THE SPATIAL PATTERNS OF ZIPCAR IN BOSTON AREA

INTRODUCTION

Urbanization along with issues in scarce resources, shortage of space, increasing energy cost and pollution require people to rethink personal vehicle ownership. Carsharing, a sustainable concept provides temporary automotive access for people seeking ways to use a private car while relieving the cost of purchase and maintenance. Previous research has confirmed the way carsharing transforms the expenses on vehicle ownership into payments directly linked to trip distance and duration, which has filled in the gap of limited carrying capacity and inflexibility in other transit modes. This paper pursues a predictive exploration of Zipcar, the largest North American carsharing operator with 1 million members across 500 cities in 9 countries. A multiple regression was undertaken to quantify the spatial relationship between the Zipcar users, and their demographics and neighborhood characteristics. The primary focus is to identify whether Zipcar is determined by the local community, and thereby confirm that carsharing impacts energy use, carbon emissions, and vehicle ownership, and it could be used to provide more affordable and equitable mobility options and result in a cleaner transportation system. The spatial patterns of Zipcar memberships and its vehicles have grown steadily in MA during the six years from 2008 to 2013. The mean center and standard distance could help measure the degree to which Zipcar memberships are concentrated, as well as to confirm that the result of hot spot Analysis, which provided only hot spots and thereby identified the study in Boston area. The result of spatial error model explains more than 89% of the variance in Zipcar memberships. With spatial error violate the assumption that error terms are uncorrelated and coefficients are inefficient. Half of estimated coefficients are significant at p < 0.1. The model indicates greater number of Zipcar members have a significant positive effect on working population with high-wage, or those biking to work, having jobs in service and environmental fields, and areas with employment density, or at least pedestrian-network density. The BiLSA cluster maps show locations with significant local spatial autocorrelation by type of association. The results point to some potential effects of Zipcar on demographics and the existing transit network to work. Moreover, these suggest interesting locations that Zipcar users mostly cluster in densely employment area like Cambridge and Back Bay.

RESULTS

The Zipcar memberships and its vehicles have grown steadily in MA during the six years from 2008 to 2013. The mean center and standard distance could help measure the degree to which Zipcar memberships are concentrated, as well as to confirm that the result of hot spot Analysis, which provided only hot spots and thereby identified the study in Boston area. The result of spatial error model explains more than 89% of the variance in Zipcar memberships. With spatial error violate the assumption that error terms are uncorrelated and coefficients are inefficient. Half of estimated coefficients are significant at p < 0.1. The model indicates greater number of Zipcar members have a significant positive effect on working population with high-wage, or those biking to work, having jobs in service and environmental fields, and areas with employment density, or at least pedestrian-network density. The BiLSA cluster maps show locations with significant local spatial autocorrelation by type of association. The results point to some potential effects of Zipcar on demographics and the existing transit network to work. Moreover, these suggest interesting locations that Zipcar users mostly cluster in densely employment area like Cambridge and Back Bay.

CONCLUSION

Overall, the regression indicated that Zipcar memberships has a positive, significant effect on vehicle ownership, holding everything else constant. This effect is dominated by measures at the zip-coded neighborhood level. The regression model provides a general frame of reference for understanding the effect of the increasing number of Zipcar memberships, but it could be biased and inconsistent estimates due to the spatial nature of the data. Future analysis should be to examine whether the residuals are homoscedastic and normally distributed and each indicator is linearly related to dependent variable without multicollinearity. In addition, it is also important to look at other variables such as places with parking pressure and mixed used land.

DATA SOURCES


REFERENCES


Download from the provided link.

PROJECT

NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_1001

MAP1: Zipcar users’ distribution

MAP2: Zipcar membership clusters

MAP3: BiLSA cluster of Y and employment density

MAP4: BiLSA Cluster of Y and high-wage workers

MAP5: BiLSA Cluster of Y and office jobs

MAP6: BiLSA Cluster of Y and pedestrian network density

MAP7: BiLSA Cluster of Y and regional diversity (jobs/pop)

MAP8: BiLSA Cluster of Y and transit accessibility regional destinations

MAP9: BiLSA Cluster of Y and transit accessibility destinations

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