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Зв'язок між розвитком спортивної індустрії та економічним зростанням в Китаї

З розвитком економіки зростає прагнення людей до підвищення якості життя, що закладає основу для розширення спортивної індустрії в Китаї. Сьогодні, у деяких західних розвинених країнах внесок спортивної індустрії в економіку значно перевищує внесок традиційних галузей промисловості і обумовив новий виток економічного розвитку. Хоча спортивна індустрія Китаю досягла певного розвитку, вона все ще перебуває в зародковому стані. Порівняно із західними розвиненими країнами, розвиток спортивної індустрії Китаю відбувається відносно повільно. Метою даної статті є аналіз зв'язку між спортивною індустрією та економічним розвитком Китаю. Методологія дослідження включає методи математичної статистики та побудову VAR моделі (векторної авторегресії), яка описує взаємозалежність між кількома часовими рядами. В дослідженні використано дані статистичного індексу національної економіки та розвитку спортивної індустрії з 2011 по 2020 роки. Їх емпіричний аналіз дозволяє оцінити зв'язок між розвитком спортивної індустрії та національним економічним зростанням у Китаї. Як свідчать результати дослідження, існує висока кореляція між спортивною індустрією та економічним розвитком. Розвиток спортивної індустрії базується на певному рівні економічного зростання країни, водночас розвиток спортивної індустрії до певної стадії матиме мультиплікативний ефект. Доведено, що держава повинна сприяти розвитку спортивної індустрії, адже тим самим забезпечується симбіозний розвиток національної економіки, що загалом призводить до підвищення якості рівня життя. Задля цього необхідно стимулювати активність спортивного ринку та створити справедливую і відкриту систему правового забезпечення, а також стандартизувати систему оцінки та нагляду.

Ключові слова: спортивна індустрія, економічне зростання, додана вартість спортивної індустрії, ВВП Китаю, економіка Китаю.

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The Relationship between Sports Industry Development and Economic Growth in China

With the development of economy, people's pursuit of quality of life is increasing day by day, which lays a foundation for the development of sports industry in China. For example, in some western developed countries, the contribution of sports industry to economy has far exceeded that of traditional industry and become a new growth point of economic development. Although China's sports industry has made certain development, it is still in its infancy. Compared with the western developed countries, the development of China's sports industry is still relatively slow,

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and there are still some problems to be solved in the development of sports industry. This paper mainly studies the relationship between sports industry and economic development in China. Based on the statistical index data of national economy and sports industry development from 2011 to 2020, the relationship between sports industry development and national economic growth in China is empirically analyzed by using mathematical statistics and VAR model. According to the research results, there is a high correlation between the sports industry and economic development. The development of the sports industry is based on a certain level of economic growth of the country, while the development of the sports industry at a certain stage will have a multiplier effect. It is proved that the state should contribute to the development of the sports industry, because this ensures the symbiotic development of the national economy, which generally leads to an increase in the quality of life. To do this, it is necessary to stimulate the activity of the sports market and create a fair and open system of legal support, as well as standardize the assessment and supervision system.

Keywords: *sports industry, economic growth, added value of sports industry, China GDP, China's economy.*

Introduction

With the continuous growth of economy, the process of sports industrialization in China has been continuously upgraded, and sports undertakings have also achieved rapid development. In the new period, the development of China's sports industry should adapt to the needs of socialist modernization, strive to build a strong sports country, and strive to realize a harmonious society and revitalize the Chinese nation. Therefore, it is of great practical significance to analyze the correlation degree between sports industry and economic development.

First of all, through the analysis of the relationship between sports industry and economic growth, it is helpful to understand the internal mechanism of sports industry to promote economic development. Sports can not only indirectly develop the economy through the working efficiency of workers, but also create value through the management areas of other departments. The aim of sports industrialization is to keep the gymnasium running on income, not to need a lot of national investment. Therefore, sports industrialization must be a new economic growth point to promote economic development and make great contributions to economic construction.

Secondly, through the analysis of the relationship between sports industry and economic growth, it is beneficial to realize the transformation of economic structure and growth. China's economic development depends on the transformation of economic system and economic growth mode. As a new sector of national economic development, sports industry is not mature. Through the analysis of the relationship between sports industry and economic development, it is helpful to reconstruct the organization mode, operation mode, decision-making mode and behavior mode of sports industry and make it meet the requirements of social and economic development.

Finally, through the study of the relationship between sports industrialization and economic growth, it is in the fundamental interests of the overwhelming majority of the people. The most direct purpose of sports is to strengthen physical fitness. Although many people have participated in physical exercise for a long time, the popularization rate of national fitness is still relatively low. The main reason is restricted by the traditional concept of citizens and economic factors such as sports software and hardware facilities. Through the analysis of the relationship between sports industrialization and

economic growth, the study of the "multiplier effect" of sports industry on economic development is conducive to use of the limited sports resources such as stadiums, facilities and talents, which must have a positive effect on mass sports. Make people fully enjoy the welfare brought by the development of sports industrialization.

The literature review

In the process of development, the sports industry basically follows the steps from basic research to applied research. In the past ten years, China's sports industry has carried out many theoretical discussions around the connotation and composition of sports industry, the relationship between sports industry and sports market, sports industrialization, sports commercialization, sports policy and so on. After the research on the concept and classification of sports industry has reached maturity, domestic scholars have also begun to turn their research direction from basic research to applied research. Starting from the relationship between sports industry and economy, scholars have put forward their own views and opinions:

Du Fusheng analyzed the role of sports industry in economic development, expounded the concept of sports industry and its relationship with economy, and pointed out that "as an area of national economic activity, sports industry is a sunrise industry with great investment value and potential, and it is also the most dynamic new growth point in economic development. Its development is conducive to the adjustment of industrial structure of several generations".

Lin Ling & Peng Lianqing, guided by the theory of industrial structure, synthesize the development data of sports industry at home and abroad. Through international horizontal comparison, international provincial horizontal comparison and individual national sports industry vertical comparison, this paper makes a preliminary study on the development and evolution law of structure and internal structure of sports industry, and analyzes the influencing factors of the evolution of sports industry structure from the aspects of demand structure, supply structure, trade structure and social structure.

From the perspective of sports industry and economic theory, Qian Wei analyzed the relationship between sports industry and national economy in his thesis "The relationship between sports industry and national economy". The study finds that the development of sports

industry plays an active role in promoting the development of national economy and national fitness.

Research implications

Through the research on the problems related to the development of sports industry in China, this paper discusses the internal mechanism of sports industry to promote economic development, analyzes the basic problems and influencing factors in the process of sports industry development, and provides the decision basis for optimizing the internal mechanism of sports industry to promote economic growth.

Model setting and analysis

1. VAR model analysis on the relationship between sports industry development and economic growth

The VAR model is called vector autoregressive model. It is a non-structural method proposed by Christopher Sims in 1980 to establish the relationship between variables. To overcome the shortcomings of traditional econometric methods (structural methods such as simultaneous equation model) to determine the dynamic and complex relationship between variables. The core idea of the VAR model is to establish the model based on the statistical properties of the data (variables). Based on the Wold decomposition theorem, each endogenous variable in the system is used as a function of the lag value of all endogenous variables in the system. The univariate autoregressive model is extended to the vector autoregressive model of multivariate time series to estimate the dynamic relationship of all endogenous variables. VAR model is often used to predict the time series system of interaction and to analyze the dynamic impact of random disturbance on variable system, and to explain the influence of various economic shocks on the formation of economic system variables. To provide decision support for taking corresponding economic measures.

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + \varepsilon_t, t=1, 2, \dots, T$$

The y_t is k dimensional endogenous variable vector, A_1, \dots, A_p is the $k \times k$ dimension coefficient matrix to be estimated, p is the lag order; $\varepsilon_t \sim \text{IID}(0, \Sigma)$, k – dimensional ε_t can be related, But not with their own lag, also not related to the variables on the right of the equation.

2. Selection of indicators

2.1 Sports industry development index

There is a relatively large number of indicators to measure the development of the sports industry, the commonly used indicators are: the total scale of the sports industry, the contribution rate GDP the sports industry, the added value of the sports industry, the number of people employed in the sports industry, and so on. In recent years, in order to understand the development of sports industry in China, the State Sports Administration and the National Bureau of Statistics have adopted the index of added value of sports industry to evaluate the development of sports industry, and obtained many years of evaluation data. Therefore, added value of sports industry (TYC) is chosen as the index of development

parameter of sports industry. This index mainly refers to the final achievement of sports industry production activities in a certain period of time for all resident units in a country (or region). This index is mainly used as the index of sports industry development parameters.

According to the statistics of the sports industry of the State Sports Administration, the added value of the sports industry in China is 86.49 billion yuan, accounting for 0.46% of the total GDP. To 2019, the added value of the sports industry reached 54.94 billion yuan, accounting for 0.8 percent of the total GDP, with an average annual growth rate of 16.7 percent, much higher than the GDP growth rate in the same period. It can be seen that in recent years, China's sports industry has been greatly developed, and the role of promoting the development of national economy is also increasing day by day.

2.2 Economic development indicators

The United Nations System of National Accounts (SNA) often uses the index of gross domestic product (GDP) to measure the overall performance of a country or region. This index has high international recognition, authority and international comparison. It mainly represents the final result of all permanent units and individuals in a country or region in a certain period of time. Accordingly, adopt GDP as the index that measures our country national economy development condition.

China GDP 471.564 billion yuan in 2011, By 2020 GDP reach 14.6 trillion yuan, 17.5% of the world GDP, After America, Second place. Because our country is in the key period of changing the mode of economic development and optimizing the industrial structure, The development of sports industry is promoted to the level of national development strategy, This development opportunity should therefore be seized, Speed up development, We will further promote the process of speeding up the transformation of the mode of economic development.

3. VAR model parameter estimation of the relationship between sports industry development and economic growth

3.1 Data sources and processing

This study mainly analyzes the relationship between sports industry and economic growth in China, and selects added value (TYC) and gross domestic product (GDP) as the analysis variables. The sample range is 2010-2020. The data are mainly from China Statistical Yearbook, China Tertiary Industry Statistics Bulletin, State Sports Administration Sports Industry Statistics Bulletin, etc.

Since added value (TYC) of sports industry and gross domestic product (GDP) are time series, there may be heteroscedasticity. Therefore, before the VAR model is empirical, the TYC and GDP are pretreated and recorded as $\ln\text{TYC}$, $\ln\text{GDP}$ by taking the natural logarithm of variables. This method does not change the cointegration relationship of the original variable, can make the time series linear and eliminate the influence of heteroscedasticity.

3.2 Stationary test

To prevent pseudo-return phenomenon when establishing the VAR model of sports industry added value (TYC) and gross domestic product (GDP), it is

necessary to test the unit root of the sequence separately. In this paper, the ADF method is used to test the mathematical expression:

$$\Delta Y_t = \alpha Y_{t-1} + a + d_t + \sum_{i=1}^p \beta_i \Delta Y_{t-i} + e_t, t = 1, 2, \dots, T$$

Δ is a first order difference operator;

Y_t, Y_{t-1} are variable values for period $t, t-1$;

t as a temporal trend;

α displacement, δ coefficient t the trend term;

$\beta_i, (i = 1, \dots, T)$ is an unknown parameter;

p is lag value;

e_t is a random disturbance term.

ADF test assumes, $H_0 : \gamma = 0, H_1 : \gamma = 1$.

If the ADF test value is greater than the critical value, H_0 , accepted. That is, the sequence has a unit root, is a nonstationary sequence;

Conversely, H_1 , accepted is a stationary sequence.

Table 1

Stationary Test of Added Value and Gross Domestic Product of Sports Industry

Variable	ADF	(C, T, K)	T statistics			P Value	Stationeriness
			1 % critical mass	5 % critical mass	10 % critical mass		
lnGDP	-0.320854	C,0,1	-5.295384	-4.008157	-3.460791	P>0.1	non-stationary
lnTYC	9.401833	C,0,1	-2.816740	-1.982344	-1.601144	P>0.1	non-stationary
Δ lnGDP	-1.046988	C,0,1	-2.847250	-1.988198	-1.600140	P>0.1	non-stationary
Δ lnTYC	0.208164	C,0,1	-2.847250	-1.988198	-1.600140	P>0.1	non-stationary
Δ^2 lnGDP	-3.535064	C,0,1	-2.937216	-2.006292	-1.598068	P>0.1	stationary
Δ^2 lnTYC	-3.005171	C,0,1	-2.886101	-1.995865	-1.599088	P>0.1	stationary

Source: calculated by author.

Table 1 shows that the ADF test values lnTYC, lnGDP the sequence are all greater than the critical values at 10% confidence level. Under the assumption of H_0 , the two sequences have unit roots and are nonstationary sequences. The first order difference is carried out for the two sequences, ADF the test values are still greater than the critical values at the 10% confidence level, and the first order difference sequence is Δ lnTYC, Δ lnGDP a

nonstationary sequence. After the second order difference, the ADF test value is still less than the critical value at the confidence level of 1%, and the second order difference sequence Δ^2 lnTYC, Δ^2 lnGDP is a stationary sequence. Hence the lnTYC, lnGDP, there is a second order single integral I(2), at the confidence level of 1%, that is, the second order difference becomes a stationary sequence, which satisfies the stationary condition.

Table 2

Test of Co-integration Relationship between Added Value and Gross Domestic Product of Sports Industry

Hypothesis	Characteristic value	Trace test statistics	Critical value (5%)	P value	Conclusion
None	0.941846	25.60191	14.26460	0.0006	Reject
At most 1	0.000989	0.008909	3.841466	0.9244	Accept

Source: calculated by author.

Table 2 shows that, the original hypothesis none. There is no cointegration relationship between sequence lnTYC and lnGDP. The statistical value of the trace test is 25.60191, 14.26460 ($P < 0.01$), considering that there

is at least one cointegration relationship. The original hypothesis At most 1 shows that the sequence lnTYC has at most one cointegration relationship with the lnGDP. This assumes a trace test statistic of 0.008909, below the

5 % confidence interval critical value 14.26460 ($P > 0.05$), accept the original hypothesis. The standardized cointegration equation estimated from the results of the cointegration test is as follows:

$$\ln GDP = 0.738763 \ln TYC + 7.212310$$

The fitting index of cointegration equation is $R_2=0.983076$, $FR_2=522.7809$ ($PFR_2 = 0.01$), which indicates that the fitting effect of cointegration equation is good and the long-term equilibrium relationship between them can be well reflected.

4. Countermeasures for balanced development of national economy and sports industry

4.1 Promote the mutual and symbiotic development of national economy and sports industry

First of all, it is necessary to further publicize the popular knowledge of sports fitness and health care, establish and popularize the basic public sports service system, and raise the awareness of sports fitness among the general population.

4.2 Weigh the relativity of the influencing factors of national economy and sports industry

In the process of national economic development, attention must be paid to the short-term effect of sports industry and increase its proportion in national economy. In view of the decline of the long-term influence of sports industry on the national economy, it is necessary to identify the time node of the decrease of influence, create superior conditions to optimize the structure of sports industry and seek new growth points of sports industry system, so as to enhance the long-term influence of its national economy. At the operational level, policies and regulations are issued to maintain the stability of the national economic system, to reduce the fluctuation of the national economy in the process of transformation, and to further enhance the influence of the national economy in the development of the sports industry.

4.3 Optimizing the institutional environment for the balanced development of the national economy and the sports industry

Perfect economic policies and regulations are the institutional guarantee for the balanced development of national economy and sports industry. The introduction and implementation of relevant policies can not only create a superior market economy environment for the balanced development of national economy and sports industry. It can also provide legal and legal basis for solving market economy problems. However, in the face of complex and changeable market economy environment, the relevant laws and regulations still need to be improved. First of all, efforts should be made to eliminate the effects of the some rules and regulations for the balanced development of economic and sports industries to minimize the impact of various administrative examination and approval processes. Secondly, it is necessary to further activate the vitality of the sports market and establish a "fair and open" legal system; moreover, it is necessary to standardize the evaluation and supervision system, track and evaluate the

implementation of the relevant systems and regulations for the balanced development of the national economy and the sports industry, and continuously optimize the contents and effects of the relevant regulations and policies.

Conclusions

There is a high correlation between sports industry and economic development. Sports industry should be based on a certain level of economic development, at the same time, the development of sports industry to a certain stage will have a "multiplier effect". The development of sports industry in China has played an important role in stimulating domestic demand, promoting economic development and growth, and promoting the construction of socialist spiritual civilization. However, compared with the western developed countries, China's sports industry is still in its infancy, and the role of sports industry in economic development is still very limited. Therefore, the development of sports industry has become a new growth point of economic development. Only by actively adjusting the structure of sports industry, formulating strategic plans for the development of sports industry in time, and speeding up the reform of market value and competition mechanism of sports industry, Can let sports industry play its important role in economic growth.

By establishing the VAR model between sports industry and economic development, this paper analyzes the close relationship between the development of sports industry and economic development in China from the root, and emphatically analyzes the importance and contribution of sports industry to economic development. Finally, according to the analysis results, the relevant policy suggestions for the rapid development of sports industry in China are put forward, hoping to provide a reference basis for the development and expansion of sports industry in the future.

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