Does Uber Reduce Public Transit Use in the U.S.?

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Abstract

The rise of Uber and other transportation network (or ride-hailing) companies in recent years has jolted and revolutionized urban transportation across the globe. Most noticeably, the increased use of ride-hailing services has resulted in a fall in the demand for taxi cab services in major cities. The rapid adoption of Uber and other ride-hailing services also gives rise to more empirical and policy questions on the declining trend of public transit ridership in the U.S. The impact of Uber on urban public transit needs to be carefully evaluated in light of the potential implications on any future policy changes in transit funding and planning. This study examines the effect of Uber and transit effectiveness on public transit ridership in the U.S. using top 50 agency-level data from 2007 through 2015.

We find that (1) transit effectiveness of both bus and rail transits declined over the study period; (2) Uber's availability only significantly affected rail transit ridership in a positive way; (3) transit effectiveness was highly significant for rail transit, and when examining its effect year-by-year, rail transit effectiveness trumped Uber's availability; (4) Uber is neither a complement nor a substitute of bus transit.

Introduction

Wireless and cellular communications have transformed modern living, including urban transportation. With technological advancements, companies have been able to match drivers with a single passenger or multiple passengers where rides can be requested through varying options such as a smartphone, computer or social networking technologies (Texas A&M Transportation Institute, 2017). The rise of Uber and other transportation network companies (TNCs) in recent years has revolutionized urban transportation across the globe. The increased popularity of TNCs in the U.S. also coincides with the decline in public transit use which, because of government subsidies, has been traditionally a cheaper alternative to taxi.

Decline in ridership could further snowball because the decreasing number of passengers translates into a reduction in fare revenues, which in turn could lead to either fare increases and/or eliminations of low-performing routes.

Given the increases in the size of U.S. population, especially in major urban areas in recent years, the decrease in the use of public transit in light of the rise of ride-hailing services like Uber and Lyft have become a major challenge for both government and public transit agencies as they try to device effective policy responses to reduce congestion and facilitate mobility in urban areas.

However, the effect of ride-hailing services on public transit ridership is yet to be carefully examined (Puentes, 2017). When attempting to study the declining ridership, one should not look at the effect of TNCs (an external factor) in isolation because the operational performance of transit services, an internal factor, could also be an important factor of ridership. In this study, we seek to answer the question of whether ridership trends in recent years were the result of transit providers' own performance, or if it was a result of Uber. Simply put, was the driving factor of declined ridership internal or external, or both?

Methods and Data

We apply a sequential data envelopment analysis method to obtain the transit effectiveness index. After that, we employ a difference-in-differences approach to examine the relationship between transit effectiveness, the availability of Uber's ride-hailing services and transit ridership in major cities in the U.S. One of the regression models we consider is given as:

$$\ln\left(Riders_{i,t}\right) = \alpha + \beta_1 Effective_{i,t} + \beta_2 Uber_{i,t} + \sum_{k=1}^{K} \gamma_k Z_k + Year_t + Agency_i + \varepsilon_{i,t},$$

where $Riders_{i,t}$ is annual transit ridership of agency *i* in year *t*; the variable $Effective_{i,t}$ is the sequential transit effectiveness index of agency *i* in year *t*; $Uber_{i,t}$ is a binary variable, which is equal to 1 if Uber is present in the metropolitan served by agency *i* in year *t* and zero otherwise.

The 50 largest transit agencies in the U.S. were considered for the analysis. The panel data used in this analysis are from 2007 to 2015. Out of the top 50 transit agencies, we separated the data according to the service mode.

Forty-five transit agencies which provided bus services were considered as the category for bus. Separately, we also study transit agencies that provide rail services in the U.S. Thirty-two of the top 50 transit agencies were providers of light rail (LR), commuter rail (CR) and heavy rail (HR).

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Results

Part 1: Transit Effectiveness. Figures 1 & 2, respectively, display the total passenger miles of the top bus and rail agencies as well as the sequential input-oriented transit effectiveness index (*effi*) and the sequential output-oriented transit effectiveness index (*effo*) from 2007 to 2015.

Bus Transit. Total passenger miles of the top bus transit agencies declined by 11.27% during this period. We also observe considerable declines in *effi* and *effo*. For bus transit, the average *effi* and *effo* were 0.61 and 0.55 respectively in 2015.

Rail Transit. We also observe a decline in rail transit effectiveness, from around 0.68 in 2007 to about 0.53 in 2015 for both *effi* and *effo*. Total rail passenger miles was down in 2010, but started to rise after that year. Notice that the sequential indices gradually but consistently declined for both bus and rail transit modes.

Part 2: Regression Results.
Bus Transit. We find that both *effi* and *effo* are statistically insignificant for bus transit ridership. Uber has a negative effect on bus ridership, but the effect is not significant.

Rail Transit. Rail transit effectiveness, on the other hand, has a positive and significant effect on rail ridership. Agencies with higher transit effectiveness tend to have higher rail ridership. An increase in *effi* by 10 percentage points is predicted to increase unlinked passenger trips by 6.55%. An increase in *effo* by 10 percentage points is estimated to increase ridership by 6.36%. Uber's availability also contributes positively to rail ridership. Agencies that operate in metropolitans with Uber are estimated to have about 6% higher rail ridership than those in areas without Uber, after controlling for the sizes of transit operations and the city's population. This effect is significant at the 5% level.

Figure 1: Bus Transit Effectiveness

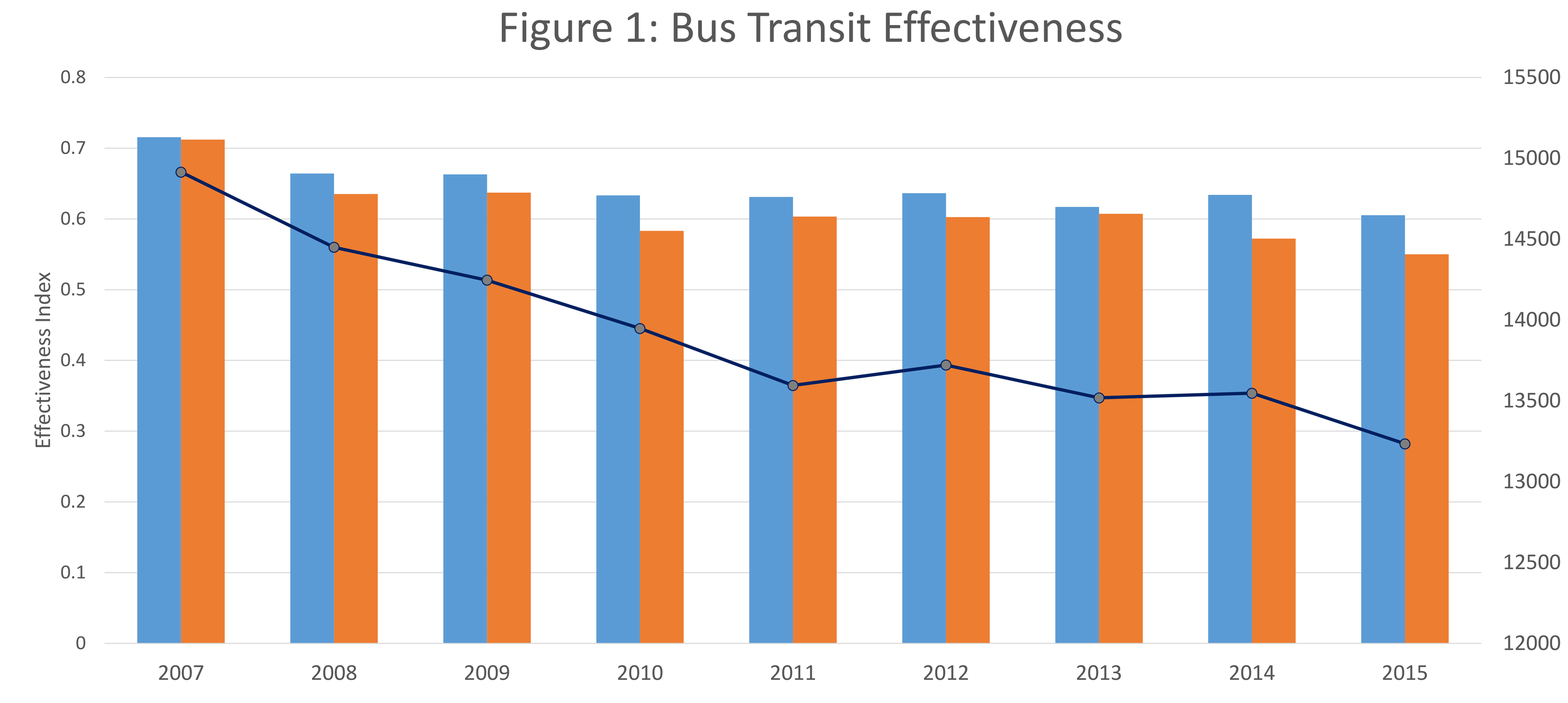
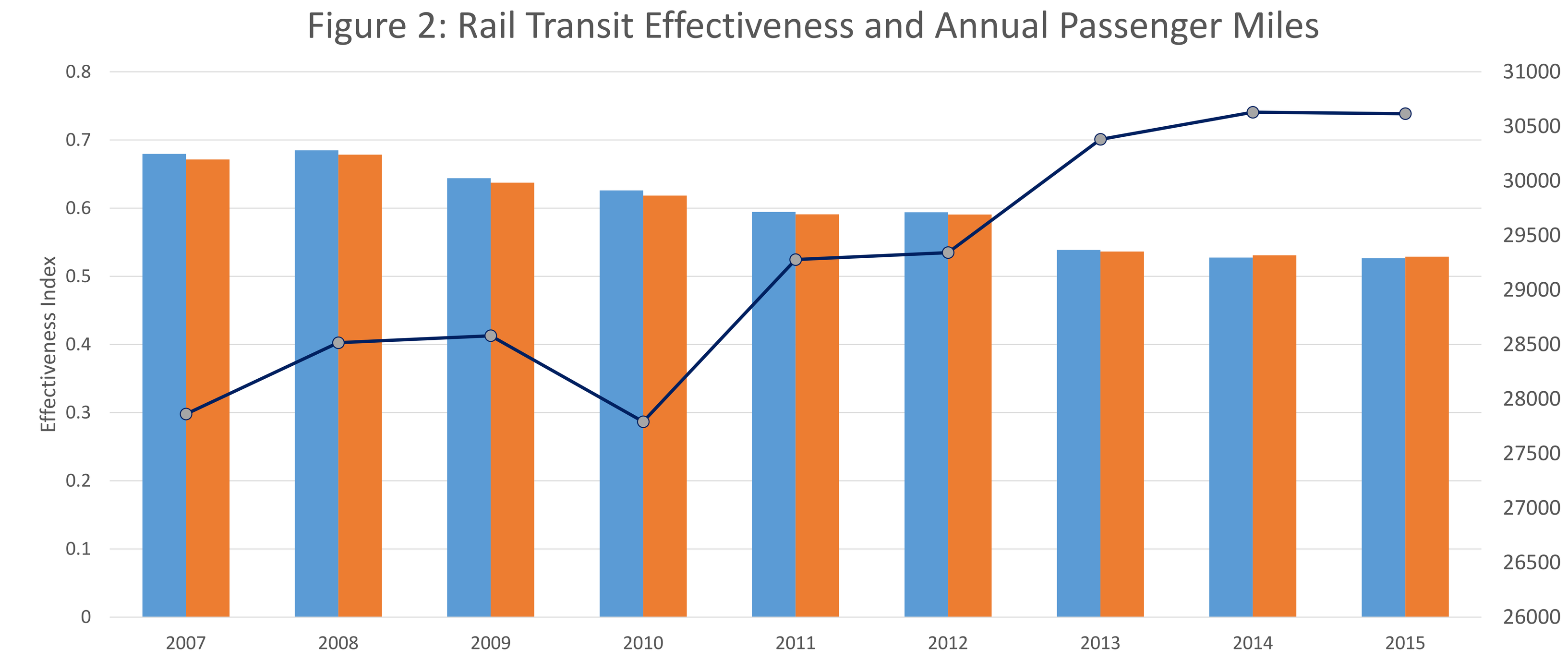


Figure 2: Rail Transit Effectiveness and Annual Passenger Miles



Conclusions

While we observe that transit effectiveness declined during 2007-2015 for both rail and bus transits, our regression results suggest that transit effectiveness was highly important for rail transit. Although the effect of Uber was positive for rail ridership, the influence of transit effectiveness trumped that of Uber. This suggests the importance of enhancing transit effectiveness in rail transit. Innovations in rail transit systems in major cities are much needed. Our study finds neither transit effectiveness nor Uber could explain bus ridership decline in 2007-2015.

References

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