Evolving Research on Price Competition in the Grocery Retailing Industry: An Appraisal

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With the end of the Supermarket Revolution in the 1970s, new forms of horizontal, vertical, and geographic competition have appeared to challenge the supremacy of the supermarket format. New retail formats like warehouse stores, supercenters, and fast-food outlets appear to affect local retail supermarket prices. Slotting allowances, coupons, and electronic data gathering have intensified retailer-manufacturer rivalry. Foreign direct investment offers the promise of new European-style management styles in U.S. grocery retailing.

Competition in the Grocery Retailing Industry

Background

The Supermarket Revolution—the replacement of small grocery stores by large, multi-department grocery stores—came to an end in the 1970s (Marion et al. 1986: table 5-1). Since then the industry has witnessed a proliferation of retail food outlets. The 1987 annual report of *Progressive Grocer* declared that "the supermarket industry is moving faster to accommodate changes in consumer shopping and eating patterns." The traditional supermarket design is being supplemented by larger store formats such as warehouse stores, supercenters, and combination stores, often incorporating food courts to combat the influence of fast-food outlets. At the same time, smaller shops with superior selection and service levels stand ready to draw away high income food shoppers. Small convenience stores have the advantage of being open long hours and located close to urban dwellings, work places, or on commuting routes or at gasoline stations. Large investments are being made in electronic shopping locations on the Internet that promise overnight delivery to the shoppers' homes. In sum, the conventional supermarket is increasingly surrounded by rival retail formats that are nibbling away at the edges of the sales currently dominated by the supermarket (figure 1). I call this process "tangential rivalry."

The proliferation of retail formats, each seeking to capture the huge retail market for food and other groceries (about $700 million in the United States), represents a challenge to researchers. Like taking a photograph, researchers have an easier time analyzing an industry that is standing still rather than trying to capture a moving target. The increasingly diverse set of market rivals implies that both the competitive environment and cost structures are changing. These in turn will likely affect supermarket pricing practices and other forms of competitive behavior.

The appearance of new retail competitors mainly affects research of *horizontal* competition, retailer-to-retailer rivalry at the consumer end of the food chain. The retail grocery industry also must contend with on-going *vertical* competition from their suppliers. Many types of strategic interaction between grocery retailers and food manufacturers have existed for decades, such as private-label programs, geographic price discrimination by manufacturers, shelf-planning programs, and manufacturer subsidies for retailer advertising. However, methods of vertical competition have proliferated or increased in importance: discount coupons, "slotting allowances" for new products, retailer access to electronic check-out data, and electronic data interchange (EDI) for inventory control. Research on vertical rivalry has always been less common than horizontal rivalry, but now it is a more complicated phenomenon to model.

A third major change in grocery retailing involves changes in *geographic* competition. Mergers have accelerated in the United States since about 1980, after a long period of relative stability, and the same phenomenon is noted in many Euro-

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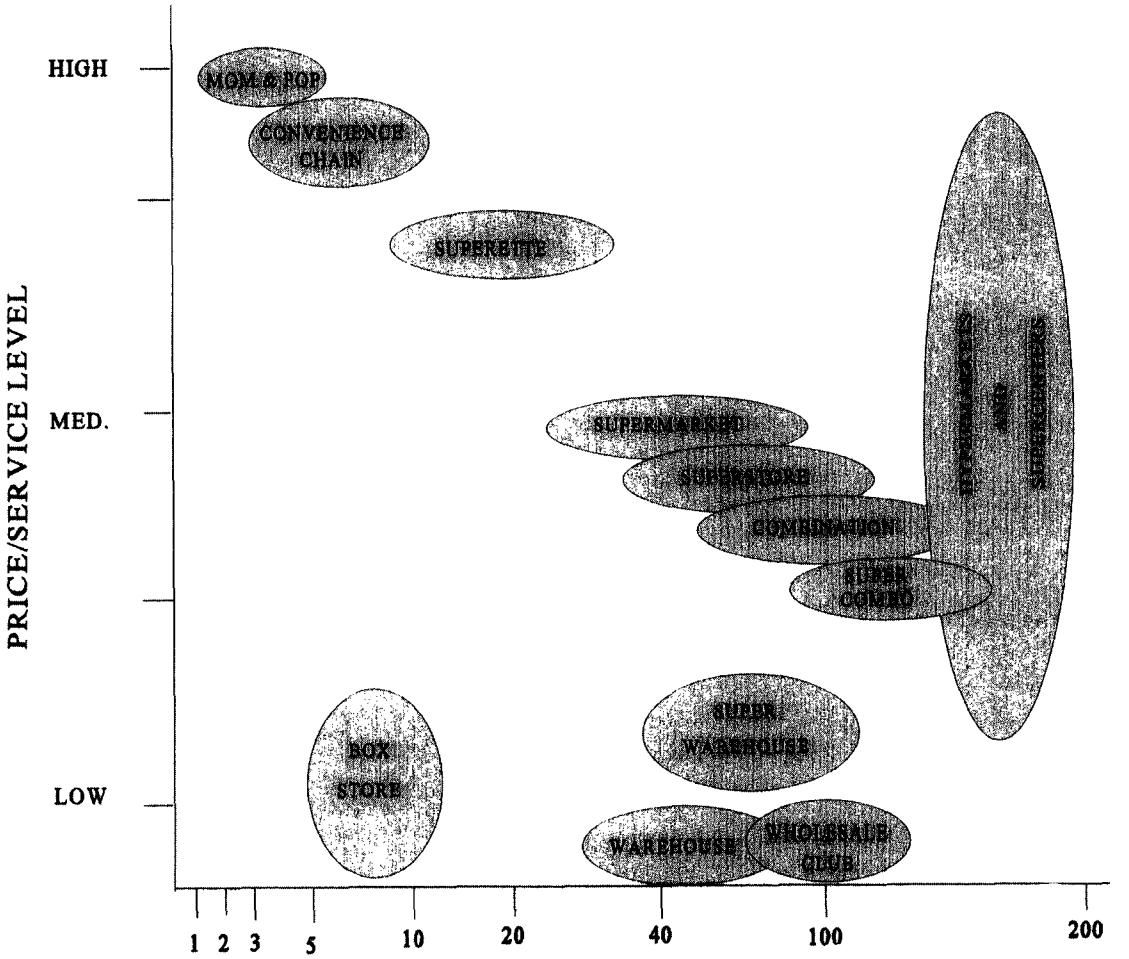

Figure 1. Retail Food Store Formats in the 1990s. Store size in logrithmic scale. Each 10,000 ft^2 corresponds to 2000 to 6000 items stocked and about $5 to $10 million in sales per store per year.

pean countries. Perhaps more significant is the increase in cross border investment that may be observed. Large grocery chains with headquarters in the United Kingdom, France, Belgium, the Netherlands, and Germany have greatly expanded their international investments, not only within the European Union but also in Asia and the Americas. Except for Wal-Mart and similar discount retailers, a surprising feature of this foreign direct investment is the absence of U.S.-based supermarket retailers. Unlike the European countries just listed, no U.S. supermarket chain has come close to developing a nationwide presence, though two recent mergers may presage that outcome in the near future. Multinational investment seems to bring with it significant changes in retail management practices.

Changes in horizontal, vertical, and geographic competition often appear to begin in higher income areas first and spread later to other areas. The supermarket revolution began in the United States in the 1930s. Similar changes started in Western Europe in the 1960s (and even later in southern Europe), just as the revolution was petering out in North America. The new era of tangential competition began in the United States in the 1970s and 1980s, just as it began to lead the way as the first "post-industrial" national economy. I hope it is not chauvinistic of me to suggest that these changes may be precursors of similar, if more compressed, trends in middle-income countries.

Objective

The purpose of this paper is to review the economic literature on empirical studies of competition in the food-retailing industry, with special attention to a few studies that attempt to cope with

the new forms of competition I have mentioned above. The focus is on studies of long-run strategic grocery pricing in the grocery industry and ignores the voluminous literature on short-run tactical pricing decisions like temporary "sales" or loss-leadership. That is, I will examine studies that generally fall into the category known as market structure-performance studies.

Horizontal Competition

Introduction

Pricing practices in the retail grocery industry have long been of interest both from a positive and normative standpoint. In either case, the focus is typically not costs, but environmental factors that can cause differences in price given costs. If such factors exist, then firms with similar costs can charge different prices in accordance with these conditions. This enables the practice of some form of price discrimination if markets are sufficiently segmented as to minimize arbitrage between them. Indeed, a useful way to distinguish between normative (or prescriptive) and positive studies is the nature of the market segmentation implied by the studies.

Prescriptive studies are most often concerned with identifying rules for optimal pricing by the grocery firm, usually at the store level. Thus, the emphasis is on factors associated with price differences across *product categories.* The major factors here are customer demographics and incomes. With this focus, the degree of competition faced by the store is less important since it is seldom viewed as having differential effects on demand by category (a point of importance herein). Competitors are generally considered to be other supermarkets selling similar goods. Only if the question under study involves optimal pricing by the multi-store firm must consideration be given to price levels at stores facing differences in competition.

In contrast, positive studies are almost exclusively concerned with pricing under different degrees of firm concentration. Thus, interest is with differences in over-all grocery price across *geographic markets* that vary in terms of competitive intensity (as measured by market shares or concentration). Demographic factors are occasionally included, but only to the extent they measure differences in demand in different geographic areas. Pricing at the level of product categories is not considered. In short, in one case the emphasis is on product types. In the second, it is market types.

Positive studies have primarily been within the ken of industrial-organization (IO) economics. IO economists have long considered the question of whether retailing was an imperfectly competitive industry. Although some have reasoned that most retailing, including large-scale grocery retailing, is workably competitive (Adelman 1948; Stigler 1950), most early writers agreed with Smith (1937), who judged retailing to be monopolistically competitive. This arises due to consumer search costs and spatial differentiation, a model more formally analyzed by Salop and Stiglitz (1977) and Benson and Faminow (1985). Many other economists believed grocery retailing to be essentially oligopolistic in its pricing behavior (Baumol et al. 1964; Holdren 1968; Marion et al. 1979).

There are four noteworthy cross-sectional empirical studies of supermarket price indexes in the IO tradition. All measure competitive rivalry with a metropolitan-area sales concentration index, and three of the four also include company market share. The first study used extensive price-check data, generated by grocery retailers operating in 36 cities, to develop a market-basket price index of 94 branded food (excluding meat and produce) items. (Marion et al. 1979). Both four-firm concentration (C4) and firm market shares were found to be positively related to the index. Cotterill (1986) verified these results, also using subpoenaed price data, for a sample of 35 stores in 18 mostly small, isolated Vermont towns and cities. Cotterill and Harper (1995) further verified the positive concentration-price relationship for a sample of 34 local markets in and around Arkansas. A fourth study, drawing on highly aggregated retail food price indexes published for only 18 large U.S. metropolitan areas by the Bureau of Labor Statistics, also found that concentration was positively related to food prices (Lamm 1981).

Virtually the only journal article that fails to find a positive relationship between local-market concentration and grocery prices is one authored by Newmark (1990). In this study, a small sample of 27 cities was developed, half of them in one state (Florida). Unique among published studies, the price data were drawn from two irregular newspaper surveys. The "price" was actually the total supermarket bill for a constant list of a few grocery items. Another problem was that his concentration measure (CR4) mixed supermarkets with other kinds of small grocery stores, two types that probably do not serve the same type of market demand.

Yu and Connor examined the sensitivity of Newmark's analysis to a number of methodological and measurement factors. They substituted a true *index* of food prices for the absolute purchase

cost employed by Newmark; they recalculated the CR4 omitting small stores and tried a Herfindahl index from a government source as well; they examined the influence of a dummy variable for the Florida observations; they substituted a superior measure of income for Newmark's income variable; and they examined alternative functional forms. While further work may be done, the initial retesting was highly successful in the sense that each of these suspected flaws led to successive increases in the significance of the concentration coefficient. Most important, while the coefficient was negative and nearly significant in Newmark's study, when his flaws are corrected the coefficient turns strongly positive. This study shows the importance of good data, especially for the independent variables, and careful statistical craftsmanship.

Very few structure-price studies have been performed outside the United States, probably because reliable food-price surveys are not available or because the national surveys do not cover enough cities for cross-sectional statistical testing. One exception is an unpublished study by Drescher and Connor (1999). Aided by a 1993 special survey of consumer prices across 50 German cities and a comprehensive commercial data base on food stores, a model was tested that included eight other variables to control for intercity differences in costs and demand. The regression explained 89% of the variation in city prices.

The most interesting finding was the U-shaped relationship between the five-firm concentration ratio (CR5) and retail food prices. That is, we found evidence of significant economies of firm size as CR5 increased from the lowest levels to about 88% (a point almost equal to the mean of the sample); prices declined about 1.6 percentage points over this range. However, when CR5 increased from 88% to 100%, market power caused prices to rise 3.4 percentage points from their minimum level. The economies of scale finding is unique in the literature.

Prescriptive studies fall into the province of those that study supermarket management. Most are category pricing studies that have their foundation in the third degree price discrimination model (Blattberg and Neslin 1990; Kim et al. 1995). This model, in common with much IO economics, assumes monopolistic competition. It recognizes that supermarkets have some localized monopoly power due to enterprise reputation and spatial differentiation. This causes consumers to incur search costs and costs of inconvenience and leads to one-stop shopping (Katz 1984; Bliss 1988; Holmes 1989). Except for one early model (Holton 1957), the price discrimination models demonstrate that retail price margins are greater for products with inelastic demands.

The price elasticity of demand incorporates information about consumer buying habits in the trading area. Basing arguments on Becker's (1965) model of household economics, various writers have hypothesized that retail demand elasticity may be related to age, education, income, frequency of product purchase, car ownership, and time of week. Many of these factors reflect differences among households in price-searching effort. Empirical studies have found retail price responsiveness to be related to demographic factors, but the results are sometimes inconsistent. Nine panel-data studies reviewed by Hoch et al. (1995) found price responsiveness positively associated with age, education level, household size, wealth, car ownership, and single-earner households. In their own study, they found that price responsiveness in 18 grocery product categories was generally positively related to family size, minority ethnic composition, and income, and negatively related to education and household wealth.

Different price markups can also arise when prices of selected items are used to create a store price image, or "price signaling." As reported in Dickson and Urbany (1994), a survey of store managers found they ". . . believed consumers most frequently compare store prices on milk, meat (e.g., ground beef, chicken), produce, and soda" (p. 18). With signaling, markups no longer depend solely on product characteristics. For example, in the absence of signaling, stores might view commodities with limited substitutes, such as milk, to be relatively price inelastic, implying a relatively large markup. However, if managers believe milk prices are of special importance in the store-selection decision, from the store's perspective milk demand will be considered to be highly elastic and carry a low markup. It may possibly become a loss leader. Under category pricing, elasticities are more or less an objective reality. With signaling, elasticities depend upon the store management's subjective views concerning consumer reactions and upon the nature of store competition. Expected outcomes can clearly differ under these two cases. We will consider this in our discussion of empirical results.

Price-signaling concentrates on consumer choice among stores rather than choice among products within a store. Still, as in most IO studies, the market is viewed as unique, i.e., all supermarkets are in direct competition with one another, but other types of retailers have no effect on their pricing decisions. A more sophisticated view reflecting

realistic conditions in the late 1980s recognizes a more graduated set of competitors. The most intense price competition for a given grocery store comes from stores offering the same array of goods in the same trading area (Cassady 1962). Less intense price rivalry may be generated by neighborhood groceries, convenience stores, warehouse stores, or grocery stores in adjacent trading areas. Significant, but weak price competition may arise from gasoline stations, drug stores, discount department stores, and food service retailers. Few studies have explicitly incorporated these other, retail rivals in empirical models of supermarket price responsiveness. Hoch et al. (1995) is one exception. They developed four competitive variables to explain store-level price elasticities of 18 branded grocery products. They found that the size of warehouse stores in the trading area increased the elasticity of demand, while the distance from such stores (including those outside the immediate trading area) negatively affected responsiveness of demand. Cotterill and Harper (1995) also found that the presence of warehouse-type stores significantly reduced overall market grocery prices.

Competition from alternative retail forms expands possibilities of price discrimination, since different types of consumers may prefer different forms. As Lal and Matutes (1989, p. 532) state, "... multimarket rivalry substantially alters that nature of competition," especially when there are multiple goods. They develop a duopoly model with two goods and two consumer types appropriate to this question. This model can be illustrated with a stylized case.

Consider a supermarket with some degree of spatial monopoly-induced market power selling two goods, a necessity GI and a convenience good G2, to two groups of consumers, "rich" and "poor." The poor consumers purchase only G1 and have an elastic demand. The rich purchase both and are not price sensitive. Under these conditions, the optimal price for the G1 category would exploit the different demands the store faces: the store would practice third degree price discrimination and charge a lower price to the poor. This is not possible, however, because the two market segments cannot be separated (except imperfectly, e.g., with coupons). Hence, the store will charge the same G1 price, determined by both elasticities, to all consumers. The result would be a price between the two that would obtain under price discrimination.

Now suppose a new store enters the market. If the entrant is identical to the incumbent, prices for both goods would be expected to fall (at least in the absence of collusion). However, suppose the new store is a low-cost, warehouse store, selling only G1. With lower costs, it will set a G1 price below that of the incumbent. All the poor consumers (who consume no G2) will then migrate to the new store. In this case, the direction of the G1 price response by the incumbent supermarket is unpredictable. Attempts to regain poor customers by matching the entrant's price is not a viable long-run response since it implies pricing below cost. Any higher price will not entice poor consumers back. Hence, the optimal price for G1 is determined purely by the elasticity of G1 demand by the rich. Although this elasticity may be higher than before (given the warehouse penetration), it may still be optimal for the traditional supermarket to *increase* the price of G1 if the rich want to avoid the costs of shopping at two stores. The warehouse store has thereby segmented the market in a way that permits the traditional supermarket price to depend solely on the demand exercised by rich customers. As a consequence, the magnitude and direction of the supermarket's G1 response depends upon three factors: pre-entry level of G1 price, the warehouse price, and the elasticity of demand by the rich, all of which are case-specific. An optimal response might also include measures to increase the demand inelasticity of the high income consumers, such as increasing service levels.

That this model appears to capture an important aspect of current food retailing is illustrated in a recent *Wall Street Journal* (1997) article on supermarket response to supercenter competition. This article notes that rather than lowering prices to new competition.

> Supermarket chains are ... expanding and remodeling their stores—they are also promoting the quality and freshness of their perishables. Independent supermarkets are pooling their resources to finance better advertising and store improvements. Food retailers say these methods typically have been more effective than price cutting. (p. B11)

Similar evidence is provided by a recent study by Messinger and Narasimhan (1997). They found that the expansion in supermarket size and the increase in the number of items carried is associated with higher, not lower, operating costs. Their provisional conclusion is that the observed changes in store type are not to achieve scale economies but to provide one-stop shopping, a response to consumer demand for time-saving convenience.

As in the case of category pricing, complications arise in the Lal and Matutes framework when the supermarket's pricing strategy includes signaling. If pre-entry G1 prices were low (i.e., low relative to no signaling), one would expect these prices, if

anything, to rise. Here, signaling with G1 plays into the strength of the warehouse store. To the extent that signaling is continued or adopted, we would also expect G2 price to fall. The incumbent may set a G1 price considerably above the new competitor's and lower its G2 price. By this, it hopes to call attention to G2 goods and attract G2 consumers, who (due to the cost and inconvenience of visiting two stores) then remain to purchase G1, despite the higher price.

Binkley and Connor

This study is somewhat unusual in several respects. In order to obtain an especially large sample of 95 cities with widely varying sociodemographic characteristics, the authors chose to use a commercial data set with several limitations. Its amateur price takers sample only 26 grocery items and only in five stores per city. To avoid sample error, they averaged prices over three quarters drawn from three years. Doubtless there is a large degree of measurement error in such a data source, but statistically speaking this will increase noise in the model that will make the coefficients of the independent variables inefficient but unbiased. A surprising feature of the price data was the low and frequently negative correlations between pairs of grocery items across the sample cities. Because wholesale prices tend to be similar across the nation, this implies that mark-up behavior varies considerably across cities.

Because of the correlation results the authors were prompted to employ principal components analysis to develop two indexes of grocery prices. The factor loadings indicated that the first index was loaded heavily by prepackaged dry grocery items, whereas the second index was predominantly fresh and chilled grocery items. Thus, the Binkley and Connor study is among the few that blend the two major analytical approaches: the industrial-organization (positive economics) and managerial (normative or prescriptive).

The third unusual feature of Binkley-Connor was the particularly rich modeling of the competitive environment for supermarkets. Seven variables captured such features as supermarket concentration, chain ownership, pricing turbulence, and the presence of tangential rivalry by warehouse stores and fast food places. (Eleven other covariates were included to capture intercity variation in costs, city characteristics, and regional location).

The results for the competitive variables are fairly complex and, quite frankly in a couple of cases, puzzling. As a rule, the competitive environment as a whole more strongly affects pricing of the fresh and chilled items than the packaged dry groceries. However, there were large differences in how individual sources of rivalry affected the two types of grocery products. For example, supermarket concentration weakly raised prices on packaged goods, but had no effect on the perishables. Also interesting was the strong, but opposite effects of warehouse-store and fast-food rivalry on the two groups of grocery products. Binkley and Connor believe that the large differences observed reflect discriminatory pricing. Discriminatory pricing requires market segments with different demand elasticities. It also requires that the markets can be separated. This is considerably facilitated when retail food markets have non-identical competitors serving specialized segments, such as that of the working hypothesis of this study. Furthermore, segmentation is likely to enhance the role of price signaling. Here, the use of selected prices may generate a store image of strength and low prices in goods of interest to particular consumer segments.

Overall, the results depict a changing market, with the degree of rivalry among supermarkets no longer the only important competitive force shaping supermarket pricing decisions. The evidence is that serious competition has arisen not only from new formats of grocery retailing—warehouse stores, for example—but also from the restaurant industry. This should not be a surprising outcome in a world in which large changes in the retail landscape are bringing about corresponding changes in consumer shopping behavior.

Vertical Competition

The effects of the structure and conduct of suppliers on grocer-retailer performance has received little empirical attention, largely because of severe constraints on manufacturers' or wholesalers' data. Much of the interest in this topic deals with hypotheses about the relative power of retailers vis-a-vis their suppliers, sometimes referred to as "countervailing power," a loose term that may have originated with Galbraith (1954). One investigation of this topic by Connor et al. (1996) tried to detect the influence of retailer vertical power on manufacturers with a cross-sectional study of long term changes in manufacturing concentration. The idea is that in channels where retailers offer lots of private-label goods (a proxy for the vertical bargaining power of retailers), increases in manufacturers' concentration should be suppressed. No evi-

dence supporting this hypothesis was found in this study.

Dobson and Waterson have developed a game-theoretic model that examines the impact of manufacturer-retailer bargaining on retail prices. The motivation of their analysis was the increase in tight contracting arrangements in vertical subsectors found when retailing becomes highly concentrated. These arrangements are becoming known as "chain management" strategies (Hughes 1994). Dobson and Waterson conclude that chain management strategies can have the effect of increasing a retailer's power over both selling price (positive) and buying price (negative) when retail concentration increases. Therefore, the net impact on retail price is ambiguous, depending on whether buying power or selling power dominates.

In the 1990s, a small number of game-theoretical studies of manufacturer couponing explored the phenomenon as vertical competition between manufacturers and retailers (reviewed in Connor 1997a). Prior to 1990, couponing was seen only as a strategy of price discrimination by retailers. The newer vertical analyses conclude that coupons are issued by manufacturers to create barriers to entry. In one duopoly model, coupons prevent retailers from introducing private label products and blockade entry by a third manufacturer. Another theoretical conclusion is that the size of retailer mark-ups can affect the manufacturers' wholesale price and the size of the coupon discount. When retailers have low mark-ups on a product group sold in their stores, manufacturers raise their wholesale price (above their costs) and at the same time increase the effective price discount on coupons they offer to consumers. The larger coupon values help keep price-sensitive consumers buying the brand.

Gerstner et al. (1994) provide some modest empirical support for the role of consumer coupons. A cross-sectional regression analysis of coupons found that the size of the discounts offered by manufacturers was inversely related to retailer mark-ups. Moreover, the size of the coupon discount had the net effect of raising retail prices (because manufacturer's prices were elevated). Connor (1997a) examined coupon use in grocery products generally with a more intense analysis of coupons in the breakfast cereal industry. Some 15 to 20% of the wholesale price of breakfast cereals is accounted for by couponing costs. The size of the coupon discounts varies systematically by type of company and product segment.

One limitation of all the analysis of vertical competition reviewed thus far is that retailers are assumed to be direct customers of manufacturers. It is true that about 20% of the U.S. wholesale value of manufactured foods is delivered directly to stores by the manufacturers' own driver-salesmen (Connor and Schiek 1997). However, the remaining 80% of processed foods and other grocery products pass through the intermediate grocery-wholesaler stage. With the exception of Johnson and Connor (1998), there are no formal analyses of retailer-wholesaler rivalry. Implicitly, grocery wholesalers have been considered as completely passive instruments of either manufacturers or retailers. However, this assumption probably varies by country. In the United States a large share of grocery sales pass through hundreds of independently owned merchant wholesalers (Connor 1997b). The degree of vertical integration by retailers into general-line wholesaling varies considerably across various metropolitan areas, as does the extent of concentration by wholesalers.

Johnson and Connor (1998) examined the effect of wholesaler market structure on retail prices using a model similar to that of Binkley and Connor (1997). The most important findings are that the effect of wholesale market structure on prices varies by type of grocery product. Sales concentration at the general-line grocery wholesale level of the food system systematically *reduces* the retail prices of packaged groceries. They interpret this as an efficiency effect. No such effect was found for produce and refrigerated foods; instead, there was weak evidence that another aspect of wholesale structure, the degree of backward integration by retailers in a local market, had a positive effect on these perishable goods. It appears that retailer integration is either inefficient for these goods or is a costly product-differentiation strategy. Integration had no effect on packaged-foods prices.

Conclusions

There are three major forces for change in competitive conditions in food retailing today. The first is the multiplication of retail formats selling food, including general-merchandise department stores and food service places that provide what I have called tangential rivalry. Second, there is increasing recognition of the importance of strategic vertical interaction between grocery retailers and their suppliers. Recent analyses have focused on vertical rivalry in the form of private-label programs, subsector coordination through tightly specified contractual arrangements (chain management), manufacturer coupons, and the role played by local market structure of grocery wholesalers. Third, strategic decision making is being affected by the

transfer of new management systems and institutions through foreign direct investment by grocery retailers.

A full understanding of competition in grocery retailing requires that attention be paid to all three aspects of rivalry: the horizontal, vertical, and geographic dimensions. In this brief survey, I have focused mostly on formal empirical cross-sectional studies of retail price competition. This literature is most fully developed in the case of horizontal price competition. Studies for the most part divide into two neat categories: *prescriptive* analyses of category management often using store-level price data and *positive* economic studies in the industrial-organization tradition of market-level studies. However, one theme of this survey is that hybrid studies of product groupings (ones that correspond to the departments of grocery stores) across separated markets have much to offer by way of increasing our understanding of the determinants of strategic pricing practices.

There are many studies of supply chain management being conducted today in the prescriptive business-school tradition (Ziggers). For the most part, the vertical relationships studied focus on the conditions for the development of high degrees of trust required to make these arrangements stable and profitable. This survey tried to summarize the few studies that examine the ultimate effect on consumer prices of vertical competition. This literature is relatively scant but growing.

The literature on international investment that examines competitive impact is nearly an empty box. This literature typically consists of case studies of particular investments (e.g., Wrigley 1998) or speculative-descriptive treatments of the aggregate phenomenon. Formal studies of the price effects of direct investments are yet to be done.

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