Spatial-temporal Evolution of Coupling Coordination between Socio-economic Development and Growth of Service Economy—A Case Study in Zhejiang Province

Ping SUN¹,a,*, Chang-Juan ZHENG¹,b

¹School of Finance and Trade of Ningbo Dahongying University, Ningbo 315175, Zhejiang, China

apynsun@163.com, bzhengchangjuan@163.com

*Corresponding author

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Abstract. Based on the analysis of coupling mechanism between socio-economic growth and the growth of service economy, this paper reconstructed the evaluation index system of regional socio-economic development and service economic growth, then obtained comprehensive evaluation index of regional socio-economic development and the growth of service economy by using entropy method. On the use of coupling coordination model, this paper measured the coupling development of socio-economic development and the growth of service economy in Zhejiang Province, and carried out spatial econometric analysis of coupling coordination degree of different regions. Main conclusions are as follows: the coupling coordination degree of socio-economic growth and service economic growth in Zhejiang Province was growing during 2002-2012. At the meantime, the spatial region variation of coupling coordination degree was changing constantly. The internal constitution of high level and low-level areas were changing obviously. In addition, the coupling coordination degree of socio-economic growth and the growth of service economy in Zhejiang Province shows agglomeration trend, and clearly showing the stepped spatial pattern of “high in northeast and low in southwest”.

Introduction

With the continuous development of China’s economy, the proportion of service industry in GDP is continuously increasing. Service industry’s contributions to the socio-economic development have won the attention and recognition from economic community. To accelerate the development of service industry and improve the status of service industry in the national economy is one of the important guidance of the government’s economic policy for many years [1]. Therefore, study on how to maintain the development of Zhejiang service industry better and faster, and how to promote the Coupling Coordination of the development of social economy and service economy, has become an important issue in the government departments and academic circles.

About theoretical research on the growth of service industry, the most representative is undoubtedly Petty—Clark’s Law proposed by British economist Clark in the 1940s. This theory has become the classic to reveal the relationship between economic development and industrial structure change. Today, industrial structure change theory which is cored on Petty—Clark’s Law is the consensus in theoretical circles [2-3]. “Economic structure service”
has become an important feature to measure the regional industrial structure high level. The relationship between the proportion of the service industry and the level of economic development has aroused widespread concern in economic growth and economic development theory [4].

Research shows that there is a positive correlation between China’s per capita GDP and service industry added value. It also shows the stage characteristics of correlativity [5-6]. From the provincial perspective, the cointegration analysis of service industry development and economic growth correlation in Guangdong Province verifies the contribution of the service industry development to GDP growth, and the effectiveness on industrial structure transformation [7]. There is a coupling relationship between service industry and service trade, service industry (or production service industry) and manufacturing industry. There is an intrinsic coupling and interactive development relationship between modern service industry and manufacturing industry[8]. Bing-qiang Li (2010) investigated the coupling mechanism of the interactive development between service industry and service trade from the aspects of performance, structure change, clustering and adverse effect[9]. Chun-hua Ye, Lu Xu etc. (2012) [10], on the basis of Symbiosis Mechanism in the theory of Industrial Ecology, analysed the coupling mechanism between service industry and service trade. Jian-jun Chen, Jing-jing Chen (2011) [11], taking Zhejiang Province as an example, verified the cooperative localization effect between manufacturing and production service industry from the perspective of promoting the coordinated development of regional industry.

In short, in academic circles, research on the relationship between service industry growth and the level of economic development, as well as the coupling coordination of service industry and related industries now is in the ascendant, but research on coupling coordination relationship between the development of social economy and the service economy growth is not enough. Existing research remains in the level of qualitative analysis, or focuses on single association [12]. Research, based on the new economic geography and service economics theory, using econometric analysis methods to deconstruct the coupling mechanism between social economic development and the service industry growth, and using empirical methods to explain the interactive development rules between service industry and regional social economy is still very limited.

The growth of service industry is driven by the progress of social technology, the deepening of the division of labor, the rising cost of production, and the structural changes of consumer demand caused by urbanization and other factors [13]. The level of socio-economic development restricts the growth of service industry. The level of regional socio-economic development is the basis and premise of the evolution and updating of industrial structure. On the other hand, service industry does not automatically appear with the growth of economy. Service industry has become one of the most important structures in the growth of modern economy [13]. Knowledge-intensive modern service industry is an important boost power to improve socio-economic quality. Socio-economic development and service economic growth are mutually supportive, as well as restrict and promote each other. They have an inherent coupling and interactive development relationship [14].

**Construction of Index System and Data Source**

**Coupling Mechanism Analysis**

Coupling means two or more than two systems or modes of motions influence and combine...
with each other through interaction, which is a dynamic relationship of mutual dependence, coordination and promotion [15]. System coupling theory was first applied to the study of physics, and has been widely applied in the fields of economics, ecology and other research fields in recent years [16]. Socio-economic development and service economic growth interact with each other through their respective coupling elements, which is an interactive relationship of mutual promotion and coordinated development. Therefore, it is appropriate to apply “coupling” to characterize the relationship features between them. Coupling coordination degree reflects the intensity of mutual dependence and influence between each subsystem [17]. Only on the basis of internal coordination of the subsystems, and each subsystem cooperating and coordinating each other to form a cohesive force, the goals of socio-economic development and regional industrial structure can be smoothly achieved. Obviously, the spatiotemporal coordination of socio-economic development and the growth of service economy is based on time and space as the reference system. On the premise of maintaining the internal coordination of the subsystems, both can be harmouniously coordinated in the target, phase, speed, level and policy of the development.

The Construction of Index System

Research on the coupling coordination between socio-economic development and the growth of service economy must be based on the evaluation of the two systems. From the angle of system theory, follow the principles of representative, scientific nature, comparability, availability and so on and take the research results by related scholars for reference. After multicollinearity analysis between the index and correlation analysis, build their comprehensive evaluation index system. As for the measurement of socio-economic development level, this study used socio-economic development scale and quality as the base level, selecting 11 statistical indicators. As for the calculation of service economy growthlevel, this study used the four indicators, namely development scale, industrial structure, growth speed and economic performance for the base level, totally selecting 11 statistical indicators. Thus, evaluation index system was constructed, including 6 base levels and 22 indicators of the development of socio-economy and service economy.

Analysis of Coupling Coordination Degree Between Socio-economic Development and Service Economic Growth in Zhejiang Province

Comprehensive Evaluation of Socio-economic Development Level and Service Economic Growth

The comprehensive evaluation index of socio-economic development level (u₁) and service economic growth (u₂) was calculated according to entropy method. During 2002-2012, the level of socio-economic development shows an comparatively obvious upward trend in each county (city) of Zhejiang province, especially in Hangzhou and Ningbo city areas. The comprehensive evaluation index of socio-economic development in these two cities respectively increased from 0.171 and 0.173 in 2002 to 0.730 and 0.750 in 2012. In addition, the economic development level of 11 cities in different periods is higher than other counties (cities) in different degrees.

The growth level of service industry shows a relatively stable upward trend in 11 cities in Zhejiang province, with Hangzhou city and Ningbo city the most obvious. In addition, in other 58 counties (cities) belonging to Hangzhou, Ningbo, Shaoxing, Jiaxing and Huzhou
counties, together with other 26 cities, such as Dongyang, Yiwu, Yongkang, the level of service economic growth also shows a clear upward trend. However, in other 32 cities and counties the level of service economy growth is slightly rising, but the trend is not obvious.

**Time Variation Characteristics of Coupling Coordination Degree**

During 2002-2012, the average value of the coupling coordination degree between economic development level and the service economy growth rose from 0.327 to 0.467. The coupling coordination degree in counties (cities) also changed from 0.252-0.469 to 0.321-0.841, which showed a rising trend on the whole.

During 2002 to 2012, the evolution characteristics of the coupling coordination degree between economic development level and the growth of service economy in Zhejiang province were evident. During the first stage (2002-2004), the degree was 0.252-0.499. The coupling coordination degree between economic development level and the growth of service economy in Zhejiang province slightly increased, but in counties where the coupling coordination degree was relatively high or low, the increase was not obvious. The overall development level was relatively low. During the second stage (2005-2009), the degree is 0.250-0.696. A significant feature of this stage is: the coupling coordination degree between economic development level and the growth of service economy showed a clear upward trend in counties and cities where the original coupling coordination degree was at a high level. However, the coupling coordination degree of economic development level and the growth of service economy in counties and cities where the coupling coordination degree was relatively low was still hovering in the low, which showed no obvious rising. During the third stage (2010-2012), the degree was 0.301-0.841. The coupling coordination degree between economic development level and the growth of service economy in each county and city of Zhejiang province was in the ascending orbit.

**Spatial Differentiation of Coupling Coordination Degree**

With the help of Arcgis10.1 software, this paper analyzed the change of the coupling coordination degree between economic development level and the growth of service economy in Zhejiang province at three times, and explored the spatial differentiation of the coupling coordination degree between them. As we can see from the study, in Hangzhou city and Ningbo city, the districts with a high coupling coordination of economic development and the growth of service economy in Zhejiang Province, the economic development and service economic growth ranked the first in Zhejiang Province in the three times, affected by such factors as economic basis, development stage, location conditions, population size, policy environment. The coupling coordination degree between the two was relatively higher. In 2002, the higher area was made up of Shengsi and other 10 regions, while in 2012 the regions were further reduced into 9. Among them, Shengsi, Huzhou City area, Jiande, Quzhou city area, Jinhua city area, Yongkang, Lishui City area changed from the higher area into middle area, while Cixi, Yuyao and Taizhou rose from the middle region to the rank of the higher area. However, the number of the low level regions increased from 9 in 2002 to 15.

**Summary**

This paper, taking regional economy as a unit, studied the dynamic coupling mechanism between socio-economic development and the growth of service economy. On the base of the construction of evaluation index system of regional socio-economic development and service
economic growth, using the coupling coordination degree model, this paper measured the coupling coordination degree of scio-economic development level and service economic growth in counties (cities) of Zhejiang Province. The conclusions are as follows:

First, the coupling coordination degree between regional socio-economic development level and the growth of service economy shows an upward trend. As for the coupling coordination degree in the northeast of Zhejiang Province, where the level of economic development is relatively high, the rising extent is the most obvious. However, in the southwest of Zhejiang, where and the level of economic development is relatively backward, the rising extent is much smaller. Second, the spatial region type of the coupling coordination degree between regional socio-economic development level and the growth of service economy in Zhejiang province is in the change. The coupling coordination degree between the level of economic development and the growth of service economy is strongly affected by the stage and level of economic development. Third, the coupling development between economic development level and the growth of service economy in Zhejiang province shows the trend of agglomeration and has obvious characteristics of spatial pattern. The hot spots are concentrated in the northeast region of Zhejiang Province, and the coupling coordination degree of the southwest region of Zhejiang Province is mainly in the cold area and sub cold area, which is a general distribution pattern of the “northeast high, southwest low”.

This study indicates that we need to further strengthen the driving force of socio-economic development on the growth of service economy. In the consolidation of county economy development in the northeast of Zhejiang, with Hangzhou and Ningbo as its center, more attention should be paid to the socio-economic development in the counties (cities) in the southwest of Zhejiang, which provides a good foundation for the fast growth of service economy. In addition, support and guide such production service industries as finance, science and technology, transportation and so on, increase the support for the development of education, health and other public services as well as promote the healthy interaction and coupling coordination development of socio-economic development and the growth of service economy.

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