Understanding the Ridership Decline on a Disaggregated Spatial and Temporal Level in Five Cities

Simon Berrebi, Sanskruti Joshi, Taylor Gibbs and Kari Watkins

In 2017, following five consecutive years of decline, bus ridership in the United States reached its lowest point since APTA started collecting the metric in 1965. For transit agencies across the country, this ridership crisis coincides with large scale urban migration, sweeping service changes, and the advent of private transportation services. Understanding the effect of these trends on ridership is necessary to plan for mobility in a dynamic, connected, and autonomous world. The effects of these emerging trends on transit ridership, however, have only been studied a regional level, and their underlying dynamics are still misunderstood.

Our research analyzes the change in ridership in Portland, Miami, Minneapolis, Atlanta, and Pittsburgh at 50,000 stops using Automated Passenger Count data. Changes in ridership are explained with service levels, population, jobs, and demographic data at a disaggregated level from multiple sources. In addition, trip density data were obtained from a leading ride-hailing company on a highly specific spatial and temporal scale. Panel regression models are developed to explain where, how, and why ridership is changing between 2012 and 2017. Internal and external factors are separated in two analyses. In the first part, only bus stops that were neither added nor removed in the five-year period are analyzed in a fixed-effect model. In the second part, the effects of service changes in time and space are considered in a pooled model.

This study investigates the complex relationship between transit and ride-hailing usage while controlling for shifts in access to transit and population demographic. The impact of gentrification, network redesigns, mode cannibalism, and service allocations policies on ridership are identified. The research then asses the competitive advantages and natural complementarity between transit and ride-hailing based on density, land-use, and demographics. This research provides an important tool to help policy makers to plan for optimal public-private integration frameworks and make long-term plans for autonomous vehicles.