BioTechnology

An Indian Journal

The research of marine industry's structure optimization based on economic growth

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ABSTRACT

Researches about Marine industrial structure optimization are mainly from the Angle of qualitative, based on the perspective of economic growth from the Angle of qualitative are less, however, the fundamental goal of industrial structure optimization is to promote economic growth. The article used gray correlation analysis method from the Angle of the qualitative to analyze the correlation effect among economy and the marine three industries. The result showed that Marine tertiary industry and economy had the highest correlation, Marine second industry followed, but Marine second industry and first industry had similar correlation with economy. Therefore, the paper proposed that China must give priority to develop Marine tertiary industry, not abandon the development of Marine second industry, improve the quality of Marine first industry.

KEYWORDS

INTRODUCTION

With constantly improved attention to marine economy, how to optimize structure and promote contribution to economic growth is becoming an important research project, as it has already become a new national economy growth point. As we all kwon, the aggregate growth in economic development is highly rely on the status of industrial structure adjustment, and the industrial structure optimization is a general rule of economic development. Company with all kind of problem spring up in the flied of land population, resource and environment, marine industry will become the next key point of economic development, and so it is very important to Figure out the relationship and correlation effect of marine industry's structure with economic development. This article tries to make step forward in china marine industry's structure optimization by the aspect of economic growth, and take more beneficial explore in quantitative analysis.

DOMESTIC AND FOREIGN RESEARCH PROGRESS

There are not so much researches on marine industry's structure both home and abroad. But still have some relatively representatives, like Chettys(2000)[1], Nijdam and Langen(2003)[2], they were take study respectively on New Zealand and Netherland's marine industry cluster, analyzed dynamic association between cluster evolution progress and international competition. And they thought that clustering's competition strength lie in leader companies and their relationship.

Research on marine industry's structure by domestic scholars is mainly focus on analyzing the present structure, evolution and optimized standard. Yu Hainan etc (2009)[3] analyzed the evolution progress of china's marine industrial structure of china by "Three axis diagram method", and concluded that china's marine industrial structure presents dynamic evolution progress that in first step, primary industry on the leading role, and then in second step, the second and the tertiary industry developing very fast. At last, the tertiary industry will come to the leading role of china's marine industrial structure. So there is the "third step, second step and first step" dynamic evolution sequence. For the discussion of marine industrial structure, most scholars are support the above point, but there still someone hold different opinions that It should depend on if the marine resources be used reasoned or not, and outstanding the marine second industry's position. (Ji Yujun, Jiang Xuzhao, 2011[4]).

As for the relationship between marine industry, economic development and land industry, most scholars thought that the development of marine industry should take the path of land and sea industries well-coordination, and then achieve land and sea industries well-coordinated development (Yu Jinkai, Cao Yanqiao, 2009[5],Gong Meirong, Han Zenglin, 2011[6]), and for the significant correlate mechanism between marine industrial development and economic growth, there are domestic scholars have ever done quantitative analyzed (ZhaoXin, Zheng Hui, 2010[7]).

Generally speaking, the current study mainly focused on analyzing marine industrial structure by the aspect of quantitative. And telling the unreasonable problem among the industry then put forward policies of marine industrial development. This article will make study on the marine industrial structuring problem in the aspect of economic growth by build gray correlation of marine primary industry, second industry and tertiary industry with economic growth.

THE RELATIONSHIP OF MARINE INDUSTRIAL STRUCTURE AND ECONOMIC DEVELOPMENT

The degree of attention to marine economy increased constantly

With the pressure from land resources, environment and population, every country in the world are move their eyes to the vast ocean which with splendid resources and vast areas. Every country's marine development strategy continuous advanced, so the 21th century been called ocean's century. Since 1990, china has treaded the development of marine resources in the future as a keystone of national development strategy, and Figure out that developing marine industry as a important measure. After make policy of "The national marine economic development planning outline", china enters a rapid growth stage of developing marine economy. In report of The 18th National Congress of Communist Party of China, it put forward that we should improve the ability of marine resources development, develops the marine economy, protect the marine ecological environment and resolutely safeguard the national marine rights, build powerful marine country. And that means china has begin to implement the "Maritime power strategy". The "Twelfth Five Year Plan" put forward clearly that we should "vigorously develop the marine economy", "adhere to the sea land coordination, formulate and implemented marine development strategy and then improve the comprehensive management power of ocean development". Make sure that china wills fully implementing the "maritime power strategy". And with the degree of attention to marine economy increased constantly, marine economy will become the powerful engine to pull up China national economic development, and then it will be a new key point of china economic development.

Marine industry develops rapidly and get increasingly prominent position

In recent years, china marine industry demonstrating rapid development status, especially after the time made reform and opening-up policy, there are great promote happened to industrial growth speed, and start taking shape. Since the time before 1978 when there are only three major traditional industries include fishery industry, salt industry and marine transport industry, till 1990s the offshore oil and gas industry as well as coastal tourist industry have great development. And when the time comes to 21th century, some new marine industries like marine chemical industry Marine biological medicine and

marine electric power are develop rapidly, and so the whole marine industry make much more contribution to national economy. During the year of 2002~2012, the yearly growth rate has hit 13% (Figure 1), and it higher than the same year's GDP around 10% growth rate.

With the marine economy development, the scale of marine industry also keeps expanding. The total value of marine industry in 1979 was only 6.4 billion Yuan. 2003, the number comes to 1000 billion, and then 2007, it comes to 2500 billion, at the recently year of 2012, the number just hit 5000 billion, what was more, it take 9.6% proportion of GDP. And with the marine industry's growth rate and scale's expanding, the position of it has been more significantly.
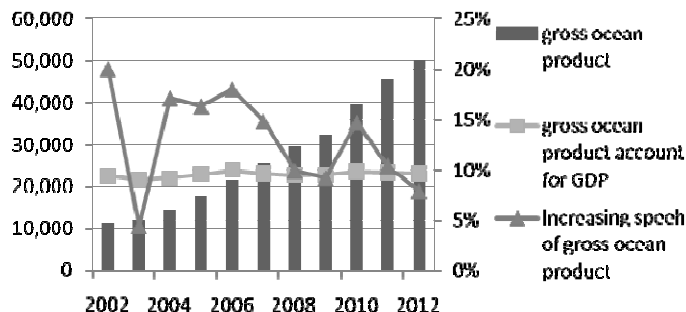

Figure 1 : The condition of china marine industry growth; Date resource: CHEN Qiu-ling etc. China Marine Industry Report (2012-2013) [M] Shanghai: Shanghai University Press, 2012.

Marine industrial structure's stability and volatility

We can see from the TABLE 1 that the evolution of china marine industrial structure shows that marine primary industry's proportion declined, and the marine second industry, as well as the marine tertiary industry's proportion is generally increased. At the same time, all the others are present "third step, second step and first step" dynamic evolution sequence, except 2006, 2010 and 2011 show "second step, third step and first step" industry structure. So we can see that china just go through the stage from "second step, third step and first step" dynamic evolution sequence to "third step, second step and first step" dynamic evolution sequence, and showing a developing condition of stability and volatility. On one side, it shows that the proportion of marine primary industry less than 7%, the marine second industry and the marine tertiary industry share same level proportion; On the other side, it shows a instability condition that the marine second industry and the marine tertiary industry alternating dominant.

TABLE 1 : China's gross ocean product and it component

Year	Marine industry total output value			Marine industry total output value constitution		
	Primary industry	**Second industry**	**Tertiary industry**	**Primary industry**	**Second industry**	**Tertiary industry**
2002	730.0	4,866.2	5,674.3	6.6	43.5	50.3
2003	766.2	5,367.9	5,818.5	6.7	45.0	48.7
2004	851.0	6,662.9	7,148.2	5.8	45.7	48.8
2005	1,008.9	8,046.9	8,599.8	5.7	45.6	48.7
2006	1,228.8	10,217.8	10,145.7	5.7	47.3	47.0
2007	1,395.4	12,011.0	12,212.3	5.4	46.9	47.7
2008	1,694.3	13,735.3	14,288.4	5.7	46.2	48.1
2009	1,857.7	14,980.3	15,439.5	5.8	46.4	47.8
2010	2,008.0	18,935.0	18,629.8	5.1	47.8	47.1
2011	2,327.0	21,835.0	21,408.0	5.1	47.9	47.0
2012	2,683.0	22,982.0	24,422.0	5.3	45.9	48.8

Date resource: Chen Qiuling etc. China marine industry report (2012-2013) [M] Shanghai: Shanghai University press, 2012.

From the primary, second and tertiary marine industry's inner structure and alternating situation, it presents slow volatility status. In general, the proportion of marine primary industry decline slowly, and during 2004~2012 it goes slower, and keep stability around 5%. Marine second industry shows "Rise—Fall—Rise--Fall", so can be divided into four stage, the first stage is during 2002~2006 when ocean shipping industry, marine chemical industry and marine engineering construction industry develop rapidly, and then increase the proportion of marine second industry; The second stage is the time during

2007~2009, In this period, marine second industry's proportion declined because of the tertiary industry increased stably, The third stage, 2009~2011, during this stage the new marine industry develop rapidly and push forward marine second industry's proportion; 2012, the fourth stage, during this period, with marine services developing, the second industry proportion decline. The marine tertiary industry proportion has changed greatly since State Statistical Bureau adds coastal tourist industry to the marine tertiary industry.

THE ANALYZE OF CORRELATION EFFECT AMONG ECONOMY AND THE MARINE INDUSTRY

Model chosen and calculation steps

Grey correlation analyze describe the relationship among factors by the factors simple's grey correlation degree, and have advantage in easy operation and little scale simples. What was more, it has small amount of calculation, so be widely used in industries correlation effect analyze. The method of calculation as follows:

First, we should make clear the factors of independent variables and dependent variables, and then treat the dependent variables as reference sequence Xo, the independent variables as comparison sequence Xi, then form the data sequence matrix as follows:

$$(X'_0, X'_1, \cdots, X'_n) = \begin{pmatrix} x'_0(1) & x'_1(1) & \cdots & x'_n(1) \\ x'_0(2) & x'_1(2) & \cdots & x'_n(2) \\ \vdots & \vdots & & \vdots \\ x'_0(N) & x'_1(N) & \cdots & x'_n(N) \end{pmatrix}_{N \times (n+1)}$$

In which, $X'_i = (x'_i(1), x'_i(2), \cdots, x'_i(N))^T, i = 0, 1, 2, \cdots, n$

Second, because of original variables always have different dimension and order of magnitude, it have to handle the variables sequence with dimensionless. The generally way to go through the method including equalization and initial value, this article chose the latter.

Third, calculate the absolute difference value of reference sequence and comparison sequence and get the absolute difference matrix, then found the maximal value and minimum value, take them as the maximal deviation and minimum value deviation. Next step, substituted the absolute difference matrix into the formula as follow, then get the K period grey correlation coefficient of sequence Xi and sequence Xo. Value of ρ range among (0,1), and it often between o.1 and 0.5, much smaller ρ can offer much bigger difference of correlation coefficient.

$$\xi_{0i}(k) = \frac{\Delta(\min) + \rho\Delta(\max)}{\Delta_{0i}(k) + \rho\Delta(\max)}$$

At last, obtained the correlation degree by calculate the mean value of N correlation coefficients of reference sequence Xo, and comparison sequence Xi.

Correlation effect analysis

The date of this research is selected from "China marine statistical yearbook", and selects the GDP (2003-2012), marine primary, second and tertiary industries (TABLE 2) as analyzing simple dates.

TABLE 2 : 2003~2012 GDP of china and the primary, second tertiary marine industrial output value (Unit: 100million Yuan)

Year	GDP	Marine primary industry	Marine second industry	Marine tertiary industry
2003	135,822.8	766.20	5,367.9	5,818.5
2004	159,878.3	851.00	6,662.9	7,148.2
2005	184,937.4	1,008.90	8,046.9	8,599.8
2006	216,314.4	1,228.80	10,217.8	10,145.7
2007	265,810.3	1,395.40	12,011.0	12,212.3
2008	314,045.4	1,694.30	13,735.3	14,288.4
2009	340,902.8	1,857.70	14,980.3	15,439.5
2010	401,512.8	2,008.00	18,935.0	18,629.8
2011	473,104.1	2,327.00	21,835.0	21,408.0
2012	519,470.1	2,683.00	22,982.0	24,422.0

Date resource: "China marine statistical yearbook 2003-2012"

After handle dimensionless process to the above dates, substitute the absolute different value into third step's grey correlation coefficient formula, and make $\rho = 0.4$, then get the grey correlation degree as follow:

TABLE 3 : Correlation degree of china economic development and marine primary, second and tertiary industries

Year	$r_{01}(t)$	$r_{02}(t)$	$r_{03}(t)$
2003	0.552	0.437	0.581
2004	0.860	0.529	0.760
2005	0.636	0.711	0.833
2006	0.411	0.507	0.718
2007	1.000	0.833	0.972
2008	0.593	0.637	0.841
2009	0.491	0.671	0.750
2010	0.390	0.362	0.726
2011	0.289	0.453	0.666
2012	0.588	0.680	0.485

By calculating the arithmetical average of correlation degree matrix, we can obtain the correlation degree marine primary, second and tertiary industries: $r_{01} = 0.581,$ $r_{02} = 0.582,$ $r_{03} = 0.733.$

And because of $r_{03} > r_{02} > r_{01}$, we can find that marine tertiary industry have highest correlation degree with GDP, and then marine second industry, last is marine tertiary industry, but difference between marine second industry and marine primary industry is very small.

MARINE INDUSTRIAL STRUCTURE OPTIMIZED STRATEGY

Give priority to the development of marine tertiary industry--- The characteristics is leader

The development of marine tertiary industry is sign of the marine industrial structure come to advanced stage, and it is also the trend or direction of marine economy and marine industrial structure. In recent years, china marine industry develop rapidly and would have been not if the contribution from marine tertiary industry absent. For now, the output of marine second and tertiary industry is keep in same level, and it says that there is still big develop space and prospect exist in marine tertiary industry.

From the correlation effect of marine industry and economic development we can see marine tertiary industry has highest correlation degree with economic development, and so, strive to develop the marine tertiary industry should be the key point of economic development. As well as, enhance marine tertiary quality and proportion can accelerate the development of china's economy. Judged from the angle of global marine industry's value chain, china still stay in the bottom of marine industry's value chain, and processing, making and added value are low in technology, especially like marine logistics service, offshore financial services, marine engineering technology service and marine information service and so on are develop very slowly. So it have to develop marine tertiary industry greatly which is on the top of marine industrial chain, and make it new highlight of marine industry.

Generally speaking, the development of 11 provinces in china coastal depend on the marine industrial characteristics, every coastal provinces which have well develop in marine industry all have their own features, except Shandong province that is mainly depend on rich fish and salt resource. Like Shanghai's marine transportation industry and coastal tourist industry all on the on the top of china, and the industrial output take over one in three of national total output value of the same industry; Zhejiang province's marine biological pharmaceutical industry is on the top of china; Guangdong province's income of coastal tourist industry is on the second position in china; Fujian province become the fifth marine economic province by take good use of coastal travel and see island resources. So, it should strive to develop marine tertiary industry and take care of the local characteristics, as the same time, avoid phenomenon of soma structure of industrial structure and cut-throat competition come into being.

Do not loosen the development of marine second industry ---Armed by science and technology

In most time, upgrading of marine industrial structure is like a way from marine primary industry to marine second industry and then the marine tertiary industry, and generally come into the "third step, second step and first step" industrial development pattern. Without the development of marine second industry, it will hard to make step on the development of marine tertiary industry. So the marine second industry has important position in connecting link among marine second industrial structure optimizing process.

From the marine industry's correlation effect with economic growth, the marine second industry's correlation degree with economic growth is just after the marine tertiary industry's and during present situation; we could not let it ease. In recently ten years, china marine economy develop rapidly, and it mainly benefit from the development of marine second industry, especially part of eastern area should pay more attention to it, such as Guangdong province, have three top position in china of the marine electric power, offshore oil and gas industry and seawater utilization industry; As traditional marine ship industrial base, Shanghai's total industrial output occupies one in three of national same industrial output; Shandong province's marine salt industry occupies 30% of country, and the marine chemical industry, seawater utilization and marine engineering construction industry all on the second of china.

As for marine second industry which has a certain develop base, it can expand the R&D invest and applicant high technology in traditional marine industry and enhance the products' technical level and added value, then achieve transformation and upgrading of traditional industry. What was more, turn it into marine strategic high-tech industry. At present, in china, we define the marine monitoring and detecting technology, marine biotechnology, marine ecological simulation system technology, deep sea diving Technology, ocean mineral resources development technology, seawater desalination and utilization technology, the extraction technology of seawater chemical resource, ocean energy technology, marine Information technology, the use of ocean space and marine engineering technology[9] as the marine new and high technology.

Improve the marine primary industry---Sustainable development

Conclude from the correlation effect of marine industry and economic development, there almost have the same correlation degree between marine primary industry and marine second industry with economic development, and so, it is necessary for economic development to develop marine primary industry. China marine industry mostly is marine fishery, and the proportion of marine industrial total output nearly less than 5% during recent years, but there are still some series problem exist like problem come with overfishing and low level processing.

It should adhere to the strategy of sustainable development principle, and realize the guiding principle that marine fish culture, fishing and processing all in one. As for the fish culture, by adding high levels of marine aquaculture base, it can achieve the aquaculture industry scale and intensive development. As for the fishing, carry out the adjustment and optimization of ocean fishing structure and layout, then optimized the reasonable use of fish resources, encourage and support the development of marine fishery industry. As for processing, expand the deep processing and comprehensive utilization of aquatic products, to extend the industrial chain of marine fishery and improve the added value of marine products.

REFERENCES

[1] E.Stephanie Chang; Disasters and transport systems: Loss, recovery and competition at the Port of Kobe after the 1995 earthquake. Journal of Transport Geography, **8**, 53-65 **(2000)**.

[2] Nijdam Michiel, W.Langen, Peter De; Leader Films in the Dutch Maritime Cluster. Paper presented at the ERSA Congress, **32**, 16-27 **(2003)**.

[3] Yu Hainan, Yu Jinkai, Liu Shuguang; Analysis on the Evolution of Marine Industrial Structure in China Based on "Triaxial Diagram " [J]. Yunnan Finance & Economics University Journal of Economics & Management, **4**, 71-76 **(2009)**.

[4] Ji Yunjun, Jiang Xuzhao; Is Optimization Standard of Marine Industrial Structure the Improvement of its Tertiary Industry's Proportion?—Based on the Formation Characteristic of Marine Industry Structure [J]. Review of Industrial Economics, **10**, 82-94 **(2011)**.

[5] Yu Jinkai, Cao Yanqiao; Analyze on marine industrial correlation model[J]. Marine information, **2**, 13-17 **(2009)**.

[6] Gong Meirong, Han Zenglin; Study on Oceanic Economy in Liaoning Based on Theory of Industrial Clusters[J]. Resources Development & Market, **03**, 202-204+262 **(2011)**.

[7] Zhao Xin, Zheng Hui; Mechanism research of the relationship between marine industry development and macro economic growth in China based on VAR model [J]. Chinese Fisheries Economics, **1**, 131-137 **(2010)**.