

Empirical Study on the Economic Impact of Small and Medium-Sized Sports Events on China's New First-tier Cities

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Abstract: To investigate the impact of medium and large sports events on the economies of first-tier cities in China, this study employs the ordinary least squares method to analyze the relationship between economic growth, the frequency of sports events, and industrial output in six cities—Guangzhou, Nanjing, Jinan, Shenyang, Tianjin, and Xi'an—that hosted events such as the National Games and marathons from 2000 to 2023. The empirical results indicate that the frequency of small and medium-sized sports events, along with factors such as financial and retail industry output, have a positive impact on economic development. Furthermore, due to varying levels of development, the specific industries impacted by sports events differ across cities. This research demonstrated that the rational planning of medium and large sports events can contribute to urban economic development.

Keywords: Sports Events; Economic Growth; Industrial Output; Regression Analysis

1. Introduction

In recent years, sports events have become a significant engine driving urban economic development. By hosting various types of sports events, cities can not only enhance their international visibility but also stimulate the development of related industries such as tourism, catering, and accommodation, increase employment opportunities, and promote regional economic growth. Especially in China's second-tier cities, small and medium-sized sports events are increasingly valued and have become new highlights in urban economic development. However, compared to large sports events, the economic impact of small and medium-sized sports events has been relatively understudied, lacking systematic theoretical and empirical

analysis.

Baade and Matheson found that although large sports events like the Olympics and the World Cup have a significant short-term impact on the host city's economic growth, their long-term effects are not significant [1]. Preuss proposed that the economic impact of sports events is reflected not only during the event but also in the infrastructure construction and long-term branding effects before and after the event [2]. Quirante et al. examined the economic impact of the 2021 Senior and Elite Badminton World Championships, highlighting significant short-term economic benefits through increased visitor spending [3]. Wang showed that the Beijing Olympics positively impacted GDP growth, employment, and tourism revenue in the Beijing area [4]. Liu found that the Asian Games in Guangzhou had significant effects on urban infrastructure construction and the improvement of citizens' quality of life [5]. Zhang noted that while large sports events significantly promote urban economic development, the study of small and medium-sized sports events is still insufficient and needs further exploration [6]. Li through his study of the Qingdao International Sailing Week, found that small and medium-sized sports events can significantly promote the development of the city's tourism and related service industries [7]. Zhao showed that small and medium-sized sports events positively impact the enhancement of city brand image and the improvement of residents' quality of life [8]. Chen pointed out that although small and medium-sized sports events are not large in scale, their high frequency has a sustained promoting effect on urban economies [9]. Chutipongdech and Kampitak reviewed key success factors in sports event management, emphasizing the importance of organizational capabilities and stakeholder engagement in enhancing economic outcomes [10]. Quirante et al. examined the economic impact of the 2021 Senior and Elite Badminton World

Championships, highlighting significant short-term economic benefits through increased visitor spending [11].

This paper studies the relationship between economic growth and structural evolution from 2000 to 2023, using Guangzhou, Nanjing, Jinan, Shenyang, Tianjin, and Xi'an as case studies. Guangzhou, as the capital of China's most economically developed province, has accumulated years of reform and opening-up experience. Tianjin, as an important city in the Beijing-Tianjin-Hebei coordinated development, is geographically close to the capital Beijing and plays a significant role in northern China's economic development. Nanjing, Jinan, Shenyang, and Xi'an, as provincial capitals, represent the highest level of development in their respective regions and have gradually developed their unique industrial advantages. What are the commonalities and differences in the impact of small and medium-sized sports events on these distinctive cities? This research will provide valuable insights into the economic effects of sports events.

2. Overview of Economic Development in Guangzhou, Nanjing, Jinan, Shenyang, Tianjin, and Xi'an

This study selected Guangzhou, Nanjing, Jinan, Shenyang, Tianjin, and Xi'an as the research objects. These six cities hosted multiple small and medium-sized sports events, such as the National Games and marathons, from 2000 to 2023, providing a rich data foundation and research value.

2.1 Standards for Small and Medium-Sized Events

An event is recognized as a small or medium-sized event if it meets at least three of the following five criteria:

Finally in the number of participants: Typically, the number of athletes ranges from hundreds to thousands, and the total number of staff, including referees, coaches, and volunteers, is relatively small.

Secondly in the number of spectators: The number of on-site spectators is fewer than 50,000, or the number of television and online viewers is mainly concentrated locally or regionally.

Thirdly in the duration: The event lasts for a short period, generally one to several days.

Fourthly in the media coverage: The event is primarily covered by local or regional media, including television, the internet, newspapers, and social media, with relatively limited international media coverage and broadcasting. Finally in the economic impact: The event has a certain promotional effect on the local economy of the host city, mainly in tourism, catering, and accommodation, but the overall impact is relatively small, with event budgets typically ranging from tens of thousands to millions of dollars.

2.2 Guangzhou

As shown in Figure 1, Guangzhou is the economic center of southern China and hosted the 2010 Asian Games. The Asian Games significantly promoted Guangzhou's economic development and urban construction, particularly in infrastructure development and service industry growth. Studying Guangzhou can explore the long-term economic impact of large sports events on the city.

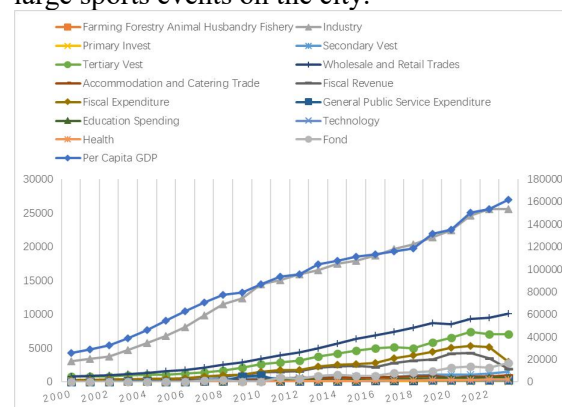


Figure 1. Distribution of Guangzhou's Three Industries from 2005 to 2022

From Guangzhou's economic data from 2000 to the present, it can be observed that the per capita disposable income of urban residents and the output value of various industries have significantly increased from 2000 to 2023. The per capita disposable income of urban residents increased from 25,758 yuan in 2000 to 161,634 yuan in 2023. The total industrial output value increased from 310.002 billion yuan to 2.55295 trillion yuan, and the total wholesale and retail trade volume increased from 81.28 billion yuan to 1.006792 trillion yuan, reflecting significant economic growth and development in Guangzhou during this period. Meanwhile, fiscal revenue and expenditure have also

increased substantially, from 21.99077 billion yuan and 25.85965 billion yuan to 194.415 billion yuan and 297.166 billion yuan, respectively.

2.3 Nanjing

As shown in Figure 2, Nanjing, as a historical and cultural city in China, has actively hosted various small and medium-sized sports events in recent years, such as the Nanjing International Marathon and the Nanjing International Dragon Boat Race. These events have injected new vitality into the city and promoted the development of local tourism, catering, and accommodation industries. As a research object, Nanjing can provide valuable cases on the multiple impacts of small and medium-sized sports events on urban economies.

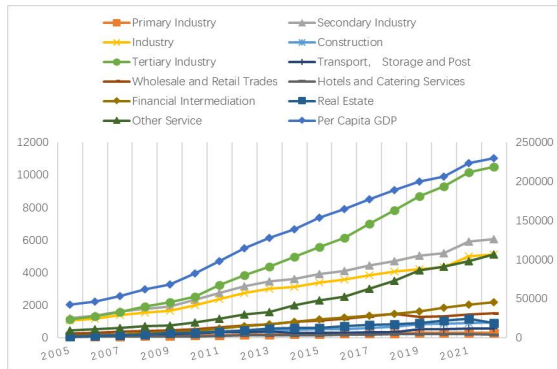


Figure 2. Distribution of Nanjing's Three Industries from 2005 to 2022

From the economic data of Nanjing from 2005 to the present, it can be observed that the per capita regional GDP increased from 19,838 yuan in 2000 to 229,558 yuan in 2022. The output value of various industries has also significantly increased. The output value of the primary industry increased from 8.004 billion yuan in 2005 to 31.556 billion yuan in 2022. The output value of the secondary industry increased from 120.028 billion yuan to 606.964 billion yuan, and the output value of the tertiary industry increased from 113.079 billion yuan to 1.052265 trillion yuan. The output values of major industries such as manufacturing, wholesale and retail, construction, transportation, and finance have all significantly increased, reflecting the rapid economic development and overall strength enhancement of Nanjing.

2.4 Jinan

As shown in Figure 3, Jinan, as the capital of

Shandong Province, boasts abundant natural resources and cultural heritage. By hosting small and medium-sized sports events such as the Jinan International Marathon and the Jinan International Dragon Boat Race, Jinan has not only enhanced its city profile but also effectively promoted local economic development. As a research object, Jinan can reveal the practical effects of small and medium-sized sports events on economic driving, tourism development, and social impact.

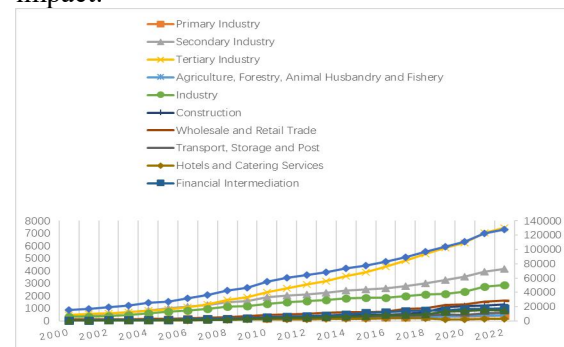


Figure 3. Distribution of Jinan's Three Industries from 2000 to 2022

From Jinan's economic data from 2000 to the present, it can be observed that the per capita regional GDP increased from 15,356 yuan in 2000 to 128,287 yuan in 2022. The output value of various industries has also significantly increased. The output value of the primary industry increased from 10.927 billion yuan to 42.052 billion yuan. The output value of the secondary industry increased from 46.823 billion yuan to 418.024 billion yuan, and the output value of the tertiary industry increased from 47.135 billion yuan to 742.67 billion yuan. The output values of major industries such as manufacturing, wholesale and retail, construction, transportation, and finance have all significantly increased, reflecting the rapid economic development and overall strength enhancement of Jinan.

2.5 Shenyang

As shown in Figure 4, Shenyang, as an important city in Northeast China, showcases its vitality and charm by hosting small and medium-sized sports events such as the Shenyang International Marathon and the Shenyang International Dragon Boat Race. These events play a significant role in promoting local economic growth, increasing employment, and enhancing the city's brand image. As a research object, Shenyang can

provide specific practical cases of the economic and social development impact of small and medium-sized sports events.

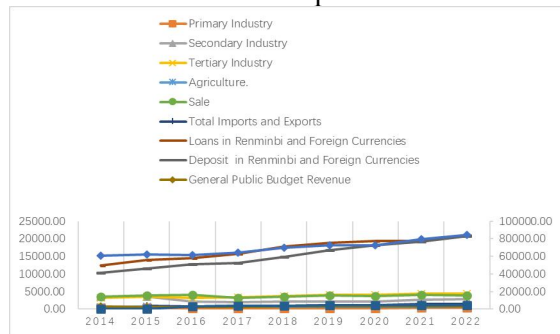


Figure 4. Distribution of Shenyang's Three Industries from 2014 to 2022

From Shenyang's economic data from 2014 to the present, it can be observed that the per capita regional GDP increased from 60,625 yuan in 2014 to 84,268 yuan in 2022. The output value of various industries has also significantly increased. The output value of the primary industry increased from 32.53 billion yuan to 33.52 billion yuan. The output value of the secondary industry decreased from 354.11 billion yuan to 288.55 billion yuan, while the output value of the tertiary industry increased from 323.23 billion yuan to 447.51 billion yuan. The total output value of agriculture, forestry, animal husbandry, and fishery, the total retail sales of consumer goods, the total import and export volume, the balance of deposits and loans of financial institutions, and the general public budget revenue and expenditure have all grown to varying degrees, reflecting Shenyang's steady economic development and overall strength enhancement.

2.6 Tianjin

As shown in Figure 5, Tianjin is an important port city and economic center in China. By hosting small and medium-sized sports events such as the Tianjin International Marathon and the Tianjin International Dragon Boat Race, Tianjin has achieved remarkable results in enhancing its city image and promoting economic development. These events have driven the development of tourism, catering, and service industries. As a research object, Tianjin can provide rich data support for studying the economic impact of small and medium-sized sports events.

From Tianjin's economic data from 2005 to the present, it can be observed that the per capita regional GDP increased from 30,567.05 yuan

in 2005 to 119,234.96 yuan in 2022. The output value of various industries has also significantly increased. The output value of the primary industry increased from 11.238 billion yuan to 27.315 billion yuan. The output value of the secondary industry increased from 163.053 billion yuan to 603.893 billion yuan, and the output value of the tertiary industry increased from 141.569 billion yuan to 999.926 billion yuan. The output values of major industries such as manufacturing, construction, wholesale and retail, transportation, warehousing and postal services, accommodation and catering, information transmission, software and information technology services, finance, and real estate have all significantly increased, reflecting the rapid economic development and overall strength enhancement of Tianjin.

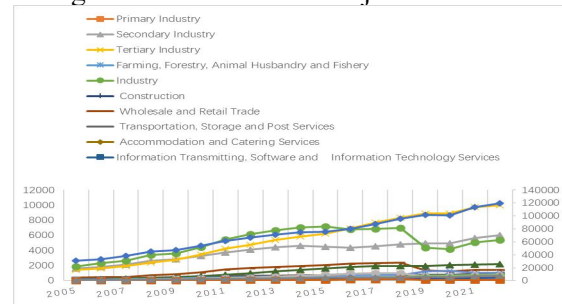


Figure 5. Distribution of Tianjin's Three Industries from 2005 to 2022

2.7 Xi'an

As shown in Figure 6, Xi'an, as the starting point of the ancient Silk Road and a historical and cultural city in China, has enhanced its international visibility and attractiveness in recent years by hosting small and medium-sized sports events such as the Xi'an International Marathon. These events have not only promoted urban economic development but also injected new momentum into local tourism and related industries. As a research object, Xi'an can reveal the dual role of small and medium-sized sports events in cultural heritage and economic development.



Figure 6. Distribution of Xi'an's Three Industries from 2000 to 2022

From Xi'an's economic data from 2000 to the present, it can be observed that the per capita regional GDP increased from 9,484 yuan in 2000 to 88,806 yuan in 2022. The output value of various industries has also significantly increased. The output value of the primary industry increased from 4.465 billion yuan to 36.206 billion yuan. The output value of the industrial sector increased from 21.844 billion yuan to 243.907 billion yuan, and the output value of the construction industry increased from 5.869 billion yuan to 168.619 billion yuan. The output values of major industries such as wholesale and retail, transportation, warehousing and postal services, accommodation and catering, finance, and real estate have all significantly increased, reflecting the rapid economic development and overall strength enhancement of Xi'an.

3. Empirical Tests and Results

3.1 Descriptive Statistical Analysis

As shown in Table 1, from 2000 to 2023, an analysis of Guangzhou's economic data shows significant growth in GDP and residents' income (INCOME). The tertiary industry (THIRD) dominates the economy, with active consumption expenditure (CONSUMPTION) and import/export trade (IMPORT/EXPORT). Expenditure on public services, including education (EDU), technology (TECH), and health (HEALTH), is relatively high. Correlation analysis indicates that GDP is significantly positively correlated with consumption expenditure (CONSUMPTION), residents' income (INCOME), and the tertiary industry (THIRD), reflecting coordinated economic development and the government's emphasis on public services.

Table 1. Descriptive Statistics of Guangzhou's Economic Data

Variable	Mean	Median	Man	Min	Std	Variance	Skewness	Kurtosis
GDP	91425.58	40650.6	25758	94387	161634	-0.04558	-0.95719	1.025534
CONSUMPTION	28780.13	13459.89	10671.78	29350.09	49480.27	0.040824	-1.50609	2.108664
INCOME	39741.48	22151.71	13380.47	36245.8	80500.86	0.467409	-1.10895	2.045428
ARGI	348.1579	132.767	163.05	358.7	582.79	0.178852	-1.04027	1.269602
INDUSTRY	14374.21	7339.029	3100.02	15481.59	25574.41	-0.12203	-1.20534	1.512619
FIRST	8.289167	8.423723	0.8	3.705	33.77	1.452857	2.11524	9.533354
SECOND	652.7571	360.6672	141.13	613.075	1511.13	0.555637	-0.07471	1.172818
THIRD	3422.473	2286.242	775.88	3003.305	7381.6	0.391075	-1.26869	2.122391
INPORT	456.3546	196.2047	114.13	540.45	712.58	-0.54103	-1.09814	2.286267
OUTPORT	549.5554	288.8575	116.24	576.945	976.19	-0.14312	-1.43333	2.008521
SALE	4722.06	3185.54	812.8	4156.475	10067.92	0.303223	-1.43451	2.26181
HOTEL	482.0929	263.5301	142.53	477.01	944.7	0.173317	-1.51811	2.236285
GINCOME	1748.683	1305.348	219.9077	1557.41	4307.964	0.518805	-0.83074	1.767527
GEXPEND	2143.219	1684.956	258.5965	1795.13	5286.932	0.609874	-0.89314	2.221539
SERVICE	217.423	225.8878	32.9561	138.3666	977.3199	2.455176	6.239393	43.92488
EDU	248.5216	214.1389	25.1923	199.4148	643.39	0.674066	-0.99653	2.676607
TECH	87.0711	83.14453	1.5293	55.2562	243.9456	0.548818	-1.18236	2.472496
HEALTH	122.1209	120.2592	12.1814	71.2773	364.7	0.902643	-0.60585	3.385803
GOVFINANCE	803.5092	857.3147	17.8772	532.6852	2788.3	0.884124	-0.32901	2.995895

As shown in Table 2, from 2005 to 2022, Nanjing's GDP and various industries have shown steady growth. The secondary and tertiary industries are the main drivers of economic growth, with financial

intermediation and other service industries also showing significant development. Overall, Nanjing's economic structure is balanced, development is stable, and the data distribution is relatively symmetrical and smooth.

Table 2. Descriptive Statistics of Nanjing's Economic Data

Variable	Mean	Median	Max	Min	Std Dev	Variance	Skewness	Kurtosis
Per GDP	132093	133310	229558	42026	63868	4079092000	0.03	-1.43
Primary	201.95	209.45	315.56	80.04	81.34	6615.94	-0.18	-1.4
Secondary Industry	3480.1	3537	6069.6	1200	1564.1	2446446	0.09	-1.18
Industry	2979.7	3058.4	5139.6	1043	1311	1718828	0.04	-1.2
Construction	501.15	479.31	931.45	157.1	258.45	66796.77	0.41	-1.01

Tertiary	5127.8	4669.8	10523	1131	3171.6	10059270	0.38	-1.23
Transport	336.21	326.69	574.81	143	137.12	18801.78	0.52	-0.68
Sale	895.01	896.27	1500.4	274.9	436.8	190798.13	-0.03	-1.61
Hotels	145.08	150.02	234.97	50.8	63.15	3987.79	-0.11	-1.51
Financial Intermediation	972.55	912.5	2200	114.5	672.2	451852.79	0.36	-1.08
Real Estate	563.89	583.49	1160.7	88.3	327.83	107470.08	0.17	-1.03
Other Service	2212.2	1794	5132.5	459.3	1572.3	2471973.44	0.6	-1.05

Table 3. Descriptive Statistics of Jinan's Economic Data

Variable	Mean	Median	Max	Min	Std Dev	Variance	Skewness	Kurtosis
Per GDP	61645	60207	128287	15356	35353.61	1.25E+09	0.37	-1.01
Primary	248.1	259.32	420.52	109.27	100.84	10168.71	0.03	-1.35
Secondary	2013	2058.29	4180.2	468.23	1115.15	1243697	0.31	-0.85
Tertiary	3033	2613.49	7426.7	471.35	2219.09	4924072	0.6	-0.85
Agriculture	238	237.9	441.62	96.02	110.33	12172.53	0.27	-1.13
Industry	1438	1507.9	2869	331.97	763.79	583370.8	0.14	-0.94
Construction	442	321.1	1321.7	82.77	397.8	158241.8	1.24	0.32
Wholesale	620.7	523	1622	114.91	477.97	228460	0.82	-0.38
Transport	294.9	296.6	667.53	58.85	178.91	32010.57	0.46	-0.69
Hotels	120.1	140.69	237.56	26.22	66.73	4452.27	-0.05	-1.26
Financial	433	330.1	1029.8	39.94	345.72	119525.1	0.46	-1.33
Real Estate	320.3	255	876.95	21.5	282.98	80078.28	0.79	-0.63

As shown in Table 3, from 2000 to 2022, Jinan's GDP has shown significant growth, with an average value of 6,164.5 billion yuan. The tertiary industry has become the main driver of economic growth, with an average value of 303.3 billion yuan, indicating the significant contribution of the service sector to economic development. Meanwhile, the secondary industry and industrial sector also demonstrated robust development, with average values of 201.3 billion yuan and 143.8 billion yuan, respectively, highlighting the importance of manufacturing and construction. The notable growth in the construction and wholesale industries, with average values of 44.2 billion yuan and 62.07 billion yuan respectively, indicates active infrastructure and commercial activities. Additionally, the financial and real estate sectors have also developed significantly, with average values of 43.3 billion yuan and 32.03 billion yuan respectively, reflecting the diversification and investment potential of the city's economy. Jinan has maintained balanced development across various industries, with a stable economic structure and positive growth trends. As shown in Table 4, from 2014 to 2022, an

analysis of Shenyang's economic data shows that the GDP had an average value of 69,739 billion yuan. The tertiary and secondary industries are the main drivers of economic growth, with average values of 3,765.6 billion yuan and 2,551.9 billion yuan, respectively. These two industries hold significant positions in the economic structure, reflecting the substantial contributions of the service and manufacturing sectors. Additionally, loan and deposit data, with averages of 16,998 billion yuan and 15,296 billion yuan respectively, indicate an active financial market and its clear support for the economy. The agriculture and wholesale and retail industries also maintained steady development, with average values of 602.5 billion yuan and 3,725.6 billion yuan, demonstrating the stability of traditional industries. Public revenue and expenditure had averages of 704.72 billion yuan and 952.93 billion yuan, respectively, indicating a sound public financial situation and significant government investment in public services and infrastructure. Shenyang has maintained balanced development across various industries, with a stable economic structure and positive growth trends.

Table 4. Descriptive Statistics of Shenyang's Economic Data

Variable	Mean	Median	Min	Max	Std Dev	Variance	Skewness	Kurtosis
Per GDP	69739	69506	60625	84268	8411.96	70760991	0.600767	-0.82881
Primary	299.12	303.6	249.6	341.4	35.0179	1226.252	-0.21875	-1.82047
Secondary	2551.9	2169	1919	3541	614.798	377977	0.865674	-0.87224

Tertiary	3765.6	3756	3129	4475	492.762	242814.4	0.136344	-1.60128
Agriculture	602.5	609.8	504.8	688.6	70.1048	4914.677	-0.19282	-1.84626
Sale	3725.6	3847	3253	3986	249.492	62246.11	-0.79874	-0.20791
Imports and Exports	1049.8	1006	748.6	1416	245.362	60202.48	0.715523	-0.69102
Loans	16998	17746	12458	20855	2915.78	8501755	-0.29633	-1.42828
Deposit	15296	14912	10267	20777	3638.03	13235299	0.159775	-1.35788
Public Revenue	704.72	720.6	606.2	785.5	63.4878	4030.699	-0.47842	-1.02828
Public Expenditure	952.93	965.4	808.6	1074	105.121	11050.5	-0.26678	-1.87131

Table 5. Descriptive Statistics of Tianjin's Economic Data

Variable	Mean	Median	Min	Max	Std Dev	Variance	Skewness	Kurtosis
Per GDP	72057	73152.5	30567	119235	27338	747386530	0.111139	-1.012
Primary	161.3	156.805	103.4	273.15	48.898	2391.0143	1.138748	1.0168
Secondary	3948	4387.54	1631	6038.9	1288.8	1660879.3	-0.43737	-0.712
Tertiary	5588	5624.93	1416	9999.3	2922.4	8540131.9	0.030824	-1.397
Farming	177.8	176.89	103.4	283.37	52.89	2797.3357	0.448122	-0.281
Industry	5026	5229.59	1885	7196.5	1756.9	3086808.5	-0.34844	-1.147
Construction	547	642.415	166.1	786.89	214.12	45845.324	-0.66974	-1.112
Wholesale	1410	1413.17	436.1	2361.5	641.68	411754.56	-0.08872	-1.134
Transportation	646	702.14	227.2	1061.1	230.62	53187.775	-0.4346	-0.296
Accommodation	180.7	163.4	70.15	327.94	79.142	6263.4647	0.445632	-0.854
Information	300.9	208.315	77.13	627.57	202.43	40977.985	0.514983	-1.485
Finance	1226	1329.09	159.2	2197.3	752.25	565874.97	-0.16122	-1.696
Real Estate	604.6	542.095	128.8	1302.5	367.4	134979.43	0.536382	-0.744
Services	453.8	477.12	45.6	1001.5	318.38	101368.93	0.383325	-0.93
Scientific Research	509.1	552.03	78.98	1005.2	309.11	95550.393	0.129483	-1.221
Environment	104.7	104.025	21.89	210.14	63.436	4024.1477	0.386542	-1.072
Other Services	258.7	187.435	66.9	567.71	172.46	29743.764	0.776152	-0.801
Education	360.8	290.535	93.25	808.22	228.67	52287.693	0.741646	-0.64
Health	198.2	153.005	40.35	420.02	130.42	17009.07	0.415069	-1.357
Culture	72.63	60.775	13.24	193.03	50.148	2514.8325	1.235135	0.9559
Management	323.7	300.87	75.27	672.41	181.03	32771.942	0.322187	-0.785

As shown in Table 5, from 2005 to 2022, Tianjin's GDP and various industries have shown steady growth. The secondary and tertiary industries are the primary economic drivers, with notable development in the industrial and construction sectors. The financial and real estate sectors have also performed well. Agriculture, wholesale and retail, transportation, and other service

industries have maintained stable growth, indicating the city's diversified and sustained economic growth potential. Significant investments in public services such as education and health reflect the government's emphasis on social development. Overall, Tianjin has maintained balanced development across various industries, with a stable economic structure and positive growth trends.

Table 6. Descriptive Statistics of Xi'an's Economic Data

Variable	Mean	Median	Min	Max	Std Dev	Variance	Skewness	Kurtosis
Per GDP	44058	43723	9484	88806	26800	718250492	0.1719	-1.4485
Farming	169.86	165.43	44.65	362.1	108.32	11732.28	0.4441	-1.1628
Industry	1037.9	1009.3	218.4	2439	652.28	425474.47	0.4959	-0.6931
Construction	633.76	507.01	58.69	1686	541.07	292756.92	0.6199	-0.9465
Wholesale	414.96	406.26	65.87	856	276.62	76519.328	0.2267	-1.4512
Transport	173.86	160.29	43.01	350.4	113.24	12824.204	0.2979	-1.5136
Accommodation	99.82	114.66	18.46	187.7	54.249	2942.9567	-0.16	-1.3742
Financial	453.54	278.09	33	1237	410.99	168916	0.6248	-1.1131
Real Estate	321.55	245.14	16.96	881	307.11	94318.961	0.7506	-0.8737
Other Services	1290.2	905.54	147.1	3581	1114.2	1241457.5	0.8489	-0.5749

As shown in Table 6, from 2000 to 2022, Xi'an's GDP has shown significant growth, with the tertiary and secondary industries being the main drivers of economic growth, particularly in the industrial and construction sectors. The financial and real estate sectors have also performed well, indicating the city's diversified and sustained economic growth potential. Agriculture, wholesale and retail, transportation, and other service industries have maintained stable growth, demonstrating Xi'an's balanced development across various industries, a stable economic structure, and positive growth trends.

3.2 Variable Selection Explanation

The economic impact of sports events is a dynamic process. To better reflect this dynamic change, this study employs the stepwise regression method. The per capita regional GDP of Guangzhou, Nanjing, Jinan,

Shenyang, Tianjin, and Xi'an over the past 20 years is selected as the dependent variable to represent the economic development level of the host cities. The independent variables include the output values of industries such as manufacturing, wholesale and retail, construction, transportation, and finance, as well as the number of sports events held. The regression analysis aims to analyze the contribution of each factor to economic indicators.

A multiple regression model is set up with per capita GDP, financial industry output, and retail industry output as the dependent variables, and the number of sports events held, infrastructure investment, and the number of tourists as the independent variables. The model is formulated as follows: $Y = c + \beta_1X_1 + \beta_2X_2 + \dots + \beta_nX_n + \epsilon$, Where Y represents the dependent variable, X_1, X_2, \dots, X_n represent the independent variables, c is the constant term, $\beta_1, \beta_2, \dots, \beta_n$ are the regression coefficients, and ϵ is the error term.

Table 7. Regression Analysis Results and Additional Statistics for Guangzhou

Variable	Coefficient	t-Statistic	Prob.		
C	50134.84	10.0579	0		
Event	14491.24	2.354411	0.0284		
Govfinance	37.86182	8.675069	0		
R-squared	0.877202	F-statistic	75.00648	DW stat	1.647764

Using the stepwise regression method on Guangzhou's relevant economic data (Table 7), it could be analyzed the relationship between per capita regional GDP and various economic sectors as well as sports events. The results indicate that the number of sports events (EVENT) and government financial expenditure (GOVFINANC) have a significant positive impact on Guangzhou's per capita regional GDP.

Using the stepwise regression method on Nanjing's relevant economic data (Table 8), it could be analyzed the relationship between per capita regional GDP and various economic sectors as well as sports events. The results indicate that the number of sports events

(EVENT), financial industry (FINANCE), accommodation and catering industry (HOTEL), and wholesale and retail industry (SALE) have a significant positive impact on Nanjing's per capita regional GDP.

Using the stepwise regression method on Jinan's relevant economic data (Table 9), it could be analyzed the relationship between per capita regional GDP and various economic sectors as well as sports events. The results indicate that the number of sports events (EVENT), accommodation and catering industry (HOTEL), tertiary industry (TERTIARY), and secondary industry (SECONDARY) have a significant positive impact on Jinan's per capita regional GDP.

Table 8. Regression Analysis Results and Additional Statistics for Nanjing

Variable	Coefficient	t-Statistic	Prob.		
C	15766.78	6.726407	0		
EVENT	2516.466	2.029378	0.0634		
FINANCE	54.33915	13.06568	0		
HOTEL	277.4655	4.659264	0.0004		
SALE	23.13563	2.269221	0.0409		
R-squared	0.998614	F-statistic	2340.963	DW stat	1.351516

Table 9. Regression Analysis Results and Additional Statistics for Jinan

Variable	Coefficient	t-Statistic	Prob.		
C	4081.258	9.958522	0		
EVENT	-633.675	-2.18901	0.042		
HOTELS	27.19403	8.071103	0		
TERTIARY	7.498541	19.80334	0		
SECONDARY	15.85578	19.93063	0		
R-squared	0.999798	F-statistic	22235.09	DW stat	1.568823

Table 10. Regression Analysis Results and Additional Statistics for Shenyang

Variable	Coefficient	t-Statistic	Prob.		
C	6570.268	1.063903	0.3283		
EVENT	475.5084	0.309032	0.7677		
TERTIARY	16.64887	10.66345	0		
R-squared	0.949882	F-statistic	56.85881	DW stat	1.737654

Table 11. Regression Analysis Results and Additional Statistics for Tianjin

Variable	Coefficient	t-Statistic	Prob.		
C	11561.85	13.07529	0.0058		
EVENT	10758.28	12.29205	0.0066		
ACCOMMODATION	-251.558	-13.8675	0.0052		
CONSTRUCTION	75.7111	12.39376	0.0064		
CULTURE	487.6905	21.98344	0.0021		
EDUCATION	151.3005	10.33467	0.0092		
ENVIRONMENT	123.018	7.488965	0.0174		
FINANCE	17.32873	11.81497	0.0071		
HEALTH	116.5707	7.566121	0.017		
MANAGEMENT	-137.999	-6.80426	0.0209		
OTHERSERVICE	52.32836	6.148038	0.0255		
REALESTATE	-38.9663	-9.53294	0.0108		
SCIENCE	-38.0446	-5.30384	0.0338		
SERVICES	-130.956	-9.02482	0.0121		
TRANSPORTATION	18.31026	5.512772	0.0314		
WHOLESALE	23.39976	8.532584	0.0135		
R-squared	0.999995	F-statistic	26161.68	DW stat	2.433543

Table 12. Regression Analysis Results and Additional Statistics for Xi'an

Variable	Coefficient	t-Statistic	Prob.		
C	3430.83	5.643209	0		
EVENT	-1886.37	-1.74594	0.0962		
WHOLESALE	98.89354	60.03584	0		
R-squared	0.997455	F-statistic	3918.624	DW stat	1.872909

Using the stepwise regression method on Shenyang's relevant economic data (Table 10), it could be analyzed the relationship between per capita regional GDP and various economic sectors as well as sports events. The results indicate that the number of sports events (EVENT) does not have a significant positive impact on Shenyang's per capita regional GDP. Using the stepwise regression method on Tianjin's relevant economic data (Table 11), it could be analyzed the relationship between per capita regional GDP and various economic sectors as well as sports events. The results

indicate that the number of sports events (EVENT), accommodation and catering industry (ACCOMMODATION), construction industry (CONSTRUCTION), culture, sports, and entertainment industry (CULTURE), education industry (EDUCATION), water conservancy, environment, and public facility management industry (ENVIRONMENT), financial industry (FINANCE), health and social work (HEALTH), public administration, social security, and social organizations (MANAGEMENT), resident services, repair, and other services (OTHERSERVICE), real

estate industry (REALESTATE), scientific research and technical services industry (SCIENCE), information transmission, rental, and business services (SERVICES), transportation, warehousing, and postal services (TRANSPORTATION), and wholesale and retail industry (WHOLESALE) all have a significant positive impact on Tianjin's per capita regional GDP.

Using the stepwise regression method on Xi'an's relevant economic data (Table 12), it could be analyzed the relationship between per capita regional GDP and various economic sectors as well as sports events. The results indicate that the number of sports events (EVENT) and the Wholesale and Retail Trades (Wholesale) have a significant positive impact on Xi'an's per capita regional GDP.

4. Research Conclusions and Recommendations

By analyzing data from 2000 to 2023 for six Chinese cities—Guangzhou, Nanjing, Jinan, Shenyang, Tianjin, and Xi'an—that hosted small and medium-sized sports events, it could be can draw the following conclusions. These events have varying degrees of impact on the economic development of these cities.

Firstly, Guangzhou, as the capital of China's most economically powerful province, has a robust economic foundation. The study found that small and medium-sized sports events have a significant positive impact on the financial and retail sectors in Guangzhou. The hosting of sports events has promoted the development of tourism, catering, and accommodation industries, driving the growth of related industrial outputs.

Nanjing actively hosts various small and medium-sized sports events such as international marathons and dragon boat races. These events have not only revitalized the city but also boosted the local tourism, catering, and accommodation industries. The research shows that sports events significantly positively impact Nanjing's financial sector, accommodation and catering industry, and wholesale and retail industry. By hosting international marathons and dragon boat races, Jinan has enhanced its city profile and effectively promoted local economic development. The study indicates that sports events have a significant positive impact on Jinan's accommodation and catering industry,

tertiary industry, and secondary industry.

Although Shenyang's sports events have relatively little economic driving effect, they still positively influence the tertiary industry. The research found that sports events have a certain positive impact on the tertiary industry output value in Shenyang. The insignificant effect may be due to Shenyang's overall weaker economic foundation, with the economic driving effect of sports events being relatively small. Shenyang's economy mainly relies on traditional industries, whereas small and medium-sized sports events have a more significant impact on high-tech and modern service industries, thus the impact is not as prominent compared to other cities.

Tianjin has achieved remarkable results in enhancing its city image and promoting economic development by hosting international marathons and dragon boat races. The research shows that sports events have a significant positive impact on Tianjin's accommodation and catering industry, construction industry, cultural, sports and entertainment industries, and several other sectors. The multiple influential variables for Tianjin may be attributed to its unique geographical location near the capital, Beijing, and its important role in northern China's economic development. Tianjin's diversified economic structure allows it to fully leverage the various economic benefits brought by sports events.

As a historical and cultural city, Xi'an has enhanced its international visibility and attractiveness by hosting international marathons and other events. The research found that sports events significantly positively impact Xi'an's Wholesale and Retail Trades and overall economic development. Sports events attract many tourists, increasing consumer demand and driving the development of retail, catering, accommodation, and other service industries, directly enhancing the city's economic income. By improving infrastructure, the overall competitiveness and attractiveness of the city are elevated, laying the foundation for long-term economic development. Particularly in Tianjin and Xi'an, sports events significantly promote the development of cultural industries, education, and information transmission industries.

Reasonable government fiscal expenditure and

policy guidance play a crucial role in promoting the development of sports events and related industries. For example, Guangzhou has effectively promoted economic growth by increasing fiscal investment to support infrastructure and public services improvements. The hosting of sports events promotes the optimization and upgrading of urban industrial structures. For instance, Nanjing has improved its economic level and innovation capacity by developing the financial industry, accommodation and catering industry, and wholesale and retail industry.

Shenyang's insignificant economic driving effect of sports events may be related to its overall lower economic foundation. Shenyang has long relied mainly on traditional industries, with relatively lagging economic development, leading to a relatively weak driving effect of sports events on its economy. Although small and medium-sized sports events can promote the development of tourism, catering, and other tertiary industries, this impact is not significant in Shenyang. To enhance the economic driving effect of sports events in Shenyang, it is necessary to further optimize its industrial structure and increase investment and development in modern service and high-tech industries.

To better utilize sports events to promote urban economic development, the following policy recommendations are proposed. Firstly, cities should reasonably plan and manage small and medium-sized sports events based on their economic foundation and development needs to avoid resource waste and economic burden caused by excessive hosting. Secondly, the government should increase support for sports events, particularly in infrastructure construction and public services, to ensure the smooth progress of events and maximize their economic benefits. Additionally, sports events should promote the diversification of industries, especially cultural industries, education, and financial industries, enhancing the city's overall competitiveness and economic resilience. Finally, cities should pay attention to the subsequent utilization of sports venues and related facilities, formulating follow-up utilization plans to avoid idleness and waste, ensuring the long-term economic benefits brought by sports events.

In summary, small and medium-sized sports

events have a significant positive impact on the economic development of China's new first-tier cities. Cities should leverage the opportunities provided by sports events through reasonable planning and policy support to promote sustainable urban economic development. This research provides empirical evidence for policymakers, demonstrating that promoting sports events and related industries can effectively enhance urban economic levels and drive sustainable urban development.

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