A Model Coupling Analysis on Large-scale Sports Competitions and the Development of Host City

Xiaohui Che

Sports Department of Jiangsu University, Zhenjiang 212013, China

Abstract

In recent years, large-scale sports competitions have been carried out extensively in most cities in China, and large-scale sports competitions have promoted urban development to some extent. However, the specific means of advancement and the measurement criteria require a further study. If the coupling between large-scale sports competitions and the development of host city is analyzed, its internal links coexist with the external promotion. Therefore, this study builds on the model design of large-scale sports competitions and the development of the host city and analyzes their coupling relationship. Five first-class variables, including per capita GDP, foreign exchange growth, employment rate, city reputation and tertiary industry development, are applied as a measurement criterion to study the objective pattern of the regional economic growth during sports events and then to propose an optimized strategy. The aim is to promote the effectiveness of large-scale sports competitions in China’s cities, to stimulate the steady growth of regional economy with the most fundamental effectiveness, and to effectively drive urban development.

Keywords: Sports Competitions, Host City, Model Design, Coupling Analysis.

1. RESEARCH BACKGROUND

1.1 Literature Review

The most direct impact of sports events on a city is the driving force and the growth of economic efficiency. In the course of organizing the event, the influx of foreign tourists in the city will inevitably bring abundant basic needs in terms of the city’s internal culture, transportation, accommodation and other aspects, and the economic profits will penetrate in a variety of industries (Zhang, 2015). Furthermore, the incentive force of this economic chain is presented in the early, medium and late stage of the events. NASCAR Valley in the United States enjoys a high reputation in the field of car racing. In each of the previous seasons, Charlotte city surely has relatively high economic growth space (Xu and Liu, 2011). In light of the overall coordination of car racing events, the related industries are in simultaneous development, including vehicle maintenance, design and research, spare parts production and other aspects (Liu and Zhang, 2013). Undoubtedly, all the drivers have produced a certain degree of coupling and promoted the local economy in terms of souvenirs, iconic items, basic necessities and other elements.

1.2 Research Purpose

This study is based on the investigation of large-scale sports competitions, and it is indicated that its event organization and urban development have a certain role in promotion. In the process of development, the relationship between large-scale sports competitions and urban development is the main direction of this study (Chai and Lin, 2013). Although the general effects of economic growth indicate the fuzzy effect and the potential support of sporting events, how to apply this support to urban development is first considered by the host city (Zhang, 2013). Effective economic growth during the sporting event is evident. However, if the event ends, whether the maintenance system at the late stage will be able to put forward more effective measures or even the maintenance method, needs to be considered. To this end, in order to promote the simultaneous development of large-scale sports competitions and host cities, how to evaluate the objective existing driving force requires a parametric design based on the coupling analysis model. Furthermore, the internal connection and the external manifestation of coupling between the two elements are evaluated through the changes in the relevant parameters (Chen and Wang, 2014). In this paper, five first-order variables and the corresponding second-order variables are analyzed, and the fuzzy judgment is made by the coupling effect function model. Besides, the computational
formula of the coupling degree and the coupling coordination degree are applied for revision and verification, so as to determine the existing coupling relationship between two systems—large-scale sports competitions and the urban development of host city, and to plan a more effective management style and a development strategy. The organization approach of large-scale sports competitions as well as policy adjustment and guiding regulation during the event are in balanced development, and the promotion and the driving force of large-scale sports competitions exerting on urban development is further stimulated.

2. COUPLING EFFECTS OF THE ORGANIZATION OF LARGE-SCALE SPORTS COMPETITIONS AND THE COMPREHENSIVE URBAN DEVELOPMENT

2.1 Adjust the Growth Amount of Urban Foreign Exchange and Surplus Value

The amount of foreign exchange growth greatly promotes urban development, and economic development level can also be used to measure foreign exchange indexes. The weight relation is distinguished on basis of the strength of international abilities. If no foreign exchange earnings are generated in international trade, but in local tourism, insurance, or other industries, it can also be regarded as invisible trade income (Wang, 2012). Therefore, during large-scale athletic events, players, their teams and supporters around the world are gathered in host cities, and corresponding trade income will incur. Although trade income of this kind is not easy to be calculated to obtain an accurate numerical representation, because of its objective conditions and formation environment, it can also be adopted as an important index to measure the relevant degree of coupling. Besides, related industries generated by foreign exchange, such as hotel services, travel services, transportation services, post and telecommunications services, can be applied to evaluate the specific means of trade growth and the representation of indirect coupling effect (Huang and Luo, 2014). If the most direct measurement—trade surplus and deficit are adopted, the most direct growth amount has a certain indirect relationship with the development of large-scale sports competitions. Therefore, the increase in foreign exchange earnings and the surplus value can be employed as an important reference variable for the degree of coordination.

2.2 Drive the City to Provide Employment Opportunities

The employment rate of urban residents is a key basic condition for measuring urban development. If the urban employment rate is extremely low, its industrial development certainly would not reach the expected level, and would also affect the social stability and the harmonious development of all classes (Wang, 2015). Based on the free adjustment relation of the market economy, maintaining a continuous rise of employment rate requires the judgment on the liquidity of the production capital. In any city, unemployment rate exists in different stages of urban development, so the effective way to boost the employment rate needs to be balanced from the overall planning of urban development (Zhao and Yang, 2015). In the process of holding large-scale sports competitions, urban development, labor demand and human resources demand grow in the same pace, and a positive situation of mutual promotion and coordinated development takes shape in a variety of industries, thereby elevating the local employment rate. The fundamental opportunity to create jobs lies in the direct employment conditions presented by large-scale sporting events, such as the most basic maintenance and management required by the hosting sports venues, the expanded bearing capacity needed by the basic service industry in the host city, and the synchronous growth of basic human resources demands of the related industries. In view of the analysis on the related sports events and the growth of employment rate in China, the sum of the proportion of the annual growth rate of the same year and the next year exceeds the other years, commonly with a comparative growth on moving base of 18.92% and a year-on-year increase of 12.58%. Among them, the growth of employment rate during the 2008 Beijing Olympic Games is the most prominent, and its value of increase is more than 30% of the previous years. This indicates that the organization of large-scale sports events holds a reference value of coupled regulatory conditions for the urban employment rate.

2.3 Enhance a City’s International Influence and Reputation

International exchanges and communication, even the growth of the proportion of external investment, have a fairly strong coupling relationship with city reputation and international influence that is equivalent to a city’s important brand image. In case of a well-known city, the external inspection tour and investment intention would form a virtuous circle. When the city’s international influence is enhanced, the confidence and perseverance of external investment is increased. During the large-scale competitive events, players and tourists from various cities can feel the human environment, the infrastructure, the service concept and other aspects in the host city, which can form a subjective impression on the city. This impression can serve as a special communication of international influence, but also the performance mechanism of word of mouth. When the cultural heritage and
the city image of a host city stimulates the potential awareness of tourists, the city image’s brand effect would become word of mouth and further provide multi-cultural recognition conditions for the international influence and reputation of urban development (Jing and Liang, 2009). Therefore, in the crucial stage of urban development, the ability to undertake large-scale competitive sports events is an important leverage of city brand image, and the measurement index of this leverage is the city’s international influence and reputation.

3. SELECT THE REFERENCE VARIABLE OF COUPLING DEGREE

This study selects the reference variables of coupling degree according to the cities that have held large-scale sports competitions. Among them, five first-level reference variables are respectively selected on the basis of the development of the host cities: per capita GDP, foreign exchange growth, employment rate, city’s reputation and the development of the tertiary industry. The first-level variables consist of n second-level variables, namely:

First, per capita GDP includes per capita consumption level, per capita consumption capacity, per capita income indicators, the lowest income line, and the average income line, etc.

Secondly, foreign exchange growth is made up of foreign exchange transaction value, the daily quota of foreign exchange transactions, import and export trade margin, foreign exchange flow in sports competition season, and foreign exchange effectiveness index during the whole season, etc.

Besides, employment rate includes hotel services, tourism merchandise sales, commodity retail, and human resource saturation, etc.

In the end, a city’s reputation comprises the value of tourism product brand, the average annual growth of inbound tourism, the quality of urban residents, and cultural transmission, etc.

In addition, the tertiary industry development involves freight growth, post and telecommunications business income, highway mileage, the proportion of foreign direct investment, and the degree of completion of service facilities, etc.

In the study on design-related variables, the core index of this study is the coupling relationship between large-scale sports events and urban development. Therefore, a comprehensive judgment is made on the correlation among the above-mentioned variables and the mutual promotion, as illustrated in Figure 1.

![Figure 1. A Coupling Model System Based on The Reference Variables](image)

4. THE COUPLING MODEL OF LARGE-SCALE SPORTS COMPETITIONS AND URBAN DEVELOPMENT

The two major systems, large-scale sports competitions and the urban development in host cities, are not independent individual systems. Based on the internal relation analysis, urban development is a crucial condition for hosting an event, and sports events stimulate the potential power of urban development from different dimensions. Hence, the two systems have a coupling relation with mutual promotion and penetration. For this purpose, this paper designs a coupling effectiveness function mechanism and a model system and
further evaluates the practical effectiveness and the coupling relation degree of large-scale sports competitions and urban development.

4.1 Function Mechanism of Coupling Effect

In terms of the coupling function for large-scale sports competitions and urban development of host city, first, \((i = 1, 2, \ldots, m)\) is set to be the urban development variable, and then \(u_i\) is the \(j\)-th index of parameter variable \(i\) and its parameter value is \(x_{ij}(1, 2, \ldots, n)\). \(a_{ij}\) and \(\beta_{ij}\) can be regarded as the upper and the lower limits of the stable interval of simultaneous development, so the effectiveness system of the coupling model for large-scale sports competition and urban development, \(u_{ij}\), is represented by positive and negative interval. The positive effect interval is \(u_{ij} = \frac{(X_{ij} - \beta_{ij})}{(a_{ij} - \beta_{ij})}\) and the negative effect interval is \(u_{ij} = \frac{(X_{ij} - \alpha_{ij})}{(a_{ij} - \alpha_{ij})}\). In the positive and negative effect interval, \(u_{ij}\) is the value of contribution effect of Variable \(X_{ij}\). The value of \(u_{ij}\) can reflect the comprehensive index satisfaction of the measured area. When the value of \(u_{ij}\) is close to 1, it indicates the most satisfied; when it approaches 0, it is the most dissatisfied. Therefore, \(0 \leq u_{ij} \leq 1\) is the most significant measurement index of coupling degree:

\[
u_{ij} = \sum_{j=1}^{m} \lambda_{ij} u_{ij} \quad (1)\]

Because of the existence of interrelated secondary variables in the two systems, the performance of the total contribution values is designed for the second-level variables so as to determine the coupling authority and the geometric mean between the two systems:

\[
u_i = \sum_{j=1}^{m} \lambda_{ij} \quad (2)\]

When \(u_{ij}\) is the subsystem of the variable, the total system has a contribution value and \(\lambda_{ij}\) is the parameter weight. The facilitating effect produced by the change of the parameter and the coupling degree is clarified.

4.2 Computational Formula of Coupling Degree and Coupling Coordination Degree

The research focus of this study is large-scale sports competitions and its coupling relationship with the development of host cities, so the sub-system designed in this study can be regarded as the specific situation where \(N = 2\). The coupling degree function of sporting events and urban development is calculated as:

\[
u_n = \left(\frac{u_1 + u_2 - u_{ij}}{\|u_1 + u_2\|}\right)^{1/n} \quad (3)\]

This formula mainly calculates the influence of internal relation of the two systems in the process of coordinated development and then determines the relevant changes during sports events, including system coordination degree, matching degree, coordination degree and support degree (Tang, 2007), which reflects the level of comprehensive development and the relevance of the coupling degree of the two systems. The higher the coupling degree is, the stronger its relevance is. They can be adopted as measurement indexes that integrate their unified development, thus accelerating the integration process. When the relative value of coupling degree is too low, the spillover effect is obviously weakened, which further indicates that the negative effect is greater than the positive effect. Eventually, the economic development of the city is influenced, and its negative effect can be judged as the negative effectiveness of coupling.

4.3 Quantitative Assessment Criteria for Coupling Model

When the calculation results indicate \(C = (0, 1)\) and \(C = 1\), the coupling degree is the highest. When \(0 < C \leq 0.2\), the urban development level is in the initial stage and the coupling of the two systems is weak. When \(0.2 < C \leq 0.6\), it is indicated that the urban development level is in the middle stage with obvious urban development space; the coupling is obvious; sports competition events have the support function to the urban development. When \(0.6 < C \leq 0.8\), urban development enters the high-level stage and the associated indicators have a mutual promotion role. In other words, urban development exerts a significant impact and positive
effects on large-scale sports events. 0.8 < C ≤ 1.0 represents the best stage. The two systems are in the stage of balanced development which is regarded as the largest optimal configuration environment; their development results demonstrate the strongest synchronization; the two systems are mutually reinforcing each other; regional economy rapidly grows.

5. A COUPLING ANALYSIS ON THE SYNCHRONOUS PROGRESS BETWEEN LARGE-SCALE SPORTS COMPETITIONS AND URBAN ECONOMY

This study investigates and collects the data of relevant cities that have held large-scale sports competitions in China in recent years as well as the changes of the relevant variables in the same year, including the 2011 Lanzhou International Marathon, the Ninth National University Games held in Tianjin in 2009, the World Track and Field Championships held in Beijing in 2015, the ATP Men’s Professional Tennis Shanghai Masters Tournament in 2016. The above research data are compared, analyzed and substituted in the formula:

\[ C_n = \left( \frac{u_1 + u_2 - u_0}{[u_1 + u_2]} \right)^{1/n} \]  \hspace{1cm} (4)

It is indicated that the coupling degree of sports competition events and urban development system is 0.479596. The related data calculation results of the second-order variables are demonstrated in Table 2.

<table>
<thead>
<tr>
<th>level-one variable</th>
<th>GDP per capita</th>
<th>Foreign exchange growth</th>
<th>The employment rate</th>
<th>City visibility;</th>
<th>Tertiary industry development</th>
</tr>
</thead>
<tbody>
<tr>
<td>coupling factor</td>
<td>5.25</td>
<td>3.96</td>
<td>4.28</td>
<td>5.12</td>
<td>6.02</td>
</tr>
<tr>
<td>feature</td>
<td>Middle stage 2</td>
<td>Middle stage 0</td>
<td>Middle stage 1</td>
<td>Middle stage 2</td>
<td>High-level stage 0</td>
</tr>
</tbody>
</table>

The coupling degrees of per capita GDP and city reputation have exceeded 5.00, thus confirming that the positive effect of large-scale sports competitions is more prominent (Xiao and Li, 2010). However, based on the analysis on employment rate and foreign exchange growth, the real growth rate is not equal to other variables. Two reasons might be involved. First, although the employment rate has been improved, due to the short duration of sports events, surplus positions of employment group are left after the events end and unemployment develops again. Secondly, the inevitability of per capita GDP growth can be confirmed from the rapid development of the tertiary industry. Whereas, the liquidity of foreign exchange growth does not improve to the same standards of the tertiary industry. Based on the analysis, the amount of foreign exchange investment absorbed from the current large-scale events in China is relatively limited. Besides, the proportion of domestic investment is expanded to become the tertiary industry’s greatest strength of support (Qian and Lin, 2016). However, this development situation can be attributed to the preferential policy provided for the tertiary industry by the local government before the tournament and can be benefited from the fact that there is enough time for the tertiary industry to optimize. In this way, the trend of increasing proportion of foreign investment presents obvious coupling, and thus stimulating the integrated development potential of the tertiary industry and accomplishing the market occupancy after the sports events end with a relatively high degree of fitness.

6. CONCLUDING REMARKS

The coupling relationship between the two systems can be determined based on the above evaluation results. However, two aspects are required if a synchronous growth relationship of the level-one variables are maintained in the development process. On the one hand, in order to promote the coordinated development of large-scale sporting events to contribute to regional economy growth during the post-match period, the first step is to analyze the fundamental reasons why the employment rate fails to maintain after the end of sports events. Although per capita GDP has effectively experienced a rapid growth, the per capita GDP can not yield more stable results if the employment rate can not always be maintained at the dimension value (Wang and Ye, 2005). Therefore, in the process of undertaking large-scale sports events, the objective employment rate must be applied as a measurement criterion. In the process of ensuring the rapid development of the tertiary industry, personnel recruitment is of high significance. On the other hand, in the stage of building up city reputation and influence, it is necessary to simultaneously stimulate the proportion of a continuous growth in foreign exchange.
To this end, certain policy concessions and adjustments should be conducted to continuously stimulate the confidence of external investment. In this way, under the mutual promotion of both sides, a favorable operation approach is afforded to large-scale sports competitions and the regional economy is supported to progress in a steady way, thereby achieving the important role of optimizing the urban development.

REFERENCES

Qian X.Y., Lin Y.S. (2016). Construction of tourism public marketing model of large-scale sports events based on the exploratory study of individual cases, Tourism research,8(04), 48-55.
Wang L. (2015). The wealth effect of international large-scale events on China's sports industry in the context of sports globalization, Based on the case study method, China sports technology,51(05), 116-122.