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Pricing Strategies of Food Retailers

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Abstract

Studies examining pricing outcomes in the food retail industry are complicated both by the multiproduct nature of transactions and by the presence of highly concentrated food processing and retailing industries that mediate between relatively competitive farm product markets and the consumer market. In this review, we examine theoretical and empirical evidence for retail pricing and the vertical relationships that have emerged among retailers, food manufacturers, and farmers. We first focus our analysis on consumer behavior in multiproduct retail markets, including consumer search, habit formation, and reference pricing, and then discuss retail market outcomes for price discrimination, price fairness, and price obfuscation. We then turn to relationships between retailers and food manufacturers through bargaining outcomes, market foreclosure, and slotting allowances, and discuss the resulting implications for retail-price pass-through.

1. INTRODUCTION

Global food-value chains are transforming in ways that connect farmers to consumers through increasingly consolidated downstream food retail markets (Reardon & Timmer 2012, Barrett et al. 2019). Worldwide, the dominance of food retailing by major supermarket chains implies higher and higher levels of market concentration. In the United States, for example, four firm concentration ratios in the supermarket industry are above 60% in major metropolitan markets, and more than 70% of local zip codes have Herfindahl–Hirschman Index values higher than the 0.25 threshold that defines highly concentrated markets under the US Department of Justice and Federal Trade Commission merger guidelines. Moreover, as retailers continue to increase both the breadth (number of categories) and the depth (average items per category) of products available at supermarkets, new products and services offered by retailers further raise the capital requirements for entry into the consumer food market. Yet, despite the global trend toward supermarket consolidation, retail margins have remained relatively narrow for most grocery products, an outcome which suggests that highly complementary sales and an emphasis on cross-category volume may place considerable competitive pressure on retailers in the downstream stage of the food system. In this article, we review the theoretical and empirical research on food retail markets with the aim of identifying emerging trends.

From an industrial organization perspective, the vertical structure of food markets is unique. In most manufacturing markets, firms maintain proprietary technology and exercise market power at the brand level, and the usual economic approach is to examine retail market power in downstream consumer markets as well as the use of vertical restraints between a manufacturer and its retailers to control vertical externalities such as double marginalization or insufficient sales effort applied to the manufacturers' goods. In contrast, both downstream consumer markets and upstream farm product markets in the food system tend to be populated by relatively competitive agents, resulting in a market structure that bottlenecks through highly concentration food processing and retailing sectors at intermediary stages of the food system. Retailers and food processors facilitate transactions in the food system between price-taking farmers in the upstream farm product market and price-taking consumers in the downstream retail food market(s). Accordingly, retail-pricing strategies can be designed both to exert market power over consumers (Chintagunta 2002) and to enhance food processor/retailer market power in farm product markets, thereby reducing farm prices paid to competitive agricultural producers (Rogers & Sexton 1994, Sexton & Zhang 2001, Hamilton 2003, Sexton 2012). In recent years our interest in retail markets for farm products has evolved to address complex pricing strategies over multiproduct purchases, and to examine retailer behavior that complements pricing decisions.

Indeed, pricing strategies in multiproduct retail markets not only involve selecting more than one price but often involve selecting other competitive variables. Retailers set relative price levels across complementary product categories and determine individual prices for highly substitutable brands within product categories (Thomassen et al. 2017). Retail-pricing strategies therefore encompass price discrimination (both across products and over time), vertical contracting decisions and wholesale-price determination between food manufacturers and retailers (Innes & Hamilton 2006, 2009; Rey & Vergé 2004), joint product variety and pricing decisions that result in different depths of the product assortment across categories such as milk and breakfast cereal (de Palma et al. 1994; Richards & Hamilton 2006, 2015; Hamilton & Richards 2009; Trindade 2015), or simultaneous decisions regarding price and quality (McManus 2007). This line of research accounts for the observation that multiproduct retailers must not only make decisions over entire product lines but also offer a desirable mix of attributes within each product line.

Models of multiproduct retail markets are understandably complex. In general, it is possible that every product sold by a retailer competes in demand with every product sold by every retailer.

For example, when shopping online, consumers can view retail prices from multiple retailers at once for any particular item. However, when consumers purchase multiple items on each shopping occasion, as is typical in food retail markets, there are limits to the extent of market competition between supermarkets. Consumers may tend to price-compare across retailers only for frequently purchased items such as cheese, cereal, and milk but not for less frequent purchases such as aluminum foil, flour, and spices, and supermarkets often complicate reference prices by providing their own private labels (Ward et al. 2002, Bontemps et al. 2008).

For grocery purchases from brick-and-mortar retailers, considerable economies of scope exist in purchasing multiple products at a time from a single supermarket, as one-stop shopping reduces the transaction cost of visiting different stores to collect a basket of items. Economies of one-stop shopping create incentives for retailers to set prices at the basket level and to conceive of competition with rivals in terms of acquiring store traffic as opposed to head-to-head competition at a highly dimensioned, individual product level (Smith 2004, Smith & Thomassen 2012, Richards et al. 2017). Both the trend toward retail competition over large sets of complementary products and advances in technology are changing the retailing function in fundamental ways. These effects have become particularly pronounced with the emergence of supercenters such as Walmart and online platforms like Amazon that increase the ability of consumers to make complementary purchases across multiple categories on a single visit.

In this review, we examine the theoretical and empirical evidence for the economics of retail food pricing and suggest opportunities for future research. We consider the behavior of retail prices using a bottom-up approach, beginning with elements of consumer behavior that affect pricing and then examining vertical relationships between retailers and their suppliers.

2. CONSUMER BEHAVIOR AND RETAIL PRICING

2.1. Multiproduct Pricing

When specifying demand facing an individual retailer, it is critical to consider how individual products compete. In general, it is possible that every product sold by a retailer competes in demand with every product sold by every retailer. Yet, even though consumers can view retail prices from multiple retailers at once for any particular food item using online resources, the opportunity cost of doing so is high for individual items in consumers' consideration sets. Moreover, supermarkets often provide their own private labels, further complicating the ability of consumers to make store-choice decisions based on relative prices that retailers set on individual products. Instead, consumers tend to price-compare across retailers only for frequently purchased items and form an overall perception of a retailer's prices based on outcomes for food expenditure at the basket level. Economies of scope in consumer food markets drive households to purchase multiple products at a time from a single retailer, providing incentives for consumers to select among retailers according to convenience, quality, and price at the basket level.

Two approaches are commonly used to model pricing behavior in supermarket oligopoly models: purchase incidence models and multiproduct locational models. The workhorse in purchase incidence models is the nested logit model (Anderson & de Palma 1992). The underlying assumption of this model is that each consumer purchases one brand from among competing brands in a category. This model has been extended to consider multiple purchases in nested constant elasticity of substitution (CES) models (Richards & Hamilton 2006).

The multiproduct locational model considers a Hotelling-type structure in which consumers select retail stores according to distance from their home and workplace. The simplest structure is to consider duopoly retailers located at endpoints of a unit line with consumers distributed between them on the line with sufficiently large density that a set of consumers with different

tastes can be aggregated into a representative consumer at each location.[1] The representative consumer at each location has indirect utility of the form $v(p, n)$, where p is the vector of retail prices and n is the number of products available. An example of a utility structure that captures consumer preferences for product variety is the symmetric substitutes model of Dixit & Stiglitz (1977), $U(x, n, x_0) = u\left(\sum_{i=1}^{n} x_i^{\theta} \mathrm{d}i\right) + x_0$, where aggregate utility is assumed to be separable between the retail products, $x \in (0, n]$, and a numeraire good, x_0, and where $0 < \theta \leq 1$ measures the degree of substitutability between products. To address problems involving variety choices, this equation can be written for a continuum of goods as

$$U(x, n, x_0) = u\left(\int_0^n x_i^{\theta} \mathrm{d}i\right) + x_0. \qquad 1.$$

Product diversity is more valuable to consumers for smaller values of θ, and the products are perfect substitutes when $\theta = 1$, in which case variety has no value to consumers. For cases in which $\theta < 1$, indirect utility, $v(p, n)$, is strictly increasing in variety, n.

For any utility structure, the effect of prices on indirect utility is given by Roy's identity, $x_i^* = -[\partial v(p, n)/\partial p_i]$. For utility functions of the form of Equation 1, the effect of product variety on indirect utility in symmetric equilibrium is $\partial v(p, v)/\partial n = [(1 - \theta)/\theta]px$.

The multiproduct locational model with one-stop shopping is helpful in explaining both product variety choices by retailers and cross-sectional pricing incentives. To see this, consider a Hotelling model with multiproduct retailers on each end of a unit line segment and representative consumers distributed uniformly on the segment with unit mass. Consumers visiting retailer i receive indirect utility units, $v(p_i, n_i) - t\delta$, from purchase of a multiproduct basket from retailer i; here, δ is the consumer's distance from the retailer and t is transaction cost per unit of distance. Letting $\delta^*(p_i, p_j) = 1/2 + (1/2t)[v(p_i, n_i) - v(p_j, n_j)]$ denote the location of the consumer indifferent between purchasing a basket from either retailer, demand facing retailer i is

$$\Pi^i(p_i, p_j) = \delta^*(p_i, p_j)\pi_i(p_i) - F, \qquad 2.$$

where $\pi_i(p_i) = \sum_{i=1}^{n}(p_i - w_i)x_i(p, n)$ is per-customer profit from consumers who shop with retailer i; w_i is the wholesale price of good i; $x_i(p, n)$ is consumer demand for good i; and F is fixed cost, a portion of which may be sunk.

Notice that retail profit can be decomposed into two components: (*a*) $\pi_i(p_i)$ is the intensive margin of retailer profit for customers visiting retailer i, and (*b*) $\delta^*(p_i, p_j)$ is the extensive margin of prices, where changes in price stimulate the so-called business-stealing effect that determines retailer i's market share of the consumer population. Profit on the intensive margin of retailer i depends only on her own prices, which implies that the first-order condition with respect to p_j $(j = 1, \ldots, n)$ is

$$\frac{-x_j}{t}\pi_i(p_i) + \delta^*(p_i, p_j)\left(x_j + \sum_{i=1}^{n} \frac{\partial x_i}{\partial p_j}(p_i - w_i)\right) = 0, \quad j = 1, \ldots, n. \qquad 3.$$

This condition has an intuitive interpretation. $\delta^*(p_i, p_j)$ is the number of customers who frequent store i according to the vector of retail prices selected by each retailer, (p_i, p_j). For each of these customers, the optimal price of each product is the monopoly price, $x_j + \sum_{i=1}^{n}(\partial x_i/\partial p_j)(p_i - w_i) = 0$. Under oligopoly, this term is positive—the retailer sets oligopoly prices below the monopoly price level—to equate the incentive to raise prices on the intensive margin with the

[1] Anderson et al. (1992, chapters 3–4) have shown that a representative consumer whose utility is increasing in product variety can stand for a heterogeneous population of consumers.

loss of customer purchases, $(x_j/t)\pi_i(p_i)$, which is the gain of the entire basket of purchases, $x_i = (1, 2, \ldots, n)$, for consumers on the margin who switch from the rival's store to the retailer's store following a discount in one of the retailer's prices, $dp_j < 0$.

The outcome is a form of Ramsey pricing. All strategic interaction among retailers is subsumed into the term $\delta^*(p_i, p_j)$. A small increase in the price of brand j shifts customers to rival retailers, $\partial\delta^*/\partial p_j = -x_j/t$, decreasing the retailer's sales across the entire basket of products sold by the retailer, $\pi_i(p_i)$.

The one-stop-shopping model conceptually underpins a large literature on strategic retail pricing. Pricing incentives can be considered for multiple brands within a store, and oligopoly pricing incentives can be considered across stores in a manner consistent with the nested logit (and nested CES) model. Below, we discuss applications to the problems of shopping basket pricing, price discrimination, consumer search, loyalty and habit formation, reference pricing, price fairness, and price obfuscation.

2.2. Shopping Basket Pricing

It is well understood that consumers purchase groceries not category by category but by shopping basket (Russell & Petersen 2000, Kwak et al. 2015, Richards et al. 2018b). Yet, most traditional models of retail pricing are conditioned on demand models that assume consumers purchase food by making decisions one category at a time. Given the importance of multiproduct pricing described in the previous section, it is not surprising that the implications of such shopping-basket models are economically important. For example, conventional wisdom suggests that complementarity within shopping baskets, for instance, when consumers purchase milk and breakfast cereal together, is likely to be procompetitive (i.e., resulting in lower equilibrium prices) as retailers seek to internalize intercategory pricing externalities for complementary goods. However, in an empirical model that includes products from four different food categories, Richards et al. (2018b) show that such complementarity can lead to higher equilibrium prices. The intuition is clear: Competing retailers in a given market have an incentive to lower prices on complementary products in order to build volume from customers already in their stores. Unlike a monopoly retailer, they also have an incentive to reduce all prices in an attempt to steal business from rivals. But because margins are driven lower for all products due to retailers' motives to drive larger basket sizes through complementary pricing, there is less incentive to steal customers from rivals in the resulting, low-margin business. As a result, selling complementary products can soften price competition. Such an empirical finding is exactly the opposite of what one would expect to find on the basis of analysis of single-category data.

One explanation for the emergence of megaretailers such as Walmart is that they capitalize on economies of scale inherent in retailing, as in the one-stop-shopping model described above. However, pricing complementarity can also lead to higher overall price levels for food products, which not only provides an alternative explanation for the rise of large retailers but also helps explain why increased investment is currently flowing into the food retailing industry (e.g., the entrance of Aldi into the US market and the purchase of Whole Foods by Amazon). The emergence of larger retail-store formats also enhances the opportunity for retailers to generate rents from cross-category purchases through price discrimination.

2.3. Price Discrimination

Food retailers are increasingly sophisticated in their use of highly granular data and price-optimization algorithms. Because consumers tend to choose retail outlets on the basis of

convenience, or habit, there is a strong argument that each store possesses a measure of local market power (Slade 1995). Consequently, most price-optimization efforts by food retailers are built on the assumption they are able to price-discriminate among the consumers who enter their store.

Research on the general topic of price discrimination tends to concern durable goods, based on the idea that vendors selling goods that tend to degrade in value over time face a time consistency problem. While sellers would like to be able to commit to low production levels in the present in order to create higher resale values in the future, when the future arrives they desire to produce more in order to take advantage of the higher prices. Consumers know that sellers have the incentive to overproduce in future periods, so they wait to purchase (Coase 1972, Anderson & Ginsburg 1994). When the future arrives, sellers validate consumers' expectations, discounting older goods. The presence of secondary markets facilitates this mechanism, as low-valuation consumers can simply buy used goods, which provide viable competition for new goods. Economic models of the role of secondary markets in durable good price formation are legion (Corts 1998, Takeyama 2002, Esteban & Shum 2007) but rely fundamentally on the fact that durable goods can be expected to provide a stream of services into the future, where the content of the service stream degrades very little with the passage of time. In the case of food, however, perishable items that do not sell by the end of the day are difficult to resell in a market for used goods.

In most retail markets, sellers have a well-defined mechanism for price discrimination. That is, manufacturers are able to produce a range of quality over which consumers are able to array themselves according to their willingness to pay for higher-quality items. In the theoretical literature, the conditions for profitable price discrimination by a monopolist are well understood (Mussa & Rosen 1978, Anderson & Dana 2009). Although differences in demand elasticity between market segments remains a necessary condition for price discrimination to be profitable, it is far from sufficient, as the curvature of demand is also important. Offering private-label, or store-brand, products is one way in which food retailers can price-discriminate among high-valuation and low-valuation consumers (Mills 1995); however, doing so is constrained if the local-monopoly assumption does not hold in practice.

In fact, much of the recent literature on food retailing regards retailers as oligopolists, competing on price and perhaps some other element of quality (Richards & Hamilton 2006). In oligopoly markets, the theoretical conditions for profitable quality-based price discrimination differ greatly. That is, both Holmes (1989) and Corts (1998) show that the outcome of price discrimination in oligopoly markets is likely to be much different from the monopoly result as firms compete for quality-loving consumers.

In general, a firm's ability to price-discriminate among consumers according to their preference for quality depends on the degree of market competitiveness. Armstrong & Vickers (2001) show that the optimal pricing schedule will be nonlinear, that is, Ramsey-like prices that consist of both a fixed and a variable part, intended to extract any surplus associated with quality differentiation. In their model, consumer preferences include both horizontal and vertical elements, although they do not consider the possibility that the incentive to price-discriminate results in a probability mass of consumers at some, low-quality level.

While there is a relatively large literature on the theoretical conditions for profit-enhancing price discrimination in either monopoly or oligopoly markets, there are relatively few empirical examinations in consumer nondurable-good markets. There are a number of examples from other types of markets—markets with settings that are arguably more amenable to second-degree, or quality-based, price discrimination (Verboven 2002). Because most empirical studies do not have access to cost data, examining whether price–cost margins reflect price discrimination is a difficult empirical question.

Of course, there are fundamental differences between price discrimination in monopoly and oligopoly markets. Media and technology markets may be more amenable to price discrimination due to the existence of positive network externalities (Nair et al. 2004) and the proliferation of local and item-specific monopolies. Crawford & Shum (2007) test an empirical model based on the Mussa & Rosen (1978) model of quality-based price discrimination, and find that cable firms with more monopoly power tend to degrade quality substantially relative to a competitive benchmark. In each of these settings, however, the market involves either long-term investments or one-time uses of a service, so the nature of quality differentiation differs from a retail food setting.

Consumer products that are both highly differentiated and frequently purchased likely offer less latitude for price discrimination. Repeat purchases mean that consumers tend to be well attuned to the horizontal differences among products, and examples of clear vertical separation are few. Among the empirical studies that examine price discrimination in food markets, a study by Nevo & Wolfram (2002) examines couponing activity in the breakfast cereal market and uses a price-discrimination argument to explain how couponing works. Although price discrimination is the orthodox explanation for why coupons seem to make sense, these authors' empirical results find the opposite, namely that coupon use is positively related to shelf prices, meaning that non-coupon prices tend to fall at the same time coupons are used. Besanko et al. (2003), in contrast, use a structural model of the vertical relationship between ketchup manufacturers and retailers to show that third-degree price discrimination is not a prisoner's dilemma but can be profit increasing. Studies of this nature, however, are constrained by the fact that, in the packaged-good industry, retailers are given products of fixed quality, so the notion that retailers can price to the distribution of willingness to pay for quality is only hypothetical.

When selling perishable goods like food products, however, retailers can sell products with a wider range of quality attributes. Separating vertical from horizontal differentiation in perishable-food markets is both necessary to identify quality-based price discrimination and a relatively tractable problem with high-quality scanner data. In summary, food-product retailers appear to have a relatively wide latitude to price-discriminate by selling fresh food that varies in quality and exploiting heterogeneity in consumers' preferences for quality.

2.4. Consumer Search

In contrast to the law of one price for homogeneous products sold in competitive markets, food retailers often sell identical products for dramatically different prices, even in online markets that facilitate price comparisons. Different prices for otherwise similar products can exist as an equilibrium outcome for a number of reasons, due to (*a*) the presence of a mix of informed and uninformed consumers (Varian 1980, Burdett & Judd 1983, Carlson & McAfee 1983), (*b*) markets that consist of consumers with both high and low valuations (Pesendorfer 2002), (*c*) variation in the degree of brand or store loyalty (Villas-Boas 1995), or (*d*) differences among consumers in their search intensity. In the last case, if the cost of searching is low, for instance, in an online shopping environment, we would expect to see the law of one price hold, at least approximately. However, this does not appear to be the case empirically, as Brynjolfsson & Smith (2000) document significant price variation in online markets, even for products such as books that are virtually identical across online retailers. Clearly, consumers do not search very much, even when doing so is relatively inexpensive.

Is this true for retail food markets as well? Using an empirical model based on the equilibrium price dispersion framework derived by Burdett & Judd (1983) and Hong & Shum (2006), Wildenbeest (2011) estimates search costs for food shoppers at the shopping-basket level. He uses a maximum likelihood approach developed by Moraga-Gonzalez & Wildenbeest (2008),

assuming that firms compete directly in utility space in the sense of Armstrong & Vickers (2001). While Wildenbeest (2011) focuses on single-product purchases (baskets of groceries), Richards et al. (2016a) consider a more general food retailing example based on a multiproduct mixed-strategy price equilibrium. They find that equilibrium price dispersion remains, even when considering baskets of goods that are priced according to more complex multiproduct pricing equilibria. On the basis of this literature, it is safe to assume that costly search is an empirical regularity in food retailing.

The broader implications of costly consumer search are critical for retail food prices for several reasons. First, with the purchase of Whole Foods by Amazon in 2017 and the expansion of online offerings from Walmart, online shopping for food has moved from a curiosity to an emerging trend and has become a competitive threat to the existing way of doing business. It is not clear, however, that lower search costs online will necessarily mean lower prices. Despite expectations that lower search costs should reduce grocery prices, an emerging literature on online search behavior provides evidence that demand elasticities for grocery items are systematically lower at online retailers than at their offline counterparts (Chu et al. 2008). While there are a number of plausible explanations for this seemingly paradoxical effect—for instance, online consumers may tend to be more time constrained, have higher incomes, or have higher brand loyalty than offline consumers—online retailing also allows consumers to search for very specific items in a relatively inexpensive way. For example, consumers searching for red Nike Air Jordan basketball shoes in a size 13 are likely to easily find them online but would have to search for days in a physical store.

Second, online retailers are less constrained in the extent of their product offerings than brick-and-mortar stores, leading to a long-tail effect that flattens the sales distribution across products.[2] The ability to search more efficiently for desired product attributes in online markets can sharpen interretailer product differentiation, reducing the elasticity of demand for foods sold online, thereby raising retail margins (Kuksov 2004, Cachon et al. 2008). In fact, empirical evidence suggests that the net effect of selling food online is to raise prices, not lower them (Richards et al. 2018b). At least in the United States, however, online food retailing is still in its infancy, so a broader conclusion regarding the long-term effects of shifting from offline to online food retailing remains an important empirical question.

2.5. Loyalty and Habit Formation

Whether online retailing becomes an habitual part of consumers' shopping behaviors is particularly important, given the pervasiveness of state dependence in shopping behavior. Indeed, retailers understand the value of loyalty and direct much of their marketing efforts to attracting, and retaining, valuable customers. Conventional reasoning suggests that loyal customers are less price sensitive, and thus represent opportunities for potential profit (Klemperer 1995), but more recent theoretical and empirical research suggests that the opposite may be true (Cabral 2009, Dubé et al. 2009, Richards & Liaukonyte 2019). We first discuss the empirical issues associated with identifying state dependence in food markets, and then return to the implications for equilibrium pricing.

Empirically distinguishing a loyal customer from one who merely purchases at the same store or purchases the same brand over time, due to habit or from unobserved preferences, is inherently difficult. In the early empirical literature on this issue, Heckman (1981) draws a sharp distinction between habit persistence, defined as the serial correlation in utility between successive purchases,

[2]Lower online search costs can result in deeper effective assortments, which is the segment of the product assortment that shoppers actually sift through to find the specific product attributes they desire.

and structural state dependence, defined as the effect of lagged purchases on current utility. Adding a third dimension to the empirical debate, Keane (1997) demonstrates the importance of accounting for unobserved heterogeneity in preferences when testing for the extent of state dependence in demand.

Conceptually, Liu-Thompkins & Tam (2013) draw a sharp distinction between "attitudinal loyalty" and habitual purchase. While both can generate observed repeat-purchase behavior, they derive from fundamentally different behavioral sources, as attitudinal loyalty reflects a much deeper commitment to a brand or firm and is often borne of careful reconsideration on each purchase occasion, while habit is more likely to derive from a desire to maximize convenience and minimize transaction cost. Because these behaviors differ in the level of consideration that underlies each purchase, they have dramatically different implications for cross-selling. While attitudinal loyalty is likely to generate many opportunities for cross-selling, habit is exactly the opposite, as the buyer is not likely to consider the salience of attributes of the purchased product for other, related purchases.

In the empirical literature, researchers now distinguish between four forms of state dependence (Roy et al. 1996): (*a*) structural state dependence, or the effect of previous choices on the decision made on the current purchase occasion; (*b*) incidental state dependence, or the serial correlation in utility between previous choices and the choices available today (Heckman 1981); (*c*) habituation, which captures a second form of serial correlation in choices actually made by households; and (*d*) unobserved heterogeneity, or the notion that factors unique to the individual, yet unobserved, may mean that the consumer purchases the same item on subsequent trips simply out of idiosyncratic preference (Keane 1997). Separately identifying the independent effects of each of these four factors is clearly challenging and typically requires a deep panel data set in which the econometrician observes multiple purchases over a range of alternatives from a relatively large number of cross-sectional units.

In the recent literature on food retailing, Adamowicz & Swait (2013) adopt a completely different way of thinking about repetitive purchases from the usual state-dependence explanation. They conceptualize repeat purchases either as coming from a repeated, yet complete, evaluation of all alternatives, arriving at the same conclusion each time, or as one of two alternatives. On one hand, if consumers are so-called cognitive misers, they may seek heuristics in decision making and simply choose the same thing as on the previous trip out of simplicity, to avoid having to decide. On the other hand, they may choose the exact opposite in order to manifest a desire for variety. Adamowicz & Swait (2013) devise a two-stage econometric framework that consists of a decision mode and a decision stage and apply it to two categories from the widely available household panel data. They find that their model outperforms a simple state-dependence model, suggesting that their two-stage procedure is preferable. While understanding the importance of loyalty and habituation is potentially important for retail pricing, few retailers are able to exploit a mechanism for profitable price discrimination according to loyalty status.

Dynamic-pricing equilibria, generally modeled as Markov-perfect equilibria (MPE), may be fundamentally different from more usual, static, Bertrand–Nash equilibria. If food consumers' purchases, whether at the brand or store level, are indeed state dependent, then the equilibrium prices may differ qualitatively from static prices. In the theoretical literature on this issue, Rhodes (2014), Villas-Boas (2015), and Cabral (2016) show how loyalty, or switching costs more generally, can potentially be procompetitive, even in a market with frequently purchased consumer goods. At the very least, stores have an incentive to compensate consumers for switching through lower prices (Arie & Grieco 2014). Arie & Grieco (2014), however, do not offer a mechanism for valuing the extent of compensation associated with consumer switching costs. Richards & Liaukonyte (2019), by contrast, argue that the compensation argument of Arie & Grieco (2014) is more general

in that switching consumers must be compensated for not only the fixed costs of switching but also the real option that switching costs create. Because real option values tend to create a gap between grocery prices that would otherwise induce switching between stores, they argue that loyalty likely induces larger gaps in prices between stores, and less apparent competition, than would otherwise be the case.

Empirical tests of pro- versus anticompetitive effects are rare in a food retailing context. Dubé et al. (2009) show that the magnitude of switching costs in the orange juice and margarine categories are sufficient to lead to lower retail prices. However, Richards & Liaukonyte (2019) argue that switching costs among stores, and baskets of groceries, are likely to be more substantial and more important for retail pricing. Using a MPE pricing model, they find that state dependence is perhaps the most important factor in consumers' choice of stores, and as a result, switching costs both are substantial and lead to significantly lower prices than a static model would suggest. Somewhat counterintuitively, therefore, the recent literature on retail-store choice suggests that loyalty to retail stores is more likely to be procompetitive than anticompetitive.

2.6. Reference Prices

Empirical models of store choice, and brand choice for that matter, implicitly assume that consumers are fully informed of all alternative prices and can perfectly recall prices from their own shopping experiences. These models also assume that consumer willingness to pay is absolute, and not dependent on some reference point. However, in reality, consumer knowledge and recall may instead be somewhat less clear, so reference prices may be more important in driving consumer choice (Mazumdar et al. 2005).

In the literature on this topic, there are two forms of reference prices: internal and external. Internal reference prices, on one hand, refer to prices that are stored in memory on the basis of perceptions of actual, fair, or other price concepts (Klein & Oglethorpe 1987, Winer 1988, Bell & Lattin 2000, Mazumdar et al. 2005, Richards et al. 2015). External reference prices, on the other hand, form from observed stimuli in the purchase environment—for instance, the price charged by another retailer, the price of a similar product (Briesch et al. 1997), or point-of purchase shelf tags such as MSRP (manufacturer suggested retail price) (Blair & Landon 1981). Mayhew & Winer (1992) find that both internal and external reference prices affect purchase probabilities; however, in their model, the magnitude of the discount has the same explanatory power as the existence of the discount, suggesting that consumer choice might be due to indication of savings rather than the amount of discount.

Empirical research shows that consumers do not respond to small differences between observed and reference prices, or show "latitudes of price acceptance" (Gupta & Cooper 1992). In other words, consumers appear to be insensitive to price changes between an upper and a lower threshold surrounding the reference price. Eichenbaum et al. (2011) find that reference prices are also inertial and have an average duration of roughly 1 year, even though weekly prices change roughly once every 2 weeks.

These thresholds are often explained as behavioral phenomena, for instance, according to assimilation–contrast theory, adaptation-level theory, or prospect theory. While such violations of rational economic behavior are possible, behavioral explanations lack generalizability and predictability. More importantly, future research should strive to formalize these phenomena with an explanation that is more grounded in microeconomic theory. Richards et al. (2015) present one such explanation. According to them, consumers may not respond to small changes in price simply because they recognize the real option embedded in the decision to change their behavior. If consumers face uncertain retail prices and incur fixed costs in searching for grocery products (Hong

& Shum 2006, Moraga-Gonzalez & Wildenbeest 2008, Wildenbeest 2011, De Los Santos et al. 2012), then every purchase decision embodies a real option value. Waiting until the uncertainty surrounding the retail price is resolved creates a potentially significant value for the option holder. Allowing the shelf price to change either upward or downward sufficiently to make exercising this option worthwhile creates a zone of apparent acceptance around the reference price. In this zone, the consumer neither capitalizes on the opportunity to take advantage of a perceived deal on the product nor reluctantly responds to an underlying need for a product that is deemed relatively expensive. Intuitively, consumers know that if retail prices are volatile, there is a chance that the price will either fall far enough to make immediate purchase a wise decision or rise far enough to fulfill a need at an apparently usurious price. Waiting for either to happen creates inactivity that results in hysteresis, or the persistence of a phenomenon even after its initial cause has disappeared. Richards et al. (2015) show that the real option explanation is preferred to the behavioral alternatives using scanner data from the breakfast cereal category.

The existence of reference prices, internal or external, explains the existence of a number of related behavioral biases, such as inequity aversion due to unfair pricing or perceptions of value due to price obfuscation. We discuss these issues next.

2.7. Price Fairness

Perhaps due to its fundamental importance for the viability of any pricing system, price fairness has assumed a prominent place in both economics (Rotemberg 2011) and marketing research (Xia et al. 2004). Central to any model of price fairness is the notion that buyers, either explicitly or implicitly, have some sort of reference price they use to assess whether or not a price is fair. Quite simply, fairness is not an absolute concept. So what exactly constitutes a fair price in the mind of a consumer? Consumers form benchmarks of fairness in a number of ways: perceptions of the seller's cost (Kahneman et al. 1986, Bolton et al. 2003), buyers' previous experience with the product or seller (Bolton et al. 2003, Darke & Dahl 2003), cultural differences among buyers (Bolton et al. 2010), competitor prices (Bolton et al. 2003), loyalty to the retailer (Martin et al. 2009), the procedures used to set prices (Maxwell 2002, Shehryar & Hunt 2005), the motives inferred for setting prices (Campbell 2007), any perceived violation of social norms in price setting (Garbarino & Maxwell 2010), and interpersonal differences in prices (Ordóñez et al. 2000, Darke & Dahl 2003, Anderson & Simester 2008, Allender et al. 2019).

Retail prices can evoke feelings of unfairness among consumers for a number of reasons. Kahneman et al. (1986) argue that consumers are motivated by a sense of dual entitlement, which maintains that consumers' perceptions of price fairness are governed by the notion that firms are expected to earn a reference level of profit, and consumers expect to pay a reference price. If consumers believe that a price increase is driven by higher demand—for example, a snowstorm raising the demand for shovels (Kahneman et al. 1986)—then the price is more likely to be viewed as unfair than if it were driven by higher costs of selling shovels. While interpersonal notions of equity are implicit in the reference price according to Kahneman et al. (1986), equity theory (Oliver & Swan 1989) makes such comparisons explicit as a basis for evaluating the fairness of a price. According to equity theory, the perception of a deal is guided by the reasoning that consumers perceive a deal to be fair when all participants in the market share a common ratio of benefits to costs (Darke & Dahl 2003, Xia et al. 2010).

This interpretation of equity theory relies on outcomes, or distributive justice, but prices that are set according to rules that are deemed to be per se unfair are regarded as violations of procedural justice (Martin et al. 2009). Maxwell (2002), for example, finds that consumers will regard prices as more fair, and will be more willing to purchase from one retailer relative to another, if

they are aware of the rules used to set prices. Procedural justice, however, is often judged specific to an industry or market, as perceptions of justice are made relative to social norms that have evolved differently from one context to the next (Xia et al. 2004). Social norm theory explains why airline passengers do not appear to mind paying different prices from others in nearly identical seats, while Amazon was forced to abandon its attempt to price DVDs the same way in 2000 (Garbarino & Maxwell 2010).

Regardless of social norms, buyers are more likely to be satisfied with the price they paid if they feel they received a good deal (Darke & Dahl 2003). Transaction utility theory (Thaler 1985) maintains that buyers obtain some benefit simply from the perception that they paid less than their reference price—and references prices can be established through interpersonal comparisons. In the context of discriminatory pricing, each of these theories would predict that price transparency—knowledge of what others paid—can lead to perceptions of inequity through any one of a number of mechanisms. Each of these theories contains an element of a more general theory of how consumers form perceptions of price fairness, perceptions that are influenced by how much surplus exists to be allocated in the transaction, and how interpersonal considerations of inequity can affect the equilibrium allocation. Food retailers, therefore, are generally constrained in their ability to price-discriminate, or use dynamic-pricing algorithms, by consumers' perceptions of inequity (Richards et al. 2016b).

In ultimatum games, the leader often offers a far larger allocation of her endowment to the follower than would be predicted by the subgame perfect equilibrium solution (Ho & Su 2009). If players are fairness minded, and consider the payoffs to the other in making their decision, then the equilibrium offer is much greater than predicted by standard game-theoretic solutions. Fehr & Schmidt (1999) develop a model of inequity aversion in which agents' utility is reduced when they make either less or more than others in the game. Charness & Rabin (2002), however, maintain that experiments based on models of simple inequity aversion are inherently confounded by designs that allow for only difference reduction, not reciprocity or the ability to improve social welfare more generally. Ho & Su (2009) argue that these models capture peer-induced fairness by considering only the payoffs of agents in the same situation as themselves, and not broader concerns of distributional fairness among other players in the game. In a food retailing context, this literature highlights the importance of recognizing consumers' perceptions of fairness, in terms of both the prices paid by others and the amount of profit made by the retailer.

Connecting fairness perceptions and demand is critical to understanding whether a discriminatory pricing regime will succeed or fail. Among those who consider this question, Anderson & Simester (2008) use a large-scale, choice-based field experiment to study the question of why retailers do not offer premium prices for larger-size clothing, even when they typically pay wholesale premiums for plus sizes. They find that buyers of sizes that marginally qualify as large perceive premiums as unfair and are less likely to buy as a result. Anderson & Simester (2010) find that customers react by making fewer subsequent purchases if they buy a product and later observe the same retailer selling it for less, attributing this effect to consumer antagonism. Losing some customers, however, does not necessarily mean that discriminatory pricing is suboptimal but, in fact, increases net demand as the elasticity of demand is inversely related to its level. If perceptions of price fairness affect demand, then rational retailers should respond accordingly. Rotemberg (2011), for example, argues that optimal pricing is constrained by considerations of fairness. As food retailers continue to adopt increasingly sophisticated pricing methods, therefore, they need to be keenly aware of the potential negative effects that new pricing strategies may have on consumer demand (Richards et al. 2016b).

2.8. Price Obfuscation

The observation that consumers do not search completely, or that there are substantial barriers to search, means that retailers can engage in strategic obfuscation. Strategic obfuscation implies that sellers may adopt strategies that are intended to prevent price comparison among a set of identical, or at least readily substitutable, products (Ellison & Wolitzky 2012). For example, insurance providers tend to provide subtly different contract terms in order to prevent consumers from comparing the true coverage per dollar of premium among firms, and online vendors often require the user to click through several web pages before discovering the real price of an item (Ellison & Ellison 2009).

In the price-obfuscation literature, there are two types of obfuscation: (*a*) adding attributes to obscure the true nature of the product (Gabaix & Laibson 2006, Ellison & Ellison 2009) and (*b*) making the pricing structure itself sufficiently complex that consumers have difficulty determining the true price (Carlin 2009, Wilson 2010).[3] If interpersonal price comparisons do indeed represent a significant barrier to a firm's ability to price-discriminate, then preventing price transparency represents another potential source of market power.

Much of what we know about strategic obfuscation is based on settings in which firms are able to vary the attributes of their product such that direct price comparisons are difficult, or at least more costly (Ellison 2005, Gabaix & Laibson 2006).[4] If firms have the ability to add on features that raise the final price, but are not necessarily advertised, they can use these features to price-discriminate in a competitive environment (Ellison 2005). Gabaix & Laibson (2006) show that when the market consists of a substantial number of naïve consumers who are unaware of the add-on premium, add-ons can proliferate in equilibrium. Essentially, add-ons are a form of strategic obfuscation, as they are intended to raise the effective price of an item without affecting the shelf price, or the price that consumers initially see when searching for the product. Because adding features to mass-produced consumer products is often not possible, these models describe a special case that is not typical of most retail markets. Moreover, empirically, strategic obfuscation through attribute complexity is difficult to identify independently from mere differentiation, particularly at the level of differentiation typical of retail food markets.

There are examples of strategic obfuscation in many other markets. For example, Carlin (2009) shows that prices rise in the complexity of prices charged for financial products, and interprets complexity as strategic obfuscation. Somewhat counterintuitively, he shows that this effect does not go away as the number of firms increases, as the degree of complexity rises as well. The reason is straightforward: As more firms enter, each firm receives a smaller share of expert buyers. Therefore, their best response is to increase the level of complexity in order to increase rents from uninformed consumers in the absence of expert consumers. Each firm faces the same incentive, so the fraction of informed consumers falls as firms enter and complexity reduces competition more generally. Firms actively manage the level of obfuscation as the proportion of uninformed consumers is endogenously determined by the complexity choices made by the firms. Food retailers, therefore, can potentially engage in strategic obfuscation simply by making the pricing structure more complex.

Others predict that complex pricing structures can lead to higher equilibrium prices. In fact, how prices are framed can affect complexity (Spiegler 2006, Chioveanu & Zhou 2013), where

[3] Ellison & Wolitzky (2012) describe a more general form of obfuscation that can include both attribute and pricing obfuscation as special cases. They show that it is individually rational for firms to obfuscate in a competitive model of costly search and oligopolistic rivalry.

[4] Versioning is a type of obfuscation through attribute variation in which the intent is to induce consumers to self-select into higher- or lower-priced variants where the difference is unrelated to cost (Varian 1997).

price framing refers to how prices are presented to the consumer—in retail gasoline, prices are defined on a per-gallon basis, but are offered per box, or per unit, in the retail consumer packaged-good industry. Chioveanu & Zhou (2013) find that, in equilibrium, firms randomize their choice of price frame in order to reduce the elasticity of demand and sustain positive profits. Firms choose both frame differentiation and frame complexity, so there are two separate dimensions through which obfuscation enters the model. Piccione & Spiegler (2012) find a similar result in a model in which firms compete in both prices and complexity, while Muir et al. (2013) demonstrate the importance of obfuscation in a service context. Such obfuscation in services is common, but it is difficult to disentangle horizontal differentiation from complexity in pricing schedules. In a food retailing context, retailers such as Walmart now offer a wide range of in-store services, potentially increasing their opportunities to raise overall store margins through this mechanism.[5]

Determining whether complexity rises to the level of obfuscation may be easier in the lab. For example, Kalayci & Potters (2011) induce subjects' preferences for a hypothetical consumer good, so the subjects are able to hold willingness to pay constant while the complexity of the pricing terms is varied. These authors define complexity in terms of the number of attributes their subjects must consider in comparing products, while the attributes do not affect utility directly. By allowing complexity to vary randomly over a series of product choices, Sitzia & Zizzo (2009) attempt to disentangle subjects' aversion to complexity from their sense of being exploited; they find no evidence of complexity aversion and only weak evidence in support of their exploitation hypothesis.

Obfuscation is likely to be important in an online environment, as discriminatory pricing through internet-based retail platforms invites buyers to compare the price they paid with others. Interpersonal differences in price are likely to be among the more salient drivers of fairness perceptions online, as discriminatory pricing relies on interpersonal differences in willingness to pay in order to extract the most surplus from the market (Gelbrich 2011). Providing context for interpersonal comparisons is critical in establishing expectations that a system of pricing will yield outcomes that are, while not always similar among buyers, at least acceptable (Darke & Dahl 2003, Anderson & Simester 2008). Perceptions of unfairness, however, do not necessarily mean that a system of discriminatory pricing is inherently untenable. Weisstein et al. (2013), for example, show that framing prices in terms of dollars off or percent off can reduce the perception that a price gap between one consumer and another is unfair, and can improve the level of trust in the vendor. In contrast, Piccione & Spiegler (2012) also show that framing can be an effective means of obfuscation. Food retailers understand these tools well, as they often frame discounts in different ways, even within the same page of ads.

As an example of strategic obfuscation in the food retailing industry, Richards et al. (2019) consider the case of retailers in France offering slightly different packages of Coca Cola–branded products for substantially different prices. While retailers are likely to offer different packages for reasons other than strategic obfuscation, perhaps as a means of horizontal differentiation, as second-degree price discrimination, or to practice block pricing, Richards et al. (2019) control for each of these other strategies and identify significant margin differences due purely to obfuscation. In an experimental context, Allender et al. (2019) show that strategic obfuscation may be an effective means of overcoming consumers' concerns regarding the inherent unfairness of price discrimination. Simply, according to Allender et al. (2019), if consumers do not see the prices others pay, then any dissatisfaction they may have with paying a higher price is moot. Perhaps most importantly, higher margins in this case persist even when consumers are fully aware that the seller is obfuscating.

[5]Piccione & Spiegler (2012) argue that their approach provides a new interpretation of differentiation that admits perceptual differentiation through framing complexity.

In food retail markets, personalization is regarded as a way to move consumers away from nontargeted mass discounts in order to improve retailers' profit. Since food retailers are increasingly turning to such price-discrimination schemes, they need to realize that such pricing strategies are highly risky due to consumer fairness concerns. Several large retailers seem to understand these concerns and are currently exploring different ways to implement personalized pricing with reduced price transparency. For example, Sam's Club rolled out checkout apps that show individual prices to consumers without others noticing. Moreover, Kroger is piloting a digital shelf edge—a technology that uses in-store sensors and analytics to provide product recommendations and custom pricing discreetly through mobile devices. Future research should investigate how successful such sophisticated pricing approaches are in reducing fairness concerns in the contexts of food-price personalization.

3. SUPPLY SIDE AND RETAIL PRICING

Retail-pricing strategies include pricing in upstream markets, and upstream markets are particularly important in the food retailing industry. Absent food manufacturers and distributors at the wholesale level, retailers would essentially mediate prices between sets of competitive, price-taking farmers and consumers. Unlike the usual vertical structure considered in manufactured-goods markets, in which vertical restraints to correct such things as double marginalization tend to be set by manufacturers to control retailer behavior, retailers are large players in food markets. As such, they are often capable of influencing prices in competitive farm product markets, for instance, as the buyer for its own private-label product. In this section, we describe retail-pricing incentives on the supply side of food markets.

3.1. Slotting Allowances

Slotting allowances are a common practice in grocery retailing. Slotting allowances, which are upfront tariffs paid by manufacturers to retailers for access to supermarket shelves, are especially common in frozen and refrigerated foods, dry grocery, beverages, snacks, candy, and microwaveable shelf-stable foods, with magnitudes that range between $75 and $300 per item per store in the United States. The economic effects of slotting allowances are highly controversial. On one hand, slotting allowances can enhance efficiency, for instance, by pricing scarce shelf space (Sullivan 1997), by allocating the risk of product failure between retailer and manufacturer (Bloom et al. 2000), or by providing a signaling element for manufacturers to reveal private information about product success to retailers (Lariviere & Padmanabhan 1997, Richards & Patterson 2004). On the other hand, slotting allowances can have anticompetitive effects, serving as a mechanism for retailers to exercise market power over consumers by facilitating higher wholesale prices that signal rival retailers an intent to set correspondingly high retail prices (Shaffer 1991), or for food processors to acquire a leadership position in farm procurement markets by contracting with retailers for higher wholesale prices (Hamilton 2003). Slotting allowances can also reduce market access by foreclosing markets to de novo entrants (Marx & Shaffer 2004) and serve as an instrument for national brand manufacturers to control the retail prices of private labels (Innes & Hamilton 2009).

Hamilton & Innes (2017) examine the effect of slotting allowances on retailer incentives to provide product variety and demonstrate that slotting fees result in superior outcomes for product variety. Longer product lines create better matches between consumers and brands, increasing consumer utility and thereby providing an opportunity for retailers to capture consumer rents from lengthening their product lines. Absent slotting allowances, product variety is undersupplied

in the retail market equilibrium, because rival retailers respond to longer product lines by cutting retail prices, and anticipating this pricing response of rivals deters each retailer from increasing product variety. Slotting allowances raise equilibrium retail prices, increasing returns on the margin from introducing new products in the consumer market, which in turn provides an incentive for retailers to increase product variety.

3.2. Retail Pass-Through

There is overwhelming empirical evidence that retail prices rise faster than they fall in response to wholesale-price variation, both in food and agricultural markets (Ward 1982, Azzam 1999, Goodwin & Holt 1999) and for other items, most notably gasoline (Borenstein et al. 1997) and consumer goods more generally (Peltzman 2000). Similarly, higher retail costs tend to be passed along more completely than lower retail costs. Although there are a number of potential explanations for asymmetric retail price adjustment, from adjustment costs (Slade 1999) to kinked demand curves (Bailey & Brorsen 1989), this so-called rockets and feathers phenomenon is typically attributed to market power, as retailers are able to pass wholesale-price increases on to the consumer but face little competitive pressure to reduce prices when their costs decrease.

Rarely, however, do empirical researchers subject the market power explanation to a formal test. Admittedly, it is tempting to claim that asymmetric pass-through is due to market power, as retailers tend to profit by not passing wholesale-price reductions on to consumers. However, because the empirical evidence spans many different retail product markets that are considered to be highly competitive, the conclusions drawn from the asymmetric pricing literature regarding the evident exercise of market power has come into question. Rather, incomplete or asymmetric pass-through may instead be due to consumers' rational search strategy as well as retailers' response (Yang & Ye 2008, Tappata 2009, Richards et al. 2014).

The distinction between consumer search and market power as explanations for asymmetric price adjustment is not just an academic curiosity. When food prices are rising, the public media and many legislators point to positive retail margins as evidence of excessive market power and usurious pricing policies as likely causes of retail food-price inflation. Moreover, Richards & Hamilton (2015) show that consumers can be shielded from price pass-through when retailers respond to wholesale-price increases by jointly increasing prices and reducing the depth of products offered, trimming poor-selling products out of the assortment to help moderate price increases on top-selling brands. If the true source of pass-through asymmetry lies in rational, competitive behavior on the part of both consumers and retailers, then food-price inflation is an expected, yet unfortunate, structural outcome of the food marketing system.

Reflecting a broad skepticism that market power could explain such a pervasive phenomenon, Yang & Ye (2008) and Tappata (2009) explore theoretical explanations that assume pass-through is determined as an equilibrium between competitive firms and rational consumers. Tappata (2009) extends the explanation for equilibrium price dispersion developed by Varian (1980) to endogenize consumer search behavior. He shows that rational consumers will search more when prices are rising relative to when they are falling, so prices adjust more quickly in an upward direction—exactly the rockets and feathers observation, but without market power. Yang & Ye (2008) also explain asymmetric price adjustment using a model of consumer search, but the underlying mechanism is driven by learning asymmetries: One group of consumers learns of cost increases faster than it learns of cost decreases, so the elasticity of demand (which rises in the number of searchers) is higher for price increases than decreases, again leading to the same asymmetrical adjustment result with no market power. Despite the emergence of consumer search as a theoretical explanation for asymmetric pass-through, empirical tests remain rare.

Similar to food retailing, gasoline markets provide a setting that is readily amenable to empirical study. Lewis (2008) and Chandra & Tappata (2011) provide empirical evidence in support of the consumer search model in gasoline markets, but they do not explicitly include market power as a potential alternative explanation. In a food retailing context, Richards et al. (2014) test a traditional market power explanation against a mechanism reflecting Tappata's (2009) search-based explanation, and show that asymmetry in retail food-price adjustment is more likely due to frictions in consumer search, and not market power possessed by retailers. On the basis of this literature, we can conclude that the rockets and feathers phenomenon, and retail pass-through in general, may be better conceived of as a problem in consumer search, and not one of market power.

3.3. Bargaining Equilibria

Empirical researchers are now thinking differently about pricing power at the retail level. While the debate once revolved around whether retailers and suppliers play Stackelberg-type games or whether Bertrand competition at each level was more the norm (Villas-Boas & Zhao 2005), more recent models frame vertical relationships between retailers and suppliers in terms of axiomatic Nash bargaining models (Draganska et al. 2010, Richards et al. 2018a). With these models, interest centers not on market power in the traditional sense but rather on bargaining power, defined as the ability to negotiate a larger share of the entire margin, or retail price less production cost.

Structural models of bargaining equilibria between retailers and manufacturers are, by now, reasonably well understood. These models maintain that the solution to the Nash bargaining problem between retailers and manufacturers yields a single parameter that is able to measure the relative bargaining power of the parties. Combined with the level of disagreement profit, or profit earned if negotiations fail, facing each party, the level of bargaining power determines the share of the total margin that is appropriated by either the manufacturer or the retailer (Draganska et al. 2010). Within this framework, researchers often focus on structural factors that underlie the degree of bargaining power exercised by either side (Meza & Sudhir 2010), the role of demand interrelationships among downstream retailers (Richards et al. 2018a), the form of contract between retailers and manufacturers (Lim & Richards 2019), or even the role of antitrust law in regulating the nature of the bargaining relationship (Yonezawa et al. 2020). Yet, there are many issues that remain to be explored within this bargaining framework.

There is a deep theoretical literature that explores the nature of Nash bargaining equilibria. For example, one strand of the literature explores the importance of the structure of demand relationships downstream (Bulow et al. 1985), while another applies the same logic to better understand the nature of supply-chain contracts (Iyer & Villas-Boas 2003). Because bargaining is inherently contextual, the applications, and power, of this approach appear to be without limit.

Importantly, how the total margin is allocated depends on two elements: (*a*) the disagreement profit, defined as the profit that accrues if negotiations fail and the product is not sold, and (*b*) the bargaining power parameter, which depends on the inherent bargaining position of the two players. The disagreement profit term reflects the fact that if a product is not sold, the sales, and profits, of all the other items sold by the retailer, or manufacturer, are affected by the nature of the demand interrelationships each face. Draganska et al. (2010) solve for the equilibrium relationship between wholesale and retail prices by maximizing the generalized Nash (GN) product in wholesale prices for product *j*:

$$\mathrm{GN} = [\pi_j^g(w_j) - d_j^g]^{\lambda}[\pi_j^f(w_j) - d_j^w]^{(1-\lambda)}, \qquad 4.$$

where π^g is the retailer's profit; π^f is manufacturer, or supplier, profit; w_j is the wholesale price; d_j^w is the disagreement profit to the supplier for product j; and d_j^r is the disagreement profit to the retailer for failing to arrive at an agreement to sell the same product. In this expression, λ is the bargaining power parameter, which measures the relative power of the retailer (λ) and the wholesaler ($1 - \lambda$). Finding the wholesale price that maximizes the GN product, conditional on the demand relationships facing the retailer, determines the relative bargaining position of each party as well as how the total margin is allocated.

Despite the depth of the existing theoretical and empirical literature, many potential applications to food retailing remain. For example, Shaffer & Zettelmeyer (2004) consider how channel advertising, or advertising by different members of the same vertical channel, affects the relative market power exercised by each. However, they do so in a traditional framework, without considering disagreement profit explicitly, or bargaining. Actions taken by members of the channel that are designed to affect the allocation of profit should be addressed in a generalized bargaining framework. Antitrust law is another area in which bargaining may be important. For example, Yonezawa et al. (2020) examine whether the Robinson–Patman Act (RPA) is effective in achieving its intended goal—equalizing wholesale prices among competing retailers—in a Nash bargaining context. After controlling for differences in bargaining power among retail chains, they find that the RPA is ineffective, and indeed counterproductive, in protecting small retailers.

4. CONCLUSION

We argue that, despite the apparent competitiveness of the food retailing sector, food retailers have many opportunities to price above marginal cost. Retailers, for example, can price-discriminate between low- and high-quality products, as evidenced by the recent surge of ultrahigh-quality private-label products. Although price discrimination is constrained by consumers' perceptions of price fairness, we describe a number of ways in which retailers can obfuscate higher prices, whether by offering different versions of essentially the same product or by framing prices in ways that consumers find confusing. As the share of consumers' food expenditures spent online rises, retailers such as Walmart can be expected to exploit consumers' search behavior and offer a wider range of items to appeal to very specific tastes. Ultimately, food prices online may be higher than we expect. Retailers may also find new opportunities for profit in consumers' tendency to shop habitually, whether online or offline, although there is a growing body of evidence that such state dependence may, in fact, be procompetitive.

We also consider an emerging body of theoretical and empirical research that frames vertical relationships between suppliers and retailers in terms of bargaining power instead of the traditional market power approach. As the data available for empirical research become increasingly granular, and with wider access to wholesale-price data, we can learn much more about how product innovations, antitrust rules, and other considerations affect the allocation of profit between downstream retailers and upstream suppliers.

Future research should consider new ways of thinking about vertical relationships among farmers, manufacturers, and retailers. While the Nash bargaining model we describe above is one way to conceptualize how farmers interact with intermediaries further down the value chain, other approaches are available as well (Sexton 2012), including models of intermediation based on the relative degree of market power of food processors in upstream markets and retailers in downstream markets (Hamilton et al. 2015). A potentially fruitful opportunity for future research is to examine how market power is consolidated in an increasingly concentrated food system at each of the various points in the supply chain among farmers, distributors, food manufacturers, and retailers.

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