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Examining the Impacts of Mega-Events on Urban Development Using Coupling Analysis: A Case Study of the Boao Forum for Asia

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Abstract: Mega-events, as a strategic approach taken by entrepreneurial governments, have the ability to transform the image of a city. This study explores mega-events and their relationship to urban development by developing a coupling coordination degree model and using the official statistics of Qionghai, China, from 2010 to 2015. The results of this study show that the dynamic of coordination between mega-events and urban development is a classical S-shaped growth curve. In the coupling system, this study also reveals that relevance index and the economy, as sub-indicators, make significant contributions to mega-events and urban development, respectively. Finally, the researchers concluded that the international large-scale events can significantly promote the urban development in host cities. This study reveals theoretical issues and practical implications for policy makers and event managers to achieve integrated and coordinated development between mega-events and urban development.

Keywords: mega-event; urban development; coupling analysis; Boao Forum for Asia

1. Introduction

Over the past several decades, mega-events, such as the gourmet festivals, cultural celebrations, sports, concerts, and marathons, have been largely conducted in western countries, as well as in more developed event-tourist destinations. The popularity of such events is increasing, and many developing countries and cities have also started to provide financial and policy advisory support for them in recent years. Obviously, economic and social benefits, both in the short run and in the long run, are important drivers of hosting mega-events in many cities and regions [1–3]. Mega-events have positive consequences for the host area, including positive economic effects. For example, host cities are expected to be internationally recognized and become a means to attract capital and people (of the right sort) over a period of time. A major motivation of cities that are facing financial difficulty is to extract funds from central government grants by hosting mega-events. In addition, the growing role of mega-events in improving the image of the host cities internationally and for resolving agendas in national politics has attracted increasing attention in the developing world. From a more socially oriented perspective, attention turns to highlighted negative impacts on the poorest by addressing urban renewal that is designed to enhance the city's landscape. On the one hand, a result of hosting mega-events can be a considerable increase in investment in infrastructure and support for rapid and

equitable urban transformation. A significant amount of expenditure goes into the infrastructure required for hosting the event [4]. This involves the provision of a range of cultural and entertainment infrastructure, such as galleries, sports stadia, motor-racing tracks, convention centers, theme parks, and their supporting infrastructure. On the other hand, sustainability is becoming one of the most important ideas in mega-event studies. More and more organizers and planners are placing great importance on sustainability when they hold mega-events. Coordination between mega-events and urban development is an essential factor in achieving sustainability in urbanization. Mega-events are an essential part of sustainable urban development and are becoming increasingly important for urbanization and local development, and event-related research has expanded dramatically as a popular topic. Mega-events are intended to promote local and regional economic development by attracting investment, worldwide media attention, tourists, and audience attention. Host cities generally attach particularly significant factors to urban development, including the event's pulling effect on economic growth, income derived from the event, and tourism generated by the event. Therefore, numerous studies have focused on mega-events' economic impacts and the functions of staging mega-events for host cities. Most studies estimate the long-term economic costs and benefits of mega-events. Aside from the main economic implications, prior studies have examined the sociocultural, environmental, and political (community) impacts of mega-events on urban development. The successful hosting of large-scale events will greatly promote the development of a city. Many short-term mega-events (e.g., first-order, one time, and high-profile events) are usually examined in terms of their tourism and economic impacts. Increasing attention has been paid to the host city of large-scale events, which can stimulate economic growth and strengthen the place of local culture in global agendas.

The preparation expenditures of facilities and infrastructure, visitor support for spending revenue, receipt of event, and exposure to the full array of media constitute the baseline of much mega-event analysis. An analysis of mega-events can focus on them as tools of government policy or ideologies. In addition, threading together corporate event sponsorships, media audiences, and commodified entertainment, the effects of mega-events can be evaluated in the light of the accumulation and concentration of capital. A mega-event may be short lived, but it has an impact and meaning far beyond the event itself for the host city. Globalization and the economic restructuring of cities have both been powerful factors in the attractiveness of mega-events as stimulants to urban economic redevelopment. Urban boosters and advocates of pro-growth strategies claim long-term socio-economic development and job creation will benefit particularly from the hosting of mega-events. Undoubtedly, it is difficult and debatable to measure whether there really is a positive net effect of mega-events. The links between mega-events and urbanization have received much less attention in developing countries probably because of the transformation of urban spaces and the renewal of urban spaces, such as residential, retail, and entertainment development. Considering the speed of the development of urbanization in China, which contains lots of the fastest-growing cities in the world, this is most evident when associated with mega-event-related issues of city expansion.

The aim of the current study is to examine the coupling links between mega-events and city urbanization. To accomplish the aim of this study, we raise the following core project objectives. Firstly, data from 2010 to 2015 are used to reveal the rapid and dynamic changes and the degree of coupling between mega-events and urbanization. The second objective of this study is to evaluate the contributions of selected urbanization and mega-event subsystem indicators and identify the greatest respective contributions made by the indicators of each system. As regards the changes of urbanization level, it is important to identify the indicators, because this can provide a knowledge base to promote the coordination of mega-events and city urbanization. Finally, the third objective of this research is to identify the development stage and coordination degree between mega-events and city urbanization.

This paper is organized as follows. The Section 1 identifies gaps and generates major research questions. The Section 2 consists of a general review of the important, foundational research literature. This is followed by a Section 3 that deals with the research methods. The results of this study are reported in the fourth part of this paper. The conclusion is the final part of this research paper.

2. Literature Review

2.1. Mode Coupling Theory

Coupling is a concept in physics that refers to two or more circuit elements, between the input and output or electric network, between which there is close cooperation and mutual influence; the interaction can be from one side to the other side of the phenomenon of energy transmission [5]. In other words, coupling is a measure of two or more entities that depend on each other. The concept of coupling is referenced by subjects such as atmospheric science, water science, ecology, economics, and agricultural science and a concept of systematic coupling has been put forward. The concept of coupling with the host cities and events can be defined as: in certain areas, events, and the host city of the mutual promotion and coordinated development, at the same time, between components of the two systems, interact with each other to further common resources and elements of reasonable allocation and promote the optimization of industrial structure and the organization of the structure, city spatial structure, function structure, and the process of forming event space layout and city space layout integration in the regional economy [6]. Coupling between events and host cities is not only the coupling between the two systems but also the coupling between the two elements of the two systems [7]. Through the division of labor and urban development and cooperation, complementary advantages, in order to promote the optimal allocation of resources, upgrade the industrial structure of the event and the city's rational layout. With the increase in coupling degree, the elements of the two systems will be integrated organically into a regional dynamic open platform [8]. The network is made up of a sports network, a city network, and network resources. Through the network, the city space layout is decentralized, the industrial layout is centralized, and the city's efficiency is maximized; on the other hand, different cities have different city functions and economic functions to allocate more resources in the wider region and to obtain the spillover effect between the individual events, and a single city cannot reach [9]. In a certain area, the spatial and temporal coordination and the coordination between event development and urban expansion are emphasized by the coupling of events and host cities (See Figure 1). The factors of the coupling development between events and host cities include natural resources and social resources, such as government policy, human cohesion, local social habits, and local culture.

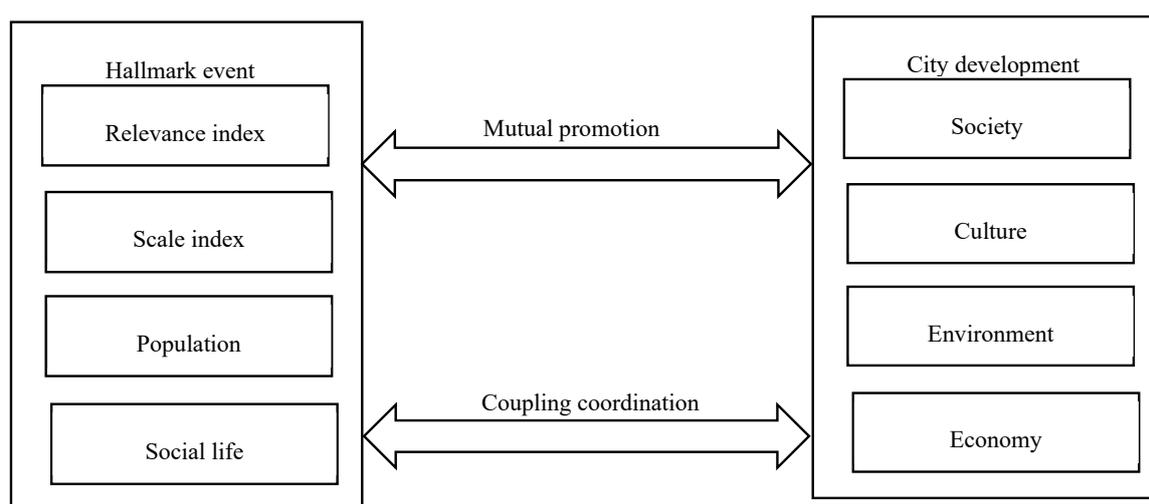


Figure 1. The coupling relevance model of hallmark event and city development.

2.2. The Relationship between Mega-Events and Urban-Development

The topic of examining the theoretical relationship between events and urban development has received more attention recently. Previous studies have found that there are many positive and negative effects generated by mega-sporting events in host cities. Malecki [10] stated that hosting

world expositions and fairs is important and significant for urbanization and destination competition. By analyzing the stadium project in Durban, Maennig and Du Plessis [11] argued that hosting a mega-event (along with the new facilities and infrastructural development required to organize it) will have positive effects on urban development. Fourie and Santana-Gallego [12] demonstrated that mega-sporting events increase predicted tourism by approximately 8% in the same year on average. As visitors spend money on food, transportation, accommodation, and entertainment in the host country, the induced demand will boost the local economy; this is referred to as “direct economic impact”. This expansionary effect will be further exaggerated by additional rounds of expenditure called the “multiplier effect”. Although the initial investment in preparatory projects can be expensive, the creation or enhancement of infrastructure will benefit the host country in the longer run. Furthermore, extensive media exposure can attract foreign investment and international trade for an extended period of time [13]. Such benefits may include the enhancement of the stock of human capital, management expertise, and the health condition of citizens. Absalyamov [14] examined the influence of cultural and sports mega-events on the improvement of the quality of life in the region. Ren [15] showed that international large-scale comprehensive sports events can significantly promote the development of sports venues and facilities and the construction of professional sports teams, so as to promote the development of sports undertakings in host cities. In the environment of economic globalization and capital internationalization, large-scale sports events have become an increasingly important catalyst for city development and have injected new impetus into the development of cities. However, mega-events also have a negative impact on almost every host city and region, and these impacts have been well documented. For example, several studies have confirmed that hosting mega-events can result in social, cultural, and environmental problems. Shin and Li [16] and Boykoff [17] argued that the positive expectations from the hosting of mega-sporting events can be wiped out by some adverse effects, such as budget overruns, delays in schedule, redundant infrastructure, and social differentiation.

2.3. Evaluation Indicator System

2.3.1. Mega-Event Indicators

Mega-events have gained considerable attention in recent years. There is no accepted definition of the size of a mega-event in the theoretical literature. Brent Ritchie [18] characterizes mega sporting events as having large amounts of visitors and participants, generating global publicity, significant role in economy marketing tactics (such as tourism), economic and social impact linked to the long-term legacy. For example, the impact of visitor frequency on the relationship between the event and impacts is positive and significant, but both positive and negative effects arise from increased visitor numbers [19]. From an economic perspective, if there are collaboration agreements between stakeholders, such as an event organizing committee, local enterprises, and the public, the biggest economic benefits of the event are gained by the host city and the location [20]. As it turns out, if an event is rooted locally, there will be closer regional cooperation. From a social perspective, it is also important to highlight the role of local society and public involvement because the values’ system of a society can be expressed by events, and traditions can be strengthened by events [21]. Compared to other types of events, the most socially valuable events accord with local needs in addition to stimulating exchanges of experiences and attitudes between visitors and locals. This value can be obtained by implementing public participation in event planning and execution [22]. Event images are also an important element from the perspective of social impacts. Richards and Wilson [23] argued that when events and the location positioning strategy are consistent with each other, the event will have the capacity to influence the image of the location. Bandi Tanner et al. [24] stated that the event performance index consists of seven key indicators: size, economic value, touristic value and destination image, innovative strength, value network, the value of participation and social exchange, and the relative environmental burdens.

According to this assessment, the indicators of mega-events include the scale index, relevance index, population, and social life.

2.3.2. Urban Development Indicators

More and more governments have considered urban development and renewal as a key national imperative. The existing literature has showed that there are many measures and index systems for assessing the level of development of urbanization. For example, to assess urbanization levels, Li et al. [25] and Ding et al. [26] presented a scientific and practical comprehensive evaluation index system of urbanization that included four dimensions: demographic, economic, social, and spatial. He et al. [27] investigated the economic, social, and environmental benefits of urban infrastructure as three typical benefits generated by urban growth. Among these, economic urbanization reflects the process and mechanism of rural economic transformation to an urban economy, which is the driving force of urbanization. It is measured by the GDP of a city, local financial revenue, the proportion of secondary industry in GDP, and the per capita disposable income of urban households. Social urbanization reflects the level of construction of public service facilities during the process of urbanization, and it is mainly shown in freight turnover, total annual import and export volume, the number of overseas visitors received, and per capita park size. The cultural development of urban areas is an important step towards urbanization and it is mainly reflected in urban population density, the quantity of employment, and education expenditure. The environment is the embodiment of new urbanization's intensive emphasis on environmental protection, represented mainly by GDP energy consumption, afforestation in the city, and environmental governance expenditure.

3. Methodology

3.1. Study Site and Context

Boao is a town located in Qionghai city in Hainan province. Boao has been the permanent venue of the Asia Forum since 2002. Qionghai city covers a large area of land in Hainan and has, via the Boao Forum for Asia, become the busiest forum and region for China's international economic development and cooperation and cultural activities. Qionghai further establishes and grows a well-developed brand through hosting the Boao Forum for Asia and the Miss World pageant to set up a high-end all media market platform for tourism brand promotion and international communication. The development model of the tourism development zone is based on a small tourism town and large projects supported by policies. Boao town is a typical tourism development zone, and it has taken full advantage of the brand strength of the Boao Forum for Asia and unique natural ecological resources to build a world-class tropical coastal tourist destination. The Forum has not only greatly increased the number of overseas tourists and accelerated the development of the tourism industry and urbanization but also attracts a large number of well-known international enterprises, thus promoting the integration of Qionghai city and the international market, communication, and the exchange of tourism economy and culture.

3.2. Data Source and Data Preprocessing

We have obtained the required mega-event data and urban development data from official statistics which range from 2010 to 2015. Before undertaking the analysis, the data needed to be normalized because of the different dimensions and magnitude of the selected indicators. All indicators can be classified into two categories, which are seen as both positive and negative; thus, there is a positive association between indicators and the conditions of system development. The indicators, as used and divided here, are changed into a non-dimensional numerical value using the following equation:

Positive indicator:

$$U_{ij} = \frac{X_{ij} - \min X_j}{\max X_j - \min X_j}$$

Negative indicator:

$$U_{ij} = \frac{\max X_j - X_{ij}}{\max X_j - \min X_j}$$

in the above formula, i represents the year, j represents the indicator, the normalization value is U_{ij} , the original value is X_{ij} , and $\max \{X_j\}$ and $\min \{X_j\}$ are the highest and the lowest values of the indicator j , respectively, across all the years that were studied. After processing, all values of the index are within the range of [0, 1].

3.3. Data Analysis

3.3.1. The Indices for the Evaluation of Mega-Events and City Development

To verify the coupling relations between a mega-event and the city development of Qionghai, with reference to indexes that have been created previously, aggregated index systems are constructed to measure the impacts of a mega-event and the consequences for urban development. The selection of all indicators had to be guided primarily on the basis of the following three selection criteria: (1) select highly cited indicators; (2) cover important elements in the development of a mega-event and urban development; and (3) choose the simplest indicators to facilitate data searching, data understanding, and data dissemination. According to the Pearson correlation analysis results, this study further chooses indicators that make up an index. Finally, 4 primary indexes and 12 secondary indexes constitute the mega-event index system, and 4 primary indexes and 14 secondary indexes form the urban development index system.

3.3.2. Evaluation of the Mega-Event and City Development Index System Indicators

The entropy method has become the most commonly used method in the field of urban development and it is also used to reveal the weight of each indicator in the mega-event and city development index systems. Depending on the information entropy and the degree of variation in the indicators, the importance given to each indicator can be calculated through the use of information entropy. The weight of each indicator is calculated as follows (where n represents index numbers, and m means years):

The proportion of the indicator j in year i :

$$P_{ij} = \frac{X'_{ij}}{\sum_{i=1}^m X'_{ij}}$$

Information entropy of the indicator:

$$E_j = -k \sum_{i=1}^m P_{ij} \ln(P_{ij})$$

Entropy redundancy:

$$D_j = 1 - E_j$$

Weight of the indicator:

$$\lambda_i = \frac{D_j}{\sum_{j=1}^n D_j}$$

Evaluation of the indicator:

$$U_{i=1,2} = \sum_{j=1}^n \lambda_{ij} U_{ij}, \sum_{j=1}^n \lambda_{ij} = 1$$

In the system of a mega-event index and city development indicators, this study uses the entropy method to determine the important role of each indicator, thus resulting in an output similar to the one shown in Tables 1 and 2, respectively.

Table 1. Coupling coordination interval and degree.

Serial Number	Coordination Degree Interval	Coordination Level
1	0–0.1	Extreme imbalance
2	0.001–0.2	Serious imbalance
3	0.2001–0.3	Moderate imbalance
4	0.3001–0.4	Mild imbalance
5	0.4001–0.5	Nearly imbalance
6	0.5001–0.6	Barely coordination
7	0.6001–0.7	Primary coordination
8	0.7001–0.8	Intermediate coordinate

Table 2. The integrated assessment value and coupling coordination degree between the Boao Forum for Asia and Qionghai's development.

Year	U_1 (BFA)	U_2 (The Development of Qionghai)	C	D	Evaluation
2010	0.0562	0.159	0.4393	0.2276	Moderate imbalance
2011	0.1598	0.302	0.4757	0.3415	Mild imbalance
2012	0.2697	0.3583	0.495	0.3998	Nearly imbalance
2013	0.5363	0.4582	0.4985	0.4939	Nearly imbalance
2014	0.6855	0.6911	0.5	0.5869	Barely coordination
2015	0.8188	0.7707	0.4998	0.6283	Primary coordination

3.3.3. The Coupling Coordination Degree Model

Coupling explores the theoretical phenomenon of the mutual influence of two or more systems through interactive mechanisms. Though the concept of coupling has been discussed thoroughly, as well as being applied frequently in studies of urban development, it has seldom been used to further examine the interactive relationship between urbanization and mega-events. Owing to the system evolution process of urbanization and mega-events having multi-component and multidisciplinary features, a systemic approach is required for successful results. Thus, this study constructs and examines a coupling relationship assessments model. The coupling degree model is described by the coupled system, the equation for which is shown below:

$$C_n = \left\{ (m_1 \cdot m_2 \cdots m_n) / \left[\prod (m_i + m_j) \right] \right\}^{\frac{1}{n}}$$

Due to some striking similarities in the relationship between a mega-event and urban changes, it is quite different for complex systems. Coupling, despite its origins in physics, is still considered appropriate for exploring mega-events and their relationship to urban development. This study establishes a coupling coordination degree model for mega-events and urban development, as follows:

$$C = \left\{ (U_1 \times U_2) / [(U_1 + U_2)(U_1 + U_2)] \right\}^{\frac{1}{2}}$$

The coupling degree of a mega-event and urban development is represented by C , the mega-event system is represented by U_1 , and the urban development is U_2 . The coupling coordination degree model of a mega-event and urban development is further established as the following formulas:

$$D = (C \times T)^{\frac{1}{2}}, \quad T = \alpha U_1 + \beta U_2$$

in the above equation, the coupling coordination degree between a mega-event and urban changes is represented by D , T denotes the level of impact of a mega-event and urban changes, α represents

the contribution of a mega-event to the comprehensive system, and β is the contribution of urban development to the comprehensive system. The overall coupling degree of urbanization and a mega-event can be classified into three primary development stages, which can be broken down further into three subclasses. Ultimately, twelve different sub-classes of development stages are established to explain the coupling relation between U_1 and U_2 . The development index generated by the comprehensive coupling and the twelve classifications is shown in Table 2.

4. Results

4.1. Analysis of the Mega-Event and Urban Development Index System

The significance of a high or low correlation coefficient, in which the subsystem indexes were used and compared in this study, is shown in Table 3. A detailed description of the comprehensive index is constructed, as shown in Table 1, and the weight of each indicator can be estimated by using the entropy weighting technique. All four key indicator indexes of mega-events—scale index, relevance index, population index, and social life index—are then ranked by the importance assigned to particular values, with the following result: relevance index (36.58%) > social life (23.67%) > population (23.26%) > scale index (16.49%). In the four-primary system, economy (29.53%) is the highest weighting indicator and exerts the most considerable impact on city development at a comprehensive level. The rest of the indicators are ranked as follows: environment (24.35%), culture (23.48%), social (22.64%). These observations suggest that the economy was the major driving force for urbanization in Qionghai from 2010 to 2015.

Table 3. The evaluation indicators system and its weights on the coupling mega-event system and urban development system.

Items	First Class Indexes	Weight	Second Class Indexes	Weight	Type
Mega-mark event	Scale index	0.1649	Total Investment in Fixed Assets	0.4694	+
			Fixed assets as a percentage of GDP	0.5306	+
	Relevance index	0.3658	Tourism Income	0.2695	+
			Number of visitors	0.3424	+
			Real estate investment	0.168	+
			The proportion of tertiary industry in GDP	0.2201	+
	Population	0.2326	the number of employees in tertiary industry	0.284	+
			Newly employed population	0.2618	+
			Population urbanization rate	0.4542	+
	Social life	0.2367	road area per citizen/m ²	0.3017	+
			Added value for transportation, storage and postal services	0.3467	+
			total retail sales of consumer goods	0.3516	+
Economy	0.2953	GDP of a city	0.1668	+	
		local financial revenue	0.2314	+	
		The proportion of secondary industry in GDP	0.4386	−	
		Per capita disposable income of urban households	0.1631	+	
Culture	0.2348	urban population density	0.5534	−	
		quantity of employment	0.2314	+	
		Education expenditure	0.2152	+	
Society	0.2264	Freight Turnover	0.229	+	
		Total annual import and export volume	0.1924	+	
		The number of overseas visitors received	0.3727	+	
		Per capita park size	0.2059	+	
Environment	0.2435	GDP energy consumption	0.2432	−	
		Afforestation coverage in the city	0.2959	+	
		Environmental governance expenditure	0.4609	+	

As shown in Table 3, urban population density (55.34%), environmental governance expenditure (46.09%), the proportion of secondary industry in GDP (43.86%), and the number of overseas visitors

received (37.27%) had the largest influence on the urban development subsystem. Thus, indices for urban management are developed in terms of population and population density. Such indices can play key roles in urban planning and management processes. This issue is of great importance in the context of the increasing impact of large-scale events and the deepening process of urbanization. In general, two key indicators, the economy indicator and the environment indicator, have a strong influence on urban development.

4.2. Coupling Analysis of Mega-Event Values and Urban Development

By using different cases for mega-events and urban development, this study examines the degrees of coupling coordination and the impacts of a mega-event on urban development ($\alpha = 1/3, \beta = 2/3$; $\alpha = 1/2, \beta = 1/2$; $\alpha = 2/3, \beta = 1/3$). Table 2 demonstrates each case and the degree of coupling between urbanization and large-scale events from 2010 to 2015. A comparison of the results concerning various cases of coupling shows that the cases differ slightly, though several consistent trends emerge. These results suggest that the coupling degree has not been affected significantly by the importance of urban development indicators and mega-event indicators. Thus, we focus primarily on the general trends revealed in this study.

This study collected data covering a period of five years; the data show an uptrend, marked by an overall increase of the coordinated coupling degree between urbanization and mega-events, and S-shaped curves are produced. According to the results, this study divides the evolution of the coupling system into three distinct time periods (2010–2012 (two years), 2013–2014 (one year), and 2014–2015 (two years)). Our analysis takes into account the different degrees of coupling coordination and the level of comprehensive urban development and mega-events during these periods. The results of the analysis can be shown as follows (see Figure 2):

- (1) 2010–2012: In the initial stage, there is a general increasing trend of the coupling degree between a mega-event and city development. More specifically, the development level of the Boao Forum for Asia was lower than the level of the city development during this time. Studies have found that the processes of a mega-event and city development are not coordinated. In fact, mega-events and city development have a mutually adverse effect, and this may be why the Boao Forum for Asia event lags considerably behind urbanization.
- (2) 2013–2014: During these two years, the overall coupling degrees between the event and the city development remain at a higher level, showing cross-level change. Gradual improvement of the comprehensive event subsystem level and comprehensive city development subsystem level is achieved between these two years, and the coupling degree is more balanced and stable. The coupling degree transforms from the “slightly unbalanced” to the “nearly balanced” development stage and remains balanced.
- (3) 2014–2015: The city development of Qionghai experiences a remarkable period of rapid growth during this year and is barely balanced with a high coupling degree. Subsystems of events have recently undergone rapid growth, and, at the same time, city development subsystems have seen steady growth in the past two years. The “Primary balanced development” stage between the mega-event and city development begins in 2014, and, since then, the developmental trajectory of the mega-event and the city development have shown comprehensive coordination.

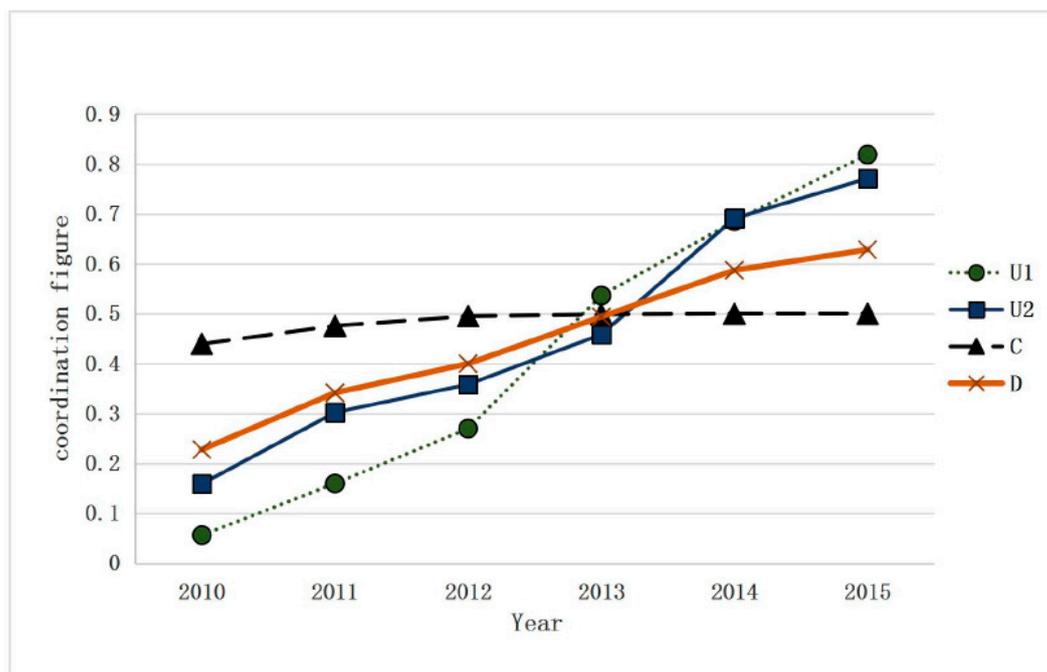


Figure 2. The coupling dynamic evolutionary of the Boao Forum for Asia and Qionghai's development.

On the basis of the above analyses, this study has produced significant and meaningful results by coupling the coordination degree model to the development of Qionghai's future. As the permanent venue of the Boao Forum for Asia and one of the most rapidly growing cities for tourism in China, analyzing the critical factors that influence the future of urban sustainability and identifying the coupling coordinated relationship between the Boao Forum for Asia and Qionghai's urban development have played a significant role in its success. The results of empirical testing show that the rapid urban growth of Qionghai placed significant influence on the Boao Forum for Asia in the early stages. During the period 2010–2012, there was an imbalance in the coupling relationship between Qionghai's city development and the Boao Forum for Asia. The results also reveal that implementing an effective strategy has become increasingly important for the process of city development and the Boao Forum for Asia. The coupling relations between city development and the Boao Forum for Asia have transformed from “nearly imbalanced” to “primary coordination” after the implementation of the foundational scientific strategic plan.

5. Discussion and Conclusions

5.1. Theoretical Implications

Three major theoretical contributions can be identified to the current mega-event literature on urban development. The first theoretical contribution of this study is in providing an examination of the relationship between a mega-event and urban development in Qionghai city by developing a coupling model. To the best of our knowledge, few studies have been conducted using the coupling analysis to examine the relationship of mega-events to city development in developing countries. To fill this gap, this study formulated a model of coupling coordination degree and demonstrated the interaction between and the influences of a mega-event and urban development on each other. As noted above, the proposed degree of the coordinated coupling model describes an “S”-shaped curve between the Boao Forum for Asia and city development of Qionghai in the period 2010–2015. The coupling relationships of Qionghai urbanization and the Boao Forum for Asia undergo periods where things are unbalance at first and then grow into a barely balanced development stage and primary coordination. Mega-events, such as the Boao Forum for Asia, have garnered much attention

over the past few years, especially during periods of rapid urbanization. Research has found that the mega-events' projects can improve the local economy and enhance competitiveness, and the dynamic coupling of the Boao Forum for Asia to urban development was strengthened simultaneously.

Secondly, Müller [28] argued that more empirical studies are needed to explore the size, costs, and impacts of large-scale events in greater depth. This study has proposed a new comprehensive index to assess mega-events and their relationship to urban development and the weight of evaluating indicators. Among the primary indicators, the relevance index and economy have been found to be more effective than others. The idea was supported by Sanders [29], who argued that the adequate facility and other public conveniences development projects for business and leisure travelers are part of the mega-event strategy, which can extend traditional approaches to business and economic development. However, the strategy of staging a mega-event was different and was considered to be a way to generate economic growth because the impacts of mega-events will vary depending on their size. Many events, such as a Superbowl or a political convention, can create clear focal points that attract tourists and attention to a destination. Attracting sufficient size and scope is one of the central goals of a mega-event strategy to encourage and support local development projects.

Thirdly, quantitative analysis shows that Qionghai's mega-event and urban development levels have increased substantially: the increment speed of urban development is higher than the increase speed of mega-event before 2012 and it has a good promotion role in the development of urban development. Since 2012, urban development has developed rapidly and exceeded the level of mega-event development to promote faster mega-event development. The coupling degree between the mega-event system and the urban development system is between 0.2 and 0.8, which is in the antagonistic stage and is gradually approaching the integration stage; this shows that mega-event development and urban development are in a common development state. The fluctuation in the coupling coordination degree between the mega-event system and the urban development system increases gradually, changing from a low coordination coupling to a good coordination coupling stage, and it is expected to enter a stage of high-quality coordination and coupling in the future.

5.2. Managerial Implications

The findings of the current study provide some interesting insights for city managers. This research has identified the interaction between mega-events and urban development. It is very important for the Boao Forum for Asia and Qionghai's urban development to promote each other and to promote the coupling between the Boao Forum for Asia and Qionghai's urban development. This study can leverage the greatest benefit and help guide future urban development by interacting with mega-events such as the Boao Forum for Asia. Firstly, the process of a city mega-event selecting the bid, according to the comprehensive economic strength of city development, system infrastructure, government management, human resources, and the quality of the citizens, involves a degree of opening up conditions to choose their own development of the mega-events. Taking into account the impact of a mega-event on the city economy, population, society, and environment, some events have little effect on the city's comprehensive economic and environmental aspects, and the local government is easily ignored, causing the government to provide insufficient support for the event, thus affecting the development of events in the locality.

Second, this study shows that mega-events, as planned events, have become the driving force of destination managers because of the economic impacts and functions of such events. In the increasingly fierce competitive environment, the city's core competitiveness determines the status of the city in international competition, and urban brand plays a particularly important role in the city's core competitiveness. Once the city has the right to host a mega-event, it will receive the attention of the global news media in the long process of preparing to to host the mega-event [30,31]. All the efforts made by government departments toward the success of a mega-event are easy to publicize and promote, which requires government departments to strive to improve their organizational capabilities, ensure government information publicity, and increase communication and exchanges. On the other

hand, by organizing a mega-event, the characteristics of the host city, including its history and culture, tourism scenery, economic strength, and efficient government, will be on display and promote an understanding of the city in the world outside of the city. Eventually, this enhances the visibility of the city and its core competitiveness. A city in the process of organizing a mega-event should not just focus on ensuring the success of the mega-event but should also consider improving the city development plan and the connections between hosting mega-events and city development. The city should select the important elements in its development that are linked closely with mega-events, grasp the opportunity to organize mega-events, and comprehensively publicize and market the city brand. Smith [32] argued that event support might relate to the communities as well as the event itself, which force destinations (cities) to solve event-related problems. The impacts of salient issues are likely to work both ways. A well-executed event can also create opportunities if these issues are handled properly by the destination. In addition, hosting events that are very attractive to communities and destinations is key to ensuring a successful event. Thus, there are internal correlations between event success, global competitiveness, and the urban development of the destination city.

Thirdly, this study has demonstrated that the construction and development of urban infrastructure can promote the rapid development of the urban economy and society. To develop a city, we must first build infrastructure. Infrastructure is the foundation of urban development and it embodies the level of urban construction. Only when the infrastructure is well-established and the people's lives have a proper material base can urban social and economic activities be carried out smoothly. For example, the preparation and hosting of a sport event placed some pressure on Beijing's urban transportation. However, mega-events can also be funded by both domestic and foreign funds. The government and the people will also sponsor a mega-event. This is actually a kind of financing for a mega-event. These inputs provide funds for the transformation and construction of urban transportation infrastructure and effectively promote the improvement and upgrading of urban infrastructure. In preparation for the event, for the orderly protection of infrastructure construction, the municipal government must do transportation planning. First, the relevant departments must estimate the traffic flow during the event, such as the maximum traffic flow; this is the basis of traffic planning. Secondly, according to the actual situation and the estimation, results are a reasonable and effective way to develop a long-term development plan and formulate corresponding development strategy. Finally, according to the long-term plan and the strategic estimation of investment funds, an investment plan must be made to ensure minimum investment for maximum social benefits. This will not only enable the effective planning of the transportation infrastructure but can also optimize the living environment in improving traffic through a mega-event, changing the appearance of the city.

6. Limitations and Suggestions for Future Research

There are several limitations to this study that offer direction for future research. First, studies that consider indicators are limited, and developing more indicators is the most urgent requirement in further research. Secondly, this study is written from an urban tourism perspective to identify the coupling relationship between a mega-event and urban development for Qionghai. There is a need to explore existing developments, particularly in other urban areas. Last but not least, considering the limited official data of the Boao Forum for Asia, this study uses only five years of research data and analysis, and further research that uses more data is recommended.

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