The Evaluation of the Effect of the 2008 Financial Crisis on China's Openness

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Abstract. This paper uses economic openness evaluation index system to assess the impact of the 2008 financial crisis on economic openness of mainland China. It then conducts empirical analysis to comprehensively evaluate and compare the situation, characteristics and spatial-temporal evolution of economic openness of various regions in mainland China since the 2008 financial crisis, thus to assess the situation of anti-financial crisis and the response potential in various regions. The results of the analysis show that the regions with good economic foundation and balanced economic development have strong capability to resist the 2008 financial crisis, the regions with high economic extroversion and high dependence on exports to Europe and the United States have been greatly affected, and still have not eliminated the negative impacts. At the same time, the 2008 financial crisis has promoted the economic openness path evolution in various parts of mainland China and become the driving force for the opening-up transformation. The risk aversion effect of the diversified and balanced open path was manifested, and forced by the huge impact of the 2008 financial crisis, all regions began to gradually move toward a comprehensive open path of balanced development. Different characteristics and types are shown in the opening-up of local economies after the 2008 financial crisis. The economically developed areas developed from single-oriented to fully open type and even omnipotent high open areas. The coastal economically developed areas began to show signs of radiation effects in the surrounding areas. The economic openness between China's various regions is quite different, and the level of economic openness in the central and western regions is still relatively low with little change, so it is less affected by the 2008 financial crisis.

Introduction

The level of openness in mainland China has been severely affected by the 2008 financial crisis. Through constructing relevant openness indicators on the base of relevant data, this paper evaluates the situation and analyzes the characteristics and types of economic openness of the various regions by using the entropy method and clustering methods to analyze different types of openness in mainland China (excluding Hong Kong, Macao and Taiwan).

Measurement and Analytical Method

There are different definitions of economic openness and measurement method, which are divided into broad definition and narrow definition. The definition in narrow sense mainly measures the economic openness from three aspects: trade, financial and investment openness. In the empirical research, the indicator system of economic openness can be selected according to the research purpose. This paper chooses the definition of economic openness in narrow sense to construct the evaluation indicator system, because it has gained relatively more recognition, and it is easier to find relevant indicator data (Due to space constraints, we do not elaborate on the specific
This paper mainly conducts an empirical analysis of the economic openness of the mainland China from the perspectives of the regional ranking, type, characteristics, spatio-temporal evolution of the evaluation indicator system values.

Data Selection

The data in this paper are all quoted from the 2008-2017 China Statistical Yearbook. The relevant statistical data on the yearbook are calculated to obtain relevant indicator data according to the constructed indicator system. This paper selects the relevant openness indicator data one year before the 2008 financial crisis (2007) as the base period of comparison, and examines the economic openness indicators of the provinces and municipalities in mainland China from 2007 to 2016 for an empirical analysis. The data come from China Statistical Yearbook from 2008 to 2017. All the indicators have been screened through Pearson correlation text.

An Empirical Analysis of the Opening-up in Mainland China after the 2008 Financial Crisis

The level of openness in mainland China has been severely affected by the 2008 financial crisis. So 2008 is the key time node for this paper. This paper compares the changes of the opening level of the mainland China before and after the 2008 financial crisis. The time nodes selected for comparative analysis are 2007 (the year before the 2008 crisis), 2008 (the year when the financial crisis broke out), 2009 (the year after the financial crisis), and the recent year of 2016.

Indicator Measurement and Calculation Results

This paper has processed 320 raw data of 10 statistical indicators related to 6 indicator variables of the 3 types of indicators from 2007 to 2016 by the calculation method of entropy method and obtained the weight value of the 6 indicator variables, which are shown in the following table.

<table>
<thead>
<tr>
<th>Indicator categories</th>
<th>Indicators</th>
<th>Comentropy</th>
<th>Redundancy</th>
<th>Indicator weight value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade openness</td>
<td>Export value as a share of GDP</td>
<td>0.843043789</td>
<td>0.156956211</td>
<td>0.179784006</td>
</tr>
<tr>
<td></td>
<td>Import value as a share of GDP</td>
<td>0.804717381</td>
<td>0.195282619</td>
<td>0.223684627</td>
</tr>
<tr>
<td>Financial openness</td>
<td>The proportion of total liabilities of foreign-invested industrial enterprises to GDP</td>
<td>0.86788527</td>
<td>0.13211473</td>
<td>0.151329567</td>
</tr>
<tr>
<td>Investment openness</td>
<td>The proportion of total foreign investment in fixed assets to total investment in fixed assets of the whole society</td>
<td>0.859327806</td>
<td>0.140672194</td>
<td>0.161131633</td>
</tr>
<tr>
<td></td>
<td>The proportion of actual use of foreign capital in the amount of capital formation</td>
<td>0.837448341</td>
<td>0.162551659</td>
<td>0.186193259</td>
</tr>
<tr>
<td></td>
<td>The proportion of foreign registered capital of foreign-invested enterprises to the total registered capital of foreign-invested enterprises</td>
<td>0.914550861</td>
<td>0.085442139</td>
<td>0.097876907</td>
</tr>
</tbody>
</table>

Data Source: China Statistical Yearbook, 2008~2017

From the weight value ranking of indicators, the order from large to the small are successively the import value as a share of GDP (0.2237), the proportion of actual use of foreign capital in the amount of capital formation (0.1862), the export value as a share of GDP (0.1798), the proportion of total foreign investment in fixed assets to total investment in fixed assets of the whole society (0.1611) and the proportion of total liabilities of foreign-invested industrial enterprises to GDP (0.1513). This shows that the proportion of imports and the proportion of exports are the main factors to evaluate the economic openness of China and other regions.
The Evolution of China's Economic Openness from 2007 to 2016

The individual indicator levels and comprehensive levels of the economic openness of various regions in mainland China in 2007-2016 can be obtained by using the entropy method, and relevant overall analysis and structural analysis can be carried out.

From the national average level of China's economic openness under the entropy method, both the comprehensive level and the individual trade, financial and investment openness have experienced a process of a peak in 2007, then a sharp decrease in 2009, and since then entered the decline phase after the 2008 financial crisis. With the global financial downturn, some countries started a trade war, thus China’s export trade decreased, some foreign-invested enterprises have been withdrawn from China. Furthermore, some manufacturing industries in China’s coastal areas moved to Southeast Asia. Both trade and investment openness of China have declined rapidly and entered the downward channel. The comprehensive level of the indicator system has never recovered to the previous level. This shows that the 2008 financial crisis has severely affected the opening-up of the Chinese economy. The year 2008 has become a watershed in the trend of China's economic opening-up.

Judging from the economic openness of various regions in China under the entropy method, the trends of the economic openness indicator in most regions are similar to the national average level, which first peaked in 2007 and then entered the downward channel after the global economic downturn in 2008.

Figure 1. The Comprehensive Level of Economic Openness in Various Regions of China's Mainland before and after the 2008 Financial Crisis in 2007-2016.

Data Source: China Statistical Yearbook, 2008-2017
After the 2008 global economic downturn, the trend of openness indicators in most parts of mainland China has shown a downward trend. Among them, Shanghai, Beijing, Fujian, Chongqing, Shaanxi, Zhejiang and Hainan have seen a wave of rebound after the impact of the financial crisis due to relatively balanced development open path of the diversified economy, but went down again quickly. While Guangdong, Jiangsu and Shandong (mainly exported to South Korea), which were highly dependent on trade exports, have been declining in economic openness, and there have been no rebound. In Liaoning Province, there was a clear rebound in 2016, which may be due to the effectiveness of the opening policy along the border. The Tibet Autonomous Region experienced a major rebound in 2012. Although it has declined since then, it has remained close to the level before the 2008 financial crisis. Other provinces have been basically in a continuing decline trend. However, most of the regions are in a slumping downtrend and still have not recovered to the level of economic opening-up in 2007 before the 2008 financial crisis. In addition, the level of economic opening-up between China's regions is quite different. The level of economic opening-up in the central and western regions is still low, their changes before and after the 2008 financial crisis were small, which made them less impacted by the 2008 financial crisis.

The comprehensive level of economic openness of various regions from 2007 to 2016 shows: the economic openness of various regions in mainland China have been greatly affected by the financial crisis in 2008, and then entered a long-term decline channel, up to now, it has never restored to the previous level. This shows that the level of economic opening-up of a country or region is deeply affected by the world economic environment. When the world economy is prosperous and world economic activity is vigorous, the economic openness degree of a country or region will increase rapidly and rise to a higher level. On the contrary, if the world economy is sluggish and world economic activity shrinks, the economic openness degree of a country or region will drop rapidly and may stay in the downward channel for a long time, making it difficult to get out of the trough.

The Changes of the Economic Openness Rankings

We select several key time nodes to compare and analyze the rankings of economic openness in various regions. These key time nodes are the year 2007 which is the year before the financial crisis in 2008 (the base period of comparative analysis), the year 2008 when the financial crisis broke, the bottom level year 2009 after the 2008 financial crisis and the year 2016 which can reflect the latest situation.

Judging from the changes in China's comprehensive level of economic openness in the four key years before and after the 2008 financial crisis, the rankings in coastal areas and old industrial areas have changed significantly. The rankings of Shanghai and Beijing quickly jumped after entering into the 2008 financial crisis, with Shanghai surpassing Guangdong and Beijing surpassing Tianjin. After the 2008 financial crisis, Tianjin’s economic openness rankings declined relatively. The ranking of Zhejiang has steadily increased from the 7th in 2007 before the crisis to the 5th in 2016. Liaoning and Chongqing also jumped rapidly, with Liaoning surpassing Shandong and Chongqing surpassing Jiangxi. The rankings of Henan and Shaanxi have significantly improved. Jiangsu is relatively stable in the third place. The coastal provinces of Guangdong, Shandong, and Hunan have experienced a retrogression and soon been surpassed by other regions. The rankings in other regions have not changed much. Xinjiang has a ranking retreat after 2008, but its ranking is still ahead of the neighboring western regions.
Judging from the reasons of the ranking changes, the regions with better economic foundation, more comprehensive development and diversified open paths have been less affected by the crisis, and their rankings have risen. The trade-oriented and single exporting markets regions have been greatly affected and their rankings have fallen. The regions that implement balanced open policies and diversified trade exporting regions have strong capability to resist the impact of the 2008 financial crisis, and their rankings had been rebounded, such as Shanghai, Beijing, Zhejiang, and Liaoning provinces (opened along the border, to Russia, South Korea, etc., implemented a diversified multi-regional open policy). The areas with prominent trade and single export destination open routes, especially those that rely heavily on European and American export markets and traditionally highly opened coastal areas are deeply impacted by the 2008 financial crisis and have got stuck in a quagmire, their economic openness levels continues to decline. Shanghai and Beijing quickly jumped after the 2008 financial crisis due to the relatively balanced development open path (balanced open path). With its consistent financial open tradition, solid industrial foundation and good talent accumulation, Shanghai has taken the lead in exerting its financial openness. After that, it continued to implement a balanced and open policy of comprehensive development and quickly surpassed Beijing and Guangdong, due to its leading financial openness level and comprehensive openness level to rank first in the country in terms of economic openness. Beijing has steadily increased its ranking due to its balanced development path and surpassed Tianjin. Liaoning and Chongqing also jumped rapidly with the border openness and “Belt and Road” policy to change into multi-regional openness path, and has also changed the plight of over-reliance on the Europe and the US. The coastal areas with high economic openness, outstanding trade and relatively single exporting markets have experienced a retreat. Guangdong (mainly exported to Europe and the United States) and Shandong (exported to South Korea), which rely heavily on a single regional market, have regressed and soon surpassed by other regions. The rankings of other regions have not changed much. The Xinjiang Uygur Autonomous Region,
despite its ranking retreat after 2008, still ranks in front of Hunan which has a stronger industrial and economic strength due to its national superiority in the “Belt and Road” region. Zhejiang still adheres to the strategy of balanced openness and has the capability to resist the impact of crisis. Its ranking has risen from the 7th in 2007 to the 5th in 2016. Trade-led regions have been hit harder and their rankings have fallen. Coastal areas and regions with better industrial bases have higher economic openness, but they have been seriously affected by the 2008 financial crisis, their rankings have declined. Among them, the regions with diversified open paths have increased their rankings after the 2008 financial crisis. Guangdong, which started with trade exports, has experienced a decline in economic opening-up ranking due to foreign investment withdrawal, economic transformation and industrial transfer after the 2008 financial crisis. Henan in the central region with good industrial base, Shaanxi and Chongqing in the west and Liaoning in the northeast have undertaken industrial transfer and implemented investment attraction and opening-up after the 2008 financial crisis, their rankings have greatly improved. The economic openness levels in provinces such as Shandong and Hunan with a certain industrial base but small changes in open policies and slower industrial upgrading have not changed much. Xinjiang ranks middle and much higher than the neighboring western regions due to its increasingly active border trade and oil and gas trade with Central Asia for more than a decade. Its ranking has declined slightly after the 2008 financial crisis but still maintains a relatively good ranking, far ahead of the neighboring regions. The economic openness levels in the central and western regions have been low, and the rankings have changed little. The economically backward regions have been ranking bottom because their economies have been lagging behind.

The changes of the economic openness levels in mainland China before and after the 2008 financial crisis indicate that the areas with comprehensive development, diversified open policies and multi-regional open cooperation have strong resistance to financial crisis and external risk. This confirms the rule of investment risk diversification and avoidance of “do not put eggs in the same basket”, which also applies in the field of economic openness.

The Evolution of Open Types

We adopt cluster analysis to classify the economic openness levels of various regions in mainland China based on the entropy method results of the economic openness indicator system in various areas of mainland China, and summarize the characteristics of each category.

The clustering method is adopted here. The open types throughout the country are divided into five categories according to the values of various open indicators. In the decade of 2007-2016, the open types in Chinese mainland have changed a lot. The following six open types have emerged as a whole (The six open types here basically mean that, the open types are divided into five categories each year and six open types have appeared due to the types changes of various regions within ten years).

(1) Highly open type: The representative region is Shanghai. Features: The highest level of trade openness, which makes it belong to the first grade of the highest comprehensive level of economic openness.

(2) Fully open type: The representative region is Guangdong. Features: Trade, financial and investment openness are all higher, which makes it belong to the second grade of higher comprehensive level.

(3) Investment-oriented type: The representative region is Jiangsu. Features: Investment openness is relatively prominent, the financial openness and investment openness are both higher, which makes it belong to the third grade of higher comprehensive level.

(4) Trade open type: The representative area is the early Guangdong, Beijing and etc. Features: Trade openness is relatively prominent, the financial openness are also higher, which makes it belong to the fourth grade of higher comprehensive level.

(5) Balanced open type: Zhejiang, Fujian, Hainan and Chongqing. Features: Openness is more comprehensive, investment opening is relatively prominent, and the comprehensive level of openness is relatively low.
(6) Low open type: Hebei, Shanxi, Inner Mongolia Autonomous Region, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi Zhuang Autonomous Region, Sichuan, Guizhou, Yunnan, Tibet Autonomous Region, Shaanxi, Gansu, Qinghai, Ningxia Hui Autonomous Region, Xinjiang Uygur Autonomous Region. Features: The openness of all indicators is the lowest and the open comprehensive level is also the lowest.

Figure 3. Radiation Map of the Final Clustering Center of Individual Indicators of the Economic Openness Types During 2007~2016.

Data Source: China Statistical Yearbook, 2008~2017

From the cluster analysis results of the industrial economy's openness indicators system in the above four representative years, we can see that the economic openness levels of different regions have shown different features and types after the 2008 financial crisis, and the economically developed areas have developed from a single-led type to a fully open type area, or even an omnipotent highly open area.

Before the 2008 financial crisis, Guangdong benefited from a trade-oriented open strategy. With a large amount of trade and foreign-invested enterprises, its comprehensive level of economic openness was the highest. Shanghai occupied the second place relying on industrial base and port trade. Beijing, Tianjin, Zhejiang and Fujian followed closely with the relatively balanced development open strategy. Jiangsu closely followed Shanghai and Guangdong, vigorously introduced foreign-funded enterprises, and embarked on an investment-led open path.

After the 2008 financial crisis, Shanghai has been focusing on the financial openness relying on the tradition of financial openness and the unique financial open policy given by the state, comprehensively enhanced the various sub-items of economic openness, and moved toward a comprehensive open path, thus firmly occupied the first place of comprehensive economic openness level. Beijing had a relatively strong anti-financial crisis capability with its consistently balanced
open path and surpassed Jiangsu to rank the third place. Jiangsu has focused on foreign business and investment attraction and moved toward a balanced open path. Zhejiang still adheres to the strategy of balanced opening-up with the capability to resist the impact of the 2008 financial crisis and is less affected, jumped from the 7th in 2007 to the 5th in 2016, moved from the third level in 2007 to the fourth level in 2008 and again returned to the third level of openness in 2016.

In 2007, Jiangsu took an investment-led open path before the 2008 financial crisis and undertook a large number of manufacturing operations in the epitaxial processing area of Shanghai. In 2008, when the 2008 financial crisis broke out, it generated a large number of trade exports relying on previous investment companies and became an investment-led open area. After the 2008 financial crisis, Jiangsu Province once again followed Shanghai’s financial open policy and undertook a large number of high-tech enterprises investments, and then moved to a balanced open path like that of Shanghai.

On the whole, Shanghai and Guangdong have become the pioneers of economic openness. Tianjin, Jiangsu, Zhejiang, Liaoning, Shandong, and Chongqing have a higher economic openness levels relying on a good industrial economic base. The northwestern economic backward areas, like Tibet Autonomous Region, have always belonged to low-open areas.

From the evolutionary causes of the above-mentioned economic openness types, we could see that Shanghai, Beijing, Zhejiang, and Liaoning provinces were less affected by the 2008 financial crisis with a relatively balanced diversified open path, and jumped to a higher openness level. Shanghai's economic openness level are superior to those of Beijing and Guangdong, especially in the financial openness, thus leapt to the highest level of openness, which is highly open type. Beijing lags behind Shanghai in financial openness, and is also inferior to Shanghai and Guangdong in other aspects. As a result, the level of economic openness of Beijing is much lower than that of Shanghai and Guangdong. However, due to the advantages of a balanced open path, it surpasses Jiangsu which has been in a leading position previously. Zhejiang has promoted its openness level steadily due to its consistently open and balanced tradition. The economically extroverted Guangdong and Jiangsu were deeply affected by the 2008 financial crisis and forced to transform from an investment-led road to a balanced open path. Guangdong has changed its traditional open path to seek industrial upgrading and moved to a diversified, multi-regional open path. Jiangsu has regained its old investment-led road, exerted efforts in attracting investment, introduced multi-regional high-tech enterprises including leading Taiwanese enterprises that started with OEM trade processing and leading manufacturing industries in Japan and South Korea, such as large enterprise group who owns technological property rights like memory and hard drives, and have also been forced to move toward a balanced open path.

The evolution of the economic openness type in various areas of Chinese mainland illustrates that the 2008 financial crisis has forced various regions in Chinese mainland to adjust their open policies and gradually moved toward a balanced open path of diversification. The diversified risk dispersion and avoidance rules also apply in the field of economic openness, which state that diversified balanced open path has strong capability to resist financial crisis and external risk, and also has the effect of risk dispersion and avoidance.

In addition, the economic openness level in the central and western regions of the Chinese mainland is still low and also less impacted. Therefore, their open paths have changed little before and after the 2008 financial crisis.

Regional Interaction Analysis

We then study the data variation trend of these different regions at different time points on the map, and then judge whether there is interactive development trend between different regions, especially adjacent regions, so as to judge whether the inter-regional radiation effect existed.
Figure 4. The Evolution of Economy's Openness Degree in Various Regions before and after the 2008 Crisis (Temporal and Spatial Analysis).

Data Source: China Statistical Yearbook, 2008–2017

Judging from the spatio-temporal evolution of the economic opening-up in various regions of mainland China before and after China's accession to the WTO, Shanghai and Guangdong have obvious radiation driving effects on the economic openness in the surrounding areas. In particular, Shanghai has effectively driven the economic openness level of the surrounding Jiangsu province, which has been characterized by the trend of same rise and fall of the economic openness level with Shanghai. In this process, Jiangsu, as the hinterland of Shanghai, actually undertakes a large number of high-tech enterprises overflowing from Shanghai and related economic spillover effects, and has embarked on the path of joint development and openness between neighboring regions with Shanghai. The 2008 financial crisis has accelerated the formation of regional joint openness pattern between Shanghai and Jiangsu provinces. Guangdong was deeply affected by the 2008 financial crisis and the subsequent economic openness has not been able to restore to its pre-WTO level, and its surrounding areas have also shown a similar decline in openness.

In addition, the economic openness levels between various regions in Chinese mainland is quite different. The economic openness level in the central and western regions is still low and the changes are small, therefore, the evolution of the economic openness path is also not obvious there.

Conclusion

Judging from the above analysis of the economic openness indicator system in various regions of mainland China, the following conclusions are drawn.

First, the economic openness levels between various regions in Chinese mainland is quite different. The economic openness level in the central and western regions is still low and the changes are small, so it is less affected by the 2008 financial crisis.

Second, the 2008 financial crisis has had a great impact on the economic openness of the Chinese mainland. As a whole, it still has not completely escaped the decline channel after the 2008 financial crisis. This shows that the economic openness of the Chinese mainland is very dependent on the external environment.
Third, the changes of the economic openness rankings in various regions before and after the 2008 financial crisis and their reasons show that: (1) The economic openness levels of various regions in Chinese mainland showed different characteristics and types after the 2008 financial crisis, and the economically developed regions has developed from a single-dominant into a fully open type, or even omnipotent highly open area. (2) A balanced open path, a diversified open strategy and a multi-regional open cooperation bring about strong anti-financial crisis and external risk resistance capability. The regions that implemented the diversified open strategy were less affected, and their rankings have risen. The trade-led regions were hit harder and ranked lower. China’s inland coastal areas and regions with better industrial bases have higher economic openness, but they have been seriously affected and their rankings have declined. Among them, the regions with diversified open paths have increased their rankings after the 2008 financial crisis.

Fourth, the 2008 financial crisis has forced various regions in Chinese mainland adjusted from a trade-led or investment-led single-dominant open path to a balanced open path and gradually moved toward a balanced open path of diversification and comprehensive development. Also, the diversified risk dispersion and avoidance rule also apply in the field of economic openness. Still further, the economic openness level in the central and western regions is still low and is less impacted by the 2008 financial crisis, thus the changes are small, because their economic openness paths have also evolved less.

At last, judging from the spatial-temporal analysis of the economic openness levels in various regions, we can see that the developed coastal areas have begun to show signs of radiation effects on the economic openness of surrounding areas. Shanghai and Guangdong showed signs of obvious economic openness radiation driving effects on the surrounding areas, especially Shanghai’s radiation effect on Jiangsu. The 2008 financial crisis has accelerated the formation of regional joint openness pattern.

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References


