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THE ECONOMIC IMPACT OF MEGA SPORTING EVENTS ON HOST NATIONS

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ABSTRACT

This empirical study provides fresh evidence and insights into the economic impact of hosting mega sporting events. It examines three key economic dimensions: economic growth, employment, and tourism. Using a dataset covering the period 2000–2024, the study analyzes four mega sporting events, the Olympics and FIFA World Cup, held between 2016 and 2022 in Brazil, Japan, Russia, and Qatar. The Difference-in-Differences (DiD) method was employed to generate results. Nine countries that were top bidders for these events were chosen as the comparison (control) group. The findings reveal no significant effect of the Olympics in Brazil and Japan, nor of the FIFA World Cup in Russia, on any of the indicators: economic growth, tourism, or employment. The pre- and post-event economic situations in these three nations remained unchanged. However, in the case of Qatar, the FIFA World Cup had a significant negative impact on economic growth but a significantly positive impact on employment. Tourism in Qatar, however, received no significant effect according to the empirical results. The study recommends that when deciding to bid for hosting a mega event, nations should consider goals beyond economic benefits. It is further recommended that while employing the DiD model, the control group should be carefully chosen. This is because, despite differences in economic structure, governance, and infrastructure between the treatment and control groups, the parallel trends assumption may appear to hold by coincidence, which could lead to biased DiD outcomes.

Keywords: Olympics; FIFA World Cup; Economic Growth; Tourism; Employment; Difference-in-Differences

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Chapter 1

INTRODUCTION

Hosting mega sports events like the Olympics or FIFA World Cup serves as a key opportunity for nations to attract tourism, improve economic conditions, and generate employment. Countries also gain significant recognition across the world by hosting such events (Maennig, 2019). Mega events, unlike other events, spark the attention of potential host countries due to their reoccurrence after every specific period, large number of spectators and viewers, significant number of participants, and massive worldwide media attention (Swayne & Dodds, 2011). In addition, having a sports-friendly environment reflects a country's image as a modern, peaceful, prosperous, and growing economy.

Countries are seen spending billions of dollars on sports events since it has become a significant source of achieving economic prosperity. For example, Qatar spent over US \$220 billion on hosting the FIFA World Cup 2022. This makes the 2022 World Cup the most expensive ever conducted. The reason for this massive spending is that Qatar had never hosted any mega events prior to this one. Hence, they were lacking proper infrastructure for hosting such an event. Secondly, Qatar's intention was to demonstrate their best in order to secure more hosting of future mega events. The previous couple of World Cups were relatively costly events of their time, with Brazil spending \$15 billion and Russia spending \$11.6 billion.

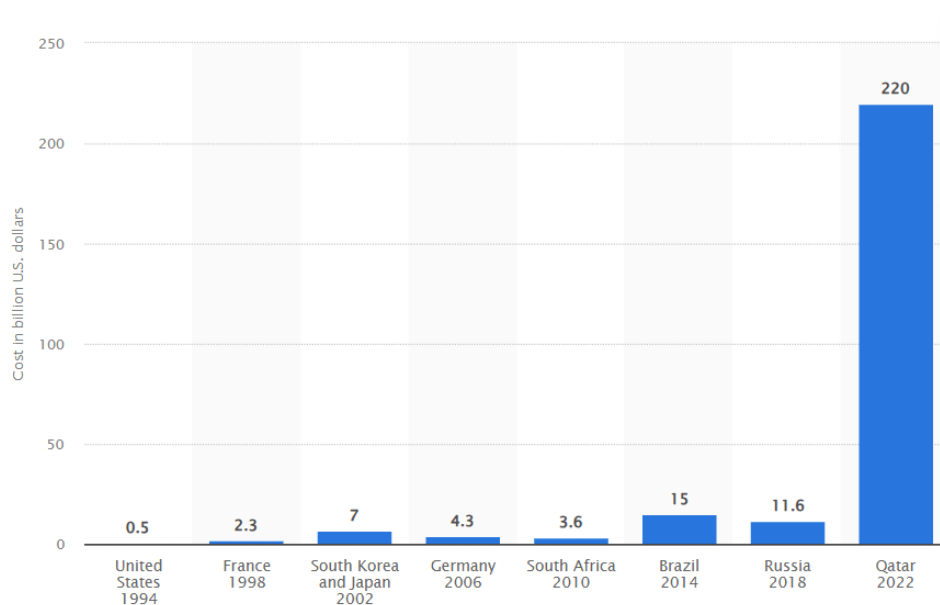


Figure 1.1: Total Expenditure on Hosting the FIFA World Cup
Source: Statista (2024)

Hosting Olympic Games is also costly. Data shows that the Winter Olympics of 2014 was the costliest event of all time, with a spending of over US \$28.9 billion. While the Summer Olympics of 2016 also stands as the most expensive event, with a cost of \$23.6 billion among all Summer Olympics that have ever taken place. Cost overruns in such events usually occur because of the lack of supporting infrastructure for the event (Scandizzo & Pierleoni, 2017). This is why studies show that host cities often experience economic deficiencies as a result (Tien et al., 2011; Scandizzo & Pierleoni, 2017). Tien et al. (2011) also claimed that hosting Olympic Games is seen to generate more adverse impacts compared to net benefits. They state that hosting these events is not about fiscal benefits but improved international profile of the host countries, international recognition, and creation of long-term alliances.

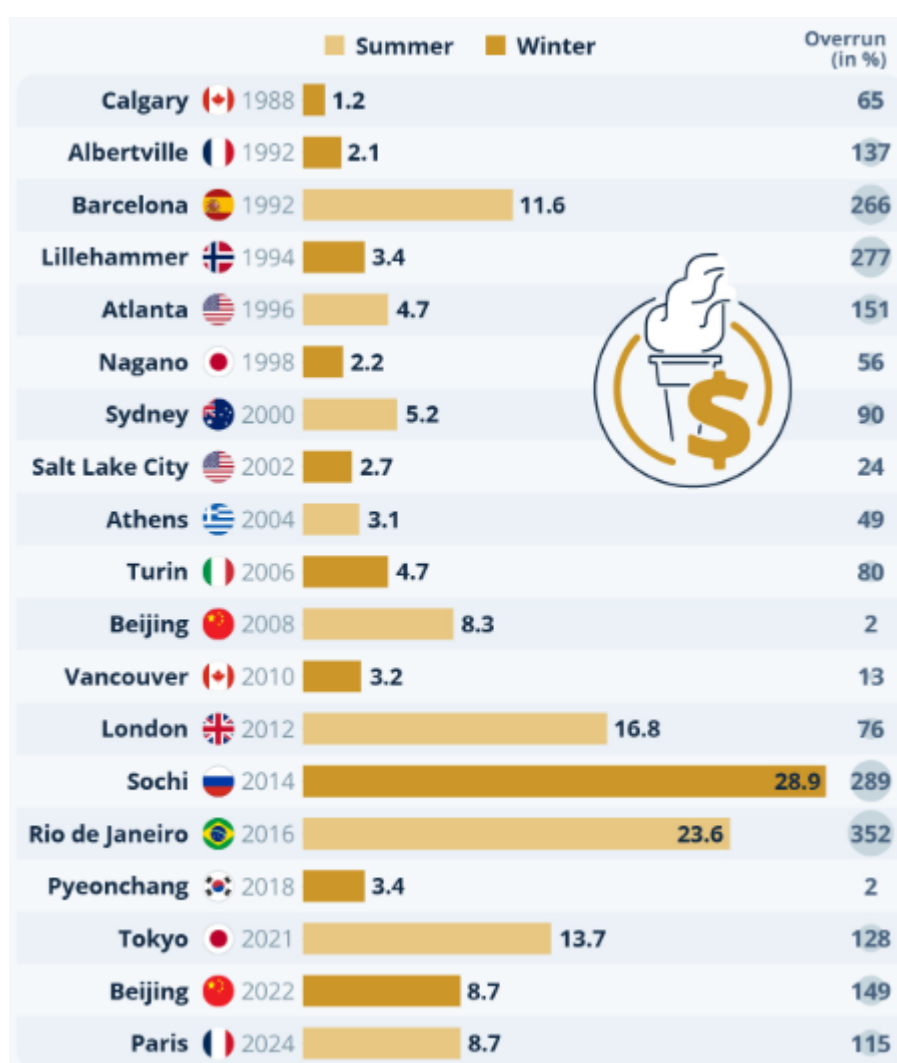


Figure 1.2: Total Expenditure on Hosting the Olympic Games
Source: Buchholz (2024)

Hosting mega events is often considered a symbolic demonstration of a modern nation rather than a profitable activity, since many studies show that the economic impact of such events is

either unclear or temporary (Ferris et al., 2022). A small number of studies have claimed that although hosting mega events results in a positive increase in economic growth, the magnitude is very small compared to the expenditure the countries have made on such events (Tien et al., 2011). While the remaining studies analyzing the economic impact show that countries that host mega events like the FIFA World Cup or Olympics have enjoyed a positive impact of the events on economic growth (Brückner & Pappa, 2015).

One common thing in hosting mega sporting events is that these events are either conducted in national capitals like Paris, Beijing, and London or in culturally significant and popular cities like Sydney, New York, or Rio de Janeiro (Alshikhy et al., 2025). Although the events are costly, the host countries' main motive is to attract greater returns against their investments in terms of various financial and non-financial outcomes. Researchers say that the goal is to enhance international recognition of host cities and present them as a competitive city and destination for festivals (Alshikhy et al., 2025). However, one common challenge faced by the hosts is the temporary nature of the event with heavy sunk costs, yet the legacy these events leave behind is permanent (Weidenfeld et al., 2016). The other key challenge is to align the local culture with the outside world and build long-lasting relationships, since the outside world has different cultures, diversified audiences, and unidentical sponsors and brand owners (Weidenfeld et al., 2016).

In the present modern world, attending and experiencing mega events is not only limited to physical attendance. Traveling is no longer a compulsory requirement to enjoy these events in person. Instead, due to the massive spread in broadcasting, especially witnessed after 1980, broadcasting through numerous media channels has become a new source of generating significant revenues (Müller et al., 2022). Resultantly, media display of mega events has successfully enhanced the value of mega events, especially because of the competition among major sponsors and brands to facilitate large-scale marketing (Alshikhy et al., 2025).

Mega sporting events, according to a number of studies, have social, environmental, infrastructure-related, and economic consequences, which are mostly favourable. The key social impacts include enhanced reputation of the host nation, cultural and social exchange, and integration, while it may also disturb the life of local residents and hence may not equally benefit all stakeholders (Mair et al., 2021). Regarding environmental consequences, hosting mega events involves a huge production activity, and usually any production activity is likely to generate carbon emissions into the environment (Collins et al., 2009). Also, it may result in waste generation, water pollution, and even disturb natural habitats and ecology (Collins et al.,

2009). The infrastructure of host cities improves to a great extent, since accommodating a large number of participants and spectators requires a lot of construction, such as sporting and residential facilities (Mhanna et al., 2019). Therefore, mega events help a country achieve long-term developments in infrastructure. Among all, categorically, the main objective of the host nation is to attain economic benefits. The three most important economic objectives include enhancements in Gross Domestic Product (GDP) growth, a rise in tourism flow, and employment generation (Amponsah et al., 2018; Mhanna et al., 2019).

Despite the benefits discussed earlier, mega events are also highly criticized by researchers for their enormous costs, increased debts, short-term benefits, limited benefits to the population, unjust spending on mega events instead of human welfare, and also serving as a cause of social distress. While some argue that hosting mega events just leverages accumulation of soft power. Hence, a careful examination of benefits and costs related to the hosting of the mega events is crucial. Generally, benefits must exceed costs for an initiative to be successful. The Summer Olympics of London 2012 showed various forms of criticism by major stakeholders. A study conducted by Giulianotti (2012) revealed various forms of criticism; for example, critics argued that the event was less likely to benefit cities economically outside London, like new job creation. Some considered the events would facilitate uneven distribution of resources and major segments of society would remain unaffected. There were also campaigns launched by environmentalists against the construction of new buildings and the displacement of local farmers. In addition, protests were also staged against participant nations that suppress women's rights. Plus, some anti-Olympics protests also took place claiming that the event is more like a commercial activity rather than a sporting event.

The present study, therefore, intends to examine why it is crucial for a country to host a sporting mega event despite heavy criticisms and huge costs. The goal is to check whether the economies of host nations of previously conducted mega sporting events gained economically. The study will also reflect on pre- and post-event situations of the host nations so that gains could be better understood. For this purpose, time-series data of countries that hosted mega events, particularly the Olympics and FIFA World Cup, will be analysed.

1.1. Significance of the Study

It is essential to examine the economic impact of mega sporting events so that investors have a better understanding of the gains that will aid them in decision-making when bidding to host such events. In addition, the present study will also provide lessons to the stakeholders,

including the general public, non-governmental organizations, environmentalists, policymakers, and researchers. Understanding the hosting of mega events is also essential because hosting such events is not only costly but also heavily questioned by the general public. Therefore, there is a need for careful and fact-based evaluation of the economic outcomes of the events for host nations. The study provides fresh evidence, so it is more relevant for researchers and policymakers since global trends are rapidly changing, especially after the COVID-19 pandemic and the current geopolitical landscape.

1.2. Research Aims and Objectives

The study aims at investigating the economic impact of hosting mega events, specifically the Olympics and FIFA World Cup, in terms of economic growth, employment, and trade. Economic benefits are the primary benefits that a country considers before jumping to the conclusion of hosting a mega event. Thus, the following objectives are designed to achieve a broader understanding of the phenomenon:

- To estimate and analyze the impact of hosting a mega sporting event on GDP growth, unemployment, and tourism.
- To examine the pre- and post-event economic condition of the host nation with the help of data.
- To provide lessons to nations interested in hosting future mega sporting events, helping them make informed decisions about bidding to host such events.

1.3. Research Questions

Based on the findings of related literature studies, a number of research questions emerged. The most relevant questions are as follows:

1. What makes countries host mega sporting events, economic benefits or other motives?
2. What is the magnitude of favourable or adverse economic impacts of mega events?
3. Should investments be directed towards projects other than mega events?
4. What group of countries did not gain from hosting mega events and why?
5. Is it desirable to invest in hosting a mega event in the present dynamic and competitive environment?

Chapter 2

LITERATURE REVIEW

The debate on whether to host mega sporting events and the potential benefits or losses of a mega event is not new. Many nations are seen bidding for achieving hosting rights of mega events for the first time in history, showing that the events are still of vast importance. The topic is so broad that its various aspects are separately studied in the literature. There are a number of studies examining economic, social, environmental, political, and legacy impacts. The present review of literature first looks into different techniques and frameworks to calculate the economic impacts, then discusses the studies that provided various findings after examining the economic impact of mega sporting events.

2.1. Frameworks to Assess the Economic Impact of Mega Events

Literature shows that there are three major techniques to estimate the economic impacts of mega events. Although the techniques are popular and have been frequently used in numerous previous studies, all three techniques have advantages and disadvantages. Other than these techniques, the econometric approach is among the widely used approaches to assess the economic impact.

The first approach is the input-output (I-O) analysis, initially propounded by Leontief (1936). It is a basic framework used to examine transactions across three key sectors: primary inputs, intermediate (processing), and final demand. In this method, all the benefits in the form of flow of goods and services to the host nation against the initial spending, achieved as a result of hosting an event, are calculated. The key disadvantage of this method was that it is based on an unrealistic assumption stating that inputs allocated for mega events are obtained free of cost and are used in fixed proportions (Wan & Song, 2019).

The second framework is the Computable-General-Equilibrium (CGE) model proposed by Dwyer et al. (2005). This framework helps countries analyse the entire economy with the help of an advanced I-O model. It basically reflects how an economy reacts to different shocks or changes. For example, it helps users identify what would happen to the economy on a large scale when the event of FIFA World Cup takes place, or natural disasters occur, or when a major policy change is introduced. The model aids in assessing the favourable effect of an event (for instance, FIFA World Cup) on the host city as well as adverse effects of the event on other cities of the host nation. However, according to Wan and Song (2019), one of the main

disadvantages of the approach is that due to the complex nature of this approach, it is hard to define measurement of scale and also the intangible benefits and costs.

The third approach is known as the Cost-Benefit Analysis (CBA), introduced by Jules Dupuit a long time ago in the 1840s (Talvitie, 2018). This approach helps in determining welfare changes through a careful assessment of costs and benefits (Andersson et al., 2008). The approach allows users to adjust market prices to capture market changes and even allows them to use alternative evaluations. The intangible benefits are also included and evaluated in the CBA analysis, for instance brand reputation, employee morale, and a positive work environment (Andersson et al., 2008). In short, CBA is a comprehensive analysis of all possible benefits and costs, including both tangible and intangible benefits and costs. The decision-making based on CBA is straightforward: if benefits outweigh costs, then the business activity (e.g., FIFA World Cup) is worthy and fruitful; and in the opposite case, the business is not ideal for investment.

Lastly, the econometric approach is one of the most frequently used impact assessment techniques. The econometric approach has mainly three types of assessment models: time profiling, gravity, and hedonic pricing models (Wan & Song, 2019). The time profiling models are useful in assessing before and after impacts of an event on the economy. These models include Difference-In-Difference (DID) model, Vector Autoregressive (VAR) model, Chow breakpoint test, and Linear Regression models with dummy variables and interaction terms, and so on. Wan and Song (2019) state that the second type of econometric models is gravity models, which help examine bilateral trade flows from outside nations to a country. In the case of mega events, the model is extended to measure inflow of tourists to the host country (Rabadi et al., 2016). The final type is the hedonic pricing method, propounded by Rosen (1974). This model takes into account both internal and external factors that affect the price of a good or service in a market. For example, it is useful in estimating the impact of a mega event on hotel prices and ratings as undertaken by Hermann and Herrmann (2014). Researchers recommend that the hedonic pricing model, in the case of impact analysis of mega sporting events, is effective when a control group is used for comparison (Wan & Song, 2019).

2.2. Studies on Impact of Mega Sporting Events on Economic Growth

Kobierecki and Pierzgalski (2022) analyzed Olympic Games and FIFA World Cups held between 2010 and 2016 using the difference-in-differences (DID) method. Their goal was to quantify potential economic benefits attained as a result of hosting mega sporting events. The

host countries analyzed were Canada, Brazil, South Africa, and the United Kingdom. The results showcased that hosting such events does not cause any change in economic growth. However, Wan and Song (2019) found different results while analyzing mega events conducted in Brazil and the United Kingdom. Using a panel data technique and cross-sectional correlation, their findings revealed that the economic impact in terms of economic growth may vary in the case of developed and developing countries. They found that since the UK is a developed nation, no huge investments in infrastructure were required, and therefore hosting the Olympic Games of 2012 significantly improved the UK's economic growth and helped it survive the aftermath of the global subprime crisis. Whereas Brazil directed funds reserved for local development towards hosting two mega events, the Olympics and FIFA World Cup, resulting in a decline in its economic growth.

A study conducted covering the period 1990–2012 by Demir et al. (2015) studied the development impact of Olympics conducted in Australia, China, and Greece on host nations. The authors used a multiple linear regression analysis along with Percentage Trend Analysis and the Chow Breakpoint test. The results indicated that the GDP growth of all three host nations significantly rose during the mega sporting events. The same findings were obtained by Li et al. (2012), who analyzed the economic impact of the Beijing Olympics of 2008 using CGE modelling, but the researchers discovered that although the effect on economic growth is positive, it is only about 0.1% of overall GDP, which is not enough compared to the size of the economy. Resultantly, they concluded that the economic impact tends to be smaller as the size of the economy increases.

Billings and Holladay (2011), in their analysis of the economic impact of hosting Olympics, employed the DID method with an extended dataset ranging from 1950 to 2005. As a control group for comparison, the authors chose those cities that were finalists for hosting the Olympics but were not selected in the end. The findings revealed that the two economic indicators, GDP per capita and trade openness, did not receive any significant impacts from hosting the Olympic Games. Another study by Zawadzki (2022) also utilized the DID approach but found mixed results. For Winter Olympic Games, the author found no long-run significant effect, while for Summer Olympics, a statistically significant and positive effect was seen during the post-Olympics period of the host cities.

Recent evidence, as documented by He and Yu (2025) using a scoping review, analyzed the FIFA World Cup of 2018 in Russia and the 2022 FIFA World Cup in Qatar. Examining 14 articles, with the majority published between 2019 and 2023, the authors found that FIFA World

Cup hosting has favourable effects on the economic growth of the host nation, in addition to positive effects on tourism and hospitality industries, stock markets, and neighbouring regions, which were also affected positively because of the event. However, Borga (2020) separately analyzed developed (Germany) and developing host nations (Brazil) of FIFA World Cup tournaments conducted in 2006 and 2014. The Ordinary Least Squares (OLS) method was used to draw conclusions. The author used investments in infrastructure and investments in stadiums as independent variables. The results revealed that although the impact of hosting the World Cup on GDP is negative in both nations, it is more severe in the developing nation.

2.3. Studies on Impact of Mega Sporting Events on Tourism

Attracting tourism inflow to the host nation is one of the major reasons behind hosting a mega sporting event. To check whether tourism significantly increases, various studies have been conducted. Most of the studies revealed that tourism increases as a result of mega events hosting (Fourie & Santana-Gallego, 2011; Teigland, 1999; Baumann & Matheson, 2018), but the magnitude and post-event situation may be different (Teigland, 1999).

Using the DID approach, Baumann and Matheson (2018) investigated the tourism impact of the 2016 FIFA World Cup conducted in Brazil. The findings showcased that the event directed one million tourists to Brazil during a two-month period. Additionally, the study found that one-fourth of the tourist arrivals was attributed to the Argentinian national team's advancement in the tournament. Hence, tourism arrival is also subject to how exciting the event becomes. This finding was also confirmed by Fourie and Santana-Gallego (2011), who claimed that tourism arrival is dependent on many factors like the participating teams, type of the event, and the season during which the event occurs, whether top or off-season. The technique used by Fourie and Santana-Gallego (2011) was the standard gravity model for tourism.

Vierhaus (2018) presented an interesting and thorough finding while investigating the impact of the FIFA World Cup and Olympic Games on tourism. The author employed the gravity equation of international trade with Olympics data spanning from 1962 to 2020 and FIFA World Cup data from 1962 to 2022. The results showed that the summer host destination countries of Olympic Games saw significant tourist arrivals 8 years before the event, during the event, and 20 years post-event. Conversely, the FIFA World Cup was unable to generate significant tourism in the long run. It was evident that during the event, a rise in tourism was witnessed, but after 1 to 4 years it vanished. The researcher saw a small and nearly irrelevant effect of the Winter Olympics post-event for up to 5 to 8 years. Findings regarding the Summer Olympics

are also confirmed from another study by Song (2010), who also employed the gravity model of international trade. The study showed that tourism and exports both rise as a result of hosting the event; however, the tourism effect is rapid and short-lived. Li et al. (2013) also found that there is a positive effect on tourism in the case of the Beijing Olympics of 2008, but the magnitude of this impact is not reasonable compared to the size of the economy.

Demir et al. (2015) suggested that the popular belief of having a rise in tourism and a country's image enhancement for the longer term should be reconsidered. They made this judgment after analyzing the development and tourism impact of the Olympics. Using the Chow Break Point test, the authors found that except for Greece, no significant effect on tourism was found in the case of Australia and China. Drapkin (2023), using the gravity approach, also discovered that hosting mega events was found to have insignificant effects on tourist arrivals in host nations. Only a few nations experienced a rise in tourism as a result of hosting a mega event. They even found that those countries which were already experiencing a decline in tourism could not prevent themselves from this situation despite hosting a mega event. On the contrary, Baade and Matheson (2004) argued that compared to the investments made on hosting the FIFA World Cup, the magnitude of economic benefits, including tourism inflow, is not justified. They claimed that pre-event expectations are often overstated and unrealistic.

2.4. Studies on Impact of Mega Sporting Events on Employment

It is widely accepted that mega sporting events significantly generate employment opportunities temporarily, while scholars have varying views on the long-term impact on employment. Another group of researchers thinks that the employment impact of hosting mega events is only limited to a few specific sectors of the economy (Feddersen & Maennig, 2012; Swart & Bob, 2004). Generating employment opportunities is also one of the major motives behind hosting a mega sporting event (Swart & Bob, 2004).

A recent analysis of hosting the FIFA World Cup, covering the period from 1983 to 2022 and examining a panel of 10 countries, by Soussane and Ibourk (2025) found favourable employment effects of the event. Using Robust Weighted Least Squares (RWLS) along with the Estimated Generalized Least Squares (EGLS), the results indicated that long-term unemployment levels significantly reduce in four years post the event. The authors attributed the developments in infrastructure, tourism, and services sectors as a source of employment. The key lesson from the study suggested that in order to attain economic benefits from hosting a mega event, the right conditions are essential.

Even if the host country is developed, a reduction in unemployment levels is not guaranteed. This is evident from the study by Hagn and Maennig (2008), who analyzed the FIFA World Cup of 2006 held in Germany using the DID approach by comparing unemployment in 12 venues with unemployment in 63 different German cities. Their findings revealed that there was no significant impact of the soccer World Cup on unemployment. The situation of host cities was not significantly different from non-host cities as per the results.

Tien et al. (2011) provided deep insights into the problems by analyzing 15 countries that hosted the Olympics, using panel data analysis. Their findings indicated the economic impact of hosting is limited to only a couple of parameters: economic growth and unemployment. The study pointed out that the positive effects on GDP and employment levels are short-term. These findings are also evident in the recent work of Mukendi et al. (2025), who also found short-term benefits of hosting the Qatar 2022 World Cup in the form of employment, but emphasized that in order to attain long-term benefits, the host country should have a diversified economy, better infrastructure, and an improved job market.

Further understanding of how the employment impact of hosting a mega event is delivered is presented by Zhang (2023) in his review article. The study claimed that although employment opportunities emerge as a result of a mega event, these opportunities are limited to the middle and upper class of the economy, resulting in greater income inequalities. Hence, it makes the welfare impact of the event questionable. The claim was later verified by Ivanov and Ashyrov (2024), who empirically presented how hosting mega events like the Olympics and FIFA World Cup unjustly benefits the rich class of society with 1% and 10% increases in wealth shares of the top segment at the expense of people in the bottom 50%.

2.5. Literature Gap

Although the economic impact of mega sporting events on host countries is highly debated among scholars, fresh evidence is still limited. The present study attempts to jointly examine the economic impact of mega sporting events in terms of GDP growth, tourism and employment which is also rare in the literature. From the literature, clear motivations behinds hosting a mega event are still unclear. For example, findings on economic growth impact are contradictory with some showing positive and varying impacts like Wan and Song (2019) and Demir et al. (2015) while some showing no significant impacts Kobierecki and Pierzgalski (2022) and Billings and Holladay (2011). Regarding tourism impact, most studies revealed that the economic benefits in the form of tourism are short lived and are of small magnitude (Song, 2010; Demir et al.,

2015; Baade & Matheson, 2004, Li et al., 2012). Most studies agreed that hosting mega events have positive impacts on employment (Soussane & Ibourk, 2025) but are also temporary (Hagn & Maennig, 2008; Tien et al., 2011; Mukendi et al., 2025) while some stated that the employment benefits did not reach the poor but benefited the rich hence hosting mega events spread income inequalities (Zhang, 2023; Ivanov & Ashyrov, 2024). The study therefore investigates with the help of empirical evidence whether economic benefits were really achieved as a result of hosting a mega event or the economic benefits are of least concern and other motives such as demonstration of 'soft power' and image building are the hidden reasons. The study also estimates the magnitude and scale of the economic impact, which is also scarce in the literature to check whether the economic impact is justifiable or not.

Chapter 3

METHODOLOGY

Various frameworks such as Input-Output analysis (Leontief, 1936), CGE models (Dwyer et al., 2005), and Cost-Benefit Analysis (Talvitie, 2018; Andersson et al., 2008) are widely used for the impact analysis of hosting mega sporting events. However, all of these approaches have limitations in assessing the economic impact. The econometric approach, on the other hand, is a broader approach under which numerous types of analyses are performed, each with its own features. It is one of the most frequently used impact assessment techniques. From most of the studies reviewed, one of the most commonly adopted econometric techniques is the Difference-in-Differences (DID) method (Kobierecki & Pierzgalski, 2022; Billings & Holladay, 2011; Zawadzki, 2022; Baumann & Matheson, 2018; Hagn & Maennig, 2008). The other tests and techniques that are to be used, as well as data and sources, are detailed in this chapter.

3.1. Data

The present study analyses four mega sporting events, specifically the Summer Olympics and the FIFA World Cup held between 2016 and 2022, with a dataset ranging from 2000 to 2024 with annual frequencies. The Olympic events to be analysed are the Brazil Olympics of 2016 and the Japan Olympics of 2021, whereas the FIFA World Cups analysed are the Russia World Cup of 2018 and the Qatar World Cup of 2022. The control group includes nine countries (other than those previously mentioned) that were top bidders for the mentioned events, including the United States, Spain, Turkey, South Korea, the United Kingdom (England), Australia, the Netherlands, Belgium, and Portugal. The data has been collected from the World Development Indicators (WDI) and the United Nations World Tourism Organization (UNWTO).

The variables used in the analysis are illustrated in the table below:

Table 3.1: Variables, definitions and sources

Variable	Definition	Source
Gross Domestic Product (GDP)	Expressed in US dollars, based on 2015 constant prices.	WDI
Tourism (TRM)	Measured as the arrival of international tourists (overnight visitors) to the host nation, with a stay period of no more than one year.	UNWTO
Unemployment (UNE)	Expressed as the percentage of unemployed workers out of the total labor force, as estimated by the International Labour Organization (ILO).	WDI
Consumer Price Index (CPI)	An index based on the reference period 2010 = 100, comprising prices of consumer goods and services.	WDI
Real Effective Exchange Rate Index (REER)	Presented as the nominal exchange rate, adjusted for prices, based on the period 2010 = 100.	WDI
Foreign Direct Investment (FDI)	Constitutes the net inflows from foreign nations in the form of investments, expressed as a percentage of GDP.	WDI
Gross Fixed Capital Formation (GFCF)	Expressed in US dollars at constant prices, with 2015 as the reference year.	WDI

Source: Compiled by the author

3.2. Descriptive Statistics

Before conducting any tests, researchers usually examine the properties of the variables of the study (Nick, 2007). Descriptive statistics are considered useful in analysing the variables at a glance (Kaur et al., 2018). Marshall and Jonker (2010) state that prior to finding answers to research questions, it is necessary to check the type of data, which later helps in applying further statistical procedures to the data. In addition, they also claimed that descriptive statistics are quite useful in analysing a sample. The popular statistics are mean, median, and standard deviation; however, researchers state that depending on the nature of the variables, measures of central tendency may vary (Nick, 2007). The present study also first looks into descriptive statistics to ensure whether the sample meets certain expectations.

3.3. Empirical Model

The Difference-in-Differences (DiD) model helps in analysing the effect of a specific event, policy, or treatment on a group of those who are likely to be affected (treatment group) compared to those who are not (control group) (Ryan et al., 2014). The DiD model is referred to as a longitudinal study which compares the after situation with before as a result of a treatment (Culyer, 2014). The DiD model can be better illustrated with the example of a high school student of which a certain number of students get extra lessons after regular classes (Bradley & Green, 2020). The DiD model will thus help determine what the effect of extra

lessons is on students compared to those who are not taking any extra lessons (Bradley & Green, 2020). Similarly, in the study of mega events, the DiD model helps analyse the before and after situation of a country in terms of any variable, for example, economic growth (Kobierecki & Pierzgalski, 2022). The model compares the GDP growth of the host country with the group of those countries that are not hosting the mega event. In the present study, to attain more accurate results, the host countries are compared with those that are not hosts but were potential candidates to host the event. The method helps in decision-making for the policymakers to decide whether to invest in a particular mega sporting event or not (Kobierecki & Pierzgalski, 2022). Of course, if the economic indicators of the host nation behaved in a similar fashion as the non-host nations, then it can be concluded that the event has no meaningful outcome for the host nation. Presently, the economic impact of four mega events in terms of GDP, employment, and tourism is to be analysed. Resultantly, three separate equations for each of the dependent outcome variables are to be constructed as shown below.

a) Economic Growth Model:

$$GDP_{it} = \alpha + \beta_1 Post_t + \beta_2 Treated_i + \beta_3 (Treated_i \times Post_t) + \gamma X_{it} + \varepsilon_{it} \quad (3.1)$$

b) Tourism Model:

$$Tourism_{it} = \alpha + \beta_1 Post_t + \beta_2 Treated_i + \beta_3 (Treated_i \times Post_t) + \gamma X_{it} + \varepsilon_{it} \quad (3.2)$$

c) Employment Model:

$$Unemployment_{it} = \alpha + \beta_1 Post_t + \beta_2 Treated_i + \beta_3 (Treated_i \times Post_t) + \gamma X_{it} + \varepsilon_{it} \quad (3.3)$$

In the above equations, GDP_{it} is taken as a measure of the host nation's economic growth. The tourism impact is measured by the variable $Tourism_{it}$. Whether the employment situation improves or worsens in the host nation, the variable $Unemployment_{it}$ is utilized. $Post_t$ is a dummy variable, equating to 1 for the year in which the mega sporting event is held and onward years, and 0 for all years before the event. $Treated_i$ is also a dummy variable, representing the host country on which the treatment is being applied or where the event takes place when equal to 1, and 0 for all other countries. $Treated_i \times Post_t$ is the interaction term, which is used to estimate the DiD effect of the event, with the coefficient β_3 showing the average change effect of, for example, the 2016 Summer Olympics on Brazil's economic growth. The variables X_{it} represent all the relevant control variables, such as inflation, exchange rate, and investment in each model. The error term, reflecting the influence of unobserved variables, is presented by ε_{it} .

Since four mega sporting events are to be analyzed in the present study, three equations discussed above have been estimated for each nation, totalling 12 equations. Lags of the dependent variable are also used in some equations for better results. Variables used in all of the equations are expressed in natural log form except for the binary variables.

For the Summer Olympics of 2016 held in Brazil, the following equations are estimated.

$$\begin{aligned} \ln GDP_{it} = & \alpha + \beta_1 \ln GDP_Lag_{it} + \beta_2 \ln FDI_{it} + \beta_3 \ln GFCF_{it} + \beta_4 Rio16_t + \beta_5 Treated_i + \\ & \beta_6 DiD_{it} + \varepsilon_{it} \end{aligned} \quad (3.4)$$

$$\begin{aligned} \ln UNE_{it} = & \alpha + \beta_1 \ln UNE_Lag_{it} + \beta_2 \ln FDI_{it} + \beta_3 \ln GFCF_{it} + \beta_4 Rio16_t + \beta_5 Treated_i + \\ & \beta_6 DiD_{it} + \varepsilon_{it} \end{aligned} \quad (3.5)$$

$$\ln TRM_{it} = \alpha + \beta_1 \ln REER_{it} + \beta_2 Rio16_t + \beta_3 Treated_i + \beta_4 DiD_{it} + \varepsilon_{it} \quad (3.6)$$

The following equations have been used to measure the economic impact of the Tokyo 2021 Summer Olympics held in Japan:

$$\begin{aligned} \ln GDP_{it} = & \alpha + \beta_1 \ln GDP_Lag_{it} + \beta_2 \ln FDI_{it} + \beta_3 \ln CPI_{it} + \beta_4 Tok21_t + \beta_5 Treated_i + \beta_6 \\ & DiD_{it} + \varepsilon_{it} \end{aligned} \quad (3.7)$$

$$\begin{aligned} \ln UNE_{it} = & \alpha + \beta_1 \ln UNE_Lag_{it} + \beta_2 \ln FDI_{it} + \beta_3 \ln GFCF_{it} + \beta_4 Tok21_t + \beta_5 Treated_i + \\ & \beta_6 DiD_{it} + \varepsilon_{it} \end{aligned} \quad (3.8)$$

$$\begin{aligned} \ln TRM_{it} = & \alpha + \beta_1 \ln TRM_Lag_{it} + \beta_2 \ln REER_{it} + \beta_3 Tok21_t + \beta_4 Treated_i + \beta_5 DiD_{it} + \\ & \varepsilon_{it} \end{aligned} \quad (3.9)$$

Similarly, the impact of the FIFA World Cup of 2018 held in Russia has been estimated using the below equations.

$$\ln GDP_{it} = \alpha + \beta_1 \ln FDI_{it} + \beta_2 \ln CPI_{it} + \beta_3 Rus18_t + \beta_4 Treated_i + \beta_5 DiD_{it} + \varepsilon_{it} \quad (3.10)$$

$$\begin{aligned} \ln UNE_{it} = & \alpha + \beta_1 \ln UNE_Lag_{it} + \beta_2 \ln FDI_{it} + \beta_3 \ln GFCF_{it} + \beta_4 Rus18_t + \beta_5 Treated_i + \\ & \beta_6 DiD_{it} + \varepsilon_{it} \end{aligned} \quad (3.11)$$

$$\ln TRM_{it} = \alpha + \beta_1 \ln REER_{it} + \beta_2 Tok21_t + \beta_3 Rus18_i + \beta_4 DiD_{it} + \varepsilon_{it} \quad (3.12)$$

Lastly, the FIFA World Cup of 2022 that took place in Qatar was analysed using the following equations.

$$\begin{aligned} \ln GDP_{it} = & \alpha + \beta_1 \ln GDP_Lag_{it} + \beta_2 \ln FDI_{it} + \beta_3 \ln CPI_{it} + \beta_4 Qat22_t + \beta_5 Treated_i + \beta_6 \\ & DiD_{it} + \varepsilon_{it} \end{aligned} \quad (3.13)$$

$$\ln UNE_{it} = \alpha + \beta_1 \ln FDI_{it} + \beta_2 Qat22_t + \beta_3 Treated_i + \beta_4 DiD_{it} + \varepsilon_{it} \quad (3.14)$$

$$LnTRM_{it} = \alpha + \beta_1 LnTRM_{Lag_{it}} + \beta_2 LnCPI_{it} + \beta_3 Qat22_t + \beta_4 Treated_i + \beta_5 DiD_{it} + \varepsilon_{it} \quad (3.15)$$

Some control variables, such as REER and GFCF, were excluded because of the absence of data. Additionally, observations with missing values were also dropped. The determinants of economic growth, like the lag of GDP, inflation (CPI), and gross fixed capital formation (GFCF), were previously used by Ferris et al. (2022) in their growth model. The tourism impact is measured using a modified gravity model (Rabadi et al., 2016). The present gravity model considers the exchange rate (REER) as a potential control factor for tourist arrivals, in addition to inflation. The unemployment-impact equation of Hagn and Maennig (2008), with slight adjustments, has been used. Foreign direct investment (FDI) and gross capital formation (GFCF) have been used as control factors in the unemployment equation (Ali, 2022).

3.4. Parallel Trends Test

The study first employs the DiD method to assess the economic impact of mega events using R programming, then later uses the parallel trends test to verify the outcome. Parallel trends are considered a key assumption of the DiD method, and if this assumption is not fulfilled, the DiD outcome may be biased and misleading (Riveros-Gavilanes, 2023). The present study uses the linear hypothesis function of R programming developed by Fox et al. (2013). The test helps in examining whether two groups; treatment group and control group, followed the same trend before the event (Li & Zhang, 2023) and whether the DiD effect is zero. However, the parallel trends assumption may not always be satisfied, and some degree of deviation may exist (Roth and Rambachan, 2019). Hence, a parallel trends plot is also utilized in the present study to check the pre-assumption of the DiD model.

Chapter 4

RESULTS AND DISCUSSIONS

The results are presented in three parts. Firstly, the Difference-in-Differences (DiD) estimates are presented along with interpretations. Secondly, the parallel trends test outcome is presented to ensure whether the assumptions of pre-event parallel trends between the treated group and the control group exist or not. Thirdly, a parallel trend plot is utilized to further analyse the pre-event trends as well as the post-event trends to ensure whether the treatment (in the present case, a mega sporting event) had any effect on the patient (host country in the present scenario). The same findings are shown for each of the mega sporting events studied. Before everything, the descriptive statistics are presented to aid in analysing the sample in a quick and useful manner.

4.1. Descriptive Statistics Results

A total of thirteen countries were chosen for the analysis, out of which four countries hosted mega sporting events such as the Summer Olympic Games and the FIFA World Cups held between 2016 and 2022, while nine countries were non-host countries but potential bidders for the events. A summary of overall variables in the complete sample is shown in the table below.

Table 4.1: Descriptive Statistics

Stat.	GDP	TRM	UNE	CPI	REER	FDI	GFCF
Mean	2590.5B	28,489,568	6.62	114.30	97.73	3.92	586.5B
Median	1194.2B	10,883,000	5.62	105.06	99.26	1.98	269.9B
Standard Deviation	4522.8B	40,253,506	4.22	88.41	17.10	9.39	958.0B
Minimum	33.7B	246,000	0.10	20.59	53.79	-30.78	28.8B
Maximum	22679.5B	183,178,000	26.09	1322.88	152.99	85.98	4996.4B
Count	325	325	325	322	272	324	299

Source: Author's computation

The average GDP of the thirteen countries in the chosen sample is 2.59 trillion, but the median GDP is 11.94 trillion. The standard deviation spread is quite high, almost double the mean GDP at 45.22 trillion, which is likely due to the selection of developing countries like Qatar and Turkey in the sample. The size of the economy also matters. Usually, countries have higher GDP because of the bigger size of the economy. The minimum GDP in the sample belongs to Qatar in the year 2000, and the maximum GDP belongs to the USA in the year 2024. The mean tourism inflow is 28 million, while the median tourism inflow is 10.9 million individuals. Once again, the spread from the mean tourism value is higher at 40.25 million individuals. The

minimum inflow was recorded in Australia in 2021, and the maximum tourist inflow was recorded in the USA in 2006. The mean unemployment level in the selected countries is 6.62 percent, and the median is 5.62 percent. The spread from the mean is 4.22 percent, probably due to low unemployment levels in Qatar and high unemployment levels in Spain during 2011–15. The mean CPI inflation is 114.30, while the median is 105.6. The CPI spread is also higher because of low levels of inflation in Turkey and Russia in the early 2000s and high levels of inflation in Turkey during recent years. The minimum and maximum values of CPI also correspond to Turkey. The mean exchange rate in terms of REER is 97.73, while the median exchange rate is 99.26. The spread is around 17.1 index points. FDI as a percentage of GDP has a mean value of 3.92 and a median value of 1.98 percent, but the standard deviation spread is quite high at 9.39 percent. Some countries even had negative FDI (net inflows), like Belgium and the Netherlands. A probable reason is that these countries had more investments outside their country compared to inside FDI flows. Lastly, gross fixed capital formation (GFCF) in terms of mean value is 586.5 billion and 269.9 billion dollars in terms of median. The spread for mean GFCF is high at 958 billion, which is likely due to low capital formation in Portugal and high capital formation in the USA. No data was available for REER in the case of Turkey and Qatar and for GFCF in the case of Qatar, which is why the count is 272 for REER and 299 for GFCF. A few observations for CPI and FDI were also missing. Hence, during the analysis, rows with missing observations were dropped, or alternative control variables in models were used. For example, in the case of Qatar, REER was not used as a control variable; instead, CPI was used.

4.2. Economic Impact of Rio 2016 Olympics

To assess the economic impact of the Summer Olympics of 2016 on the Brazilian economy, three models have been estimated specifically for economic, employment, and tourism impact. The outcome of the growth model is as follows:

Table 4.2: Impact of Rio 2016 on Economic Growth

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.08	0.05	1.70	0.0899 .
LnGDP_lag	0.97	0.01	147.49	< 2e-16 ***
LnFDI	0.00	0.00	-1.11	0.2665
LnGFCF	0.03	0.01	5.23	3.93e-07 ***
Rio16	0.00	0.00	0.23	0.819
Treated	0.01	0.01	0.86	0.3912
DiD	-0.01	0.01	-0.74	0.462
F-Stat. (Prob.)		< 2.2e-16		
Significance Codes: '***' P < 0.001, '**' P < 0.01, '*' P < 0.05, '.' P < 0.1				

Source: Author's computation

The findings reveal that there is no significant DiD effect of the Rio 2016 Olympics on Brazil's economic growth. However, one-period lag of LnGDP has a significantly greater positive impact on GDP growth of Brazil. The control variable log of GFCF also affects the economic growth positively and significantly. One percent capital formation is expected to enhance the economic growth by 0.03 percent. The statistically significant p-value of the F-statistics confirmed the overall significance of the model.

Table 4.3: Coefficient Covariance Matrix - Growth Impact of Rio 2016

Sr. No.	Res. Df	Df	F	Pr(>F)
1	217			
2	215	2	0.4033	0.6686

Source: Author's computation

The parallel trends test revealed that the treated group and the control group have no pre-event parallel trends since the p-value of the F-statistic is insignificant.

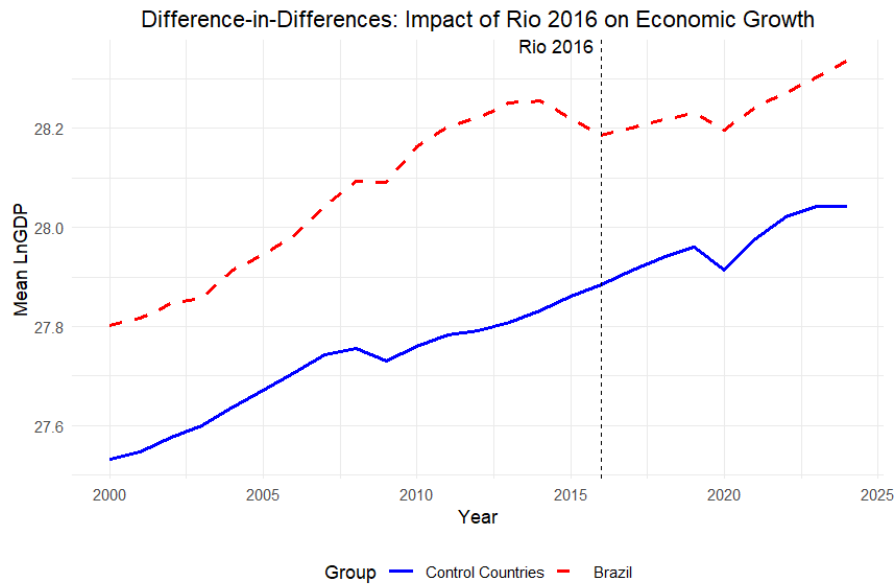


Figure 4.1: Impact of Rio 2016 on Economic Growth

The parallel trend plot, as exhibited in Figure 4.1, shows that prior to the event, both the treated and control group followed almost the same trend; however, post the event, no major shifts in the host country's economic growth are seen. Hence, the previous finding of no DiD is confirmed.

Table 4.4: Impact of Rio 2016 on Unemployment

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.71	0.25	2.80	0.006 **
LnUNE_lag	0.94	0.02	45.87	< 2e-16 ***
LnFDI	-0.02	0.01	-2.46	0.015 *
LnGFCF	-0.02	0.01	-2.31	0.022 *
Rio16	-0.08	0.02	-3.52	0.0005 ***
Treated	-0.02	0.04	-0.52	0.607
DiD	0.10	0.06	1.50	0.136
F-Stat. (Prob.)		< 2.2e-16		
Significance Codes: '***' $P \leq 0.001$, '**' $P \leq 0.01$, '*' $P \leq 0.05$, '.' $P \leq 0.1$				

Source: Author's computation

The results indicate that Brazil's unemployment level increases if the preceding year's unemployment level (LnUNE_lag) is significantly positive. The control factors FDI and GFCF significantly reduce unemployment in Brazil. The post-2016 period (Rio16) has a significant impact on unemployment in both groups, but the DiD effect is insignificant, showing that the Olympics has no significant employment effect on Brazil. The F-statistic suggests that the overall model is significant.

Table 4.5: Coefficient Covariance Matrix - Employment Impact of Rio 2016

Sr. No.	Res.Df	Df	F	Pr(>F)
1	217			
2	215	2	3.1281	0.0458 *

Source: Author's computation

The parallel trends assumption is satisfied since the p-value belonging to the F-statistic is significant. This means that before the event, both the treatment and control groups were moving in the same direction.

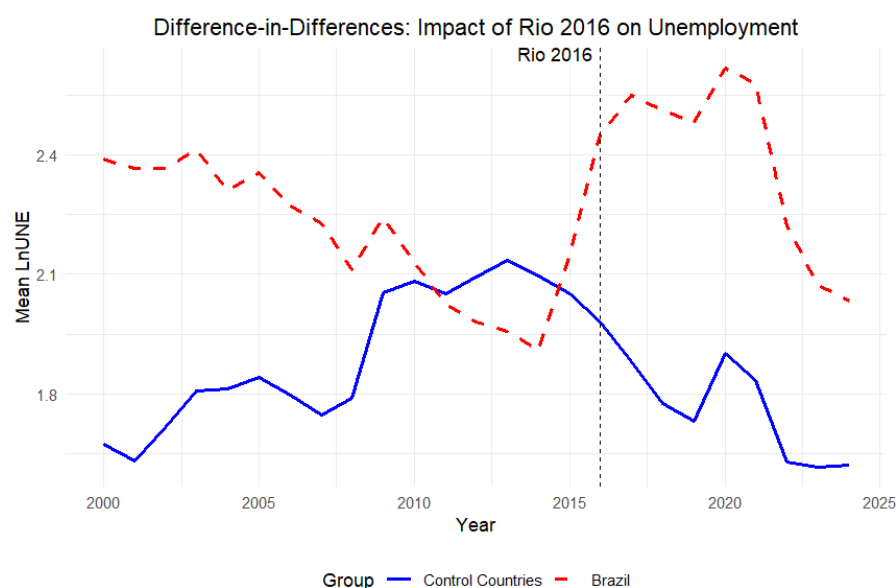


Figure 4.2: Impact of Rio 2016 on Unemployment

Although shifts in unemployment levels in Brazil were intense, they almost followed the same trend as the control group. A sharp and severe decline in unemployment levels was seen in 2019, but this might be caused by other factors such as FDI and GFCF, as predicted by the model, or COVID-19, but not the 2016 Olympics.

Table 4.6: Impact of Rio 2016 on Tourism

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	9.35	2.78	3.37	0.0009 ***
LnREER	1.59	0.60	2.65	0.009 **
Rio16	0.01	0.17	0.09	0.931117
Treated	-0.83	0.34	-2.41	0.017 *
DiD	0.09	0.52	0.17	0.862007
F-Stat. (Prob.)	< 2.2e-16			
Significance Codes: '***' P < 0.001, '**' P < 0.01, '*' P < 0.05, '.' P < 0.1				

Source: Author's computation

The results, as reported in Table 4.6, show that the average treatment effect of the 2016 Olympics on tourism in Brazil after the event is insignificant. However, the control variable

REER exerts a positive and statistically meaningful influence on international tourism in Brazil. A justification for this could be the relatively low exchange rate of Brazil compared to other famous tourist destinations located in developed countries. Another reason could be the “fear of missing opportunity,” since most people would try to visit their favourite destinations before it becomes too expensive. Otherwise, an increasing exchange rate may not attract significant tourism. The Treated coefficient is negative and significant, indicating that Brazil’s tourism was lower compared to the control group in the absence of the Olympics.

Table 4.7: Coefficient Covariance Matrix - Tourism Impact of Rio 2016

Sr. No.	Res. Df	Df	F	Pr(>F)
1	219			
2	217	2	3.6626	0.02727 *

Source: Author’s computation

The linear hypothesis test, as reported in Table 4.7, reveals that before the event of the Olympics of 2016, both the treated group and the control group followed the same trends, since the F-statistics has a significant corresponding p-value.

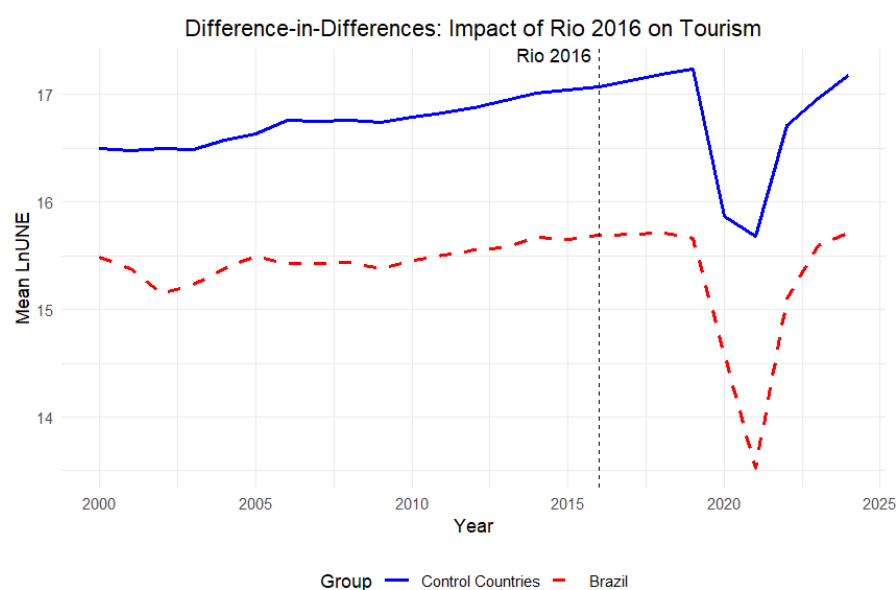


Figure 4.3: Impact of Rio 2016 on Tourism

The same findings as suggested by the linear hypothesis test are generated by DiD plot shown in Figure 4.3. Both the treated group (Brazil) and the control group follow the parallel trend before the event of the 2016 Summer Olympics. Even after the event, no significant shift is visible except for the hit caused by the COVID-19 pandemic.

4.3. Economic Impact of Tokyo 2021 Olympics

The Tokyo Olympics held in Japan were initially scheduled to be held in 2020, but due to the COVID-19 pandemic, they were postponed to 2021. Still, the event was marked as successful by the International Olympic Committee. To analyze its impact on economic growth, employment, and tourism in Japan, three separate equations for each of the dependent variables were estimated, whose results are as follows:

Table 4.8: Impact of Tokyo 2021 on Economic Growth

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.07	0.06	1.30	0.19425
LnGDP_lag	1.00	0.00	575.94	< 2e-16 ***
LnFDI	-0.003	0.00	-1.78	0.077 .
LnCPI	-0.002	0.01	-0.36	0.717
Tok21	0.02	0.01	3.12	0.002 **
Treated	-0.02	0.01	-2.63	0.009 **
DiD	-0.01	0.02	-0.50	0.621
F-Stat. (Prob.)		< 2.2e-16		
Significance Codes: '****' P ≤ 0.001, '***' P ≤ 0.01, '*' P ≤ 0.05, '.' P ≤ 0.1				

Source: Author's computation

The result showed that post the Summer Olympics of 2021 event (Tok21), all countries in the sample witnessed a rise in GDP growth. The GDP growth of Japan (Treated) was -0.02 percent less compared to the control group before the event. Findings also show that the Summer Olympics of 2021 had no significant effect on Japan's economic growth. Moreover, the lag of LnGDP has a strong positive impact on Japan's economic growth, while FDI and CPI have an insignificant impact at the 5% level. The F-statistics show that the model is jointly significant.

Table 4.9: Coefficient Covariance Matrix - Growth Impact of Tokyo 2021

Sr. No.	Res. Df	Df	F	Pr(>F)
1	215			
2	213	2	1.5648	0.2115

Source: Author's computation

The parallel trend test shows that the treatment group and the control group were moving in opposite directions prior to the event. However, further clarification on whether the assumption is satisfied is depicted in the graph below.

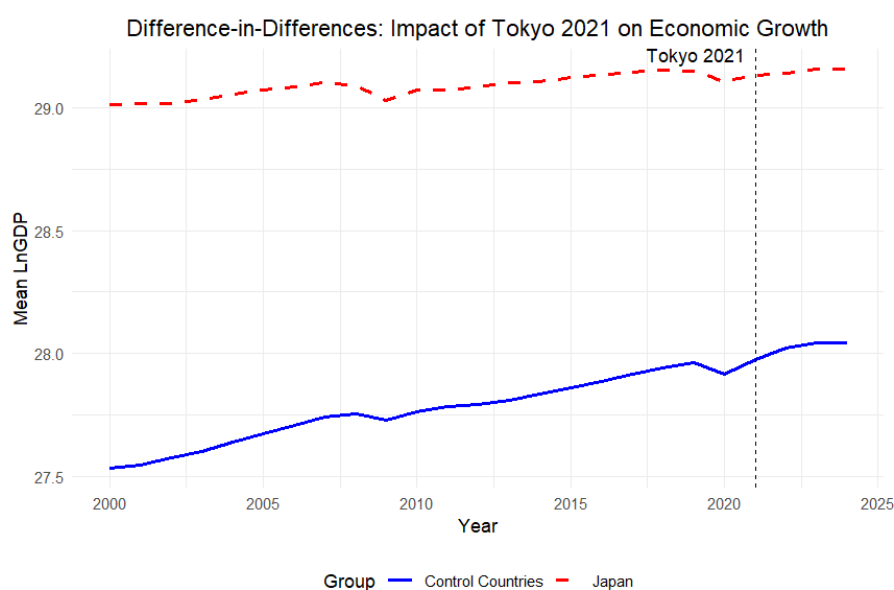


Figure 4.4: Impact of Tokyo 2021 on Economic Growth

The parallel trend plot, as displayed in the figure, negates the previous findings provided by the linear hypothesis test; instead, it shows that the mean economic growth of both the treatment group and the control group followed the same direction. It also confirms the DiD model findings that no significant average treatment effect was witnessed.

Table 4.10: Impact of Tokyo 2021 on Employment

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.70	0.25	2.84	0.005 **
LnUNE_lag	0.94	0.02	47.00	< 2e-16 ***
LnFDI	-0.02	0.01	-2.46	0.015 *
LnGFCF	-0.02	0.01	-2.37	0.020 *
Tok21	-0.11	0.03	-3.97	0.0001 ***
Treated	-0.09	0.04	-2.17	0.0309 *
DiD	0.11	0.09	1.18	0.239
F-Stat. (Prob.)		< 2.2e-16		
Significance Codes: '***' P ≤ 0.001, '**' P ≤ 0.01, '*' P ≤ 0.05, '.' P ≤ 0.1				

Source: Author's computation

The DiD model outcome shows that there is no significant treatment effect of the Summer Olympics of 2021 on employment in Japan. The unemployment in the previous period (lag of LnUNE) causes further unemployment significantly. The control factors FDI and GFCF significantly lower the unemployment level in Japan. The post-event effect on the unemployment level is negative in the entire sample of countries. The unemployment level in Brazil (Treated) before the event was significantly negative. The F-statistic suggests that at least one variable is significant in the overall model.

Table 4.11: Coefficient Covariance Matrix - Employment Impact of Tokyo 2021

Sr. No.	Res. Df	Df	F	Pr(>F)
1	215			
2	213	2	6.394	0.0020 **

Source: Author's computation

The assumption of parallel trends in the treated sample and control sample is satisfied since the probability value of the F-statistic, as per the linear hypothesis test, is significant, meaning that employment levels in both groups before the event were the same.

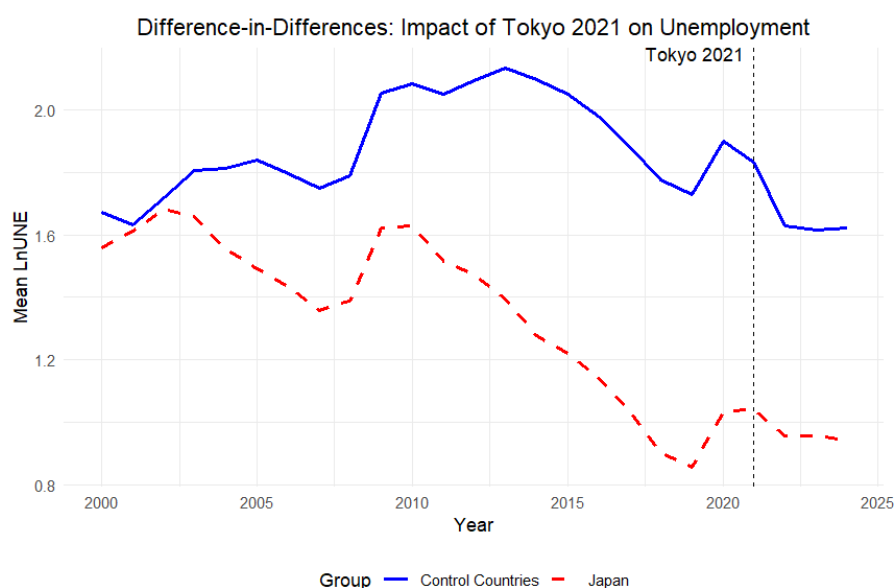


Figure 4.5: Impact of Tokyo 2021 on Employment

The parallel trends plot also verifies the previous outcome of the insignificant DiD impact of the Olympics on employment in Japan. Both the treated group and the control follow the same pattern before and after the mega event.

Table 4.12: Impact of Tokyo 2021 on Tourism

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.60	1.42	1.84	0.068 .
LnTRM_lag	0.93	0.03	29.74	<2e-16 ***
LnREER	-0.32	0.30	-1.08	0.282
Tok21	0.27	0.11	2.55	0.012 *
Treated	-0.06	0.13	-0.47	0.636
DiD	0.08	0.33	0.26	0.798
F-Stat. (Prob.)		< 2.2e-16		
Significance Codes: '***' P ≤ 0.001, '**' P ≤ 0.01, '*' P ≤ 0.05, '.' P ≤ 0.1				

Source: Author's computation

The findings obtained using the DiD method show no significant average treatment effect of the Tokyo 2021 Olympics on tourism in Japan. The lag of LnTRM shows an increasing and

significant effect on tourism in Japan. The exchange rate (REER) has no meaningful consequences for tourism. The post-treatment period (Tok21) positively affected tourism in all countries. The model is jointly significant as per the p-value of the F-statistic.

Table 4.13: Coefficient Covariance Matrix - Tourism Impact of Tokyo 2021

Sr. No.	Res. Df	Df	F	Pr(>F)
1	209			
2	207	2	0.800	0.451

Source: Author's computation

The coefficient covariance matrix reported in Table 4.13 shows that the treated group and the control group do not follow the same mean tourism pattern, since the F-statistics accompanies an insignificant p-value.

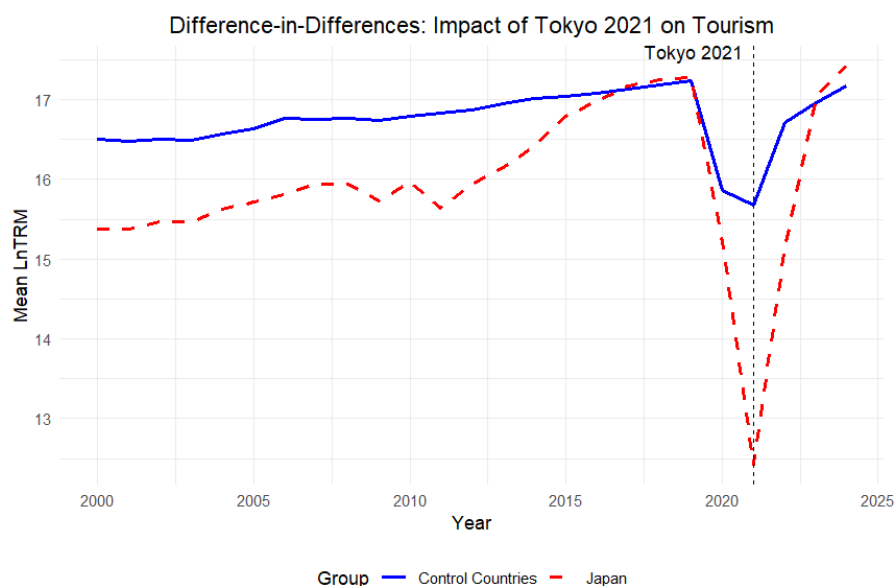


Figure 4.6: Impact of Tokyo 2021 on Tourism

Except for the period 2009 to 2011, the mean tourism of Brazil and control countries almost followed the same pattern. While tourism in Japan rose above the control group before COVID-19, it later aligned with the control group. As per Figure 4.6, no significant difference in tourism was spotted in Japan.

4.4. Economic Impact of Russia 2018 FIFA World Cup

The World Cup of 2018 was not the only mega sporting event that Russia has ever hosted. The Summer Olympics of 1980 and the Winter Olympics of 2014 were also hosted by Russia. Despite being an emerging economy, Russia has well-suited infrastructure for sporting events (Davydova et al., 2019). Like other nations, Russia also seeks to improve its economic situation

by leveraging the hosting of mega events. The economic impact assessment of the 2018 World Cup in Russia is as follows.

Table 4.14: Impact of Russia 2018 on Economic Growth

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	26.83	1.03	26.10	< 2e-16 ***
LnFDI	-0.30	0.07	-4.34	2.16e-05 ***
LnCPI	0.28	0.23	1.26	0.208
Rus18	0.04	0.21	0.18	0.858
Treated	-0.10	0.28	-0.35	0.724
DiD	-0.22	0.65	-0.34	0.732
F-Stat. (Prob.)		0.00026		
Significance Codes: '***' P < 0.001, '**' P < 0.01, '*' P < 0.05, '.' P < 0.1				

Source: Author's computation

The growth impact results, as reported in Table 4.14, show that the DiD effect is insignificant and, thus, the FIFA World Cup does not impact Russian economic growth. The control variable FDI demonstrates an adverse effect on GDP, which is likely due to the geopolitical tensions that the country is currently facing, and the levels of FDI flows may not be large enough to impact GDP growth positively. The model, as per the F-statistic, is overall significant due to the p-value lower than 5%.

Table 4.15: Coefficient Covariance Matrix - Growth Impact of Russia 2018

Sr. No.	Res. Df	Df	F	Pr(>F)
1	225			
2	223	2	1.246	0.2897

Source: Author's computation

The findings of the linear hypothesis test reported in Table 4.15 indicate that the treatment country and control countries have varying GDP patterns before the event. However, an alternative reflection of parallel trends is shown in the figure below.

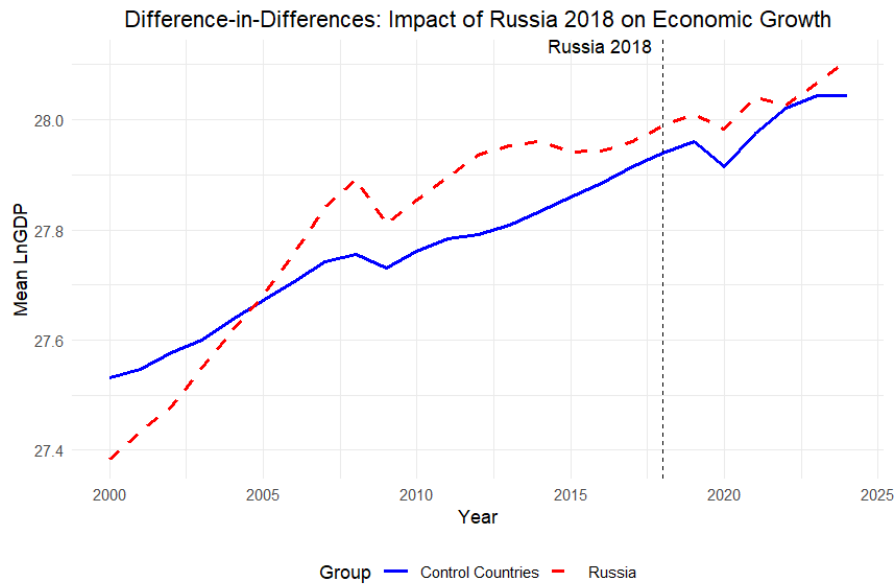


Figure 4.7: Impact of Russia 2018 on Economic Growth

The plot of parallel trends, as displayed in Figure 4.7, suggests that the mean GDP trends of Russia were slightly different at the beginning of the study period, but they followed almost identical trends as the control countries. No significant shifts can be seen after 2018 as a result of hosting the mega event, hence confirming the previous DiD findings.

Table 4.16: Impact of Russia 2018 on Employment

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.73	0.25	2.88	0.004 **
LnUNE_lag	0.94	0.02	45.26	< 2e-16 ***
LnFDI	-0.02	0.01	-2.43	0.016 *
LnGFCF	-0.02	0.01	-2.42	0.016 *
Rus18	-0.06	0.02	-2.52	0.013 *
Treated	-0.06	0.04	-1.59	0.114
DiD	0.05	0.08	0.54	0.591
F-Stat. (Prob.)		< 2.2e-16		
Significance Codes: '***' $P \leq 0.001$, '**' $P \leq 0.01$, '*' $P \leq 0.05$, '.' $P \leq 0.1$				

Source: Author's computation

The employment effect estimated using the DiD approach reveals that no significant average treatment effect of the 2018 World Cup is delivered, whereas FDI and GFCF significantly reduce the unemployment level in Russia. A post-period (Rus18) negative unemployment effect is also evident in the set of chosen countries. The model, in aggregate, is significant, as indicated by the significant p-value relating to the F-statistic.

Table 4.17: Coefficient Covariance Matrix - Employment Impact of Russia 2018

Sr. No.	Res. Df	Df	F	Pr(>F)
1	214			
2	212	2	4.194	0.0164 *

Source: Author's computation

The parallel trend assumption is also satisfied, since the F-statistic value in the coefficient covariance matrix is statistically significant (see Table 4.17). This ensures that the DiD model output is not biased or inaccurate.

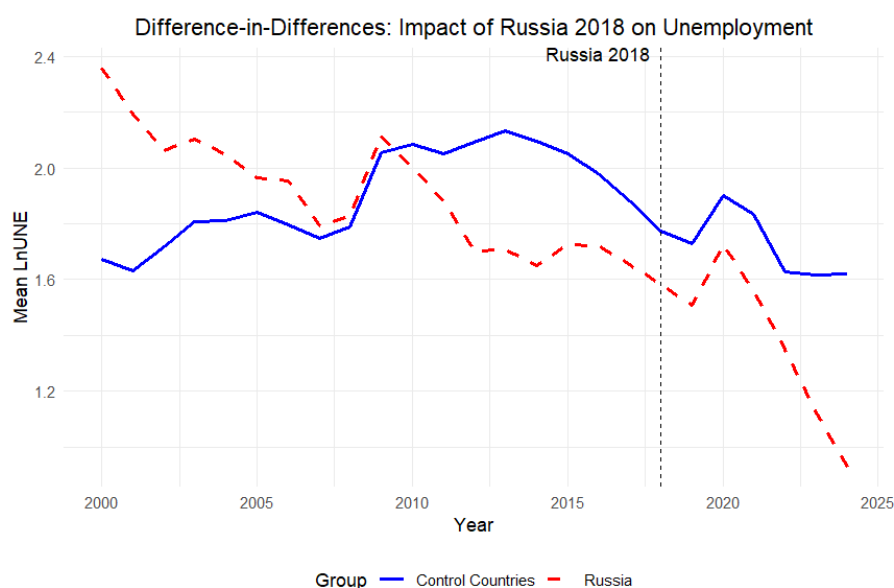


Figure 4.8: Impact of Russia 2018 on Employment

The graph of parallel trends also confirms the previous conclusion from the linear hypothesis test by indicating similar and parallel trends in Russia and the control countries. The post-treatment situation, according to the graph, is not significantly affected by the mega event.

Table 4.18: Impact of Russia 2018 on Tourism

Coefficient	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	10.13	2.75	3.68	0.0003 ***
LnREER	1.43	0.59	2.40	0.017 *
Rus18	-0.13	0.18	-0.69	0.492
Treated	0.55	0.31	1.78	0.076 .
DiD	-0.62	0.54	-1.15	0.251
F-Stat. (Prob.)		0.08267		
Significance Codes: '***' P ≤ 0.001, '**' P ≤ 0.01, '*' P ≤ 0.05, '.' P ≤ 0.1				

Source: Author's computation

The FIFA World Cup of 2018 does not seem to be favourable in terms of tourism for Russia, as indicated by the insignificant coefficient corresponding to DiD. Conversely, it is the exchange rate (REER) that significantly boosts tourism. Results also point out that Russia had

positive tourism in the absence of the FIFA World Cup, as reflected by the Treated coefficient. The overall model is jointly significant but at the 10% level, showing that the model could be improved further if certain adjustments were made.

Table 4.19: Coefficient Covariance Matrix – Tourism Impact of Russia 2018

Sr. No.	Res. Df	Df	F	Pr(>F)
1	219			
2	217	2	2.136	0.121

Source: Author's computation

The coefficient covariance matrix in Table 4.19 showcases an insignificant p-value of the F-statistic, suggesting that the treatment group and control group followed different paths prior to the mega event of the 2018 World Cup.

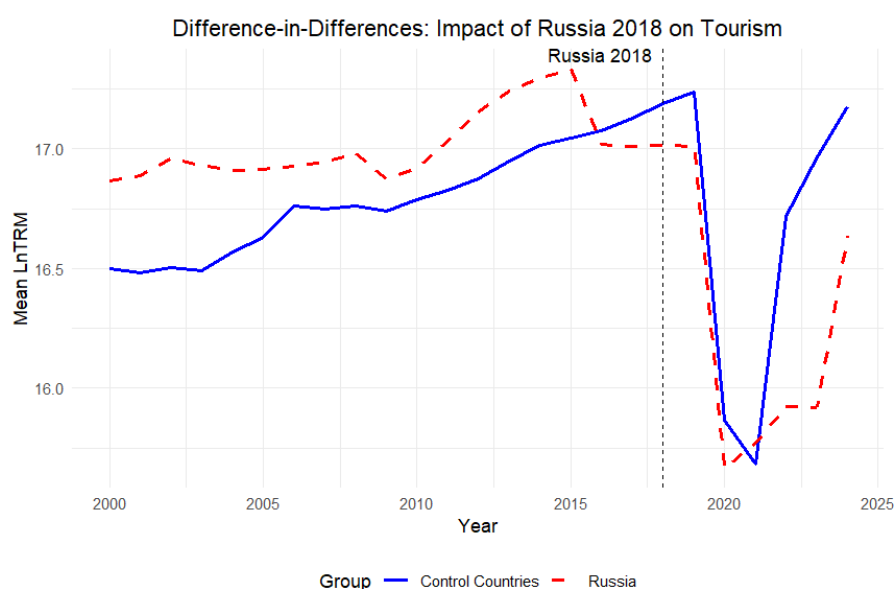


Figure 4.9: Impact of Russia 2018 on Tourism

The Difference-in-Differences plot in Figure 4.9 shows that mean tourism in Russia and the control countries was alike for most of the pre-event period, except for a sudden decline in tourism in Russia in 2016. The post-event situation in both groups is also fairly similar, suggesting no significant DiD effect.

4.5. Economic Impact of Qatar 2022 FIFA World Cup

Qatar is the country that has spent the highest volume of money on hosting the FIFA World Cup ever (Statista, 2024). This makes it crucial to analyze the economic gain Qatar achieved as a result of hosting the mega event. The economic impact analysis of the Qatar 2022 World Cup is detailed below.

Table 4.20: Impact of Qatar 2022 on Economic Growth

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.03	0.07	0.46	0.649
LnGDP_lag	1.00	0.002	475.92	< 2e-16 ***
LnFDI	-0.0003	0.002	-0.13	0.897
LnCPI	0.0046	0.01	0.59	0.555
Qat22	0.01	0.01	1.01	0.312
Treated	0.07	0.01	6.54	4.73e-10 ***
DiD	-0.07	0.03	-2.62	0.010 **
F-Stat. (Prob.)		< 2.2e-16		
Significance Codes: '****' P ≤ 0.001, '***' P ≤ 0.01, '*' P ≤ 0.05, '.' P ≤ 0.1				

Source: Author's computation

The DiD model output, as reported in Table 4.20, reveals that the average treatment effect of hosting the FIFA World Cup on Qatar's economic growth is statistically significant and negative. This may likely be due to investment shifts in sporting infrastructure as well as huge spending on the event by Qatar. Though the Treated factor has a positive coefficient, revealing that prior to the event, Qatar's GDP was positive and higher than that of the control countries. The lagged GDP has a positive and statistically significant effect on the current GDP of Qatar. The overall model is jointly significant, according to the corresponding significant p-value of the F-statistic.

Table 4.21: Coefficient Covariance Matrix - Growth Impact of Qatar 2022

Sr. No.	Res. Df	Df	F	Pr(>F)
1	211			
2	209	2	8.593	0.0002 ***

Source: Author's computation

The parallel trend test outcome, as shown in Table 4.21, indicates that the mean GDP of Qatar and the control countries moved in the same manner before the event, justifying the assumption of the model.

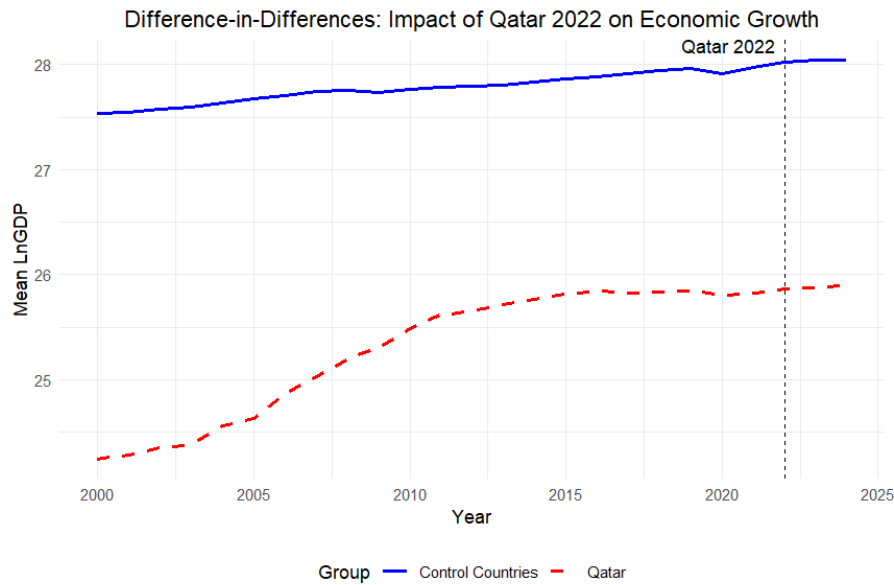


Figure 4.10: Impact of Qatar 2022 on Economic Growth

The trend plot in Figure 4.10 also confirms that, post the event, the treated and control groups followed the same pattern. Since the assumption of parallel trends holds, the previously mentioned DiD findings are justified.

Table 4.22: Impact of Qatar 2022 on Employment

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.86	0.05	36.13	<2e-16 ***
LnFDI	0.03	0.03	1.09	0.2751
Qat22	-0.20	0.12	-1.71	0.090
Treated	-2.67	0.13	-20.11	<2e-16 ***
DiD	-0.96	0.41	-2.34	0.020*
F-Stat. (Prob.)		< 2.2e-16		
Significance Codes: '***' P ≤ 0.001, '**' P ≤ 0.01, '*' P ≤ 0.05, '.' P ≤ 0.1				

Source: Author's computation

Then comes the employment impact. The model output in Table 4.22 shows that the DiD average treatment effect on Qatar's unemployment level is significant and negative. It suggests that the FIFA World Cup of 2022 helped Qatar reduce the unemployment level successfully. The control factor, FDI, on the other hand, shows no significant employment effect. The F-statistics value is highly significant, which means that the present model is jointly significant.

Table 4.23: Coefficient Covariance Matrix - Employment Impact of Qatar 2022

Sr. No.	Res. Df	Df	F	Pr(>F)
1	223			
2	221	2	540.360	< 2.2e-16 ***

Source: Author's computation

The linear hypothesis test in the present case yielded a statistically acceptable probability value, which suggests that Qatar, as the treatment group, and the control countries in the sample followed the same patterns before the event.

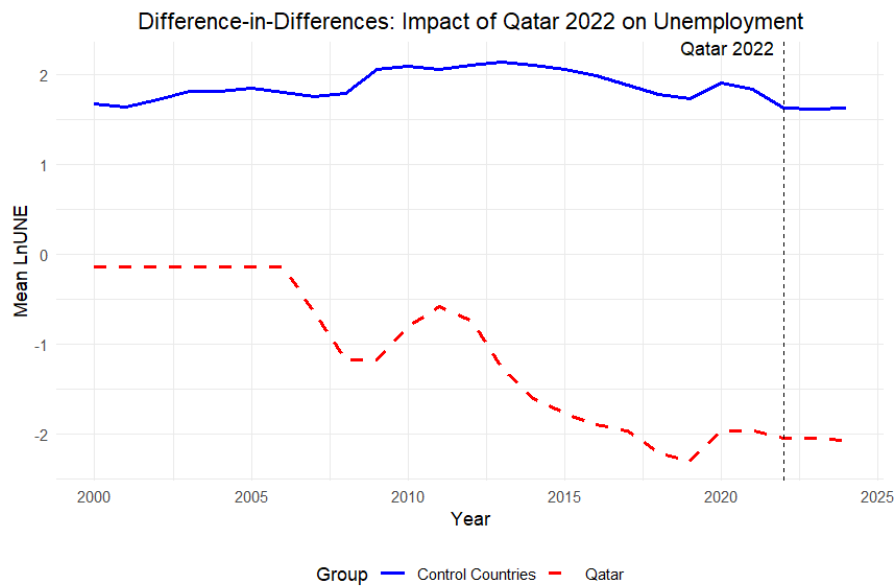


Figure 4.11: Impact of Qatar 2022 on Employment

The plot of the DiD shows that prior to the event, Qatar and the control nations had the same mean unemployment patterns. The post-intervention differences shown in the plot are not due to pre-existing trends but are a result of the event itself. The original outcome of the DiD model is hence confirmed here.

Table 4.24: Impact of Qatar 2022 on Tourism

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.95	0.52	3.77	0.0002 ***
LnTRM_lag	0.94	0.02	39.83	< 2e-16 ***
LnCPI	-0.22	0.09	-2.41	0.017 *
Qat22	0.63	0.10	6.58	3.08e-10 ***
Treated	-0.11	0.11	-0.98	0.326
DiD	0.14	0.26	0.52	0.601
F-Stat. (Prob.)	< 2.2e-16			
Significance Codes: '***' P ≤ 0.001, '**' P ≤ 0.01, '*' P ≤ 0.05, '.' P ≤ 0.1				

Source: Author's computation

The estimates presented in Table 4.24 show that the Qatar World Cup of 2022 has no average treatment effect on tourism. The variable Qat22 shows that post-event, all countries in the sample witnessed a significant rise in tourism, so the World Cup may not be the reason. Additionally, rising CPI in the host nation, as a control variable, is not good for tourism since

it has a negative and statistically significant impact on tourism. The overall model, as the F-statistic value with its corresponding significant p-value suggests, is jointly significant.

Table 4.25: Coefficient Covariance Matrix - Tourism Impact of Qatar 2022

Sr. No.	Res. Df	Df	F	Pr(>F)
1	236			
2	234	2	5.307	0.006 ***

Source: Author's computation

The parallel pre-existing trends assumption is also met since the p-value of the F-statistic is significant. This means that the treatment group and the control group were similar in their trends before the event.

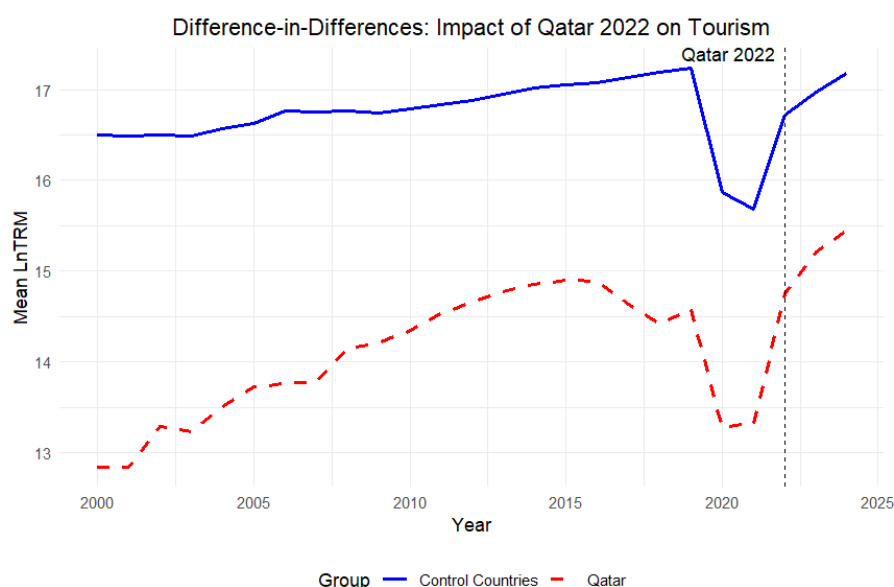


Figure 4.12: Impact of Qatar 2022 on Tourism

The DiD plot in Figure 4.12 reflects both the before and after treatment mean tourism outcomes of Qatar and the control countries. No significant differences are visible before the events, so parallel trends are evident from the graph. In addition, post the event, both groups continued following the same trends, showing that the intervention does not account for any differences.

CONCLUSION AND RECOMMENDATIONS

This study enriches the literature by providing fresh evidence on the impact of hosting mega events on host nations. The study uses a data set spanning the period 2000–2024 and analyzes the four mega sporting events of the Olympics and FIFA World Cup held between 2016 and 2022. The chosen events are the Rio (Brazil) Summer Olympics of 2016, the Tokyo (Japan) Summer Olympics of 2021, the Russia 2018 FIFA World Cup, and the Qatar 2022 FIFA World Cup. As a control group, nine countries that were top bidders for the mentioned games were selected. Results were obtained using the Difference-in-Differences (DiD) method. The economic impact in terms of growth, employment, and tourism was assessed. The findings showed that the Rio 2016 Olympics, the Tokyo 2021 Olympics, and the 2018 FIFA World Cup had no significant impact on the economic growth, employment, and tourism of the host nations. Hence, previous findings by Kobierecki and Pierzgalski (2022) and Billings and Holladay (2011) regarding economic growth, Drapkin (2023) regarding tourism, and Hagn and Maennig (2008) regarding unemployment were confirmed. The pre- and post-economic conditions of the nations remained unchanged as per the DiD outcome. In contrast, the Qatar 2022 World Cup had a significant but adverse impact on economic growth, opposing the scoping-review findings of He and Yu (2025), while a statistically significant and positive impact on employment was found. Before the event, Qatar and the control countries had parallel trends, but post-event, a significant shift in economic growth and employment levels in Qatar was witnessed. However, no significant impact on tourism was observed in the case of Qatar.

Based on the findings, it is recommended that when economic benefits are concerned, countries should consider opportunities other than hosting mega sporting events, since no significant economic impact in most cases is found in the present study. The decision to host mega events comes with higher costs and economic risks. However, if motives are other than economic, such as image building, cultural exchange and promotion, and infrastructure development, then hosting can be considered. It is also recommended that while studying economic impact using the DiD model, researchers should carefully choose the comparison (control) group, since bias could result from differences in economic structure, governance, and infrastructure.

There are several limitations of the present study. First, the data post-events, especially in the case of Qatar, is limited. Future studies can fill this gap by including more data as the years pass by. Second, the present study employed the DiD method and considered the post-event period from when the event started to later years, but the impact of large-scale events may be

manifested right after the announcement, according to Wan and Song (2019). Taking the post-announcement period into consideration would likely provide different results. Last, the DiD model assumes that the treatment group (host countries in the present case) and the control group (non-host countries) must have followed the same trends prior to the event. So, even if this assumption is satisfied, it is unclear whether it is a coincidence or other factors have resulted in such patterns in the control group. Hence, in this case, the output generated by the DiD model may be biased.

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