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Study on cooperation of green economy between Fujian and Taiwan

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ABSTRACT

Green economy is the inevitable requirement for cooperation between Fujian and Taiwan, but there are many problems such that the green industry system is not complete which is lack of professional talents and independent brands and so on. The significance of solving such problems is to achieve industrial upgrading and structural optimization of the current economy between Fujian and Taiwan. The existing research on development of green economic cooperation between Fujian and Taiwan has not formed mature unified paradigm, most of theoretical results just embodies some discussion papers and policy documents. In this research, we innovatively analysis economic cooperation strategy selection based on Cooperate Game model, then put forward the idea that is to build the Green Economic Zone of Taiwan Strait which has not been proposed before. It is constructive for green industries and green-city cooperating measures to improve economic cooperation between Fujian and Taiwan coupling. The building method may be including policy, city, technology and industry cooperation.

KEYWORDS

Fujian; Taiwan; Green economy; Cooperation.



INTRODUCTION

"Green economy" was firstly proposed from "Green economic blueprint" by British economist David Pearce in 1989^[1]. After Pearce, the theoretical circles have not made systematic research comprehensively on the green economy, just staying in the theoretical level. The foreign researcher Dumitru Raluca-Ana-Maria pointed that the green economy is an economic pattern of response to the current environment and resources of multiple crises as the times require^[2]; Borel-Saladin and Jacqueline Madeleine thought that the green economy is not only an incremental change or "green washing" concept, but likely have a substantial impact or change of realizing the goal of sustainable development^[3]; The domestic scholar Qu Geping mentioned the green economy is based on ecological environmental capacity, resource carrying capacity for the premise, a kind of economic development and improve the ecological environment, realizing the sustainable utilization of natural resources of continuous improvement and quality^[4]; Cui Rubo thinks that the green economy is neither a kind of local economic phenomenon nor the narrow sense of environmental protection industry or ecological industry, but a pattern of market economy unified environmental ration and economic efficiency in essence of unity^[5]. Liao Fulin thought that the green economy is a new development model to coordinate resources, the relationship between environmental protection and economic growth^[6]; Zhang Ye proposed green economy is the production, circulation, distribution and consumption process which did not harm the environment and human health and profitable economic activities in 2002^[6]. In this paper, the definition of green economy summarized as: green economy is a model of economic development which looks the relationship between protection and economic development as the core and green technology as the basic goal, based on circular economy, low - carbon economy as the main content, promoting economic comprehensive green and ecological, to achieve a harmonious and win-win economic, social and ecological result. Theoretical study on the economic cooperation between Fujian and Taiwan in recent years has obtained great progress, but few research on the cooperation of green economy between Fujian and Taiwan. In 2013, Zhang Tianshu and others discussed the Complementarities of green economy between Fujian and Taiwan according to current situation of the cooperation of green energy industry on both sides^[7]; In 2011, Li Fei and Zhang Luyang thought that the development of green industry between Fujian and Taiwan is very promising and put forward the corresponding strategies^[8]; Some other scholars devoted to wind industry, solar photovoltaic industry, the nuclear power industry and so on. In a conclusion, the existing research on development of green economic cooperation between Fujian and Taiwan has not formed mature unified paradigm, most of theoretical results just embodies some discussion papers and policy documents. The overall level is still relatively backward. This paper puts forward the cooperation mode of green economy between Fujian and Taiwan and the path based on the analysis of economic cooperation, trying to provide a theoretical basis for the green economy cooperation between Fujian and Taiwan.

ANALYSIS OF THE CURRENT SITUATION

The development of green economy in Fujian

Fujian has proposed the establishment of ecological province goal in 2002 and developing green economy has become an important content of the transforming mode of economic development after 30 years reform and opening-up. In 2009, Fujian developed low-carbon economy policy objectives; During "The Twelfth Five Year Plan" period Fujian vigorously promoted energy-saving environmental protection, new energy and other green industry and as a seven strategic emerging industry to cultivate; Along with the economic growth, Fujian province's energy consumption has decreased year by year. For example, in 2012, up to 5% from a year earlier, 2010 and in 2011 were 10% and 8.61%, the energy consumption of GDP million yuan for 0.607 tons of standard coal, than in 2011 dropped 5.7%, simultaneously industrial wastewater emissions, emissions of pollutants are also decreased; China green development index report indicated that Fujian ranked in eighth and seventh from 2011 to 2013 in 30

provinces (area or city), in recent years Fujian attached great development of green economy, gradually forming the green industry system; From the government work report, we know the development of marine economy, organic agriculture and construction of new energy system will become the Fujian government working key. As the data showed, the green industry in Fujian has gradually began to develop by technological innovation, industrial upgrading, green energy development, change the traditional mode of economic development. However, the development of green economy in Fujian is still facing many threats and challenges from technology, capital, innovation, mode and other elements, therefore strengthening green economic cooperation between and Taiwan is the main way to transform economic development mode and also an important content for Fujian and Taiwan industry further docking.

The development of green economy in Taiwan

Taiwan completed the upgrading of the industrial structure transformation and development pattern of low carbon economy in the last century 80's and rapidly accessed to high-developed agricultural, industrial modern society. In 2008, Taiwan formulated the policy of energy saving and carbon reduction action plan, and set 2010 as the year of Taiwan energy conservation and carbon; In 2009, the Taiwan authorities make biotechnology, tourism, green energy, health care, agriculture and the cultural creative industries as the emerging industry development direction, and planed to invest 20 billion yuan of funds to build a global solar cell production base, which is the world's largest LED light source supplier and global wind power generation system. Therefore the green industry achieved a lot of opportunities continuously strengthen the low carbon, environmental protection and construction of circular economy system; The authorities in Taiwan have set up a "CXS green energy industry project", renewable energy development act and related professional organizations, which developed solar cell industry ranking fourth in the world, 98% of the products are sold to Europe and other foreign markets; Taiwan grasped the trend of economic globalization and world industrial development under the situation of rapid development with strong capital and advanced technology to form the development pattern. But scholars have pointed out, the biggest problem Taiwan is facing to green energy industry is the lack of independent technical, most of the industry's core technology is still controlled in the hands of the developed countries, which will limit the development of green economy in Taiwan^[10].

The history of green economic cooperation between Fujian and Taiwan

Fujian and Taiwan in, the progressive realized cultural exchange, docking industry and marketing interaction between Fujian and Taiwan with the ECFA era. The green industry have got the good development platform with the rapid generation of technology and market in the process of transformation, and actively promoted cooperation between Fujian and Taiwan, by creating their own brand, achieving the common goal of protecting environment and economic development. Since 1998, The two cities have begun their green economic cooperation trip with "LED lighting industry and exchange conference", signing a letter of intent green industry cooperation between Fujian and Taiwan. In 2011, the government put a lot of green energy industry project included in the ECFA framework agreement to promote the transformation and upgrade of Taiwan and Fujian; Meanwhile, experts and representatives of relevant departments study on green energy, standardization and certification system, to build the platform, which lays the foundation of green energy industry cooperation between Fujian and Taiwan^[11].

Green economic cooperation between Fujian and Taiwan has formed the development pattern, and obtained rapid development based on complementary advantage. We summarizes its development have the following four characteristics. First of all, a clear division of labor specialization. Fujian and Taiwan have their own green economy advantage, for example, Fujian has the rapid growth of market demand and product processing and sales ability, but Taiwan master the green industry frontier technology and energy development capacity. The industrial vertical and horizontal division of labor, to a certain extent, is conducive to give full play to each other's advantages, greatly enhance the

competitiveness of the two cities' green industry integration. Secondly, cooperation presenting interactive trend. Recent years, Taiwan actively use ECFA to develop a number of preferential policies, to improve the investment environment and system, especially take the green energy, tourism, cultural and creative industries as a key investment industries to attract many Fujian enterprises to invest in Taiwan. Thirdly, to be innovative model. Fujian which provides cheap labor system in the process of cooperation is still in the lower link of industry chain, but Taiwan, is the hinterland of the lack of autonomy. At the same time, the green economy understanding level and system is different, so the integration of many enterprise resources, capital and technology has a great challenge. Mode of green economy development has a big gap exists, failed to form a green economy industry group and industry chain and lack of long-term planning and system security. Fourth, the green industrial enterprise develop slowly. There are many small and medium enterprises in green industry and mainly engaged in OEM production, but their marketing capabilities and technology research capabilities is relatively weak; Meanwhile, the competitive ratio is higher complementarity with the threat of mutual bargain. It's difficult to realize the technology, resources and market integration so that the enterprises failed to break the limitation, and suffered many difficulties, especially the part of enterprises in Taiwan when was affected by the global financial crisis. From the development trend of green economy and green industry cooperation, the two cities will break the traditional mode of production. With the development of technology and the development of Chinese the mainland market, Fujian enterprises will be up to the green industry chain, and Taiwan enterprises will adjust the industrial positioning to form a more reasonable industrial cooperation pattern.

ANALYSIS ON FEASIBILITY OF GREEN ECONOMIC COOPERATION

Congenital advantage

Since the reform and opening up, Fujian has become more active in economic development of Taiwan based on the natural relationship, with the geographical and cultural advantages inherent in the economic and trade cooperation with Taiwan, laying a solid foundation for exchanges and cooperation between Fujian and Taiwan. In recent years, Fujian gave full policy efforts to build economic zone on the west side of the Straits and made remarkable achievements; On the other hand, Taiwan attracted many Fujian business people to visit and invest. Fujian will devote to Pingtan experimentation area and accelerate the construction of highway and railway bridge to promote the information, modern logistics, marine, tourism and other green low carbon industry development; Taiwan look Fujian as the investment and investment target, and plan to develop green energy, tourism, cultural and creative industries to attract the investment and entrepreneurship.

Huge development space

According to the lifecycle theory of green industry, it is growing stage, whose value is on the rise from 2009 to 2015. With many years of research and development, the key technology has achieved a breakthrough and the green products costs continue to reduce. At the same time, the global market have been issued by the size, and number of green technology have been applied to business which has good economic productivity. Due to the growing global energy crisis and environmental pollution are getting more and more attention, the green industry is a kind of economic form and meet the needs of the human energy saving and protecting environment which will create greater economic interests. Along with the increasing international green industry market in Fujian, the development prospects of the economic cooperation between Fujian and Taiwan is relatively good. In addition, because of the green economic cooperation across the Taiwan Strait around the government policy support and massive subsidies, the potential of the green industry has been developing and releasing, and expanding the development space for the green economic cooperation.

Great policy foundation

Nowadays, industrial cooperation and development pattern will determine the success or failure under the background of informatization. With 30 years of development, Fuzhou, Quanzhou, Xiamen city have developed rapidly, becoming the most active coastal cities whose industrial chain and industrial division of labor are more mature adjacent to Taiwan. According to the "Twelfth Five Year Plan", Fujian will devote to information technology, energy saving and environmental protection, marine high-tech industries as a new starting point for green economy in Fujian; On the other hand, Fujian set down fiscal, tax, finance, credit and personnel training and other preferential policies to attract Taiwanese investment to emerging industrial agglomeration. Taiwan is a creative, pioneering and innovative city, which have promoted the industrial settlement and development, with use of the innovation efficiency, frequently getting international institutions must. According to the 2013 global competitiveness report, Taiwan was named the world's first industrial cluster development. Benefit of green economic cooperation between Fujian and Taiwan policy is obvious with ECFA and bypass plan jointly formulated many policies to strengthen, deepen the docking and cooperation of green economy between Fujian and Taiwan.

Analysis on Fujian and Taiwan game strategy and coupling degree

Cooperative game theory emphasizes the collective rationality, efficiency, fairness and justice, i.e. promoting justice and equity based on the collective rationality of realization. In this paper, we use the game model of the cooperation between Fujian and Taiwan. To simplify the analysis, we assume the two cities have the same income under the same strategy, and both sides adopt profit cooperation strategy without the cooperation of the parties due to mutual benefit. The main players is rational economic man body in this model refers to the green economy. As showed in the Figure1, we show optimal strategies specific benefits of cooperation and game.

		<u>Fujian</u>	
		Cooperative	Non cooperative
Taiwan	Cooperative	A,A	C,D
	Non cooperative	D,C	B,B

Figure 1 : Utility matrix simplified graph between Fujian and Taiwan

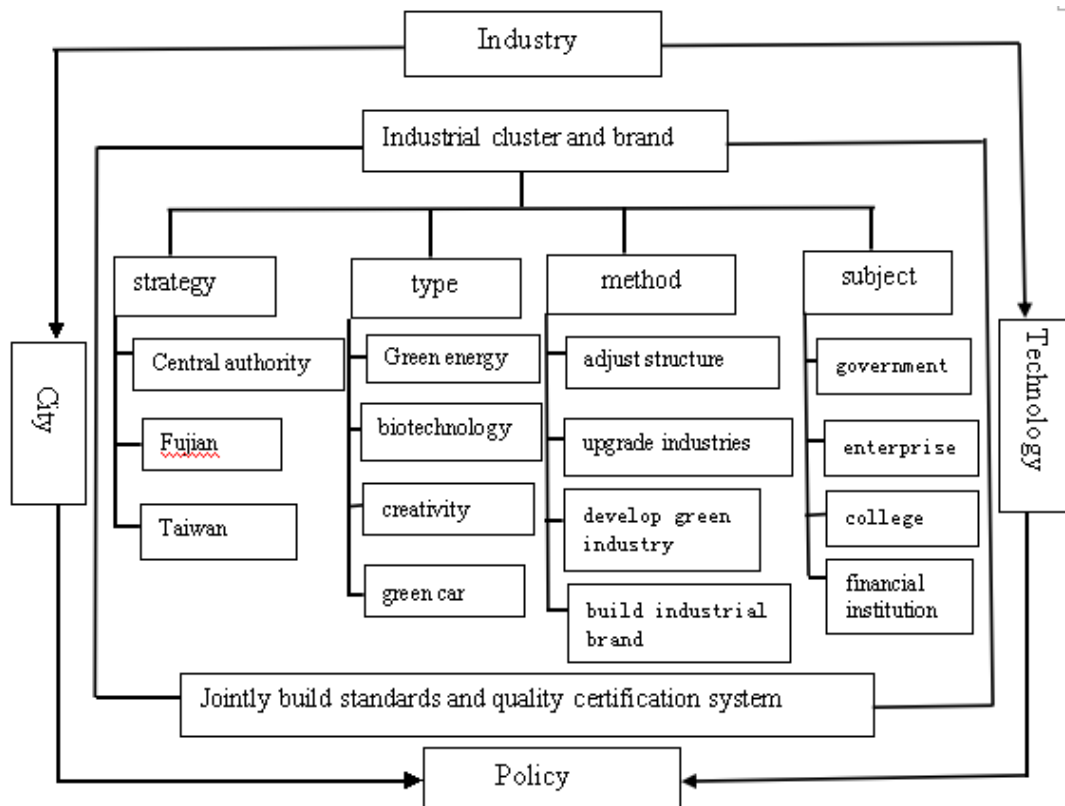


Figure 2 : Future cooperation framework diagram of green economy between Fujian and Taiwan

3.1 There will be a typical "prisoner's dilemma", if profit of both sides satisfies the condition: $A < D$ and $C < B$. The two cities are taking the non cooperation strategy that is a Nash equilibrium. If the green economy participants trust each other to avoid vicious competition, price, etc., and choose cooperative strategy, they can obtain better gains. But based on the perspective of individual benefit maximization, they each will choose noncooperation which can make personal income to obtain the maximum. Therefore the "prisoner's dilemma" will make that the cities can not achieve the expected result of economic cooperation between Fujian and Taiwan, when their common interests are damaged and the coupling of green economic cooperation between Fujian and Taiwan is lowest. The main reason is the lack of trust, incentive, reward and punishment mechanism and security for green industry in the process of cooperation. To obtain higher than the other income expectations, they have to choose non cooperation strategy.

3.2 If the both sides profit value meet the conditions: $A > D$ and $C > B$, the two main bodies will take cooperative strategy that is not only Nash equilibrium, but also the model the Pareto optimal of the model. In this case, the green economy participators will eventually adopt the cooperation strategy in multiple or single game process as rational agents. Under the condition of market economy, the support and subsidies from government fully integrate green industrial cooperation between Fujian and Taiwan. Then they will select the cooperative strategy which can achieve the effect of industry cluster and the scale of economy between Fujian and Taiwan. The enterprises adopt cooperative strategy yields superior other strategies. Therefore, when coupling degree of economic cooperation between Fujian and Taiwan is the highest, the cooperation is an inevitable choice to pursue the maximization of economic benefits.

3.3 If the both sides profit value meet the conditions: $A < D$ and $C > B$, the enterprise of the green economy will choose uncooperative strategy when another one choose cooperation in repeated game. Investigate the reason, the enterprises initially in a single game will select the cooperative strategy to obtain better returns. However, after many cooperations, due to the slow economic recovery and incomplete mechanism of green industry, the cooperative costs rise and cooperative efficiency reduce,

resulted in the selection of cooperation strategy yields. As a rational economic person, the enterprise will not both take cooperative strategies, which leads the coupling degree with green economic cooperation between Fujian and Taiwan is low.

Overall, the green economic cooperation between Fujian and Taiwan is affected by various factors leading to the strategy space is difficult to completely trend as (cooperation, cooperation). In the actual circumstances, there will often appear "prisoner's dilemma" to reduce the green economic cooperation between Fujian and Taiwan, therefore, government must start from coordinate their income structure, create fair and reasonable platform for cooperation and improve the coupling degree of enterprise cooperation in order to realize the sustainable development and the green economy. From the result, we put forward the idea that is to build the Green Economic Zone of Taiwan Strait.

POLICY AND SUGGESTION

Policy cooperation--- jointly setting up the green product standards and quality certification system

The development of green economy cooperation needs more policies implement jointly between Fujian and Taiwan to establish an efficient, fair and standard market mechanism. In this paper, we put forward that establishing the relevant product standards and quality certification is the basic security policy cooperation between Fujian and Taiwan to realize the development of green economy. Therefore, the official industry organizations should strengthen consultation and cooperation as soon as jointly research and establish the green product quality certification system. They can try in the aspect of green agricultural products, new technology products, low carbon products such as the first work, strengthening exchanges and international organizations to learn and actively promote the market supervision mechanism between Fujian and Taiwan, such as production and sales promotion. The government should devote to the institutionalized and standardized green economic cooperation platform, which can fully guarantee the income structure of two green industry cooperation and improve the coupling degree of green economic cooperation. We think that Taiwan ought to play a leading role, with the development of green industry experience accumulated over years. Taiwan government is mobilizing the relevant departments, such as universities and social institutions and other resources, to establish green economic industry standards and quality certification system for designing and producing green economy.

City cooperation---promoting green city construction

The ECFA era creates new forms and management mode for cooperation between Fujian and Taiwan, which can realize complementary advantages and optimize configuration to eliminate local protectionism and the waste of resources. Green city construction of Taiwan have accumulated rich practical experiences such as low carbon mode formulating "green building", "low-carbon building", "low-carbon transport" and other policies to promote green city to develop. It is instructive for the Fujian green city construction. Fujian take Xiamen city as the test point that can be green city construction, strengthening exchange with Taiwan and the transformation of traditional manufacturing industry to construct a complete system. The government should actively use ECFA protocol and CDM mechanism for cooperation in the work of energy-saving to achieve the creation of green city cooperation. In addition, the universities, enterprises and other social institutions should create a platform for green economy academic exchanges and tourism between Fujian and Taiwan to expand cooperation influence.

Technical cooperation---strengthening green technology cooperation

The government should establish the policy support mechanism to establish "learn-produce-research" value chain system to realize collaborative innovation of enterprises, schools and research institutions, which can deepen the docking with the cooperation in the field of green materials and

ecological technology. Pingtan experimentation area can be used as a base for the development of Fujian and Taiwan green economic cooperation to make full use of the "pilot" policy, resource advantage and geographical environment. We consider that promoting scientific and technological resources to the emerging industry clusters is very important for the green economy. At the same time, Taiwan should develop further deregulation and establish green industry cooperation platform, especially employ talents from Fujian universities which engaged in the specialized or technical working personnel system, to boost the human resource and technology resource flow freely between Fujian and Taiwan. In addition, the green science and technology cooperation ought not be without active participation from universities, enterprises and financial institutions which is innovative source of green technology.

Industry cooperation---accelerating green industry cluster and brand

Taiwan and Fujian must by build a complete system of green industry chain, to effectively adjust the industrial structure so that promote the transformation and upgrading of traditional industries as soon as cultivating the new industries brand. First of all, they should increase financial investment to support the construction of green industry chain; Secondly, Fujian and Taiwan ought to integrate competitive advantage of regional industrial clusters and industrial chain system, to optimize the integration of the green industry resources; Third, the government shall guide the green enterprises to establish own brand with the implementation of brand strategy. In a word, transformation of industrial cooperation between Fujian and Taiwan by production type vertical division of labor will break the traditional cooperative mode is becoming a trend.

RESULTS AND DISCUSSION

The development level and scale of green economy has become one of the new logo for competitiveness of a country or region. Our country pays much attention to the construction and development of Economic Zone of Taiwan Strait, where need to change the traditional developing mode of economy to realize the transformation of traditional industries and the optimization of industrial structure. The development of green economy cooperation between Fujian and Taiwan is one of the effective ways to achieve this goal. Therefore, Fujian and Taiwan must build green product standards and quality certification system, promote the green city construction, strengthen the green science and technology cooperation and accelerate the development of green industry cluster and brand to create new economic growth point for economic development. In a word, we put forward the idea that is to build the Green Economic Zone of Taiwan Strait has full of possibility and necessity.

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