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# Determining the Financial Efficiency of Mega Events

Murat Güldoğan[1, 2], Ferhat İnce[3]

***ABSTRACT***

Mega events, providing prestige and economic contributions to host cities and countries, are of great importance in terms of internationalization. In addition to their extra advantages, these events must be organized efficiently for sustainable development. To the best of our knowledge, although some studies investigate the efficiency of countries participating in mega-events, no study concentrates on the efficiency of mega-events as an organization. Accordingly, this study examines the financial efficiency of each sub-event of three mega-events: the Summer Olympic Games, the Winter Olympic Games, and the FIFA Men's World Cup. In this context, the bootstrap DEA method was utilized. The findings revealed that almost all mega events were organized inefficiently. It is thought that addressing the efficiency levels of mega-events at the organizational scope might yield a new perspective for mega-event authorities and lead to new literature.

***Keywords:*** *Mega Event Management, Financial Efficiency, Data Envelopment Analysis, Bootstrap.*
***JEL Classification:*** *C14, G14.*

# Mega Etkinliklerin Finansal Etkinlik Düzeylerinin Belirlenmesi

***ÖZET***

Ev sahibi şehirlere ve ülkelere prestij ve ekonomik katkılar sağlayan mega etkinlikler, uluslararasılaşma açısından büyük önem taşımaktadır. Ekstra faydalarının yanı sıra sürdürülebilir kalkınma için bu etkinliklerin verimli bir şekilde organize edilmesi gerekmektedir. Bilindiği kadarıyla, her ne kadar bazı çalışmalar mega etkinliklere katılan ülkelerin etkinliğini araştırsa da hiçbir çalışma mega etkinliklerin bir organizasyon olarak etkinliğine odaklanmamaktadır. Bu bağlamda, bu çalışma Yaz Olimpiyat Oyunları, Kış Olimpiyat Oyunları ve FIFA Erkekler Dünya Kupası olmak üzere üç mega etkinliğin her bir alt etkinliğinin finansal etkinliğini araştırmaktadır. Bu bağlamda, bootstrap VZA yöntemi kullanılmıştır. Bulgular, neredeyse tüm mega etkinliklerin etkin olmayan bir şekilde organize edildiğini ortaya koymuştur. Mega etkinliklerin etkinlik düzeylerinin örgütsel kapsamda ele alınmasının mega-etkinlik otoriteleri için yeni bir bakış açısı sağlayabileceği ve yeni bir literatüre öncülük edebileceği düşünülmektedir.

***Anahtar Kelimeler:*** *Mega Etkinlik Yönetimi, Finansal Etkinlik, Veri Zarflama Analizi, Bootstrap.*
***JEL Sınıflandırması:*** *C14, G14.*

[1] Corresponding Author: mguldogan@anadolu.edu.tr
[2] Dr., Eskişehir Technical University, Eskişehir. ORCID: 0000-0002-5494-7318.
[3] Res. Asst., Eskişehir Technical University, Aviation Management Department, Eskişehir. ORCID: 0000-0003-3220-8909.
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## 1. INTRODUCTION

In today's our modern world, mega-events such as national and international festivals, cultural celebrations, sports, concerts, and marathons are held in western countries on a mega scale, as well as in more developed tourism activity centers. As the prestige and prevalence of such events and organizations increase, many developing countries and cities have begun to provide financial and policy advisory support for this in recent years. Firstly, economic and social activities, both in the short-term and in the long-term, are known to be substantial driving forces for hosting mega activities in many cities and countries (Barton & Ramírez, 2019; Bottero et al., 2019; Koodsela et al., 2019). At the same time, mega-events have many favorable consequences, including positive economic effects for the host region. One of the most prominent motivations of countries facing financial challenges is to get funding from central government grants by hosting mega-events. In addition, the growing role of mega-events in improving the international image of host cities and solving national political issues has attracted increasing attention in the developing world. From a more socially oriented perspective, by taking urban renewal designed to enhance the image of the city, attention is turned to the highlighted adverse effects on the poorest. On the other hand, a result of hosting mega-events can be a significant increase in infrastructure investments and support for rapid and equitable urban transformation. A considerable amount of money is spent on the necessary infrastructure to host the event (Matheson, 2009). Financial management is a crucial process for events (Richards & Palmer, 2010). Losses are inevitable if financial management is not given due importance and is not continuously monitored and evaluated throughout the relevant event. The function of financial management ensures that the budgets to be created for the event are used effectively throughout the project. In terms of event management, financial management can be defined as the process of creating a budget for each sub-event and effectively managing the budget. Examining post-event studies before large-scale events are organized may result in less commitment to organizing events and more quantitative pre-event studies. However, it should not be forgotten that although the necessary controls are made during the event as well as the preparation stage, if there are deviations in the budget, required corrections should be made (Baade & Matheson, 2002). Today, international organizations that decide where to organize large-scale events focus on candidate countries/cities that offer prices based on stable and sound financial principles to host the event. However, while these organizations financially control the functioning of the event, it is a significant challenge for hosts to be able to finance the necessary infrastructure for large-scale events. It does not seem painless to measure the efficiency of investments in projects that are formed by the organization of a large-scale event and have complicated results. In this sense, this paper aims to evaluate the financial efficiency of mega-events. The remainder of this paper is structured as follows: Section 2 summarizes the efficiency studies focusing on mega-events, and Section 3 introduces the methodology with its origins and details. Section 4 offers the results briefly and objectively, and the final section summarizes the results, indicates the restrictions of the paper, and confers further research recommendations with conclusions.

## 2. LITERATURE REVIEW

Lozano et al. (2002) evaluated the efficiency of the participant countries in the five Summer Olympic games (Los Angeles, Seoul, Barcelona, Atlanta, Sydney) held between 1984-2000 (Lozano et al., 2002). The Gross National Product and population were input variables, while the total number of bronze, silver, and gold medals were output variables. There were four organizing countries: the USA, South Korea, Spain, and Australia. The results of the output-oriented BCC (Banker, Charnes, Cooper) analysis proposed the USA was the most efficient organizer country ($\overline{x}$=91.9), while Spain was the worst ($\overline{x}$=31.6). The findings also revealed that rich/more populated lands had decreasing returns to scale, while poor/small ones had increasing returns to scale. Lins et al. (2003) conducted the output-oriented BCC model initially and proceeded with the zero sum gains model placing weight restrictions on the medals to assess the efficiency levels of the participants that gained at least one medal in the Sydney 2000 Olympic Games (Lins et al., 2003). The number of bronze, silver, and gold medals was considered as output, while the population and GDP (Gross domestic product) were input. Because of the model's nonlinearity and numerous variables, the authors stressed that obtaining results is harsh. The model would be considerably simplified if merely one output (the number of medals in the context of the Olympic Games) was available. The results of the developed model indicated that just seven countries were efficient: the USA, Australia, Cuba, Russia, Bahamas, Macedonia, and Barbados. Li et al. (2008) examined the efficiency levels of countries joining the six Olympic Games, Los Angeles 1984, Seoul 1988, Barcelona 1992, Atlanta 1996, Sydney 2000, and Athens 2004, through the context-dependent assurance region data envelopment analysis (Li et al., 2008). The countries were evaluated with their income levels, and World Bank's classification system was used: Low (up to 825 US $), lower-middle (826-3357 US $), upper-middle (3358-10,461 US $), and high (10,462 and more US $). The inputs were the GDP per capita (US $) and population, while the outputs were earned medal types. The findings revealed that the efficient countries in the Athens 2004 Olympic Games were predominantly classified as low and lower-middle income. Wu et al. (2009) conducted a similar study that of Li et al. (2008), with the same type of variables, but they utilized a cluster analysis for determining benchmarks for countries that serve inadequately (Wu et al., 2009a). Wu et al. (2009b) executed the game-cross efficiency model with the same variables to extend the Sydney 2000 Olympic Games results of Lozano et al. (2002), and the findings showed that even if minor adjustments can differ the efficiency levels and rankings of decision-making units (i.e., countries), there was no efficient country according to the game-cross model (Wu et al., 2009b). The other evidence that some revisions change the results is the study with Lexicographic authored by (Zhang et al., 2009). Indeed, there might be opposite thoughts in some papers published early (de Mello et al., 2008). Different extensions of the DEA (Data envelopment analysis), such as Integer-Valued DEA (Wu et al., 2009c), Bounded DEA (Azizi & Wang, 2013), Parallel DEA (Lei et al., 2015), CCR (Flegl & Andrade, 2018), Two-stage DEA (de Cássio Rodrigues et al., 2019), Two-stage with fixed-sum outputs (Li et al., 2020), DEA with input multiplier restrictions (Sekitani & Zhao, 2021), have been tried in other efficiency analysis studies related to the Olympic Games.

As to another mega-event, FIFA, some papers evaluated the efficiency of goalkeepers (Alp, 2006; Alp & Özsoy, 2017) and teams with offense and defense (Djordjević et al., 2015).

## 3. METHODOLOGY

DEA is a non-parametric efficiency measurement method having a linear programming design for evaluating the performance of peer units called decision-making units (Ji & Lee, 2010; Cooper et al., 2011). DEA is highly utilized in various domains, such as the health sector (Guerrini et al., 2017; de Almeida Botega et al., 2020), the education system (Kao & Hung, 2008; Ghasemi et al., 2020), the banking sector (Yang, 2009; Tao et al., 2012), the airline industry (Lozano & Gutiérrez, 2014; Hu et al., 2017), the airport industry (Martín & Román, 2001; Kan Tsui et al., 2014), and the rest. DEA was first proposed by Edwardo Lao Rhodes' doctoral thesis (Rhodes, 1978). The CCR (Charnes, Cooper, Rhodes) model is proposed by (Charnes et al., 1978). As DEA studies have become more popular over time, the CCR model has been tried to be developed, and the BCC model was proposed by Banker et al. (1984). The CCR model has constant returns to scale, while the BCC model has variable returns to scale (Geissler et al., 2015). It means the efficiency frontier of CCR is linear, and that of BCC is convex. The output-oriented approach determines the output level that can produce the given input. In contrast, the input-oriented approach is utilized for the optimum input level to generate the given output. (Cook et al., 2014). The output-oriented approach is appropriate for determining the maximum output amount by utilizing the existing inputs. On the contrary, the input-oriented procedure is suitable for detecting the optimum input combination that can generate the current output level (Birman et al., 2003). The output-oriented approach is appropriate if the input variables are immobile or structural elements that are determined after a long-term planning process. The input-oriented technique is suitable if the inputs are financial or operational components (Cullinane et al., 2006; Özsoy & Örkcü, 2021). To be more explicit, the results of the input-oriented approach demonstrate how much input needs to be decreased for a firm to become efficient. The basic DEA models, such as CCR and BCC, are criticized for providing biased estimates (Nguyen et al., 2015). We utilized the bootstrap approach (Simar & Wilson, 1998) to eliminate this problem. Furthermore, we determined the iteration number (B= 5000) and alpha value ($\alpha$= 0.01) to obtain precision in the results. Besides, we convert all variables to their logarithmic value to reduce standard error. Friedman and Sinuany-Stern (1998) stated that the DMU number has to be n>3(inputs + outputs). Thirty-eight DMUs, two inputs, and three outputs exist in the dataset, indicating no rule violation. We collected the data prepared by Müller et al. (2022) from Harvard Dataverse (Müller et al., 2022). There are three mega-events in the dataset: Summer Olympic Games, Olympic Winter Games, And FIFA Men's World Cup. The mega-events in the dataset have financial information that consists of ticketing revenue, broadcast revenue, international sponsorship revenue, domestic sponsorship revenue, cost of venues, and cost of organizations. We, however, excluded the 2018 Pyeongchang Olympic Winter Games, the 1980 Moscow Summer Olympic Games, and domestic sponsorship revenue due to data deficiency. Thus, ticketing revenue, broadcast revenue, and international sponsorship revenue were

considered output variables. The cost of venues and cost of organization were considered input variables. We meticulously researched historical exchange rates and converted all local currencies into US $. The analysis is conducted with the deaR package in R (Coll-Serrano et al., 2023).

## 4. RESULTS

The descriptive statistics of the dataset are presented in Table 1.

**Table 1**. Descriptive Statistics

| Variables | Minimum | Maximum | Mean |
|---|---|---|---|
| *Outputs (million $)* | | | |
| Ticketing Revenue | 1.2 | 988 | 190.9 |
| Broadcast Revenue | 1.6 | 3.127 | 829.4 |
| International Sponsorship Revenue | 0.2 | 1.660 | 441.5 |
| *Inputs (million $)* | | | |
| Cost of Venues | 3.7 | 774 | 25.106 |
| Cost of Organization | 2.4 | 568.391 | 18.119 |

**Note:** Table 1 doesn't represent the logarithmic values but original values

Accordingly, the most oversized expense item of the 33 mega-events is the cost of venues, while the supreme income item is the broadcast revenue. The aggregated efficiency results of 33 mega-events are compiled in Table 2.

**Table 2**. Efficiency Scores of Mega Events

| Events | Year and Location | BCC | Bootstrapped BCC | C.I. | |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| Summer Olympic Games | 1964 Tokyo | 0.859 | 0.834 | 0.791 | 0.857 |
| | 1972 Munich | 0.792 | 0.773 | 0.734 | 0.791 |
| | 1976 Montreal | 0.768 | 0.746 | 0.714 | 0.766 |
| | 1984 Los Angeles | 0.883 | 0.843 | 0.782 | 0.882 |

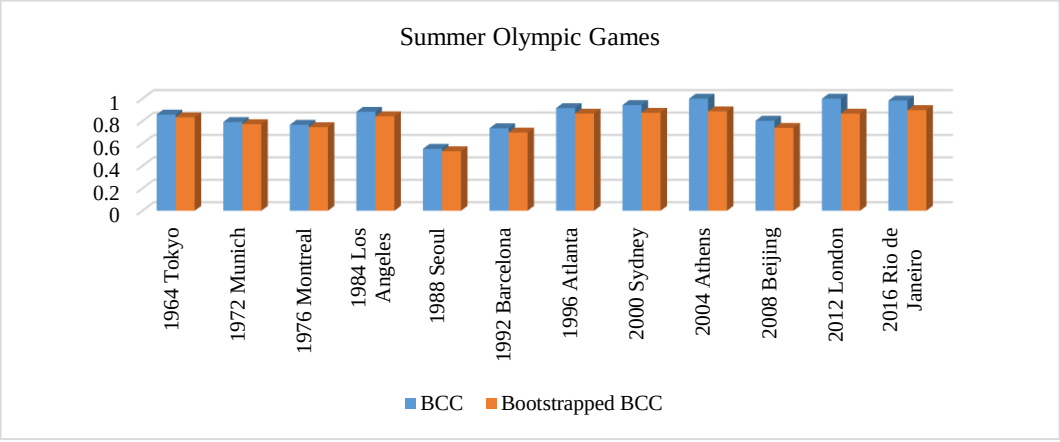
| | | | | | |
|---|---|---|---|---|---|
| | 1988 Seoul | 0.553 | 0.531 | 0.495 | 0.552 |
| | 1992 Barcelona | 0.736 | 0.698 | 0.650 | 0.735 |
| | 1996 Atlanta | 0.916 | 0.867 | 0.799 | 0.913 |
| | 2000 Sydney | 0.944 | 0.875 | 0.799 | 0.940 |
| | 2004 Athens | 1.000 | 0.887 | 0.810 | 0.997 |
| | 2008 Beijing | 0.803 | 0.740 | 0.676 | 0.801 |
| | 2012 London | 1.000 | 0.867 | 0.693 | 0.996 |
| | 2016 Rio de Janeiro | 0.983 | 0.898 | 0.804 | 0.979 |
| **Winter Olympic Games** | 1968 Grenoble | 0.975 | 0.962 | 0.921 | 0.974 |
| | 1980 Lake Placid | 0.827 | 0.799 | 0.758 | 0.825 |
| | 1988 Calgary | 0.776 | 0.755 | 0.707 | 0.775 |
| | 1992 Albertville | 0.825 | 0.805 | 0.753 | 0.824 |
| | 1994 Lillehammer | 0.796 | 0.769 | 0.718 | 0.795 |
| | 1998 Nagano | 0.738 | 0.690 | 0.633 | 0.736 |
| | 2002 Salt Lake City | 0.778 | 0.722 | 0.657 | 0.776 |
| | 2006 Turin | 0.793 | 0.746 | 0.685 | 0.790 |
| | 2010 Vancouver | 0.881 | 0.827 | 0.761 | 0.877 |
| | 2014 Sochi | 0.820 | 0.768 | 0.703 | 0.818 |
| | 1970 Mexico | 0.958 | 0.942 | 0.899 | 0.957 |
| | 1974 West Germany | 0.934 | 0.915 | 0.875 | 0.933 |
| **FIFA Men's World Cup** | 1978 Argentina | 0.934 | 0.913 | 0.872 | 0.933 |
| | 1982 Spain | 0.863 | 0.838 | 0.798 | 0.862 |
| | 1990 Italy | 0.803 | 0.774 | 0.735 | 0.801 |

| | | | | |
|---|---|---|---|---|
| 1998 France | 0.808 | 0.766 | 0.701 | 0.806 |
| 2002 Japan & South Korea | 0.773 | 0.726 | 0.659 | 0.771 |
| 2006 Germany | 0.810 | 0.761 | 0.698 | 0.808 |
| 2010 South Africa | 0.757 | 0.703 | 0.644 | 0.755 |
| 2014 Brazil | 0.978 | 0.893 | 0.797 | 0.975 |
| 2018 Russia | 1.000 | 0.870 | 0.693 | 0.996 |
| **Mean** | 0.850 | 0.803 | 0.791 | 0.857 |

**Note:** C.I. = Confidence Interval

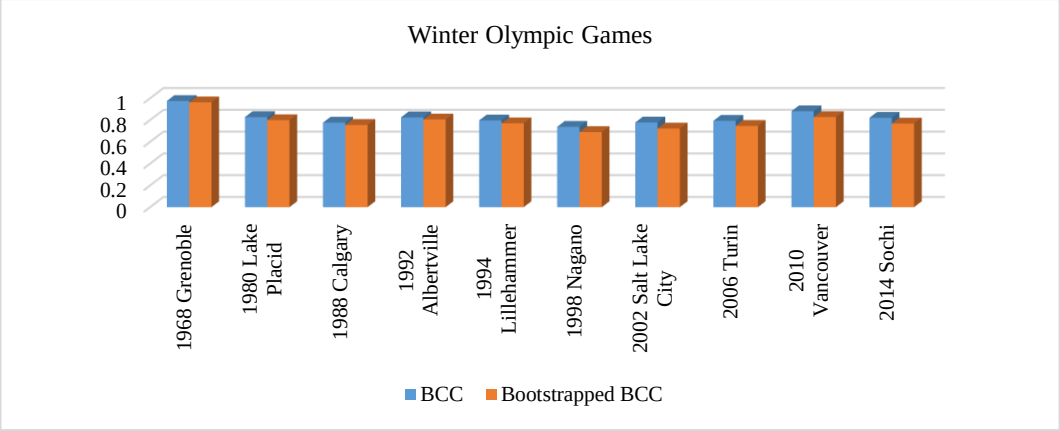
The traditional BCC results suggest that only two Summer Olympic Games were organized efficiently in terms of finance: Athens and London. The 1988 Seoul Summer Olympic Games had the lowest relative efficiency at 55.29%. According to the BCC, the financial success rate of the Summer Olympic Games is 85.3% in terms of efficiency, while that score is 79.66%, bias-corrected BCC says. Additionally, bias-corrected BCC scores show the most efficient Summer Olympic Games hosted by Rio de Janeiro in 2016. We illustrated the comparable results of the Summer Olympic Games in Figure 1. It is clear from Figure 1 that the last three Summer Olympic Games have an increasing trend of financial efficiency.

**Figure 1.** Comparable results of the Summer Olympic Games



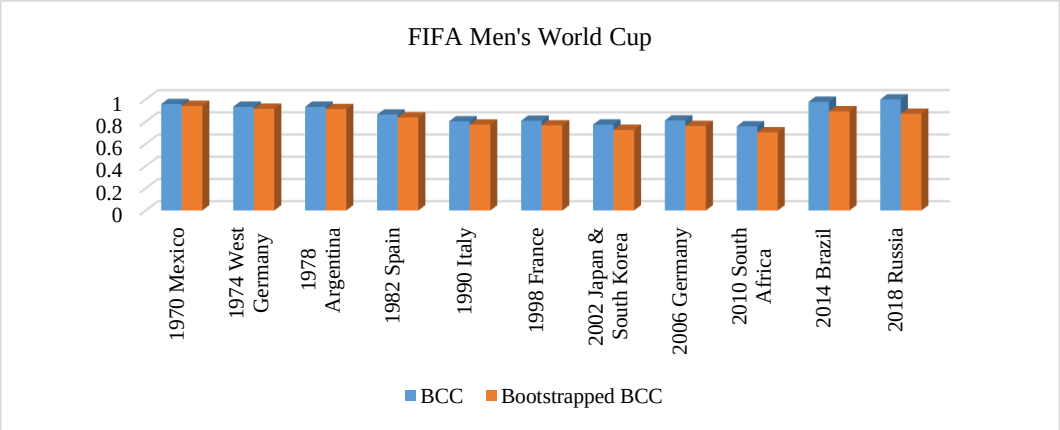
We indicate the efficiency graphic of the Winter Olympic Games in Figure 2.

**Figure 2.** Comparable results of the Winter Olympic Games




Accordingly, both models have two common findings: The first one is none of the Winter Olympic Games have achieved financial efficiency. Besides, the closest is Grenoble with a score above 95%, and the furthest is Nagano with 73.8% and 69% (for BCC and bootstrapped BCC, respectively). The BCC results show that the average efficiency score of the Winter Olympic Games is 82.1%, while according to the bootstrapped BCC, this value is 78.4%. We show the comparable efficiency levels of the FIFA Men's World Cup in Figure 3.

**Figure 3.** Comparable results of the FIFA Men's World Cup



The basic model shows that only the FIFA Men's World Cup in Russia is a financially efficient organization, while the one in South Africa is the least efficient at 75.7%. According to the bootstrapped BCC model, the event in Mexico has the highest financial success, while South Africa remains in the last place. According to the BCC results, the average efficiency score of the FIFA Men's World Cup is 87.4%, while this value is 82.7% in the bias-corrected model.

## 5. DISCUSSION, CONCLUSION AND RECOMMENDATION

This paper aims to analyze the financial efficiency of all sub-events of three mega-events held from 1964 to 2018. The dataset used in the study consists of the data compiled by Müller et al. (2022) and published in the Harvard Dataverse. We converted all local currencies into US $. The BCC results display that the average efficiency score of 33 mega-events is 85%. The results of the bootstrapped model indicate that the traditional model yields biased findings by 4.7% and that the events are 80.3% efficient. The results of both models reveal that the Summer Olympic Games are more financially successful than the Winter Olympic Games, and the FIFA Men's World Cup is the most prosperous mega-event analyzed. The underlying reasons for this phenomenon require further investigation. Mega events, undoubtedly, are essential projects for countries/cities not only nationally but also internationally. Countries hosting such projects need to carry out efficient process management activities, starting from the planning process for the pre-event (event preparations, etc.), during and after the event, including the audit function, to realize a successful event. In a nutshell, it is only possible for the event to reach the desired goal with the foreseen resources, to meet the stakeholders' expectations, and to be successful only by managing the event well (Timur, 2014). An effective budget program needs to be created, and a budget should be established in line with this program to conduct the planned activities effectively. Events have positive and adverse impacts on the economy, environment, cultural, social, political, and tourism (Douglas et al., 2001). In terms of economic effects, mega-events provide new job opportunities, investment, sponsorship, and increase living standards, while also may cause inflation and, as a result, pushing up service costs. One of the most critical matters for mega events is financial management (Richard & Palmer, 2010). The function of financial management ensures that the budgets to be created for the event are used effectively throughout the project. In terms of event management, financial management is defined as the process of creating a budget for each sub-activity and managing the budget effectively (Güldoğan, 2018). Monitoring and evaluating the impacts of events have several benefits. The most important benefits that can be addressed within the scope of the study are determining problems and developing solutions, finding ways to improve management, and identifying costs and benefits (Getz, 1997). The main limitation of this paper can be considered as the lack of theoretical background of the dataset used in this paper due to the absence of any study concentrating on the financial efficiency levels of mega-events in the literature. Another one is the possible inaccurate information reached while the conversion of local currencies to the average exchange US $ rate in the year the event was held. Mega-events are undoubtedly

powerful means of disseminating favorable destination images through media (Knott et al., 2015). Accordingly, they, especially sports mega-events, can yield huge economic contributions to the hosting countries (Lee & Taylor, 2005). On the other hand, these events might not be beneficial since they require considerable infrastructure (Preuss, 2011). For instance, after the 2002 FIFA World Cup held in South Korea and Japan, many cities in these countries had stadiums designed much more oversized than necessary, which brought enormous financial liabilities (Horne & Manzenreiter, 2006). Further, the dataset in this paper doesn't include some noteworthy revenue types, such as tourism, accommodation, transportation, and catering, which may change the efficiency levels of mega-events. Moreover, social data like hosting countries' culture and locals' perceptions may affect mega-events success (Chiam & Cheng, 2013). From this point of view, this examination should be seen as a beginning. Undoubtedly, numerous reasons may lead to inefficiency. For example, Müller (2015) stated that exaggerating the favorable impacts of mega-events, the gap between actual and planned budgets, and oversized infrastructure troubles in resource allocation. In other words, any disruptions in the planning process may harm the success of mega-events. In addition, Kassens-Noor and Lauermann (2017) shared the same thought regarding the oversized infrastructure and suggested event managers should reduce the size and requirements of the events. Could the reasons mentioned above have led to inefficiency for the mega-events in our dataset? Further, are the results due to the host country's size of the financial (MCAP) and/or economic (GDP) development, democratic/autocratic alignment, and the degree of integration? Accordingly, future studies could involve these potential reasons and adopt a similar approach by employing second-stage regression analysis to determine the endogenous or exogenous efficiency drivers with macro/micro scale variables.

## Statement of Research and Publication Ethics

In all processes of the article, the principles of research and publication ethics of Manisa Celal Bayar University Journal of Social Sciences were followed.

## Authorship Contribution Statement

Murat Güldoğan; Conceptualization, Writing - Original Draft, Writing - Review & Editing, Supervision. Ferhat İnce; Methodology, Formal analysis, Writing - Original Draft, Writing - Review & Editing.

## Declaration of Interest

The authors declare they do not have any conflict of interest.

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