

# Comparison of Population and Industrial Structure between Urban Agglomerations of the Pearl River Delta and World-Class Urban Agglomerations

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**How to cite this paper:** Mei, N.X. (2019) Comparison of Population and Industrial Structure between Urban Agglomerations of the Pearl River Delta and World-Class Urban Agglomerations. *Modern Economy*, 10, 886-899.

<https://doi.org/10.4236/me.2019.103059>

**Received:** February 20, 2019

**Accepted:** March 19, 2019

**Published:** March 22, 2019

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## Abstract

In 2017, the planning of the urban agglomeration of the Pearl River Delta Bay Area was officially launched, which is an important measure to promote the integrated development of Guangdong, Hong Kong and Macao. The strategic position of the urban agglomeration of the Pearl River Delta region is of great importance, and the study of this Bay Area urban agglomeration needs to be followed up and deepened. This paper selects the panel data of the Pearl River Delta Bay Area and its major cities from 2000 to 2015, analyzes and calculates the deviation of industrial structure through graphs, and compares and analyzes the urban agglomerations of the New York Bay Area to explore the Pearl River Delta city. The overall population spatial characteristics of the group and the state of the industrial structure. This research is intended as an attempt to broaden the thinking for more in-depth research in the future.

## Keywords

Pearl River Delta, World-Class Urban Agglomeration, Population, Industrial Structure

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## 1. Introduction

Nowadays, the development of urban agglomeration has become one of the core hot spots in the discussion of urban competitiveness. Urban agglomerations are a large number of different natures within a specific geographical area. Cities of type and scale depend on certain natural environmental conditions, with one or two oversized or megacities as the core of the regional economy, with modern

means of transportation. And the accessibility of the integrated transportation network, as well as the highly developed information network, the intrinsic connection between the two urban individuals and the development of a relatively complete urban “aggregate” [1]. The large urban agglomeration is considered to be the growth pole of economic and social development of a country or region, and the most competitive regional organization form in the world today, and the most promising urban agglomeration in the urban agglomeration is the Bay Area urban agglomeration. The world-class urban agglomeration is a high-level form of urban agglomeration development. In 1961, the French geographer Jane Gottman proposed that the world-class urban agglomeration should have five characteristics: large overall size, dense urban areas, multiple metropolitan areas, one or more international cities, and one or more large international trade transit port. At present, the definition of world-class urban agglomerations is inconsistent, and there are five world-class urban agglomerations recognized worldwide: the Atlantic Coast urban agglomeration in the northeastern United States, the Chicago-centered Great Lakes urban agglomeration, the Tokyo-centered Japan Pacific Coast Urban Agglomeration, the London-centered British urban agglomerations, and Paris-centered urban agglomeration in northwestern Europe.

The Bay Area is a hot spot in the discussion of world-class urban agglomerations. In the same sea area, a cluster of urban areas with strong functional cooperation consisting of multiple ports and cities is called the Bay Area. It has a natural open economic development advantage due to its superior location conditions and has unique geographical, ecological, economic and human values. Among the world-recognized urban agglomerations, the most important Bay Areas, such as the San Francisco Bay Area, the New York Bay Area, and the Tokyo Bay Area of Japan, can be regarded as leaders in global economic development and technological change.

Hong Kong, Macao and Pearl River Delta is one of the most developed and dynamic areas in China. In March 2015, the National Development and Reform Commission, the Ministry of Foreign Affairs and the Ministry of Commerce jointly issued the “Vision and Action for Promoting the Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road”, which proposed to “deepen cooperation with Hong Kong, Macao and Taiwan to create a large bay in Guangdong, Hong Kong and Macao Area”. In March 2016, the State Council issued the “Guiding Opinions on Deepening the Pan-Pearl River Delta Regional Cooperation”, clearly requiring Guangzhou and Shenzhen to join hands with Hong Kong and Macao to jointly build the Guangdong, Hong Kong and Macau Bay Area and build a world-class urban agglomeration. At the end of the same year, the National Development and Reform Commission issued a notice proposing to start planning for the urban agglomeration of the Pearl River Delta Bay Area this year. On February 28, 2017, the Guangdong Pearl River Delta Optimization Development Fund held a signing ceremony, proposing to invest 50 billion Yuan in the Pearl River Delta world-class urban agglomeration, major platform construction and industrial transformation and upgrading, and

support the promotion of the Pearl River Delta optimization development strategy implementation. This series of measures has shown that under the “One Belt, One Road” strategy, the thinking and practice of the deep development of the Pearl River Delta will be further deepened. It is imperative to officially integrate Hong Kong and Macao into the urban agglomeration of the Pearl River Delta Bay Area, so as to carry out integrated planning and promote the joint efforts of Guangdong, Hong Kong and Macao to build a world-class Bay Area urban agglomeration.

## **2. Related Literature Review**

### **2.1. Domestic Research on Urban Agglomeration**

Since the 1980s, Chinese scholars have started special research on urban agglomerations. The concept of urban agglomeration, spatial range identification criteria and formation mechanism are the most debated issues among scholars. Following the concept of “urban continuous area” proposed by Zhou Yixing, the formulation of “urban group” also came into being. Dong Liming, Cui Gonghao, Yao Shimou, Wu Qiyang and other scholars have all raised their own understanding of the urban agglomeration. Since the beginning of the 21st century, scholars have continued to discuss the concept definition and identification criteria of urban agglomerations. Many scholars have begun to analyze the formation mechanism, development process and intrinsic characteristics of urban agglomerations. Fang Chuanglin [2] draws a comparative analysis table of urban-urban area-urban circle-city group-metropolitan area, which clearly and intuitively expresses the four stages of urban agglomeration and the characteristics of each stage. There are four main forms of recent development, including the concept and characteristics of theoretical research on contemporary urban agglomerations, the part of networked empirical research, theoretical policies and strategies, and the planning and practice of theoretical research [3].

In the past ten years, there have been more and more comparative studies on the three major urban agglomerations in China, namely the Beijing-Tianjin-Hebei urban agglomeration, the Yangtze River Delta urban agglomeration and the Pearl River Delta urban agglomeration. Sun Yao [4] constructed the evaluation index of urban agglomeration competitiveness. Based on the data of 39 cities in China's three major urban agglomerations, the empirical analysis showed that Shenzhen is the most competitive city and its comprehensive score is significantly higher than that. Other cities, followed by Shanghai, Beijing, Guangzhou and other cities, from the regional average evaluation value, the regional competitiveness rankings are: Pearl River Delta, Yangtze River Delta, Beijing-Tianjin-Hebei. Peng Li and Huang Chongxi [5] compared the advantages and disadvantages of the Yangtze River Delta, the Pearl River Delta and the Beijing-Tianjin-Hebei development urban agglomeration. They believe that the Yangtze River Delta and the Pearl River Delta should pay attention to overcoming the industrial convergence problem and think that the Pearl River Delta (Little Pearl River Delta, no

Including Hong Kong and Macao) Compared with the Yangtze River Delta and Beijing-Tianjin-Hebei, there is an inherent advantage, that is, the same city, the administrative divisions will be much less. Deng Lijun [6] introduced the Gini model to calculate the city-scale Gini index and the urban economic Gini index, and analyzed the top ten urban agglomerations in China. The results show that the economic agglomeration of China's top ten urban agglomerations is generally higher than the population concentration, population and economic development. The difference in balance is obvious; however, the balance between this balance and the economic level of urban agglomerations is not significant, and does not present the geographical differentiation characteristics of the eastern, central and western regions.

## 2.2. Research on the Pearl River Delta

The research on the urban agglomeration of the Pearl River Delta mainly focuses on the coordinated development and the path of sustainable development, and many scholars regard Hong Kong and Macao and the inland cities of the Pearl River as one, to carry out the Guangdong, Hong Kong and Macao Bay Area or the Greater Pearl River Delta urban agglomeration related analysis. Cheng Yuhong and Li Ketong [7] put forward the four-point judgment standard and corresponding measurement method for the coordinated development of urban agglomeration on the basis of scientifically defining the concept of coordinated development of urban agglomeration, and then provide new ideas for the coordinated development of the "Great Pearl River Delta". Liu Xiaohui *et al.* [8] constructed a comprehensive evaluation index system of three hierarchical index groups and horizontal indicator groups in Hong Kong and Macao Pearl River Delta. The data from 1997 to 2005 were selected and the indicators were determined by analytic hierarchy process. The weighting of the model, the establishment of a comprehensive measurement model, a comprehensive evaluation of the evolution trend and structural characteristics of the sustainable development of the Hong Kong and Macao Pearl River Delta, found that in terms of its internal structural characteristics, the development of the various standards and domain layers is quite different.

In addition to this, there are also studies on land and population. Liu Zhijia and Huang Heqing [9] quantitatively analyzed the spatial and temporal changes of urban construction land expansion, GDP, and resident population in the Pearl River Delta region over the past 30 years through the land use change data of remote sensing images from 1979 to 2009. Characteristics, the results show that: 1) the increase of construction land is mainly at the cost of the reduction of agricultural land; 2) the permanent population of the Pearl River Delta region has a significant correlation with economic growth; 3) for the entire region, the resident population, GDP and construction land A linear correlation.

In the past two years, as the concept of Guangdong, Hong Kong and Macao Bay Area has been written into the national strategy, the research on the Pearl

River Delta urban agglomeration has been carried out in the conceptual form of “Guangdong, Hong Kong, Macao and Bay Area”, focusing on the spatial structure change and industrial cluster evolution in the region, network systems and collaborative development. Xiang Xiaomei and Yang Juan [10] studied the industrial synergy of Guangdong, Hong Kong and Macao Bay Area, pointing out that Guangdong, Hong Kong and Macao Bay Area has developed urban agglomerations, world-class seaport groups, airport clusters and efficient logistics systems, and the industrial structure is highly complementary. It is believed that promoting the coordinated development of Guangdong, Hong Kong, Macao and Bay Area requires innovative industrial division of labor and industrial chain comprehensive integration mechanism, collaborative research and development and new business joint education mechanism and two-way expansion mechanism of international and domestic markets. Qin Chenglin and Pan Dandan [11] analyzed the industrial structure convergence and desirability of 11 cities in Guangdong, Hong Kong and Macao, and found that there are obvious industrial structure convergence at the three industrial levels, and the degree of convergence of industrial structure within the manufacturing industry is The decrease is attributed to the upgrading of the industrial structure in the Pearl River Delta region and the unified planning and division of labor in the advanced manufacturing industry during the industrial upgrading process. Therefore, it is believed that the city of Guangdong, Hong Kong and Macao should be encouraged to achieve product differentiation and promote Inter-industry division of labor and cooperation between cities, with particular emphasis on the division of labor and cooperation in strategic emerging industries to ensure the upgrading of industrial structure. Wang Fengyun and Ren Yaping [12] believe that in order to build a world-class urban agglomeration in Guangdong, Hong Kong and Macau, the Bay Area must first solve the problem of precise positioning of individual cities within the urban agglomeration and avoid repeated construction and homogenization competition within the city. Based on the theory of synergy, Zhou Chunshan *et al.* [13] divided regional coordinated development into four stages: isolation, diffusion, symbiosis and integration, and sorted out the coordinated development process of Bay Area in Guangdong, Hong Kong and Macao, and called the current stage the “symbiotic stage”. The future stage is called the “integration stage”, and the characteristics and mechanisms of coordinated development are analyzed from five aspects: economy, urban and rural, transportation, policy and planning.

### **2.3. Comparative Study with World-Class Urban Agglomerations**

The world-recognized urban-level urban agglomerations include the New York-centric Atlantic Coastal City Group in the Northeast, the North American Great Lakes City Cluster with Chicago as the center, the Japanese Pacific Coast urban agglomeration centered on Tokyo, and the British city with London as the core. The group and the western European urban agglomeration centered on

Paris. The typical urban agglomerations of the world show some common characteristics and development rules in the development process. They have common experience in the spatial structure, formation process and division of labor system. They can be summarized into five aspects: they have good geographical position and natural conditions. The formation process is phased, has a central dominance, and has a reasonable division of labor and cooperation system [14]. Liu Aimei and Yang Decai [15] analyzed the “efficiency trap” that may be caused by over-developing urban agglomerations based on the theory of urban agglomeration and urban scale, combined with the experience of Japanese urban agglomeration development, and analyzed the cost-benefit of individual urban residents from different costs. The utility of residents emphasizes the need to pay attention to the negative externalities generated by the expansion of urban agglomerations and excessive agglomeration, and promote the balanced development of urban economy. Li Zhen and Liu Pinan [16] summarized the criteria for judging world-class urban agglomerations and used it as an analytical framework for judging the gap in the construction of world-class urban agglomerations in the Pearl River Delta. The study found that the Pearl River Delta urban agglomeration has a certain gap with world-class urban agglomerations in terms of global central functions, modern industrial systems, inter-city transportation networks, and urban agglomeration coordination mechanisms.

In general, there are more literatures comparing the Yangtze River Delta and Beijing-Tianjin-Hebei with world-class urban agglomerations, while the Pearl River Delta discussion focuses more on the Pearl River Delta’s own indicators and competitiveness evaluations. The Pearl River Delta Bay Area urban agglomeration is linked to world-class urban agglomerations for comparative and quantitative research.

The comparative study in this paper selects the urban group of the New York Bay area as a reference. Although the San Francisco Bay Area and the Pearl River Delta are generally more common analogy, the San Francisco Bay Area urban agglomeration is not among the world-class urban agglomerations and is located in the northeastern United States. The New York Bay Area urban agglomeration is an information economy control center in the United States and the world, and has formed an industrial system centered on knowledge-intensive industries such as financial insurance, real estate, and information. This has economic advantages with Hong Kong, Shenzhen, and Guangzhou. Similarities, in-depth comparative research may be instructive for the further development of the Pearl River Delta urban agglomeration.

### **3. Research Methods and Data Selection**

#### **3.1. Research Methods**

This paper draws on Yin Deting and Shi Yi [17] to study the population distribution of the Beijing-Tianjin-Hebei urban agglomeration, that is, to observe the spatial characteristics of the urban population by observing the population

data and conducting comparative analysis, and further deepen the population research from the employment perspective, using the industry. The structural deviation degree is used to examine the coordination between the industrial structure and the employment structure within the urban agglomeration.

Used  $\frac{S_a}{S}$  to indicate the structural deviation of the industry a, the formula is:

$$\frac{S_a}{S} = \frac{Y_a/Y}{L_a/L} - 1$$

Among them,  $Y_a$  indicates the year-end GDP created by the industry a;  $Y$  indicates the total GDP at the end of the year in the study area;  $L_a$  indicates the number of employees of the industry a at the end of the year;  $L$  indicates the total number of employed people at the end of the year in each region studied.

Then  $\frac{Y_a/Y}{L_a/L}$  can be explained as the output value of the industry a as a percentage

of the output value of each industry. The ratio of the proportion of the sum to the proportion of the total number of employed people in the total employment. When the structural deviation degree of an industry is equal to 0, it means that the output value structure of the industry is highly consistent with the employment structure, and the equilibrium state is reached in the total amount; when it is greater than 0, it means that the labor productivity of the industrial unit is higher, and the closer to 0, the more The industry should absorb more labor to keep the development of the industry consistent with the ability to absorb employment; less than 0 means that there is hidden unemployment in the industry, and measures need to be taken to promote the transfer of labor.

### 3.2. Data Selection and Processing

Since Hong Kong and Macao returned to the motherland on July 1, 1997 and December 20, 1999 respectively, although the “one country, two systems” policy has retained the original capitalist system, it has been between the inland and Hong Kong and Macao before and after the reunification. The relationship is very different. Therefore, this paper considers the data of the Pearl River Delta Bay Area to be used after 1999, that is, the data from 2000 to 2016. The data comes from the corresponding year’s “Guangdong Statistical Yearbook”, “Macau Statistical Yearbook” and “Hong Kong Statistical Yearbook”. For vertical comparison, when analyzing economic indicator data, the data of different years should be processed as comparable prices at constant prices. It should be noted that Hong Kong, Macao and the inland Pearl River Delta region use different currency units. In order to unify the measurement, when importing economic indicators data of Hong Kong and Macao, according to the average exchange rate between Hong Kong dollar, Australian dollar and RMB in the current year, Hong Kong and Macao will be unified. The relevant indicator data is converted into indicator data in which RMB is used as a unified unit. The population data is based on the number of permanent residents

at the end of the year<sup>1</sup>.

## 4. Empirical Analysis of the Spatial Characteristics of Urban Population in the Pearl River Delta Bay Area

### 4.1. Population Size and Economic Growth

The population changes in the Bay Area and the Pearl River Delta urban agglomerations are shown in **Table 1** between 2000 and 2015 (valued at five-year intervals). From these data, we can see that the population of the New York Bay area is larger than that of the Pearl River Delta urban agglomeration, but the population of the New York Bay area urban agglomeration has been very stable in the past 15 years, with only a small increase, and the Pearl River Delta The population of urban agglomerations grew rapidly between 2005 and 2015, and the gap between the population of the New York Bay Area urban agglomerations was greatly reduced. Among them, the population growth in Macao and inland cities is the most obvious, and the population growth in Hong Kong is moderated, which is closer to the demographic characteristics of the New York Bay Area urban agglomeration. Hong Kong can be regarded as the leader of the Pearl River Delta Bay Area, and its economic development level has always been the closest to developed countries. Comparing the proportion of urban agglomerations (cities) in the national economy and the proportion of the population, in 2015, the total mass of urban agglomerations in the New York Bay area was 22.3%, and the proportion of the population was 22.4%<sup>2</sup>. The economic proportion and population accounted for It is flatter than the basic. In the same year, the ratio of Hong Kong's local GDP to China's GDP was 2.92%<sup>3</sup>, and the population ratio was 2.25%. The ratio of the economy to the population was basically the same.

In order to more intuitively observe and compare the population and changes, the author draws a histogram, as shown in **Figure 1**.

From the histogram, we can directly see the difference between the total population of the Bay Area and the population of the Pearl River Delta, and the population growth of the Pearl River Delta urban agglomeration is even stronger. The total population of Hong Kong has not changed much. Lu Jiu City's population growth contribution is obvious, but because the geographical area of Macao is too small, although the population is very dense, the absolute value of the total population is small compared with the total population of Hong Kong and the inland nine cities. In the bar chart of the average annual growth rate of the population drawn by the author, the population growth of Macao is clear at a glance, as shown in **Figure 2**. Among them, Hong Kong and the Bay Area of New York have an average annual growth rate of population, and Hong Kong is

<sup>1</sup>The exception is Hong Kong, whose demographic data is in the middle of the year. And its statistical population is "resident population", including "resident population" and "mobile population".

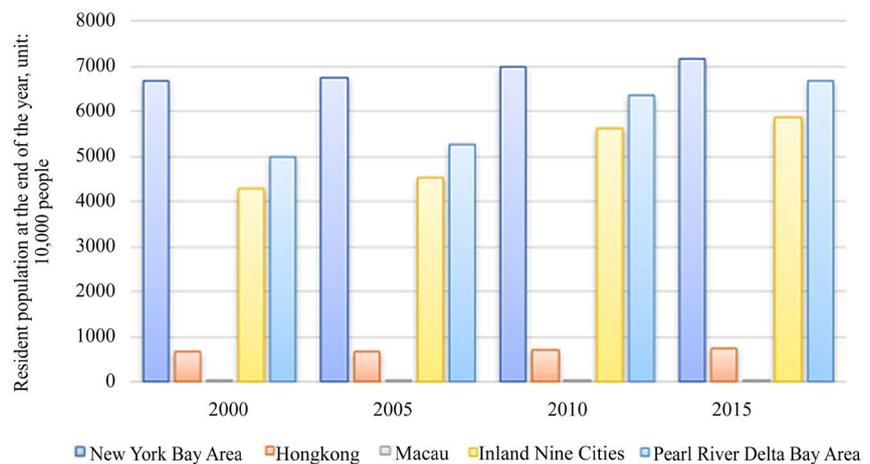
<sup>2</sup>Source: US Bureau of Economic Analysis.

<sup>3</sup>Since China's gross domestic product (GDP) accounting does not include Hong Kong, Macao and Taiwan regions, it is unreasonable to rush into the ratio of acquisitions. Therefore, through the comparison of the two ratios, more accurate and intuitive results can be obtained.

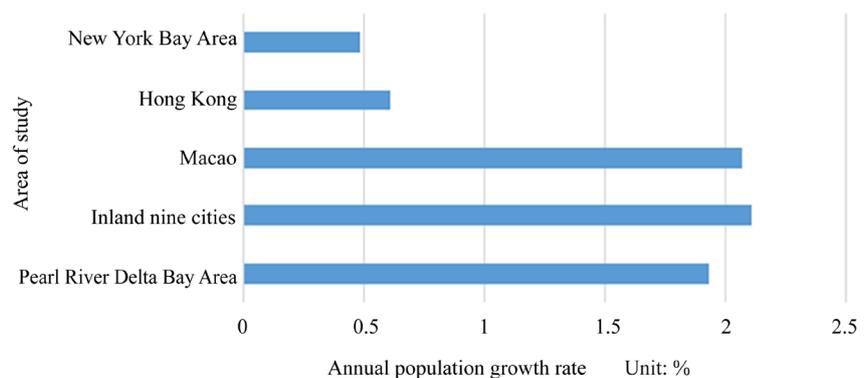
**Table 1.** Comparison of population size of urban agglomerations in the Bay Area of the New York Bay and the Pearl River Delta

	2000 (10,000 people)	2005 (10,000 people)	2010 (10,000 people)	2015 (10,000 people)	annual growth rate (%)
New York Bay Area	6671.6	6754.2	6996.6	7166.5	0.48
Pearl River Delta Bay Area					
Hong Kong	666.5	681.32	702.42	730.57	0.61
Macao	43.19	46.81	53.46	58.76	2.07
Inland Nine Cities	4289.78	4547.14	5616.39	5874.30	2.11
Total	4999.47	5275.27	6372.27	6663.63	1.93

Note: US related data comes from the US Census Bureau published data from 2000 to 2015; Pearl River Delta inland city data comes from the corresponding year's "Guangdong Statistical Yearbook"; Hong Kong and Macao data comes from the corresponding year's "Hong Kong statistics Annual Report" and "Macao Statistical Yearbook".



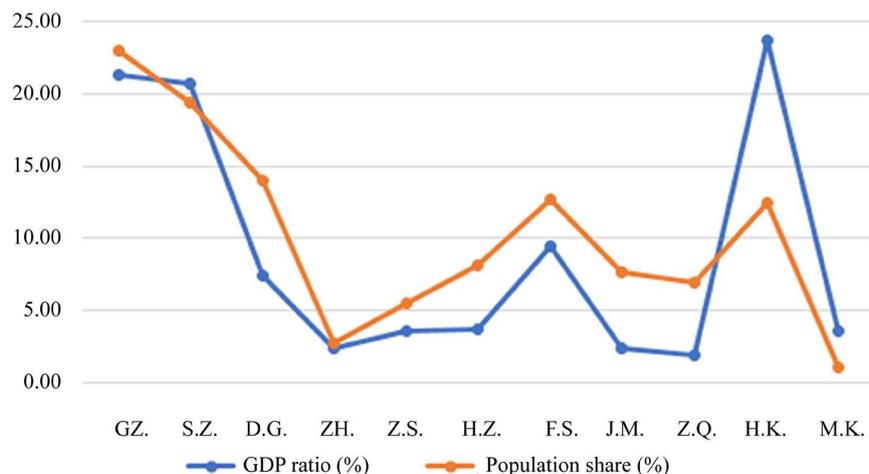
**Figure 1.** Population size of the New York Bay Area urban agglomeration and the Pearl River Delta Bay Area urban agglomeration. Note: US related data comes from the US Census Bureau published data from 2000 to 2015; Pearl River Delta inland city data comes from the corresponding year's "Guangdong Statistical Yearbook"; Hong Kong and Macao data comes from the corresponding year's "Hong Kong statistics Annual Report", "Macao Statistical Yearbook".



**Figure 2.** Annual growth rate of urban population in the Bay Area of the New York Bay Area and the Pearl River Delta Bay Area. Note: US related data comes from the US Census Bureau published data from 2000 to 2015; Pearl River Delta inland city data comes from the corresponding year's "Guangdong Statistical Yearbook"; Hong Kong and Macao data comes from the corresponding year of the "Hong Kong Statistical Yearbook", "Macao Statistical Yearbook".

slightly higher. The average annual growth rate of the population of Macao and the Inland Nine Cities exceeds the annual growth rate of the population of the New York Bay Area urban agglomeration, which also makes the population growth of the entire Pearl River Delta urban agglomeration reach the same period in the New York Bay Area Times.

Refined to each city (special administrative region) of the Pearl River Delta urban agglomeration, **Figure 3** shows the relationship between the population share of GDP and the GDP ratio of these cities (special administrative regions), and the proportion of population to GDP or GDP. Size relationship. Looking at the trend of the two lines, GDP ratio and population ratio seem to be positively correlated. Cities with a high GDP ratio tend to have a large proportion of the population. The difference in population ratio between the inland and the nine cities is more obvious than the difference in GDP. Hong Kong, as an international financial, trade and shipping center, ranks fifth in 11 cities, but its GDP is much higher than the Pearl River Delta. Any city in the district. Guangzhou, which has the highest proportion of population, and Shenzhen, which has the highest proportion of population, have a higher GDP ratio than other cities except Hong Kong (special administrative region). Between Dongguan and Foshan, Dongguan's population is slightly higher than Foshan, while GDP is slightly lower than Foshan. The overall economic growth of the two cities is not much different. If Hong Kong is regarded as the leader of the Pearl River Delta Bay Area and Guangzhou and Shenzhen are regarded as the second leaders, Dongguan and Foshan can be cultivated as the third-tier radiation city. Macao has the lowest proportion of population, but its GDP is higher than Zhuhai, Jiangmen and Zhaoqing. The development of Zhuhai in recent years seems to be in a downturn, which may be related to the different driving dynamics of Hong



**Figure 3.** Population and GDP ratio of cities/special administrative regions in the Pearl River Delta Bay Area. Note: US related data comes from the US Census Bureau published data from 2000 to 2015; Pearl River Delta inland city data from the corresponding year's "Guangdong Statistical Yearbook"; Hong Kong and Macao data from the corresponding year's "Hong Kong statistics Annual Report", "Macao Statistical Yearbook".

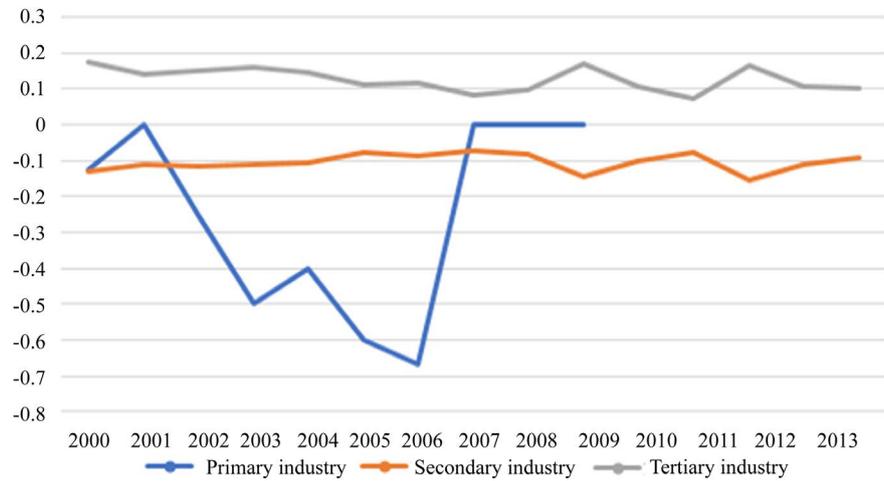
Kong and Macao. As a financial and trade center, Hong Kong has shifted a large part of its industry to the eastern cities of the Pearl River, represented by Shenzhen and Dongguan, and continues to drive the economic vitality of these cities. In the past few decades, Macao has developed into a tourism city dominated by entertainment and gaming, which makes it difficult for Zhuhai to gain unique development opportunities due to its proximity to Macau.

#### 4.2. Employment Structure and Industrial Structure

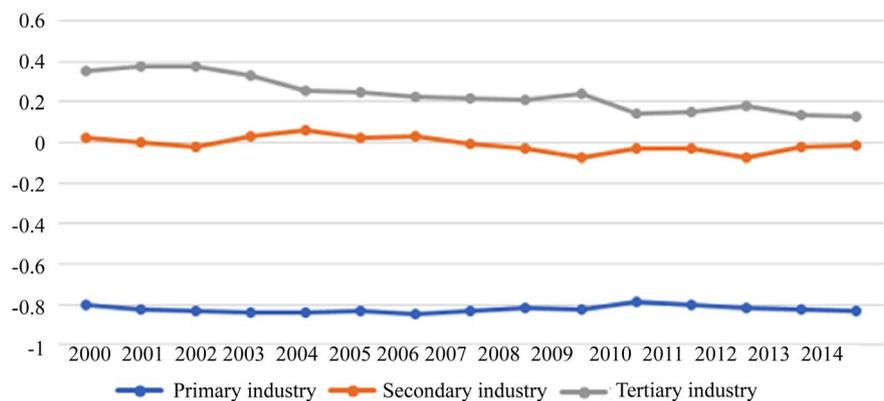
On the one hand, due to the limitation of data acquisition, on the other hand, because Hong Kong plays a driving and radiating role in the urban agglomeration of the Pearl River Delta region, the key to the development of the Pearl River Delta is that the inland cities are responding to the reforms and seeking to explore their own development path. Therefore, this part selects the core cities in the inland areas of the Pearl River Delta—Shenzhen and Guangzhou, to calculate the industrial structure deviation of the three major industries in the two cities, and then consider whether the overall industrial structure and employment structure of the Pearl River Delta are sufficiently coordinated.

As the first special economic zone established by China's reform and opening up, Shenzhen has developed into an international city with certain influence in just 30 years. The "Shenzhen Speed" created by the world has attracted worldwide attention. Behind the rapid development of a city's economy, there may be hidden dangers or crises. Under the background of supply-side reform, it is of far-reaching significance to think about the rationality of the city's industrial structure. **Figure 4** shows the industrial structure deviation of the first, second and third industries in Shenzhen from 2000 to 2014. From the figure, we can see that in the past 15 years, the deviation of the Shenzhen tertiary industry has been greater than 0, and the structural deviations of the second and third industries are almost all less than zero. Among them, the structural deviation of the second and third industries is relatively stable, and the fluctuation of the primary industry is very obvious. From 2001 to 2006, the deviation of the structure of Shenzhen's primary industry declined sharply, indicating that the labor force in the primary industry was surplus. The surplus labor transferred from the primary industry provided a certain labor supply for the development of the secondary and tertiary industries, and these labors generally It is cheaper and has played an important role in promoting the development of industries such as manufacturing, logistics and service industries. Subsequently, the labor force accelerated from the primary industry, and the output value of the primary industry decreased to close to zero, which made the deviation seem to rise. In fact, after 2007, the proportion of the primary industry in Shenzhen was almost negligible. Instead, information software, transmission, etc. were replaced. High-tech industries and advanced service industries shine.

The changes in the deviation of the three major industrial structures in Guangzhou are showed in **Figure 5**. Among them, the primary industry has always been negative, and the degree of deviation is close to  $-1$ , indicating that



**Figure 4.** Industrial structure deviation of the three major industries in Shenzhen. Note: the data comes from “Shenzhen Statistical Yearbook from 2000 to 2015”<sup>4</sup>.



**Figure 5.** Industrial structure deviation of the three major industries in Guangzhou. Note: the data comes from “Guangzhou Statistical Yearbook” (2000-2015).

there is a long-term surplus labor in the primary industry of Guangzhou. It should be strengthened to help this part of the labor force to be evacuated to positions that can create production value, such as Through education and training, these labor force transformations are involved in the production of secondary and tertiary industries; the deviation of the structure of the secondary industry is always near zero, indicating that the ability of the secondary industry to absorb labor has become saturated; Industrial units have the highest labor productivity and stronger labor absorption capacity and space, but their absorption capacity has also been saturated since 2013.

Interestingly, it seems that there is a trade-off between the structural deviations of the secondary and tertiary industries in Shenzhen and Guangzhou.

## 5. Conclusions

This paper selects the panel data of the Pearl River Delta Bay Area and its major

<sup>4</sup>Since 2010, the proportion of Shenzhen’s primary industry has been negligibly small, so the deviation from 2010 to 2015 is missing on the line chart.

cities from 2000 to 2015, and explores the overall population spatial characteristics and industrial structure of the Pearl River Delta urban agglomeration. Through the analysis of the chart and the calculation of the deviation of the industrial structure, combined with the comparative analysis of the New York Bay area urban agglomeration, the conclusion is drawn.

As far as population growth is concerned, the urban agglomeration of the Pearl River Delta Bay Area is still far away from the world-class urban agglomerations. The average annual growth rate of the population in Macao and the Inland Nine Cities exceeds the annual growth rate of the urban population in the New York Bay Area. Four times as many, the population growth of the entire Pearl River Delta urban agglomeration has reached four times that of the New York Bay area. Hong Kong's population growth is closer to that of the world's cities. From this perspective, Hong Kong is more suitable to lead the Pearl River Delta urban agglomeration to a world-class urban agglomeration.

In terms of the relationship between population share and GDP, Hong Kong's output value is much higher than the theoretical value of its population share, highlighting its economic influence as an international financial, trade and shipping center. Comparing the data of other cities, it can be seen that there is still a considerable development gap between cities in the urban agglomeration of the Pearl River Delta. Relatively backward cities should actively seek cooperation with leading cities and opportunities for joint innovation, and fully absorb the economic and technological radiation effects of Hong Kong, Shenzhen and Guangzhou. It is important to note that Zhuhai should no longer rely on the promotion of Macao, strengthen economic ties with Shenzhen and Guangzhou, and take the initiative to find a dynamic development mode that is most conducive to stimulating the economy and improving people's well-being.

In terms of industrial structure deviation, the primary industry in the major cities of the Pearl River Delta Bay Area is crowding out or has squeezed out a large surplus of labor. Governments and social organizations can guide these labors to the second and the third through education and training. The three industries continue to create value. Through the deviation of industrial structure, the ability of the same industry in different industries or different cities to absorb labor can be compared. The second and third industries in Guangzhou have stronger absorption of labor than Shenzhen. Therefore, Shenzhen should continue to deepen the adjustment of industrial structure, further encourage innovation and entrepreneurship, and develop more vital industries to meet the development bottleneck.

Of course, due to the limited ability of the author, there are still many shortcomings and deficiencies in this paper, such as the logic is not rigorous enough, the thinking is not enough, the analysis is not enough, the explanation of the problem is loopholes and so on. Just as an attempt to broaden the thinking for more in-depth research in the future.

### **Conflicts of Interest**

The author declares no conflicts of interest regarding the publication of this paper.

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