



## Research on China's marine economic growth pattern: An empirical analysis of China's eleven coastal regions



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### ARTICLE INFO

#### Keywords:

Marine economic growth pattern  
Coastal regions  
Marine policy  
Total factor productivity  
Intensive coefficient  
China

### ABSTRACT

The development of China's marine economy has never been more challenging due to serious problems such as the waste of marine resources, pollution of the marine environment and uneven development in the region. Therefore, the study of China's marine economic growth pattern has great significance and may ensure the sustainable development of the marine economy. This study utilizes data on China's eleven coastal regions from 2006 to 2014 and applies the Cobb-Douglas production function and the Solow residual method to evaluate the contribution rate of the total factor productivity of the marine economy of China's coastal regions. To more objectively illustrate the marine economic growth pattern, this paper introduces the intensive coefficient of marine economic growth. The results indicate that the contribution rate of the total factor productivity of the marine economy of China showed a slightly rising trend from 2006 to 2014, and its average growth rate increased from  $-0.58\%$  to  $3.39\%$  between 2006 and 2014. China's coastal regions differed in their contributions to the total factor productivity of the marine economy. During the same period, the main driving factor of marine economic growth was factor inputs and China's marine economic growth pattern was still extensive. In terms of regions, although most coastal regions in China experienced extensive growth, the extent of the growth of the marine economy of China's coastal regions has declined after the pilot projects implemented by the Chinese government in 2012.

### 1. Introduction

In the 21st century, in addition to the increasing population and dwindling land energy and mineral resources reserves, the marine industry has become a new global concern. Therefore, every maritime state in the world has successively regarded the development and utilization of marine resources as an essential part of their national development strategy. The marine economy has gradually incited competition among countries.

China includes vast maritime territories and has abundant sea resources. Since the founding of the People's Republic of China, the status of China's marine economy has developed rapidly in the national economy, and marine economic policy has gradually developed [1]. When The Great Remodelling of Socialism was completed,<sup>1</sup> China began to adopt a planned economic system and established a socialist economic system, which included both a state-owned economy and a collective economy that affect the marine economy [2]. Subsequently,

in China, the development of the marine economy was seriously hampered by the “Cultural Revolution”<sup>2</sup> [3]. The Third Plenary Session of Eleventh Central Committee focused on economic development and created China's initial marine economic policy, which sought to integrate the management of the marine economy [4,5]. In the 21st century, China's marine economy has become an element of new growth that affects the national economy. The government and ordinary citizens have gradually increased their awareness of the marine economy [6–8]. Additionally, the Eleventh Five-Year and Twelfth Five-Year Plan outlined the establishment of the marine industry in a special chapter [9]. The long-term development of the marine economy has gradually been promoted to the national strategic level, and China introduced a system of national marine economic planning [10]. China's marine economy grew at an average annual rate of 13.5% during the period of the Eleventh Five-Year Plan and the Twelfth Five-Year Plan. At the end of the Twelfth Five-Year Plan, the Chinese gross ocean production (GOP) totalled 6.4669 trillion yuan, and the Chinese gross

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<sup>1</sup> The Great Remodelling of Socialism was the socialist transformation of agriculture, industry and the capitalist industry and commerce, led by the Communist Party of China after the founding of the People's Republic of China.

<sup>2</sup> The Cultural Revolution, also referred to as “the Great Proletarian Cultural Revolution”, was a period of civil strife launched by Mao Zedong that was exploited by the Counter Revolutionary Clique. This revolution was a serious disaster to the party, the state and people of all nationalities.

domestic product (GDP) totalled 68.2635 trillion yuan.<sup>3</sup> At that time, the GOP represented 9.47% of China's gross domestic product, which indicates its importance. However, problems remain regarding the growth of the marine economy. On the one hand, the development of most marine industries depends solely on material factor inputs and considers only “quantity” while ignoring “quality”, which results in considerable waste of marine resources and restricts the long-term development of the marine economy [11]. On the other hand, increasing industrialization of China's coastal regions has caused considerable marine environmental pollution, such as industrial waste water, domestic sewage, solid waste emissions and offshore oil leakages [12]. In 2015, the health of marine ecosystems, including estuaries, bays, wetlands, coral reefs, mangroves and seagrass beds, were monitored; the analysis indicated that the proportion of the ecosystems that were healthy, sub-healthy, and unhealthy were 14%, 76% and 10%, respectively [13]. Because of these problems, the transformation of the marine economic growth pattern has become the top priority for the development of China's marine economy. In this context, it has become urgent to study China's marine economic growth pattern, which is the only way to accelerate the transformation of the marine economic growth pattern and realize the sustainable development of China's marine economy sooner [14–16].

The growth of the marine economy has significant regional differences because of unique geographical attributes. Obvious differences exist among various regions in terms of marine factor endowment, strategy development, potential advantages and growth characteristics. In 2010, the Chinese government began to attach importance to pilot projects of marine economic development. The National Development and Reform Commission approved the work programme of the pilot areas in the Shandong, Zhejiang, Guangdong, Fujian and Tianjin provinces. In January 2011, the State Council approved the planning of a blue economic zone in the Shandong peninsula, which indicated that the marine economic development pilot project entered the implementation phase and China's regional development was extended from land to sea. On June 30 of the same year, the State Council formally approved the establishment of the new district of the Zhoushan islands in the Zhejiang province, which was the first national strategic functional area in China that was focused on the marine economy. On June 3, 2014, the State Council approved the establishment of an economic district for the west coast of Qingdao, which indicated that the national marine economic development pilot project had entered a new stage of comprehensive implementation [17].

China's coastal regions include the Circum-Bohai Sea Region, the Yangtze River Delta Region and the Pearl River Delta Region. The GOP of the Circum-Bohai Sea Region reached 2.2152 trillion yuan in 2014, accounting for 37% of the National GOP in China and represents the largest marine economic development region in China. The Yangtze River Delta Region is second, with a GOP of 1.7739 trillion yuan, accounting for 29.6% of the National GOP in China. The Pearl River Delta Region accounted for the smallest proportion of the National GOP at only 20.8%.<sup>4</sup> The division these marine regions is based only on geographical categories and does not reflect the specific features of the marine economic development in the regions. To better describe the characteristics of different marine economic regions and the marine economic growth pattern, the boundaries of the coastal regions can be refined. Therefore, this paper selects eight coastal provinces, one autonomous region and two municipalities<sup>5</sup> in these three regions as the objects of study for further research. Conducting a comprehensive and objective evaluation of China's marine economic growth pattern at the

regional development level has important practical significance for grasping the pulse of the marine economy in China, understanding the advantages of the regional marine economies, and developing a reasonable regional development strategy [18].

At the beginning of this century, scholars in various countries began to realize the importance of studying the marine economic growth pattern [19–21]. To better study the marine economic growth pattern, Colgan discussed the methodology for developing a data series on economic activity related to the ocean economy in the U.S. that was available for widespread use by coastal managers [22]. Subsequently, Morrissey provided policymakers and planners with the first trend-level analysis of many subsectors of the marine economy in England (2003–2011) using secondary data provided by the Office of National Statistics. It is important to understand how economic activities that depend on marine resources are changing and how marine management decisions need to evolve to address these changes [23]. However, both Colgan and Morrissey analysed this question in a very elementary manner, and few studies have analysed the marine economic growth pattern using a quantitative approach. Most scholars focused on a specific marine industry, such as coastal tourism, marine transportation or marine fisheries, rather than considering the entire marine industry [24–27]. In addition, only a few scholars studied the contribution rate of marine factors to the development of the national marine economy [28,29]. Furthermore, previous studies focused more on the contribution of the marine economy to the national economy. Only a few scholars have studied the impact of the marine economy on the region. Morrissey and O'Donoghue studied the regional contribution of the marine industry to the national economy using descriptive statistics [30]; however, their study lacked a quantitative analysis and an examination of different time periods. Most existing studies conduct a qualitative study of the marine economic growth or use total factor productivity (TFP) of the marine economy as the index to carry out an empirical study on the marine economic growth pattern. However, the measurement method of using the index of the TFP of the marine economy relies on the efficiency of production and is insufficient to explain changes in the status and characteristics of China's marine economic growth pattern. Therefore, this paper uses the contribution rate of the TFP of the marine economy as the index for the marine economic growth pattern. Utilizing data on the marine economy for China's eleven coastal regions from 2006 to 2014, this paper analyses the changing trends and characteristics of China's regional marine economic growth patterns to make a judgement regarding China's regional marine economic growth pattern. This analysis will be not only beneficial for all levels of management departments to determine problems in the development of the marine economy but also important for the rational planning of the development of China's marine economy in the future.

The remainder of this article is arranged as follows: Section 2 presents the concept of an economic growth pattern and discusses extensive and intensive economic growth as well as the TFP and factor inputs of the marine economy and regional development. Section 3 analyses China's current marine economy and specifically describes the economic characteristics of the coastal regions in China. Sections 4–6 provide the empirical analysis, which considers the national marine economic policy from both a horizontal and vertical angle to evaluate the contribution rate of the TFP of the marine economy for China's coastal regions, and then determines the marine economic growth pattern using an index of the intensive coefficient. Section 7 concludes the paper.

## 2. Conceptual foundation

“Economic growth pattern” is a concept adopted by the Soviet Union and Eastern European countries according to Karl Marx's classification of an economic growth pattern, which was used to analyse economic development problems [31]. In modern economics, the

<sup>3</sup> These data were derived from the “China Statistical Yearbook” and the “China Marine Statistical Yearbook”.

<sup>4</sup> These data are derived from the 2014 China Marine Economic Statistics Bulletin published by the National Oceanic Administration.

<sup>5</sup> These include Liaoning, Hebei, Shandong, Tianjin, Shanghai, Jiangsu, Zhejiang, Fujian, Guangdong, Guangxi and Hainan (from north to south).

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