

Analysis on Social and Economic Influence of Large-scale Sports Events

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Abstract

The organization of large-scale sports events can not only promote the development of urban economy but also improve urban image, and enhance urban construction. At the same time, it is of great influence for social and economic development the host place. Relevant industrial economy theories are used to summarize social and economic influence of sports events from economic benefit and social benefit, such as commercial service (e.g. infrastructure, tourism and catering), real estate industry, employment rate, and cultural environment. On this basis, the author introduces the influence coefficient, establishes an influence model, and proposes the quantitative method of influence from the angle of input-output. With a large-scale sports meeting as an example, the author uses actual data in combination to verify the effectiveness of this model. At last, the author discusses social influence of this category of sports events.

Key words: ARGE-SCALE SPORTS EVENTS, INFLUENCE MODEL, SOCIAL BENEFIT, ECONOMIC BENEFIT

1. Introduction

Since the commencement of commercial operation mode on the Olympic Games in Los Angeles, various large-scale sports events not only brought fascinating commercial profit but also resulted in significant influence on local social and economic development, forming comprehensive events with commerce, culture, entertainment, and athletics in coexistence. Preparation, organization and influence of sports events in various stages are penetrated into local infrastructure, talent cultivation, and resource reorganization, so as to form an industrial chain with complex relations. It also becomes a social focus for how to reasonably measure the relationship between sports events and urban development and how to give full play to positive effect of sports events. Most scholars chose to discuss the influence of sports events from the perspectives of industrial relationship and cost benefit. Chen Jinliang and other scholars made an exclusive research on positive role of Central Plains

Economic Region in the local sports events in such aspects as environmental operation, commercial model cultivation, and maintenance of consumer groups [1]. Song Namei and other scholars utilized relevant theories about demand information and welfare economics to research the promotion of sports events for economic development, and proposed relevant policies and recommendations on this basis [2]. Li Jie introduced $E=Y/X$ model of investment cost efficiency through the cost effectiveness analysis method, and made a comprehensive analysis on opportunity costs for sports events. This research points out that it is necessary for organizers of large-scale sports events to consider indirect social impact and improve the people's welfare and future benefit as much as possible [3]. Based on the theory of industrial relationship and affection, Tang Xiaotong and others analyzed the relationship between input goods and consumers in sports events, and established the industrial affection and logic model of sports events [4].

In short, most of above researches are concentrated on qualitative research on the relationship between sports events and other industries. The investment income analysis lacks quantitative analysis among different industries, especially for the influence of sports events on urban social and economic development. In this paper, the author plans to apply the input-output theory in introducing the influence coefficient, making an innovative analysis on the relationship between sports events and social economics, and establishing an influence model. The degree of influence of sports events is quantitatively measured and discussed by calculating the influence coefficient, with expectations to use the calculated result of this model to provide reference to the future planning development of sports events.

2. Influence model of sports events

2.1 Influence factors

The organization of large-scale sports events has significant influence on urban development. Such in

fluence is of dual characters. On the one hand, large-scale sports events have very high urban requirements. In the initial stage of organization, it needs considerable investment of capital and manpower in a short period of time. In the middle stage, it needs sufficient guarantee of commercial operation, with expensive organization costs. On the other hand, the organization of sports events can promote rapid development of local economy, employment, related industries, infrastructures, and cultural atmosphere, with remarkable associated benefit. If properly developed and utilized, sports events can play a positive role in regional social and economic development. Sports events cover a large scope of influence, including board and lodging, medical treatment, transport, communication, and security. For the convenience of analysis, influence factors are classified as cost factors and benefit factors according to the input-output theory, as shown in Table 1.

Table 1. Influence Factors of Large-scale Sports Events

Influence factors	Cultural environment	Stadium facilities	Municipal facilities	Industrial structure
Factor attribute	Benefit	Cost	Cost (benefit)	Benefit
Influence factors	Event organization	Natural environment	Event income	Employment
Factor attribute	Cost	Cost	Benefit	Benefit

Above table shows 8 categories of major factors associated with the organization of sports events. Among above influence factors, stadium factor and event organization are basic factors deciding the success of sports events. To apply for relevant sports events, it is necessary for an efficient organization to take charge application, operation and other specific works of those events. At the same time, it also needs to build and reconstruct relevant gymnasiums and stadiums and guarantee smooth organization of those events. In this process, considerable materials and human resources will be consumed, which are major costs of the events. Accordingly, for traveling, accommodation and safety of athletes and audiences, it is necessary for the host place to invest large-scale capitals in construction of metro, public transportation, athletes' villages, and infrastructures in the early preparation stage, so as to guarantee normal life beyond sports events. For a short period of time, such influence factors belong to cost investment. Viewed from a long period of time, however, those influence factors are quite beneficial for the improvement of urban development and construction level. Therefore,

they belong to potential income factors. During the organization of sports events, certain negative impact (e.g. noise and garbage pollution) will be generated for the local environment due to numerous participants and complex situation. At the same time, some security issues may be caused. Thus, it is essential for security measures during the organization of sports events. These measures become one of major investment costs. For the organization of sports events, the most visual income is event income, mainly including ticket income, income from broadcasting right, income from sponsors, and income of intangible assets (e.g. mascots and event derivatives) [5]. Additionally, it has stronger demands for local industrial structure adjustment, especially for promotion of the tertiary industry as well as tourism, catering, and entertainment. On the one hand, it created more employment opportunities in industrial structure optimization. On the other hand, it also enriched and made it convenient for the lives of residents, created good cultural atmosphere, and promoted urban image. Huge influence of such indirect benefit also becomes a major reason for many

cities to hold sports events. For further quantization of the influence of such events, a specific analysis is made on the establishment of influence model.

2.2 Establishment of influence model

The development of sports events on social and economic development can be considered from two aspects: cost and income. The formation of such influence is sourced from the event investment, which penetrates, through multiplier effect, into the course of local social and economic development by the mode of social benefit and economic benefit. While establishing the influence model, therefore, we need to consider its input-output effect, combine relevant features of sports events according to influence coefficient in the industrial chain theory, and obtain a model to quantify its influence through further optimization and improvement. So-called influence coefficient is also termed as backward correlation coefficient, which reflects the promotion capacity of industry for social and economic benefit. Its fundamental formula is shown as follows:

$$\delta_j = b_{cj} / \sum_{j=1}^8 \alpha_j b_{cj} \tag{1}$$

$$\alpha_j = Q_j / \sum_{j=1}^8 Q_j \tag{2}$$

$$b_{cj} = \begin{bmatrix} b_{c11} & \dots & b_{c1j} \\ \cdot & \dots & \cdot \\ b_{cj1} & \dots & b_{cjj} \end{bmatrix} \tag{3}$$

Wherein: b_{cj} stands for the demand coefficient matrix of various influence factors caused by the industry. α_j is the proportion of the output of factor j in total output value. Q_j reflects the output value of factor j . This coefficient comprehensively reflects the influence level of factor j ($j=1,2,3\dots 8$) for output value development of the whole industry. The size of this coefficient is closely correlated with the output value of various factors. According to this formula and in combination with the proportion of the whole industry in national economic industry, the influence model of sports events can be obtained:

$$\eta_j = \sum_{j=1}^8 \delta_j Q_j / D \tag{4}$$

In the model, D is total output value of national economy, $j=1,2,3\dots 8$. This model reflects the industrial influence of each factor. Moreover, it can also be used to work out the influence of industry on national society and economy. In combination with Formulas (1) and (3), the demand coefficient matrix of each fac-

tor is calculated by experts' scores according to subjective influence of different factors and attributes of cost and benefit and in combination with specific conditions of different events. Quantization of output value of various factors is worked out through contrast calculation based on practical output or similar reference standards. For instance, the output value of noise pollution can be calculated with reference to environmental compensation standards. The output value of cultural environment can be measured through equal investment into cultural construction. Greater result of such influence indicates greater influence of this industry on national economy and society. The value range of this calculated result is between 0 and 1. To verify the feasibility of this model, a large-scale sports event should be taken as an example. Through comprehensive comparison, 2014 Nanjing Youth Olympic Games is taken as an example to analyze and quantify its social and economic influence.

3. Analysis on the influence of Nanjing Youth Olympic Games

3.1 Overview

Nanjing Youth Olympic Games was opened in Nanjing on August 16, 2014. It lasted for 12 days. In total, 3,787 young athletes all over China participated into various sports events. Approximately 12,000 coaches, guests and journalists were present at Nanjing Youth Olympic Games. Moreover, there were more than hundred thousand volunteers [6]. In this period, Nanjing Youth Olympic Games influenced and changed Nanjing from various aspects, such as tourism, commerce and trade, transport, finance, environment, culture, and sports, resulting in lots of investment and consumer demands, and promoting great-leap-forward social and economic development.

To guarantee smooth traffic during Youth Olympic Games, Nanjing carried out a traffic transformation plan. In total, approximately RMB 1.6 billion was invested [7]. To guarantee good environmental quality during Youth Olympic Games, the government of Nanjing City took new measures for control of water environment, air environment, and industrial environment. In the preparation period, Nanjing invested about RMB 20 billion into the rainwater & sewage separation and transformation project, and RMB 6.049 billion into control of industrial, motor vehicle and open area pollution. In total, 56 small-sized chemical plants were closed or moved, and environmental protection transformation projects were accomplished for 15 enterprises.

By holding Youth Olympic Games, Nanjing got further improvement to its international influence and urban quality. Economy, culture and industries of the

whole city were optimized and upgraded. Values of “excellence, respect, friendship” were advocated in Youth Olympic Games, forming the trend of fresh vitality, driving the climax of physical fitness, and remodeling culture and sports atmosphere in Nanjing City. No matter for residents and the city, Youth Olympic Games has significant influence. In combination with various influence factors and by virtue of the influence model, its specific influence is further quantified.

3.2 Influence calculation of Nanjing Youth Olympic Games

It can be known by combing sports events of Youth Olympic Games that its influence factors can also be classified as 8 categories: stadium facilities, cultural environment, municipal facilities, industrial structure, event organization, natural environment, event income, and employment. For stadium facilities, event organization, and other direct cost factors, Nanjing Youth Olympic Games controlled its budget around RMB 1.8 billion as China advocated frugal organization of sports events, increased by approximately 10% when compared with the Youth Olympic Games in Singapore. Among 35 stadiums, only one stadium was constructed for Nanjing Youth Olympic Games. The mode of expansion and reconstruction was adopted for the rest 34 stadiums. In the village of Nanjing Youth Olympic Games, materials of some devices were from the village of Asian Youth Games. In terms of market operation, diversified methods were used to positively promote, give play to market effect, and expand the benefits of sponsorship, franchise, and ticket. According to relevant statistics, the sponsored amount from 6 cooperative partners (e.g. Suning and Tencent) exceeded RMB 1.5 billion. Among 8 exclusive sponsors, the sponsored amount from 3 TOP sponsors exceeded RMB 0.6 billion. Mascots and other derivative became bestsellers, with the franchise incomes of about RMB 0.3 billion.

In terms of ticket, through promotion, average

ticket selling rate of the Youth Olympic Games reached over 80%. For some events with great demands, the highest ticket selling rate even reached 98.9%. In 225 ticket selling sessions, 650,000 tickets were sold. In total, there were 60,000 tickets for the opening ceremony. According to the comprehensive calculation, ticket proceeds were estimated approximately RMB 0.2 billion. Employment posts included temporary and long-term posts. During the Youth Olympic Games, lots of reception, ticket inspection, and other temporary posts were provided. After the completion, some posts were provided in stadium operation, maintenance and other aspects. In total, Nanjing Youth Olympic Games improved about 8,000 posts. According to monthly salary of RMB 4,447 in Nanjing in 2014, the employment output was estimated approximately RMB 22 million. As a key development project of the “12th Five-Year Plan” of Nanjing, the Youth Olympic Games also received considerable investment from the Nanjing government in municipal facilities, environmental maintenance, and industrial optimization. The Youth Olympic Games was of significant influence. Since Nanjing’s success in winning the right to hold the Youth Olympic Games, the government invested over RMB 60 billion in environmental control, accounting for more than 3% of GDP. In 2015, the transit trip reached 50% for citizens in Nanjing. Traffic construction of Nanjing was advanced by 10 years by the Youth Olympic Games. At the same time, it also brought forth 6 metros and 2 new cities. Continuous optimization of industrial structure resulted in rapid development of nine categories of new industry, including Internet information, smart grid, biological medicine, satellite application, rail transit, and intelligent equipment manufacturing. In 2014, Nanjing realized main business incomes of RMB 470 billion. Accordingly, estimated output of 8 influence factors of Nanjing Youth Olympic Games can be calculated, as shown in Table 2.

Table 2. Output of Influence Factors of Nanjing Youth Olympic Games (100,000,000 yuan)

Influence factors	Cultural environment	Stadium facilities	Municipal facilities	Industrial structure
Output value	120	12.6	240	4700
Influence factors	Event organization	Natural environment	Event income	Employment
Output value	5.4	240	26	0.22

Note 1: According to the cost structure principle of sports events, the proportions of event organization and stadium facilities are distributed as 30% and 70%;

Note 2: The investment into cultural environment, urban environment, and natural environment is distributed as 20%, 40% and 40%.

According to relevant statistics, total regional economic output of Nanjing reached RMB 882.075 billion in 2014, increased by RMB 80.897 billion against the last year. The increase speed reached 10.1%, which was ranked the 11th in China. Viewed from quarterly GDP change, the total output of Nanjing in the 4th quarter was RMB 260.075 billion in 2014, RMB 211.261 billion higher than the 3rd quarter, with obvious increase. The contribution of the Youth Olympic Games cannot be neglected. In combination with the features of Nanjing Youth Olympic Games, the demand coefficients of 8 influence factors were scored by experts. The following matrix was obtained:

$$b_{ij} = \begin{bmatrix} 0.42 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0.66 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.64 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0.83 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.71 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0.55 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.78 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0.53 \end{bmatrix}$$

In the matrix, different coefficients reflect close correlation of sports events with various influence factors. Greater coefficient indicates stronger influence. According to specific situation of the Youth Olympic Games and in combination with data in Table 2, it can be obtained that $\alpha_j = [0.022 \ 0.002 \ 0.045 \ 0.879 \ 0.001 \ 0.045 \ 0.005 \ 0.00004]$. According to relevant statistics, GDP of Nanjing was RMB 880 billion in 2014, $D=8800$. The influence of Nanjing Youth Olympic Games can be calculated with Formulas (1) – (4)

$$\delta_j = \begin{bmatrix} 0.119 \\ 0.187 \\ 0.181 \\ 0.235 \\ 0.201 \\ 0.155 \\ 0.220 \\ 0.150 \end{bmatrix}$$

$$\eta_j = \sum_{j=1}^8 \delta_j Q_j / D = 0.137$$

It can be known from above results that the influence of the Youth Olympic Games is 0.137 for overall society and economy. Its economic significance is that overall influence of the local society and economy reaches 13.7% through the organization of Nanjing Youth Olympic Games. In other words, 13.7% of

local GDP was formed by the organization of the Youth Olympic Games. Moreover, such influence is direct influence in the year of holding. After the Youth Olympic Games, many fixed assets were left. It is a long-term evolution and accumulation course for optimization of the whole industrial structure, with hysteresis effect. Such long-term influence will last for a longer period of time. Viewed from the overall influence level of sports events, the Youth Olympic Games only received limited investment. However, its leverage effect is very obvious. The precedent of Beijing Olympic Games accumulated lots of experiences for the organization of the Youth Olympic Games, and also expanded the influence of relevant sports events. It can be put in this way: China's successful holding of various large-scale sports events cannot be separated from the influence and inheritance of previous events.

4 Conclusions

The holding of Nanjing Youth Olympic Games brought forth profound influence on transition, industrial adjustment, and management ability improvement of Nanjing City. Through the first Youth Olympic Games, Nanjing received further improvement to its appearance and fine & network-based management level. At the same time, improvement was also made to the cultural, living, and sports and leisure environment of Nanjing people. It can be said that qualitative improvement was made to Nanjing's political, economic and cultural development level under the influence of the Youth Olympic Games. A "modern, international, intelligent, and green" city image was shaped. Through a comprehensive analysis on the features of sports events, the author establishes the influence model in this paper. Moreover, the author also analyzed actual situation of the Youth Olympic Games, calculated its influence with this model, and quantify intangible influence of sports events, so as to make it convenient for host cities and other relevant departments to make future decisions and plans, and measure the influence of different sports events.

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An Exploration Study on Quality Performance Casual Path Model Based on BN Method

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Abstract

According to MBNQA:1997 standard and scale, empirical data was obtained through a questionnaire survey from Chinese railway construction enterprise, and used Bayesian Networks for PC algorithm, the path model of the causal relationship between QMP and QP is acquired. The CPT parameter is obtained by EM algorithm, reasoning analysis and diagnosis research are conducted, and some conclusions and suggestions are drawn. Finally, the methodological and practical value of the BN model is discussed.

Key words: RAILWAY CONSTRUCTION ENTERPRISE, QMP, QP, BN STRUCTURE LEARNING, PC ALGORITHM, SENSITIVITY ANALYSIS.