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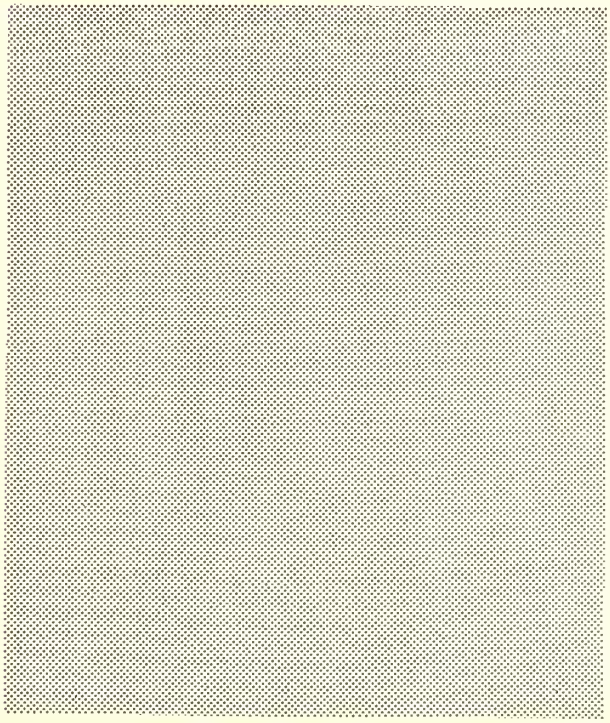
SOME ECONOMIC ASPECTS OF ORANGE PROCESSING



MARKETING ECONOMICS DIVISION
ECONOMIC RESEARCH SERVICE
U.S. DEPARTMENT OF AGRICULTURE

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SOME ECONOMIC ASPECTS OF ORANGE PROCESSING 1/

Per capita consumption of orange products has shifted greatly since 1946, the year frozen orange concentrate was introduced on the market. Consumers rapidly accepted orange concentrate and the resulting increased processing had a major impact on the industry. The changing pattern of consumption of fresh oranges, canned orange juice, and frozen orange concentrate was one of the more obvious manifestations. 2/ However, numerous other interrelated changes have occurred. This article will attempt to relate the increase in processing to prices, marketing costs, and marketing efficiency. The 10-year span, 1953-62, was selected for analysis. This period seemed most satisfactory since the effects of increased processing had emerged by 1953, and the abnormal conditions caused by the December 1962 freeze in Florida were excluded.

Orange Consumption

In this 10-year period, consumption of fresh oranges dropped from 27.6 pounds per person to 15.7 pounds, a decrease of 43 percent (table 15). Per capita consumption of canned orange juice decreased 39 percent during the period--from 3.1 pounds to 1.9 pounds. In sharp contrast, consumption of frozen orange concentrate increased from 12.8 pounds (reconstituted basis) per person in 1953 to 19.5 pounds in 1962, or 52 percent. Despite the large changes in per capita consumption of these products individually, combined consumption of the 3 on a single-strength equivalent basis remained essentially unchanged. Consumption of the 3 products totaled 30.5 pounds per person in 1953, 31.0 pounds in 1962, and averaged 30.1 pounds for the entire 10-year period. 3/ During 6 of the 10 years, consumption varied less than 5 percent from average; it varied more than 10 percent only once--downward in 1958, a year of very high prices.

For the first 5 years of the period, expenditures averaged $4.74 per person. In no year did expenditures vary more than $0.07 from that figure. In 1958, price increases more than offset reduced consumption and a new level of per capita expenditures was established at $5.51. For 2 years following, there was practically no variation. Expenditures dropped to $5.30 in 1961 and to $5.15 in 1962.

Prices

Closely associated with the changing pattern of consumption were changes in orange prices. Table 16 contains prices per 24 ounces single-strength equivalent for the 3 products individually and combined into an average price for oranges. 4/ The average price alternated above and below the 1953 price of 22.9 cents through 1957. Variations were small, however, ranging from 1.0 cent below in 1955 to 2.0 cents above in 1956. In 1958, because of a reduced orange crop following a severe freeze, the average price for the 3 products jumped to 32.2 cents, the highest level in the 10-year period. A downward movement in prices followed, reducing the average price to 25.4 cents in 1962.

Concealed in the average prices are the somewhat different price behavior

1/ Prepared by Victor G. Edman, agricultural economist, Marketing Economics Division, Economic Research Service, USDA.

2/ These 3 products accounted for most of the orange consumption. Because retail prices are available for these 3 only, other orange products could not be included in the analysis.

3/ Figures for total consumption of 3 products include fresh oranges and frozen concentrate converted to a single-strength basis.

4/ The average of retail prices of oranges sold fresh, as canned juice and as frozen concentrate weighted by their respective volumes of consumption.

Table 15.--Oranges, fresh, canned juice, and frozen concentrate: U. S. average per capita consumption and expenditures, 1953-62

Year	Fresh oranges	Canned juice 1/	Frozen concentrate 2/	Total 3/	Consumer expenditures per capita
	Pounds	Pounds	Pounds	Pounds	Dollars
1953	27.6	3.1	12.8	30.5	4.76
1954	24.5	3.1	13.9	29.9	4.79
1955	24.8	3.0	15.8	32.8	4.69
1956	22.6	2.4	15.5	30.4	4.81
1957	21.6	2.4	17.0	31.7	4.67
1958	17.6	2.7	13.3	24.9	5.51
1959	19.8	1.9	16.6	30.2	5.53
1960	19.4	2.1	17.6	31.1	5.52
1961	16.2	1.7	16.8	28.0	5.30
1962	15.7	1.9	19.5	31.0	5.15

1/ Single-strength juice.
2/ Single-strength equivalent.
3/ Fresh oranges and frozen concentrate converted to a single-strength basis.

Table 16.--Oranges: Retail price and farm-retail spread per 24 ounce single-strength equivalent, 1953-62

Year	Retail price				Farm-retail spread			
	Fresh oranges	Canned juice	Frozen concentrate	All	Fresh oranges	Canned juice	Frozen concentrate	All
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
1953	26.8	17.7	19.6	22.9	20.4	13.4	14.9	17.4
1954	30.3	18.2	18.6	23.6	21.2	13.8	14.2	17.2
1955	26.9	17.6	18.3	21.9	19.1	13.6	14.1	16.2
1956	30.3	19.6	19.6	24.9	20.9	14.5	13.8	17.4
1957	29.3	18.5	18.3	22.6	21.0	13.8	13.6	16.5
1958	43.5	20.8	27.0	32.2	27.6	17.0	20.3	22.5
1959	32.5	25.9	25.8	28.4	22.5	17.2	17.7	19.5
1960	36.9	22.4	22.5	27.7	24.5	16.4	16.1	19.1
1961	38.3	25.2	24.6	29.3	26.0	16.6	16.5	19.8
1962	37.6	22.2	20.9	25.4	27.2	16.3	14.3	17.8

patterns of the 3 products used in computing the averages. Retail prices for canned juice and frozen concentrate were nearly equal from 1953 to 1962. In all years except 1958, the difference in their prices per 24 ounce single-strength equivalent was less than 2.0 cents, and in 7 years that difference was less than 1.0 cent. The retail price for fresh oranges during this period averaged about 35 percent higher per 24 ounces single-strength equivalent than the price of processed products. The trend in relative positions, however, helps explain shifts in per capita consumption. From 1953 through 1957, prices for each product fluctuated from year to year, but relative positions remained stable. In 1958 all prices moved sharply upward. Fresh oranges increased 14.2 cents; concentrate was up 8.7 cents; and canned juice rose 2.3 cents followed by an increase of 5.1 cents in 1959.

After reaching these peaks, price behavior for the 3 products became more divergent. Fresh orange prices dropped sharply in 1959, then moved upward and remained relatively high through 1962. Canned juice prices maintained a moderately high position through 1962. The price of concentrate fluctuated after 1958 but fell in 1962 to a level slightly above the pre-1958 years. Consequently, the price gap between fresh and processed oranges widened. The 1962 price of 20.9 cents for concentrate compared with 22.2 cents for canned juice and 37.6 cents for fresh oranges.

The changes in consumption of individual products reflect these price changes. Concentrate became a much better buy relative to canned juice and fresh oranges--a situation borne out by consumption data. However, not all consumption shifts were in response to price changes. Undoubtedly variations in other determinants of demand, such as preferences of consumers and prices of substitute commodities, also had an effect.

The price behavior described for fresh oranges, canned juice, and frozen concentrate following 1957 reflected shifting supply-demand relationships for these products. Increases in population and consumer income during the 10 years probably exerted an upward pressure on demand for all 3 products. In addition, changes in consumers' tastes and in prices of substitute products may either have increased or decreased demand. Supplies, in terms of total orange production and their use, may be described more specifically. In 1953, approximately 51 percent of the U. S. orange crop was sold fresh compared to 49 percent processed. The percentage processed increased steadily. In 1962, 73 percent of the crop was processed and 27 percent sold fresh. In terms of boxes, processed use increased from 57 million boxes in 1953 to 98 million boxes in 1962. Fresh use decreased from 58 million boxes in 1953 to 35 million boxes in 1962. Fresh orange prices increased greatly because of reduced supplies and possibly an increase in demand. The retail price climbed from 26.8 cents per 24-ounce equivalent in 1953 to 37.6 cents in 1962. In contrast, the upward pressure on prices of processed products coming from increased demand was almost counterbalanced by the increased supply, particularly of frozen concentrate. Canned juice cost 17.7 cents per 24 ounces in 1953, compared with 22.2 cents in 1962. Frozen concentrate was 19.6 cents per 24 ounce single-strength equivalent in 1953 and 20.9 cents in 1962.

Marketing Costs

Increased utilization of the orange crop for processing suggests higher returns in this use compared with alternatives. While marginal returns cannot be calculated from available data, a partial explanation of the increase in processing is offered by comparing marketing costs for fresh oranges, canned juice, and frozen concentrate. The farm-retail spread is used as an estimate of total unit marketing costs. In 1953, the spread for oranges sold fresh was 20.4 cents compared with 13.4 cents for canned juice and 14.9 cents for frozen concentrate, all for 24 ounce single-strength equivalents (table 16). By 1957 the spread for fresh oranges had risen to 21.0 cents and the spread for canned juice to 13.8 cents, while the spread for concentrate had dropped to 13.6 cents. In 1958 all spreads soared along with prices. However, the spread for fresh oranges, after decreasing in 1959, increased through 1962. The spread for canned juice did not go as high as those for the other products in 1958, but its subsequent decline was small. The spread for concentrate, on the other hand, declined considerably after 1958. As a result, the 1962 spread was 14.3 cents for concentrate compared with 16.3 cents for canned juice and 27.2 cents for fresh oranges.

The main marketing-cost advantages of concentrate involve smaller costs for transportation and retailing, which more than offset the added cost of processing. For example, because of increased standardization and reduced perishability, retail stores in Washington, D. C., in 1959-60

were able to sell 6 ounces, the equivalent of 24 ounces of single-strength juice, for a markup of less than 5.0 cents compared with 7.2-13.3 cents for the equivalent quantity of fresh oranges. 5/ The cost of transporting 6 ounces of concentrate from Florida to Washington, D. C. was less than 1.0 cent compared with 3.0 cents for an equivalent quantity of fresh oranges shipped from Florida and 7.1 cents from California.

Intercity Price Variation

Orange prices vary considerably among cities. Under a perfectly efficient competitive system, these variations would not exceed transportation differentials. Actually they often do. The impact of increased processing on intercity price variation was examined by comparing prices in 1962 and 1953 for 20 major cities.

In 1953, annual retail prices of fresh oranges per 24 ounces single-strength equivalent ranged from 20.1 cents in Los Angeles to 32.2 cents in Seattle, a difference of 12.1 cents (table 17). Ten years later, fresh orange prices varied from 27.2 cents in Washington, D. C. to 46.6 cents in Seattle, a difference of 19.4 cents.

The price range for canned juice was less. In 1953, 24 ounces of canned juice cost from 15.2 cents in Atlanta to 19.8 cents in Los Angeles, a range of 4.6 cents. In 1962, the price of canned juice varied from 19.2 cents in Atlanta to 27.6 cents in San Francisco, a difference of 8.4 cents.

The smallest range in prices was for frozen concentrate. In 1953, prices per 24 ounces single-strength equivalent varied from 18.1 cents in Boston to 21.2 cents in Cleveland and Detroit, or 3.1 cents. In 1962, the lowest price for concentrate was 19.0 cents in Scranton and the highest was 26.8 cents in San Francisco, a difference of 7.8 cents.

The price increases that occurred from 1953 to 1962 were not unique for orange products. The BLS Consumer Price Indexes for 1962 (1953=100) ranged from 108 in Detroit and Pittsburgh to 118 in Boston. However, the percentage change for fresh oranges was always more, and usually much more than the general price level change. This was not true for concentrate. Frozen concentrate price increases were seldom more (and in most cases less) than the increase in the general price level. In 5 cities, the 1962 price for concentrate was less than the 1953 price.

Therefore, the increase in orange processing had a strong damping effect on the intercity variation in average orange prices. The percentage change in the average price for the 3 products was more than the Consumer Price Index change only in Boston, Houston, Los Angeles, Portland, Oregon, St. Louis, and San Francisco. In the other 14 cities the percentage change in orange prices was about the same or less than the percentage change in the general price level.

5/ Badger, Henry T., The Impact of Technological Change on Marketing Costs and Grower's Returns, MRR 573, U. S. Dept. Agri., Dec. 1963.

Table 17.--Oranges: Retail price per 24-ounce single-strength equivalent and consumer price index, by cities, 1953 and 1962

City and U.S. average	1953					1962					Percentage change in price 1953 to 1962			
	CPI all items 1/	Retail price per 24-ounce equivalent				CPI all items 1/	Retail price per 24-ounce equivalent							
		All oranges	Fresh oranges	Canned orange juice	Frozen orange concentrate		All oranges	Fresh oranges	Canned orange juice	Frozen orange concentrate	All oranges	Fresh oranges	Canned orange juice	Frozen orange concentrate
		Cents	Cents	Cents	Cents		Cents	Cents	Cents	Cents	Percent	Percent	Percent	Percent
Atlanta	100	20.0	20.5	15.2	20.5	110	22.1	28.0	19.2	20.0	10.5	36.6	26.3	- 2.5
Baltimore	100	21.5	23.4	16.8	20.6	114	22.2	27.3	21.7	20.2	3.3	16.7	29.2	- 2.1
Boston	100	21.4	25.3	16.8	18.1	118	25.7	37.3	24.3	21.3	20.1	47.4	44.6	17.7
Chicago	100	22.8	27.9	16.9	18.3	114	25.8	41.2	21.3	20.2	13.1	47.6	26.0	10.4
Cincinnati	100	20.9	22.8	16.7	19.8	111	22.2	27.9	22.3	20.0	6.2	22.3	33.5	1.0
Cleveland	100	23.8	27.4	18.0	21.2	113	24.2	35.2	22.1	20.1	1.7	28.4	22.8	- 5.2
Detroit	100	24.8	29.3	18.6	21.2	108	26.2	40.8	21.5	21.0	5.7	39.2	15.6	- 1.0
Houston	100	23.3	28.7	17.8	18.7	110	27.7	44.0	21.6	21.9	18.9	53.3	21.3	17.1
Kansas City	100	30.0	27.8	18.0	18.6	114	27.6	45.1	21.4	21.3	- 8.0	62.2	18.8	14.5
Los Angeles	100	19.8	20.1	19.8	19.4	115	27.7	40.4	25.0	23.0	39.9	101.0	26.3	18.5
Minneapolis-St. Paul	100	24.3	28.9	18.8	20.5	113	26.5	41.7	22.1	21.0	9.1	44.2	17.6	2.4
New York City-New Jersey	100	23.6	28.9	16.8	19.4	114	24.4	37.5	21.4	19.6	3.4	29.7	27.3	1.0
Philadelphia	100	21.2	24.6	16.7	18.3	113	22.6	31.2	20.8	19.4	6.6	26.8	24.6	6.0
Pittsburgh	100	23.9	28.5	17.3	20.5	108	25.5	36.4	21.9	21.6	6.7	27.7	26.5	5.4
Portland	100	24.0	28.9	19.6	19.6	112	28.7	42.3	25.4	23.6	19.6	46.4	29.6	20.4
St. Louis	100	20.3	27.8	17.2	20.3	112	25.9	41.4	21.4	20.3	27.6	48.9	24.4	0
San Francisco	100	23.0	26.0	19.7	20.3	117	30.6	41.0	27.6	26.8	33.0	57.7	40.1	32.0
Scranton	100	21.2	23.9	16.5	19.3	112	23.3	35.0	20.0	19.0	9.9	46.4	21.2	- 1.6
Seattle	100	25.9	32.2	19.5	20.2	115	29.6	46.6	26.4	23.3	14.3	44.7	35.3	15.3
Washington, D.C.	100	21.6	24.4	17.2	19.5	111	22.1	27.2	20.1	20.3	2.3	11.5	16.9	4.1
U. S. average	100	22.9	26.8	17.7	19.6	113	25.4	37.6	22.2	20.9				

1/ Bureau of Labor Statistics Consumer Price Index.