Forces Shaping World Food Markets and the Role of Dominant Food Retailers

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Abstract: This paper discusses recent developments in the structure of food markets worldwide, including rising consolidation and concentration, increased vertical coordination and control, and emphasis on multifaceted dimensions of product quality. Particular attention is paid to the role of international grocery retail chains in this process. I argue that these structure developments are inconsistent with the tenets of the perfect competition market model and discuss the consequences of misapplying the competitive model in these settings.


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In this paper I summarize some of the major structural changes influencing world agricultural markets. They include increasing consolidation and market domination by large processing, trading, and retailing firms, disappearance of traditional auction or spot markets for exchange of farm products and their replacement by various forms of contracts and vertical control, and a growing emphasis on product differentiation and increasingly broad dimensions of product quality. None of these changes is consistent with the tenets of traditional models of competitive agricultural markets. As a consequence, the competitive model is probably incapable of describing most agricultural markets in the world.

Because the competitive model is the simplest to use, a key question is the consequences involved in using it to analyze marketing problems and issues when the core assumptions of the competitive model are violated. I will show that for many key questions the consequences of misapplication of the competitive model can be quite profound, meaning that researchers must apply appropriate models of imperfect competition to study most modern agricultural markets.

Despite consolidation throughout the food market system, I argue that powerful grocery retailers, oftentimes with international scope, have emerged as the dominant players in the food chain in most parts of the world. Further, the way grocery retailers do business has also changed and is tied inexorably to the increasing vertical coordination and control in the food marketing system. Market channels have been streamlined and so-called “middlemen” are being eliminated. Traditional wholesale markets for fresh
foods have declined in importance and have been replaced by direct procurement from grower-shippers via contracts. Retailers through marketing contracts exercise considerable vertical market control over upstream suppliers in terms of varieties produced, inputs utilized, production schedules, etc. Yet we know little about grocery retailer pricing and promotion strategies or how these strategies affect both the level and variability of prices at the farm level. I will show that in general they act to the detriment of farmers, decreasing the mean farm price and increasing its variability.

In the subsequent sections of this paper, I provide more details on the major economic forces shaping world food markets, placing particular emphasis on the role of grocery retail chains and the impacts of their market power and pricing strategies on the welfare of farmers. Then I discuss the implications of these market developments for agricultural economics and for analysis based upon our traditional models.

**Forces Shaping World Agricultural Markets**

The food industry is highly concentrated in most developed countries at both the retail and processing stages and concentration is rising over time (Sexton 2000; Kaufman 2000; Rogers 2001; Dobson, Waterson, and Davies 2003). Ability to track these trends in the U.S. is diminished by reduced data collection at the national level, so in many cases the most recent statistics are quite dated. The average 4-firm concentration ratio (CR4) in U.S. food manufacturing was about 76 percent in 1997, ranging from 62 percent in sugar cane mills to 98 percent in cigarettes. Average seller concentration in the EU is higher, ranging from an average CR3 of 55 percent in Germany to 89 percent in Ireland, with an average CR3 across 9 EU countries of 67 percent (Cotterill 1999).
Several important differences are apparent in the food retailing market structures in the U.S. and EU. Average CR5 in food retailing at the national level in the EU is 65 percent, much higher in the U.S., where the comparable figure is 35 percent (Cotterill 1999; McCorriston 2002). Because retail markets are localized in geographic scope, it is important in considering retailer oligopoly power to examine concentration at the local and regional level. In this regard, Cotterill reports that in 1998, CR4 in the U.S. averaged 74 percent across the top 100 US cities.

Consolidation through mergers and acquisitions has been a major factor contributing to increasing concentration. Domestic mergers and acquisitions in the food sector doubled between 1990 and 2002 (McCorriston 2002; Sexton and Sheldon 2004). Moreover, international mergers and acquisitions have also been increasing significantly. For example, EU-based retailers such as Royal Ahold and Sainsbury have expanded into U.S. markets, and Wal-Mart has expanded into the EU.

The emergence and evolving market domination of supermarkets in Africa, Asia, and Latin America is documented in Reardon et al. (2003), Hu et al. (2004), and Coyle (2006). The supermarket revolution in developing countries began in the larger cities of richer Latin American countries and then quickly spread to smaller cities and poorer countries on the continent. By 2000, the supermarket share of retail sales in Latin America was in the range of 50-60%, only slightly less than the 70-80% share attained in the U.S. over five decades. East and Southeast Asia experienced a similar diffusion, although beginning several years later than in Latin America. Africa is the most recent

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1 See Kaufman (2000), Kaufman et al. (2000), and Harris et al. (2002) for recent summaries of merger and acquisition activities in U.S. grocery retailing. See Cooper (2003) and Dobson, Waterson, and Davies (2003) for summaries of concentration issues in European food retailing.
front in the global development of retail chains, with South Africa at the forefront, where
Reardon et al. (2003) reported a 55% supermarket share of all retail food sales.

Just as the takeover of food retailing by large supermarket chains in developing areas
has not been uniform across countries, it has not been uniform across product categories.
It has been largest for packaged and dry goods, where the chains’ scale advantages are
most powerful, and lowest for fresh produce, although almost certainly that share is
destined to continue to rise over time, as consumers’ buying habits change. Particularly
noteworthy from the perspective of power in the global food market is that this growth
has been mainly accomplished by the large, international grocery chains, in particular,
Wal-Mart, Carrefour, and Royal Ahold, although smaller multinationals and regional
chains have also played a key role (Reardon et al. 2003).

*The Many Dimensions of Product and Firm Quality*

The term “quality” can refer to many dimensions of a product. In the context of food,
quality may refer to a product’s taste, appearance, convenience, brand appeal, and
healthfulness, but also to broader dimensions such as characteristics of the production
process (e.g., usage of chemicals, sustainability, physical location, or confinement
conditions of animals) and implications of production and consumption of the product for
the environment. Product quality in all of its dimensions is critical in modern food
markets. Consumers in high-income countries such as Europe and the U.S. want to
consume and are willing to pay more to consume foods that satisfy the quality
dimensions that are important to them (Misra, Huang, and Ott 1991; Govindasamy and
Italia 1999; Loureiro and Hine 2002, Teisl, Roe, and Hicks 2002; Kiesel and Villas-Boas
2007; Basu and Hicks 2008). Given the great heterogeneity among consumers in what food product attributes matter to them, considerable opportunities exist for product differentiation and exploitation of market niches.

Of course, most firms do not sell directly to consumers, but instead sell to market intermediaries who transmit information regarding consumer demands upstream and also introduce additional considerations relating to their own preferences. As open-market exchanges have become replaced increasingly with various forms of vertical market coordination and as downstream buyers have become increasingly powerful, transactions in the food sector have become more complex, involving more than the mere transfer of a food product.

Thus, in addition to the quality of the products being marketed, a second dimension of “quality” pertaining to the attributes of the firm producing and/or marketing the product has come to matter in modern, vertically coordinated market chains in terms of its abilities to satisfy the characteristics in a supplier sought by downstream buyers. For example, grocery retailers seek suppliers who can provide product reliably year around and in volumes necessary to meet their needs, provide ancillary services, such as category management, third-party product-safety certification, and electronic data interchange, and supply products across a category (Salin 1998; Calvin and Cook 2001; Dimitri et al. 2003).

The ability to meet many of the characteristics sought by downstream intermediaries relates at least indirectly to size or scale of the seller, a fact which helps to explain the steady trend towards increasing firm size and concentration in the food marketing sector. However, when the desired quality characteristics of the food products themselves are
considered, opportunities are created for well-positioned, small firms to exploit market niches. The “localvore” phenomenon (Ayres and Bosia 2008), in which adherents seek to consume only food products produced within a certain geographic bound of their location, provides the clearest example of a product-quality dimension that compels small-scale production. However, the same conclusion applies to various other product characteristics, such as those relating to specific production practices. First, to the extent that the product attributes are valued highly by a relatively few consumers, large-scale agribusiness is unlikely to be involved. Second, the practices themselves are usually labor intensive and not conducive to mechanization or other scale-intensive processes, mitigating or eliminating cost disadvantages for small-scale producers. Thus, although the seller-quality dimensions important to downstream intermediary buyers auger for large-scale sellers and a concentrated food marketing sector, the heterogeneous and evolving preferences of consumers are leading to a broadening of the dimensions of product quality and creating market niches conducive to the success of small-scale producers and marketers.

*Vertical Coordination and Control*

Vertical coordination and control and the use of production and marketing contracts is difficult to measure in a quantitative way because the extent of vertical relationships exists on a continuum, ranging from essentially none in open-market transactions to complete control in the case of vertical integration. Although contracts have been widely used in agriculture for a long time, their incidence is increasing and extending to the
developing world and, further, the amount of control exercised is increasing. In almost all cases control is exercised by the downstream trading partner, who restrains the behavior of upstream suppliers. Notably, this is opposite of the direction given in the standard model of vertical control, which features an upstream manufacturer constraining the behavior of downstream retailers charged to sell its product.

The evolution towards greater degrees of vertical control is, of course, not independent of the other major trends influencing the food sector. Contracts are a device to surmount the information problems that can lead to diminished product quality. By actually controlling use of key inputs, including their application, downstream firms address moral hazard issues that would otherwise diminish product quality and increase food safety issues. Contracts can also specify quality standards and thereby address adverse selection problems that might be caused by failure of the open market to adequately recognize and reward quality.

Thus, there is little doubt that contract production can improve market efficiency and align production with the demands of the market for particular quality attributes. Contracts, however, may also be a device to consolidate buyer market power, and they may result in the exclusion of the smallest producers, leading to further consolidation at the farm sector.

**Grocery Retailer Power and Farmer Welfare**

High concentration among food retailers raises genuine concerns about retailers’ ability to influence prices charged to consumers through exercise of oligopoly power, and prices

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2 Contract farming, where a downstream processor/marketer provides inputs and technical advice to producers, has been a key approach to incorporating smallholders into high-quality export supply chains (e.g., Key and Runsten 1999; Takane, 2004).
paid to suppliers through exertion of oligopsony power. Consumers are distributed geographically and incur nontrivial transaction costs in traveling to and from stores. This condition leads to a spatial distribution of grocery stores, and gives a typical store market power over those consumers located in close proximity to the store (Faminow and Benson 1985; Benson and Faminow 1985; Walden 1990; and Azzam 1999). These considerations make grocery retailing a “natural oligopoly” (Ellickson 2007). Other considerations that enhance retailers’ power to influence consumer prices include imperfect information among consumers (e.g., as to the prices that are being offered), and differentiation among retailers based upon the services they emphasize, advertising they conduct, and marketing strategies they pursue.

Retailers’ role as buyers from commodity shippers and food manufacturers has received comparatively little attention. Large food manufacturers with prominent brands are likely able to countervail any retailer buying power, but farmers when they sell directly to retailers and private-label manufacturers lack similar bargaining power. The imbalance of bargaining power is exacerbated in industries where the farm product is highly perishable because farmers cannot access outside selling opportunities or defer sale through storage in hopes of attracting a better price.

Fresh produce commodities provide some of the better opportunities to examine retailer buying power because farm prices are typically reported publicly, as are shipping

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3 Cotterill (1993) contains a debate on the issue of oligopoly power in grocery retailing, and Connor (1999) and Wright (2001) provide relatively recent critiques of research into the concentration-price relationship in grocery retailing.

4 Weatherspoon and Reardon (2003) and Reardon et al. (2003) describe retailers’ use of centralized procurement systems and spatially dispersed distribution centers that may encompass multiple countries in developing regions. These devices consolidate the chain’s buying power. Buyer power may well be most pronounced in developing countries where agricultural markets are characterized by dominant buying firms, buyer collusion (with no legal means to prevent it), and a general lack of selling opportunities for farmers. See Mérel, Sexton, and Suzuki (2009) for a summary of literature on buyer power in developing countries.
costs to major consuming centers, and sales are often direct from grower-shippers to retailers. Sexton and Zhang (1996) and Sexton, Zhang, and Chalfant (2003) examined pricing for California-Arizona iceberg lettuce and concluded that retailers were able to capture most of the market surplus generated, essentially consigning grower-shippers to near zero economic profits over the time period analyzed. Richards and Patterson (2003) found little ability for retailers to influence farm prices for fresh grapes and oranges in the U.S., but concluded that retailers held shipper prices below the competitive level for Washington Apples and Florida grapefruits.

What are the consequences of retailer market power for the welfare of farmers? A first basic point is that either oligopoly power or oligopsony power is detrimental to farmers because either causes sales of the farm product to be diminished, and, since farm price in all cases is determined at the intersection of total sales volume with the farm supply curve, any sales-reducing market power reduces farm price along a normal upward-sloping supply curve. The magnitude of the impact can be assessed for parameter values common to agricultural product markets. Such an analysis is provided in Sexton (2000) and is discussed in more detail later in this paper.

*Retailer Pricing Strategies and the Farm-Retail Price Link*

The relationship between a commodity’s price at the farm and the price at retail, known as the farm-retail price spread or the marketing margin, has been studied and measured extensively through the years.\(^5\) In this section, I present three stylized facts about grocery retailer pricing and the link between prices at farm and retail. Due to these facts the farm

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and retail prices nowadays bear little relationship even for basic produce commodities, so a traditional model specifying retail price as a simple mark-up function of the farm price has almost no predictive power. I explore to what extent the indicated retailer behavior can be explained by the extant economic theory and, finally, investigate the impact of some of the behavior on upstream producer markets.

My work with various colleagues has focused primarily on fresh foods—fluid milk and produce commodities—in the U.S. In many ways, these products are ideal for examining retailer pricing behavior because they are often sold directly from the farm gate or shipping point to retail, undergo relatively little transformation in moving from farm to retail, have public data on farm prices, and are perishable, insuring timely movement of product from farm to retail and making it easier to generate appropriate temporal comparisons between farm and retail prices. Although the focus of this work has been on the U.S., given that large grocery chains are international in their scope, the pricing patterns observed in one country or region are apt to be exhibited elsewhere as well.

- **Stylized fact 1**: Prices among retailers in a given city or region for a given commodity exhibit wide dispersion and low correlation.

- **Stylized fact 2**: Retail price changes are at most loosely related to price changes for the farm commodity, and, thus, acquisition costs play a comparatively minor role in the retail pricing decision.

- **Stylized fact 3**: Transmission of farm price changes to retail is (a) delayed, (b) incomplete, and (c) asymmetric.

Empirical studies document a remarkable degree of cross-sectional price dispersion among food retailers within a city and intertemporal price variations for a given retailer (Pesendorfer, 2002; SZC, 2003; Li 2007). A basic source of price dispersion among
retailers is the adoption of so-called “everyday low pricing” (EDLP) by some and “high-low pricing” (HLP) by others. Evidence that variations in retail prices are not closely correlated with changes in the prices in the upstream market also abounds (MacDonald, 2000; Chevalier, Kashyap, and Rossi (CKR), 2003; Sexton, Zhang, and Chalfant, 2003; Hosken and Reiffen, 2004a, 2004b; Li, 2007), suggesting that most retail price changes are strategic and not due to random shocks in the primary product market.\(^6\)

Illustrations of stylized facts 1 and 2 are provided in tables 1 and 2 for Los Angeles area grocery chains for Hass avocados and iceberg-lettuce-based salads, respectively. In both cases the primary agricultural product is produced in close proximity to Los Angeles and undergoes little (in the case of salad blends) or no (in the case of iceberg lettuce and fresh avocados) processing in moving from farm to retail, meaning that factors intervening between the farm and retail price are relatively limited. Yet we see that the correlations of prices among the Los Angeles retailers are very low and in some cases negative, as are the correlations between the farm price and the various retail prices. Table 2 tells a similar story for iceberg-based salad blends. Although iceberg head lettuce is the primary ingredient used in preparing these salads, the correlation between the retail prices and the farm price for lettuce is generally negative. The prices charged by the Los Angeles retailers for a standard brand (Dole) of the salad blends are essentially uncorrelated, despite the fact that they face nearly identical acquisition costs.

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\(^6\) A prominent example of a strategic price change is putting a product on sale, defined as a price reduction that is the result of a decrease in the margin. A large portion of retailers’ price reductions is due to sales (MacDonald 2000; CKR 2003; Hosken and Reiffen 2004a, 2004b; Li 2007). Hosken and Reiffen (2004a) showed that a typical product has a “regular” or modal price, and that most deviations from the regular price are downward and short-lived. Temporary price reductions accounted for 20 to 50 percent of annual variations in retail prices for the grocery products in their study.
The empirical evidence also supports delayed, incomplete, and asymmetric price transmission, with farm price increases usually transmitting more fully to retail than farm price decreases. Notable studies include Pick, Karrenbrock, and Carman (1990) for citrus, Zhang, Fletcher, and Carley (1995) for peanuts, Richards and Patterson (2003) for semiperishable fresh fruits, and Kinnucan and Forker (1987), Carman (1998), Frigon, Doyon and Romain (1999), Carman and Sexton (2005) for dairy, and Li (2007) for avocados. Each of these studies found asymmetric response in retail prices and margins to farm price changes, with the magnitude of retail price changes being larger for farm price increases than for farm price decreases.

Table 1: Shipping-Point and Retail Price Correlations for CA Hass Avocados—Los Angeles-Area Chains

<table>
<thead>
<tr>
<th></th>
<th>LA-1-L</th>
<th>LA-1-S</th>
<th>LA-2-L</th>
<th>LA-2-S</th>
<th>LA-3-L</th>
<th>LA-3-S</th>
<th>LA-4-L</th>
<th>LA-4-S</th>
<th>LA-5-L</th>
<th>LA-5-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA-1-L</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>LA-1-S</td>
<td>0.53</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA-2-L</td>
<td>0.31</td>
<td>0.16</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA-2-S</td>
<td>0.09</td>
<td>0.11</td>
<td>0.19</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>LA-3-L</td>
<td>0.12</td>
<td>0.32</td>
<td>0.16</td>
<td>0.01</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA-3-S</td>
<td>-0.09</td>
<td>0.30</td>
<td>0.04</td>
<td>0.35</td>
<td>0.33</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA-4-L</td>
<td>-0.20</td>
<td>0.32</td>
<td>0.43</td>
<td>0.09</td>
<td>0.17</td>
<td>-0.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>LA-4-S</td>
<td>0.51</td>
<td>0.55</td>
<td>0.31</td>
<td>0.24</td>
<td>0.22</td>
<td>0.38</td>
<td>0.34</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA-5-L</td>
<td>0.31</td>
<td>-0.15</td>
<td>0.23</td>
<td>0.02</td>
<td>0.08</td>
<td>-0.26</td>
<td>0.25</td>
<td>0.04</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>LA-5-S</td>
<td>0.13</td>
<td>0.27</td>
<td>0.13</td>
<td>0.34</td>
<td>0.14</td>
<td>0.13</td>
<td>0.36</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>fob-L</td>
<td>0.16</td>
<td>0.29</td>
<td>0.15</td>
<td>0.33</td>
<td>0.17</td>
<td>0.15</td>
<td>0.34</td>
<td>0.35</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>fob-L(-1)</td>
<td>0.28</td>
<td>0.35</td>
<td>0.26</td>
<td>0.45</td>
<td>0.10</td>
<td>0.16</td>
<td>0.40</td>
<td>0.43</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>fob-S</td>
<td>0.28</td>
<td>0.38</td>
<td>0.27</td>
<td>0.48</td>
<td>0.12</td>
<td>0.18</td>
<td>0.34</td>
<td>0.44</td>
<td>0.33</td>
<td></td>
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<tr>
<td>fob-S(-1)</td>
<td></td>
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</table>

Notes: LA-1-L (LA-1-S) denotes large (small) avocados sold at retail chain 1 in Los Angeles; fob-L and fob-L(-1) denote contemporaneous and one-week lagged shipping-point prices for large avocados shipped from production region to Los Angeles, respectively.
Table 2: Correlations of Retail Prices in Los Angeles for Iceberg Blend Salads and Iceberg Lettuce

<table>
<thead>
<tr>
<th>Retailer Brand Size</th>
<th>Retailer 1 Dole 12</th>
<th>Iceberg Head</th>
<th>Retailer 2 Dole 12</th>
<th>Dole 16</th>
<th>Dole 32</th>
<th>Iceberg head</th>
<th>Retailer 3 Dole 12</th>
<th>Dole 16</th>
<th>Dole 32</th>
<th>Iceberg head</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Dole-12oz Iceberg head</td>
<td>1.00</td>
<td>-1.10</td>
<td>1.00</td>
<td>1.00</td>
<td>0.80</td>
<td>1.00</td>
<td>1.00</td>
<td>0.05</td>
<td>0.04</td>
<td>1.00</td>
</tr>
<tr>
<td>2-Dole-12 oz Iceberg head</td>
<td>0.05</td>
<td>0.19</td>
<td>-0.01</td>
<td>0.37</td>
<td>-0.36</td>
<td>0.23</td>
<td>0.43</td>
<td>1.00</td>
<td>0.05</td>
<td>0.60</td>
</tr>
<tr>
<td>3-Dole-12 oz Iceberg head</td>
<td>0.15</td>
<td>0.26</td>
<td>-0.08</td>
<td>0.09</td>
<td>0.01</td>
<td>-0.10</td>
<td>-0.11</td>
<td>-0.54</td>
<td>0.72</td>
<td>0.76</td>
</tr>
<tr>
<td>Shipping-point Iceberg</td>
<td>-0.07</td>
<td>-0.11</td>
<td>-0.06</td>
<td>-0.21</td>
<td>0.36</td>
<td>-0.08</td>
<td>-0.31</td>
<td>-0.02</td>
<td>0.45</td>
<td></td>
</tr>
</tbody>
</table>

For example, Carman and Sexton (2005) studied fluid milk pricing by fat content in five western U.S. cities (Denver, Phoenix, Portland, Salt Lake City, and Seattle) and found price transmission that was consistent with predictions of the prototype competitive model (full and symmetric transmission) in only three of 40 possible instances. For California avocados Li (2007) found that on average 66% of an increase in shipping price passed through to retail, but only 29% of a decrease in shipping price passed through to retail. However, price transmission occurred more quickly for price decreases than for price increases, with 72% (99%) of the total adjustment to a decrease in shipping-point prices occurring after one week (two weeks), while only 41% (56%) of the adjustment to a shipping-point price increase occurring within the same time frames.
A model of competitive food retailers and simple, cost-based margins cannot explain any of these stylized facts. Under perfect competition product prices for stores within a city should be highly correlated with each other and also with the price for the farm commodity. Under competitive retailing, price changes at the farm transmit fully and quickly, based upon shipping time, to retail.

However, these stylized facts are also mostly inconsistent with traditional models of market power and single-product sellers. For example, the low correlation of prices among retailers is inconsistent with retailer market power generated through collusion. Under a typical collusive agreement, prices would be highly correlated. Thus, the relative independence of retailers’ price movements indicates that the pricing practices are sustained by retailers’ unilateral market power, not collusion.

Models of unilateral seller market power can explain the result that retail prices respond only partially, or in extreme cases not at all, to changes in price at the farm level. In general, sellers with market power rationally absorb a portion of any cost shock through their pricing to consumers. Partial absorption of a farm price increase represents the outcome of balancing the marginal impact of a lower profit per unit from not fully transmitting the cost shock with lower profit from reduced sales if the cost shock is transmitted fully. A simple example is the profit-maximizing monopolist with a linear demand schedule and constant marginal costs who transmits exactly half of a cost shock forward to consumers.

Price rigidity can also be explained by re-pricing or menu costs within a competitive market framework (Levy et al. 1997), or by some retailers’ use of EDLP as an overarching marketing strategy in a differentiated oligopoly framework. When changing
prices is costly for retailers, a product’s price will be fixed unless its marginal cost or demand changes by a sufficient amount to justify incurring the cost of re-pricing (Carlton 1989; Azzam 1999). However, menu and other costs associated with adjusting prices should cause prices to not adjust at all to minor shocks and to adjust fully to major shocks. Moreover, these traditional menu costs should be much lower under modern retailing systems than they have been in the past. The empirical evidence showing partial adjustment to shocks in the farm price is consistent with a market-power model, but not an adjustment-cost model.

Asymmetry of price transmission is also not readily explained within a competitive framework or by conventional models of monopoly or oligopoly. In a standard model of monopoly or oligopoly pricing, the optimal price change in response to a given increase or decrease in marginal costs may not be symmetric, and depends upon the convexity/concavity of consumer demand (Azzam 1999; Xia 2009). However, because most demand curves are more elastic at higher prices, demand curvature considerations ordinarily call for retailers to absorb a greater share of a cost increase than a cost decrease (Bettendorf and Verboven, 2000), which, as noted, is not what the evidence tends to show. Demand curvature considerations, moreover, cannot explain asymmetries in the speed of response to a price decrease relative to a price increase.

Levy et al. (2005) offer an interesting explanation for asymmetry of price adjustments based upon theories of rational consumer inattention. They present empirical evidence that small price increases among grocer retailers occur more frequently than small price decreases but that no asymmetry exists for large price changes. They posit that rational inattention among consumers makes demand for individual products in stores very
inelastic around the region of the current price, thus making price increases profitable but providing little benefit to decreasing price. Another implication of rational consumer inattention is that transmission of farm price decreases should occur in large increments to attract consumers’ attention, while farm price increases should be transmitted gradually, in small increments over time, so that consumers are less apt to notice them and reduce purchases. This in fact is precisely the behavior reported by Li (2007) for the pricing of fresh avocados in the U.S., but other studies have found that price decreases have transmitted more slowly.

Without question another key but little understood factor influencing grocery retailer pricing and marketing strategies is the multiproduct nature of food retailing. Modern supermarkets supply 40,000 or more distinct product codes and use a variety of strategies to differentiate themselves from their competitors. Sales are intended to attract consumers to the store, with the hope that, in addition to the sale item, they will buy other items at the full price. This intuition underlies the model of Lal and Matutes (1994), who explain retail sales in terms of the multiproduct retailer’s need to credibly commit to provide surplus to consumers in order to entice them to visit the store.

However, Lal and Matutes’ model cannot explain why the goods chosen to be advertised often change weekly. Nor does the model provide any predictions for the dynamics of retail pricing. It is reasonable that retailers differentiate themselves by advertising different items each period and promoting a product at different periods of time. Hosken and Reiffen (2001, 2004b) extended the LM multiple-product analysis to a dynamic setting. Their model predicts considerable variation in the frequency and magnitude of sales across products.
How does retailers’ pricing behavior affect the farm product market?\footnote{This section is based upon ongoing research conducted with Chenguang Li (Li and Sexton 2009).}

As we have seen retailer market power, by reducing purchases and sales, causes lower prices at the farm gate. In addition, retail prices that adjust only partially, or not at all, to shocks in the farm market are harmful to farmers, tending to reduce average farm income and increase its variability. The fundamental point is that, if some share of the final sellers of a commodity stabilize price relative to market conditions and thus only partially transmit farm price changes despite shifts in supply and/or aggregate demand, then price must fluctuate more widely for all other sellers, in order for the market to clear. Marginal revenues are, thus, not equated across the alternative outlets selling the farm product, decreasing total revenue available from a given level of production.

I illustrate this point using the rather extreme, but common, retailing practice of holding retail price fixed for extended periods of time, despite perhaps wide fluctuations in price at the farm level. Suppose that a commodity is sold in either grocery retail markets (market 1) or other final markets, such as restaurants and cafeterias in hospitals, schools, or other institutions (“food service”—market 2). Figure 1 illustrates the basic setup for the model for the two market outlets. The left quadrant depicts the retail market, where $D_1^R$ denotes the retail demand from final consumers for the commodity, and $D_1$ denotes the derived farm demand from grocery retailers under perfect competition in procurement—retail demand less all per-unit variable costs involved in marketing the product. The right quadrant depicts the aggregate food service market, where $D_2^F$ denotes the final demand for the commodity in food service market, and $D_2$ denotes the
derived farm demand of the food service sector under perfect competition in procurement. For ease of illustration, $D_1$ and $D_2$ are assumed to be identical on the graph, and the initial harvest level, $Q_0$, is divided equally between the two markets. Final prices are given by $P_{1,0}^R$ and $P_{2,0}^F$ at the retail market and food service market, respectively, and farm price is given by $P_{1,0} = P_{2,0}$.

Assume that the farm supply of the commodity is subject to random supply shocks over time due to unexpected factors, such as the weather and that there is no storage for the commodity (it is perishable). Assume also that the food service sector operates competitively in selling and procuring the commodity.

![Figure 1: Retail Demand ($D_1^R$), Food Service Demand ($D_2^F$), and Farm Demands ($D_1$ and $D_2$)](image-url)
Suppose at time 1, production increases from the mean harvest level \((Q_0)\) to \(Q_0 + \Delta\), where \(\Delta\) denotes a small positive constant. If each of the two markets allows the downstream price to change in response to the increase in production, then each sells \(0.5(Q_0 + \Delta)\), and the farm price falls to \(P_{1,\text{f}} = P_{2,\text{f}}\). Farm income net of harvest costs from both markets changes from the initial level AIBC to the area MKUP. However, if retailers adopt fixed-pricing strategy despite the farm supply shock, then the retail price remains the same: \(P_{1,\text{r}} = P_{1,0}\), and sales at retail market remain at \(0.5Q_0\). In order for the market to clear, the food service sector now sells \(0.5Q_0 + \Delta\), with the farm price in the food service market falling to \(P_{2,\text{f}}\). Due to arbitrage in the farm product market, the farm price paid by retailers must equal the farm price paid by the food service sector, that is \(P_{1,\text{r}} = P_{2,\text{f}}\). The farm income from both markets changes from the area AIBC to the area FIXD, where FIXD < MKUP. The farm income loss due to retailers’ fixed pricing behavior is the shaded area in figure 2.
Suppose at time 2, farm production decreases to $Q_0 - \Delta$. If both markets allow their prices to change in response to the increase in production, each sells $0.5(Q_0 - \Delta)$ and farm price in each market increases to $P_{1,1} = P_{2,1}$. Total farm income changes from the area AIBC to the area MKUP. If instead, retailers keep price fixed at $P_{1,2}^R = P_{1,0}^R$, retail sales remain at $0.5Q_0$. The food service sector now sells $0.5Q_0 - \Delta$. The farm price paid by the food service sector is higher in response to decreased sales in the food service market. And due to the arbitrage between the two markets, the farm price paid by the grocery retailers must equal the farm price paid by the food service sector. As a result, with the negative supply shock, the total farm income is greater when retailers adopt fixed retail prices.
pricing strategy than when both retailers and the food service sector adopt markup price. The farm income gain is marked as the shaded area with the vertical lines.

Figure 3: Implication of Fixed Retail Pricing on Farmer Welfare under negative supply shock

Figure 4 combines the farm income loss and gain due to retailers’ fixed pricing behavior. Graphically, the upward diagonal-line shaded area is larger than the vertical-line shaded area, which indicates that the income loss incurred from a positive supply shock outweighs the gain incurred from a negative supply shock, assuming the average production change is zero.

In addition to the potential farm income loss, the graphical analysis reveals that retailers’ fixed retail pricing strategy increases the volatility and riskiness of the farm income compared to the baseline mark-up pricing case, further reducing the welfare of risk-averse farmers.
The result illustrated in figures 2-4 holds broadly. A sufficient condition for fixed prices to be harmful to producer welfare is that marginal revenue is a decreasing function of sales for all market outlets. The conclusion applies to markets with both elastic and inelastic demands. Finally, the presence of imperfect competition in any of the procurement markets does not alter the fundamental conclusion. One factor that may,

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8 Let inverse demand in a market j be denoted as $P_j(H_j)$, where $H_j$ denotes sales in market j. Total revenue in market j is $TR_j = P_j(H_j)H_j$. Marginal revenue is $MR_j = dTR_j/dH_j = P_j'(H_j)H_j + P_j(H_j)$, and $dMR_j/dH_j = P_j''(H_j)H_j + P_j'(H_j) + P_j'(H_j)$. Thus, $dMR_j/dH_j < 0$ whenever $2P_j'(H_j) < -P_j''(H_j)H_j$. This condition holds for all concave demand curves, including linear, and also mildly convex demands.

9 It might be argued that consumers prefer stable prices, so retailers who hold prices constant despite fluctuations in market conditions actually increase demand for the product (Okun, 1981). Indeed this logic is presumably the basis for EDLP. However, as noted, stabilizing prices in one sector of the market implies
however, alter the conclusion is the presence of binding harvest costs for the farm product (Li and Sexton 2009). Sexton and Zhang (1996) emphasized the role of per-unit harvest costs in setting a lower bound for fresh produce prices, and demonstrating that farm prices were often constrained by the amount of these costs for California-Arizona iceberg lettuce. There is no comparable upper bound on the farm price. Thus, retailers’ actions that cause farm prices to become more volatile can actually increase farm income if the harvest-cost constraint limits the downward volatility in price, while upward volatility is not constrained.

It is difficult to assess the empirical importance of retailers’ pricing practices in influencing farm prices and incomes, but Li and Sexton (2009) provide some evidence. In addition, to fixed pricing and mark-up pricing, they also identify high-low pricing and periodic sales as common retailer pricing strategies. In a series of simulations with equal weight of 1/4 assigned for each type of pricing behavior and demand elasticity and supply volatility parameters derived from studies of actual produce industries, they found the mean of the total farm income to be reduced by 1.91% on average relative to the case where all retailers used mark-up pricing. The standard deviation of weekly farm income was more than three times greater under this retail configuration than if all retailers used mark-up pricing.

**Implications for Agricultural Market Analysis**

I return now to the question of whether our traditional competitive models of agricultural markets are capable of usefully analyzing modern markets and the forces that have been even greater price instability in the other sectors, which, under the same logic, would have an adverse effect on demand in those sectors.
discussed in this paper. Models must of necessity simplify reality, and the assumption of perfect competition can be viewed as one such simplification because the competitive model is the simplest to work with. Is it an appropriate tool even if we agree that most or all modern agricultural markets do not satisfy all (or possibly any) of the fundamental tenets of perfect competition, especially if the departure of the market from perfect competition is not too “severe”?

This question has been a central focus of my work in recent years, conducted jointly with various colleagues and current and former students. The conclusion from this body of work is that, for many important questions, even modest departures from perfect competition, such as the presence of relatively weak oligopoly or oligopsony power are sufficient to lead analysis based upon the competitive model to severely biased conclusions. A basic approach from this work has been to parameterize the extent of market power along the unit interval, with a market power parameter equal to 0, denoting perfect competition, 1.0 denoting pure monopoly or monopsony, and intermediate values denoting various degrees of oligopoly and oligopsony power. Because of this model’s flexibility in handling market power at different stages of the market chain, it achieves simplification elsewhere, notably by assuming that the product sold at the farm and to consumers is homogeneous. Thus, the major focus of this work is on the implications of market power in the food chain.

Some observations based upon this body of work are as follows:

- Efficiency (deadweight) losses from modest departures from competition in the food-marketing sector are minor (Alston, Sexton, and Zhang 1997; Sexton 2000). This

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10 The conceptual basis for this approach (or, as some would argue, lack of such a basis) is discussed in various of the papers cited in this section.
observation is not new. It is the same fundamental point as Harberger (1954) made. This point can be seen intuitively by visualizing the basic-deadweight-loss (or Harberger) triangle. For a small departure from competition, this triangle is small, in the limit infinitesimally small. However, it increases at an increasing rate as a function of the degree(s) of market power exercised, so if market power is severe, or is exercised at multiple stages along the market chain (Sexton et al. 2007), deadweight losses become large and consequential, approaching upwards of 25% of the total market surplus that would be available under perfect competition.

- The efficiency consequences of oligopoly power are relatively greater than the consequences of oligopsony power for a given level of market power, ceteris paribus. In terms of market efficiency, oligopsony power matters only to the extent that the farm input matters as a factor in producing the final product. The farm share as a fraction of the food retail dollar is now less than 20% on average in the U.S., making oligopsony power quite inconsequential as a source of overall economic inefficiency (Alston, Sexton, and Zhang 1997; Sexton 2000).

- The distributional consequences of market power are much greater than the pure efficiency consequences. Whereas the deadweight loss is triangular in its shape, the profits earned by the marketing sector represent a rectangle with height equal to the retail price minus farm price and marketing-sector costs and width equal to the market output. Any market power that causes output in the market to decrease even slightly raises price to consumers and reduces price to farmers, expanding the height of the entire rectangle and generating concomitant reductions in consumer and producer surplus. This point is of considerable importance because much of our
market analysis is policy oriented, with specific policies designed to help farmers and oftentimes also poor consumers.

- Market intermediaries with even rather modest amounts of market power can capture large shares of the benefits from policies intended to benefit farmers. This point has been made through analysis of several specific policies, beginning with Alston, Sexton, and Zhang’s (1997) analysis of the distribution of benefits from farm-sector production research. Sexton et al. (2007) extended this model to allow for successive market power (market power exercised at multiple stages—e.g., processing and retailing), and applied the model to analysis of the impacts of trade liberalization.\textsuperscript{11} Saitone, Sexton, and Sexton (2008) extended the framework to consider market power both upstream and downstream from the farm level. The specific context of that application was the U.S. subsidy provided for corn ethanol, which previously had been analyzed only with competitive models. However, U.S. farmers purchase seed from a highly concentrated seed sector and sell corn into a concentrated processing sector. If these firms are able to exercise market power, the analysis demonstrates that they capture a large share of the subsidy benefit.

- Farmer investment decisions are distorted by the presence of market power. Production decisions are of course distorted by market power, but, as noted, this distortion will be small for modest levels of market power. However, it is the much larger distributional consequences of market power that influence incentives to invest.

This point is clear from the work of Alston, Sexton, and Zhang (1997) on farm sector

\textsuperscript{11} This analysis shows, for example, that even moderate levels of market power when exercised at multiple stages of the market chain allow market intermediaries to capture over half of the benefits from trade liberalization, leaving relatively little for developing-country farmers who are the intended beneficiaries of such a strategy.
research, although that paper treated the supply shift from research-induced innovations as exogenous. Zhang and Sexton (2002) demonstrated formally the disincentive to invest created by market power when they analyzed optimal commodity promotion expenditures as a function of the degree of downstream market power. Just as market intermediaries with market power could capture a large share of the benefits from the supply shift induced by farm sector research, so, too, they capture a large share of the benefits from a retail demand shift induced by commodity promotion, attenuating farmers’ incentives to invest in such a program.

- Accepted “wisdom” regarding agricultural policies based upon analysis of competitive markets may not be true for imperfectly competitive markets. This point is made in the recent dissertation research of Carlo Russo (2008), who demonstrates that the accepted wisdom regarding the superior welfare consequences of decoupled agricultural income support programs relative to price floor or deficiency payment programs need not be true when downstream markets are imperfectly competitive. The conventional wisdom is that coupled support policies create a deadweight loss that is eliminated by decoupling support in a competitive market. Russo’s counterpoint is that either program, by fixing a minimum farm price outside of the market process, restricts downstream buyers’ ability to exert oligopsony power. Thus, coupled support policies can have a precompetitive and welfare-enhancing effect that is usually not considered when evaluating alternative policies.\(^\text{12}\)

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\(^{12}\) Russo (2008) also makes the point that cost to the treasury of a deficiency-payment program may be much greater under market power. Farm supply in the market is inelastic as a function of the market-clearing price because supply is fixed the target price or loan rate set under the policy. The price at which this supply will clear the market is lower under downstream oligopoly power and, possibly, also due to oligopsony power, directly raising the cost of the program to the treasury and, in essence, directing a portion of the subsidy to downstream intermediaries.
Conclusions

Agricultural markets throughout the world have undergone a rather dramatic transformation. It is marked by consolidation and market domination by large processing, trading, and retailing firms, disappearance of traditional auction or spot markets for exchange of farm products and their replacement by various forms of contracts and vertical control, and a growing emphasis on product differentiation and increasingly broad dimensions of product quality. This paper has summarized some of these changes and discussed their implications for how we study agricultural markets.

Large international grocery retail chains have emerged through this process as the dominant players in the food system. Despite their unquestionably important, if not dominant, role in the food system, we know rather little about retailers’ behavior in terms of choices of products and brands carried, pricing strategies, and strategies concerning sales and promotions. A goal of this paper has been to lend insight on some of these dimensions of retailer behavior and to analyze the impacts of various aspects of retailer behavior on the upstream farm markets.

Little, if any, of retailers’ behavior can be explained by a competitive model, but most of the indicated behavior is also inconsistent with traditional models of market power and sellers of a single product. Although theory does provide cogent explanations for aspects of the behavior summarized here, much more needs to be done.

An area of particular neglect is analysis of the implications of food retailer behavior for the upstream markets and farmer welfare. Although large retailers most likely possess some degree of oligopoly power, a strong argument can be made that consumers benefit on net from the revolution due to lower prices caused by economies of size and
scope generated by large chains and by the access they offer to a vast array of products. The impact on producers, especially small-scale producers, is probably less favorable. There is little evidence that the efficiencies generated by large food retailers are reflected in higher prices at the farm level.
References


