Are Highways Conduits or Barriers for Urban Travelers?
A Welfare Analysis Using Smartphone Data

Non-technical Write-up

Alice Wang

This paper examines how highways affect urban quality of life through travel behavior and travelers' welfare. Leveraging novel smartphone GPS data, this study provides granular insight into the impact of highways on urban mobility and access to amenities. While highways are traditionally seen as critical conduits for economic growth and regional connectivity, their effect on local travel within dense urban zones is less understood. Non-work trips, which make up 80% of all intra-city travel in the U.S., are particularly impacted by these infrastructure choices. This paper addresses this gap by investigating highways' dual role in cities: although they facilitate longer commutes, they can also discourage local non-work travel, reducing access to points of interest (POIs) in urban areas.

The study's findings are striking: in densely populated urban zones, highways primarily function as barriers for non-work travel. When routes involve crossing or using urban highways, there is a notable 24% reduction in visits to POIs - a deterrent effect equivalent to adding 2.4 minutes of travel time. This barrier effect is most pronounced for shorter trips, suggesting that highways impose a fixed cost on travel. While suburban highways show minimal impact on access to amenities. The barrier effect on commuting in urban areas is smaller but still present.

To understand the welfare implications of these findings, the paper develops a quantitative urban model that integrates commuting and non-work travel choices. This model includes two innovative features not typically seen in existing research: the influence of consumer behavior on local amenities and the clustering of consumption opportunities in response to consumer preferences. Two counterfactual highway systems aiming at removing the disamenities were evaluated: (1) transforming urban highways into underground tunnels and (2) replacing highways with primary surface roads. Both scenarios yield substantial welfare gains, ranging from 9% to 10.2%, primarily from improvements in amenities. Nevertheless, urban and suburban areas experience disparate outcomes. Significant improvements in urban amenities attract inflows of population and consumption opportunities, enhancing the benefits of consumption agglomeration but also driving up urban land prices and worsening suburban amenities.

This paper's findings build on existing studies that highlight highways' contribution to economic growth but challenge the assumption that highways are universally beneficial to urban residents. It offers key policy insights suggesting that while highways enable efficient, long-distance travel, they may detract from urban quality of life by limiting local mobility. These findings are reminiscent of Jane Jacobs' arguments in *The Death and Life of Great American Cities*, where she advocated for walkable, interconnected neighborhoods. This study underscores the trade-offs in highway infrastructure, suggesting that policymakers may need to prioritize projects that mitigate the physical barriers highways impose on cities to support more accessible, livable urban spaces.