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Estimating store choices with endogenous shopping bundles and price uncertainty☆

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ABSTRACT

We develop a structural model of retail store choices for which household shopping plans and price beliefs are endogenously determined. In our model individual households make their store choices based on their expected basket costs, which are determined by their shopping plans and price beliefs. Previous studies use realized purchases as a proxy for unobserved shopping lists and also assume homogenous price expectation across all households over the entire sample period. Our approach improves the measures of expected basket costs by estimating intended shopping lists of households using a duration model and also by constructing household-, time-, store-, and goods-specific price expectations. In our empirical application using a scanner data set, we find that the store choices become significantly more elastic to prices when the correction is applied.

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1. Introduction

We develop a household level demand model of store choice in the supermarket industry. The store choice of grocery shoppers has two distinctive features compared to other consumer choice problems. First, store choice decisions involve bundle purchase behavior. Consumers decide on which stores to visit depending on their shopping plan, which is characterized by the goods and quantities they intend to buy at a store. Second, consumers face price uncertainty before they actually visit a store. Shoppers may acquire certain information on prices from out-of-store advertising such as newspaper inserts or weekly circulars on sales, but most of the shelf prices are unknown a priori. Shoppers, therefore, may rely on price expectation for their store choice from their shopping experiences.

As most of other consumer choice problems, a discrete choice framework would be a natural setting to model the store choice problem, in which consumers either choose one store or use their money on the outside alternative. However, the aforementioned features of store choices raise an empirical challenge in estimating the discrete choice model. Note that the "price" that consumers face in store choices is the expected cost of a *planned* shopping basket. Measuring this expected basket price is fairly challenging because it involves multidimensional consumer choice problems. Namely, the expected basket price is determined by the goods a shopper intends to buy and what she knows about prices before visiting a store. These two ingredients that determine the expected basket price—that is, planned shopping list and price belief—are not merely entangled by inter-temporal aspects of consumer behavior, but they are typically unobservable to researchers. Using expected basket prices measured with error may lead to severe bias in the estimates of demand parameters, and previous studies have endeavored to find a better way of measuring these expected basket prices. In this paper we construct an improved measure of the expected basket price by estimating consumer specific price expectations and shopping plans. We, then, estimate store choices using a consumer level multinomial choice model with the plug-in estimates of expected basket prices.

Correctly estimating consumer demand and price elasticities is central to the study of many important policy questions such as pricing strategies of firms, antitrust policies, and welfare effects of introducing new goods. For instance, using the estimates of demand parameters store or brand managers, who design pricing policies with short-term price promotion, can predict how much price cuts increase future store traffics or accelerate in-store purchases. Estimating consumer demand and price elasticities also plays a key role in understanding the welfare implication of merger policies or zoning regulations that restrict new stores' entry by providing precise measures of competition levels between retailers.

To approximate unobservable basket prices, previous store choice studies used realized purchases as a proxy for the unobserved shopping lists and assumed homogeneous price expectations across households and over the entire sample period (see Bell et al. (1998), Smith (2004), Briesch et al. (2009), Hansen and Singh (2009), and Beresteanu et al. (2010)). This approach potentially generates measurement error in the