Using REIT Data to Assess the Economic Worth of Mega-Events: The Case of the 2020 Tokyo Olympics

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1 May 2017

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Abstract

This paper proposes an alternative approach to evaluate the effects of hosting mega-events, such as the Olympics, Football World Cup, and World Expo. Based on capitalization hypothesis, previous literature studies examined whether the announcement of mega-events affects prices of firms' stock or real estate property. In contrast, I utilize data on Real Estate Investment Trust (REIT), whose price has two features of stock and property price. The standard event study methodology with high-frequent data allows the estimation of abnormal returns due to the mega-event of interest, and clarifies the relationship between level of returns and characteristics of REIT's property. I present an empirical example—the 2020 Tokyo Olympics—and the results are as follows: 1) investors judged that the comprehensive effects would be positive; 2) the effect becomes smaller as the distance from Host City (Tokyo-to) increases; 3) even in areas far from Tokyo-to, real estate used for hotels and commercial facilities are relatively susceptible to the Olympics.

Keywords: mega-events; Olympic Games; Real Estate Investment Trust; event study

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1. Introduction

How much is worth hosting global mega-events such as the Olympics, Football's World Cup, and World Expo? Such prestigious projects represent an honor for the host citizens, but they require considerable public funds. Usually, a large amount of national tax money is also allocated to the project, that is, the residents in non-host cities and regions must also bear the event cost. Thus, the economic net benefits that a nation enjoys from hosting mega-events is a matter of public concern.

The impact of mega-events on various economic aspects has been investigated in the literature.[1] Rose and Spiegel (2011) find that hosting mega-events significantly increases national exports. Brückner and Pappa (2015) show that the Olympics have a positive impact on GDP, consumption, and investment. In addition, there are also studies investigating the effects on host cities' income and employment (Jasmand and Maennig 2008; Feddersen et al. 2009; Feddersen and Maennig 2012; Hagn and Maennig 2008, 2009; Miyoshi and Sasaki 2016), as well as tourism (Mitchell and Stewart 2015).

According to the capitalization hypothesis, future benefits and cost flows due to a mega-event should be incorporated into the present value of assets, such as firm stocks and real estate properties. Many researchers examine whether successful Olympics bids announcement significantly affect firms' stock prices (Berman et al. 2000; Veraros et al. 2004; Samitas et al. 2008; Leeds et al. 2009; Mirman and Sharma 2010; Sullivan and Leeds 2016). These analyses of stock price fluctuations only deal with the effects on corporate profits. On the other hand, investigating the change in property prices triggered by information on mega-events can uncover more comprehensive effects. Kavetsos (2012) highlights the positive impacts of the 2012 London Olympics announcement (i.e., a successful bid in 2005) on property transaction prices in the host areas (boroughs) within London and the vicinity of the main stadium.[2]

The approach using property price data, however, suffers from removing the simultaneous shocks unrelated to the effects of mega-events, whereas the approach using stock price data easily addresses the problem. This is because of the differences in asset liquidity. A stock is frequently traded in the exchange markets, and its price is available as high-frequency data (e.g., day, hour, or real time unit data). This feature reduces the risk that multiple significant shocks occur at the same time as the announcement period. In contrast, the liquidity of real estate properties is poor, because transactions do not occur frequently. Thus, after the news release on the mega-event, it takes a reasonable time to accumulate a certain number of transactions observations. Moreover, the available time series data on property prices (transaction prices or appraisal values[3]) is usually of low frequency (in general, one-year unit). This means high risk of multiple shocks being mixed.[4]

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[1] See Baade and Matheson (2016) for a survey on the Olympic Games' effects.

[2] Some associated retrospective studies investigate the effects of construction and open reveal of sports stadium using a hedonic price model with property price data (e.g., Tu 2005; Ahlfeldt and Maennig 2010).

[3] The values of non-traded properties are greatly appraised referring to the actual transaction prices of neighboring properties. Due to the expense, the frequency of such updates is usually once a year.

[4] Even with difference-in-differences method, this problem owing to low-liquidity (or low-frequent data) cannot be completely addressed. Because this method does not cope with anything against other shocks unrelated to the shock of

This paper proposes an alternative approach to assess the value of hosting mega-events, in which data on Real Estate Investment Trust (REIT) are used. REIT is a financial instrument that generally raises funds through the companies investing in income-producing real estate: that is, REIT price has two features of security and property price.[5] Since REIT prices are obtained as high-frequency data like stock prices, it is possible to employ event study methodology that measures abnormal returns due to the announcement of the mega-event of interest.[6] The abnormal return implies the comprehensive effects of holding the mega-event, because REIT price, like property price, represents the discounted present value of future rents from the properties that the REIT invests and owns.

Additionally, using characteristics of the REITs' properties, the determinants of the level of abnormal returns can be clarified. REIT constructs real estate portfolio by attributes of properties for risk diversification, implying that the portfolio of each REIT has unique characteristics. It is possible to investigate the relationship between estimated abnormal returns and the characteristics of REIT portfolio (especially location and intended-use of properties) by estimating a cross-sectional model.

I examine the effectiveness of this method through the case study of the 2020 Tokyo Olympics. On September 8, 2013, Tokyo won its bid to host the Olympics. Incidentally, "OddsChecker.com," a website for UK bookmakers, on September 3, 2013, said that Tokyo had a 44% chance of winning the Olympics bid. Therefore, it is assumed that the International Olympic Committee (IOC)'s announcement changed investors' prospect on future income from the properties that the Japanese REIT (i.e., J-REIT) owned.[7] The results show that the price of the J-REITs significantly responded to the IOC's announcement. In addition, I find that the level of abnormal returns depends on the geographical configuration of J-REIT properties. In particular, investors expected that the Olympic Games have impacts mainly on the host city (i.e., Tokyo-to), and the extent of the impacts gradually decreases as the distance from the host city increases. However, even in domestic areas far from the host city, the property values of hotel and commercial facilities are relatively sensitive to the Games than those with other purposes.

This study is the first investigating the impacts of sports mega-events on REIT returns. Some studies deal with the events strongly associated with REIT itself (e.g., Howe and Jain 2004, for the regulatory change; Tang et al. 2016, for debt announcements for each REIT), while others identify the effects of social and economic mega-events (e.g., Bredin et al. 2007, for monetary policy; Glascock and Lu-Andrews 2015, for extreme market-related events such as the Lehman Brothers bankruptcy). This study contributes to the latter stream of research. However, it is also the first study that examines the relationship between the extent

interest for analysis, common to all sample units belong to the treatment group (or control group).

[5] There are some studies investigating whether the fundamental value of the J-REIT is determined by the real estate price and/or the stock price. See, e.g., Miyakoshi et al. (2016) as for Japanese REIT.

[6] The event study methodology supposes that the effects of an event will reflect immediately in security prices, assuming rationality in the marketplace (MacKinlay 1997).

[7] See the article in "Around The Rings" (http://aroundtherings.com/site/A__44382/Title__Istanbul-Plans-Viewing-Party-Odds-Favor-Tokyo/292/Articles).

of a shock and the characteristics (e.g., location and intended-use) of REITs' properties.[8]

The remainder of this paper is organized as follows. Section 2 shows J-REITs' returns before and after the Tokyo 2020 Olympics announcement. Section 3 investigates the relationship between the change in returns and J-REITs' characteristics, and Section 4 concludes.

2. J-REIT returns and the 2020 Tokyo Olympics

J-REIT began in September 2001 with two companies that owned 44 pieces of real estate (total market capitalization: JPY 319 billion); as of February 2017, J-REIT contained 58 companies that owned 3,519 properties (JPY 15,812 billion).[9] J-REIT is the largest REIT market in the world after the US and Australia. As of November 2014, the number of REITs in the US is 231, in Australia 52, and in Japan 46, and market capitalization (US$ million) in the US is 82,549, in Australia 86,169, and in Japan 84,100. [10]

Information on individual properties of REITs is described in the settlement of accounts of each REIT investment company. In Japan, the Association for Real Estate Securitization (ARES) constructs and discloses J-REIT Property Database.[11] The database includes various types of attributes of the real estate properties: location, market value, purposes of use, age, and so on. For example, Figure 1 shows the number of J-REITs' properties by prefecture.[12] The properties are found in most areas of Japan, but are heavily concentrated in and around urban areas (i.e., Tokyo-to, Osaka-fu, and Aichi-ken).

[8] Glascock and Lu-Andrews (2015)'s purpose is to clarify how liquidity and size of REITs determine the extent of abnormal returns around extreme market-related events.
[9] This information is obtained from the Association for Real Estate Securitization (ARES) J-REIT Databook.
[10] See Miyakoshi et al. (2016) 's table 1 whose data source is EPRA Global REIT Survey 2014, European Public Real Estate Association.
[11] This database is available from the ARES's web site (https://jreit-pdb.ares.or.jp/pdb/).
[12] "Prefecture" is the first level of administrative division of Japan. There are 47 prefectures whose names have "ken," "fu," "to," or "do" added to the end.

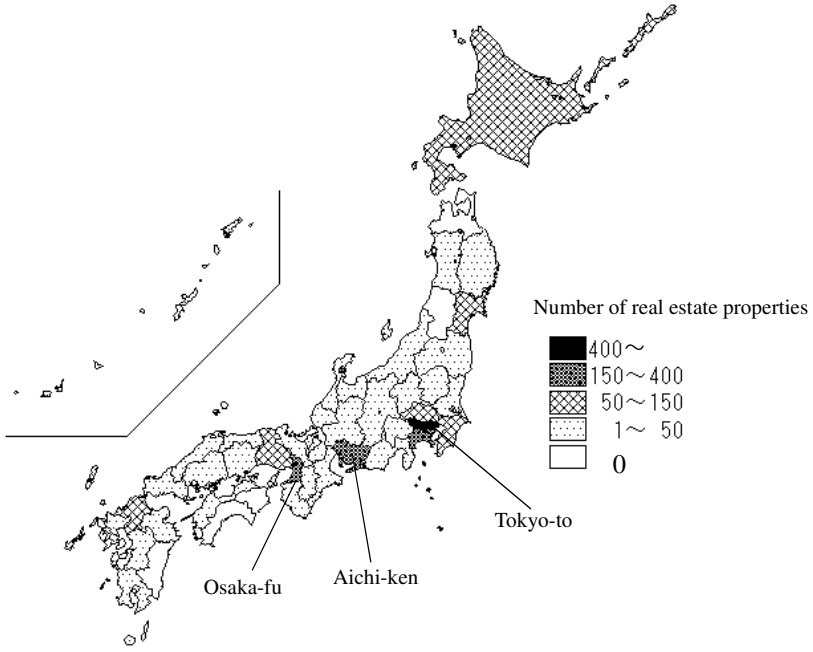


Fig. 1 Spatial distribution of J-REITs' real estate properties

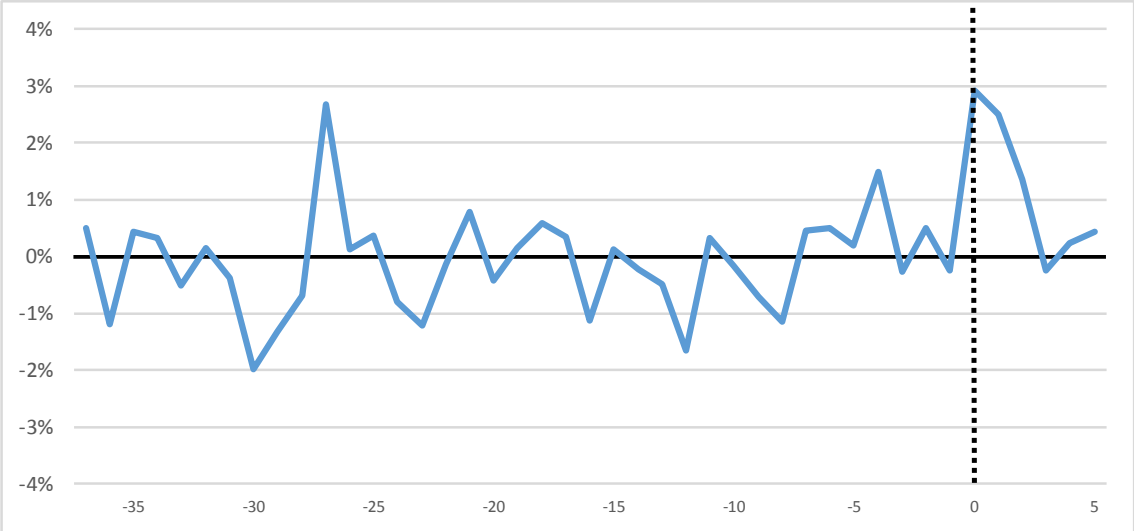
Notes: The data ARES J-REIT Property Database (as of October 2015).

In what follows, I preliminarily state how J-REIT returns changed when Tokyo-to won the bid to host the 2020 Olympic and Paralympic Games.

On September 8, 2013, Tokyo-to was awarded the 2020 Olympics hosting. The day is, a Sunday. Thus, I set the first trading day since then (i.e., September 9, 2013) as the event day for this analysis. At that time, 41 J-REITs were traded on the Tokyo Stock Exchange. Their names and security codes are summarized in Table 1. Figure 2(a) shows the daily change in the average value of the returns across those J-REITs around the event day (37 pre-event days, the event day, and 5 post-event days).[13] I find that the average value at the event day is about 3%, which seems to change greatly since the previous day, and during three days since then, each average return is above 1%. In addition, a big negative did not occur in the five post-event days. Figure 2(b) shows the cumulative values of the daily average returns described in (a). I find that the cumulative values had been mostly negative in pre-event days. However, the negative width sharply shrinks at the event day, and it turned to and remained positive in post-event days. These observations suggest that the announcement of Tokyo's win should significantly change investors' prospect for J-REIT properties.

[13] Hoshino Resort (No. 3287), which is one of the 41 REITs, was first listed on the stock market on July 16, 2013, 39 trading days prior to the event day. To avoid list-based shock, I select July 18, 2013, as the beginning of the period.

(a) Average returns for J-REITs



(b) Cumulative values of the average returns for J-REITs

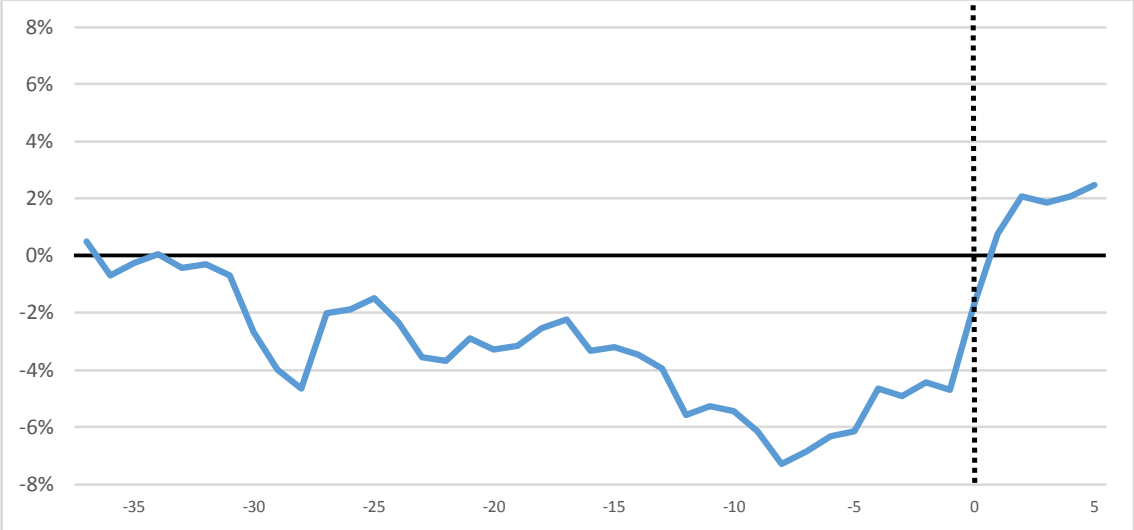


Fig. 2 Plot of J-REIT's return around the event day (September 9, 2013)

Notes: The observation period consists of 37 pre-event days, the event day, and 5 post-event days, where the event day is expressed as zero. The returns of 41 REITs, which were traded on the Tokyo Stock Exchange at the event day, are calculated on a closing price basis. J-REIT daily prices are obtained from the database of *Yahoo! Japan Finance* that is a website on Japanese stock market.

Next, following standard event study methodology (MacKinlay 1997), I study the announcement shock of Tokyo win on each return of 41 J-REITs by estimating the abnormal returns, a measure to evaluate the impact due to the event of interest (i.e., the announcement). Specifically, I calculate the actual return minus the normal return, both at the event day. The normal return is defined as the expected return without

conditioning on the event (i.e., the 2020 Olympics site decision). There are two common choices for modeling it: the *constant mean return model* and the *market model*. The former model assumes that the mean return of a given security is constant through time, whereas the latter model assumes a stable linear relationship between market return and each security return. Since this study allows for the possibility that mega-events can also significantly affect market return (i.e., J-REIT market return or firm stock market return), I select the *constant mean return model*.

Table 1 summarizes individual J-REITs' actual, normal, and abnormal returns at the event day. I find that the abnormal returns are larger than actual returns for most of J-REITs. This is because most of the estimated normal returns are negative. The estimated abnormal returns, instead, vary from a high 7.80% (No. 8982) to a low 0.50% (No. 3285); the average for all J-REITs is 3.05%, and the standard deviation is 1.41%. Using this sample, I conduct a t-test for the null hypothesis that hosting the 2020 Olympics has no impact on the income from REITs properties, that is, the average abnormal return is zero. Under the null hypothesis, the t-statistics is 13.84, thus rejecting the null hypothesis at 1% significance level.

Table 1 J-REITs' Actual, Normal and Abnormal Returns for Hosting the 2020 Tokyo Olymic Games

Securities code	J-REIT Name	Actual return (%)	Normal return (%)	Abnormal return (%)
3226	Nippon Accommodations	3.11	-0.12	3.23
3227	MCUBS MidCity	1.92	-0.09	2.01
3234	MORI HILLS REIT	4.58	-0.27	4.85
3240	Nomura Real Estate Residential	4.46	-0.12	4.58
3249	Industrial & Infrastructure	2.09	-0.28	2.37
3263	Daiwa House REIT	1.96	-0.15	2.11
3269	Advance Residence	1.56	-0.26	1.82
3278	Kenedix Residential	2.53	-0.30	2.83
3279	Activia Properties	2.13	-0.22	2.35
3281	GLP J-REIT	1.60	0.00	1.60
3282	Comforia Residential	3.29	-0.42	3.71
3283	Nippon Prologis	1.30	-0.02	1.32
3285	Nomura Real Estate Master	0.41	-0.09	0.50
3287	Hoshino Resorts	3.26	-0.12	3.38
8951	Nippon Building	4.31	-0.13	4.44
8952	Japan Real Estate	4.14	-0.04	4.18
8953	Japan Retail	2.09	-0.24	2.33
8954	ORIX JREIT	4.14	-0.17	4.31
8955	Japan Prime Realty	3.34	0.02	3.32
8956	Premier	5.69	-0.11	5.80
8957	TOKYU REIT	2.97	-0.34	3.31
8958	Global One	3.64	-0.08	3.72
8959	Nomura Real Estate Office	0.83	-0.12	0.95
8960	United Urban	2.78	0.01	2.77
8961	MORI TRUST	3.71	-0.11	3.82
8963	Invincible	2.23	-0.09	2.32
8964	Frontier	2.67	-0.14	2.81
8966	HEIWA	3.70	-0.17	3.87
8967	Japan Logistics	2.50	-0.08	2.58
8968	Fukuoka REIT	1.24	-0.18	1.42
8972	Kenedix Office	2.73	-0.09	2.82
8973	Sekisui House SI	2.48	-0.05	2.53
8975	Ichigo Office REIT	2.25	-0.19	2.44
8976	Daiwa Office	4.09	0.00	4.09
8977	Hankyu REIT	1.64	-0.02	1.66
8979	Starts Proceed	1.47	0.00	1.47
8982	Top REIT	7.67	-0.13	7.80
8984	Daiwa House Residential	2.75	-0.22	2.97
8985	Japan Hotel	5.45	0.11	5.34
8986	Japan Rental Housing	1.49	-0.08	1.57
8987	Japan Excellent	3.60	-0.10	3.70
	Average	2.92	-0.13	3.05
	Standard Deviation	1.41	0.11	1.41

Notes: Abnormal return in the event day is actual return in the evet day minus normal return in the event day. The normal return in the event day is calculated following tne constant mean return model of standard event study method. I set average of actual retruns for the 37 trading days prior to the event day as the normal return.

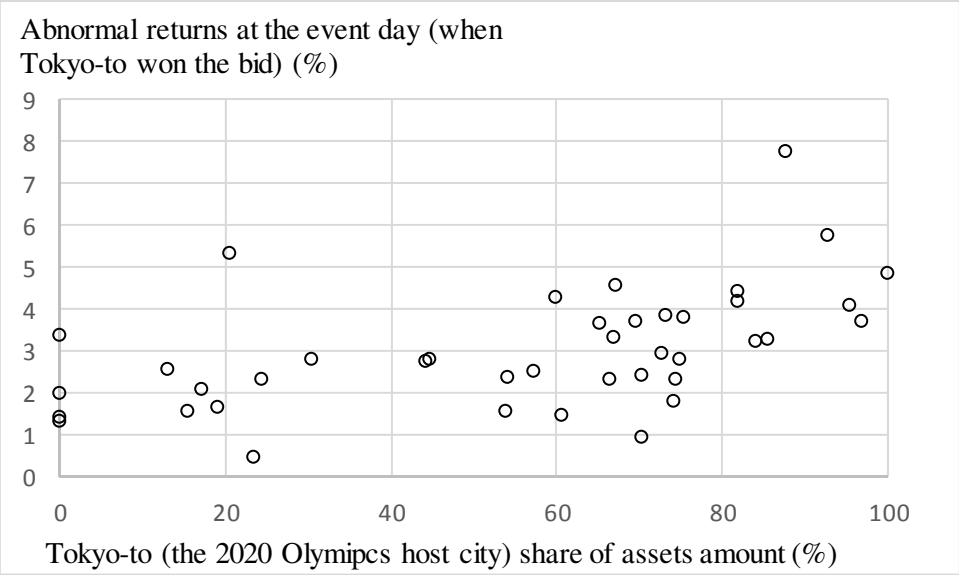


Fig. 3 Scatter diagram of the abnormal returns and Tokyo-to share of assets for J-REITs

Figure 3 shows the relationship between abnormal returns and Tokyo-to share of real estate properties owned by the J-REITs. I find that the larger Tokyo-to (host city) share is, the higher the extent of abnormal return. Interestingly, the abnormal returns of four REIT companies having no properties in Tokyo-to are all above 1%, that is, 3.38% (No. 3287), 2.01% (No. 3227), 1.42% (No. 8968), and 1.32% (No. 3283). The average for these J-REITs is 2.03%, and the standard deviation is 0.36%. Although the sample is quite small (4), I conduct a t-test as follows: under the null hypothesis that the average of these four abnormal returns is zero, the t-statistics is 5.797, which rejects the null at 1% significance level. This result may indicate that investors expect the effects of the Olympics to spill over to areas other than the host city.

Additionally, Figure 3 shows that even if the value of the Tokyo-to share is about the same, the abnormal returns values are dispersed, implying that the magnitude of the effect could depend on other attributes of REIT properties.

3. Estimating determinants of the extent of the abnormal returns

To get a sense of the magnitude of the impacts of the Tokyo 2020 Olympics, this section examines the relationship between the level of abnormal returns and the characteristics of REIT property portfolios. Specifically, I clarify whether and how the attributes of location and intended use influence the level of abnormal returns.

3.1 Method and independent variables' construction

I estimate two cross-sectional models with different types of independent variables relating to geographical attributes: share-variables and a distance-variable.

First, to confirm the relationship between areas' configuration and the level of abnormal returns, I estimate the following regression:

$$\widehat{AR}_{i\tau} = a + \sum_{j=2}^{J} b_j \cdot AREA_{ji} + \sum_{k=2}^{K} c_k \cdot USAGE_{ki} + \varepsilon_i, \quad (1)$$

where $\widehat{AR}_{i\tau}$ is the abnormal return for REIT i at time τ, as obtained in the previous section; $AREA_{ji}$ is the area-share variable corresponding to the share of the amount, based on market value, of real estate used in the area j for REIT i; $USAGE_{ki}$ is the usage-share variable corresponding to the share of the amount, based on market value, of real estate used for specified usage k for REIT i; and ε_i is the disturbance term.

As for the geographic scope of $AREA_{ji}$, I select the major metropolitan areas and set the other areas as "Rest of Japan." As already confirmed in Figure 1, many REIT properties are located in and around Tokyo-to, Osaka-fu, and Aichi-ken, which are major metropolis in Japan. I employ three Metropolitan Employment Areas (MEAs) [14]: Tokyo MEA, Osaka MEA, and Nagoya MEA[15]. Further, to investigate the effects on adjacent areas around Tokyo-to, I divide Tokyo MEA by Tokyo-to and the other areas. The latter area is called Tokyo MEA excluding Tokyo-to.

For $USAGE_{ki}$, I classify J-REIT's real estate properties into five categories: Residence, Hotel, Office, Commercial facilities, and Logistics facilities.[16] For example, if a mega-event increases the number of tourists, the price of a REIT that invests in hotels is likely to respond to the announcement on hosting the Olympics. Furthermore, if a mega-event significantly improves incomes or amenities, the price of a REIT that invests in residences should also respond to it.

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[14] Kanemoto and Tokuoka (2002) proposed definition of Japanese Urban Employment Area, which is based on the residential sphere of commuters, and Japanese counterpart of the Core Based Statistical Area. The Urban Employment Area is divided into Metropolitan Employment Areas (MEAs) and Micropolitan Employment Areas (McEAs) according to their sizes. A MEA is a UEA whose core area has a DID (Densely Inhabited District) population of at least 50,000, while a McEAs is that with a DID population of at least 10,000 and less than 50,000. See the following web site for details, http://www.csis.u-tokyo.ac.jp/UEA/index_e.htm.

[15] Nagoya is the seat of Aichi-ken. Although Kanemoto and Tokuoka (2002) formally defined Nagoya-Komaki MEA, the name is abbreviated to "Nagoya MEA" in this study.

[16] If a piece of real estate has more than two purposes of use, I select that which is listed first, assuming that this is likely the primary one.

$AREA_{1i}$ and $USAGE_{1i}$ are used as base variables, where one of the categories must be excluded from the regression equation ('Rest of Japan' and 'Residence', respectively).

Second, I estimate another type of cross-sectional model to assess the following two relationships: 1) degree of impact and distance from the host city, 2) which purpose of use is relatively is susceptible to the mega-event's shock even when the property is far from the host city.

$$\widehat{AR}_{i\tau} = a + b \cdot log(WAD_i) + \sum_{k=2}^{K} c_k \cdot USAGE_{ki} + \sum_{k=2}^{K} d_k \cdot log(WAD_i) \cdot USAGE_{ki} + \varepsilon_i, \qquad (2)$$

where WAD_i is the weighted average of distances between the host city and location of properties that REIT i owns, that is, how far the REIT asset is from the host city.[17] To build WAD_i, I use the straight-line distances between the offices of two prefectural governments, Tokyo-to and the prefecture where the property is located. Equation (2) also includes the interaction terms ($log(WAD_i) \cdot USAGE_{ki}$), whose coefficients ($d_k$) are important clues to clarify the second relationship.

3.2 Descriptive statistics

Table 2 presents the descriptive statistics of the independent variables. As for $AREA_{ji}$, mean values in each area are 55.2% in Tokyo-to, 15.8% in Tokyo MEA excluding Tokyo-to, 14.3% in Rest of Japan, 11.1% in Osaka MEA, and 3.6% in Nagoya MEA. I find that each J-REIT tends to have real estate located in major MEAs, in particular Tokyo MEA. Further, I find that the area-share variables of Nagoya MEA vary only slightly across REITs, as it results from their standard deviation and maximum values are relatively small.

The mean values for WAD_i is 140 km, and standard deviation is 160 km. The minimum is 0, thus, I consider $log(WAD) \equiv log(WAD + 1)$ for regression.

The mean values for $USAGE_{ki}$ are 37.7% of Office, 27.1% of Residence, 16.9% of Commercial facilities, 11.6% of Logistics facilities, and 6.7% of Hotel. Standard deviation, minimum and maximum values indicate that each variable varies widely across the J-REITs.

[17] The weights are the shares of asset amount based on market value.

Table 2 Descriptive statistics for independent variables

		Mean	S.D.	Min.	Max.
$AREA_j$ (%)	Tokyo-to (Host city)	55.2	30.3	0	100.0
	Tokyo MEA excluding Tokyo-to	15.8	15.8	0	69.4
	Osaka MEA	11.1	17.3	0	80.5
	Nagoya MEA	3.6	3.7	0	12.7
	Rest of Japan	14.3	21.6	0	100.0
WAD (100km)		1.4	1.6	0	8.7
$USAGE_k$ (%)	Residence	27.1	40.8	0	100.0
	Hotel	6.7	22.2	0	100.0
	Office	37.7	38.6	0	100.0
	Commercial facilities	16.9	25.5	0	100.0
	Logistics facilities	11.6	28.9	0	100.0

3.3 Results

Table 3 shows the result of regression (1). First, I find that the extent of the abnormal returns depends on the geographical configuration of J-REIT properties. The coefficients of area-share variables are all positive, which means that a reduction in the share of Rest of Japan within REIT property portfolio increases the extent of its abnormal return.

However, these positive values and their statistical significances are different among the variables. The estimated coefficients vary from a high 0.046% of Tokyo-to to a low 0.012% of Nagoya MEA. Further, that of Tokyo-to and Osaka MEA are significantly different from zero at significant-level 1% and 10%, respectively, while those of the other MEA areas are insignificant at all significance levels.

Second, I find that Hotel is the most sensitive to the announcement among the five purposes of use. The estimated coefficient of Hotel is 0.043%, which is remarkably high as compared to the others (0.007% of Office, 0.003% of Commercial facilities, and 0.000% of Logistics facilities). Besides, only the coefficient of Hotel is significant.

Table 4 shows the result of regression (2). I find the coefficient on $log(WAD_i)$ to be significantly negative, meaning that the farther from Tokyo the property location is, the less the impact of the Olympics.

This coefficient (–1.547) supposedly measures the negative effect when real estate is fully allocated to residence; however, the results of the coefficients on $log(WAD_i) \cdot USAGE_{ki}$ show that the degree of this negative relationship depends on the purposes of use. The coefficients on these interaction terms regarding hotel and commercial facilities are positive, and both of them are significant at 5% and 10% significance levels, respectively. This means that the degrees of the negative relationship for hotel and commercial facilities are weaker rather than that for residence.

Meanwhile, the value for offices is negative, but not significant. These results show that, even in locations far from the host city, hotels and commercial facilities are more likely to be affected by the Olympic Games.

Table 3 Cross-sectional model 1

Dependent variable: the abnormal returns (%)			
$AREA_j$	Tokyo-to (Host city)	0.046	[0.010]***
	Tokyo MEA excluding Tokyo-to	0.028	[0.018]
	Osaka MEA	0.014	[0.008]*
	Nagoya MEA	0.012	[0.047]
$USAGE_k$	Hotel	0.043	[0.008]***
	Office	0.007	[0.005]
	Commercial	0.003	[0.008]
	Logistics	0.000	[0.009]
Constant		-0.739	[0.876]
Adj-R-squared		0.370	
Sample size		41	

Notes: The method of estimation of regression (1) is least squares. Robust standard errors that correct for heteroskedasticity are in squared brackets.
*Significantly different from zero at 90% confidence, **95% confidence, ***99%confidence

Table 4 Cross-sectional model 2

Dependent variable: the abnormal returns (%)			
$log(WAD)$		-1.547	[0.635]**
$USAGE_k$	Hotel	-0.011	[0.013]
	Office	0.020	[0.009]**
	Commercial	-0.021	[0.014]
	Logistics	-0.019	[0.020]
$log(WAD)*USAGE_k$	Hotel	0.027	[0.011]**
	Office	-0.025	[0.015]
	Commercial	0.021	[0.012]*
	Logistics	0.012	[0.020]
Constant		3.860	[0.428]***
Adj-R-squared		0.482	
Sample size		41	

Notes: The method of estimation of regression (2) is least squares. Robust standard errors that correct for heteroskedasticity are in squared brackets.
*Significantly different from zero at 90% confidence, **95% confidence, ***99%confidence

4. Conclusion

Using REIT data, this study proposes an alternative method to evaluate the effects of hosting mega-events. The approach using property price data targets more comprehensive effects than the approach using stock price data. However, the former approach suffers from removing the simultaneous shocks unrelated to the mega-event. As the transaction of a property does not occur frequently, its price is available as low-frequency data (e.g., annual data). This feature implies high risk of multiple shocks being mixed. In contrast, using the REIT price allows capturing the features of both property and stock prices. Starting from this, I examine the impact of the 2020 Tokyo Olympic and Paralympic Games, using standard event study methodology. The results showed that investors expect Olympic Games to have an impact mainly on the host city (i.e., Tokyo-to), and the extent of such impact gradually decreases as the distance from the host city increases. However, even in domestic areas far from the host city, the property values of hotel and commercial facilities are more sensitive to the Games than those with other intended uses.

As the REIT market grows, the number of REITs will increase and the related real estate portfolios will be richer in variety. In this context, the method described herein will become increasingly helpful.

Acknowledgments: I am grateful for the constructive comments from Yukari Iwanami, Shin Kimura, Minoru Kitahara, Tetsuya Nakajima, Hideki Nakamura, Akihiko Noda, Ryosuke Okazawa, Shinpei Sano, and Shuji Uranishi.

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