



# Research on the Mechanism of Sports Industry Promoting China's Economic Growth -- Based on the Two-Dimensional Log-Linear Model

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**Abstract.** China is in a critical period of economic transformation, and the sports industry is particularly important to economic transformation. Based on this, the paper uses the statistical data from 2003 to 2019 in China to propose three mechanism hypotheses for promoting economic growth, and uses a two-dimensional log-linear model and SPSS data processing software to analyze the relationship between China's sports industry and economic growth. The results show that: (1) The development of sports industry can promote China's economic growth, and the effect is remarkable; (2) Economic growth and the development of sports industry are mutually promoting; (3) The development of sports industry can reduce medical investment, but can't effectively promote employment.

**Keywords:** The sports industry · Economic growth · Growth mechanism · Two dimensional log-linear model

## 1 Introduction

At present, China is in the critical period of economic transformation, and it is the focus of economic development to excavate the new engine of economic growth [1]. In recent years, with the improvement of residents' living standards and the continuous improvement of national health awareness, sports and other related consumption continues to increase, the sports industry is rapidly developing. In 2019, the total output value of China's sports industry was 2,948.3 billion, accounting for 2.98% of GDP in that year and up 10.9% over the previous year. The output value of sports increased from 0.95 trillion yuan in 2012 to 2.95 trillion yuan in 2019, with an average growth rate of 17.6%, and its weight in GDP keeps increasing. According to relevant departments, the output value of sports in China will reach 4% of GDP by 2035, reaching the level of moderately developed countries.

As a new rising industry, the investment in sports industry is booming. As we all know, sports industry and economic growth have mutual influence. Sports industrialization and agglomeration effect can promote economic growth to a certain extent, while economic development will react to sports industry. However, what is the impact of sports industry

on economic growth? What is the transmission mechanism? Based on this, it is necessary to fully study the relationship between the development level of the sports industry and economic growth, and deeply analyze the transmission mechanism through which the sports industry promotes economic development, the degree of its influence and the ways of influence, so as to help solve the existing problems of the sports industry.

## 2 Mechanism Analysis of the Sports Industry Promoting Economic Growth in China

Regarded as a green industry, the sports industry is an important part of the national economy. With the development of the age and the continuous improvement of national health awareness, the sports industry will play an increasingly obvious role in the national economy. From the perspective of economics, the sports industry infrastructure construction is vigorously invested, with the fact that the agglomeration effect of the sports industry is more and more obvious, the national fitness boom is coming, the demand for sports is expanding, and the sports industry has gradually become an important part of economic and social development with its own characteristics. Based on this, this paper puts forward three theoretical hypotheses for verification.

H1: Sports industry can promote China's economic growth, the effect is obvious.

Ren Bo and Dai Jun used measurement methods to sort out the relationship between the added value of sports industry and economic growth, and conducted a quantitative analysis of the added value of sports industry and economic growth in China from 2006 to 2015. The results show that there is a linear relationship between the added value of sports industry and economic growth in China [2]. Based on China's provincial data from 2005 to 2015, Yao Songbo empirically analyzed the impact of China's sports industry agglomeration on regional economic growth by using static and dynamic panel models, and estimated the level of sports industry agglomeration in various provinces and cities by using industry proportion index. The results show that there is a significant non-linear relationship between sports industry agglomeration and economic growth, showing an inverted u-shaped structure [3]. As we all know, China's population has exceeded 1.4 billion, which shows that sports demand and consumption will certainly form scale effect, that is, sports industry market has huge development potential, population scale effect makes sports industry become an important support to expand domestic demand, but also an important focus of industrial transformation and upgrading. Sports industry is an important part of China's economy, and its development can promote economic growth to a certain extent. Therefore, based on previous studies, this paper puts forward hypothesis 1: the development of sports industry can promote economic growth.

H2: There is an interaction between sports industry and economic growth.

Sports industry and economic development influence each other. Yao Songbo used location entropy method and coupling coordination model to calculate the coupling and coordinated development of sports industry agglomeration and regional economic growth in 15 provinces (cities and districts) in China from 2010 to 2018. The results show that the agglomeration degree of sports industry has significant regional differences, but the overall trend is obviously improving, and there is an obvious coupling characteristic between sports industry and regional economic growth [4]. Hong Banghui et al. used

VAR model to study the impact of sports industry and human capital on economic development based on the national statistical data from 2006 to 2018. The results show that there is a significant co-integration relationship between sports industry, human capital and economic development, and sports industry has a significant positive impact on economic development. The promotion of national health awareness leads to an increase in the demand for sports-related products [5]. The preferential consumption of sports products further drives the development of the sports market and forms the agglomeration effect of sports industry, thus affecting the economic growth. The development of national economy cannot be separated from the promotion of sports industry; In turn, economic growth will further promote the construction of sports infrastructure, expand the sports industry credit funds, and affect the development of the sports industry.

H3: The development of sports industry can reduce medical investment, but the effect on employment is not obvious.

At present, with the improvement of national health awareness, the big health industry has gradually emerged and become a hot spot of social concern [6]. With the wave of comprehensive fitness, the national health awareness is constantly improved. Physical activity plays an important role in improving physical fitness, preventing diseases and recovering from diseases, thus indirectly reducing medical expenses.

“Steady growth and employment” has always been a buzzword in the Chinese economy [7]. Employment is fundamental to people’s livelihood and plays an important role in supporting social stability. However, the contribution of sports industry to China’s economic growth is not high, still less than the developed countries of 4%. In addition, the sports industry is still in development, and its scale role has not been fully revealed, so the role of sports industry in stimulating employment is insufficient. Based on this, the paper puts forward hypothesis 3: the development of sports industry can reduce medical investment, but the effect of stimulating employment is not obvious.

### 3 Variable Selection and Model Construction

#### 3.1 Variable Selection and Data Source

- (1) Explained variables. GDP is used to measure the strength of China’s economic growth. In this paper, GDP is logarithmic to measure the level of economic growth. In order to eliminate the impact of price, GDP conversion index is used for processing.
- (2) Core explanatory variables. S\_val represents the output value of sports industry and the development level of sports industry in China.
- (3) Control variables. S\_inv represents investment in sports fixed assets, S\_emp represents employment in sports industry. For statistical reasons, the article is represented by employment in culture, sports and entertainment. M\_cos represents the medical cost, which is measured by the national financial medical expenditure data. S\_nub indicates the number of sports institutions.

The data used in this paper are all from *China Statistics Grade*. Since the output value data of sports industry was only released in 2006, this paper estimates the data of 2003, 2004 and 2005 according to the growth rate published by sports related departments. Name and data description of each variable are shown in Table 1.

**Table 1.** Variable selection and data description

| category           | name  | instructions                       | Sample | mean  | Var  | max   | min   |
|--------------------|-------|------------------------------------|--------|-------|------|-------|-------|
| Explained variable | LNGDP | Economic growth                    | 17     | 12.96 | 0.37 | 13.80 | 11.83 |
| The core variables | S_val | Output value of sports industry    | 17     | 8.40  | 1.03 | 9.70  | 6.65  |
| Control variables  | S_inv | Investment in sports fixed assets  | 17     | 8.92  | 0.81 | 10.29 | 7.45  |
|                    | S_emp | Recreational and sports employment | 17     | 4.92  | 0.01 | 5.02  | 4.80  |
|                    | M_cos | Health costs                       | 17     | 8.63  | 0.85 | 9.80  | 7.02  |
|                    | S_nub | Number of sports institutions      | 17     | 8.81  | 0.01 | 8.88  | 8.64  |

### 3.2 Model Construction

Based on theoretical assumptions [8], the model is established as follows:

$$LN\ GDP = \rho_0 + \rho_1 LN\ S_{val} + \rho_2 LN\ Con + \mu \tag{1}$$

$$LN\ S_{val} = \gamma_0 + \gamma_1 LN\ GDP + \gamma_2 LN\ Con + \mu \tag{2}$$

$$LN\ GDP = \varphi_0 + \varphi_1 LN\ S_{val} + \varphi_2 LN\ S_{emp} \times LN\ S_{val} + \varphi_3 LN\ M_{cos} \times LN\ S_{val} + \varphi_4 LN\ Con + \mu \tag{3}$$

$\rho_i, \gamma_i, \varphi_i$  are correlation coefficients respectively,  $\mu$  represents random error. H1 corresponds to Eq. (1); H2 corresponds to Eq. (2); H3 corresponds to Eq. (3).  $LN\ S_{emp} \times LN\ S_{val}$  represents the cross terms of sports development level and employment,  $LN\ M_{cos} \times LN\ S_{val}$  represents the cross terms of sports development level and medical and health investment.  $LN\ Con$  represents other control variables.

## 4 The Empirical Analysis

(1) The development of sports industry can promote China’s economic growth, the effect is obvious. The regression results of sports industry and economic growth are shown in Table 2. (1) represents the regression results without the introduction of other control variables, and (2), (3) and (4) represent the regression results with the gradual addition of control variables. It can be seen from the regression results that the regression coefficients of sports industry are positive with little difference, and both of them have passed the significance test at the level of 5%, indicating that the model has certain stability and a very high degree of fitting. Specifically, the development of sports industry is helpful to promote China’s economic growth, and the effect is remarkable. This also verifies hypothesis 1 of the paper. This result shows that the development of sports industry to promote China’s economic growth is an important part.

**Table 2.** Regression results of the impact of sports industry on economic growth

|                | (1)      | (2)       | (3)       | (4)       |
|----------------|----------|-----------|-----------|-----------|
| C              | 4.944*** | 10.040*** | 9.780***  | 12.542**  |
| LN S_val       | 0.230*** | 0.322***  | 0.324***  | 0.285***  |
| LN S_emp       |          | -1.042*** | -1.020*** | -1.122*** |
| LN S_inv       |          |           | 0.179*    | 0.191*    |
| LN M_cos       |          |           |           | 0.272**   |
| Constant       | 0.194*** | 0.200***  | 0.217**   | -0.064    |
| R <sup>2</sup> | 0.995    | 0.998     | 0.998     | 0.998     |
| F              | 1539.347 | 2764.634  | 1922.134  | 1461.006  |

Note: \*, \*\* and \*\*\* indicate that each variable is significant at the level of 10%, 5% and 1% respectively

(2) There is interaction between sports industry and economic growth. The regression results of the impact of economic growth on the development of sports industry are shown in Table 3. The empirical results show that, on the whole, the regression results of economic growth coefficients are all positive with little difference, indicating that model (2) is relatively stable. The regression results passed the significance test of 1%, indicating that economic growth has a significant positive effect on the development of sports industry, and the effect is significant, which also verifies theoretical hypothesis 2. The establishment of hypothesis 2 shows that the development of sports industry depends on the economic development of a country. Only when the economic income reaches a certain level, will the people pay more attention to health and improve their health awareness. The growing level of economic development also leads to more resources putting into sports infrastructure construction, so as to promote the development of sports industrialization and further promote the development of sports industry. It can be seen from the empirical results that the regression coefficient of sports and sports employment is positive and has passed the significance test, indicating that employment is also the development of sports industry to a certain extent.

(3) The development of sports industry can reduce medical investment, but can not effectively promote employment. The regression results of sports industry, sports and sports employment, medical expenditure and economic growth are shown in Table 4.

The regression coefficient of  $LNM\_cos \times LNS\_val$  (the cross term of sports exhibition level, medical and health investment) is negative, and passes the significance test of 5% level. It is suggested that reducing medical expenses can promote economic growth, and the development of sports industry can effectively reduce medical expenses. This is mainly because of the rapid development of the sports industry and the gradual strengthening of national health awareness. Sports improve the physical quality, reduce medical expenses, and promote economic development. However,  $LNS\_emp \times LNS\_val$  (the cross terms of sports development level and employment) is negative, and passed the test of significance, which means that at this stage employment of the recreational industry impact on economic growth is not obvious, the contribution of recreational

**Table 3.** Regression results of the impact of economic growth on the development of sports industry

|                | (1)        | (2)        | (3)        | (4)      |
|----------------|------------|------------|------------|----------|
| C              | -11.577*** | -27.028*** | -25.010*** | -5.633   |
| LN GDP         | 1.859***   | 2.429***   | 2.400***   | 1.855*** |
| LN S_emp       |            | 6.064***   | 2.876***   | 1.768*   |
| LN S_inv       |            |            | -0.274     | -0.145   |
| LN M_cos       |            |            |            | -0.126   |
| Constant       | -0.117     | -0.409***  | -0.515**   | -1.846   |
| R <sup>2</sup> | 0.981      | 0.993      | 0.993      | 0.983    |
| F              | 408.948    | 793.825    | 562.799    | 479.894  |

Note: \*, \*\* and \*\*\* indicate that each variable is significant at the level of 10%, 5% and 1% respectively

**Table 4.** Regression results of the relationship between sports industry and employment and medical treatment

|                    | (1)       | (2)       | (3)      | (4)       |
|--------------------|-----------|-----------|----------|-----------|
| C                  | 6.532***  | 4.887***  | -1.067   | 1.040     |
| LN S_val           | 0.928***  | 0.899*    | 0.918*** | 1.292***  |
| LN S_val* LN S_emp | -0.122*** | -0.012*   |          |           |
| LN S_val* LN M_cos |           |           | -0.050** | -0.086*** |
| LN S_emp           |           |           |          |           |
| LN S_inv           |           | -0.111*** | 0.031    |           |
| LN M_cos           |           |           |          | 0.974***  |
| Constant           | 0.206***  | 0.203**   | 0.541*** | -0.042    |
| R <sup>2</sup>     | 0.998     | 0.998     | 0.997    | 0.997     |
| F                  | 2770.483  | 1892.467  | 1266.325 | 1571.597  |

Note: \*, \*\* and \*\*\* indicate that each variable is significant at the level of 10%, 5% and 1% respectively

industry employment to economic growth is limited. This is mainly because the sports industry is still in the initial stage of development, and its development potential has not been fully activated. At the present stage, it is mainly invested by capital, and the scale effect is not obvious, which is also consistent with the actual situation in China. Thus, theoretical hypothesis 3 is verified.

## 5 Conclusion

As a new rising industry, the investment in sports industry is booming. As we all know, sports industry and economic growth have mutual influence. Sports industrialization and agglomeration effect can promote economic growth to a certain extent, while economic development will react on sports industry. In-depth study on the transmission mechanism of sports industry to economic growth has an important impact on China's economic transformation. Based on the data of Sports industry and economic growth in China from 2003 to 2019, this paper conducts empirical research and analysis on the relationship between sports industry and economic growth. The specific conclusions are as follows:

- (1) The development of sports industry can promote China's economic growth, the effect is remarkable. With the increase of national demand and consumption for sports, the market potential of sports industry has gradually emerged and become a new driver of China's economic growth. At the same time, with the agglomeration and diversification of sports industrialization, it can better meet the different needs of the people, and sports industry is increasingly important in expanding domestic demand and promoting economic growth.
- (2) Sports industry and economic growth are mutually promoting. Hypothesis 1 and its verification show that sports industry can promote economic growth. On the other hand, economic growth has a negative effect on the development of sports industry. With the economic growth, the national investment in sports foundation design and construction will increase, and the credit scale of sports industry will expand accordingly, thus further promoting the development of sports industry and digging the potential of sports industry. Thus forming a virtuous cycle of "economic growth - sports industry development - economic development".
- (3) The development of sports industry can reduce medical investment, but can't effectively promote employment. Reducing medical expenses can promote economic growth, and the development of sports industry can effectively reduce medical expenses. This is mainly because of the rapid development of the sports industry and the gradual strengthening of national health awareness. Sports improve the physical quality, reduce medical expenses, and promote economic development. But at this stage the employment of the recreational industry impact on economic growth is not obvious, the contribution of employment of the recreational industry to economic growth is limited. This is mainly because the sports industry is still in the initial stage of development, and its development potential is not fully activated. At this stage, it's mainly invested by capital, scale effect is not obvious, which is consistent with the actual situation of our country current.

Based on the above research results, this paper puts forward relevant policy suggestions from two aspects. On the one hand, sports industry can promote the economy. Therefore, it's significant to cultivate sports consumption market, and dig the demand potential of sports market deeply. The government and other relevant departments should increase investment, improve sports infrastructure construction, enhance health awareness, and further expand the sports consumer market. On the other hand, relevant departments should strengthen the sports industry credit and fiscal and tax policy support. By

expanding the scale of sports industry credit, reducing the tax burden of sports industry, vigorously supporting small, medium and micro sports enterprises in colleges, we can further cultivate and develop sports market, and actively promote sports industrialization.

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