2012 London Olympics' Impact on Income Inequality

Dou Liu, Johnson Wu, Eddie Shim, Aryan Pandhi

GitHub: https://bit.ly/3hmgMWI

Highlights

- Determined the socioeconomic structure of London using median income as the metric
- Calculated impact of Olympic games on the different boroughs using Difference in Difference method
- Found features that are most important in causing the income change due to the games using the Random Forest Model

Background

Our research aims to answer the questions: How does the 2012 London Olympics affect the income of people in different boroughs of London? What are the intermediate factors that cause this change in income?

Datasets and Pre-processing

External Datasets:
1. Jobs and Job Density, Borough from Office for National Statistics (ONS)
2. Qualifications of Working Age Population, Borough from ONS
3. Business Demographics and Survival Rates, Borough from ONS

Data Preprocessing:
1. Normalized typos in the datasets across employment activity data
2. To account for inflation, calculated real values each year by normalizing the income, earnings and other quantities that are based on the currency
3. Discarded the City of London in the analysis due to a lot of missing data

Data Insights

Figure 1 indicates that in 2012 there was high income inequality. City of London and boroughs on the west have much higher income than boroughs on the east. The ticket revenue grid shows that the most revenue was earned in Newham (NWM). Newham is the borough where the Olympic Park was built.

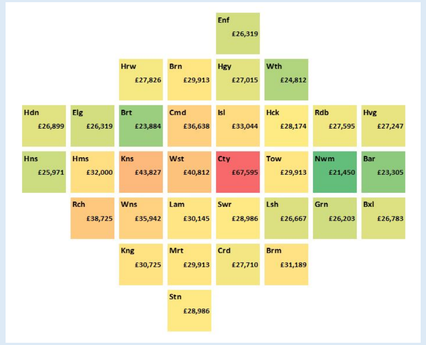

Fig 1. 2012 London Median Income by Borough

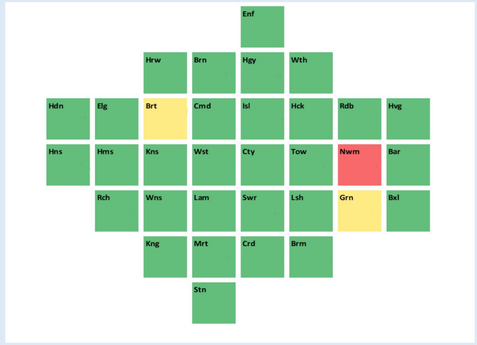

Fig 2. Olympic Games Ticket Revenue Grid

Random Forest Model to Rank Economic Features

This model is a tool that allows us to select the most significant features that impacted income growth caused by the Olympic games. The top two economic features are:

1. job_density: This value is the number of jobs in that borough divided by the working-age (male and female: 16-64) population. This aligns with our intuition that a higher job density in that area is the leading factor for the net effect.

2. percent_NVQ4+: This value is the population size of people with a college degree or higher: This indicates that the percentage of higher degree holders contribute significantly towards income growth.

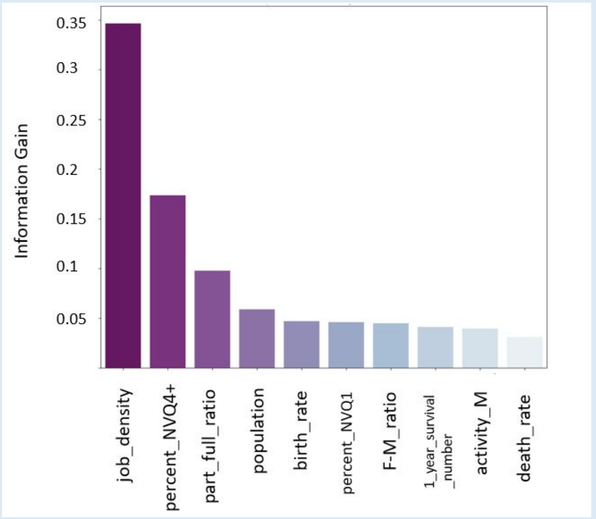

Fig 4. RF Feature Importance

Difference in Difference (DID) Method to Analyse Impact on Median Income per Borough

Difference in Difference Method is used to exclude the impact of external factors and isolate the effect of Olympics on the median income in each borough. To obtain the net effect on income, the Olympic games are treated as the "treatment", and the boroughs are divided into a control group (boroughs assumed not to be affected by the treatment) and treatment group (boroughs assumed to be affected). The DID Regression coefficient has the value of the effect on income solely caused by the Olympic games.

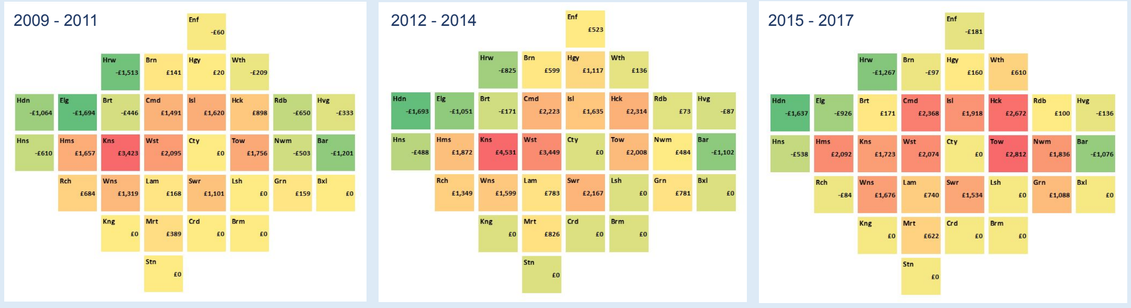

Fig 3. Difference In Difference Regression Coefficients

Assumptions:
1. Most boroughs in London show a spike in underground activity during the time of the games. The boroughs that don't are used as the control group (assumed least impacted).
2. Different candidates within the control group don't necessarily have the same trend before the treatment
3. The impact of the games began in 2008 due to the preparation required

Results:
1. Positive short term impact on originally high income regions. e.g. Kingston & Chelsea
2. Positive long term impact on originally low income regions close to the events. e.g. Newham
3. Negative impact on low income regions located away from events. e.g. Hillingdon

Actionable Results

- A host city should look to center its Olympic events around a poorer region, as the Olympics can help drive long-term sustained growth and ameliorate income inequality.
- The economic impact of the Olympics not only occurs during the year of its event, but is primarily weighted on the proceeding years, for at least 5 years. Host cities should continue to address increasing tourism, businesses, and infrastructure growth even after the Olympics in order to capture this growth. Metrics to specifically focus on in order to ensure growth is captured are job density and education levels.
- Host cities should be aware of negative externalities that consequently come with rising income in poorer regions. They should be aware of possible issues such as gentrification and look to actively address these issues.

References

Bertrand, Marianne; Duflo, Esther; Mullainathan, Sendhil (2004). “How Much Should We Trust Differences-In-Differences Estimates?