

ECONOMIC INEQUALITY:

THE UNEVEN LEGACY OF THE LONDON 2012 OLYMPICS

Team 31
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EXECUTIVE SUMMARY

The Olympic Games are far more than just an elite athletic competition. This global phenomenon becomes the hotspot of the world every four years, and brings an enormous amount of attention to the city that hosts it. Government leaders who vie to host the Olympics argue that it boosts their city's economic growth and international reputation, and point to the regeneration of Barcelona and Athena following their games in 1992 and 2004, respectively. Yet many economists believe these statements are exaggerated, and given the large cost of hosting, revenues from the games may fail to produce net profit.

In our research, we explore how the potential economic gains were redistributed across society in the host city following the games. We analyzed the 2012 London Olympics and looked at the tourism sector, as well as the wage distribution in and around the London area. Using synthetic control, we estimate the evolution of the economic parameters after 2012 had the Olympics not happened and compare it to the actual data, providing a causal estimate of the effect of the Olympics. We observed a significant increase in the average spendings of tourists, as well as the annual number of visits. But a closer look at different gender and employment shows that economic growth benefit all groups evenly. Focusing on Newham, where the Olympic stadium was constructed, we find that part-time workers saw large benefits due to the games, but full-time workers saw little to no benefit. Female workers saw wages stagnate or even fall before returning to trend, while male workers saw essentially no effect.

We highlight that that there are likely varied effects of hosting the Olympics, and many different types of cities host the games with varying approaches to preparation and varying outcomes. We explored the outcome in depth for the London games, but studying other events in countries with different cultural and political values could help us better understand the social welfare and inequality implications of hosting the Olympics.

BACKGROUND & RESEARCH QUESTION

This is only the beginning of a process that will drive extraordinary regeneration in east London. But we can already say, with pride, that the 2012 Games have made a lasting difference – for the better – to the economy of London and the UK.

– Boris Johnson

RESEARCH MOTIVATION

In a winning bid to host the Summer 2012 Olympics, government officials described their goal to jump-start the renewal of London's East End, the poorest part of the city. In 2009, Rio de Janeiro beat out Madrid, Tokyo, and Chicago for the right to host the 2016 Olympics. Brazil had successfully recovered from the 2008 financial crisis and people cheered for the increased tourism and urban infrastructure improvements President Luiz Inácio Lula da Silva promised in their country's bid.

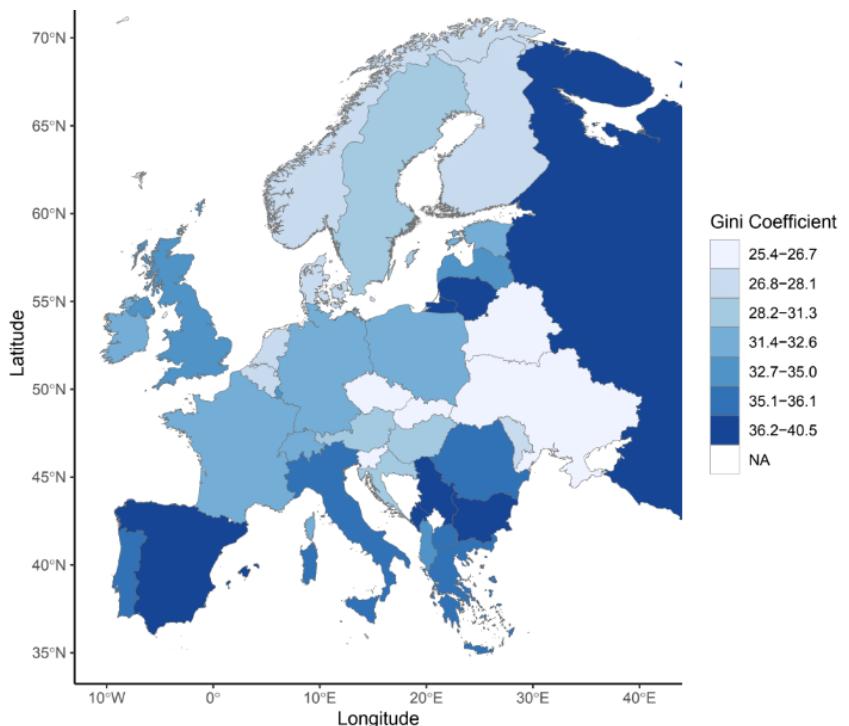
Both London and Rio de Janeiro exemplify a common theme for cities that host the Olympics. Public financing of the Games is often promoted as infrastructure development and a boost to the economy that benefits everyone. However, a growing number of economists argue that only the wealthy and the privileged profit from the event, often at the expense of others in the city. This contradiction led us to investigate if the Olympics does indeed bring greater inequality to its host cities.



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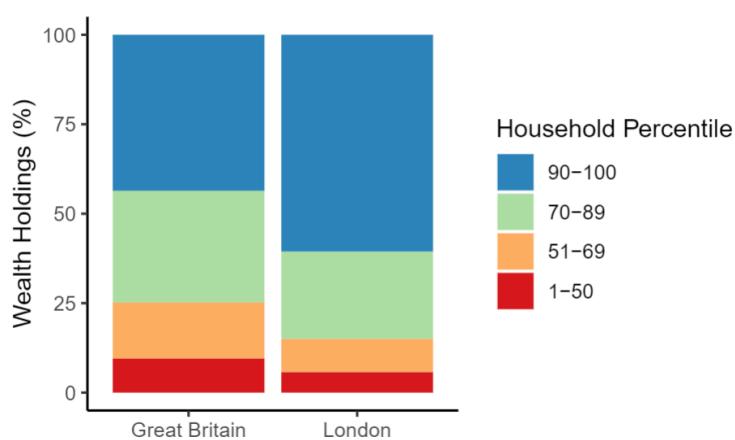
WHY LONDON?

While measures of inequality could be analyzed in many different host cities, we focused on the effect of the 2012 Olympic Games on its host city: London. The UK has high levels of economic inequality when compared to other developed countries. Additionally, the UK has release high quality data make empirical evaluation possible.



In the upper right is a map we made of Gini Coefficients across Europe in 2015, where 0 represents perfect equality and 1 represents perfect inequality. In fact, the UK is currently the fourth most unequal country in Europe.

This inequality is even more exaggerated in London. In 2012, the city's poverty rate was roughly 28%, whereas the average rate for the rest of Great Britain was roughly only 21%. The extent of financial disparity in London is also higher than in any other part of the country, since it contains about one sixth of both the top and bottom 10% of the British population by wealth. In fact, the top 10% of households in London own about 60% of the wealth in the city, as shown in the graph we created below. Additionally, London has the largest gender pay gap in the UK, with women earning 30.4% less than men.



06 RESEARCH QUESTIONS

We test two main questions to measure the economic impact of the 2012 London Olympics and its relationship to inequality:

1. Did the 2012 Olympic games increase economic activity in London?
2. If yes, were these gains distributed evenly across society?

First, we explore whether hosting the Olympics contributed to a significant increase in tourism, tourist spending, and economic growth in the years following the games. In the years leading up to the games, the British government spent \$14 billion in taxpayer funds constructing new sports venues, athlete housing, hotels, and expanding London's infrastructure (Moss 2012; Neild 2012). Despite these significant investments, researchers are divided as to whether hosting the Olympic games contributes to economic growth.

Some argue that countries hosting the Olympics have experienced significant gains in trade (up to 30%); interestingly, the authors attribute this gain to the positive signal that bidding to host the Olympics sends to other countries, as bidding countries must possess the extensive infrastructure and resources to host the games (Rose and Spiegel 2009). On the other hand, many argue that hosting the Olympics games comes with a hefty price tag and often leads countries to invest taxpayer funds into projects that do not produce long-term economic benefits. Skeptics point to Greece's preparation for the 2004 Athens Olympics – where many Olympic structures now lie empty despite their significant cost for an already financially burdened country – and Brazil's preparation for the 2016 games in Rio de Janeiro – which effectively bankrupted the city – as examples of all that can go wrong (Moss 2018).

Second, we ask whether potential economic gains are distributed evenly across society. Nearly all economic policies have winners and losers. Welfare programs benefit low-income households, while low capital gains taxes and corporate tax cuts typically benefit the wealthy. Accordingly, we can view the British government's decision to host the games as a policy designed to promote economic growth, though exactly who benefits is unclear.

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On the one hand, hosting the games could promote local economic growth if increased tourism and infrastructure lead to gains for local businesses that use this money to hire employees and expand their businesses. On the other hand, wealthy individuals could disproportionately benefit if big hotel chains and corporations become more profitable (as a result of the city's investment) but fail to invest this in the community (e.g., by buying back stocks rather than funding new small businesses).

Hosting the games could also lead to greater inequality through the opportunity cost of government spending. Since hosting the games requires governments to spend significant public funds on infrastructure and construction, these funds cannot go toward healthcare, childcare, education, welfare, or other social services that are critical for London's poorest households. Accordingly, hosting the Olympics games could disproportionately harm low-income households if preparation for the games diverted funds away from social services. Although either explanation for increased inequality is plausible, we do not seek to adjudicate among these possible mechanisms in this paper; instead, we establish whether hosting the games led to greater inequality, which we measure using changes in wages and unemployment.

ENDOGENEITY

Although it is incredibly important for countries to understand the economic effects of hosting the Olympics, endogeneity makes this difficult to measure. For one, cities and countries that host the Olympics are often significantly different than others that do not host the Olympics. Countries must have extensive public infrastructure and resources for the Olympic committee to even seriously consider a country's bid. Accordingly, many countries that host the games are developed countries with high levels of economic growth. Rarely, developing countries host the games, but these are often countries that have undergone significant economic growth and see hosting the games as a way to increase their standing in the international community. This was true when Beijing hosted the games in 2008, as China sought to debut a new national image and gain prestige internationally by hosting the games (Panagiotopoulou 2012). These peculiarities make it difficult to distinguish the economic effects of hosting the games from those that make some countries more likely to be selected as hosts in the first place.

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Similarly, teasing out the potential effects of hosting the games on inequality presents a challenge because there can be many omitted variables. To overcome these challenges, we use the synthetic control method – which allows us to create a causal estimate of the effect of hosting the Olympics on our outcomes of interest by creating a "synthetic" version of London using a weighted combination of other regions in the United Kingdom and boroughs in London without Olympic venues.

Did the games increase tourist spending and visits?

GEOGRAPHIC LEVEL: UK'S 12 REGIONS

OUTCOME VARIABLES

Tourist visits - Estimate of total number of international in thousands by year (2002-2019)

Tourist spending - Estimate of total international tourist spending in millions of Pounds by year (2002-2019)

Source: [Visit Britain's quarterly survey](#)

PREDICTORS

Arts - Proportion of respondents who have "engaged with the arts in the last year" (2005-2019)

Museums - Proportion of respondents who have "visited a museum or gallery in the last year" (2005-2019)

Heritage - Proportion of respondents who have "visited a heritage site in the last year" (2005-2019)

Source: UK Department for Digital, Culture, Media and Sport's [Taking Part survey](#), which has run continuously since 2005 and provides reliable statistics on cultural engagement

Roads - Road lengths in miles (2005-2019)

Source: UK Department of Transport's [Road lengths statistics](#), available from 2005

Q2 DATA SOURCES

Were these gains distributed evenly?

GEOGRAPHIC LEVELS: UK'S 12 REGIONS AND LONDON'S 32 BOROUGHS

OUTCOME VARIABLE

Wages - Average earnings by hour (2002-2019); level: region and borough

Source: UK Office for National Statistics' Annual Survey of Hours and Earnings

PREDICTORS

Region and Borough:

Workforce Participation - Proportion of working-age persons who are in the workforce, by gender (2005-2019)

Source: UK Office for National Statistics Annual Population Survey

Borough only:

New Houses - Number of new houses completed by fiscal year (2005-2019)

Source: : Greater London Authority's London Development Database, which records significant planning permissions granted in London for new housing

Median House Prices - Average median home price by year (2006-2019)

Source - Price Paid Data published on Land Registry website

Number of Pubs - Number of registered public houses and bars (2002-2016)

Source: UK Office for National Statistics Public Houses and Bars

Why did we choose these predictors?

TOURISM GROWTH PREDICTORS

One predictor we used to look at tourism growth is the participation level in arts events, which helps us get a sense of the engagement with the arts and cultural scene that attracts tourists. The level of engagement with cultural attractions such as museums and heritage exhibits is also a great way to understand the tourism level in a city like London, which is well-known for its historical landmarks and famous exhibitions. Another important aspect of tourism is accessibility, since it allows for a larger number of tourists to move places and, indeed, increase visits and spending. Since road infrastructure plays a big role in that, we chose the length of the driveways as our predictor, in an attempt to understand the level of convenience of London tourism.

WAGES PREDICTORS

When looking at wages and economic activity, one predictor we included is the workforce participation, which tells us the breakdown by gender of the current workforce. This will indeed give us some insights on how the wages are split up between different gender groups. One other related field we considered is the housing market. The real estate prices are a good estimator for the economic health of the population, as well as the overall net worth of the city. The number of new houses is also important to add to our model, as it is directly correlated to the housing demand in the region and, therefore, the wealth level of its citizens. One last good predictor for wages is the number of public houses and bars in the city. As a part of the entertainment sector, an increase in the number of bars predicts increased engagement and, therefore, increased incomes for London's citizens, who are now able to direct some of their wages towards leisure.

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THE TOURISM PREDICTORS ARE SHOWN IN THE TABLES BELOW.

Table 1: Total Spendings Growth Predictors Means

	Synthetic London	London
Total spendings (GBP)	8479.02	8421.75
Arts participation (%)	71.66	72.43
Museum visits (%)	71.66	72.43
Heritage visits (%)	59.33	61.39
Roads length (miles)	37.44	37.30

Table 2: Total Visits Growth Predictors Means

	Synthetic London	London
Total number of visits	14973.52	14981.96
Arts participation (%)	72.20	72.43
Museum visits (%)	72.20	72.43
Heritage visits (%)	59.93	61.39
Roads length (miles)	37.49	37.30

Why did we analyze data at the borough level?

The British government claimed that the Olympics would stimulate growth in East London, a post-industrial neighborhood in need of redevelopment. The pressure and funding of the Olympics would serve as a catalyst for this rejuvenation. Stratford, a district in the East End of London in the borough of Newham, was home to the majority of Queen Elizabeth Olympic Park, including Olympic Village for the athletes, London Stadium, Aquatics Centre, and Media Centre. Since most of the infrastructure development was concentrated in the London Borough of Newham and a major economic goal of hosting the Olympics was to encourage growth in that region, we primarily analyzed data at the borough-level. This allows us to evaluate the short- and long-term economic impact on the area of London that was most affected by the Olympics, in comparison to the London's 32 other boroughs.

SYNTHETIC CONTROL

Using the synthetic control method, we measure the causal effect of hosting the Olympics on tourist spending and visits. We also explore whether these potential gains led to an increase in wages in the borough where most Olympic venues were built.

Social scientists often study comparative case studies to understand large-scale events that cannot be studied through experiments. However, one weakness of comparative case studies is that there is no systemic method for selecting control cases. The synthetic control method (Abadie and Gardeazabal 2003; Abadie, Diamond, and Hainmueller 2010) helps overcome this weakness by proving a systematic way to select control cases; it creates a "synthetic control" using a weighted average of the control cases based on characteristics that can help predict the outcome of interest. This method allows researchers to compare the counterfactual outcome of the synthetic control absent the intervention to the actual outcome for the treated unit following the intervention.

Another key advantage of the synthetic control method is that it enables comparative case studies when no individual control unit serves as a good counterfactual for the treated unit (Abadie, Diamond, and Hainmueller 2015). This is fundamentally true for the UK regions and boroughs we study since there are a host of unique factors for each locality which make it virtually impossible to find a matching control case. However, by creating a weighted average of units based on key characteristics, we can begin to approximate changes in the outcome based on trends in the control units. Accordingly, this method presents an ideal way to study the socioeconomic impact of hosting the Olympics.

- Synthetic control allows us to compare realized outcomes to counterfactual outcomes despite having access to only one treated unit.

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MODEL

The model is trained using data prior to 2012 to determine Y_{it}^* , the economic metric of region i at time t in the absence of the treatment, and compare it to Y_{it} , the measured data. In particular, if the relevant treatment (in our case, the Olympics) occurs at time T , we define $\alpha_{it} = Y_{it} - Y_{it}^*$, $t > T$ to be the treatment effect. Synthetic control aims to find the optimal $(\alpha_{iT}, \dots, \alpha_{iT_{end}})$ by modeling the data points as:

$$Y_{it}^* = \delta_t + Z_i \theta_t + \mu_i \lambda_t + \epsilon_{it}$$

where δ_t is a common time-dependent factor, $Z_i \theta_t$ are the observed covariates and unknown parameters, and $\mu_i \lambda_t$ are the unknown common factors with their respective factor loadings.

Our results presented here exclude additional covariates for ease of presentation and computational efficiency, but in the full model, we observe qualitatively similar results.

London visitors increased 1.9M p.a.

Using synthetic control, we first fit the most parsimonious possible model using LASSO regression to estimate weights over the eleven other regions (pre-2012) of the United Kingdom to estimate a synthetic London. Figure 1 shows visits for synthetic London and realized London in orange and blue respectively; we observe a very close fit in the pre-period and a divergence in the post period. Summing our difference over the time period, we obtain a top-line figure of an extra 13.4M visitors over the 2012-2018 time period (or about 1.9M extra annual visitors averaged over the time period) that can be attributed to the effect of London Olympics.

In Figure 2, we conduct a placebo test: for each region other than London, we assign a hypothetical treatment to that region at the time of the Olympics and run the synthetic control method designating each region as the putative host of the 2012 olympics. We then take the difference between the synthetic host region and the realized region. Each of these produces far smaller effects than what is observed in the case of London, increasing our confidence that the estimated effect is real.

London tourist spend increased £1.8B p.a.

Again, we first fit the most parsimonious possible model using LASSO regression to estimate a synthetic London. Figure 3 shows tourist spend for synthetic London and realized London in orange and blue respectively; again, we observe a very close fit in the pre-period, and a divergence in the post period. Summing our difference over the time period, we obtain a top-line figure of an extra £12.4B over the 2012-2018 time period (or about £1.8B annually) that can be attributed to the London Olympics.

In Figure 4, we conduct a similar placebo test: for each region other than London, we assign a hypothetical treatment to that region at the time of the Olympics and run the synthetic control method designating each region as the putative host of the 2012 olympics. We then take the difference between the synthetic host region and the realized region. Again, each of these produces far smaller effects than what is observed in the case of London, increasing our confidence that the estimated effect is real.

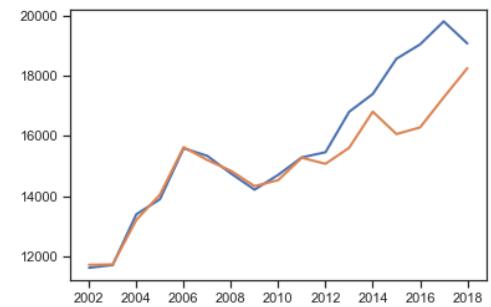


Figure 1: International visits for synthetic vs realized London

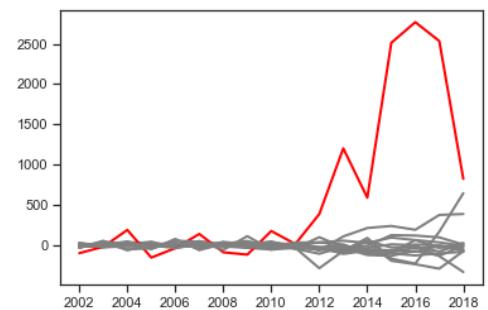


Figure 2: London visits effect vs placebo estimates

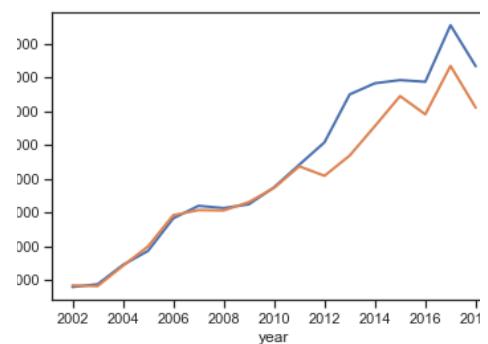


Figure 3: Tourist spend for synthetic vs realized London

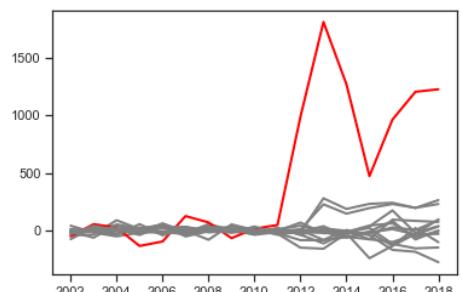


Figure 4: London spend effect vs placebo estimates

Newham workers benefited unevenly

For each (possibly overlapping) group of workers - women, men, part-time workers, and full time workers- we separately estimate weights over all London boroughs (pre-2012) using LASSO regression to create a synthetic trajectory of average wages. Figure 5 shows predicted wages for synthetic Newham and realized Newham in orange and blue respectively; again, we observe a very close fit in the pre-period for each group, but post-periods behave differently.

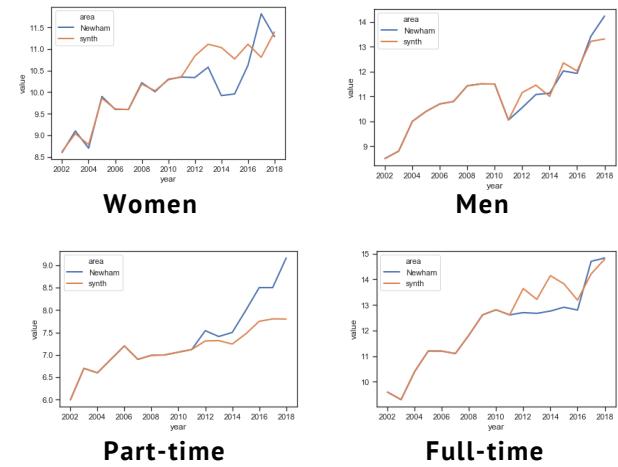


Figure 5: Hourly Wages by Group in Newham and Synthetic Newham

Part-time Newham workers seemed to benefit the most: there is a clear, upward divergence between the realized and synthetic estimates. Other groups saw mixed or modest effects. For both women and part-time wages seemed to stagnate, before eventually returning to trend, while men's realized wages tracked synthetic control wages fairly closely. We discuss effect sizes and placebo tests below.

Wage effect sizes and significance

In Figure 6, we conduct a placebo test as above - that is, for each other borough, suppose that the Olympics had been held there rather than Newham, run synthetic control, and estimate the difference over time - but we provide an alternative visualization that is easier to interpret in the case of mixed effects than the placebo test above. Here, for each group, we summarize the result of each placebo regression and the primary regression by calculating the overall difference in wage growth between the synthetic trajectory and the realized trajectory, normalized by wages in 2011. We then order the effects by magnitude. For each group, the arrow points toward's Newham's estimated effect.

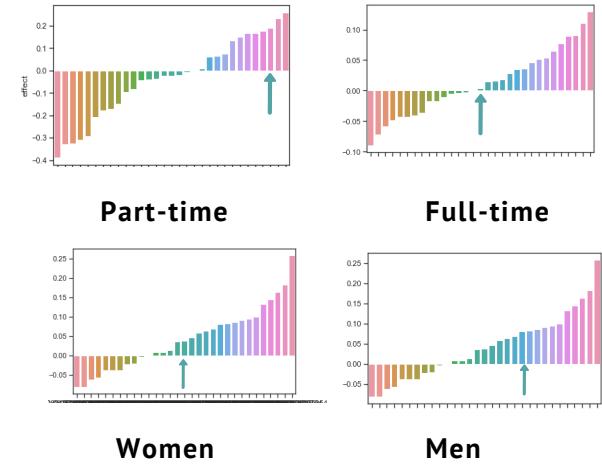


Figure 6: True and placebo effect estimates across boroughs

For Part-time workers, Newham's estimated effect is among the largest, suggesting that our estimated effect is unlikely to be the result of chance; indeed, at about 19% (annualized to about 2.7%) growth over the period, this is substantial increase. On the other hand, for each of the other groups, the estimated effect is smaller than many other placebo effects, which we know cannot be real effects (since the Olympics essentially only occurred in Newham). Thus, we would likely conclude that the other effects, while possibly real, fall within the realm of chance.

CONCLUSION



Our findings show that hosting the Olympics benefits certain populations at the expense of others. The 2012 London Olympics furthered the inequality between privileged and disadvantaged populations of the host city.

- **The Olympics stimulated growth for London, based on the increased numbers of visitors and increased tourist spending, which can be reasonably explained by the 2012 Olympics.** We compared London with other parts of the United Kingdom to predict what London is expected to have looked like had they not hosted the Olympics. Our prediction is quite similar to reality pre-2012, which suggests that the model is accurate. After 2012, there is a divergence between the model, which simulates London without the Olympics, and London's reality. After hosting the Olympics, London had a significant increase in tourism, which suggests that their economy grew overall.
- **Next we evaluated the distribution of this wealth by comparing the hourly wage in Newham with other boroughs.** Economic growth didn't impact every workforce category, as there was variation based on gender and employment status. Full-time workers saw little benefit from London hosting the Olympics, while part-time workers saw some benefits around the 2012 games. Moreover, men seem to have somewhat benefited from the event, while women were unaffected, at best, and disadvantaged, at worst.

More about London

Our research looked at the London 2012 Olympics and whether or not they furthered the inequality between different population groups. We looked at the income breakdown between genders, as well as employment status to search for any disadvantaged groups. However, our analysis doesn't cover any partition by race, age, nationality, or education level, all of which could reveal other disadvantaged groups that could further support our thesis. Moreover, a closer look at the government spending prior to and after the event could highlight if any social group is especially affected by the high cost of hosting the games. For example, a cut in the education budget would put students in the public sector in jeopardy and affect that generation for many years to come.

More about other Olympic Games

Our research focused on the UK, which is considered one of the most influential states in the world. The economic, political and social development of a city like London could, therefore, not be a good representation of what happens when the Olympics are held in a city like, for example, Rio de Janeiro. Brazil's political instability and corruption level make an interesting counterpart to London. A future analysis could compare our results to a similar test for different Olympic games, in countries with different economic power, political regime and social norms, to look for any changes in the trends.

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