Investigating the Determining Factors for Transit Travel Demand by Bus Mode in U.S. Metropolitan Statistical Areas

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Internal factors more important than external factors in determining bus transit travel demand.

Transit has been the least demanded transportation mode in terms of number of trips in the US for the last few decades. Transportation policy making and successful transit systems require proper understanding of the nature of transit travel demand. However, most research focuses on the determinants of demand in a single or just a few systems. This research focuses on understanding the determining factors for bus transit demand at the US Metropolitan Statistical Areas (MSAs) level. Initial data were collected on all 358 MSAs, and 273 were included. The remaining 85 were dropped because they did not have Metropolitan Sprawling Index data, a major focus of this study.

Study Methods

The authors used an OLS regression model to determine the factors that significantly impact transit travel demand by bus mode. Data for the analysis comes primarily from two major sources: the US Census Bureau and the Integrated National Transit Database Analysis System. In addition, the authors surveyed transit systems managers to determine the orientation pattern of their respective transit systems. Data on gas prices were obtained online from GasBuddy.com.

External variables considered in the model include: population density, median household income, percentage of African-American population, percentage of carless households, vehicles per household, percentage of college population, percentage of immigrant population, gas price, Metropolitan Sprawling Index, MSAs in the South, and presence of rail transit. Internal variables considered include: vehicle miles per capita, service intensity, revenue hours, average headway, safety (based on reported number of incidents/accidents involving transit vehicles), transit fare, transit coverage, and transit orientation pattern (CBD-oriented radial pattern or multidestination-oriented grid pattern).

Findings

Results of the regression model indicate that gas price, transit fare, transit supply, revenue hours, average headway, safety, transit coverage, and service intensity have a statistically significant impact on transit demand by bus. Among these, transit supply causes the highest impact on transit travel demand: the greater the supply, the greater the demand for transit.

The study found that certain variables that many transit planners view as important determinants did not have significant impacts on transit demand. Variables such as rail transit, transit orientation pattern, median household income, percentage of college population, percentage of immigrant population, vehicles per household, percentage of carless households, population density, and MSAs in the South all show insignificant impacts on transit demand.

Table 1. Explanatory Variables' Expeced and Demonstrated Impacts on Transit Travel Demand by Bus Mode

		Demonstrated Behavior	
External Factors	**Expected Behavior**	**Sign**	**Significant?**
Rail Transit	Negative	Negative	No
Gas Price	Positive	Positive	Yes
Metropolitan Sprawling Index	Positive	Negative	No
Median Household Income	Negative	Negative	No
Percent of African American Population	Positive	Positive	No
Percent of Carless Households	Positive	Negative	No
Vehicles per Household	Negative	Negative	No
Percent of College Population	Positive	Positive	No
Percent of Immigrant Population	Positive	Positive	No
MSAs in the South	Positive	Positive	No
Population Density	Positive	Negative	No
Internal Factors			
Transit Orientation Pattern	Positive	Positive	No
Transit Fare	Negative	Negative	Yes
Transit Supply	Positive	Positive	Yes
Revenue Hours	Positive	Positive	Yes
Average Headway	Negative	Negative	Yes
Safety	Negative	Positive	Yes
Transit Coverage	Positive	Positive	Yes
Service Intensity	Negative	Negative	Yes

Overall, findings indicate that internal variables significantly impacted bus travel demand in 2010, while external factors, with the exception of gas price, did not. Socioeconomic factors that are beyond the control of transit managers and operators do not necessarily contribute to the effectiveness and efficiency of transit systems. This simplifies the problem in a sense and reveals that the job of building ridership is within the reach of policy makers.

Policy Recommendations

The study finds that the factors internal to the transit systems predominantly define the nation's bus transit demand at the MSA level. Therefore, it will largely fall to transit managers and operators to determine how to provide efficient bus transit systems without depending on outside factors. In other words, they can attract and increase bus transit ridership by adjusting a few significant internal factors specific to their transit systems. Keeping this in mind, transit policy makers and planners may make appropriate plans and policies that will help transit authorities provide efficient transit systems to increase bus ridership.

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To Learn More

For more details about the study, download the full report at ***transweb.sjsu.edu/project/1101.html***

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