* **2017**, *22*, 423–436. [\[CrossRef\]](#)
9. Peng, J.G.; Zhu, B. Strategic Thinking of Exploitation-oriented Inclusive Finance under the vision of Developed Economics. *Theory Pract. Financ. Econ.* **2017**, *38*, 2–7.
10. Figart, D.M. Institutional Policies for Financial Inclusion. *J. Econ. Issues* **2013**, *47*, 873–894. [\[CrossRef\]](#)
11. Ghosh, J. Microfinance and the challenge of financial inclusion for development. *Camb. J. Econ.* **2013**, *37*, 1203–1219. [\[CrossRef\]](#)
12. Wang, X.H.; Guan, J. Financial inclusion: Measurement, spatial effects and influencing factors. *Appl. Econ.* **2017**, *49*, 1–12. [\[CrossRef\]](#)
13. Chakravarty, S.R.; Pal, R. Financial inclusion in India: An axiomatic approach. *J. Policy Model.* **2013**, *35*, 813–837. [\[CrossRef\]](#)
14. Kapoor, A. Financial inclusion and the future of the Indian economy. *Futures* **2014**, *56*, 35–42. [\[CrossRef\]](#)
15. Rosengard, J.K.; Prasetyantoko, A. If the Banks are Doing So Well, Why Can't I Get a Loan? Regulatory Constraints to Financial Inclusion in Indonesia. *Asian Econ. Policy Rev.* **2011**, *6*, 273–296. [\[CrossRef\]](#)
16. Demirgüç-Kunt, A.; Klapper, L. Measuring Financial Inclusion: Explaining Variation in Use of Financial Services across and within Countries. *Brook. Pap. Econ. Act.* **2013**, *44*, 279–321. [\[CrossRef\]](#)

17. Lopez, T.; Winkler, A. The challenge of rural financial inclusion—Evidence from microfinance. *Appl. Econ.* **2018**, *50*, 1555–1577. [[CrossRef](#)]
18. Allen, F.; Demircuc-Kunt, A.; Klapper, L.; Peria, M.S.M. The foundations of financial inclusion: Understanding ownership and use of formal accounts. *J. Financ. Intermed.* **2016**, *27*, 1–30. [[CrossRef](#)]
19. Anzoategui, D.; Demirgüç-Kunt, A.; Peria, M.S.M. Remittances and Financial Inclusion: Evidence from El Salvador. *World Dev.* **2014**, *54*, 338–349. [[CrossRef](#)]
20. Zins, A.; Weill, L. The determinants of financial inclusion in Africa. *Rev. Dev. Finance* **2016**, *6*, 46–57. [[CrossRef](#)]
21. Fungáčová, Z.; Weill, L. Understanding financial inclusion in China. *China Econ. Rev.* **2015**, *34*, 196–206. [[CrossRef](#)]
22. Ghosh, S.; Vinod, D. What Constrains Financial Inclusion for Women? Evidence from Indian Micro data. *World Dev.* **2017**, *92*, 60–81. [[CrossRef](#)]
23. Kairiza, T.; Kiprono, P.; Magadzire, V. Gender differences in financial inclusion amongst entrepreneurs in Zimbabwe. *Small Bus. Econ.* **2017**, *48*, 259–272. [[CrossRef](#)]
24. Sarma, M.; Pais, J. Financial Inclusion and Development. *J. Int. Dev.* **2011**, *23*, 613–628. [[CrossRef](#)]
25. Appleyard, L. Community Development Finance Institutions (CDFIs): Geographies of financial inclusion in the US and UK. *Geoforum* **2011**, *42*, 250–258. [[CrossRef](#)]
26. Fan, Z.; Zhang, R. Financial Inclusion, Entry Barriers, and Entrepreneurship: Evidence from China. *Sustainability* **2007**, *9*, 203. [[CrossRef](#)]
27. Sharma, D. Nexus between financial inclusion and economic growth: Evidence from the emerging Indian economy. *J. Financ. Econ. Policy* **2016**, *8*, 13–36. [[CrossRef](#)]
28. Chibba, M. Financial Inclusion, Poverty Reduction and the Millennium Development Goals. *Eur. J. Dev. Res.* **2009**, *21*, 213–230. [[CrossRef](#)]
29. Neaime, S.; Gaysset, I. Financial Inclusion and Stability in MENA: Evidence from Poverty and Inequality. *Financ. Res. Lett.* **2018**, *24*, 230–237. [[CrossRef](#)]
30. Chiapa, C.; Prina, S.; Parker, A. The Effects of Financial Inclusion on Children’s Schooling, and Parental Aspirations and Expectations. *J. Int. Dev.* **2015**, *28*, 683–696. [[CrossRef](#)]
31. Wang, X.H.; Qiu, Z.X. The influence mechanism of rural finance development on urban-rural income gap. *Econ. Perspect.* **2011**, *52*, 71–75.
32. Honohan, P. Cross-country variation in household access to financial services. *J. Bank. Finance* **2008**, *32*, 2493–2500. [[CrossRef](#)]
33. Honohan, P. *Measuring Microfinance Access: Building on Existing Cross-Country Data*; World Bank Policy Research Working Paper, No. 3606; World Bank: Washington, DC, USA, 2005.
34. Angus, D. *The Analysis of Household Surveys: A Microeconomic Approach to Development Policy*; Johns Hopkins University Press: Baltimore, MD, USA; London, UK, 1997.
35. Vinod, T.; Wang, Y.; Fan, X.B. *Measuring Education Inequality: Gini Coefficients of Education*; World Bank Policy Research Working Paper, No. WPS2525; World Bank Group: Washington, DC, USA, 2000.
36. Yang, X.K. *The Basis of Mathematical Economics*; National Defence Industry Press: Beijing, China, 1985.
37. Dunn, E.S. A Statistical and Analytical Technique for Regional Analysis. *Pap. Reg. Sci. Assoc.* **1960**, *6*, 97–112. [[CrossRef](#)]

