Estimation of Value Added of Regional Logistics Industry—— Quanzhou City as an example

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ABSTRACT. Six methods for measuring the value added of the regional logistics industry are proposed, and the value added of the logistics industry in Quanzhou is calculated using the statistical data from 2013 to 2017. The calculation found that the value-added of the transportation industry, the warehousing industry, the postal industry, and the wholesale and retail industry was added in a certain proportion, the value-added of the logistics industry in Quanzhou was more accurate.Combining the current status of the logistics industry in Quanzhou, it is suggested that logistics companies provide value-added services, integrate logistics industry resources, accelerate the development of terminal logistics, and improve the logistics statistics system for cargo owners will help increase the added value of the logistics industry.

KEYWORDS: Value added of logistics industry, Quanzhou City, Measurement method, Improvement Countermeasures

1. Introduction

As a national basic industry, the logistics industry plays an increasingly important role in social and economic development. Compared with traditional industries, the statistics of logistics industry need to be standardized. China's National Development and Reform Commission successively released the "Social Logistics Statistical Accounting System" and "Social Logistics Statistical Index System", and gradually promoted the improvement of China's logistics statistical accounting system. The added value of the logistics industry is a core indicator of the development of the logistics industry. The scientific measurement of the added value of the logistics industry can not only enrich China's logistics statistical accounting system, reflect the contribution of the logistics industry to GDP in a timely manner, but also provide new analysis for the development trend of the logistics industry. The perspective is helpful for the research on the relationship

between logistics industry and regional economic development. However, China still lacks systematic statistics on the added value of regional logistics, and cannot scientifically and objectively evaluate the overall development level of regional logistics. Based on this reason, this article takes Quanzhou as an example to measure the value added of the regional logistics industry by various methods, and proposes countermeasures to increase the value added of the regional logistics industry based on the factors affecting the value added of the regional logistics industry.

2. Literature review

The most common methods of measuring value added are the production method and the income method: the added value calculated by the production method is equal to total output minus intermediate inputs, and the income method is equal to the sum of labor compensation, net production tax, fixed asset depreciation and operating surplus [1]. Gao et al.used the income method to calculate the value added of industrial enterprises above the designated size and then calculates the value added of China's export trade [2]. At present, the calculation of China's logistics industry value-added is focused on analyzing the correlation effects between logistics industry and other industries, or the economic effects of regional logistics industry. For example, Wu added up the value added of logistics in the transportation, warehousing, postal and wholesale and retail industries to the added value of the logistics industry, which used to measure the development and operation of the logistics industry [3]. Other scholars have analyzed the relationship between the development of China's logistics industry and GDP growth [4]. Wu et al. used data from the Suzhou Statistical Yearbook to select the value-added of logistics industry to analyze the impact of Suzhou logistics development on regional economic growth [5]. Most of these studies involve the measurement of the added value of the logistics industry, but basically they simply use the transportation industry, the warehousing industry, and the postal industry instead of the logistics industry, using data from statistical yearbooks. Before 2014, the value added of the transportation industry, the value added of the trade logistics industry, the value added of the warehousing industry and the postal logistics industry were added to calculate the value added of the logistics industry in China, and the value added of the logistics industry no longer appears in the statistical yearbook after 2014 data. The most representative of the calculation methods is the analysis of the value-added logistics by the data mining analysis method proposed by Yan, the calculation of the logistics stripping coefficient of the logistics-related industries with the logistics statistics, and the calculation of the value-added logistics [6].

To sum up, many studies involve the added value of the logistics industry, but the study of measurement methods is still in its infancy. At present, the most common method for measuring the added value of the logistics industry is to directly add the added value of the transportation, warehousing, and postal industries. This kind of calculation lacks rationality and scientificity. A novel and scientific method is to use the industry divestiture method to measure the added value of the logistics industry, but the research content is biased towards theoretical research and

empirical research is insufficient. In addition, most of the current research on regional logistics industry added value is based on developed logistics areas such as the Yangtze River Delta, and there is almost no research on the logistics industry added value of prefecture-level cities in Fujian Province. This paper sorts out the measurement methods for the regional logistics industry's added value, to make up for the lack of research on the logistics industry's added value in Fujian, and uses various methods to measure the logistics industry's added value in Quanzhou, Fujian.

3. Method

3.1 Total value added of transportation, warehousing and postal industries

Along with the movement of the target, the sink node timely notifies the sensor nodes in the relevant detection area to join in the process of target tracking. Figure 1 is the flow chart of the moving target tracking process. Add up the value added of China's transportation industry, warehousing industry, and postal industry, and divide it by the value added of China's logistics industry to get its proportion in the value added of the logistics industry; The value added of the regional transportation industry, warehousing industry, and postal industry is divided by this proportion to obtain the value added of the logistics industry in the area. Since 2014, the value-added of the logistics industry is no longer counted in the national logistics statistics, so the value-added of the logistics industry in a certain city is calculated based on the value-added of the logistics industry in the province. The calculation formula is:

$$\alpha = \sum Y_i / Z, i = 1, 2, 3$$

$$z = \sum y_i / \alpha, i = 1, 2, 3$$

3.2 Industry divestiture method

The value-added of China's logistics industry is divided by the total value-added of China's transportation, warehousing and postal services, packaging, distribution, and wholesale industries to obtain the logistics industry's stripping coefficient; the logistics industry's stripping coefficient multiplied by the total value-added of the logistics-related industries in the region can be obtained value. Since only statistical data of the wholesale and retail industry are included in the statistical yearbook, the wholesale and retail data are used instead of packaging distribution, processing, and the wholesale industry. The calculation formula is as follows:

$$\lambda = Z / \sum Y_i, i = 1, 2, \cdots, 5$$

$$z = \lambda \sum y_i, i = 1, 2, \cdots, 5$$

3.3 Provincial GDP calculation

From the value-added and GDP of the logistics industry in Fujian Province, the proportion of the value-added of the logistics industry in Fujian can be obtained, which is similar to the proportion of the value-added of the logistics industry in Quanzhou to the GDP of Quanzhou. Added value to the logistics industry in Quanzhou.

$$z = gdp(Z / GDP)$$

z is the added value of the logistics industry in Quanzhou, Z is the added value of the logistics industry in Fujian Province, GDP is the GDP of Fujian Province, and gdp is the GDP of Quanzhou City.

3.4 Total value added of transportation, warehousing, postal and retail industries

The value added of Fujian's transportation, warehousing and postal logistics divided by the value added of transportation, warehousing and postal industry can be obtained by the proportion of value added by transportation, warehousing and postal industry in Fujian Province. Proportion of value added in the retail industry. The calculation formula is:

$$a = \sum W_i / \sum Y_i, i = 1, 2, 3$$

$$b = \sum W_i / \sum Y_i, i = 4, 5$$

$$z = a(y_1 + y_2 + y_3) + b(y_4 + y_5)$$

a is the proportion of the added value of the logistics, transportation and postal services in Fujian province to the value added of the transportation, warehousing and postal industry, b is the proportion of the value added of the wholesale and retail logistics industry in Fujian Province to the value added of the wholesale and retail industry, and W_i is the value added of the logistics and logistics industry in Fujian Province The added value of the wholesale and retail logistics, Y_i is the added value of Fujian's transportation, warehousing and postal industry and the added value of the wholesale and retail industry.

Based on the obtained proportions, the value added of the logistics and logistics of the Quanzhou city's transportation, warehousing and postal industry, and the value added of the logistics of the wholesale and retail industry are calculated, and the value added of the logistics industry of Quanzhou is added up. z is the value-added of the logistics industry in Quanzhou, $y_1 + y_2 + y_3$ is the value-added of the traffic warehouse and post in Quanzhou, and $y_4 + y_5$ is the value-added of the

wholesale and retail industry in Quanzhou.

3.5 Calculation of the proportion of fixed assets

Calculate the proportion of fixed assets investment in the transportation, storage and postal industry in Quanzhou to the fixed assets investment in the transportation, warehousing and postal industry in Fujian Province. Then calculate the added value of the logistics industry in Quanzhou, the calculation formula is:

$$z = Z(\sum f_i / \sum F_i), i = 1, 2, 3$$

z is the added value of the logistics industry of Quanzhou City, Z is the added value of the logistics industry of Fujian Province, $\sum f_i$ is the fixed asset investment of the Quanzhou transportation warehousing and postal industry, and $\sum F_i$ is the fixed asset investment of the Fujian warehousing and postal industry.

3.6 Enterprise value-added measurement

Using the income method to calculate the value added of logistics companies in Quanzhou, the formula is: value added of logistics companies = fixed asset depreciation + labor compensation + net production tax + enterprise surplus. Considering that it is difficult to collect the data of all logistics companies in Quanzhou, the A-level logistics enterprises in Quanzhou were selected as the collection object, and the fixed assets of the A-level logistics enterprises accounted for the proportion of fixed assets, the number of employees, and the business volume of the logistics industry in Quanzhou Calculate the weight of these three indicators according to the expert scoring method, and obtain the proportion of the value added of the A-level logistics enterprises in Quanzhou to the total logistics enterprises, and infer the value-added of all the logistics enterprises in Quanzhou. However, due to the lack of data such as A-level logistics enterprises in Quanzhou, it is currently impossible to use this method to measure the added value of the logistics industry in Quanzhou.

4. Results and discussion

4.1 Compare results

4.1.1 Data analysis

Six types of logistics industry value-added calculation methods, except for the total value-added of enterprises, which cannot be measured temporarily, the other five types of calculation data are derived from *Fujian Statistical Yearbook*,

Quanzhou Statistical Yearbook, and *Quanzhou National Economic and Social Development Statistics Bulletin*, the calculation results are shown in Table 1.

Table 1 Calculation results of the added value of the logistics industry in Quanzhou (Unit: 100 million yuan)

Years	Total value added of transportation, warehousing and postal industries	Industry divestiture method	Provincial GDP calculation	Total value added of transportation, warehousing, postal and retail industries	Calculation of the proportion of fixed assets	Original value※
2013	435.18	413.10	352.75	425.28	217.14	426.32
2014	485.04	466.88	392.44	477.80	198.40	477.80
2015	522.94	524.40	443.96	523.50	267.33	523.50
2016	509.68	548.92	475.87	524.63	316.05	524.63
2017	608.79	638.73	533.27	620.07	369.98	613.94

※ Original value is obtained from Quanzhou Logistics Index Research Report.

According to the original value of the unofficial value-added logistics industry in Quanzhou from 2013 to 2017, the calculation error rate is shown in Table 2.

Table 2 Error rates of five kinds of calculation results

Years	Total value added of transportation, warehousing and postal industries	Industry divestiture method	Provincial GDP calculation	Total value added of transportation, warehousing, postal and retail industries	Calculation of the proportion of fixed assets
2013	2.08%	-3.10%	-17.26%	-0.24%	-49.07%
2014	1.51%	-2.29%	-17.87%	0.00%	-58.48%
2015	-0.11%	0.17%	-15.19%	0.00%	-48.93%
2016	-2.85%	4.63%	-9.29%	0.00%	-39.76%
2017	-0.84%	4.04%	-13.14%	1.00%	-39.74%

By comparison, the error rates of methods 1, 2, and 4 are smaller, and the error rates of methods 3 and 5 are larger. The error rates measured by Method 1 and Method 2 are relatively close, and the error rate of Method 4 is the smallest, which is close to or even equal to the actual value. It can even be inferred that the calculation of the actual value of the unofficial Quanzhou logistics industry value added from 2013 to 2017 is based on the method four calculations.

4.1.2 Difference analysis

Since the data of method 1, 2 and 4 are all from the statistical yearbook and are calculated based on the added value of transportation, warehousing, postal wholesale and retail, there is a correlation between the data items of these three methods.

Method 3 smaller than the actual value of the result of the reason is: top of the

charts in fujian quanzhou economy for 20 years, in 2017 GDP accounted for 24% of GDP in fujian province, quanzhou city warehouse mail added value accounted for 27% of fujian province, the added value of retail accounts for 29% of fujian province, thus, the added value of the contribution of quanzhou logistics related is far higher than other cities, the added value of the logistics industry in quanzhou as a share of GDP should be higher than the overall level of fujian province. It is assumed that the logistics development level of quanzhou is the average level of fujian, so the calculation result is less than the actual value.

The results of method 5 were too low, and the reasons for data error were excluded, mainly including the following reasons for analysis.

Representativeness of data items. This method only chooses the fixed assets investment of transportation, storage and postal service, and does not consider the fixed assets investment of logistics industry in other industries, so it is deficient.

Reliability of accounting methods. Since the development of logistics industry in quanzhou is based on the asset-light stage, even the heavy assets invested by some cargo owners may not be included in the statistics, so the reliability may be insufficient.

The hysteresis of input and output. Capital investment is the main source of economic growth, and quanzhou city is also the important guarantee of the logistics industry development, but in the short term due to capacity constraints, and the relative stability of the industrial structure, from the investment in fixed assets to the formation of the production capacity need quite a long time, so the impact on the economy of investment in fixed assets has a lag effect, thus calculate the added value of the logistics industry will be lower than the actual value of investment in fixed assets [7].

Invest in different places. Although quanzhou has more logistics enterprises, but many enterprises are operating in the special line transport, such as franchised fujian, guangdong, Hong Kong, yunguichuan and other routes, may set up stations in these provinces and cities to invest, so there are many enterprises fixed assets investment to other provinces and cities.

Diversity of investment methods. Emerging logistics investment and management methods keep emerging. In quanzhou, there are many logistics enterprises engaged in new ways such as carless carrier, landing matching, in-city matching and warehouse matching. The fixed assets investment of these enterprises is less and it is difficult to count, but it has brought about the increase of added value of logistics industry.

4.2 Quanzhou logistics industry value added range

Exclude methods 3 and 5, select the results of methods 1, 2 and 4, and sort out the mean values of the three measures and the added value range of logistics industry in quanzhou, as shown in Table 3.

Table 3 Average value of calculation results (unit: RMB 100 million)

Years	Total value added of transportation, warehousing and postal industries	Industry divestiture method	Total value added of transportation, warehousing, postal and retail industries	The average	The minimum	The maximum
2013	435.18	413.10	425.28	424.52	413.10	435.18
2014	485.04	466.88	477.80	476.57	466.88	485.04
2015	522.94	524.40	523.50	523.61	522.94	524.40
2016	509.68	548.92	524.63	527.74	509.68	548.92
2017	608.79	638.73	620.07	622.53	608.79	638.73

The mean values of the three measurement results from 2013 to 2017 all fell within the interval, and the results of the mean values were close to or even identical with those of method 4. The above analysis shows that the value interval of added value of logistics industry in quanzhou has certain reference value for determining the value of this region.

Based on the five methods of calculation and numerical results, it is shown that the method of transportation, warehousing, postal, wholesale and retail combined is more accurate to calculate the added value of logistics industry, and the input-output relationship between logistics and various related industries is used to calculate the added value of logistics industry. It is generally believed that if the added value of industry accounts for more than 5% of GDP, the industry can be considered as the pillar industry, and the added value of quanzhou logistics calculated by this method accounts for about 8% of quanzhou GDP, indicating the importance of quanzhou logistics industry in promoting the social and economic development of quanzhou.

5. Countermeasures to improve the added value of the logistics industry

Quanzhou's special plan for the development of modern logistics industry during the 13th five-year plan period puts forward that the added value of transportation, storage and postal services will increase by 8% in 2020, and the added value of logistics industry will account for 9% of the city's GDP [8]. However, at the present stage, the added value of quanzhou's logistics industry accounts for about 8% of the city's GDP. According to the calculation value of zero addition of goods and mail delivered to warehouse closest to the actual value, the added value of quanzhou's logistics industry is still 5.923 billion yuan short of the target value in 2017, so the added value of the logistics industry needs to be increased.

To improve the added value of logistics industry can be carried out from the two angles of "upgrading" and "transformation". On the one hand, the methods to measure the added value of logistics industry in quanzhou city are mostly inseparable from the added value of warehouse mail and batch value. Therefore, to improve the added value of logistics industry, it is necessary to "upgrade" the logic-

related industries such as warehouse mail batch value and increase the added value of related industries. On the other hand, in recent years, there is fierce competition in transportation, freight forwarding, warehousing and other logistics businesses. With the help of the traditional industry of delivery of warehouse, mail and wholesale, the profit growth space is limited.

5.1 Increase the added value of logistics-related industries

First, we should increase the added value of transportation, warehousing and postal services, speed up the improvement of transportation infrastructure, build a comprehensive railway transportation system, and expand the scope of logistics business. Second, the introduction of new forms of wholesale and retail to meet the needs of consumers at different levels, so as to attract more consumer groups to improve the competitiveness of zero-batch enterprises. Third, the core business of most private enterprises in quanzhou is product research and development, manufacturing and marketing. Logistics outsourcing has become a means for manufacturing enterprises to play their core competitiveness. Through logistics outsourcing, manufacturing enterprises can reduce their costs, increase profit space and enhance their added value.

5.2 Developing value-added logistics services

In recent years, small and medium-sized enterprises in fujian have grown rapidly, accounting for more than 95% of the total number of enterprises in the province. However, financing difficulties have been the bottleneck of the development of small and medium-sized enterprises in fujian, and quanzhou is no exception. Logistics finance can broaden financing channels, solve financing difficulties, reduce capital occupation, enhance logistics value-added, reduce business risks, and increase the added value of the logistics industry. Quanzhou government can set up a bonded logistics center to attract famous enterprises to invest in quanzhou while developing value-added logistics services, strengthen the cooperation and exchange of logistics to Taiwan, and promote the rapid development of quanzhou's open economy.

5.3 Integration of logistics resources

With the wide application of Internet technology, the continuous integration of logistics resources has given birth to many new logistics models. Quanzhou can combine Internet information technology, integrate logistics resources and develop new logistics models, and improve the added value of the industry. Quanzhou's manufacturing industry is relatively developed, and manufacturing enterprises need a large amount of storage space. The integration of warehousing and distribution is conducive to the complementary and cooperative development of logistics industry and manufacturing industry, so as to improve the added value of logistics industry. It can also develop the fourth party logistics, which is not only conducive to the

sustainable development of e-commerce, but also can promote the transformation of the logistics industry and increase the added value of the industry.

5.4 Developing terminal logistics

Quanzhou large number of towns scattered wide, the development of logistics imbalance. Township enterprises single means of transport, product circulation speed is slow, there is a greater demand for logistics. The development of township logistics distribution, not only to facilitate residents, but also to the first time the enterprise products to the market, improve the economic income of the township. Urban enterprises can also increase township investment, find new profit points, create a new situation of township logistics, enhance the added value of logistics industry.

5.5 Improve logistics statistics of cargo owners

Quanzhou many manufacturing enterprises do not use the third party logistics outsourcing mode, but adopt self-run logistics. Some manufacturing enterprises have logistics facilities and equipment resources, so as to assume the logistics business of other cargo owners, also become logistics service providers. As a result, the added value generated by the logistics business of the main cargo enterprise is counted into the manufacturing industry instead of the logic-related industries, so it has an impact on the calculation of the added value of the logistics industry in quanzhou. Therefore, in the annual statistics of the manufacturing industry, it is necessary to separate the logistics business of the cargo owner enterprise and the logistics business provided by the cargo owner enterprise for other enterprises, and classify it into the logistics industry for statistics. By improving logistics statistics of cargo owners, we can not only improve the statistical system of logistics industry, but also improve the accuracy of value-added measurement of logistics industry. It is also conducive to a more comprehensive analysis of the development trend of quanzhou's manufacturing industry and logistics industry, so as to promote the separation of main and auxiliary industries and promote the logistics industry to provide professional and social services.

6. Conclusion

In view of the lack of statistics of the official added value of logistics in the region, six methods of calculating the added value of logistics are proposed. After calculating the added value of logistics industry in quanzhou city, fujian province, it is found that the total value of logistics industry can be calculated accurately and reliably. Analysis that improve the added value of the logistics industry to set out to "upgrade" the added value of related industries, and industry profit growth space is limited, the new development mode "transformation" logistics has more room to improve, from the logistics value-added services, integrated logistics resources, terminal logistics logistics modernization, improve the added value of the logistics

industry. At the same time, it is suggested to improve the logistics statistics of cargo owners, which is helpful for the accuracy of the added value of logistics industry.

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