Study on the Effects of Industrial Agglomeration in Polit Free Trade Zone——the Case of China (Fujian) Polit Free Trade Zone

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Abstract. In response to the international economic transformation, the establishment of Polit Free Trade Zone is the measure to promote further reform with more open. The China (Fujian) Polit Free Trade Zone shows both the internal agglomeration effect and the external agglomeration effect in the industry, according to the location quotient test and production function (CES) regression. We could maximize the agglomeration effect from two aspects. On the one hand, we need to expand external agglomeration effect to attract more enterprises and capital. On the other hand, we also need to use the internal agglomeration effect to reduce costs, improve revenue and promote the construction of China (Fujian) Polit Free Trade Zone. And then it could provide a reference for other Polit Free Trade Zones.

1. Introduction
The three major economies of the United States, Europe, and Japan tried to redefine international trade and investment rules with TTP, TTIP, and PSA to build a new international economic order. To regain the great country status in the global economy and trade, and at the same time deepen domestic reforms, China has begun to establish a Polit Free Trade Zone (hereinafter referred to as Free Trade Zone) nationwide and has gathered a reproducible and scalable construction experience.

The construction of China Polit Free Trade Zone is based on Marshall's (1890) concept of the industrial zone [1], that is, forming industrial agglomeration within a certain area to gain the concentration and collaboration advantages [2] and eventually achieve the purpose of promoting economic growth [3].

From the perspective of agglomeration effect, this paper explores the construction achievements, especially the industrial agglomeration effect, of the Polit Free Trade Zone, and proposes suggestions based on the empirical results.

2. Method

2.1. Sample
The Fujian Free Trade Zone is one of the second batch of free trade zones in China. It consists of 43 square kilometers of the Pingtan area, 43.78 square kilometers of the Xiamen area, and 31.26 square kilometers of the Fuzhou area. This paper chose it as an example for the three reasons: Firstly, it’s the first free trade zone to propose a "one zone and multiple parks" model. Secondly, Fujian Province has
an important geographic location. It is the starting point of the Maritime Silk Road and an important node in “the Belt and Road”. And it’s located in the west of the Taiwan Strait and also the nearest mainland province to Taiwan. Thirdly, it plays an important role in the region. It not only shoulders the task of stimulating the southeastern economic growth, but also plays an important role in strengthening the economic cooperation between Fujian and Taiwan, realizing the peaceful reunification on both sides of the Taiwan straits, and providing convenient trade and economic exchanges.

2.2. Method
The agglomeration effect includes internal agglomeration effect and the external agglomeration effect. The former one is the degree of regional industrial agglomeration. The main measurement indexes include industry concentration, concentration index of industrial space, spatial gini coefficient and location quotient index [4]. The latter refers to the effect of industrial agglomeration within a region. It’s judged by economic growth rate of individual enterprises or returns to scale of the production function [5].

When studying the external agglomeration effect, the paper draws on the results of Haggett P (1965) and other scholars’ research [4], and uses location quotient (also known as the specialization rate) to measure the spatial distribution of regional factors and analyze the industry situation of the area.

\[ E_{ij} = \frac{q_{ij}/e_j}{q_i/e} \]  

(1)

Here \( q_{ij} \) is the output of the i-industry in j region, \( e_j \) is the output of all industries in j region, \( q_i \) is the output of i-industry, and \( e \) is the total output of all industries in the country. \( E_{ij} \) is the location quotient index, and the national average is 1, the benchmark value. The larger the \( E_{ij} \), the higher the industry's concentration in the region.

When studying the internal agglomeration effects, the paper draws on the findings of Tang Jie [6] and Liu Jianfeng [5]. The effect of agglomeration economies is estimated by Equation 4, which is obtained by taking the logarithm of the combination of CES (Equation 3) with time series:

\[ H = \frac{1+b}{1-a} \]  

(2)

\[ P = A Q^a K^b \]  

(3)

\[ \ln(P) = \ln(A) + a \ln(Q) + b \ln(K) + \xi \]  

(4)

In formula (3), \( P \) is the profit of a industry in a certain year, \( Q \) is the total industrial output of a industry in a certain year, \( K \) is the net value of fixed assets of a industry in a certain year, \( a \) is the profit elasticity of output, \( b \) is the profit elasticity of fixed assets, and \( A \) is a coefficient. Take the logarithm of both sides of equation (3) to establish the model (4). In formula (2), \( H \) is the measure index, and \( l \) is the reference value, indicating that the returns to scale unchanged. If \( H \) is greater than 1, there will be increasing returns to scale of the area. If not, there will be diminishing returns to scale.

2.3. Data
This paper collects the quarterly data values of the primary industry, secondary industry, and tertiary industry (hereinafter referred to as “the three major industries”) from the first year before and after the official establishment of the Fujian Free Trade Zone in the entire country and Fujian Province from 2014 to 2016 as source data. The degree of industrial agglomeration in Fujian Province before and after the establishment of the Fujian Free Trade Zone is analyzed by calculating the location quotient index. Industry plays a forward-backward horizontal relationship in the secondary industry and is an important component of the regional economy and a key link in the industry [7]. Therefore, when
measuring the industrial agglomeration effect, the monthly data of the total profit (P), total industrial output (Q), and net fixed value (K) of industrial enterprises above designated size in Fujian Province from 2014 to 2016 are collected and taken their log to get ln (P), the dependent variable. Ln (Q) and ln(K) are independent variables, and the data are regressed after 12 months (the number of measurement samples is generally 5-10 times the number of explanatory variables in the equation) of moving average processing.

3. Result

3.1. Analysis of external agglomeration effect

![Graph showing trend of location quotient of three major industries in Fujian Province from 2014 to 2016.](image)

Figure 1. Trend of location quotient of three major industries in Fujian Province from 2014 to 2016.

The data analysis results are shown in Figure 1. From the figure, we can see that:

Firstly, from the overall trend, the location quotient of three major industries in Fujian Province has experienced significant fluctuations. Between the fourth quarter of 2014 and the second quarter of 2015, it has experienced strong fluctuations. Secondly, from the perspective of all data, the gap of the location quotient of three major industries in Fujian Province is not significant. The observed values all fall within the range of 0.5-1.5, and the gap of location quotient of three major industries at each time point is decreasing, and gradually stabilizes to a range of 1 (±0.2). Thirdly, from a single data point of view, the secondary industry is an advantageous industry in Fujian Province. In addition to the second quarter of 2014, the location quotient of the secondary industry is all greater than 1, which is higher than the national average. The secondary industry is the pillar industry with the highest degree of agglomeration and obvious advantages in Fujian Province. Although the primary industry is basically around 1, but the volatility is too high, which makes it not a stable agglomeration industry. The tertiary industry is all lower than 1, but overall it is showing an upward trend, and it has the potential to become a clustering industry.

From the above three points, it can be seen that the establishment of the Fujian Free Trade Zone has shown the external agglomeration effect for Fujian Province. The paper considers the reasons for the external agglomeration effect in the Fujian Free Trade Zone as follows. With the 1st and 2nd quarters of 2015 as the demarcation line (the Fujian Free Trade Zone was formally established in April 2015), due to the just-established Free Trade Zone, Fujian Province experienced a volatile economy and experienced an erratic industrial transformation process. Afterwards, the Fujian Free Trade Zone adopted open policy measures to actively strengthen cooperation between Fujian and Taiwan and do a good job of accepting Taiwan’s industrial transfer. On the basis of ensuring the advantages of agglomeration, the secondary industry was made minor adjustments to keep it in a stable state of aggregation and more support was transferred to the tertiary industry, so that the tertiary industry showed a sustainable upward trend. At the same time, due to the limited terrain with more mountains and less land (3:1) in Fujian Province, the primary industry is still one of the leading industries. Without reducing the ratio of the output value of the primary industry, the volatility of it will be kept at a national average.
level. Eventually, the industrial development of Fujian Province will show the tendency of the three major industries to go hand in hand.

3.2. Analysis of internal agglomeration effect

![Figure 2. Trends of H-Values from 2014 to 2016.](image)

From Figure 2, the h-value from March 2014 to May 2015 fluctuates greatly, which is an outlier and won’t be considered. From June 2014 to June 2016, the value of h showed a trend of rising first and then decreasing, and gradually approaching 0.5, indicating that the industrial agglomeration effect of Fujian Province has changed significantly and the scale of compensation has gradually decreased. It can thus be seen that the planning and construction of the Fujian Free Trade Zone has had a reverse effect on the agglomeration effect of the Fujian industrial industry, and the internal agglomeration of the industrial industry has weakened. There are two possible reasons for its happening:

Firstly, Fujian Province is undergoing industrial restructuring. The internality of the industrial agglomeration effect in Fujian Province has decreased since 2015, and there has been a negative situation in which investment has increased and profits have decreased, and the agglomeration effect has been poor. 2015 is an important period for the planning and establishment of the Fujian Free Trade Zone, therefore, it can be inferred that the reason for the reduction in the internality of the industrial agglomeration effect is that the transfer of enterprises and funds from the secondary industry, which is mainly industrial, to the tertiary industry. Due to the industrial transformation of Fujian Province after the planning of the Fujian Free Trade Zone, the influx of the tertiary industry into Fujian caused the secondary industry to be cold, the investment was reduced, and the agglomeration effect was worse than before.

Secondly, there is a lack of harmonious collaboration between Fujian enterprises. In the agglomeration process of industrial enterprises in Fujian Province, the number of industrial enterprises has continuously increased, the scale has been continuously expanded, and the degree of development has been continuously deepened. If the division of labor, cooperation, and value chain among industrial enterprises have the good convergence, there should be strong agglomeration internal effects between enterprises. However, the low quality of agglomeration caused by the blind development of enterprises in Fujian Province, and the weak sustainability of agglomeration areas result in a continuous decline in the agglomeration effect and even negative economic benefits.

4. Conclusion

According to the above research on the agglomeration effect of the Fujian Free Trade Zone, it can be seen that the planning and construction of the Fujian Free Trade Zone has a certain agglomeration effect on the development of Fujian Province, including external and internal agglomeration effects. However, due to the short completion time of the Fujian Free Trade Zone, there is still much room for improvement and development. It is necessary to maintain the positive effects brought about by the number of agglomerations, increase the quality of agglomeration, correct the negative effects, and promote the development of regional economies.
To play the role of agglomeration in the region, we need to start with two aspects. Firstly, play the "magnetic field effect" of external agglomeration effect. When a region forms a certain scale of industrial agglomeration, it will adversely affect the enterprises in the region. Therefore, it’s very important to increase the attractiveness to industrial enterprises. On the one hand, it’s necessary to increase the number of enterprises and attract enterprises of the same type to set up factories (divisions) in the region with preferential trade policies or entrepreneurial support benefits. After a certain number of enterprises have gathered, a magnetic field with agglomerated attraction will be formed, attracting more enterprises to settle in and achieving the role of “snowballing”. On the other hand, to improve the quality of enterprises in agglomeration regions, the number of SMEs has grown rapidly in the boom of “nation-wide entrepreneurship”, but the weak foundation of SMEs has less influence on the region. Secondly, make use of the "marginal effect" of internal agglomeration effect. When an industrial agglomeration area is formed, with the expansion of the scale of enterprises with or the increase of the number of enterprises in the agglomeration area, a clear marginal effect will be shown, which is reflected in the four aspects of cost, labor force, information and market [8].

This paper analyzes the statistical data of Fujian Province and uses empirical methods to compare the agglomeration conditions before and after the establishment of the Free Trade Zone. The result shows that the construction of the Fujian Free Trade Zone has shown some agglomeration effect in Fujian Province. The impact of it on industrial agglomeration is mainly reflected in the decline of the secondary industry and an upward trend of the tertiary industry in agglomeration. As one of the main tasks of it is to carry out docking industry (the tertiary industry) cooperation between Fujian and Taiwan. Therefore, Fujian Province must seize the development opportunities of the “the Belt and Road”, make use of the trade platform of the Fujian Free Trade Zone to form a regional economy in Fujian and its surrounding areas, particularly, give play to the role of agglomeration effects in the adjustment of industrial structure, transform and upgrade the industrial chain, enhance the core competitiveness of enterprises, and effectively integrate and allocate regional resources.

The China (Fujian) Pilot Free Trade Zone is a microcosm of China's Free Trade Zone. From the development status of it, it can be assumed that the establishment of the Pilot Free Trade Zone can bring an agglomeration effect to the region. However, due to the short development time of it, the current study reflects the short-term impact to a large extent, and its long-term impact is not significant which is one of the follow-up research directions. In addition, in future studies, horizontal comparison studies will be conducted with the Free Trade Zones of other provinces as an example.

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