

## Impacts of commute trip reduction programs, rail station area built environment changes, and ride-hailing services on traveler behavior

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This project consists of three related studies investigating strategies to address urban congestion: a) employer-based travel demand management strategies, b) improvement of transit station area built environments, and c) understanding the impacts of ride-hailing. Collectively, the three studies represent complementary strategies to address urban congestion. However, each of them focuses on a particular approach from managing demand side incentives to supply side service disruptions.

### **STUDY A: Employer-based travel demand management in mitigating congestion**

#### **BACKGROUND AND OBJECTIVES**

This study evaluates the effectiveness of various employer-based travel demand management (TDM) strategies and examines factors correlated with the propensity of employees to shift from driving alone to alternative modes. The study objectives are: 1) to identify which employer-based TDM strategies are most effective in changing the travel modes or schedules of employees to reduce commuting vehicle trips and mitigate congestion, and 2) to identify employer-based TDM tools that can be leveraged to promote multimodal transportation.

#### **METHODOLOGY**

The commute trip reduction (CTR) biannual survey implemented by Washington State Department of Transportation (WSDOT) was used to: 1) assess the effectiveness of CTR measures on vehicle trip rates (VTR) over time and on vehicle miles traveled (VMT) using generalized linear mixed models, and 2) quantify the effects of various employer-provided incentives on employee mode shifts towards sustainable alternatives using discrete choice models.

#### **RESEARCH FINDINGS**

The study led to several main findings:

- VTR steadily grows for three decades, and employer-based TDM measures can only decelerate the growth rate but have not reversed the trend;
- CTR's advertising efforts and collective bargaining help reduce VTR;
- Distributing transit passes to employees is negatively associated with VTR;
- Shared mobility incentives, such as carpooling subsidy and ride match, both contribute to increments in VTR;
- Emergency rides are positively associated with VTR;
- Allowing for shared rental cars on worksites is negatively associated with VTR.
- Subsidizing transit passes, flexible work schedules, and parking pricing are the most effective strategies to proportionally alter travel mode choices of employees.
- ETCs play an active role in promoting multimodal transportation.

#### **POLICY AND PRACTICE RECOMMENDATIONS**

When rewarding employees, distributing transit passes is a preferred strategy. Carsharing and carpool-related measures should be applied with caution. Governmental agencies should lead employers to advertise CTR programs and engage employees to identify their preferred TDM strategies. To promote multimodal transportation and encourage mode shifts toward more sustainable alternatives, subsidizing transit, pricing parking, and increasing flexibility in work schedules should be continually supported.

### **STUDY B: Rail transit ridership and station area characteristics**

#### **BACKGROUND AND OBJECTIVES**

This study documented changes to the built environment around 897 transit stations and related changes in ridership for those stations over an eight-year period for eight major transit agencies: BART (San Francisco Bay Area), Caltrain (San

Francisco Bay Area), CTA (Chicago), MTA (New York City), MTS (San Diego), PATH (New York and New Jersey), SEPTA (Philadelphia), and WMATA (Greater Washington DC).

## **METHODOLOGY**

We follow a before-and-after experimental design at the station-level, while adjusting for other city and station level characteristics.

## **RESEARCH FINDINGS**

We find an overall decrease in station boardings, although effects vary significantly by station and transit system. Built environments around rail stations continue to densify and have more mixing of land uses. However, they have a lower percent of low-income households and or zero-vehicle households, consistent with city-specific accounts of changing socio-demographic conditions in transit-oriented locations. In addition, we observed a trend towards increased marked crosswalks generally, and specifically high visibility crosswalks.

## **POLICY AND PRACTICE RECOMMENDATIONS**

Planning strategies to change the built environment to support transit ridership in the station areas examined have been modestly successful in increasing ridership; however, changes in the socio-demographic makeup of station areas have contributed markedly to the decline in ridership. Marked crosswalks and high visibility crosswalks did not appear to be related to increases in ridership. Efforts to modify the built environment of station areas to support higher transit ridership are necessary but likely insufficient to achieve environmental sustainability goals. Planning and policy attention to auto ownership and use, either due to changes in regional accessibility (as may be the case for low-income workers) or for other reasons, is likely to have significant impacts on transit ridership.

## **STUDY C: Ride-hailing's influence on VMT & auto ownership across levels of transit access in Metro Boston**

### **BACKGROUND AND OBJECTIVES**

This study analyzed how the growing availability of the Uber ride-hailing service affected household vehicle use and ownership across levels of transit access in Greater Boston during the initial years of Uber availability. Unlike previous studies examining the impact of transportation network companies on private vehicle use, we used year-specific information on average daily VMT and the number of vehicles in each Massachusetts Census tract, sourced from vehicle inspections and registrations; and we looked at data on spatial variability in transit access and Uber availability.

### **METHODOLOGY**

We explored the relationships between Uber availability and personal vehicle use and ownership via descriptive data analysis along with panel regression models.

### **RESEARCH FINDINGS**

We found that while Uber access was associated with decreases in daily VMT and vehicle ownership, predicted reductions were smaller for every transit stop or station per square mile in Uber's service area. In some areas with the strongest transit access, the predicted reductions were wholly offset. The models predict that 31% of the Census tracts in 2014 with Uber availability saw a net increase in VMT, and 33% saw a net increase in passenger vehicles. In short, Uber availability may have enabled less passenger vehicle use and ownership, particularly in areas with poor transit access, while encouraging households in transit-rich areas to own and use autos at a constant or higher rate.

### **POLICY AND PRACTICE RECOMMENDATIONS**

These results suggest that ride-hailing services are more likely to enable reduced personal vehicle use in areas with poor transit access, and that efforts to reduce personal vehicle use via ride-hailing are more likely to be successful in these areas.

Although we developed these three studies in parallel, they complement each other in addressing congestion with different strategies. Study A and B focus on the economic incentive and land use policy respectively, to evaluate the effectiveness of certain travel demand management strategies. Study C examines the impact of emerging new mobility services on travel behavior, as an addition to traditional travel options.

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