

# **The Impact of Urban Form and Gasoline Prices on Vehicle Usage: Evidence from the 2009 National Household Travel Survey**

**Harya S. Dillon<sup>a</sup>, Jean-Daniel Saphores<sup>b</sup>, and Marlon Boarnet<sup>c</sup>**

<sup>a</sup> Corresponding Author, Ph.D. student, Department of Planning, Policy & Design, Institute of Transportation Studies, University of California, Irvine, 4000 AIRB, Irvine, CA 92697;  
[hdillon@uci.edu](mailto:hdillon@uci.edu)

<sup>b</sup> Professor, Civil and Environmental Engineering,  
Planning, Policy, & Design, & Economics Departments  
University of California, Irvine, CA 92697 USA  
Phone: 949-824-7334; [saphores@uci.edu](mailto:saphores@uci.edu)

<sup>c</sup> Professor and Director of Graduate Programs in Urban Planning and Development, Sol Price School of Public Policy, University of Southern California  
Room 301-C Lewis Hall, Los Angeles, CA 90089-0626  
Phone: 213-740-3696; [boarnet@usc.edu](mailto:boarnet@usc.edu)

## **Abstract**

The goal of this paper is to tease out the relationship between land use, gasoline prices and travel behavior by analyzing data from the Southern California subsample of the 2009 National Household Travel Survey (NHTS), which has a quasi-experimental nature thanks to large gasoline price variations during the administration of the NHTS (March 2008-April 2009). Using Structural Equation Modeling (SEM), we specify joint models of residential urban form, vehicle efficiency choice, and vehicle use that account for self-selection and endogeneity in order to explain vehicle miles traveled (VMT) for both work and non-work trips. Our structural models capture the causal influences of household socio-economic status on residential urban form and on driving behavior, where residential urban form is treated as a latent construct that reflects observed variables such as population density, land use diversity and distance to employment centers. Our results suggest that in the short run households drive 0.27% less for non-work trips when gas prices increase by 1%, while work trips are not responsive to gasoline price changes. The direct effect of residential urban form on driving is statistically significant but small: an increase in population density of 1,000 persons per square mile decreases non-work VMT by 1.27% but it has no impact on work trips. Standardized estimates suggest that the impact of gas prices on non-work VMT is twice the size of the impact of population density. We also find that owners of more fuel efficient vehicles tend to be more educated, Asian and younger (under 30). Heads of households in low density neighborhoods tend to have a higher household income, to be older than 45 and white; these households tend to own more vehicles per driver. Our results suggest that urban form has a limited impact on short term driving behavior.

**Keywords:** land use; travel behavior; structural equation modeling; gasoline prices.