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Understanding Household Preferences For Alternative-Fuel Vehicle Technologies

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Concerns about steep fluctuations in fuel prices, dependence on foreign oil, air pollution, and global warming have heightened public interest in alternative-fuel vehicles. Despite the numerous incentives that have been offered and public opinion polls indicating that individuals are interested in AFVs, they constitute less than 1 percent of all highway vehicles in use nationwide. It is clear that we do not fully understand the

trade-offs consumers are willing (and unwilling) to make with regard to cost, environmental characteristics, and other vehicle characteristics, such as range and refueling convenience, in their vehicle purchase decision. This report explores consumer preferences among four different AFVs: hybrid electric vehicles (HEVs); compressed natural gas (CNG) vehicles, hydrogen fuel cell (HFC) vehicles, and electric vehicles (EVs).



Study Method

We conducted a nationwide, internet-based survey of 835 U.S. households. Respondents were first asked to provide their views on a wide range of transportation-related issues, including congestion, noise, and the environmental impacts of vehicles. Next we inquired about current vehicle ownership and plans for future vehicles ownership. Our goal was to better understand preferences for current vehicles and their use, as well as to customize the third part of our survey. In this last part, we asked respondents to participate in a stated-preference ranking exercise in which they ranked a series of five vehicles (four AFVs and a traditional gasoline-fueled vehicle) that differ primarily in fuel type, price, environmental performance, vehicle range, and refueling convenience. We then used a panel rank-order mixed logit model to analyze consumer preferences for AFVs.

Findings

Our findings indicate that, in general, gasoline-fueled vehicles are still preferred over AFVs—one-third of respondents ranked gasoline-fueled vehicles first, as shown in Table I. However, 20 percent of respondents ranked gasoline vehicles last, and there is a strong interest in AFVs. Although no AFV type is overwhelmingly preferred, HEVs seem to have an edge. Full EVs are the least popular of the AFVs we asked our respondents to consider; it is apparent that the limitations of these vehicles (e.g. range and recharging time) are still a deterrent to their widespread adoption by households.

Table I Summary of AFV Rankings

Vehicle Type	Average Preference Ranking (percent of respondents) ^a				
	First	Second	Third	Fourth	Fifth
Gas	36	19	13	12	21
HEV	26	23	19	17	8
CNG	13	24	28	25	10
FC	18	16	23	25	19
EV	9	11	17	20	42

^a Respondents ranked up to nine different sets of vehicles. The percent shown here is the average across all rankings.

A major focus of this research was the trade-offs people are willing to make among key AFV characteristics (i.e. price, fuel cost, range, and refueling time). The following trade-offs leave people's utility unchanged:

- A \$1,000 increase in AFV cost needs to be compensated by either:
 1. A \$300 savings in driving cost over 12,000 miles,
 2. A 17.5-mile increase in vehicle range, or
 3. A 7.8 minute decrease in total refueling time.
- A 10-mile decrease in vehicle range needs to be compensated by a 4.2-minute decrease in total refueling time.

Policy Recommendations

Our analysis reveals that consumers are receptive to AFVs—an outcome that bodes well for policymakers and manufacturers. Nearly two-thirds of survey respondents listed an AFV as their top choice in the ranking exercises. HEVs seem to be currently the most popular alternative to gasoline-fueled vehicles. Although the environmental benefits of AFVs are often touted by the media, this characteristic does not seem to be a determinant for consumers when buying a vehicle. Economic concerns are consumers' priority.

About the Authors

Dr. Hilary Nixon is an Associate Professor of Urban and Regional Planning at San Jose State University. Her research explores how humans interact with and are inseparable from the physical environment they inhabit. Dr. Jean-Daniel Saphores is an Associate Professor of Civil and Environmental Engineering, Planning, and Economics at the University of California, Irvine. His research interests include understanding preferences for “green” products using discrete choice models, decision making under uncertainty using real options, infrastructure management, linkages between transportation and the environment, and environmental economics.

To Learn More

For more details about the study, download the full report at transweb.sjsu.edu/project/2809.html