Price Rigidity and Cost Pass-Through

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Abstract: This paper contributes to the literature by investigating empirically the role of wholesale cost pass-through, mark-ups, search costs, seasonality and spatial components, as determinants of sticky retail prices.

Keywords: Price rigidity, cost pass-through, retailing.

1 Introduction

In a framework of costly price adjustments, prices are changed if the benefit of a price change outweighs the cost. The frequency of price changes depends on the probability that a retailer resets prices following a cost shock. The observation of a staggered price setting is explained by variable mark-ups, and differences in cost pass-through (e.g. GI10). This paper contributes to the literature by investigating the role of wholesale cost pass-through, mark-ups, search costs, seasonality and spatial components, as determinants of retail price stickiness. The analysis employs disaggregated weekly store-level retail scanner data and wholesale prices for major German retail chains from 2005 to 2012, including different brands and retail formats.

2 Model and Data

We define Y_{it} as the net benefit of changing the retail price of product i at time t. Price adjustments are endogenous to the firm's profit maximization problem, which depends on the covariates vector x_{it},

$$Y_{it} = x_{it}\beta + e_{it}. \quad (1)$$

with $x_{it} = [(\Delta P^{w}_{t-(0,1,2,3)} = 1); markup_i; sc_i; pl_i; region_i; size_i;\ season_t; promo_{it}]$.

A price change occurs only when the benefits of changing the retail price overweighs its costs:

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$$\Delta P_{it}^{r} = \begin{cases} 1 & if \quad Y_{it} > 0 \\ 0 & if \quad Y_{it} \leq 0 \end{cases} \tag{2}$$

Accordingly, the econometric model for a price change of the product can be specified as a normal, cumulative distribution function:

$$P(\Delta P_{it}^{r} = 1 | x_{it}) = \Phi(x_{it}\beta) \tag{3}$$

As price changes become more likely, price rigidity decreases. Differential probabilities of price changes over the cross-section imply a staggered price setting. Additionally, Gopinath and Itskhoki (GI10) point out that there is a positive correlation between frequency of price adjustments and pass-through, when mark-up elasticities and sensitivities to cost shocks vary across goods.

We define an indicator function, which is one if a price change in wholesale or retail prices occurs. The frequency of a price change is then the probability that the retailer resets prices $P(\Delta P_{it}^{r} = 1)$ upon observing a cost shock $(\Delta P_{t}^{w} = 1)$. We are interested in the question whether there is a delayed effect of changes in wholesale prices on retail prices, a phenomenon which has been widely documented in the empirical literature (e.g. BS02).

We construct average mark-ups for each product in the panel. Higher mark-ups increase the potential to deviate prices from marginal costs and mark-up elasticity increases with higher markup, which lowers the probability of a price change and cost pass-through.

We follow Richards et al. (RGL14) and approximate search costs by stock keeping units (SKU) in the store. As the number of SKU increases, search costs increase and the probability of a price change decreases.

Everyday low price (EDLP) and high-low price strategies are important determinants of retail price settings (HR04). German retailers often employ an EDLP pricing strategy for private label dairy products to lure consumers into the store (loss leader).

Cyclical consumer elasticities (Ga75) and seasonal variations in costs (BA16) represent regime shifts that retailers are equally exposed to. We construct dummy variables for spring, summer, fall, and winter. Seasonal clusters in price adjustment emphasize the role of time-variant market conditions.

Store size and retail formats may be an important factor on retail prices and pricing decisions are often conducted at the division level (NNN11). To measure spatial differences, we construct dummies for North, South, West, and East Germany. To measure the impact of store size and retail outlets, we construct ten indicator functions.

We also control for price promotions. Fluctuations in retail prices are mainly driven by promotional sales and promotional pricing strategies have a major impact on the inference about price rigidity (HR04).

Retail prices are obtained from SymphonyIRI Group (SIG11), wholesale prices are obtained from an industrywide collection of dairy sales revenues conducted by the BMELV. The store-level retail data is composed of 1822 retail prices over a period of 416 weeks from 2005 to 2012. Wholesale prices cover the costs of production, packaging and transportation to the retailer and reflect buying prices of retailers. The retail scanner data provides attribute information on store, stock keeping units, and branding. Descriptive statistics of the variables used in the empirical investigation are available upon request.

3 Discussion and Results

We estimate the probability of price changes with a random effects model. Heteroscedastic and autocorrelated error terms are frequent problems in micro-level scanner data. Therefore, we also estimate a population-average model and control for heteroscedasticity and autocorrelation of order one.

Both specifications lead to qualitatively similar results. Retail prices change delayed to wholesale price changes. Retail price movements and cost-pass through also decrease in average mark-ups. Consumer search cost in terms of stock keeping unit has a significant negative effect on the probability of a retail price change. Prices of private label products are more rigid than those of national brand counterparts. Prices change more often during spring and winter. A large fraction of differences in retail price movements is explained by retail formats. The probability of a retail price change increases with stores' size and pricing patterns differ regionally. The largest part of retail price movements is explained by promotional sales.

What can we learn from the analysis of traditional retailing with regards to the emergence of online retailing?

At a first glance we would expect that the emergence of online retailing reduces asymmetric information. If consumers search for prices of one particular homogeneous product, consumer search costs decrease, which increases price competition among retailers (Ta09; CF12). Accordingly, we expect spatial differences, retail prices and retail mark-ups to decrease and pass-through of cost shocks to increase. This implies ceteris paribus a more synchronized price setting.

On the other hand, the number of stock keeping units decreases price variability. Larger product lines increase search costs and softens price competition. Online retailers are less constrained in the extent of their product offerings (An06). Thus, online retailers' extended product lines increase consumer search costs, which cause retail prices and retail mark-ups to increase.

Further, attribute search complicates price comparison across retailers and products, which again softens price competition. Attribute search decreases with product variety (RHE16). Product variety as means of distinguishing a manufacturer's or retailer's supply from its competitors is an important of non-price competition in grocery retailing (Ca84; RH15).

Finally, price setting depends on the overall market structure (e.g. Ti88; chapter 7). The transition of traditional retailing formats and the evolution of search engines that are able to compare products across an increasing number of items, stores and product attributes will shape the future of online and offline retailing.

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