Price-Quality Tradeoffs in the Selection of Fresh Fruit: A Look at Apples

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Introduction

Many empirical studies have used various types of data (Bureau of Labor Statistics price data, case study data, and supermarket scanner data) to assess the purchase behavior of higher- and lower-income consumers and several of these studies have found lower-income consumers to pay lower prices (Leibtag and Kaufman, 2003; Hayes, 2000; Ambrose, 1979).   Most frequently, consumer purchase behavior is analyzed for a diverse set of stores (inner city, rural, suburban) with widely different prices (Ambrose, 1979; Donaldson and Strangways, 1973; Kunreuther, 1973). Mixed results are often obtained because analyses are conducted on store-level data that lack uniformity across stores and geographic areas. This study uses data from a single retailer within a common pricing zone and therefore it avoids the data measurements errors of previous studies. Indeed this study is able to avoid the less important question as to whether prices are higher or lower in poor areas and focus on a more important question: how do prices influence consumers' purchase decisions?

When lower-income consumers are observed to pay lower per unit prices, especially when they are known to confront higher prices within their shopping areas, the question is inevitably raised as to whether lower-income consumers are purchasing lower-quality products. For example, if ground beef is defined as a product category, lower-income consumers could realize lower prices by purchasing ground beef with higher portions of fat. But even if data supported such purchase patterns, this would not prove that lower-income consumers are not realizing lower prices per quality/pound. For example, yield differences between 80% lean and 100% lean could be less than price differences -- say a 20% yield difference, but a 35% price difference. In other words, an apparent higher-quality product at the supermarket level may not result in an identical higher-quality product at the preparation level. Even if yield differences

compensate for price differences, consumer perceptions may favor the reverse relationship, thereby making purchase decisions for high-fat ground beef appear rational. In other words, perceived value may differ from actual value, but in the absence of information to close the gap, there is no basis for classifying consumer behavior as irrational.

While processed goods have product attributes and price levels that may lead consumers to view product benefits across a wide range, fresh fruits and vegetables generally have attributes that are fairly common across product varieties and therefore should have a narrower range of product benefits. Consequently, observed purchases of fresh fruit and vegetables by different income groups should reflect the role of price more than the role of product attributes. To this end, this study focuses on fruit, examining consumer purchases of several varieties of apples. Apples differ in taste and flavor (less acidic, sweeter, tart, etc.), but regardless of variety, most consumers associate the following characteristics with apples: fat-free, sodium-free, cholesterol-free, and an excellent source of fiber (The Packer Guide, 2007).

Background

This study of apples is part of a larger study that examines the purchase behavior of higher- and lower-income consumers for every fresh fruit and vegetable sold in six supermarkets in Columbus, Ohio, over 69 weeks during 2001 and 2002. Three of these supermarkets were selected from inner-city areas with mostly lower-income shoppers and three were selected from suburban areas with mostly higher-income shoppers (Table 1). Importantly, prices are identical across all six stores because these stores are part of a single pricing zone. Fresh fruit is segmented into eight categories: citrus, apples, berries, soft fruit, bananas, melons, grapes and fresh-cut fruit. Fresh vegetables are segmented into six categories: greens, fresh-cut bagged

salads, salad vegetables, major vegetables (corn, potatoes, and tomatoes), yellow vegetables, and Chinese vegetables (vegetables frequently purchased for Chinese dishes). A time series cross-section model is used to estimate demand functions for each of these 14 product categories and all of the results are shown to be consistent with demand theory. Of course, the focus of this paper is not the regression results of the larger study, but the statistical analyses of prices paid by higher- and lower-income consumers for a fresh fruit category, apples. Before proceeding with apples, it should be emphasized that statistical analyses for each product category show that lower-income consumers pay lower prices per pound for all fresh fruit categories, except bananas. Oddly enough, bananas are the lowest priced fruit category in this study and other research supports the finding that lower-income shoppers purchase larger percentages of lower-priced fruit (Leibtag and Kaufman, 2003). Further, these analyses show lower-income consumers paying lower prices for all vegetable categories, saved for yellow vegetables. For this category, statistically identical prices are paid by both income groups.

Theoretical Model of Consumer Behavior

Economic theory posits that consumers attempt to maximize their utility subject to a budget constraint and product prices. Tastes and preferences play a major role in determining utility, but product prices and income constrain product purchases. Given a specified basket of market goods, lower-income consumers are expected to show higher price sensitivity because purchasing the market basket requires a larger share of their income (Nagle and Hogan, 2006). To reduce the share of income spent on a market basket of goods, one option available to consumers is to search for information on lower product prices. Search theory suggests that lower-income consumers are more likely to engage in the most search because of their lower

opportunity costs. With respect to apple varieties, this theory suggests that lower-income consumers are likely to acquire the most information about price variations across apple varieties. To the extent that information acquisition include both price and quality information, it means that lower-income consumers are likely to obtain the most knowledge of product prices and quality variations.

Purchase Options and Product Quality

Consumers have many purchase options for apples, as they are sold in 3, 4, 5 and 8-pound bags, and from bulk displays with sizes ranging from small to jumbo. Smaller amounts are also sold as sliced apples in bags and as fresh apples in tray packs. While bagged apples are generally smaller in size than those sold from bulk, there is little evidence to suggest that they are of lower quality. Indeed marketing managers of the retail chain providing these data stated emphatically that identical quality standards are used for both bagged and bulk apples, especially standards with respect to color, flavor, shape, pressure, brick and sugar.

Marketing managers did concede that wholesalers and retailers often perceive quality differences between bagged and bulk apples because they are grown in different regions. Bulk apples for this retailer come exclusively from the west coast (mainly Washington State) and bagged apples come primarily from three Midwest States (Indiana, Michigan and Ohio). Yet, managers stated that U.S. No. 1 is the minimum standard accepted for all apples. That is, combination grades (e.g., U.S. No. 1 and U.S. utility) are not accepted for bagged apples. Further, marketing managers concede that Washington State employs higher grading standards than those required by the U.S. Department of Agriculture, but they expressed some uncertainty as to whether consumers are knowledgeable of these standards and actually factor them into their

purchase decisions. To the extent that advertising is a signal of quality, consumers could associate higher quality with Washington apples because these apples are more heavily advertised (Gerstner, 1985). Yet, marketing managers argue that Washington's higher grades (e.g., Washington Extra Fancy) are more a marketing advantage for their producers than a selling advantage for consumers. This observation reflects the fact that production areas are not always identified in supermarkets.

Statistical Analyses of Apples

The six stores in this study offer 17 varieties of apples. The top five varieties for the higher-income stores are: Red Delicious (26.6%), Gala (21.0%), Golden Delicious (15.3%), Granny Smith (12.4%), and Fuji (6.0%). The top five varieties for the lower-income stores are: Red Delicious (38.9%), Golden Delicious (17.7%), Gala (11.7%), Granny Smith (9.4%), and Rome (8.0%). It should be noted that these differences in purchase varieties correspond to major differences in prices by variety (see Graph 1 and Table 2). For all 17 varieties, statistical analyses from the larger study show higher-income consumers paying an average of $1.18 per pound and lower-income consumers paying $1.01 per pound. And the relevant question for this study is whether lower-income consumers realize this $0.17 lower price per pound by purchasing lower-quality apples? Answering this question required the disaggregation of apples by variety.

Utilizing information from the produce industry that there is little to no variation in the nutritional value of apples (The Packer Guide, 2007), this study used statistical analyses of prices paid to show that lower-income shoppers could realize lower prices paid than higher-income shoppers. First, prices paid per pound are calculated for each of the 17 varieties for both higher- and lower-income stores and statistical tests are conducted for price differences between higher-

and lower-income stores for each variety. Of the 17 varieties, statistical significant differences are observed in prices paid by higher- and lower-income shoppers for 10 varieties (Table 2). More importantly, for many of these varieties, lower-income consumers not only pay lower prices per pound, but they purchase much higher percentages of these lower-priced varieties. For example, lower-income shoppers paid an average of $0.69 per pound for Red Delicious apples versus a higher $0.91 per pound paid by higher-income shoppers, a difference of $0.22 per pound. Relative to purchase quantity, Red Delicious apples represented 38.9% of total apple purchases for lower-income shoppers, versus just 26.5% for higher-income shoppers, a difference of 12.4 percentage points (Table 3).

Not only are there major differences in purchase percentages and purchase prices for most varieties, but there are major differences in purchase selections (bagged vs. bulk). Whether measured in dollars or quantities, lower-income shoppers are shown to purchase larger percentages of lower-priced bagged apples (Graphs 3, 4 and 5). As quantity shares, bagged apples represented 65% of total apple purchases for lower-income shoppers, but just 41% for higher-income shoppers. As dollar shares, bagged apples represented 51% of total apple purchases for lower-income shoppers, but just 28% for higher-income shoppers. These percentage differences coupled with the much lower prices per pound for bagged apples (Graph 2) show quite clearly that lower-income consumers can easily realize lower prices per pound. More importantly, in the absence of quality differences for bagged and bulk apples, as emphasized by managers of the retailer supplying these data, these purchases show that lower-prices can be realized without sacrificing quality. Indeed these purchases suggest that income constraints function just as theory would predict – leading consumers to search for information on price differences among varieties.

While it is relatively easy to understand how lower-income consumers realize a lower per unit price for Red Delicious, given the fact that they purchase a much higher quantity of a lower-priced variety.   Similarly, an even large price differential exists for Fuji apples and lower-income consumers purchase a smaller quantity of this higher-priced variety. As shown in Table 2, higher-income shoppers paid $1.37 per pound for Fuji, versus $1.08 per pound for lower-income shoppers, a difference of $0.29 per pound. This variety represented just 2% of purchases for lower-income shoppers, but 6% of purchases for higher-income shoppers. Combining these differences with differences shown for bagged and bulk apples, these data suggest that lower-income shoppers make purchases relative to the price sensitivity that is dictated by their incomes. Indeed these observed patterns for Red Delicious and Fuji apples are common across the other 15 varieties. As such, the rest of this discussion will highlight just a few of the remaining varieties.

Among the other top 5 varieties, higher-income shoppers paid an average of $0.85 per pound for Gala apples and this variety represented 21% of their apple purchases. By contrast, lower-income shoppers paid an average of $0.77 per pound for this variety and it represented 11.7% of their apple purchases, a percentage-point difference of 9.3%. A higher- lower-income price difference of $0.12 per pound is observed for Golden Delicious apples and lower-income shoppers purchase 2.4% more in this category. However, note from Table 3 that lower-income shoppers made Golden Delicious their second highest variety, whereas higher-income shoppers made Gala their second highest variety. Although on a per pound basis, Gale are priced lower, price differences for lower- and higher-income stores are larger for Golden Delicious. These differences suggest that Golden Delicious are more readily available than Gala as bagged apples. Also, price data suggest that Gala and Red Delicious are promoted more frequently than other

varieties of apples. Promotion of a relatively high-price variety, Gala, undoubtedly helped to diminish differences in prices paid for lower- and higher-income shoppers.

For Granny Smith, another top 5 variety, higher-income shoppers paid an average of $1.23 per pound, while lower-income shoppers paid an average of $1.14 per pound. With Granny Smith being the fourth most expensive variety, this category represented just 9.4% of total purchases for lower-income shoppers, versus 12.4% for higher-income shoppers. These percentages and associated prices suggest that lower-income shoppers are indeed price-sensitive and they make careful and thoughtful selections within each category of purchase. And with apples being a commodity for which there is little to no variation in quality among varieties, these results suggest that lower prices paid by lower-income consumers should not be dismissed as a sacrifice of quality for price.

Summary and Conclusions

Many studies have analyzed food prices paid by lower- and higher-income shoppers and they have reach conclusions that vary by the quality of their data. Some studies have concluded that lower-income consumers pay lower prices, while others have concluded that they pay higher prices. Differences in results often arise because these studies use data that are not comparable across stores and geographic areas. This study used data from a single retailer with stores across geographic areas representing both lower- and higher-income consumers. More importantly, prices were identical across all stores because they are part of a single pricing zone. If, within the six stores, consumers randomly select product purchases from various brands and varieties, prices paid should be fairly uniform across stores. Yet, for 17 varieties of apples, this study shows that lower-income shoppers pay lower per unit prices. How is this accomplished?

The results show that lower-income shoppers make a conscious effort to purchase lower-priced varieties and, within varieties, they purchase lower-priced bagged apples over bulk apples. Some may conclude that this simply represents the purchase of lower-quality apples. Yet, marketing managers of the retailer providing these data assured this researcher that identical quality standards are used for both bagged and bulk apples. But even in the absence of differences in bulk and bagged purchases for lower- and higher-income shoppers, mere selections from among varieties could easily explain differences in prices paid. For example, lower-income shoppers purchased a large percentage of Red Delicious for an average price of $0.69 per pound, whereas higher-income shoppers purchased a large percentage of Gala for an average price of $0.85 per pound. Similar differences exist for other varieties of apples. What these purchasing patterns really show is that lower-income consumers recognize the purchasing constraints of their incomes and they make adjustments in their product selections to reflect these constraints. Stated differently, the purchasing behavior of lower-income consumers is consistent with economic theory.

Table 1. Household Demographic Data for Six Stores (By Percentage)

Demographic Information	Higher-Income Consumers				Lower-Income Consumers			
	Store 1	Store 2	Store 3	Average	Store 4	Store 5	Store 6	Average
Household Income								
Under $10,000	3.8	5.0	3.8	4.2	13.8	12.9	9.3	12.0
$10,000-$49,999	32.8	41.8	37.7	37.4	57.6	58.3	54.1	56.7
$50,000-$74,999	27.4	20.9	24.6	24.3	18.5	18.2	22.4	19.7
$75,000-$99,999	17.5	12.1	15.3	15.0	6.5	6.3	8.4	7.1
$100,000 +	18.8	20.2	18.2	19.1	3.8	4.3	5.9	4.7
Race								
White	95.4	92.4	93.1	93.6	59.2	83.6	85.7	76.2
Black	2.3	3.2	5.0	3.5	38.6	14.4	12.1	21.7
Others	2.6	4.6	1.9	3.0	2.1	2.0	1.8	2.0
Education								
Grade School	4.1	2.0	2.5	2.9	7.3	10.0	11.1	9.5
Some high School	11.6	5.0	8.6	8.4	21.3	25.4	25.8	24.2
High School Gradate	28.2	16.2	27.0	23.8	33.5	36.7	37.6	35.9
Some College	26.2	26.6	28.2	27.0	24.3	19.2	17.8	20.4
College Graduate	29.9	50.6	33.5	38.0	13.8	8.8	7.5	10.0

Source: 2000 Census Data and A National Supermarket Chain

Graph 1. Top Five Varieties for Each Income Group

Percent of Total vs Variety

Variety	High-Income	Lower-Income
RED DELICIOUS	26.5	38.9
GALA	21.0	11.7
GOLD DELICIOUS	15.3	17.7
GRANNY SMITH	12.4	9.4
FUJI	6.0	
ROME		8.0

□ High-Income ■ Lower-Income
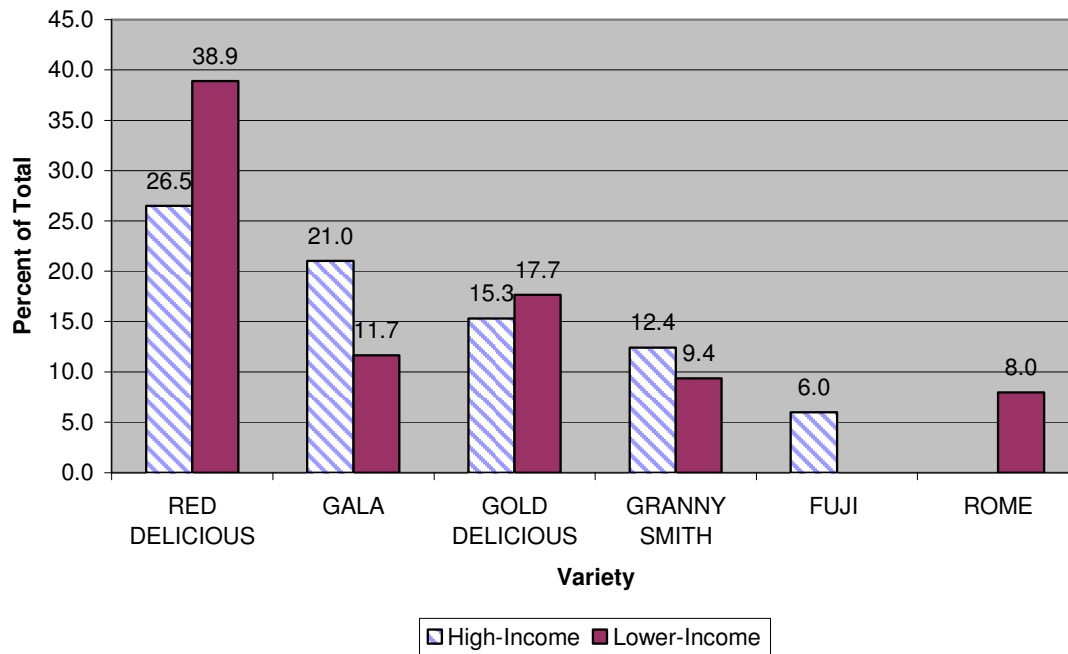
Graph 2. Price Comparisons of Bagged and Bulk-Bin Apples

Dollars per Pound

Higher-Income Stores (1-3); Lower-Income Stores (4-6)	Bagged Prices	Bulk-Bin Prices
Store 1	0.67	1.26
Store 2	0.66	1.21
Store 3	0.67	1.14
Store 4	0.65	1.04
Store 5	0.66	1.13
Store 6	0.63	1.23

□ Bagged Prices □ Bulk-Bin Prices
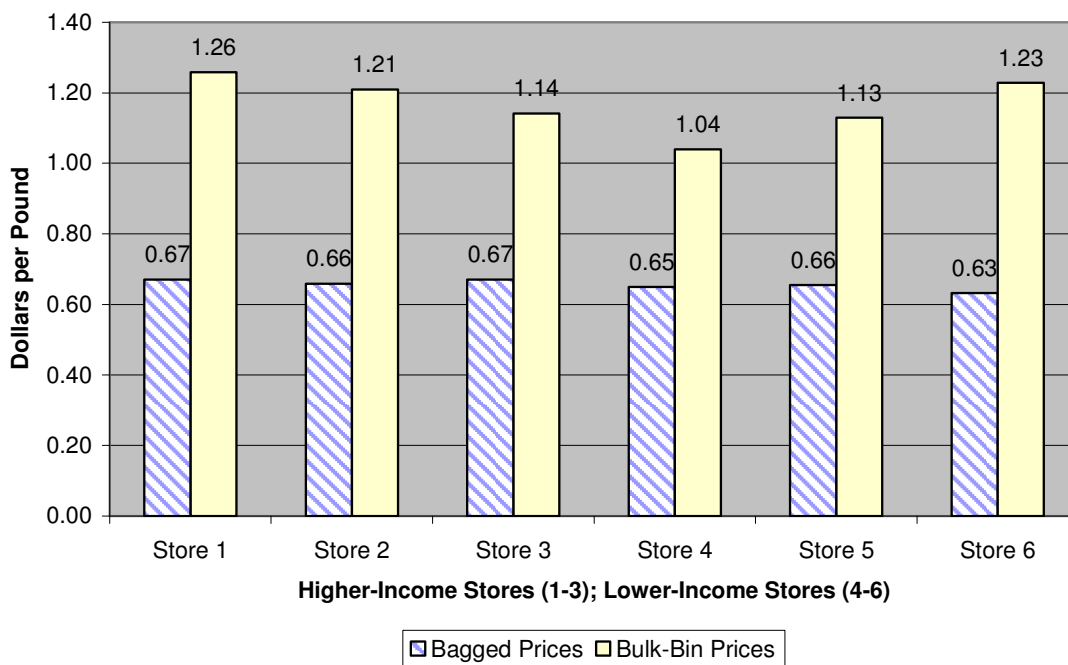
Graph 3. Dollar-Share Comparisons of Bagged and Bulk-Bin Apples by Store Type

Percent of Total

Store	Bagged Sales	Bulk-Bin Sales
Store 1	28.5	71.5
Store 2	33.0	67.0
Store 3	22.1	77.9
Store 4	48.3	51.7
Store 5	54.9	45.1
Store 6	50.9	49.1

Higher-Income Stores (1-3); Lower-Income Stores (4-6)

☐ Bagged Sales ☐ Bulk-Bin Sales
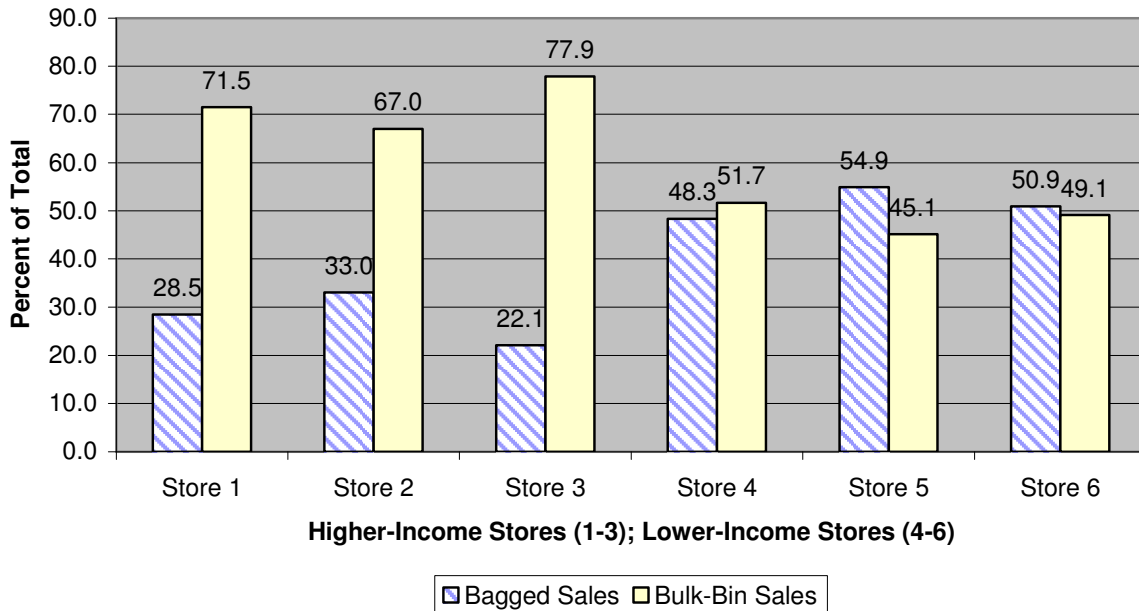
Graph 4. Quantity-Share Comparsions of Bagged and Bulk-Bin Apples by Store Type

Percent of Total

Store	Bagged Pounds	Bulk-bin Pounds
Store 1	42.8	57.2
Store 2	47.5	52.5
Store 3	32.6	67.4
Store 4	59.8	40.2
Store 5	67.7	32.3
Store 6	66.9	33.1

Higher-Income Stores (1-3);Lower-Income Stores (4-6)

☐ Bagged Pounds ☐ Bulk-bin Pounds
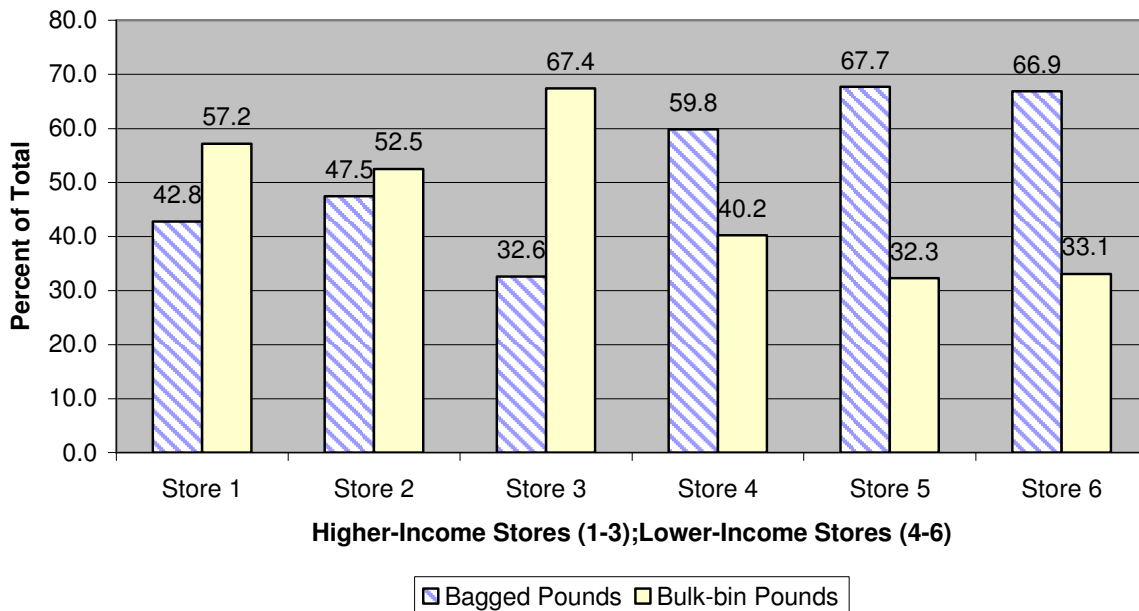
Table 2. Prices Paid Per Pound for Apples by Store and Variety[*]

| VARIETY | | HIGH-INCOME STORES (H) | | | | LOW-INCOME STORES (L) | | | | |
		Store 1 Weighted Price Per Pound	Store 2 Weighted Price Per Pound	Store 3 Weighted Price Per Pound	AVG	Store 4 Weighted Price Per Pound	Store 5 Weighted Price Per Pound	Store 6 Weighted Price Per Pound	AVG	H -- L AVG DIFF
BRAEBURN		1.31	1.29	1.33	**1.31**	1.15	1.20	1.28	**1.21**	**0.10**
CAMEO		1.08	1.20	1.04	**1.11**	1.26	1.25	1.19	**1.23**	**-0.13**
EMPIRE		0.60	0.56	0.51	**0.56**	0.42	0.49	0.57	**0.49**	**0.06**
FUJI		1.33	1.36	1.43	**1.37**	1.04	0.69	1.52	**1.08**	**0.29**
GALA		0.91	0.78	0.87	**0.85**	0.84	0.65	0.82	**0.77**	**0.08**
GINGER GOLD		0.62	0.59	0.63	**0.61**	0.62	0.59	0.61	**0.61**	**0.01**
GOLD DELICIOUS		1.05	1.02	1.06	**1.04**	0.92	0.91	0.93	**0.92**	**0.12**
GRANNY SMITH		1.23	1.21	1.25	**1.23**	1.18	1.10	1.14	**1.14**	**0.09**
JONAGOLD		1.26	1.10	0.84	**1.07**	1.00	1.18	0.68	**0.95**	**0.11**
JONATHAN		0.65	0.64	0.59	**0.63**	0.64	0.65	0.63	**0.64**	**-0.01**
MCINTOSH		0.64	0.63	0.65	**0.64**	0.63	0.65	0.63	**0.64**	**0.00**
PACIFIC ROSE		1.12	1.02	1.31	**1.15**	1.00	1.10	1.25	**1.12**	**0.03**
PAULA RED		0.96	0.73	0.68	**0.79**	0.50	0.96	0.94	**0.80**	**-0.01**
PINK LADY		1.59	1.19	1.10	**1.29**	1.30	1.21	0.93	**1.15**	**0.15**
COURTLAND		--	0.69	0.68	**0.69**	0.68	--	0.66	**0.67**	**0.02**
RED DELICIOUS		0.94	0.91	0.89	**0.91**	0.71	0.59	0.78	**0.69**	**0.22**
ROME		0.52	0.52	0.49	**0.51**	0.52	0.55	0.53	**0.53**	**-0.02**

* Price differences of $.06 or greater are statistically significant.

Table 3. Quantity Percentages of Apple Sales by Variety

Apple Variety		HIGH-INCOME STORES (H)				LOW-INCOME STORES (L)				H -- L
		Store 1	Store 2	Store 3	AVG.	Store 4	Store 5	Store 6	AVG	DIFF
		Percent of Total				Percent of Total				
RED DELICIOUS		25.17	28.47	25.80	**26.48**	42.55	37.93	36.25	**38.91**	**-12.43**
GALA		18.54	18.21	26.33	**21.03**	10.60	13.24	11.13	**11.66**	**9.37**
GOLD DEL ICIOUS		17.55	15.97	12.33	**15.28**	17.27	17.18	18.51	**17.65**	**-2.37**
GRANNY SMITH		12.59	13.14	11.53	**12.42**	8.62	9.50	10.04	**9.39**	**3.03**
FUJI		6.23	5.29	6.43	**5.98**	2.59	2.51	1.16	**2.09**	**3.90**
BRAEBURN		5.00	3.39	5.71	**4.70**	1.54	1.17	1.34	**1.35**	**3.35**
APPLES ROME		3.78	4.02	2.45	**3.42**	7.23	7.20	9.49	**7.97**	**-4.56**
JONATHAN		3.37	3.41	2.47	**3.08**	3.69	4.65	5.44	**4.59**	**-1.51**
MCINTOSH		2.61	2.40	1.48	**2.16**	1.08	1.24	1.90	**1.41**	**0.76**
JONAGOLD		2.41	1.92	0.61	**1.65**	1.44	2.29	1.27	**1.67**	**-0.02**
GINGER GOLD		0.84	1.16	0.67	**0.89**	1.71	1.78	1.87	**1.79**	**-0.90**
EMPIRE		0.83	0.78	0.39	**0.67**	0.55	0.67	0.48	**0.57**	**0.10**
CAMEO		0.51	1.20	0.66	**0.79**	0.80	0.43	0.81	**0.68**	**0.11**
PINK LADY		0.36	0.19	2.88	**1.14**	0.19	0.08	0.07	**0.11**	**1.03**
PACIFIC ROSE		0.19	0.21	0.14	**0.18**	0.08	0.10	0.16	**0.11**	**0.07**
PAULA RED		0.04	0.08	0.01	**0.04**	0.02	0.03	0.03	**0.03**	**0.02**
COURTLAND			0.15	0.11	**0.13**	0.07		0.05	**0.06**	**0.07**
Total		100.02	99.99	100.00	**100.05**	100.03	100.00	100.00	**100.03**	

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