The Uniformity of Demand for Different Food Retail Formats

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***Abstract* - Over the past decades, food retail has transformed into a heterogeneous composition of different retail formats in many industrialized countries. With this development at hand, it seems worth considering whether certain types of consumers have turned towards particular formats, i.e. if estimates for demand reactions from one isolated food retailer type remain valid for a general-purpose adaptation. In this context, we look at the case of Austria, for which discount stores have recently gained importance, and estimate the respective price and expenditure elasticities for different retail formats. A two-step estimation method is applied to account for censoring in the food budget shares, and Wald tests are run to empirically test the equality of elasticities across formats. In this regard, we also focus on the potential for alienating consumers from other formats. Beyond, we also examine if certain household characteristics favor discount store visits more than visits to the more traditional retailers. Our results indicate that demand within the more traditional formats is statistically more responsive to inner-format price changes than demand within discount stores. Furthermore, we find that discount store demand increases significantly stronger as supermarket prices go up, than vice versa.**

INTRODUCTION

Demand in food retail, despite having received great attention in numerous studies, has mostly been viewed as a homogeneous matter. Typically, a single retailer provides the basis for empirical estimations, or various retailers are treated as a unitary source of supply. When market shares are sparsely diversified across different formats, little bias is to be feared from this approach. However, for an emerging number of industrialized countries, the food retail landscape has seen considerable change in retail formats' market shares over the past centuries, with discount stores constituting an emergent format type for many European markets (Stiegert and Kim, 2009). Main characteristics of this format type in Europe include a comparably plain store ambience with little promotional or merchandising activity and only rare efforts on releasing new products, independent of the actual store size (M+M Retail 2005). The question arises whether people who frequently shop in discount stores can actually be equated with those who visit traditional formats more often. If this is not the case, demand elasticities should be differentiated by format, especially for markets where no single retail format unmistakably prevails. Clear-cut analyses focusing on differences in demand elasticities have remained scarce, particularly for Europe. The aim of our study therefore is to closely examine and empirically test the homogeneity of demand elasticities for different retail formats, for the case of Austria.

To do so, we separate discount stores from the more traditional types such as supermarkets in the Austrian food retail market, where discount stores have increased their market shares from 18 to almost 23 percent in 2002 to 2007 (Lebensmittel-bericht Österreich 2008). Corresponding to this advancement, discounters today represent the second most important retail channel after traditional supermarkets in Austria (USDA GAIN report 2013).

We initially examine the topic of store format choice by a bivariate probit model. Afterwards, we estimate price and expenditure elasticities for nine products of each format, also looking at cross-format price reactions, i.e. demand reactions in one format following price changes in the other. The equality of demand reactions for the two formats is then tested empirically, both for inner-format and cross-format responses.

DATA

A panel dataset containing information on about 6.500 households in Austria, who kept record on their purchases for the time period between 2003 and 2007, serves as the basis of our estimations. Weekly quantities and overall expenditure on nine broad product groups (white milk, mixed milk, oils and fats, cheese, meat, sausages, fruits, vegetables, other products) were reported, complemented by a number of household characteristics. As we are interested in comparing price and expenditure reactions for discount stores and more traditional formats, subsumed as supermarkets, we associated the individual chains with a format type according to the RollAMA classification included in the dataset. Generally, there are forty food retail chains in the dataset; six of these are classified as discount stores. Overall, we look at a total of eighteen goods, nine for discounters and nine for supermarkets.

Of all purchase data recorded in the dataset, around 76 percent originate from supermarket buying, while the remaining 24 percent stem from purchases in discount stores. About 90 percent of people in the dataset have visited both formats while

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being in the panel. Due to this considerably high number, we infer that store availability is not a major concern when people decide on where to shop. Still, the number of non-purchases of some goods turns out considerably high at the weekly level, which is why we chose to look at the data on the more aggregate monthly level.

METHOD

At first, we consider the household determinants of store format choice. We start out with a bivariate probit model and create one dummy variable, Y_{lht}, for each format, equalling one if the respective format was frequented by household *h* in time period *t*, and zero otherwise. As explanatory variables, we consider a set of sociodemographic factors. In addition, we also account for habit formation by introducing lags of the two dependent variables, indicating a visit to either format in the previous time period. The resulting bivariate probit model for household *h* and format *l* thus takes the following general form, with z_{kht} denoting the sociodemographic variables:

$$Y_{lht} = f(z_{1ht}, \dots, z_{kht}, Y_{lht-1}) \qquad l = 1, 2 \quad (1)$$

Next, in order to estimate demand parameters in a system of discounter and supermarket goods, the commonly popular linear Almost Ideal Demand System (LA/AIDS) is applied, following a method by Shonkwiler and Yen (1999) to account for the fact that not all goods are purchased in all time periods. The method requires that purchase probabilities are included in the LA/AIDS estimation in the form of the cumulative distributive function Φ_{iht} and probability density function ϕ_{iht} for each household *h* and time period *t*, so that the LA/AIDS eventually takes the following form:

$$w_{iht} = \Phi_{iht} * \left[\pi_{i0} + \sum_k \pi_{ik} z_{kht} + \sum_j \gamma_{ij} log p_{jht} + \beta_i \log\left(\frac{x_{ht}}{P^*_{Lht}}\right)\right] + \delta_i \phi_{iht} + \varepsilon_{iht}, \qquad i = 1, \dots, 18 \quad (2)$$

where P^*_{Lht} defines Moschini's price index, w_{iht} are the budget shares, p_{jht} are prices, x_{ht}measures total expenditure on all goods in the system, whereas π_{i0}, γ_{ij}, β_i, δ_i and $\pi_{ik}$are parameters to be estimated and ε_{iht} represents the error term. Price and expenditure elasticities are obtained from the LA/AIDS parameter estimates. Hereafter, Wald tests are applied to test if these price and expenditure elasticities are equal for both formats.

RESULTS

Regarding store choice, we obtain the intuitive result that the likeliness of a discount store visit decreases as household income increases. Our results further indicate that per month, visiting one of the formats does not significantly alter the probability of visiting the other, as also implied by the high percentage of people who visit both formats. Visits to either format in the previous month however turn out to be significant drivers of store format choice, signalling that format revisits seem more likely than format switching for Austrian consumers.

In terms of demand elasticities, own-price reactions are of the expected negative signs, while price responses in supermarkets turn out noticeably stronger for all nine goods under examination. This inequality is also acknowledged by the respective Wald tests for equality in own-price elasticities of each format. For example, a price increase in the category of white milk in supermarkets lowers demand for white milk in supermarkets more than a respective price increase in discounter white milk lowers demand for white milk in discounters.

Opposed to this, cross-format reactions are distinctly stronger for discounter demand when supermarket prices are changed than vice versa. Apart from white milk, all other cross-format own-price elasticities are significant and show the expected positive signs, i.e. almost all products of the same type are found to be substitutable across formats. Apart from this, significant differences also occur for expenditure elasticities, but the relative strength of expenditure elasticities depends on the product considered.

DISCUSSION

We estimated and compared elasticities of demand for discounters and supermarkets in Austria. Our results point at significantly non-uniform reactions for these two formats. This being said, it is not advisable for Austrian food retailers and policymakers to rely on an unambiguous reaction to price changes in their targeted group, unless they constrain themselves to a single retail format. Given our results, a comparably higher leverage can be expected when prices in the more traditional supermarket format in Austria are changed. Additionally, the more traditional formats could allure additional demand from the discounters through price cuts, while at the same time they may expect an additional boost in demand through the comparably more responsive set of consumers in their our format type. Beyond, in light of our results on store choice, it appears that discount stores tend to attract low-income consumers who are yet less sensitive to inner-format price changes. Further research on other food retail markets is necessary to validate our results, whereas the role of differences in quality and brands should be investigated, if data availability allows for it.

REFERENCES

Lebensmittelbericht Österreich 2008. Available online at www.lebensministerium.at

M+M Retail (2005). Private Label Paves the Way. Global Retail Bulletin 141: 1-23.

Shonkwiler, J.S. and Yen, S.T. (1999). Two-step Estimation of a Censored System of Equations. American Journal of Agricultural Economics 81:972–982.

Stiegert, K.W. and Kim, D.H. (2009). *Structural Changes in Food Retailing*. Six Country Case Studies. Food System Research Group publication.

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