



# An Empirical Study on the Effect of Per Capita Disposable Income of Urban and Rural Residents on the Growth of Sports Industry Based on OLS Regression Model

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**Abstract.** As a sunrise industry, the sports industry has been paid more and more attention by the state and industrial development. Since the “opinions on promoting national fitness and sports consumption to promote the high-quality development of the sports industry” (hereinafter referred to as the “opinions”) was published in 2019, the enthusiasm of Chinese residents to participate in sports consumption and sports activities has become increasingly high. Based on the statistical index data from 2006 to 2020, this paper makes panel data analysis and OLS regression model analysis on the per capita disposable income of urban and rural residents and the development of sports industry in China by using the research methods of literature, mathematical statistical analysis, regression analysis and normative analysis. The results show that the per capita disposable income of urban and rural residents increased significantly from 2006 to 2020, but the gap between the per capita disposable income of urban and rural residents is still obvious; The structure of the sports industry is gradually optimized, and the sports service industry has become the endogenous driving force of industrial value-added, occupying a leading position in the development of the sports industry; There is a large regional gap in the sports industry, especially in the sports service industry. In addition, the per capita disposable income of urban and rural residents has a significant positive correlation with the added value of the sports industry, and the per capita disposable income of rural residents has a greater impact on the added value of the sports industry than that of urban residents. Finally, combined with empirical analysis, this paper also summarizes and puts forward corresponding suggestions.

**Keywords:** Per capita disposable income of urban and rural residents · Added value of sports industry · OLS regression model · empirical analysis

## 1 Introduction

In September, 2019, the general office of the State Council issued the opinions on promoting national fitness and sports consumption and promoting the high-quality development of the sports industry (hereinafter referred to as the opinions) [1]. The opinions points out that the sports industry plays an irreplaceable role in meeting the people’s growing needs

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for a better life. Nowadays, China's economic undertakings have made great achievements. The country continues to stimulate residents' sports consumption demand and encourage the development of China's sports industry, which has become a new direction for the external expansion of the field of sports. With the continuous improvement of people's quality of life and living standards, the continuous popularization of sports awareness and sports items in society has made sports go deep into the hearts of every resident. Income growth is the basis for the increase of sports consumption. Sports consumption belongs to enjoyment and development consumption. Only when the income reaches a certain level can people be willing and possible to consume sports. Therefore, residents' income is a necessary condition for the development of sports industry, and the development of national economy also promotes the vigorous development of sports industry.

At present, the research on China's sports industry and national economic development has become the focus of academic attention, mainly focusing on the following three aspects:

First, research on the relationship between the sports industry and the national economy. The research believes that the rapid development of the sports industry can promote the growth of the national economy, In turn, the rapid development of the national economy has laid a solid foundation for the development of the sports industry, The relationship between them is mutual influence and mutual promotion; Second, the research on the coordinated development of national policy reform and sports industry, which holds that deepening the reform of sports system can enhance the driving force for the development of sports industry and promote the healthy development of sports industry; Thirdly, the research on the interactive relationship between sports consumption structure and sports industry. Through the establishment of a large number of econometric research models, this part believes that the optimization and upgrading of sports consumption structure can promote the development of sports industry; Fourth, research on sports related sub industries and economic development. The research shows that sports related sub industries can also drive regional or regional or national economic development and provide vitality for national economic growth.

To sum up, a large number of achievements have expounded the correlation between the sports industry and the development of the national economy, which has laid a foundation for further analysis and discussion of follow-up research. But at the same time, there is little research on resident income as a necessary condition for the development of the sports industry in the relevant research results. Therefore, from the perspective of national income, this paper will use OLS regression model to compare and analyze the gap between urban and rural disposable income.

## **2 Research Object and Method**

### **2.1 Research Object**

This study takes "the relationship between the disposable income of urban and rural residents and the growth of sports industry" as the research object, based on economic theory, and uses empirical analysis methods to study the relationship and impact between the disposable income of urban and rural residents and the growth of sports industry.

## **2.2 Research Method**

### **2.2.1 Documentation Method**

By collecting, combing, summarizing and summarizing the literature at home and abroad, we can understand the current research results of China's sports industry, national economy, resident income and other related issues. Study the research ideas and methods of scholars, analyze the research objectives in combination with the theory and actual situation, and determine the perspective of empirical research.

### **2.2.2 Mathematical Statistical Analysis**

The time series data from 2006 to 2020 are searched by the National Bureau of statistics. The indicators include: per capita disposable income of national residents, per capita disposable income of urban residents and per capita disposable income of rural residents; In addition, the relevant data of China's sports industry from 2006 to 2020 are collected through the General Administration of sports. The data indicators include the total value of the sports industry (this part of the data is only 2012–2020), the added value of the sports industry and the data of relevant sub industries (this part of the data is only 2015–2020). The data is sorted into a table through Excel and preprocessed, in which individual missing values are supplemented by interpolation.

### **2.2.3 Mathematical Statistical Analysis**

According to the collected data, put forward the hypothesis of multiple regression model or single regression model, and use the statistical software spss 13 conduct econometric analysis on the established model, conduct t-test and F-test on the analysis results, judge whether the model is tenable, and economically interpret the results.

### **2.2.4 Mathematical Statistical Analysis**

Through the induction, inference and summary of the laws of the phenomena or facts that occur repeatedly in the research process, a reasonable deduction and prediction can be made on this basis. Better assist in the mathematical relationship between variables and model test.

## **3 Analysis on the Current Situation of Per Capita Disposable Income of Urban and Rural Residents in China**

### **3.1 The Overall Income of Chinese Residents Continues to Rise, Shortening the Distance Between China and Developed Countries**

According to the data of China's Bureau of statistics, since 2009, the per capita disposable income of Chinese residents has entered the 10000 yuan mark, and the per capita disposable income has increased at an average rate of 7.8% in the past 20 years. Although it is still far from developed countries, especially the United States, whose per

capita disposable income is US \$40000, it has gradually narrowed the gap with developed countries. As shown in Fig. 1, by the end According to the public data of China's Bureau of statistics, since 2009, the per capita disposable income of Chinese residents has entered the 10000 yuan mark, and the per capita disposable income has increased at an average rate of 7.8% in the past 20 years. Although it is still far from developed countries, such as the United States, whose per capita disposable income is \$40000, it has gradually narrowed the gap with developed countries. By the end of 2021, the per capita disposable income of Chinese residents had reached 35128 yuan. During the two years of the outbreak of the epidemic, the per capita disposable income of residents continued to increase at a positive rate. After normalization, the per capita disposable income of residents also recovered to a growth rate of more than 7%.

### **3.2 The Per Capita Disposable Income Gap Between Urban and Rural Residents is Obvious, But the Growth Rate of the Gap Slows Down**

According to relevant data, by 2021, the gap between urban and rural residents' per capita disposable income has reached 28481 yuan, and the per capita disposable income of urban residents is 2.5 times that of rural residents. From the perspective of overall trend, the per capita disposable income of urban residents has significantly shortened compared with that of rural residents 20 years ago. Although the gap between the per capita disposable income of urban and rural residents in China is gradually increasing, and the gap is still obvious, the growth rate of the urban-rural gap is slowing down. Especially in 2020, the growth rate has dropped to 1.3%, 10% points lower than the 11.58% growth rate of the urban-rural gap in 2003, and 16% points lower than the 17.58% growth rate of the urban-rural gap in 2007.

## **4 Analysis on the Current Situation of China's Sports Industry**

### **4.1 The Overall Increment is Obvious and the Power is Full**

According to the data released by the General Administration of sports, the gross output value of China's sports industry has increased significantly in the past decade. In 2012, the total output of the national sports industry was 950 billion yuan, with an added value of 313.595 billion yuan, accounting for 0.6% of the GDP of that year. In 2020, the total output of the national sports industry was 2737.2 billion yuan, with an added value of 1073.5 billion yuan, accounting for 2.69% of the GDP. This data has reached the level of the proportion of the U.S. sports industry in the U.S. GDP in 2000.

In addition, the value-added of China's sports industry also showed a continuous upward trend. Especially in 2015, under the influence of the No. 46 document [2] "several opinions on accelerating the development of the sports industry and promoting sports consumption" issued by the State Council the previous year, the speed of value-added of the sports industry reached 35.96%. After that, the sports industry, as a sunrise industry, gives full play to its power.

## **4.2 Optimization of Industrial Structure with Service Industry Playing a Leading Role**

According to the classification of sports industry by the National Sports Bureau [3], the sports industry is mainly composed of sports service industry (sports management activities, sports competition performance, sports fitness and leisure, sports venues and facilities management, sports brokerage, sports education and training, sports media, sports goods sales and other sports services), as well as sports product manufacturing and sports venues construction.

In 2020, the total output value of the sports service industry in China's sports industry was 1.41 trillion, accounting for 51.64% of the total sports output value, an increase of 3.74% points over 2018. In 2013, the proportion of sports services in China was only 19.46%. Among them, the sales of sporting goods, the management of sports venues and facilities, and physical education and training are the top three related industries in the output value of the sports service industry. According to the petty Clark theorem [4], when the per capita national income is further increased, the distribution of labor among industries will shift from the primary industry to the tertiary industry. Combined with the classification of the sports industry, the service industry of the sports industry, that is, the tertiary industry, has an increasingly high proportion in the total output value, which has exceeded the sports product manufacturing industry, that is, the secondary industry, and the industrial structure is gradually optimized.

## **4.3 There is a Large Regional Gap in the Sports Industry, Especially in the Sports Service Industry**

According to the statistics of cultural industry review, among the 334 national sports industry bases named and recognized by the General Administration of sport, there are 79 demonstration bases, 143 demonstration units and 112 demonstration projects, covering 31 provinces (districts and cities) and 5 cities specifically designated in the state plan [5]. According to the regional division of industrial bases, the main hot spots are the Yangtze River Delta, the Pearl River Delta and the Beijing Tianjin Hebei region. The number of bases accounts for 55% of the country, and the average density of provinces reaches 25. There are no demonstration bases in Hainan, Jilin, Heilongjiang, Tibet and Ningxia. In addition, according to the obvious gap between urban and rural areas where the demonstration base is located, cities account for 58.82%, and most demonstration units are concentrated in cities.

Secondly, from the perspective of individual industries, although the sports service industry accounts for the largest proportion of China's sports industry at present, from the perspective of regional distribution, North China has the largest number of enterprises engaged in sports services, 15648, accounting for 38.93% of the national total, followed by East China, with 11189 enterprises, accounting for 27.84%, and most of the sports service enterprises are concentrated in urban centers.

## 5 An Empirical Analysis of Residents' Disposable Income on the Growth of Sports Industry

According to the above analysis, although the development of China's sports industry is rapid, the regional gap is still relatively large. In order to better understand the impact of residents' income on the contribution of the sports industry and the difference between urban and rural residents' disposable income to the sports industry, this paper will use OLS regression model for empirical analysis and research.

### 5.1 Data Sources

This paper studies the impact of the disposable income of urban and rural residents on the growth of the sports industry in China, establishes a model to study the impact of the disposable income of urban residents and the disposable income of rural residents on the added value of the sports industry, and intercepts the data from 2006 to 2020 in China. The data used in this paper are all from the National Statistical Yearbook and the relevant public data of the State Administration of sports.

### 5.2 Correlation Analysis Between Residents' Disposable Income and Total Output Value of Sports Industry

Correlation analysis is an analysis of whether there is a linear correlation or a certain law between independent variables and dependent variables [6]. The data distribution can be observed by using the scatter diagram to observe whether the two values are on a straight line. If so, it indicates that there is a certain degree of correlation. Or quantify the degree of correlation between the two by calculation, and use the value of the correlation coefficient  $r$  to express the degree of correlation. The range of values:  $[-1, 1]$ . The  $\pm$  sign before the value indicates whether it is positive or negative correlation, and the value indicates the degree of correlation. If the correlation coefficient is zero, it means no correlation [7].

The formula is:

$$r_{ij} = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{\sqrt{n \sum x_i^2 - (\sum x_i)^2} \sqrt{n \sum y_i^2 - (\sum y_i)^2}}$$

In the formula, it is the per capita disposable income of residents,  $I$  is the per capita disposable income of urban residents and the per capita disposable income of rural residents respectively ( $i = 1, 2$ ); For the added value of the output value of the sports industry, according to the 2006–2020 National Statistical Yearbook and the relevant data published by the State General Administration of sports, SPSS software is used to analyze the correlation between the per capita disposable income of residents and the total output value or added value of the sports industry.

It can be seen from Table 1 that the correlation analysis is used to study the correlation between the added value of the sports industry and the per capita disposable income of urban residents and rural residents, and the Pearson correlation coefficient is used to

**Table 1.** Pearson correlation

	Added value of sports industry
Per capita disposable income of urban residents	0.870**
Per capita disposable income of rural residents	0.971**

\* p < 0.05 \*\* p < 0.01

**Table 2.** Regression analysis results of added value of sports industry and per capita disposable income of residents (n = 15)

	Coef	Std.Err	t	p	R 2	AdjustR 2	F
constant	-1795.955	1539.77	-1.17	0.24	0.946	0.938	F (2, 12) = 137.128, p = 0.000
City	-0.306	0.393	-0.78	0.44			
countryside	1.538	0.933	1.65	0.099			

dependent variable: Added value

D-w: 0.690

\* p < 0.05 \*\* p < 0.01

indicate the strength of the correlation. The specific analysis shows that the correlation coefficient between the added value of the sports industry and the per capita disposable income of urban residents is 0.870, and the correlation coefficient between the added value of the sports industry and the per capita disposable income of rural residents is 0.971, and both show a significant level of 0.01. Therefore, it shows that there is a significant positive correlation between the added value of the sports industry and the per capita disposable income of urban residents and rural residents.

**5.3 Estimate Regression Model Parameters and Establish OLS Regression Model**

According to the above analysis, there is a significant positive correlation between the added value of the sports industry and the per capita disposable income of residents. In order to further analyze its impact degree and influencing factors, this paper establishes an OLS multiple regression model, which is constructed as follows:

$$Y = C_1 + \beta_1 X_1 + \beta_2 X_2 + \mu \tag{1}$$

Where y represents the added value of the sports industry as the explanatory variable, X<sub>1</sub> and X<sub>2</sub> represent the explanatory variables, respectively, the per capita disposable income of urban residents and the per capita disposable income of rural residents, and C represents the constant term, β<sub>1</sub> and β<sub>2</sub> represents the regression coefficient of each explanatory variable. In this paper, the least square method is used to estimate the parameters of the above models through spssua software. The results are as shown in Table 2.

It can be seen from Table 2 that the per capita disposable income of urban residents and the per capita disposable income of rural residents are taken as independent variables

**Table 3.** Regression analysis results of added value of sports industry and per capita disposable income of urban residents (n = 15)

	Coef	Std.Err	t	p	R 2	AdjustR 2	F
constant	-3898.533	605.870	-6.435	0.000**	0.940	0.936	F (1, 13) = 205.434, p = 0.000
city	0.326	0.023	14.333	0.000**			

dependent variable: Added value  
 D-W: 0.416  
 \* p < 0.05 \*\* p < 0.01

for OLS regression analysis, and the robust standard error regression method is used for research. From Table 2, it can be seen that the R square value of the model is 0.946, which means that the per capita disposable income of urban residents and the per capita disposable income of rural residents can explain 94.65% of the change in the added value. It is found that the model passes the F-test (f = 137.128, p = 0.000 < 0.05), indicating that at least one of the per capita disposable income of urban residents and the per capita disposable income of rural residents will have an impact on the added value, and the model formula is:

$$Y = -1795.955 - 0.306 * X_1 + 1.538 * X_2 \tag{2}$$

However, the model did not show significance (t = -0.778, p = 0.436 > 0.05), (t = 1.648, p = 0.099 > 0.05), indicating that the model did not pass the t-test, and there may be multiple collinearity. Therefore, in order to further scientific analysis, this paper plans to establish a univariate regression model for each explanatory variable, and the model is revised as follows:

$$Y = C_1 + \beta_1 X_1 + \mu \tag{3}$$

$$Y = C_2 + \beta_2 X_2 + \mu \tag{4}$$

The analysis results are shown in Table 3.

It can be seen from Table 3 that taking cities and towns as independent variables for OLS regression analysis, and using robust standard error regression method for research, the R-square value of the model is 0.940, which means that cities and towns can explain 94.05% of the change of added value. It is found that the model passes the F-test (f = 205.434, p = 0.000 < 0.05), which means that cities and towns must have an impact on the added value. The model formula is:

$$Y = -3898.533 + 0.326 * X_1 \tag{5}$$

According to the final model, the regression coefficient value of per capita disposable income of urban residents is 0.326, showing a significant level of 0.01 (t = 14.333, p = 0.000 < 0.01), which means that per capita disposable income of urban residents will have a significant positive impact on the added value of the sports industry.



**Table 4.** OLS regression analysis results (n = 15)

	Coef	Std.Err	t	p	R <sup>2</sup>	AdjustR <sup>2</sup>	F
constant	2825.689	472.035	-5.986	0.000**	0.945	0.941	F (1, 13) = 239.269, p = 0.000
countryside	0.795	0.051	15.468	0.000**			

dependent variable: Added value

D-W: 0.543

\*  $p < 0.05$  \*\*  $p < 0.01$

It can be seen from Table 4 that taking the per capita disposable income of rural residents as an independent variable for OLS regression analysis, and using robust standard error regression method for research, the R-square value of the model is 0.945, which means that the per capita disposable income of rural residents can explain 94.51% of the reasons for the change of added value. It is found that the model passes the F test ( $f = 239.269$ ,  $p = 0.000 < 0.05$ ), which means that the per capita disposable income of rural residents must have an impact on the added value of the sports industry. The model formula is:

$$Y = -2825.689 + 0.795 * X_2$$

According to the above model analysis, the regression coefficient value of per capita disposable income of rural residents is 0.795, showing a significant level of 0.01 ( $t = 15.468$ ,  $p = 0.000 < 0.01$ ), which means that rural areas will have a significant positive impact on the added value.

## 6 Conclusions

To sum up, first of all, there is a significant positive correlation between the per capita disposable income of urban and rural residents and the added value of the sports industry, which shows that the income of urban and rural residents will have an impact on the development of the sports industry, and its impact is positive. Therefore, increasing the disposable income of urban and rural residents is conducive to promoting the value-added of the sports industry. suggestions.

Secondly, the impact of per capita disposable income of urban and rural residents on the added value of the sports industry is significantly different. According to the above analysis, when the per capita disposable income of urban residents increases by one unit, the added value of the sports industry will change by 32.6%, and when the per capita disposable income of rural residents increases by one unit, the added value of the sports industry will change by 79.5%. Therefore, the increase of per capita disposable income of rural residents has a more obvious impact on the added value of the sports industry.

## 7 Recommendations

### 7.1 The Higher the Income Level of Residents, the More Value-Added the Sports Industry

According to Engel's theorem, with the increase of residents' income level, the proportion of food in residents' expenditure is declining, and residents will spend more income in other fields, especially leisure and entertainment projects. As one of the leisure and entertainment items, sports consumption will increase with people's continuous attention to health awareness and participation in sports activities. Therefore, to develop the sports industry and promote the development of the sports industry, we first need to improve the disposable income of residents.

### 7.2 The Income of Rural Residents Will Play a Greater Role in the Future Growth of the Sports Industry

The gap between the per capita disposable income of urban and rural residents is relatively obvious. The per capita disposable income of urban residents has been relatively high, and the per capita disposable income of rural residents is relatively low. However, it is not the urban residents with relatively high income levels that have a greater impact on the added value of the sports industry, but the rural residents. According to Keynes' Consumption Theory (that is, with the increase of income level, the amount used for consumption per unit of income increased is decreasing), it shows that the amount used for consumption per unit of income increased by urban residents is less than that of rural residents. Therefore, it can also be inferred that the amount used for sports consumption in this unit of income will account for more than that of urban residents. Therefore, in the two univariate regression models, The influence coefficient of per capita disposable income of rural residents on the added value of sports industry is greater than that of urban residents ( $\beta_1 = 0.326$ ,  $\beta_2 = 0.795$ ,  $\beta_1 < \beta_2$ ).

### 7.3 Promote Rural Residents' Income Increase, Increase Their Awareness of Participating in Physical Exercise, and Promote the Development of Sports Industry into a New Stage

Combined with the above summary and analysis, the government should vigorously promote the income increase of rural residents, shorten the gap between urban and rural disposable income, and promote rural residents to have greater consumption capacity; Secondly, cultivate the awareness of rural residents to actively participate in physical exercise, and increase the corresponding sports facilities, so as to promote rural residents' sports consumption, popularize more sports, provide more sports services, and promote the development of China's sports industry into another new stage.

## 8 Thanks

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