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Consolidated Markets, Brand Competition, and Orange Juice Prices

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Abstract

This paper examines how consolidation in the marketing system affects prices for orange juice. We isolated the pricing behavior of brand marketers, wholesalers, and retailers by observing the retail prices for specific orange juice products, including leading national brands and private label brands, in 54 U.S. markets over a 1-year period. The data provided little compelling evidence that consolidated markets engaged in non-competitive pricing behavior. Increased brand competition, particularly between private labels and leading national brands, did, however, appear to lower average market prices.

Keywords

Consumer demographics, national brands, orange juice, price behavior, private labels, wholesaler concentration, retailer concentration.

Introduction

In the United States, no single orange grower produces enough product to influence the price he or she receives in the market, nor does any group of consumers purchase enough product to influence the price they pay. However, between those two endpoints in the marketing system, the processing, packaging, and distribution stages of the orange juice supply chain have become increasingly concentrated, with several companies controlling large shares of the orange juice market at different stages along the supply chain. When a firm becomes very large, it may be able to exercise an influence on market prices (Weiss). When this happens, it gains at the expense of growers and consumers.

On the other hand, firms are motivated to grow in part so they can realize potential cost savings that often come with increasing the size and/or scope of production. When firms achieve cost savings through expansion, they are often able to offer their products at lower prices than their smaller competitors (Alchian and Demsetz). This may lead to obtaining higher market shares and eventual concentration of industries participating in particular market segments. With these two forces in play, we examined market data within the highly concentrated orange juice marketing system to discern if noncompetitive or price-reducing behaviors are more evident in the observed prices.

To understand the effects of industry concentration, one can observe a market over time or observe many different markets at some point in time. This paper presents analysis of the latter type, focusing on specific orange juice product market prices across 54 U.S. grocery marketing areas (table 1) over a 52-week period, November 4, 1989, to November 2, 1990. There are a number of advantages to this approach. Regional markets in

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Table 1—Grocery Marketing Areas

East		Midwest		South		West
Albany, NY	Scranton, PA	Charleston, WV	Milwaukee, WI	Atlanta, GA	Memphis, TN	Denver, CO
Baltimore, MD	Syracuse, NY	Chicago, IL	Minneapolis, MN	Birmingham, AL	Miami, FL	El Paso, TX
Boston, MA		Cincinnati, OH	Oklahoma City, OK	Charleston, SC	Nashville, TN	Los Angeles, CA
Buffalo, NY		Cleveland, OH	Omaha, NE	Charlotte, NC	New Orleans, LA	Phoenix, AZ
Hartford, CT		Detroit, MI	Peoria, IL	Dallas, TX	Norfolk, VA	Portland, OR
New York, NY		Grand Rapids, MI	Quad Cities, IL	Greenville, SC	Raleigh, NC	Salt Lake City, UT
Philadelphia, PA		Green Bay, WI	St. Louis, MO	Houston, TX	San Antonio, TX	San Francisco, CA
Pittsburgh, PA		Indianapolis, IN	Wichita, KS	Jacksonville, FL	Shreveport, LA	Seattle, WA
Portland, ME		Kansas City, MO		Louisville, KY		Spokane, WA

1990 exhibited wide variability in wholesale-retail consolidation. Many grocery marketing areas had four-firm concentration ratios[2] (CR-4) near or above 90 percent in both the wholesale and retail stages of the grocery marketing system. Many other marketing areas had CR-4 ratios around or below 50 percent at the wholesale and/or retailing stages.

Another advantage to working with this period is that it encompasses the time before, during, and after a severe negative supply shock in the Florida orange crop, brought on by the December 1989 orange freeze. For one to observe price behavior, prices must change, and in this period, retail prices went from their 1989 low point to the highest levels attained in the 1990s, and eventually back down again. How individual brand prices change in such conditions can say a lot about the competitive behavior in the industry.

A third advantage to the 1989/90 time period is that it affords the use of a unique data resource that has since been discontinued. Data for this analysis comes from Selling-Areas Markets, Inc. (SAMI), a grocery-marketing research firm that ceased operations in December 1990, at which time much of its data resources were donated to Purdue University. Information contained in this data set includes complete shipping logs from grocery-shipping warehouses serving supermarkets in 54 distinct grocery marketing areas (GMAs) whose total sales represented around 85 percent of U.S. supermarket sales. Log entries included shipments and average unit prices, in continuous 4-week intervals, of specific grocery items sold in each market area. This study uses summaries of these data for average prices over four approximately 3-month quarters ending November 2, 1990. The prices are for two frozen concentrate national brand products, two refrigerated national brand products,[3] and an average price for all private label products, one frozen concentrate average and one refrigerated average. Also used for this analysis is the market share that each brand (including the combined private label brands) controls within each market.

This study could not be replicated with more recent data. After 1990, no other data source with comparable market coverage is available that keeps track of grocery product shipments from wholesalers to retailers.

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The price analysis presented below for the six orange juice products takes into account such factors as wholesale and retail concentration, private label market shares, per-capita income of consumers in each GMA, and shipping distances.

Price Analysis

By 1997, the average Florida orange grove was 40 percent larger than in 1987 (1997 Census of Agriculture). Florida orange juice processing firms totaled 27 in the 1989-90 season, while only 18 firms processed orange juice in Florida in the 2000-01 season (Spreen and Fernandes). About half of all processed orange juice produced in Florida is branded by the two leading national orange juice marketing processors (Hardy). About half of all groceries purchased in supermarkets nationwide were purchased from the 20 largest grocery chains—this represents an increase of about a third in the 20-firm supermarket

[2]The four-firm concentration ratio measures the share of total sales within a well-defined market going to the four largest companies operating in that market, for example grocery sales in the wholesale or retail segment of the Baltimore, MD grocery marketing area.

[3]The four national brand products examined were each sold in all 54 marketing areas, while the two private label categories examined represent average prices of all private label FCOJ and from concentrate refrigerated orange juice respectively, sold within each GMA.

share since the early 1990s. Between the marketing processors/packagers and retailers, grocery wholesalers have also become far more consolidated since 1990. Working backwards from retailing to branding, a closer look is taken at local market pricing behavior, both in markets more advanced in this trend toward consolidation and in markets far less so.

Retail orange juice prices tend to vary by form (e.g., FCOJ, NFC, and RECON—see box), by brand and private label, by season (reflecting uneven supply conditions over time), by shipping distance from primary producing regions (e.g., shipping distance from Florida), by product attributes (e.g., calcium and pulp content), and by socioeconomic attributes of the consumer (e.g., average household income in the market area). We took the following steps in this analysis to minimize the confusion caused by these factors in our ability to explain observed retail prices.

- First, specific national brand products are examined, both over time and across markets, for example, a line of FCOJ of a specific brand name, size, and type of container. For the private label products, the specificity may vary by region.

- Second, price observations are separated into four approximately equal time periods spanning 1 year.

- Finally, retail prices are isolated and examined in markets exhibiting extreme values (e.g., high versus low) for six market characteristics that are believed to affect price: retail concentration, wholesale concentration, vertical integration, brand competition, price discrimination, and transportation. The purpose is to determine, for each of these market indicators, if price outcomes are distinguishable in markets on opposite ends of the spectrum of outcomes.

Data from the 54 grocery marketing areas span the 48 contiguous States and are also dispersed in terms of the organization of the marketing systems operating in each area. This fact allowed for price comparisons of specific products and in specific time periods between subsets of the 54 markets. For example, consider two grocery marketing areas, one served by a few large grocery chain retailers and the other served by many smaller independent retailers. If substantial cost-saving benefits or diminished competition benefits are available to large grocery store chains that control most of a market area, it is reasonable that that would be evident in a price comparison of the two marketing areas.

Rather than comparing two markets, we compared prices between two groups of 10 markets. For each comparison, the groups are denoted as the "high" group and the "low" group, where the high group represents the 10 markets with the highest levels of the market characteristic in the grouping criterion and the low group the 10 markets with the lowest levels in the criterion. Table 2 summarizes the average, maximum, and minimum values of the high and low groups

Definitions

Not From Concentrate (NFC)— Juice that is flash-heated to pasteurize it immediately after the fruit is squeezed.

From Concentrate (RECON)—Juice manufactured as a frozen concentrate, then reconstituted by adding back the amount of water originally removed.

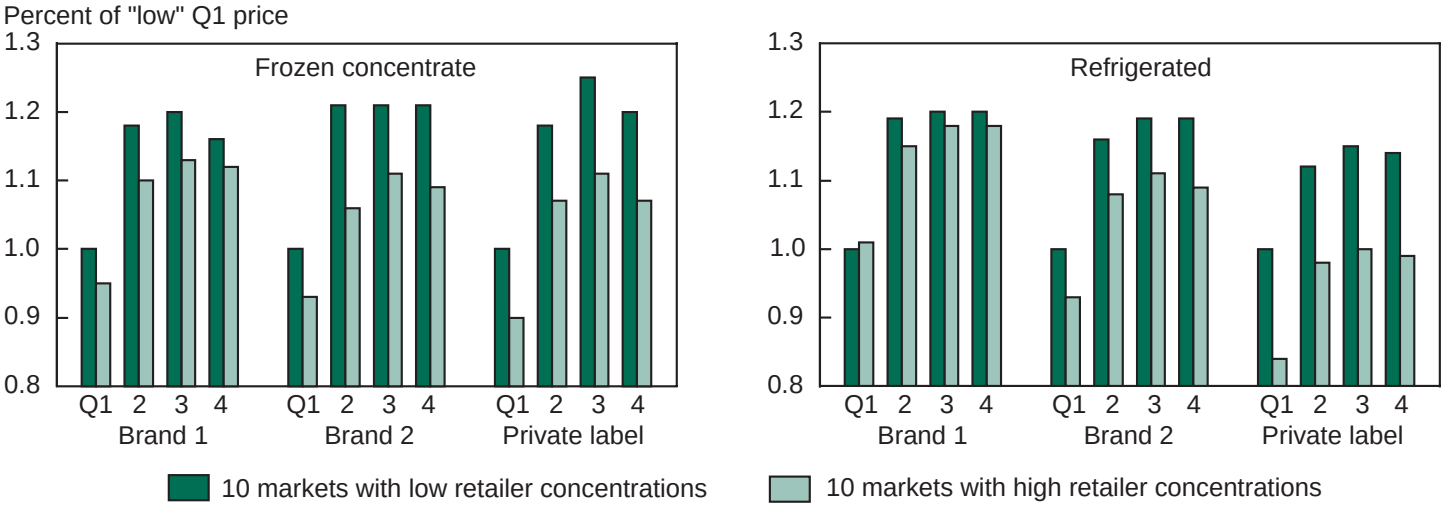
Frozen Concentrate (FCOJ)— Freshly squeezed juice that has been concentrated and frozen. Consumers reconstitute the juice by adding back the amount of water originally removed.

Source: Florida Department of Citrus.

Table 2—Summary statistics of market indicators

Criteria	Indicator	Group	Units	Average	Minimum	Maximum
Retail consolidation	Four-firm concentration ratio	high	percent	80.3	75.3	86.3
		low	percent	56.6	48.6	62.2
Wholesale consolidation	Four-firm concentration ratio	high	percent	83.6	79.0	97.0
		low	percent	51.9	42.0	60.0
Vertical integration	Warehouse capacity shares of integrated retailers	high	percent	75.1	69.0	84.0
		low	percent	21.9	0.1	31.5
Brand competition	Private label market share	high	percent	38.7	32.0	50.4
		low	percent	16.1	10.8	19.5
Price discrimination	Per-capita income in marketing area	high	dollars	16,930	15,978	18,945
		low	dollars	11,027	9,971	11,763
Transportation cost margins	Distance from central Florida	high	miles	2,022	1,310	2,553
		low	miles	409	127	615

Figure 1
Retailer concentration and orange juice prices
Quarterly market prices of orange juice for period ending November 2, 1990



for the market indicators used in each of the six criteria.

Retailer Concentration Lowered OJ Prices...

In 1990, grocery sales by the four largest grocery chains operating in a single SAMI grocery marketing area accounted for, on average, just under 70 percent of that area's grocery sales.[4] In some regions, the four largest grocery chains served over 85 percent of the retail market in their area, while in other areas, less than half the market was served by the four largest chains (Metro Market Studies). With such wide variation in retail concentration of local marketing areas, we grouped the data into the 10 markets with the highest concentration of larger grocery chains and the 10 markets with the lowest concentration, then compared prices between the two groups.

The results of that grouping are shown in figure 1. Average price data for six orange juice products are presented for both the group of low-retail-concentration markets and the group of high-retail-concentration markets. Prices are reported as averages for four 3-month periods beginning November 4, 1989.[5] The six products include three FCOJ products and three refrigerated products, and the figure groups the frozen and refrigerated products in two separate graphs. Brand 1 and Brand 2 of the frozen products are specific basic leading national brand frozen concentrate products—that is, they are the exact same product in every marketing area. The private label represents, not a specific product, but the average price across all private label or store brand FCOJ products sold within a specific GMA. For the refrigerated products, one brand is a specific refrigerated product from concentrate, the other is a specific not-from-concentrate product, and the private label product represents the average price of all private label refrigerated from-concentrate products within a specific GMA.

So one might more easily compare relative prices between groups of markets, for example "low" versus "high," the figures show prices in all quarters for both the low and high groupings as a ratio of the first-quarter price of the product in the low grouping of markets. For each of the six products, we denote the Q1 price of the low grouping as the "base price," so that the first of eight price bars presented for each product (prices in four quarters for two market groupings) always has a value of 1, since the first-quarter low market price is divided by itself. All other price bars in each group of eight reflect the price in a particular quarter (Q1 to Q4) relative to the base price.

For example, in figure 1, the Q1 price of Brand 1 in the high-concentration group had a value of 0.95, while the Q3 price in the low-concentration group had a value of about 1.2. These indicate that the Q1 price in the high-concentration group for Brand 1 was 5 percent lower than the base price, and that the Q3 price in the low-concentration group was about 20 percent higher than the base price.

The first graph in figure 1 depicts the four quarterly average prices for frozen products. This graph shows that for all three products, average first-quarter prices were lower (by as much as 10 percent for private label products) in the group of markets with a high degree of retail chain concentration. While prices in the subsequent three quarters generally went up and then down (reflecting the effects of the December 1989 freeze), prices for each of the three products were generally higher in the markets with low retailer concentration than in the markets with high retailer concentration.

[4]The four largest chains within a grocery marketing area are generally a different group of four in each of the 54 market areas.

[5]'Quarters' Q1 to Q3 represent 12-week intervals beginning Nov. 4, 1989, while Q4 is a 16-week interval ending Nov. 2, 1990.

The other graph in figure 1 depicts the same information for the three refrigerated products. The story is much the same, with the exception that the first-quarter price of Brand 1 was about the same in both the low- and high-concentration markets. For all other products and quarters, the six orange juice products were consistently priced lower in markets with high retailer concentration. Each of these results is consistent with an interpretation that retailer concentration produces cost savings that can be passed on to consumers.

...As Did Wholesaler Concentration

Grocery wholesalers purchase orange juice from marketing processors and other packagers, and distribute this juice to multiple retailer outlets (see box). In the SAMI data, all the products sold by retailers within a grocery marketing area were distributed to the retailers by wholesalers, or from warehouses of integrated retailers, with operations inside the grocery marketing area, as this is largely how these marketing areas were defined (Connor). On average in 1990, 69 percent of the grocery wholesale business within a grocery marketing area was served by the four largest grocery wholesalers operating in the area. In some regions, the four largest grocery wholesalers supplied over 95 percent of the grocery market in their area, while in other marketing areas as little as 42 percent of the area's grocery products passed through the area's four largest wholesalers.

Figure 2 shows orange juice prices in areas of high and low wholesaler concentration: the "low" group reflects the 10 marketing areas with the lowest concentration of wholesalers and the "high" group reflects the 10 marketing areas with the highest concentration of wholesalers. For the frozen products, the findings nearly replicate those shown in figure 1. This synchronicity indicates that orange juice markets where wholesaling is highly concentrated exhibit pricing behavior (at least for FCOJ) similar to markets where retailing is highly concentrated.

These findings probably stem from the retail consolidation in 1990 occurring in conjunction with vertical integration, with subsequent cost savings being passed on in the retail markets where these structural shifts were taking place.

For the refrigerated products, however, orange juice prices showed no tendency to be higher in either market. For example, Brand 1 was priced higher in all four quarters in the high-concentration group, while Brand 2 was priced lower in those markets. For private label brands, the price was higher in the high-concentration markets in the first two quarters and lower in the last two quarters. A closer look at the price data for the refrigerated products shows that for all three brands, the highest percentage price increases occurred in the low-concentration market. Taken collectively, the results in figure 2 suggest, but not as strongly as for retailing, that markets more concentrated in grocery wholesaling tend to have lower prices than less concentrated markets. There was a considerable shift in consumer preferences toward the consumption of refrigerated juices (particularly NFC) taking place in this period (Brown et al.), so it is not surprising that price behaviors are hard to discern.

...And Integrated Retailers

The consolidation of both the retail and wholesale segments of the orange juice marketing system is not coincidental. Many analysts have argued that retail consolidation is the driving force behind wholesale consolidation. Among the reasons for this, Connors notes that large grocery retailers find backwards integration into warehousing and distribution cost effective because it (i) permits a more frequent and timely delivery schedule; (ii) allows for a more precise stock mix that better matches the preferences of the retail chain's customer base; (iii) allows for warehouse expansion in locations that more closely follow the retail chain's expansion; (iv) ensures compatibility of electronic inventory-ordering systems; and (v) is a strategic tool that deters new entrants in marketing areas where the chain has large sunk costs and/or excess capacity and also deters weaker competitors in the market from aggressive pricing strategies.

These arguments again point to both efficiency and anti-competitive forces as motivating consolidation of the marketing system. A slightly more refined analysis of orange juice pricing behavior would combine the forces of consolidation at the retail and wholesale segments of the supply chain. This analysis is summarized in figure 3, where quarterly prices of the six products are compared in markets with the 10 highest and the 10 lowest concentrations of integrated retailers. Recall that figure 1 demonstrated a pronounced negative relationship between retail orange juice prices and retail concentration while figure 2 indicated this relationship was less pronounced when applied to wholesaler consolidation. Figure 3 strengthens the argument that warehouse consolidation is more efficient and leads to lower retail prices when it is integrated with retail consolidation. Specifically, note in figure 3 that the first-quarter retail prices of all six orange juice products examined were lower, by as much as 11 percent, in markets with higher shares of warehouse space controlled by integrated retailers. Prices in the fourth quarter (Q4), which generally reflected the full effects of the price spike caused by the Florida orange freeze and in most cases showed a return toward pre-freeze price levels, were also lower for all but the refrigerated private label product. These findings probably stem from the retail consolidation in 1990 occurring in conjunction with vertical integration, with subsequent cost savings being passed on in the retail markets where these structural shifts were taking place.

Private Labels Likewise Help To Lower OJ Prices

Within the Florida market, there were 27 citrus processors operating in the 1989-90 growing season. For the retail mar-

ket, what was not produced by or sold to the national brand marketers was packaged and sold under numerous regional brand names and private labels. While private label orange juice brands are not nationally marketed under a single brand name, one or several private label brands are available in every GMA. For example, a single bulk processor may produce an orange juice product that is marketed by several grocery chains under different brand logos. Another way a processor's product is marketed is under a regional brand logo. These products have a limited distribution area, possibly spanning

Orange Juice Industry Overview

Florida typically accounts for more than 90 percent of U.S. orange juice production (USDA, 2000a). However, in the 1989/90 freeze year, Florida produced only 85 percent of the domestic orange juice supply, with Arizona, Texas, and California providing the balance. In addition to domestic production, imports are also an important source of supply. Brazil and Mexico are the major exporters to the United States (USDA, 2000b). Between 1989 and 1991, Brazil accounted for approximately 85 percent of U.S. frozen imports (which are either sold domestically as frozen or reconstituted and sold as chilled), while Mexico was the source of nearly all premium chilled orange juice. Frozen concentrate accounts for approximately 98 percent of total orange juice imports with not-from-concentrate making up the remaining 2 percent.

Processing and Packaging. In Florida, around 95 percent of orange production is purchased by orange processors (USDA, 2000b). The juice is either pasteurized immediately (NFC) or processed into FCOJ. There are two types of orange processors: bulk processors and marketing processors. Bulk processors produce most of the world's orange juice. Marketing processors sell packaged juice under their own brand name and they often also purchase additional juice from bulk processors.

Juice packers purchase bulk product, package it, and, in most cases, distribute the packaged product. Some juice packers pack and market their own brands, while most pack for private labels. Other participants that may handle orange juice are blending houses, typically located in port cities. Blending houses blend concentrates from different sources and with different quality attributes in order to match customer specifications. For such blends, buyers pay a higher price for a product that consistently meets their standards.

Most orange juice is transported in the form of bulk FCOJ to packing plants throughout the United States, since shipping volumes are 5-6 times smaller with concentrate than with reconstituted juice. Before packaging in the familiar cylindrical package, filtered water is added to the concentrate to bring the brix, a measure of concentration of solids, down to three times the concentration level of fresh juices. In order to bring the FCOJ to the concentration level of fresh orange juice, three parts water must be added by the consumer. For reconstituted juices, filtered water is added to return the brix to the average of fresh squeezed juice. It is then packaged in cardboard cartons, glass, or plastic jugs and sold at retail stores.

Most NFC is packaged at fruit-processing sites and transported in final form. Limited amounts of bulk not-from-concentrate are also transported by road and rail tanker to other parts of the country for packaging.

Storage. Bulk frozen concentrate can be stored for several years, provided the temperature is kept at acceptable levels. NFC can be stored two ways, frozen or chilled. Each of these storage methods allows NFC to be stored for at least a year, a necessity as juice harvested from different times of the season are blended to obtain consistent quality the whole year through. NFC in retail packaging has a shelf life of approximately 63 days.

Nearly all production is stored is in the South Atlantic region and is distributed throughout the country to meet demand. FCOJ stocks are highly seasonal as stocks are at their lowest in November, at which time production begins anew, and peaks in May, when the last of the Valencia crop has been harvested.

Distribution. Nearly all orange juice distribution for retail sales follows one of three paths: 1) delivery through wholesalers, 2) delivery through retailers, and 3) delivery directly to the retail store. In the case of delivery through wholesalers, the advantage for the packers is that they make only one transaction, as opposed to dealing with a number of individual stores. Also, the producer is more likely to gain wider distribution of the product. Retailers have also taken over the wholesale function. In this situation, producers reduce transactions, yet distribution across various retailers may require processors to work with a larger number of wholesale distributors. These first two paths are common for frozen, while the third, direct shipment to the retailer, is more common with chilled products.

Consumer Preferences. The last decade has seen a large swing in consumer demand from frozen orange juice toward refrigerated and, especially, not-from-concentrate juices. The 1990 season was the first year in which chilled orange juice outsold frozen concentrate, and the gap has consistently widened since that time. Refrigerated orange juice is made from concentrate, except for those designated "premium" which are made from fresh oranges and never concentrated. The refrigerated type is more important in terms of sales than are frozen.

several adjacent GMAs. Of the three different kinds of branding, only the leading national brands engage in extensive national promotional activities, which can involve tens of millions of dollars for a single advertising campaign (Hardy). In 1990, the highest market share for a leading national brand in a single GMA was 38 percent (based on warehouse shipments to supermarkets within each GMA), while the highest combined market share for private labels was 47 percent.[6] Variations on these shares were large across the different markets.

[6] By way of example, the market share for the Brand 1 refrigerated product reflects the gallons of all variants of this brand of refrigerated orange juice shipped to a GMA, divided by total gallons of all orange juice shipped to this GMA, including FCOJ shipments. FCOJ shipments are converted to their fresh equivalent volume.

Among the most notable trends related to brand competition over the 1990s was the continued growth in market share of private label orange juice brands. For example, in the frozen juice category for the 52-week period ending January 2000, 32 percent of sales in supermarkets were for private label brands, up from 30 percent in the previous year (*PLMA's 2000 Private Label Yearbook*). Also, specific private label brands from the largest grocery retailers are likely to be taking mar-

Figure 2
Wholesaler concentration and orange juice prices
Quarterly market prices of orange juice for period ending November 2, 1990

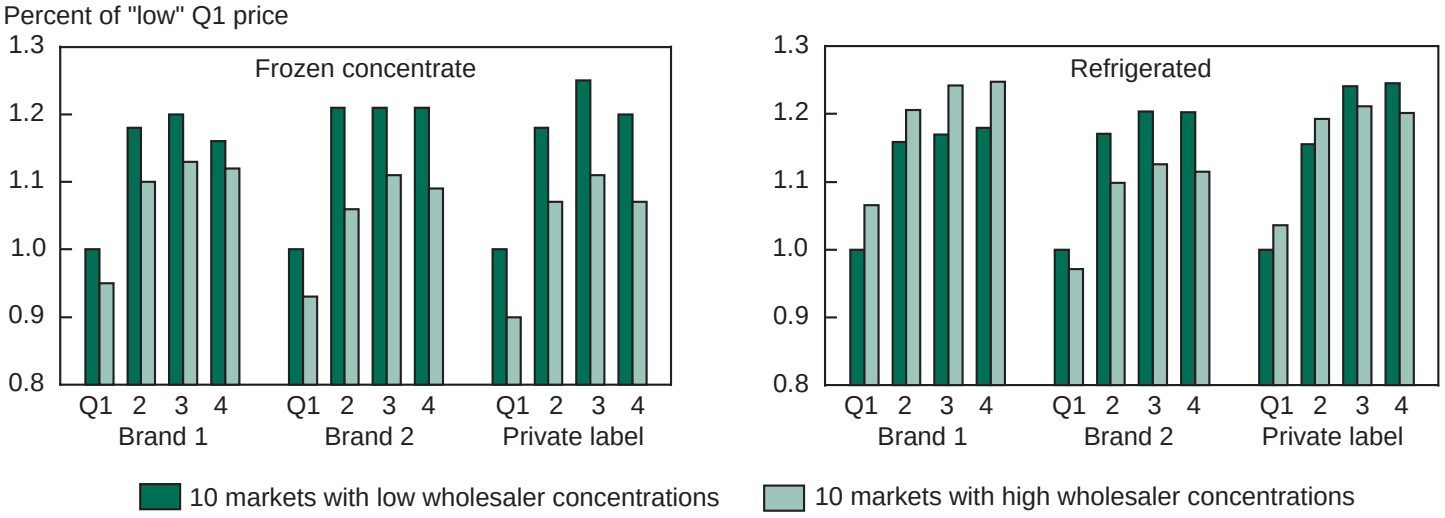
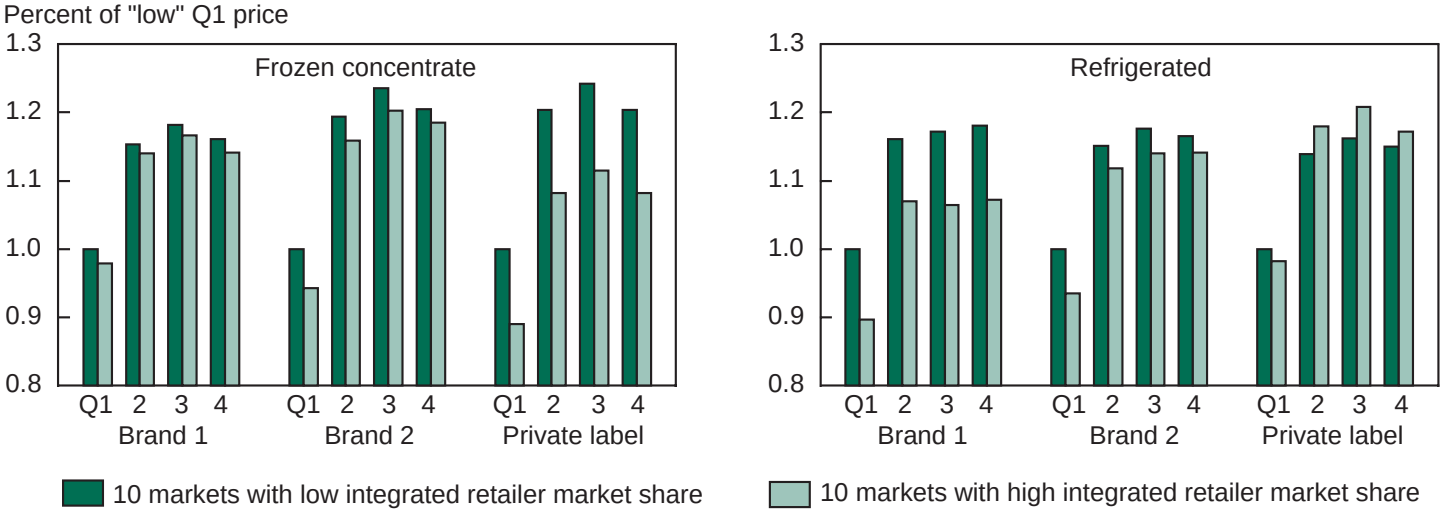


Figure 3
Integrated retailers and orange juice prices
Quarterly market prices of orange juice for period ending November 2, 1990



ket shares away from other private label brands. In the GMAs covered in this study for 1990, private label market shares were as high as 32 percent for refrigerated products and 47 percent for FCOJ; averages were much lower—20 percent for frozen products and 11 percent for refrigerated products. This variation affords the opportunity to compare orange juice prices in GMAs with both high and low private label market shares.

Figure 4 depicts the markets with the 10 highest private label market shares and the markets with the 10 lowest shares. For both the frozen and refrigerated products, the first-quarter price was always lower in markets with high private label market shares, particularly for the refrigerated products. But after the effects of the freeze (a negative supply shock) drove prices of orange juice up, the prices of most products went up faster in markets where private label shares were high. While this may suggest a mixed result, it is consistent with a scenario whereby the existence of a large private label market share brings the price of the leading national brands down. When the negative supply shock hit, processors passed the full cost on to their customers in the markets with high private label shares since their price/cost margins in these markets were already low. Another result that stands out in the figure for the refrigerated products is the large gap between markets with high and low private label shares for average first-quarter prices of both national brands. In subsequent quarters, the price of refrigerated orange juice changed little in markets with low private label market shares, while the price increased noticeably in the markets with high private label shares. These findings are compelling evidence that national brand orange juice processors are very responsive to private label competition in regional markets.

National brand orange juice processors are very responsive to private label competition in regional markets.

High-Income Areas Have High OJ Prices

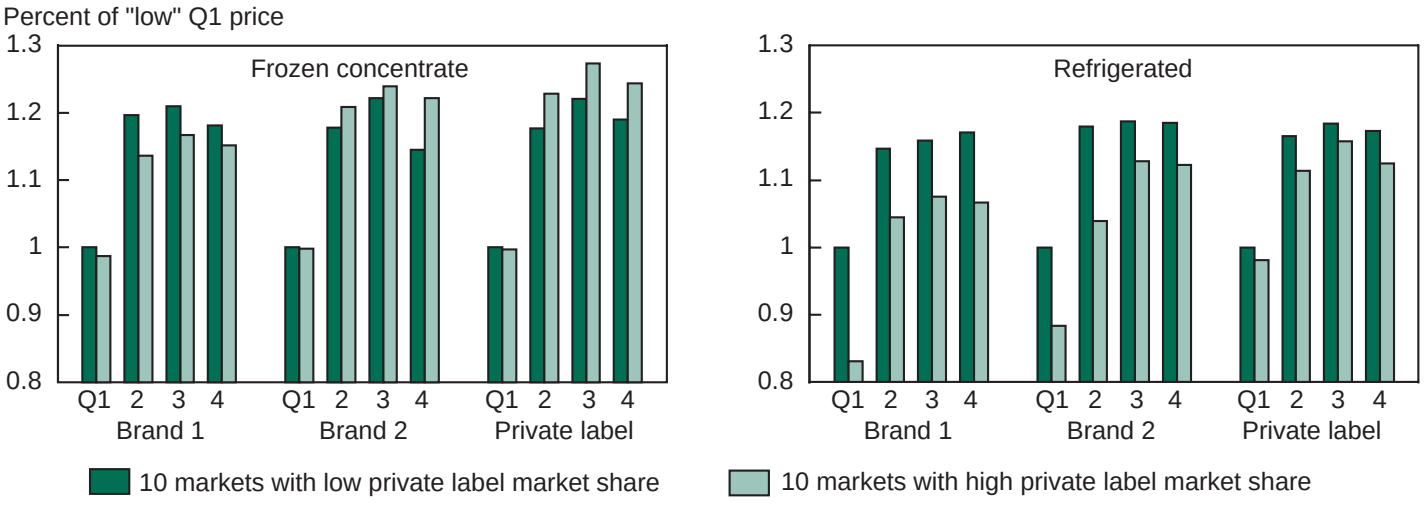
Another way companies exercise market power is through segmentation of the consumer market, by charging different prices to different segments of consumers. With the data used here, it is not easy to discern at which level of the supply chain such pricing behavior originates, but prices are available in markets that have clearly distinguishable consumer characteristics. Our approach was to determine if average household income within a specific market affected the market price of orange juice.

For frozen products, prices started higher and remained so throughout the year in markets where household incomes were high (fig. 5). For refrigerated products, no distinct pattern appeared. A closer look at the data reveals that for five of the six products, the highest percentage increases in price occurred in markets with high household incomes. While a number of possible explanations can be offered, we simply note that the results from this experiment suggest there may be some tendency toward higher consumer orange juice prices in areas with high household incomes.

Areas Distant from Florida Have Higher OJ Prices

Even when regional orange juice supply channels are otherwise indistinguishable in different marketing areas, it is still possible to observe retail price variations caused by differences in shipping costs. This scenario is especially relevant to U.S. orange juice markets, since nearly all orange juice is processed and/or shipped from Florida to all regions of the

Figure 4
Private label products and orange juice prices
Quarterly market prices of orange juice for period ending November 2, 1990



country. Further, shipping refrigerated orange juice is more costly than shipping FCOJ, which is concentrated in large part to make long-distance transportation a cost-effective alternative to establishing a geographically dispersed processing industry. But while it seems logical to expect that transportation costs and the subsequent retail prices of orange juice will increase with the distance between point of purchase and point of processing, economists have historically had difficulty in establishing this fact (Kaufman and Handy, p. 24).

To examine this issue more closely, we compared quarterly prices of the six products in the 10 markets farthest away from the Florida processing markets (the "high" group) and for the 10 markets in and around Florida (the "low" group). While this comparison does not represent a vigorous empirical test, it does demonstrate why many economists have expressed surprise at the lack of empirical evidence linking transportation costs and regional retail food price variability. For example, figure 6 shows that first-quarter orange juice prices in the distant markets were substantially higher for all three refrigerated products, while the private label FCOJ brands had higher prices in the nearby markets. But that anomalous price prevailed only in Q1; in all subsequent quarters, the private label FCOJ price was higher in the distant markets.[7] Since FCOJ products are less costly to ship (in terms of their fresh equivalent volume), and since processing

[7] On the other hand, the FCOJ price in periods Q2 to Q4 for Brand 1 differed by less than half a penny

Figure 5
Household income and orange juice prices
Quarterly market prices of orange juice for period ending November 2, 1990

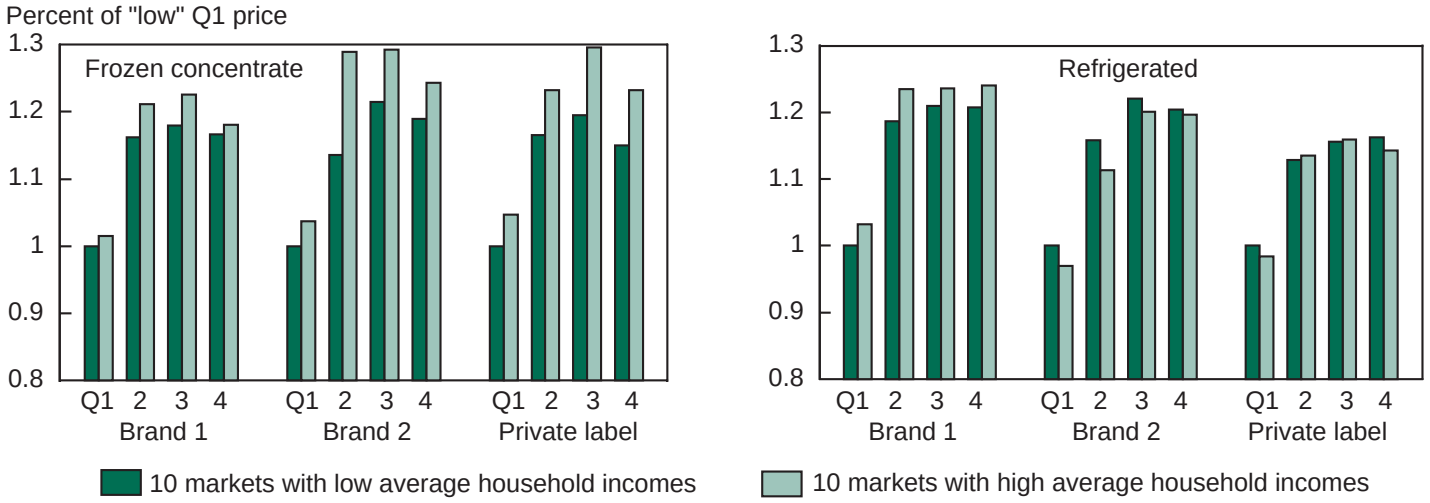
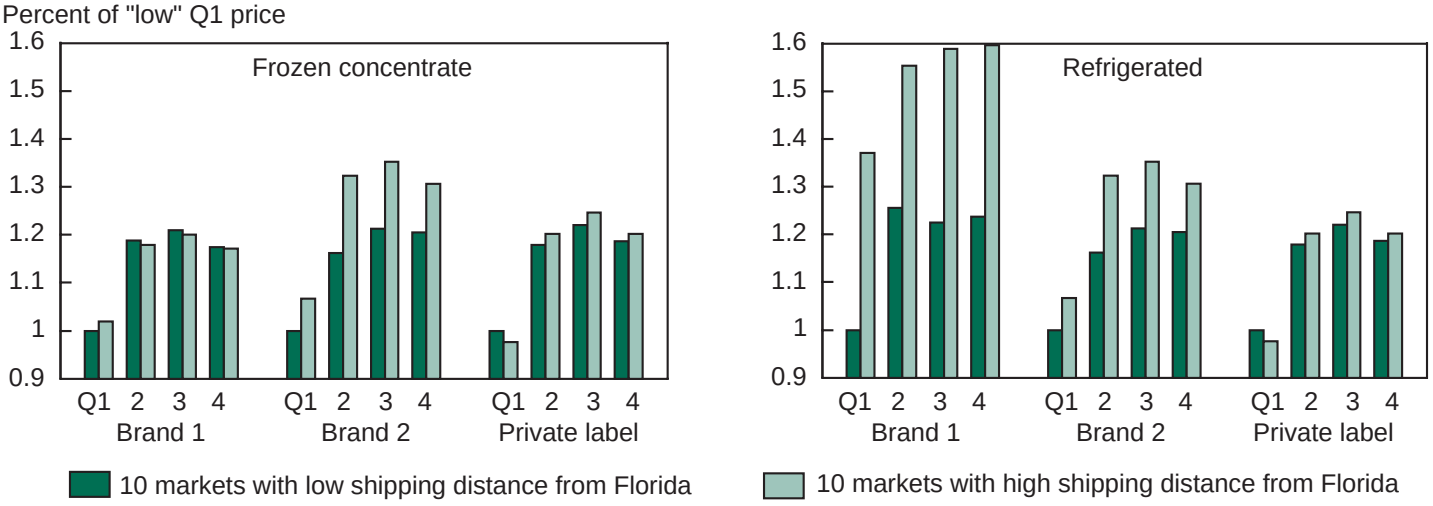


Figure 6
Shipping distance and orange juice prices
Quarterly market prices of orange juice for period ending November 2, 1990



of these products is more geographically dispersed than is processing of the refrigerated juice products (USDA, 2000a), the smaller price differences among the frozen products seen in figure 6 are not surprising. For the refrigerated products, the hypothesized transportation price margins are both evident and substantial: Brand 1 was 37 percent more expensive in the distant markets, Brand 2 was 19 percent more expensive, and private labels were 9 percent more expensive. Retail price wedges varied by quarter but remained large in the later quarters.

The substantial price wedges apparently associated with shipping distances suggest possible answers to two important questions relevant to this analysis:

(1) Does the apparent result that transportation costs influence retail orange juice prices stand up to the more rigorous statistical tests that have historically failed to establish such linkages in food markets?

(2) If transportation margins are significant, might other results presented in this section simply reflect the result that, for example, high levels of private label market shares, integrated retailing, and retail concentration are all more advanced in markets in and around Florida than in markets farther away?

While it appears that the cost-reducing forces have outweighed the anti-competitive forces as consolidation has advanced in the orange juice supply chain, continuing consolidation has not diminished the potential that anti-competitive forces may push up retail orange juice prices in the future.

Statistical Significance of Results

We used regression analysis to examine the evidence of market pricing behavior discussed in this paper. Although the technical details of this analysis are outside the scope of this discussion, some empirical conclusions of this analysis are noteworthy. The regressions show that the variation of first-quarter prices of the six products in each of the 54 GMAs listed in table 1 are largely explained by the factors discussed in this report and other related factors.[8] More important, the regression analysis indicates a strong statistical probability that transportation margins increase retail prices. Even after accounting for the effect of transportation costs on retail prices, the data also indicated a strong statistical probability that retail concentration, particularly through vertical integration of the warehouse and shipping functions, is associated with lower retail prices for the refrigerated orange juice products.[9] We also found a strong statistical association between high private label market shares and lower prices for national brands in the refrigerated orange juice segment. We found a less compelling result for the effects of household income on market prices. While higher household incomes appeared to lead to higher retail orange juice prices, the statistical probability that income and prices are related in this way was found to be rather low. For the FCOJ products, many of the qualitative effects of each criterion found in the regressions on the refrigerated segment are replicated, but the statistical significance of the findings is not compelling.

Summary

There are far fewer sellers and buyers along the orange juice supply chain today than there were only 10 years ago. This paper presents comparisons of pricing behavior in 1990 between markets more advanced in the marketing consolidation process and markets far less so. Our findings indicate that retail orange juice prices were generally lower in markets where a few grocery chains controlled large shares of the area grocery market. We also found lower prices in markets where large grocery wholesalers and/or integrated retailers dominated market sales. Also observed from this data was an apparent relationship between private label products in a market and lower prices for leading national orange juice brands. Related to this, we found that price increases were more pronounced in areas with strong private label competition, and this appeared to reflect smaller cost-to-price margins in these markets. These smaller margins meant there was less of a buffer for retailers or brand producers to hold prices steady when grower prices increased with the freeze-induced commodity shortage. While prices appeared to be higher in markets where average household incomes were high, these findings were less pronounced. Taken together, the data show how consolidation along the orange juice supply chain, such as occurred over much of the 1990s, could have contributed to lower market prices. Also apparent in this data is some indication that diminished competition, particularly diminished private label competition, leads to higher market prices.

Since the period of this analysis, there has been more widespread consolidation of grocery retail and wholesale operations, and private label/store-brand products have flourished. Consumer preferences have substantially shifted from frozen to refrigerated juice varieties, and with this shift, brand market shares have also changed. So, while it appears that

[8] Additional information for each GMA used in the regression analysis includes the combined market share of the top 10 national retailers, the combined market share of regional brand orange juice products, a measure of educational attainment, and an index (developed in a study by Binkley) of the market area's responsiveness to national advertising.

[9] An alternative explanation of these results, offered by a reviewer of the manuscript, is that orange juice is often used as a loss leader by supermarkets where brand competition is high, which may also be in highly concentrated retail market areas. A loss leader is a product sold at or below cost to attract customers to the store.

the cost-reducing forces have outweighed the anti-competitive forces as consolidation has advanced in the orange juice supply chain, continuing consolidation has not diminished the potential that anti-competitive forces may push up retail orange juice prices in the future.

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By Patrick Canning (Pcanning@ers.usda.gov) and Marinos Tsigas

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