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Evaluating Urban Regeneration Impacts of Transport Project
An Integrated GWR-DID Approach to the Mersey Gateway Project

Author: Chenhaojia (Scarlett) Liu, The Bartlett Centre for Advanced Spatial Analysis, UCL
UCL Supervisor: Dr Duncan Smith, Co-Supervisor: Nicholas Jackson and Magda Smith (TfN)

Background and Motivation

The UK government's new economic strategy aims to address regional development imbalances through investments in transport. However, existing appraisal methodologies do not align well with multi-dimensional policy goals. This study is based on the project completed in 2017. Taking the Mersey Gateway Bridge as a case study, then analysed its impact on the surrounding areas from 2011 to 2021.

Methods and Data

The core method of this study is the GWR-DID hybrid model. Here, the difference-in-differences (DID) approach is employed to establish the causal relationship of the project's impact, while the GWR is utilised to reveal the uneven spatial distribution of the impact. To implement this method, we adopt a distance-based allocation approach to define the "treatment group" affected by the project and the "control group" unaffected by it. Multi-source longitudinal data at the LSOA level, spanning 2011-2021, are used. These data are primarily sourced from: UK Census, IMD 2015 & 2019 and Mean Housing Price from ONS.

As shown in Figure 1, multiple distance rings (4km, 6km and 8km) are set as analysis thresholds to examine the spatial attenuation effect of the impact and the robustness of the results.

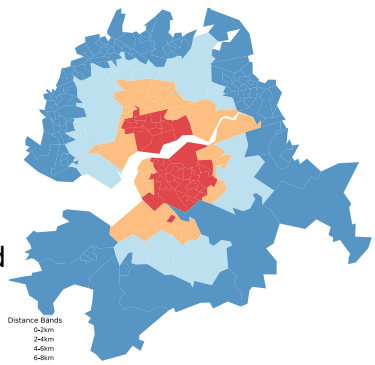

Figure 1 Research Area with Distance Ring

Before determining the final model, this study also attempted to use the Regression Discontinuity Design (RDD) method. However, since the project's impact presented a gradual spatial attenuation pattern rather than a sharp "discontinuity" change, the core assumptions required by the RDD method were not met.

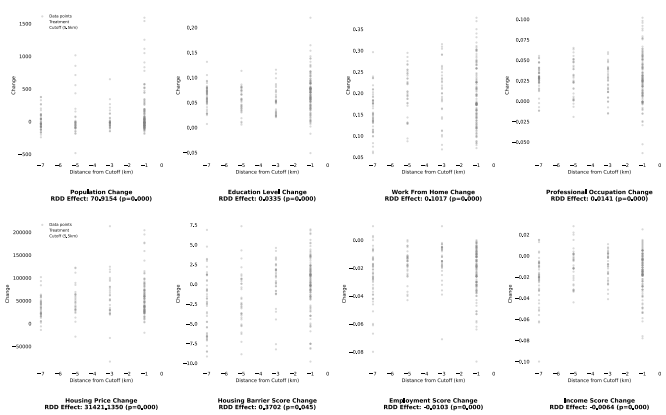

Figure 2 RDD Result with Cutoff 7km

Key Finding

Under the "Current Setting" with a primary influence radius of 6 km and a secondary influence radius of 4 km, the study revealed a series of complex outcomes. On the one hand, the project significantly improved housing accessibility, with the housing barrier score decreasing by 2.457 points ($p < 0.001$). However, this was accompanied by significant negative social changes: the average population of each LSOA within the influence area decreased by approximately 104 residents ($p < 0.01$), and the proportion of residents with higher education qualifications also dropped by 1.03 percentage points ($p < 0.05$). (Figure 2)

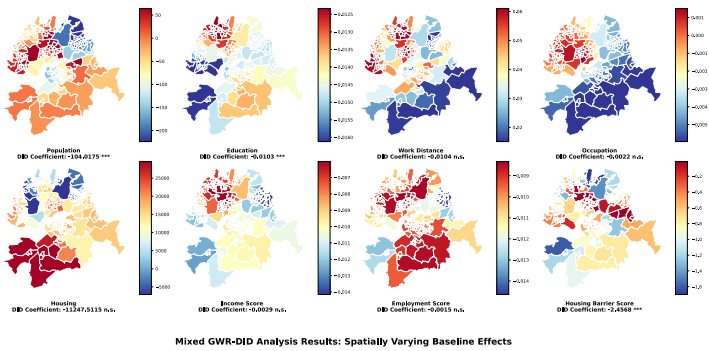

Figure 2 Mixed GWR-DID Results with Current Setting

In conclusion, under this setting, the project has presented a typical "double-edged sword" update result: although it has successfully improved housing conditions, it seems to have also triggered negative social sorting effects

Value of Research

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This study demonstrates that bridging transport-led regeneration impacts requires a multifaceted evaluation framework. The findings highlight the need for integrated policy measures to balance economic growth with social equity, ultimately informing future transport projects and regeneration strategies.

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