Hindawi
Mathematical Problems in Engineering
Volume 2022, Article ID 4086633, 10 pages
https://doi.org/10.1155/2022/4086633

Research Article

Empirical Studies on the Dynamic Relationship between Port Logistics and Marine Economic Development in Fujian Province

Lin Miao and Wenjun Pan

School of Business Administration, Huaqiao University, Quanzhou 362000, China

Correspondence should be addressed to Lin Miao; 1611407089@stu.hqu.edu.cn

Received 9 July 2022; Revised 5 September 2022; Accepted 19 September 2022; Published 3 October 2022

Academic Editor: Zaoli Yang

The marine economy in coastal areas has a great role in promoting social development, and efficient port logistics serves the high-quality development of the marine economy. There is a dynamic relationship of dependence, restriction, and mutual promotion between port logistics and marine economy, which has regional differences. Based on panel vector autoregressive model (PVAR model), the relevant panel data of Fujian Province from 2000 to 2020 were analyzed by using the Granger causality test, impulse response, and variance decomposition methods. The interactive relationship between port logistics and marine economic development was discussed, and development suggestions were put forward. The results show that the development level of port logistics in Fujian Province is low, the logistics supply cannot meet the needs of marine economy, the effect of port logistics is not significant, and the support ability for the development of marine economy is insufficient. On the contrary, the development of marine economy promotes the development of port logistics industry and the economic growth of logistics related industries, and the strong market demand promotes the further improvement of logistics supply capacity. On the whole, the two-way feedback effect between the indicators of logistics industry and the development of marine economy is weak. In the future, it is necessary to further increase the layout of port logistics network system, strengthen the support ability of port logistics to the development of marine economy, and promote the scale and quality of port logistics by relying on marine economy.

1. Introduction

As a basic industry for the development of national economy, the logistics industry has a significant industrial correlation effect in improving its quality and efficiency and has a great attraction to the marine industry agglomeration. The marine industry in the coastal areas occupies an important position, and the efficient logistics industry plays an important role in the development of the marine industry. As an important node in the global transportation network, the port is an important hub of logistics channels, the distribution center of international trade goods, and an important link of the global industrial chain and supply chain, which plays a significant role in economic development. Under the new economic conditions, port logistics plays an important role in marine economy and its strategic position is more and more prominent, which can become a huge driving force for marine economic growth. As the starting point of the Maritime Silk Road in Fujian Province, the geographical position is very superior, the national strategy implementation needs complete logistics system, and port logistics is the top priority in the logistics system. The increase of the investment in port logistics facilities and equipment can effectively enhance the degree of openness between countries and regions, which is also conductive to accelerating industrial circulation and capital exchange, and ultimately, it can achieve industrial optimization and upgrading as well as rapid development of the maritime economy.

At present, the development and construction speed of large-scale ports in China shows a fast trend, and the scale of many ports also ranks among the top in the world. However, there are still many problems existed in the process of port construction. First, Chinese port logistics alliance has low degree and cannot reasonably integrate and optimize related industries and fields to optimize economic benefits and efficiency. Second, Chinese port logistics fund operation is

not perfect. Large ports in China still depend on bank lending and short-term financing; from a long-term perspective, it is not conducive to the healthy development of the whole port industry, and it is difficult to guarantee the sustainable development of the industry; third, the information construction investment in the field of China's port logistics is insufficient, and it also lacks professional information technology personnel, and the overall competitiveness of the port logistics market is relatively weak.

The development of marine economy will also produce huge demand for the logistics industry, and the logistics service capacity must adapt to the scale of the marine industry. Marine industrial agglomeration will promote port logistics enterprises to further improve their service capacity and resource integration ability, play a radiating role, promote intraregional and transregional logistics efficiency, and thus promote the development of logistics industry. The adjustment of industrial structure and the development of marine economy in coastal areas can accelerate the construction of comprehensive transportation system, improve logistics infrastructure, and raise the level of logistics informatization, thus promoting the efficient development of logistics industry.

According to the statistical data in recent years, the overall development trend of the marine economy is the steady growth of the economic aggregate, and the growth rate tends to stabilize, but the growth rate is still higher than the GDP level in the same period, and the industrial structure is gradually optimized and reasonable. At present, the domestic marine industry has changed from the traditional single marine industrial structure to a composite structure of multiindustry crossover and integration dominated by the marine transportation industry. China's marine industry is now in the growth period, and the development of port logistics is one of the most potential and dynamic industries in the emerging marine industries, which plays a great role in promoting the transformation, upgrading, and optimization of the marine industry [1].

As a large marine province, Fujian is also one of the important starting points of the Maritime Silk Road. It has a long coastline and rich marine resources, excellent ports, and rapid development of marine economy, and the development relationship between marine economy and port logistics is close. In the newly released "14th Five-Year Plan," Fujian Province clearly put forward the requirements of expanding the blue economy space, coordinating the marine and land economy, promoting the coordinated development among the economy, society, and ecological environment, accelerating the transformation and upgrading of the industrial structure, expanding the blue economy development space, and promoting the development of the marine economy. During the 13th Five-Year Plan period, the gross marine product of Fujian Province increased by an average annual rate of 13.3%, higher than the average growth rate of provincial GDP. The marine logistics industry in Fujian Province has obvious predominance, and the GDP output value of logistics industry accounts for more than 30% of the total GDP output value of the province's marine economy.

Through the empirical study of the interactive relationship between marine economy development and port logistics in Fujian Province, explore the coordinated development of both, accelerate the construction of marine economy monitoring and evaluation system, promote various financial capital for marine economy, boost the real economy, accelerate the transformation and upgrading of marine industry, guide industrial agglomeration, promote regional growth, expand blue space, and realize the leap development of marine economy in Fujian Province. Section 1 is the introduction. Section 2 is the literature review and reviews the relevant research status of port logistics and marine economic development. Section 3 gives the theoretical analysis and research framework, which introduces the theoretical model of this paper. Section 4 gives the index selection and model establishment, Section 5 presents the empirical analysis of panel data, and finally Section 6 gives the conclusion and development countermeasures.

2. Literature Review

The research on marine economy in foreign countries is relatively earlier than that in China and mainly focuses on the marine industrial structure and the influencing factors of the development of marine economy. Luo and Zhang argued that the high-end logistics platform has a significant supporting role in supporting the development of marine economy, which can effectively improve the development level of logistics related to the marine industry and promote the application of new logistics technology in the field of marine economy and the coordinated development of land and sea [2]. Dong evaluated and analyzed the competitiveness of the marine industry in coastal cities based on the factor analysis method [3]. Dong used the direct contribution of output value to calculate the contribution of the marine economy and calculated the indirect contribution according to the growth elasticity and financial elasticity of the marine economy [3]. Ansong et al. and other organizations believed that sustainable development is the premise of marine resource development and the rational use of ecosystems within the scope of marine spatial planning [4]. Akhawan constructed an evaluation index system for the stability of the marine economic system from the two levels of resistance and resilience and studied the stability of the marine economic system in the 11 coastal provinces and municipalities of China [6]. Cheng constructed the evaluation indicators of marine economic development based on the three perspectives of marine ecology, marine economy, and marine society [5].

In the field of port logistics research, Akhavan explored the evolution of Hong Kong from a cargo hub to a global logistics center and compared it with two port cities, Singapore and Dubai [6]. Chen et al. adopted the principal component analysis--data envelope analysis (PCA-DEA) comprehensive model to evaluate the operation efficiency of the Bohai Bay Port iron ore logistics in China and established the key index and system framework for the port logistics efficiency research [7]. He and Li, according to the development situation of port logistics in the coastal cities of southern Fujian, analyzed the port development from the market, information, and talent parties and put forward

suggestions on the sustainable development of coastal port cities in the future [8]. Port logistics as one of the core part of modern logistics industry is closely related to regional economic development; Zhou adopted regression model to analyze the impact of port and air logistics on the regional economy from a quantitative perspective in Guangzhou, Shenzhen, and Hong Kong, and put forward suggestions to promote the coordinated development of logistics and regional economy [9].

In the research of port logistics and marine economy, most scholars now use radial and non-radial DEA models and their extended models to evaluate the impact of logistics efficiency on marine economy. Wang and Lou used the SFA model to explore the logistics efficiency of the core area of "Silk Road Economic Belt" [10]. Wang et al. analyzed the impact of logistics efficiency in Northern Xinjiang on regional economy by the construction of the C2R model and the C2GS2 model [11]. Gao et al. used the super-efficiency DEA-ESDA model to evaluate the logistics efficiency [12] by improving the logistics spatial weight matrix. Xu and Yang used location entropy to evaluate the marine industry agglomeration level [13]. Chen [14] explored the spatial characteristics of marine industry agglomeration according to the revised E-G coefficient. Zhang et al. introduced the connotation of the linkage between high-end logistics platform and marine economy, analyzed the action mechanism of high-end logistics platform and marine economy development and the relationship between the linkage development, and explored the implementation path of their integration [15].

At present, the research on the relationship between logistics industry and marine economy has achieved certain results, but few studies deeply explore the coordination relationship between marine economy and port logistics, and most of the papers are based on static analysis, and few studies are based on the dynamic and interactive relationship between port logistics and marine economy. Based on the relevant panel data of various regions in Fujian Province from 2000 to 2020, this paper fully considers the relevant factors of regional economic logistics development, establishes an index system that can reflect the correlation between regional material flow and regional economy, and uses panel vector autoregressive model (PVAR). The impulse response function generated by each variable is used to quantitatively analyze and study the dynamic transmission mechanism of coordination relationship between logistics and economic development.

3. Theoretical Analysis and Research Framework

3.1. Research on the Interaction Mechanism between Port Logistics and Marine Economy. Marine economy is an important field of current social and economic development. It is of great strategic significance to improve its development efficiency and quality, adjust the layout of social and economic development, change the economic development model to improve the comprehensive strength of the country, and finally realize the great rejuvenation of the country. The development of marine economy is highly dependent on logistics ports, and its development level is also affected by the development level of port logistics. For the development of marine economy, we must have new logistics port facilities to adapt to the special marine environment and take the blue deep-sea development road.

3.1.1. Port Logistics Development Promotes the Development of Marine Economy. In the marine economy, logistics and transportation industry is in a dominant position, and the port is the hub of marine logistics transportation distribution, in the development of marine economy. Port logistics industry is a complex service industry integrating transportation, warehousing, freight forwarding, and information, and it is an important part of the development of marine economy. In any period of marine economy development, the construction of port logistics is the top priority. In addition, the logistics investment can effectively promote the increase of the total output value of the marine economy, and the investment focus of the port logistics should generally be to improve the infrastructure and enhance the distribution capacity of the port [16].

3.1.2. The Development of Marine Economy Promotes the Development of Port Logistics. Similarly, the development of marine economy can also provide more resources and opportunities for the development of port logistics. On the one hand, the development of marine economy is bound to obtain rich profits and thus can attract a large amount of idle funds in the society, providing economic support for the infrastructure construction and market development of port logistics. On the other hand, the development of marine economy can also receive the attention of the society to the marine industry, so that the manpower and material resources of the marine industry will inevitably be improved, and the industrial operation efficiency will also be improved. The rapid growth of marine economy will also instill a great impetus to the port logistics industry. With the deterioration of ecological environment and the lack of natural resources, the development of marine economy is bound to take a sustainable road, and the construction of ports can better make full use of resources, suitable for the sustainable development of marine economy [17].

Figure 1 shows the interaction mechanism between port logistics and marine economy. The arrow from left to right represents the mechanism of port logistics construction to promote marine economic growth. Port logistics construction makes the infrastructure more perfect. The cargo gathering and distribution capacity of ports is continuously improving, the industrial structure of marine economy is also optimizing and upgrading; meanwhile, the market demand also rises concomitantly, and the sustainable development capacity of marine economy is improved. The arrow in the reverse direction represents the feedback mechanism of marine economic growth on port logistics construction. Marine economic growth effectively promotes the development of marine industry and increases social investment in ports, thus promoting a new round of economic growth. Port logistics and marine economy are

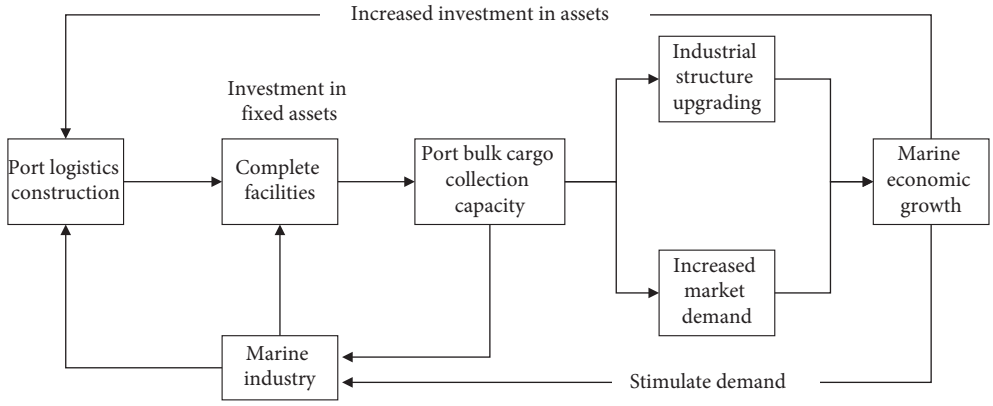

Figure 1: The interaction mechanism between port logistics and marine economy.

mutually reinforcing and complementary to each other. This interactive relationship promotes both port logistics and marine economy to rise in a spiral way.

3.2. Research Framework. The research framework of this paper is shown in Figure 2. Firstly, the interactive mechanism between port logistics and marine economy is expounded theoretically, and the mutual influence between them is analyzed. Secondly, the dynamic interaction between marine economy and port logistics was analyzed effectively by using the relevant panel data of Fujian Province for nearly 20 y. In this paper, the Granger causality test and panel vector autoregression model are used to analyze the dynamic relationship between them. Through the data analysis of the result, whether there are Granger causes between marine economy and port logistics is determined, and the future interaction between them is further analyzed by impulse response and variance decomposition. According to the dynamic results obtained, the corresponding conclusions can be drawn by comprehensive analysis.

4. Index Selection and Model Establishment

4.1. Selection of Indicators

(1) *Development Level of Port Logistics*. In recent years, the development of logistics industry is very rapid, and its position is becoming more and more important in the national economic development, but so far, there has been no index system that can measure the development level of logistics industry. Scholars also use different index systems in studying the content of the field of logistics, such as freight turnover as research standard, freight volume as research standard, cargo flux as research standard, added value as research standard, and total logistics value as the research standard. This paper combines the logistics indicators studied by previous scholars to make a comprehensive innovation and measures the development level [18] of the logistics industry from three aspects: logistics effect (CX), logistics supply (GJ), and logistics demand (XQ). The logistics effect is reflected by the added value of the transportation, storage, and communication industry; the logistics supply capacity is reflected by the transportation length of the port logistics network; and the logistics demand is specifically reflected by the annual freight volume. Because these indicators are linked to the development status of port logistics, it can intuitively reflect the development level of logistics.

(2) *Regional Economic Level*. In this paper, the index to measure the regional economic level is the GDP within the region, without considering other economic development factors, because economic development involves too large a scope to be quantified, and the GDP of regional economy can well reflect the growth rate and quantity of regional economy, so as to measure the level of regional economic development [19].

4.2. Modeling. Panel data, also known as "Parallel Data," refers to sample data formed by taking multiple sections of the time series and simultaneously selecting sample observations on these sections. The panel data model is designed to analyze the settings of time and sample heterogeneity structure, which owns the following three advantages. (1) The model can increase the observed value and improve the accuracy of the arithmetic results; (2) the model can control the unobservable factors, which is conducting to the accuracy of parameter results; (3) the model can better reflect the dynamic relationship among the research objects [20].

The general formula is as follows:

$$\begin{aligned} Y_{it} &= \alpha_i + X_{it}\beta_i + \mu_{it}, \\ i &= 1, 2, \ldots, n, \\ t &= 1, 2, \ldots, T, \end{aligned} \tag{1}$$

where Y_{it} represent the explained variables and α_i represent the intercept terms, X_{it} is the explanatory variable vector of order $1 \times K$, β_i is the column vector of the regression coefficient of order $1 \times K$, μ_{it} is the stochastic error term, and different individuals and time are expressed by order i and t, respectively.

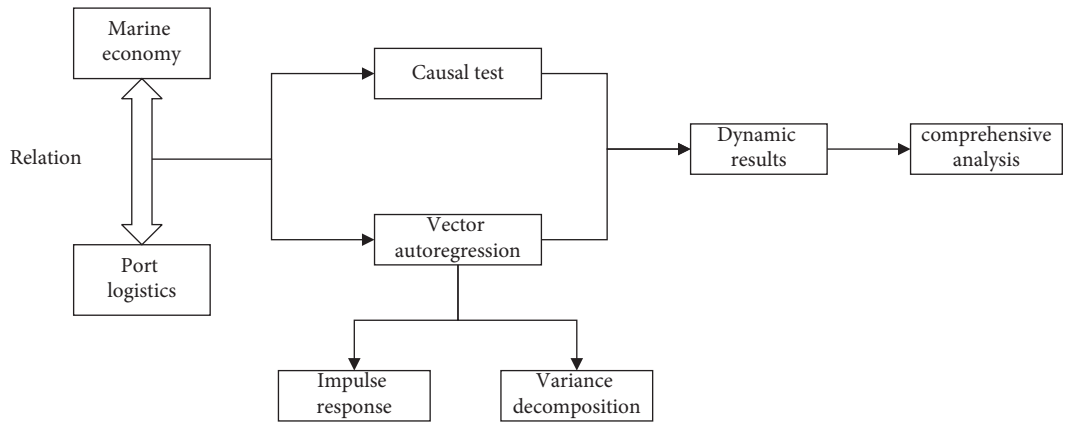

Figure 2: The research framework.

The official statistical data of Fujian Province from 2000 to 2020 are selected in this paper. All the data are from China Statistical Yearbook, China Marine Statistical Annual Report, and statistical yearbooks of relevant provinces and cities, and the influence of price factors has been removed from the index data. In addition, the natural logarithm of each time series data is also used for stationarity test and relationship analysis, so as to achieve the purpose of eliminating the influence of variance. After taking the natural logarithm of the data, the labels of each variable indicator were changed to LNCX, LNGJ, LNXQ, and LNGDP. Eviews8.0 measurement software was used for empirical analysis of the processed data.

5. Empirical Analysis

5.1. Stability Test. Before using the PVAR model, the time series variables are tested to avoid the emergence of pseudoregression. This paper uses the ADF test to test the data of each port logistics index and marine economic development in Fujian Province. The specific results are shown in Table 1.

By virtue of the analysis of the relationship between ADF test value and the critical value, it can be found that in the case where the values of each test are determined, each variable presents an insignificant state, so the original hypothesis of having a unit root (i.e., the time series is not stable) cannot be rejected. However, the first-order and second-order difference series can pass the ADF test at the 5% significance level, which indicates that each indicator is a single integer series of the first and second order. Next, the cointegration test can be applied to test whether there is cointegration relationship between port logistics and marine economy.

5.2. Coconsolidation Inspection. The stationarity of the time series is a prerequisite for the cointegration test. The above unit root test shows that although the original data series is not stable, its first-order or second-order difference series is stable, so the Johansen–Juselius (JJ) method suitable for multivariable cointegration test is used to cointegrate the numerical sequence of logistics and economic data in Fujian Province. Table 2 shows the result of JJ cointegration test in Fujian Province with a lag period of 2~3 years.

Table 1: Root in unit test for the variables.

Variable	ADF test values	Critical value			Conclusion
		1%	5%	10%	
LNGDP	−1.58	−3.621	−2.910	−3.221	Not smooth
D(LNGDP)	−1.031	−1.314	−2.170	−1.463	Not smooth
D2(LNGDP)	−5.021	−3.508	−1.953	−1.231	Steady
LNCX	−3.724	−2.365	−4.058	−3.752	Not smooth
D(LNCX)	−1.275	−1.327	−2.966	−1.271	Not smooth
D2(LNCX)	−3.209	−1.526	−1.916	−1.235	Steady
LNGJ	−2.417	−3.292	−2.648	−3.851	Not smooth
D(LNGJ)	−3.961	−1.291	−2.951	−1.207	Steady
LNXQ	−1.953	−2.492	−2.628	−3.281	Not smooth
D(LNXQ)	−4.071	−3.691	−2.960	−1.690	Steady

According to Table 2, it can be found that both the characteristic root trace test method and the maximum characteristic value test method show that there is a cointegration relationship between the port logistics level and the data of the marine economy. Next, the Granger test can be tested to see if there is a causal relationship.

5.3. Granger Causality Test. The Granger causality test is conducted on the log value of gross product, logistics output, logistics mileage, and freight volume in Fujian Province with a lag period of 2 to 3 years. The choice lag period is 2~3 years, which is because the impact between the development of port logistics and the regional economy cannot be reflected immediately, and it needs time to test. Specific results are shown in Table 3.

According to the above table, under the 5% significance level, the causal relationship between port logistics and marine economic growth in Fujian Province has the following characteristics:

(1) In Fujian Province, logistics effect and regional economy Granger causality will change from different lag period; when the lag period is 2 years, the logistics effectiveness, that is, the value added of the logistics industry, is not the Granger cause of the development of the regional economy, while the regional economy is the Granger cause of the

Table 2: Results of the Johansen–Juselius coconsolidation test.

Null hypothesis cointegration relation number	Eigenvalue	Trace test statistics	5% cutoff	Maximum eigenvalue statistics	5% cutoff
None*	0.712	63.044	48.861	29.693	25.584
Atmost1*	0.649	32.312	30.798	18.361	23.122
Atmost2	0.494	11.029	16.496	8.513	18.255
Atmost3	0.125	2.416	4.851	3.216	2.841

Note. * indicates that the 5% significant level does not accept the null hypothesis.

Table 3: Results of the Granger causality test.

Null hypothesis	Lag phase	F statistics	P price*	Decision
LNCX is not LNGDP	2	2.201	0.156	Accept
LNGDP is not the Granger reason for LNCX	2	3.901	0.031	Refuse
LNCX is not LNGDP	3	1.038	0.406	Accept
LNGDP is not the Granger reason for LNCX	3	2.656	0.093	Accept
LNGJ is not LNGDP	2	0.089	0.914	Accept
LNGDP is not the LNGJ Granger reason	2	6.482	0.011	Refuse
LNGJ is not LNGDP	3	0.067	0.990	Accept
LNGDP is not the LNGJ Granger reason	3	3.519	0.057	Accept
LNXQ is not LNGDP	2	3.827	0.050	Accept
LNGDP is not LNXQ	2	0.163	0.812	Accept
LNXQ is not LNGDP	3	4.701	0.029	Refuse
LNGDP is not LNXQ	3	0.152	0.956	Accept

Note. * represents a P value at 5% significant level.

logistics effectiveness, which indicates that the development of the regional economy in Fujian Province drives the development of the logistics industry. However, the development of the logistics industry does not promote the development of the local economy. However, there is no Granger reason for logistics effect and regional economy in the lag period of 3 years. Generally speaking, regional economy is the one-way Granger reason for logistics effect, and the impact is weak.

(2) Lag period is 2 years, and logistics network mileage is not the Granger reason of economic growth, while economic growth is the Granger reason of logistics network. The lag period is no Granger reason between logistics mileage and regional economy.

(3) When the lag period is 3 years, there is no Granger cause between logistics mileage and regional economy. When the lag period is 2 years, there is no Granger cause between the logistics demand of Fujian Province, namely, the freight volume and the regional economy. That is, there is no mutual promotion relationship between logistics development and regional economic growth. When the lag period is 3 years, logistics demand in Fujian Province, i.e., freight volume, is the Granger cause of economic growth, representing that logistics demand promotes economic growth.

5.4. PVAR Model Estimation. According to the PVAR lag order selection criterion, the convergence of the calculation results of the variable series in Fujian Province can be obtained (see Table 4). When the lag order is 3, the AIC value is −14.77375, which is the lowest value. The SC value of −12.202 also reached the lowest value. So, the optimal lag order of the PVAR model is 3.

The PVAR model is established for the relationship between logistics effectiveness, logistics supply, logistics demand, and regional economy. Specifically, the lag order of the model is 3, and the unit root is less than 1, indicating that the PVAR model is relatively stable, as shown in Figure 3.

5.5. Pulse Response Analysis. Impulse response function is a function that can be used to analyze the dynamic effects of standard deviation shock on other variables. Traditional impulse response functions are implemented by orthogonal method, but their test results strictly depend on the order of variables in the PVAR model. Therefore, this paper adopts generalized impulse response function (GIRF) to carry out impact analysis to overcome this shortcoming.

From the previous Granger test, we can get the one-way Granger reasons for the logistics effect (LNCX), logistics supply (LNCX), logistics supply (LNGJ), logistics demand (LNXQ), and regional economic development (GDP) in Fujian Province. Therefore, this paper conducts the pulse response analysis of these three groups of variables. The results of the pulse response are shown in Figure 4.

Figure 4 reflects the dynamic impact relationship between the logistics industry indicators and the regional economic growth in Fujian Province for its one-way or two-way reasons. In general, regional economic growth has a promoting role on the development of logistics, and the development of logistics also has a certain impact on the economy. It can be summarized as follows:

Table 4: Selection criteria for PVAR lag order.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	37.243	NA	$2.94\,E-06$	−3.692127	−3.529	−3.677
1	120.617	121.4236*	$1.73\,E-10$	−10.18079	−11.291	−11.054
2	138.307	18.62168	$2.12\,E-11$	−10.36713	−8.997	−11.112
3	184.964	24.92051	$2.05\,e-11^{*}$	−11.77385*	−13.212*	−15.429*

Note. * is significant at 5% level.

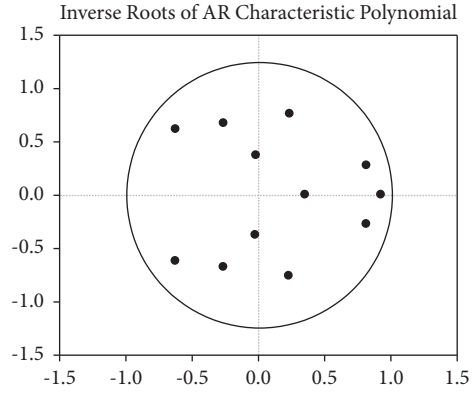

Figure 3: The AR root test roots of the PVAR model.

(1) Fujian Province regional logistics effectiveness (i.e., the added value of logistics output) has a significant impact on GDP growth, the impact in the first year is not obvious, and the impact coefficient in the second year drops to a negative value. After which the curve rises slowly and and keeps rising at a certain rate, which shows that the development of the logistics industry is closely related to the marine economy. When the marine economy is booming, the logistics industry will also get rapid development. The impact of regional economic development on itself gradually increases with time and continues to rise until it starts to decline after 6 periods of lag, but it has always maintained a high level. This shows that the economy has been doing well during this period.

(2) The port logistics supply capacity in Fujian Province is obviously affected by regional economic development and has been in a declining trend, that is, the logistics supply capacity is increasingly unable to meet the current requirements of marine economic development, the reason is that the port logistics industry itself is unreasonable structure, infrastructure is not complete, and it cannot adapt to the form of economic development, which requires that we must increase the strong investment in port logistics. The influence of logistics demand in Fujian Province on regional marine economy is relatively stable, which belongs to a positive correlation. When the logistics demand is greater, it means that the development of marine economy needs more resources, which can also show that the economic development is strong. At the same time, the development of logistics industry will also drive other industries.

5.6. Analysis of Variance Decomposition. By establishing the variance decomposition model, we can describe the extent to which the update of each variable between the variables contributes to the influence of the PVAR system variables, which is a description model of the relative effect. Model analysis is carried out with measurement software to obtain the prediction of variance decomposition (see Figure 5). Regional economy is in an almost steady downward trend, the logistics effect and logistics supply capacity are in a gentle upward trend, and not obvious, the logistics demand is almost unchanged after the lag period, and the logistics effect and regional economy have an obvious upward trend; the trend of change between logistics supply and regional economy vary in different periods. Γ3 period is a decreasing trend, 4̶6 period starts to rise slowly, and then they maintain a stable state. The influence of logistics demand on regional economy has always been at a very high level and basically maintained at a certain level. Since the fourth period, the influence has decreased, indicating that the influence of logistics demand on economic growth will be weakened. The results of variance decomposition analysis are basically consistent with the above analysis results.

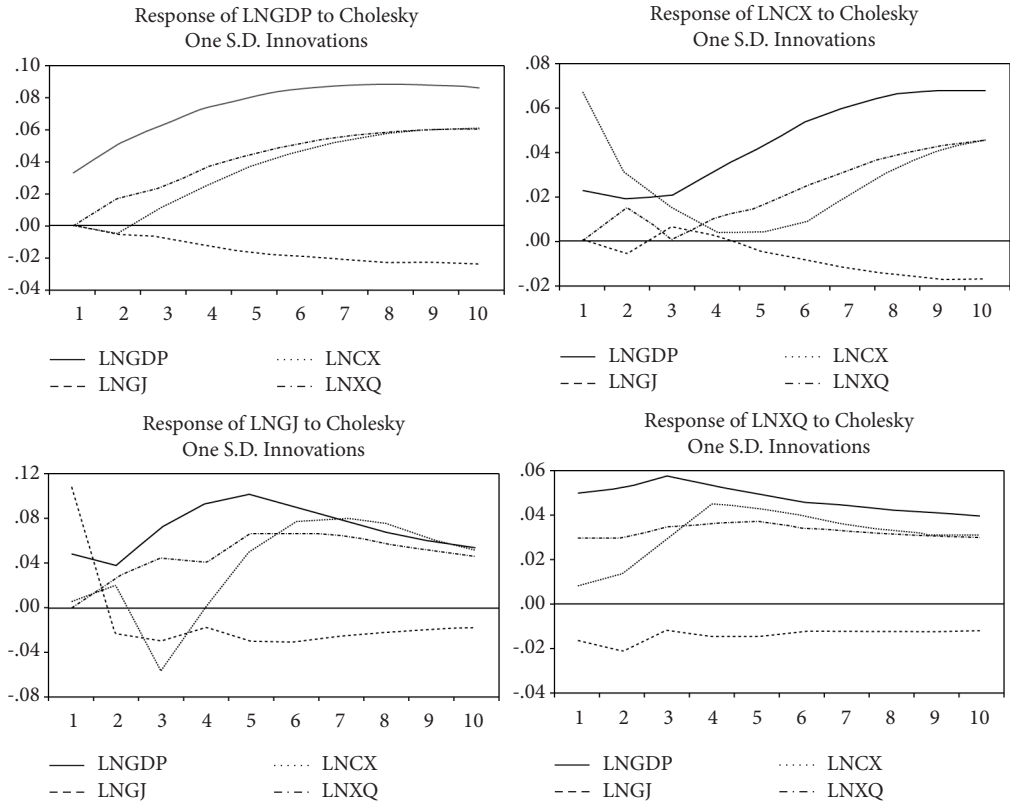

Figure 4: Dynamic influence relationship between various logistics industry indicators and marine economic growth in Fujian Province.

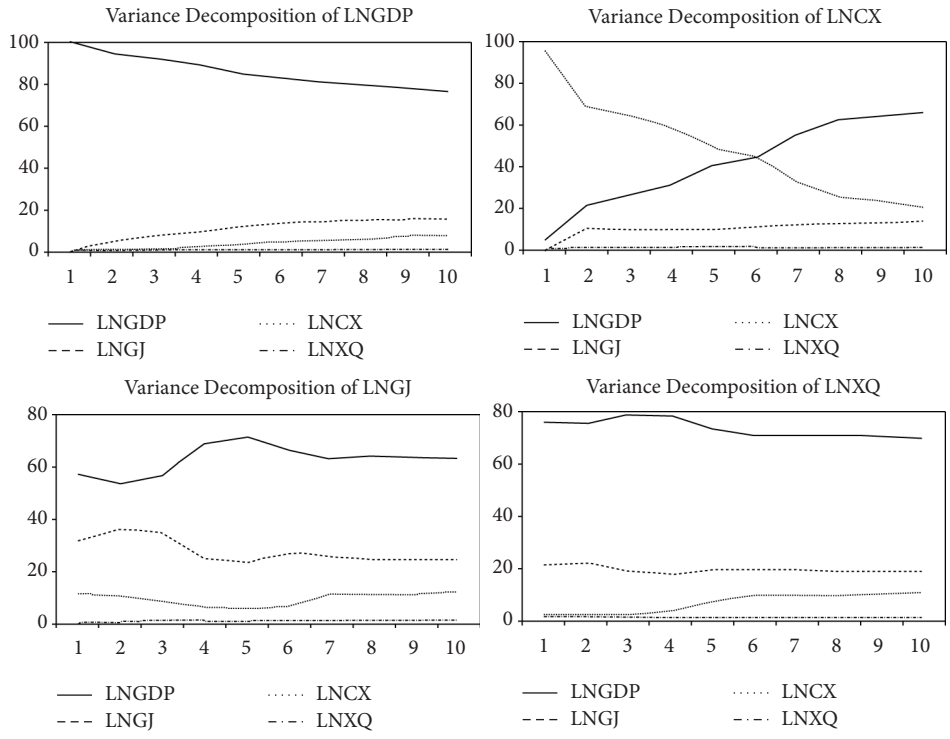

Figure 5: The variance decomposition prediction plot.

6. Conclusions and Suggestions

6.1. Conclusion. Through the establishment of panel autoregressive model and the comprehensive application of Granger test and impulse response analysis, this paper conducts an empirical analysis on the relationship between logistics effectiveness, logistics supply capacity, logistics demand, and marine economy of ports in Fujian Province from 2000 to 2020. The conclusions are as follows:

(1) According to ranger inspection, on the one hand, the logistics effect of Fujian Province does not promote the development of marine economy, which indicates that the current port logistics development level in Fujian Province is still relatively low, and the logistics development is not effective; the logistics supply capacity does not match the requirements of the current social development, and the development of regional marine economy does not promote the growth of logistics demand. On the other hand, the development of marine economy drives the development of the port logistics industry and promotes the economic growth of related logistics industry, and the marine economy of logistics supply ability also brought a certain promoting effect; due to economic development by more and more logistics restrictions, investment in logistics network mileage is more and more, and it will strengthen the logistics supply ability. Logistics demand also greatly promotes the development of the economy. However, the two-way feedback effect of the various indicators of the logistics industry and the development of marine economy is relatively weak, and the port logistics network system needs to be further developed, and the development of marine economy is less dependent on the port logistics.

(2) According to the pulse response analysis, it can be seen that the marine economic growth in Fujian Province has a large positive impact effect on some port logistics indicators, and this impact is more obvious and lasting in the logistics effect. On the contrary, some of the indicators of port logistics have a lag effect on the marine economic growth. The impact of port logistics demand on the development of marine economy shows that the internal growth of logistics can play a weak role in promoting the development of marine economy, so it is difficult to reflect it in the development of marine economy.

6.2. Policy Suggestion. To give full play to the superior location of Fujian Province, to speed up the integration of regional logistics industry, and to speed up the logistics optimization of industrial structure transformation, in this paper, for the development of logistics industry in the region of Fujian Province, we put forward the following suggestions:

(1) Accelerate the construction of a number of modern port logistics parks, actively explore the "logistics +" characteristic mode, and actively build the port logistics economic and industrial belt. Vigorously promote the application of Internet, Internet of things, big data, cloud computing, and other advanced information technologies in the field of logistics, accelerate the construction and improvement of port logistics information system platform, extend port logistics information value-added services, and promote the traditional port logistics industry to develop in the direction of informatization and high end.

(2) Break through the bottleneck of economic development, accelerate industrial upgrading and transformation, and promote development by innovation. From the perspective of industrial innovation, integrate social resources, adjust the layout of logistics industry, promote the integration, specialization, and integration of high-end logistics development, improve the development level of modern service industry, and provide necessary support for the logistics industry for the economic transformation and development of Fujian Province. At the same time, we will learn advanced logistics management concepts and professional logistics technology from developed countries and regions, vigorously introduce and cultivate talents in logistics related fields, increase educational investment, and establish and improve a high-level logistics professional personnel training system.

(3) Speed up the development of ports in coastal cities and improve the infrastructure construction of port logistics. Strengthen the coordination ability of function docking and spatial layout of port logistics infrastructure and improve the overall efficiency of modern logistics infrastructure in Fujian Province. Relying on the developed transportation conditions, vigorously develop multimodal transportation modes such as water and land intermodal transportation and sea and air intermodal transportation, and coordinate the establishment of logistics information platforms for roads, railways, and aviation. Speed up the construction of modern logistics network in Fujian Province and form an interconnected and integrated logistics information network system in Fujian Province as soon as possible.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

This study was supported by the Huaqiao University High Level Talent Research Initiation Project (no. 18SKBS203) and the Quanzhou Social Science Foundation Project (no. 2022H17).

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