



# Investigating Congestion and Solutions

## Experiments on Congestion Conditions and Pricing Initiatives

Exploratory Advanced Research . . . Next Generation Transportation Solutions



When and why drivers choose a priced or tolled facility over an untolled but congested parallel route is the subject of 3-year project funded by the Federal Highway Administration's (FHWA) Exploratory Advanced Research (EAR) Program, in partnership with the University of Central Florida and Georgia State University. "Experiments on Driving under Uncertain Congestion Conditions and the Effects on Traffic Networks from Congestion Pricing Initiatives" will examine how driver's risk preferences influence their choice of route and travel departure time.

### Field Experiments

The study will see field experiments conducted in the Miami, Orlando, and Atlanta metropolitan areas. To secure reliable statistics, the research will involve 200 to 300 drivers per metropolitan area, with participants selected in partnership with the toll authorities. The research team plans to equip the private vehicle of each participant with a GPS device to observe the participant's daily driving choices as road prices are manipulated for various routes and departure times. Choices presented to the driver during the experiment will involve routes they frequently travel, and data will be gathered only on select routes that match an important attribute set, making inferences more accurate and precise. The research will investigate how the route and departure time choices relate to personal attributes such as risk attitudes, age, and gender. This data will infer the value of time to researchers, a crucial piece of information in predicting how drivers will react to congestion pricing schemes.

### Evaluating Behavior

The study will examine how experimental economics can change transportation engineering by enabling the evaluation of behavioral responses that are difficult to predict and yet have strong influences on the effectiveness of engineering solutions. Experimental economics allows careful control of the process by which drivers participating in the study respond to alternative route and price options. Because congestion conditions are uncertain and differ across routes and departure times, the study will use estimated decision models—defined using criteria such as travel time, purpose, and value of trip—as well as various costs and benefits related to arrival times. Several congestion pricing schemes will be tested, and driver decisions will be collected through field and simulated conditions in a laboratory environment. The outcome of the study will be a set of prediction models expected to be a valuable contribution to the traffic planner's toolbox, in addition to a manual for conducting similar congestion pricing experiments.

### Simulation Experiments

Each participant will also be engaged in driving-choice experiments in a lab environment using driving and traffic simulations. These simulations will complement the field experiments, allowing identification of individual characteristics that are otherwise not observable. To provide realistic experiences in a portable environment, the study uses L3-MPRI Driving Simulation Software on portable computers, equipped with steering wheels and gas and brake pedals. Subjects will be able to choose one of two simulated routes: either a non-tolled route with uncertain congestion conditions or a tolled route with free-flow traffic. As researchers manipulate various economic incentives, including tolls, and observe how congestion varies over time, multiple participants will make route choices simultaneously and generate congestion conditions.



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## Moving Forward

The research team has already completed the design of the field and simulation experiments, and established coordination with different agencies in the three regions where data collection will occur. Preliminary tests of the procedures are underway, and full-scale pilot experiments will be conducted later this year. “The first major report of the study is a guide to the application of experimental economics in the area of congestion pricing,” explains Karen White at FHWA. “The key purpose of the guidebook at the end of the report will be to provide detailed instructions to illustrate the most effective manner in which to inform subjects about the experiment and will offer explanations of the type of statistical analysis that should be undertaken to draw valid inferences. This should ultimately prove to be a valuable reference tool.”

## Learn More

For more information on this EAR Program project, contact Karen White at FHWA, 202-366-9474. (email: karen.white@dot.gov).

## EXPLORATORY ADVANCED RESEARCH



### What Is the Exploratory Advanced Research Program?

FHWA's Exploratory Advanced Research (EAR) Program focuses on long-term, high-risk research with a high payoff potential. The program addresses underlying gaps faced by applied highway research programs, anticipates emerging issues with national implications, and reflects broad transportation industry goals and objectives.

To learn more about the EAR Program, visit the Exploratory Advanced Research Web site at [www.fhwa.dot.gov/advancedresearch](http://www.fhwa.dot.gov/advancedresearch). The site features information on research solicitations, updates on ongoing research, links to published materials, summaries of past EAR Program events, and details on upcoming events. For additional information, contact David Kuehn at FHWA, 202-493-3414 (email: david.kuehn@fhwa.dot.gov), or Terry Halkyard at FHWA, 202-493-3467 (email: terry.halkyard@fhwa.dot.gov).



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