Air Passengers' Joint Decisions about Ground Access and Parking

Using an econometric model to quantify the impact of various factors—including travel time and cost—on airline passengers' choices of access modes and parking products.

Challenge

With increasing air travel demand, it is important for airports to evaluate infrastructure investment and demand management solutions to curb traffic congestion and minimize landside energy consumption. Understanding the decisions and choices air passengers make about their ground access modes is important for both developing infrastructure planning strategies and assessing the impacts of emerging modes on airport revenues, particularly from parking. But parking choice is often overlooked in the modeling of airport ground access choices.

Our Approach

The study described here[1] addresses this gap through the development of a model of both airport access mode and parking option choice. It is a nested multinomial logit regression model based on a passenger survey conducted at Dallas Fort Worth International Airport.

By considering the diversity of the parking services available to consumers, the nested structure proposed here offers a more realistic portrayal of the value of travel time and thus better encapsulates the interaction of the mode and parking choice dimensions that are directly tied to airport revenue generation. The proposed model consists of two layers of decisions: an upper-level decision on mode choice and a lower-level decision on parking decisions (**Figure 1**). Explanatory variables include travel time and cost, socio-demographic characteristics, and travel-related variables such as trip purpose and travel party size.

Results

Unlike a traditional conditional logit model that does not consider available parking options, the proposed joint model of mode and parking decisions was found to (1)
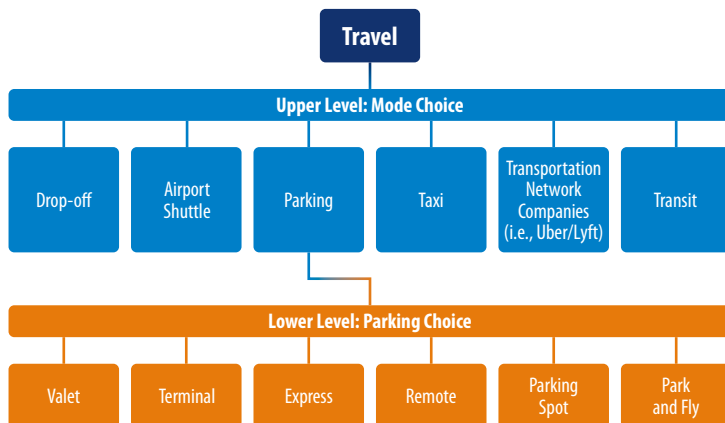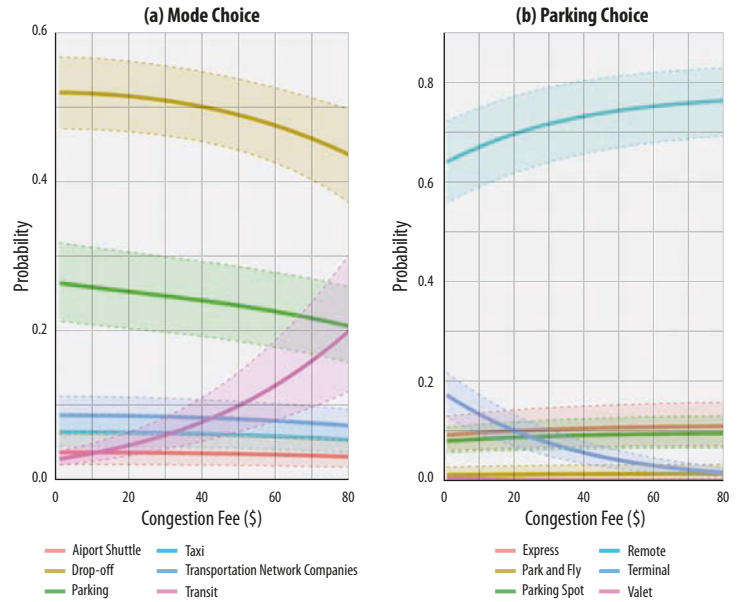

Figure 2. The mode choice and parking choice probability for an air passenger with the introduction of congestion fee at the Dallas Fort Worth International Airport. The solid lines represent the estimates of the probabilities, and the shaded area represents the 95% confidence interval. Figure from NREL

generate more realistic values of travel time and (2) have better predictive performance. Both benefits are critical for obtaining better airport parking revenue estimates and identifying traveler cohorts who might respond more strongly to policies targeting curb congestion and parking demand.

Impact

Though the joint choice of airport and access mode has been studied well, the choice of airport ground access mode in conjunction with the choice of a parking product has not been examined in detail. The latter is an important topic because emerging modes such as Uber and Lyft are gaining market share in airport ground access, which in turn influences airport parking revenues and curb space availability.

The model proposed in this study can provide a more accurate understanding of airport access travel behaviors for policymakers and airport authorities who would like to use choice models to inform their decision-making. This model can also help evaluate the "what-if" scenarios in future infrastructure planning, for example, how passengers' access mode and parking choices change with the implementation of an airport-area congestion fee (**Figure 2**). The model shows that congestion pricing can be a powerful tool for incentivizing transit use and remote parking.

For more information, visit **athena-mobility.org** or contact **athena.mobility@nrel.gov**.

Figure 1. Model structure of the NMNL of mode choice and parking decision. Figure from NREL

[1] Ge, Yanbo, Alec Biehl, Srinath Ravulaparthy, Venu Garikapati, Monte Lunacek, and Caleb Phillips. Forthcoming. "Joint Modeling of Access Mode and Parking Choice of Air Travelers Using Revealed Preference Data." *Transportation Research Record*, Accepted April 2021.