

Empirical study on the Economic and Financial Impact of the Successful Application and Hosting of the Olympic Games on the Host Countries Based on a Regression Model

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Abstract-The Olympic Games are always considered to have a substantial impact on the country's economic development so that every people living in this country will pay attention to it. They want to know whether their quality of life can be improved or how they should cope with the economic fluctuations. A detailed cross-country comparison of financial data from previous Olympic Games is provided in this work. A longitudinal comparison is used to determine whether economic growth rates have increased before and after the Olympic Games. By analyzing the data and related materials provided by the host cities of the summer Olympic Games in recent years, a regression model is also established in this paper to find out the impact of the Olympic Games on the host country. The conclusion is that the Olympic Games will not positively impact the host country's financial development and economic level. First, the reaction of financial markets to the success of most of the countries selected to host the Games was negligible. Second, on an economic level, GDP per capita growth will not accelerate because of the Olympics. The result enriches the academic circle.

Keywords: Olympic Games, financial index, GDP per capita

1 INTRODUCTION

This past August, the Games of the XXXII Olympiad, better known as the Summer Olympics, were successfully held in Tokyo after a one-year delay. While the epidemic has made this Olympics unique, it has also caused considerable economic damage to the organizers. Local economists estimate that Japan will lose 146.8 billion yen (1.3 billion dollars) from spectators unable to attend the games because of quarantine policies. ^[1] This phenomenon raises a much-discussed question again: do the Olympics positively or negatively affect the host country's economy?

The economic effect of the Olympic Games on the host country can be divided into three levels. The first level is the direct economic effect, including the income gained by the organizing committee of the host country based on the investment in Olympic facilities, security, environment, and services. These include corporate sponsorship, television rights sales, ticket sales, and various Olympic souvenirs. The second level is the indirect economic effect, including the Olympic Games in the bidding, preparation, hosting, and hosting process. The Olympic Games' physical investment drives the growth of related industries. The indirect economic effect of The Olympic Games economy in the secondary industry is mainly shown in the construction industry, manufacturing industry, and electric power, gas, water supply industry. In the tertiary industry, the strong demand during the Olympic Games will significantly promote the rapid growth of the tourism and catering industry. Meanwhile, the education industry, financial industry, insurance industry, real estate industry, media industry, logistics industry, the transportation industry will appear varying degrees of prosperity due to the Olympic Games. The third level is derivative economic effects, including the profound economic and social impacts of hosting the Olympic Games. The emergence of derivative economic effect is realized through the improvement of infrastructure of host country and host city, the enhancement of city function and city image, the expansion of opening to the outside world, the improvement of national quality, and the sustainable development of sports, culture, and tourism industries.

Finally, through the analysis of the financial index, this paper finds that the financial market of the host country of the Olympic Games does not show outstanding market performance after successfully obtaining the qualification for hosting the Olympic Games. At the economic level, by comparing the per capita GDP growth rate of the host country before and after the Olympic Games, the Positive effect of the Olympic Games on the economy is found to be not apparent. The factors determining a promotion include budget cost, over-budget rate, and whether the host country is developed.

2 LITERATURE REVIEW

According to the financial reports of previous Olympic Games, the five Olympics from 1996 to 2012, only the 2008 Beijing Olympics turned a profit when considering the summer Games' direct and induced economic benefits. ^[2, 3] Economists have also been debating the overall economic impact of the Olympics. Some argue that hosting the Summer Games has a significant positive net effect on GDP per capita and foreign trade. GDP per capita in the host region grew by an average of 3.6 percent relative to the year before the event, and this growth is somewhat likely to be long-term. ^[4, 5] Moreover, according to Andrew K. Rose and Mark M. Spiegel, holding significant events would increase exports to increase trade in the host country by more than 20%. ^[6]

On the other hand, some argue that the Olympics will have no long-term impact on GDP or trade. Stephen B. Billings and J. Scott Holladay stated that the difference in population and real GDP per capita between the host city and the shortlisted cities when the Games were awarded persisted after the Games. While varying over time, these differences do not significantly affect indicators such as population, the urban population as a percentage of a country's urban population, real GDP per capita, or trade openness. ^[7] Furthermore, The International Olympic

Committee's announcement of who won (and lost) the right to host the games did not affect the stock markets of the bidding countries either. ^[8]

This paper favors Stephen B. Billings, J. Scott Holladay, and Bryan Engelhardt et al. Conclusion. Through this work, it is not found that the election and hosting of the Olympic Games will have a positive impact on the host country's finance and economy and may even have a certain degree of adverse effect.

3 DATA

3.1 Hosts and Applicants

Table 1 below shows the basic information of the Olympics from 2008 to 2024, including the host country, the applicants, and the date of the announcement of the election.

TABLE 1 RECENT OLYMPIC ELECTIONS

	2008	2012	2016	2020	2024
Hosts	China	Britain	Brazil	Japan	France
Applicants	Turkey France Japan Canada	Spain The US France	Spain Japan The US	Turkey Spain	The US
Date of announcement of selected results	2001/7/13	2005/7/6	2009/10/2	2013/9/7	2017/9/13

Data Source: <https://olympic-museum.de/index.html>

3.2 Financial indices of Hosts and Applicants

Table 2 below lists the name and the four-day close prices, two of which are before the election and the other two are after, of the leading financial index of the host and applicant countries.

TABLE 2 THE CLOSE PRICES OF THE FINANCIAL INDEX OF HOST AND APPLICANTS AROUND THE OLYMPICS ELECTIONS

		Country (index name)	Close price			
			2001/7/12	2001/7/13	2001/7/16	2001/7/17
2008	Host	China (SSE)	2165.49	2161.34	2146.24	2140.98
	Applicants	Turkey (XU100)	9122.60	8940.80	9080.00	8688.60
		France (CAC40)	4961.43	5025.24	5022.76	4978.54
		Canada (S&P/TSX)	7670.80	7765.60	7643.70	7694.10

		Japan (N225)	12407.95	12355.15	12343.37	12128.57
			2005/7/5	2005/7/6	2005/7/7	2005/7/8
2012	Host	Britain (FTSE100)	5190.10	5229.60	5158.30	5232.20
	Applicants	Spain (IBEX35)	9807.40	9832.50	9644.40	9793.20
		US (DOW)	10371.80	10270.68	10302.29	10449.14
		France (CAC40)	4252.75	4279.95	4220.62	4300.31
			2009/10/1	2009/10/2	2009/10/5	2009/10/6
2016	Host	Brazil (IBOVESPA)	60459.00	61172.00	62369.00	62671.00
	Applicants	US (DOW)	9509.28	9487.67	9599.75	9731.25
		Spain (IBEX35)	11518.20	11326.70	11557.00	11817.10
		Japan (N225)	9978.64	9731.87	9674.49	9691.80
			2013/9/6	2013/9/9	2013/9/10	2013/9/11
2020	Host	Japan (N225)	13860.81	14205.23	14423.36	14425.07
	Applicants	Turkey (XU100)	67232.40	69689.20	71788.00	71771.60
		Spain (IBEX35)	8655.00	8632.50	88801.60	8875.19
			2017/9/12	2017/9/13	2017/9/14	2017/9/15
2024	Host	France (CAC40)	5209.01	5217.59	5225.20	5213.91
	Applicants	US (DOW)	22118.86	22158.18	22203.48	22268.34

Data Source: Yahoo Finance

3.3 GDP per capita of Hosts

TABLE 3 GDP PER CAPITA OF HOST COUNTRIES BEFORE AND AFTER OLYMPICS

	Spain (1987-1997)	United States (1991-2001)	Australia (1995-2005)	Greece (1999-2009)	China (2003-2013)	United Kingdom (2007-2017)	Brazil (2011- 2020)
1	8239.61	24342.26	20319.63	13245.19	1288.64	50444.93	13245.61
2	9703.12	25418.99	21861.33	12042.95	1508.67	47267.01	12370.02
3	10681.97	26387.29	23468.60	12538.18	1753.42	38736.90	12300.32
4	13804.88	27694.85	21318.96	14110.31	2099.23	39536.77	12112.59

5	14811.90	28690.88	20533.04	18477.58	2693.97	42047.61	8814.00
Olympics year	16112.19	29967.71	21679.25	21955.10	3468.30	42449.11	8710.10
7	13339.91	31459.14	19490.86	22551.74	3832.24	43401.31	9928.64
8	13415.29	32853.68	20082.48	24801.16	4550.45	47452.20	9151.45
9	15471.96	34513.56	23447.03	28827.32	5618.13	45039.24	8897.49
10	16109.08	36334.91	30430.68	31997.28	6316.92	41048.35	6796.84
11	14730.80	37133.24	33999.24	29710.97	7050.65	40304.72	

Data Source: World Bank Open Data

Table 3 shows the GDP per capita in the host countries of the Olympics from 1992 to 2016. For each host, the data is collected from 5 years before the Games to 5 years after the Games, altogether 11 years. As the data of 2021 has not been published when the research is done, Brazil has only the data of 10 years. However, this would not affect the process and the result of the research.

3.4 Basic Economic information for the Olympic Games

TABLE 4 FINANCIAL SITUATION AND INFLUENCE OF PREVIOUS OLYMPIC GAMES^[7]

Year	1992	1996	2000	2004	2008	2012	2016
Hosts	Spain	The US	Australia	Greece	China	Britain	Brazil
Developed or not	1	1	1	0	0	1	0
Cost budget (billion \$)	26.47	16.51	26.45	19.75	66.77	84.93	46.00
Cost (billion \$)	96.87	42.43	50.26	29.42	68.10	149.57	131.00
Over-budget rate (%)	266	151	90	49	2	76	184
Revenue (billion \$)	97.27	41.53	53.94	-50.58	69.59	149.50	111.00
Average GDP capita growth rate before Games (five years, %)	14.63	4.25	1.54	11.47	22.02	-3.00	-7.42

Average GDP capita growth rate before Games (five years, %)	-1.20	4.39	10.24	6.56	15.35	-0.84	-11.40
Delta average (%)	-15.78	0.14	8.71	-4.91	-6.67	2.16	-3.98

Data Source: <https://finance.sina.com.cn/tech/2021-07-24/doc-ikqciyzk7410932.s>

Table 4 illustrates the essential financial position of the last 6 Olympics, from 1992 to 2016, including the budget cost, the actual cost, the over-budget rate, and the revenue. For the latter analysis, the economic situation of host countries (developed or not) and the change of average GDP capita growth rate are shown in Table 4 as well.

4 MODEL

4.1 Horizontal comparison of the impact of the Olympics on the financial markets of the host and losing cities

Before establishing the research model, two points about financial markets need to be clarified, which are crucial for our subsequent research in this part. First, financial markets are far more sensitive to news than to events themselves. In other words, the financial markets of each competing country will react to the news on the International Olympic Committee's (IOC) announcement of the host city, not when the Games begin. The bidding process for the Olympic Games says that typically, the decision on the host city is made by the IOC general Committee seven years before the scheduled date of the Games. For example, the Olympics, initially scheduled for 2020, were announced in 2013 to be held in Tokyo. Analysis of financial markets should therefore focus on changes in the financial indices of each candidate country at the time of the announcement.

Second, according to the Efficient Market Hypothesis (EMH), prices fully reflect all available information in an efficient market. Although this hypothesis has been questioned in recent years, there is consensus that efficient markets respond quickly to information. In almost all the countries bidding for the Olympic Games, the financial market is relatively developed, always considering strong or semi-strong efficiency. Financial markets in these countries would react quickly to the public consultation, which could take only a day or two, possibly less. As a result, only financial market indices for a total of four trading days starting the day before the announcement of the host countries of the Olympics would be analyzed.

Each country has a different financial index size in this model, ranging from tens of thousands to hundreds of thousands. So there needs to be a way to unify the magnitude, easy to compare. Using the financial index of each country on the first day (the day before the announcement of the Olympic Games) as a benchmark, the index for each day would be divided by the benchmark index. The result both preserves the daily proportional change of all the indexes and harmonizes the magnitude of the different national financial indexes. Adjusted financial indices for all countries competing for the same Olympics over the four trading days are put together in the

same table to clarify whether the host country performed better in financial markets after receiving the news of the successful bid.

4.2 Longitudinal comparison of the impact of the Olympics on the economic conditions before and after the Games

Unlike the financial market characteristics described above, the economic impact of the Olympics will not be felt until after the Games have taken place and will be long-lasting, possibly for several years. The host country's per capita GDP growth rate is the primary observation index in this part of the economic situation research. The host country's average annual GDP per capita growth rate in the five years before the Games and the five years after the Games should be calculated. The difference between the two values, to a large extent, represents the impact of the Olympic Games on the economic level of the host country. It is worth mentioning that, since the data of 2021 does not exist, only the data of the four years after the 2016 Olympic Games in Brazil could be used, but not the five years. However, there is no significant impact due to the average calculation during the data processing. When the calculated data are reflected in the chart, the specific impact of each Olympic Games on the host country can be seen.

In order to further explore what factors in the model in the Olympic Games to the host country per capita GDP rate changes play a decisive role, a linear regression model, which includes the following variables: the Olympics' budget cost (*bucu*), actual cost (*cost*), over-budget rate (*overr*), which calculated by $\frac{actualcost}{budgetcost} - 1$, revenue, and a binary variable (*developed*), host countries are developed countries (represented by 1) or not (represented by 0), is set up. The dependent variable is the difference between the capita GDP before and after Olympics (*daver*). Then the regression model could be expressed as below (equation 1).

$$daver = \beta_0 + \beta_1 cobu + \beta_2 cost + \beta_3 overr + \beta_4 revenue + \beta_5 developed \quad (1)$$

The units of *daver* and *overr* are both 1%; *Cost*, *cobu*, and *revenue* are all measured in billions of dollars. R studio will help calculate the five beta values and analyze the specific impact of each variable on the economic situation of the host country.

5 RESULTS

5.1 News of the successful bid had little positive impact on financial markets, at least in developed countries

After adjusting the financial indices and putting together the financial indices of countries competing in the same Olympic Games, we get the following results.

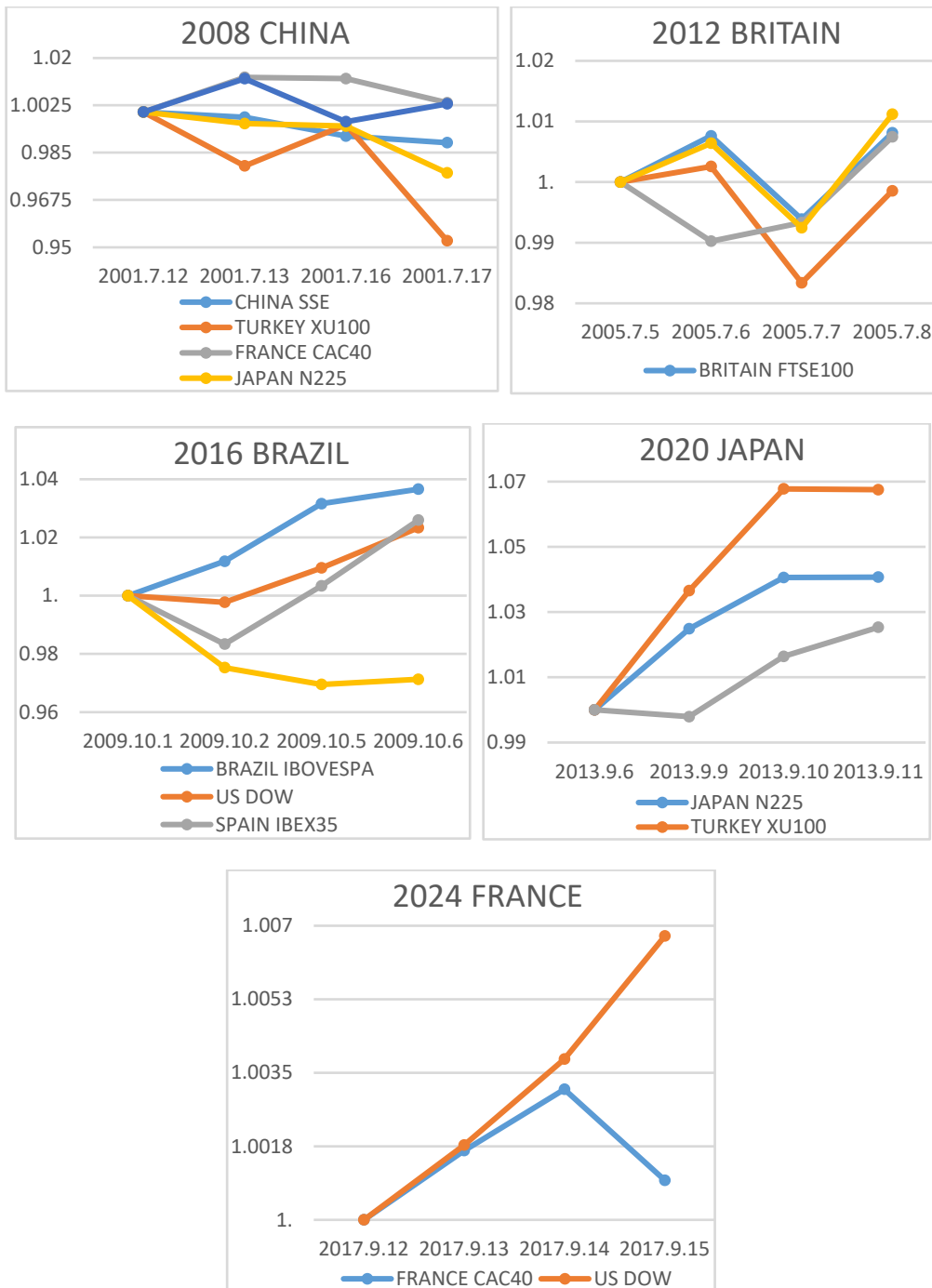


Figure 1 Financial index changes in the host country after the Olympics' election

Figure 1 shows the four-day change of financial index of the applicants and host countries of the Olympics from 2008 to 2024. As it shows, the financial indexes of the countries that successfully qualified to host the Olympic Games (the blue line) were not the best among all the candidates, except for Brazil in 2016. In the four working days after the 2008 and 2020 results were released, the financial indices of the winners, China and Japan, were just in the middle of the pack. The 2012 winner, The UK, did well, but there was no significant outperformance in the markets due to its success. The situation is even worse as recently as 2024, when France, the host country, has wholly lagged behind the United States, its only rival in the Olympic race, in financial markets after its successful bid.

Brazil in 2016 is a particular case. Two reasons may be raised. First, since the 2016 election results were announced in 2009, it was the end of the global financial crisis, the effects of which are still being felt across the world's major economies. Brazil, which has a smaller economy and less developed financial markets than its rivals, the United States, Japan, and Spain, will be less affected. Second, and more likely, Brazil can be said to be relatively undeveloped among all the successful bidders for the five Olympic Games studied in this research. Market participants will see this as a rare development opportunity for the country, and traders' optimistic expectations are fully reflected in the market performance. However, investors may be less optimistic in more developed countries because they think the Olympics will not bring about a leap in national development. As a result, the bid's success is likely to have an enormous impact in less developed financial markets.

5.2 There is a high probability that the Holding of the Olympic Games will not promote the economy and may even be a negative effect.

When taking the difference between the average annual GDP per capita in the five years before the host country hosted the Games and that in the five years after the host country hosted the Games, the following Figure 2 could be got.

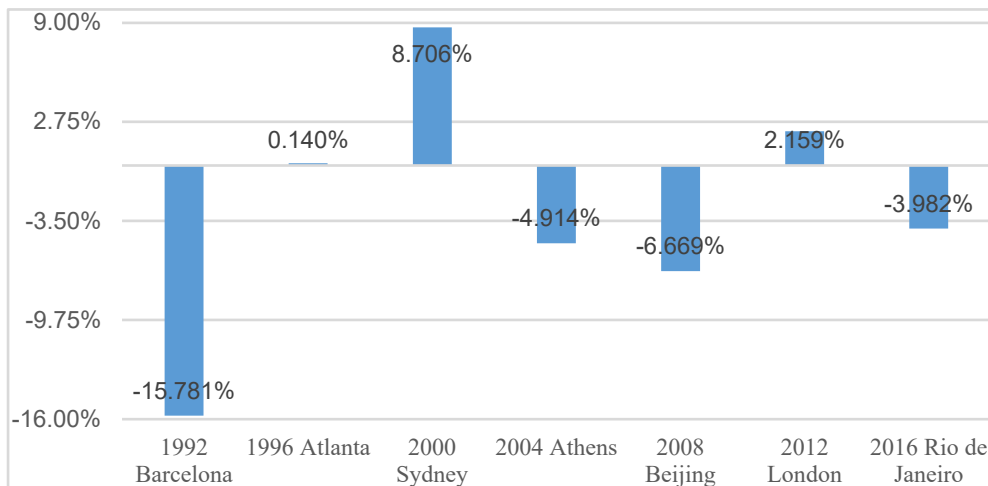


Figure 2 The difference in GDP per capita growth rate of host countries before and after hosting the Games

Figure 2 above shows that most host countries experienced a significant slowdown in economic growth after hosting the Olympic Games. Spain was the worst hit in 1992 when the average GDP per head growth was 7% lower after hosting the Olympics. Moreover, in 2008, the only Olympics to make a profit did not do so well either. In contrast to Beijing, the London Olympics, the most expensive ever (excluding the just-concluded Tokyo Olympics), experienced some economic losses but achieved positive growth in GDP per capita. Australia in 2000 performed best under this model (a nearly 9% increase), so it can be said that the Olympic Games brought a relatively apparent positive impact on the Economy of Australia.

Generally speaking, the hosting of the Olympic Games has no positive or even negative impact on the economic situation of the host country in most cases. A few exceptions may be due to features unique to a single Olympic Games. In order to find these characteristics, the following regression model could work a lot.

In order to explain the above phenomenon, which is different from daily cognition, regression analysis should be conducted, and the following conclusions could be drawn (equation 2).

MODEL INFO:

Observations: 7
Dependent Variable: daver
Type: OLS linear regression

MODEL FIT:

$F(5,1) = 11.308, p = 0.222$
 $R^2 = 0.983$
Adj. R² = 0.896

Standard errors: Robust, type = HC1

	Est.	S.E.	t val.	p
(Intercept)	31.679	7.187	4.408	0.142
cobu	-1.132	0.193	-5.863	0.108
cost	0.347	0.058	5.973	0.106
overr	-0.283	0.045	-6.296	0.100
revenue	0.206	0.047	4.344	0.144
developed	5.105	1.212	4.211	0.148

$$daver = 31.679 - 1.132 * cobu + 0.347cost - 0.283overr + 0.206revenue + 5.105developed \quad (2)$$

First of all, the R^2 of this regression model reaches 0.983, which is quite close to 1, indicating that the display data fits the model created by us to a high degree, and the obtained results are of a high reference value.

In terms of variables, we first focus on developed. It can be found that the results show that the output value of developed countries is higher than that of non-developed countries when other factors remain unchanged, with a gap of 5.105 percentage points. This point is also in line with the economic slowdown in the host countries, which is non-developed, after 2004, 2008, and

2016 Games, as shown in the chart above. It also follows that Spain's poor economic performance after hosting the 1992 Olympics was due to other factors. The profit variable is well understood. When the Olympics turn a profit, the economy of the host country tends to improve. Beijing also likely reversed the positive impact of Olympic profits because it is an underdeveloped country.

The remaining three variables are intriguing. The results showed that the Olympics harmed the economy when the budget cost increased and had a positive impact when the real cost increased. The introduction of over-budget rates explains such seemingly unreasonable results. When the budget is unchanged, increasing the actual cost will inevitably increase the over-budget rate, which will hurt the economic level of the host country, and this impact largely offsets the positive impact brought by the increase of the actual cost. That is why Spain's economy fared poorly after hosting the 1992 Olympics.

Therefore, the low budget and low over-budget rate of the Olympic Games held in developed countries will have the best economic promotion effect on the host country. When actual spending increases or the Games are held in less developed countries, the boost is somewhat diminished or even reversed.

6 CONCLUSION

According to the research, it is believed that the Olympic Games will have little positive impact on the host country's financial development and economic level. First, the reaction of financial markets to success in most of the countries elected was almost negligible. Second, at the economic level, GDP per capita growth will not accelerate because of the Olympics. Even if the investment has increased during the Olympics, which led to an increase in aggregate demand and employment growth to promote rapid economic growth. However, once the end of the Olympic investment cycle, the investment will shrink, the Olympic venues and facilities will be a certain amount idle, tourism revenue will decline, the number of unemployed will rise again. The "trough effect" will also make broadcasting fees, merchandising fees, and royalties from the Mascots and logos look insignificant.

REFERENCES

- [1] Michelle Toh and Selina Wang, CNN Business. (2021, July 21). Japan's Suntory CEO says economic losses from no-fan Tokyo Olympics will be "enormous." <https://edition.cnn.com/2021/07/21/perspectives/japan-olympics-suntory-ceo-intl-hnk/index.html>
- [2] Overmyer, M. P. (2017). Economic Impact Analysis on Olympic Host-Cities. Honors Projects. 647. Grand Valley State University.
- [3] Baade, R. A., Matheson, V. A. (2016). Going for the Gold: The Economics of the Olympics. *Journal of Economic Perspectives*, 30(2): 201–218.
- [4] Firgo, M. (2021). The causal economic effects of Olympic Games on host regions. *Regional Science and Urban Economics*, 88, 103673.
- [5] Brückner, M., Pappa, E. (2015). News Shocks in the Data: Olympic Games and Their Macroeconomic Effects. *Journal of Money, Credit and Banking*, 47(7), 1339–1367.

- [6] Rose, A. K., Spiegel, M. M. (2011). The Olympic Effect. *The Economic Journal*, 121(553), 652–677.
- [7] Billings, S. B., Holladay, J. S. (2010). Should Cities Go for the Gold? The Long-Term Impacts of Hosting the Olympics. *SSRN Electronic Journal*.
- [8] Engelhardt, B., Matheson, V., Yen, A., Chisholm, M. (2017). The Economic Impact of Olympic Games: Effects of Host Country Announcements on Stock Market Returns. Working Papers 1704, College of the Holy Cross, Department of Economics.