Structural Analysis of Manufacturer Pricing in the Presence of a Strategic Retailer

K. Sudhir
School of Management, Yale University, 135 Prospect Street, PO Box 208200, New Haven, CT 06520-8200
sk389@mail.som.yale.edu

Abstract
Consumer goods manufacturers usually sell their brands to consumers through common independent retailers. Theoretical research on such channel structures has analyzed the optimal behavior of channel members under alternative assumptions of manufacturer-retailer interaction (Vertical Strategic Interaction). Research in Empirical Industrial Organization has focused on analyzing the competitive interactions between manufacturers (Horizontal Strategic Interaction). Decision support systems have made various assumptions about retailer-pricing rules (e.g., constant markup, category-profit-maximization). The appropriateness of such assumptions about strategic behavior for any specific market, however, is an empirical question. This paper therefore empirically infers (1) the Vertical Strategic Interaction (VSI) between manufacturers and retailer; (2) the Horizontal Strategic Interaction (HSI) between manufacturers simultaneously with the VSI, and (3) the pricing rule used by a retailer.

The approach is particularly appealing because it can be used with widely available scanner data, where there is no information on wholesale prices. Researchers usually have no access to wholesale prices. Even manufacturers, who have access to their own wholesale prices, usually have limited information on competitors’ wholesale prices. In the absence of wholesale prices, we derive formulae for wholesale prices using game-theoretic solution techniques under the specific assumptions of vertical and horizontal strategic interaction and retailer-pricing rules. We then embed the formulae for wholesale prices into the estimation equations. While our empirical illustration is using scanner data without wholesale prices, the model itself can be applied when wholesale prices are available.

Early research on the inference of HSI among manufacturers in setting wholesale prices using scanner data (e.g., Kadiyali et al. 1996, 1999) made the simplifying assumption that retailers charge a constant margin. This assumption enabled them to infer wholesale prices and analyze competitive interactions between manufacturers. In this paper, we show that this model is econometrically identical to a model that measures retail-price coordination across brands. Hence, the inferred cooperation among manufacturers could be exaggerated by the coordinated pricing (category management) done by the retailer. We find empirical support for this argument. This highlights the need to properly model and infer VSI simultaneously to accurately estimate the HSI when using data at the retail level.

Functional forms of demand have been evaluated in terms of the fit of the model to sales data. But recent theoretical research on channels (Lee and Staelin 1997, Tyagi 1999) has shown that the functional form has serious implications for strategic behavior such as retail passthrough. While the logit and linear model implies equilibrium passthrough of less than 100% (Lee and Staelin call this Vertical Strategic Substitute (VSS)), the multiplicative model implies optimal passthrough of greater than 100% (Vertical Strategic Complement (VSC)). Because passsthrough rates on promotions have been found to be below or above 100% (Chevalier and Curhan 1976, Armstrong 1991), we empirically test the appropriateness of the logit (VSS) and the multiplicative (VSC) functional form for the data.

We perform our analysis in the yogurt and peanut butter categories for the two biggest stores in a local market. We found that the VSS implications of the logit fit the data better than the multiplicative model. We also find that for both categories, the best-fitting model is one in which (1) the retailer maximizes category profits, (2) the VSI is Manufacturer-Stackelberg, and (3) manufacturer pricing (HSI) is tacitly collusive. The fact that the retailer maximizes category profits is consistent with theoretical expectations. The inference that the VSI is Manufacturer-Stackelberg reflects the institutional reality of the timing of the game. Retailers set their retail prices after manufacturers set their wholesale prices. Note that in the stores and product categories that we analyze, the two manufacturers own the dominant brands with combined market shares of about 82% in the yogurt market and 65% in the peanut butter market. The result is also consistent with a balance of power argument in the literature. The finding that manufacturer pricing is tacitly collusive is consistent with the argument that firms involved in long-term competition in concentrated markets can achieve tacit collusion.

Managers use decision support systems for promotion planning that routinely make assumptions about VSI, HSI, and the functional form. The results from our analysis are of substantive import in judging the appropriateness of assumptions made in such decision support systems.

(Structural Models; Horizontal Strategic Interaction; Vertical Strategic Interaction; Retailer Pricing; Promotional Planning; New Empirical Industrial Organization)