

A Study Of The Milk Market of Memphis, Tennessee

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SUMMARY

This study was undertaken to: (1) Describe the economic characteristics of the market, (2) describe the functions of the various institutions in the market, and (3) analyze the demand for milk and milk products normally distributed by fluid milk dealers in terms of: (a) trends in sales and consumption of fluid milk products, and (b) changes in sales in response to changes in retail milk prices.

Memphis is the largest market for fluid milk in Tennessee. The population of Memphis grew consistently from 1910 to 1952 and in recent years has extended into suburban areas in both Tennessee and Arkansas. The estimated population of the market area served by Memphis distributors increased from about 356,000 in January 1943 to nearly 488,000 in December 1952.

Non-agricultural employment fluctuated but was higher at the end of the period studied than in May 1945 when employment data were first available. The trend in weekly average earnings of production workers in all manufacturing in Memphis was upward from January 1950 through December 1952, the period during which earnings data were available. Results of analysis indicated that there were no significant relationships between either changes in non-agricultural employment or earnings and changes in sales during the same month, or with sales lagged either one or two months. However, this analysis was weakened by the fact that non-agricultural employment and earnings were at a relatively high level during this period.

The retail price of standard milk changed only 18 times during the period studied but the index of retail food prices in Memphis changed 118 times. At the end of the period the index for retail food prices in Memphis was 71 percent higher and the retail price of standard milk was 63 percent higher than at the beginning of the period.

The Memphis Milk Market has within it a number of organizations exerting influence on the problems which exist in a fluid milk market. The most important of these include the Mid-South Milk Producers Association, the Memphis Dairy Exchange, Inc., the Memphis-Shelby County Health Department, the Federal Order for the Memphis Milk Marketing Area, and the Memphis Dairy Council.

Daily average sales of Class I milk sold in containers of less than one-gallon ranged from about 100,000 to 186,000 quarts equivalent from January 1943 through December 1952 (figure 1). Homogenized milk, Bulgarian buttermilk, skim milk, and special creams were relatively more important in 1952 than in 1943, while standard milk, extra rich milk, plain buttermilk, chocolate milk, and light cream were less important.

From 1943 through 1952 Class I milk was sold in Memphis in one-half gallon, quart, pint, one-third quart, and one-half pint containers. Sales in quart containers ranged from 72 to 87 percent of total Class I sales. During the last three months of 1952 one-half gallon sales jumped from about 1 percent to over 7 percent of total Class I sales. The volume in containers of less than one quart ranged from 10 to 20 percent of total Class I sales. Discontinuing sales in one-third quart containers and substituting one-half pints, early in 1951, resulted in approximately the same number of units being sold, but a decline of nearly 20 percent in the volume of milk sold in containers of less than one quart. The shift from one-third quart to one-half pint containers early in 1951 appeared to account for about 60 percent of the decline in total Class I sales during the 12-month period following the shift.

There was significant seasonal variation in daily average Class I sales and in the sales of most of the fluid milk products. Generally sales were highest during the fall and winter and lowest in the spring and summer.

The seasonal decline in sales of standard, homogenized, and extra rich milk appeared to be associated with a lack of refrigeration in some homes in the market area. This seasonal decline was offset in part by increased sales of Bulgarian buttermilk and by quarts of chocolate milk. The seasonal variation in sales of standard and homogenized milk in one-half pint containers can be attributed in part to the school lunch programs. Seasonal variations in sales of light and heavy creams were much greater than for any other of the fluid products. There were two peak sales periods for creams. The spring peak was associated with Easter and the fresh strawberry season; the December peak with the Christmas-New Year Holiday season.

Sales responses to price changes were analyzed by comparing daily average sales during the month before with daily average sales during the month after a price change. The effects of both trend and season were removed. It was assumed that if the effects of these two factors were eliminated, other factors could be considered equal from one month to the next. The range in sales variations in months following zero price change was generally as great or greater than that for months following price changes.

Sales of standard, homogenized, and extra rich milk in quart containers were combined in order to analyze the effect of price change on aggregate sales of sweet whole milk. It was found that price changes had no significant effect on aggregate sales the month following price change, nor on sales the second and third months following price changes.

When analyzed no significant effect of price changes on daily average sales of each product sold in quart containers was found. The effect of price change on daily average sales of light and heavy creams in one-third quart and one-half pint containers was also analyzed, finding a 10 percent change in the price of light cream

sold in these containers was followed by a change in sales of about 1.4 percent in the opposite direction. It was found that price changes for heavy cream sold in these containers did not significantly affect daily average sales.

It seemed reasonable to expect that a change in price would be followed by a change in the opposite direction in daily average sales. However, there were many exceptions as indicated in table 1.

TABLE 1.—*The Number of Times That Milk Sales Increased and Decreased Following Changes in the Price of Milk, by Product, Quart Containers, and the Number and Percent of "Rational" Responses, Memphis, Tennessee*

Product	Price changes	"Rational" sales responses		Prices increases		Price decreases	
				Sales decrease	Sales increase	Sales decrease	Sales increase
	No.	No.	Percent	No.	No.	No.	No.
Sweet whole milk ²	15	10	66.7	7	3	2	3
Standard	15	7	46.7	4	6	2	3
Homogenized	11	6	54.5	5	3	2	1
Extra rich	15	8	53.3	5	5	2	3
Bulgarian buttermilk	15	9	60.0	7	3	3	2
Plain buttermilk	14	9	64.3	6	3	2	3
Chocolate milk	15	10	66.7	7	3	2	3
Skim milk	12	5	41.7	2	6	1	3
Light cream	15	10	66.7	6	4	1	4
Heavy cream	12	5	41.7	3	5	2	2
Total (Excluding sweet whole milk)	124	69	55.6	45	38	17	24

¹ "Rational" in that a price change was followed by a change in daily average sales in the opposite direction.

² Includes standard, homogenized, and extra rich milk.

Since nearly one-half of the sales responses to price changes were considered "irrational," individual responses were examined and the data were arrayed variously for possible explanations of the apparently "irrational" responses. There was little difference in the proportion of "irrational" responses following price increases and those following decreases. Prices were arrayed by magnitude, but at each price where there were two or more observations, at least one appeared to be "irrational." When arrayed chronologically it appeared that "rational" observations tended to be grouped together and "irrational" observations together. About one-half of the "irrational" observations occurred between October 1950 and October 1951, a period of unusual consumer income shifting.

It was concluded that price changes had no significant effect on daily average sales of any fluid milk product sold in quart containers in the Memphis, Tennessee, Market during the period studied. Nearly one-half of the responses of sales to price changes were "irrational." However, many of the "irrational" responses apparently resulted from factors other than milk price changes.

A Study Of The Milk Market Of Memphis, Tennessee

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INTRODUCTION

Changing economic conditions render milk price changes necessary. An increase in the price of milk to consumers usually is followed by adverse publicity by the press. Perhaps that may be attributed to the relatively infrequent changes in retail milk prices, or to the possibility that consumers consider milk a public utility, or that raising its price is considered by some to be a moral wrong.

The decade of 1943-52 was one of generally rising prices. As would be expected, changes in the retail price of milk during that period were mostly increases, and, as a result, much unfavorable publicity was received by milk distributors and producers. Despite bad publicity, distributors believed that retail price changes were necessary.

Purpose of This Study

There is need in Tennessee for research which will give individuals and organizations valuable information relative to their decisions about making milk price changes. For this study Memphis was selected as the "laboratory."

The major objectives of this study were to:

1. Describe the market in terms of population, incomes, employment, and such indicators of economic activity as department store sales and retail food prices.
2. Examine and describe the role of the various institutions in the market, such as producer organizations, dealer organizations, and others.
3. Analyze the demand for milk and milk products normally distributed by fluid milk dealers in terms of:
 - (a) Trends in sales and consumption of fluid milk products.
 - (b) Changes in sales in response to changes in retail milk prices.

This bulletin is based on a Ph.D. thesis submitted by the author to the faculty of Purdue University. Statistical data used in this study have been published as Monograph No. 270, Rural Research Series, Agricultural Experiment Station, University of Tennessee, Knoxville, Tennessee, 1955.

The assistance and suggestions given by many individuals and organizations in developing this report is acknowledged.

Procedures

The Memphis Market was selected as the "laboratory" for this study because audited sales data for the market could be obtained for all fluid milk products, by container size, by months from January 1943 through December 1952. Price data were also available for the entire period with the exception that price data for milk sold in containers of less than one quart were incomplete.

Sales data were obtained from the Mid-South Milk Producers Association, the Market Administrator for the Memphis Milk Marketing Area, and from milk dealers. From January 1943 through September 1950 the Mid-South Milk Producers Association audited the sales records of all distributors, with the exception of one year, during which the records of one company were not audited. However, that company made its sales data available in order that total sales data for the market would be available for analysis. Data for October 1950 through December 1952 were obtained from the Market Administrator. A new firm started distributing milk in the Memphis Market area in October 1952, but was not regulated under the Federal Order. Estimates were made of the sales of the new distributor for October, November, and December 1952, and added to sales as reported by the Market Administrator.

Sales of milk in containers of one gallon or more were eliminated from total sales. Most of such sales were unusual ones, including sales to military installations, bulk sales to various institutions, and sales of skim milk to rubber manufacturing plants. Also many of these sales occurred at irregular intervals. In order to eliminate fluctuations in sales data caused by the different number of days in different months, sales were converted into daily average sales for each month.

There are many forces acting to cause variation in milk sales, but generally they may be classified in two groups: (1) regular or recurring variations; and (2) irregular or intermittent fluctuations. The first group might be termed "calendar variations" because it includes long-time trends, seasonal variation, day-of-the-week variation, and holiday fluctuation. The second group of fluctuations are caused by highly variable factors such as price changes, temperature, industrial conditions and the like.

Sales data were obtained for the 10-year period 1943-1952, by months. However, it soon became evident that World War II sales data would not be very valuable except for descriptive purposes. With the exception of certain descriptive materials, most of the analysis was limited to the period of July 1946 (following the termination of O.P.A. regulations) through December 1952.

Based on census data, estimates were made of the population of the market served by Memphis milk distributors in 1940 and 1950. The years between 1940 and 1950 were interpolated and population estimates for 1951 and 1952 were obtained by extrapolation.

Income data available were of two types. The first was a series of average earnings per week of production workers in all manufacturing industries in Memphis by months. However, these data were available only for 1950, 1951 and 1952. The data represented earnings before deductions of about one-fourth of the non-agricultural employees in Shelby County, in which Memphis is located.

The second type of data was a series of net effective buying income per capita on a calendar year basis, and included all of the years of this study. These income data represented the income from all sources available for disposal by consumers. In addition to the two income series, data on estimated non-agricultural employment in Shelby County, by months, from May 1945 through December 1952, were available.

The index of department store sales in Memphis and the index of retail food prices in Memphis were selected as indicators of economic activity and the general level of prices in Memphis. These series were used to compare with the level of the price of milk.

It was necessary for the purpose of this study to eliminate secular trend from the sales data. For each series of sales data, trend was measured by using the 12-months moving average, centered. Trend was removed by the moving average method by expressing monthly sales data as a percentage of the moving average.¹ Seasonal variation was measured and then eliminated from sales data.²

The assumption was made that if the effects of trend and seasonal variation were removed from sales, then other factors could be ignored in measuring the short-run effect of price on sales. The short-run effect of price change was measured by comparing daily average sales during the month following a price change with daily average sales during the month preceding the price change.

DESCRIPTION OF THE MARKET

Memphis, located in the southwestern corner of Tennessee, is the largest market for fluid milk in Tennessee. Memphis is in an important cotton producing area and is a leading cotton trade center.

Dairy herds in the Memphis milkshed are relatively large. About one-half of all whole milk sold by farmers in 1949 in West Tennessee (including counties not in the Memphis milkshed) was produced on farms with 30 or more milk cows.³ By comparison, about one-fourth of all whole milk sold by farmers in Tennessee was produced on farms with 30 or more cows. A study of the

¹ The methods followed are outlined by Pearson, F. A., and Bennett, K. R., in *Statistical Methods*, John Wiley and Sons, Inc., New York, 1942.

² The methods followed are outlined by Foote, R. J., and Fox, Karl A., *Seasonal Variation: Methods of Measurement and Tests of Significance*, Agricultural Handbook No. 48, B.A.E., U.S.D.A., Washington, D. C., September 1952.

³ Downen, M. L., *The Tennessee Farm Dairy Industry*, Monograph 266, Agricultural Experiment Station, University of Tennessee, Knoxville, Tennessee, 1952.

Memphis milkshed indicated that the average size of herds on farms producing fluid milk for that market in 1948-49 was 56.⁴

Population of Memphis

Memphis, the largest city in Tennessee, had an estimated population of 410,000 in 1952. The growth of population has extended into suburban areas of Memphis in both Tennessee and Arkansas. For the purpose of this study, it was necessary to estimate the population of the market served by Memphis distributors. This estimate was obtained for the census years of 1940 and 1950 by adding the populations of the cities of Memphis, Tennessee and West Memphis, Arkansas, urban places of Shelby County, Tennessee (other than Memphis), and the rural non-farm population of Shelby County. The population for years between was obtained by interpolation and for 1951 and 1952 by extrapolation. Memphis distributors sell milk in some additional small towns, but it was estimated that these sales were offset by sales by non-Memphis distributors in the Memphis area.

The estimated population of the market area increased an average of about 1100 per month during the period 1943 through 1952, ranging from an estimated 356,000 at the beginning to nearly 488,000 at the end of the period (figure 2).

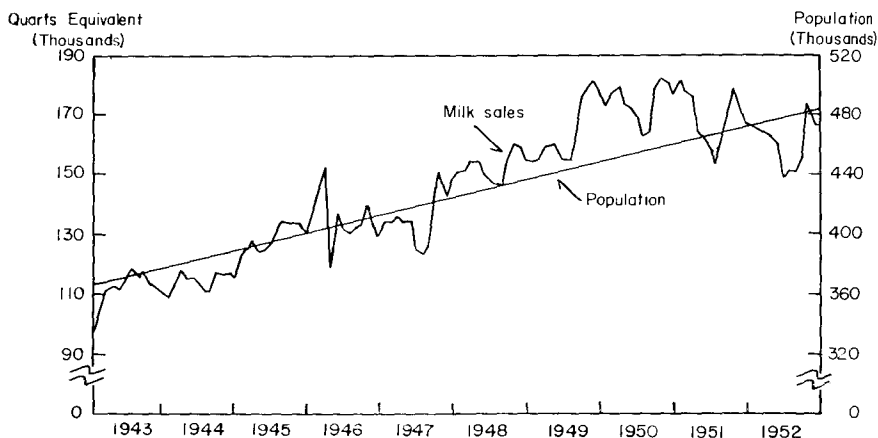


Figure 2.—Estimated population of the Memphis Market Area and daily average sales, quarts equivalent, of Class I milk sold in containers of less than one gallon, Memphis, Tennessee, market, by months, January 1943-December 1952.

The population increase was accompanied by an increase in total Class I milk sales. While milk sales fluctuated from month to month, per capita sales on an annual basis did not appear to change substantially. This is shown by table 2. However, the decline in sales in 1951 and 1952 may indicate a trend toward lower consumption.

⁴ Downen, M. L., *Seasonal Costs of Producing and Marketing Fluid Milk in the Memphis, Tennessee Milkshed, 1948-49*, Monograph 252, Agricultural Experiment Station, University of Tennessee, Knoxville, Tennessee, 1950.

TABLE 2.—*Estimated Daily Consumption Per Capita of Class I Milk in the Memphis, Tennessee, Market by Years, 1943-1952*

Years	Per Capita Consumption	Years	Per Capita Consumption
	pint		pint
1943 ¹	.67	1948	.74
1944 ¹	.64	1949	.78
1945 ¹	.70	1950	.78
1946	.70	1951	.74
1947	.68	1952	.69

¹ Estimates were made for war years, but consumption probably would have been higher during 1943 and 1944 had an adequate supply been available during all months of those two years.

The Memphis Labor Force

Estimated non-agricultural employment fluctuated between 142,000 and 173,000 in Shelby County from May 1945 through December 1952. There was considerable seasonal fluctuation in employment, much of which was due to cotton trade activities in the fall and early winter and to the pre-Christmas retail and wholesale trade peaks.

It seemed possible that a change in non-agricultural employment would affect milk sales in the same direction. This hypothesis was tested by (1) comparing change in employment and change in sales during the same month, (2) lagging change in sales one month after employment change, and (3) lagging change in sales two months after employment change. The results indicated that there was no significant relationship between changes in milk sales and changes in estimated non-agricultural employment during the periods studied. However, this analysis was weakened by the fact that employment generally was at a relatively high level during this period.

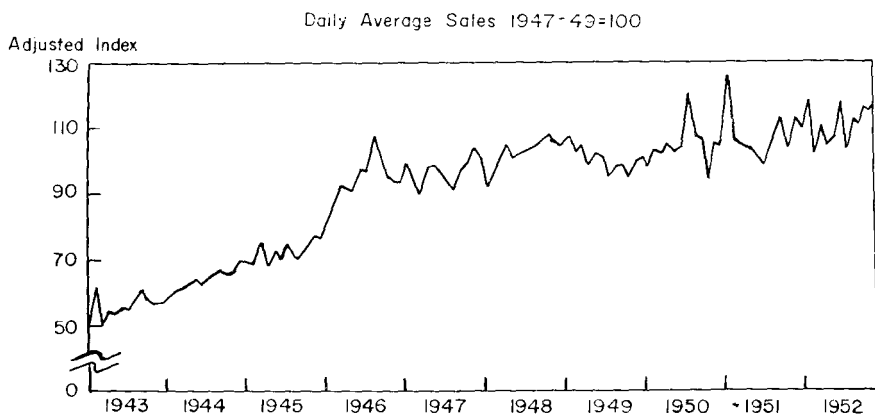
The trend in weekly average earnings of production workers in all manufacturing was upward from January 1950⁵ through December 1952. In December 1952 it was estimated that 130,550 persons were employed in non-manufacturing compared with 42,150 in manufacturing. Weekly earnings ranged from about \$50 to \$64 during that period. The upward trend in weekly earnings resulted primarily from a 20 percent increase in hourly rates during the period. In addition, there was an increase of about 1.2 hours in the average work week.

While production workers in all manufacturing represented only about one-fourth of all non-agricultural employment, it was expected that a change in earnings of such workers should be reflected in changes in milk sales in the same direction. This was tested in the same manner as the hypothesis above. The results indicated that there was no significant relationship between changes in milk sales and changes in weekly average earnings by production workers in all manufacturing.

⁵ January 1950 was the earliest month for which earnings data were available.

Department Store Sales

The index of department store sales in Memphis more than doubled between January 1943 and December 1952 (figure 3). Steady increases were experienced during the war years, and were followed by sharp increases during the time that wartime economic controls were being relaxed or discontinued. The index remained relatively stable, on the new high level, from early 1947 until the outbreak of the Korean War. Memphis consumers went on a buying spree in July 1950, and then repeated their performance in January 1951. From that time through December 1952, the index of department store sales fluctuated around a level about 10 per cent higher than pre-Korea.



Source: Indexes of Department Store Sales, Memphis, Tennessee, (A mimeographed, monthly report), Research Department, Federal Reserve Bank of St. Louis.

Figure 3.—Indexes of department store sales in Memphis, Tennessee, January 1943 - December 1952

Retail Food and Milk Prices

From 1943 through 1952 the index of retail food prices in Memphis was consistently higher than the United States index of retail food prices (figure 4). However, both indexes followed the same pattern.

During the ten-year period, 1943-52, the price per quart of standard milk in glass bottles delivered to homes in the Memphis Market ranged from 12.5 to 23.0 cents, and changed only 18 times. By comparison, the index of retail food prices changed every month except two or 118 times. At the end of the ten-year period, the index for all retail food prices in Memphis was 71 per cent higher than at the beginning of the period. This compared with a 63 per cent increase in the price of milk during the same period.

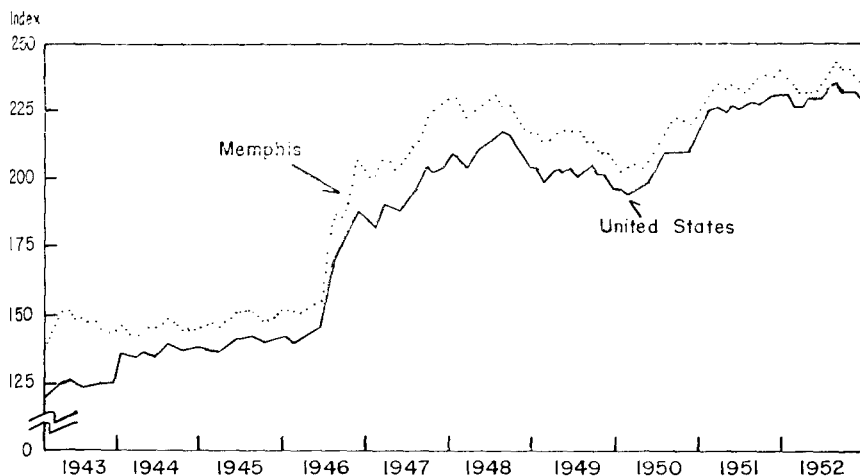


Figure 4.—Indexes of retail food prices in Memphis, Tennessee and the United States, January 1943 - December 1952, 1935-39 = 100¹

¹ Data from January 1943 - December 1949 are old series adjusted, data from January 1950 - December 1952 are new series.

Source: Federal Reserve Bank of St. Louis, 8th District (January 1943 - March 1952 obtained directly from records in St. Louis office). Subsequent data obtained from Monthly Review, Federal Reserve Bank of St. Louis, 8th District, current issues.

Net Effective Buying Income

Net effective buying income⁶ per capita in Memphis increased from \$1255 in 1943 to \$1709 in 1947 (table 3). Income declined in 1948 and 1949, then increased in 1950, but declined again in 1951. Effective buying income per capita was about 36 percent higher during 1947, the peak year, than in 1943. In 1952 it was about 12 percent higher than 1943.

TABLE 3.—Net Effective Buying Income Per Capita in Memphis, Tennessee, by Years, 1943-1952

Effective Buying Income Per Capita

Year	Dollars	Year	Dollars	Year	Dollars	Year	Dollars	Year	Dollars
1943	1255	1945	1348 ¹	1947	1709	1949	1455	1951	1403
1944	1262	1946	1433	1948	1559	1950	1586	1952	1401

¹ Interpolated

Source: Reproduced by permission of: "Survey of Buying Power," Sales Management, The Magazine of Marketing, Hill Bros., New York, May 10 Issue, 1944-1953.

INSTITUTIONS IN THE MARKET

The Memphis Milk Market has a number of organizations exerting influence on the problems which exist in a fluid milk market. These organizations include the Mid-South Milk Producers Association, the Memphis Dairy Exchange, Inc., the Memphis-Shelby County Health Department, the Federal Order for the Memphis Milk Marketing Area, and the Memphis Dairy Council.

⁶ Net effective income, as used by Sales Management Magazine, means consumer disposable income.

A certain amount of friction between the various dairy organizations exists in any fluid milk market. Their interests often are in conflict. It appears, however, that considerable effort is exerted in the Memphis Market by the organizations involved to minimize these conflicts. Generally, the relations among the organizations listed above are good.

Mid-South Milk Producers Association⁷

The Mid-South Milk Producers Association was chartered under the Cooperative Marketing Law of Tennessee on December 18, 1941. The new association had the problem of overcoming the antagonism of many producers who had had previous disappointing experiences with cooperatives. The first producer-cooperative in the milkshed known as the Shelby County Milk Producers Association was organized in 1924. This association functioned as a bargaining agency until 1929 and then went into the milk distributing business. Its operations were none too successful and in 1935 the plant was sold by the association's principal creditor. The association then disbanded. Subsequent efforts to organize were made by producers patronizing each of the two larger dealers in the market, but neither organization seemed to function effectively as a bargaining agency.

After the Mid-South Milk Producers Association was chartered and an intensive membership drive was held, the association attempted to bargain for its members in the spring of 1942. However, distributors in the market either refused to sign contracts with the association or failed to recognize it as the bargaining agent for its members. The association then appealed to the Secretary of Agriculture to issue a marketing agreement and order for the market under the provisions of the Agricultural Marketing Agreement Act of 1937.

Following the completion of the appropriate administrative steps, Federal Order No. 64 was issued, effective October 4, 1942. The dealers refused to comply with that order and a suit was instituted by the government. Before the merits of the case could be decided, however, the dealers signed contracts with the association. Then the latter petitioned the Secretary of Agriculture to suspend the order. This was done on January 20, 1943. The case pending in court was dismissed and the order was terminated later in 1943. The Mid-South Milk Producers Association began full operations on January 20, 1943, the day Order No. 64 was suspended.

Conditions in the market during late 1949 and early 1950 again caused the association to appeal to the Secretary of Agriculture to issue a marketing agreement and order for the market. Conse-

⁷ This section is based primarily on information obtained from Mr. L. F. Friend, former Manager, and Mr. R. B. Clark, Manager, of the Mid-South Producers Association, Memphis, Tennessee.

quently, Order No. 18 was issued and became effective October 1, 1950.⁸

The expenses of operating and maintaining the association are met by making deductions from the returns due members before final payment is made. The amount of such deduction cannot exceed 9 cents per hundredweight, of which 2 cents is set up in a five-year reserve revolving fund.

In addition to deductions for operation of the association, 6 cents per hundredweight is deducted for promotions. Two cents of this 6 cents is paid to the Memphis Dairy Council each month, and during June, 4 cents per hundredweight is contributed to the American Dairy Association. The remainder of the fund is spent on the promotion of "Memphis Fresh Milk." Special emphasis is placed on advertisement to encourage consumers to examine the cap or paper container for butterfat content of the milk. The association is promoting the sales of standard and homogenized milk with 4 percent butterfat content. The primary medium for advertising is newspapers, but use is made of both radio and television, with television increasing in importance.

The association also issues a "slick magazine" type of monthly publication, **Dairy News**. This publication is "dedicated to the interests of the men who produce milk and to providing a medium in which firms who make the things the dairyman needs may tell their story."⁹ The association's management uses this as their primary medium for informing the membership of its activities. **Dairy News** also features items of current interest, summaries of research results, and a list of recent research publications with instructions on how they may be obtained. **Dairy News** is completely financed by its advertising, and sent at no cost to all who belong to the association.

Memphis Dairy Exchange, Inc.¹⁰

The Memphis Dairy Exchange is owned by 7 distributors operating in Memphis and Shelby County, Tennessee. This corporation is capitalized at a low value and individual distributors hold stock on the basis of their volume of sales over about a 4-year period. In addition to these 7 member distributors, there are 8 to 10 associate members obtaining the services of the Exchange. These associate members are plants generally distributing milk in outlying territory where Memphis milk is delivered.

The Memphis Dairy Exchange is a service organization. Originally each distributor had his own bottles and had to sort out bottles of other distributors and haul those bottles to the Dairy Exchange. Bottles returned to the Exchange were sorted in order that individual distributors could obtain their own bottles in

⁸ For discussion of Order No. 18, see page twenty.

⁹ **Dairy News**, Mid-South Milk Producers Association, Memphis, Tennessee, December 1952.

¹⁰ This section is based on information obtained by interview and correspondence from Mr. John W. Simonton, Manager of the Memphis Dairy Exchange, Inc.

exchange for bottles of others. This procedure was time consuming and expensive for distributors. Therefore, in January 1947 a universal bottle was adopted by distributors on the market. Cases for glass bottles¹¹ now carry the name of Memphis Dairy Exchange rather than the name of the distributor using them. These actions have effected savings in the physical handling of cases and glass bottles.

The Memphis Dairy Exchange performs two general types of services for its members. The first is the purchase and distribution of certain supplies, such as bottles, cases, wax, glue, and vitamin D, which are purchased in quantity and distributed to all members on the same basis. Used milk bottles, such as those purchased from junk dealers, are given a pre-wash before being turned over to members.

The second type of service is the warehousing of supplies and the repair of damaged cases. Bottles and cases require most of the warehouse space of the Exchange. Damaged cases of both wood and metal are sent to the Exchange's specially equipped shop for repair. Those beyond repair are sold for salvage.

The Exchange is financed by the sale of supplies and a fillage fee. The bottle deposit made by a distributor to the Exchange is slightly higher than the deposit he receives from his customer. This is to encourage distributors to pick up empty bottles from their customers. The fillage fee is collected from distributors on the basis of the number of units of bottled milk sold. Money thus collected is used to pay any expenses not covered by sales of supplies and bottle deposits. The fillage fee is changed from time to time in order to keep income in balance with expenses.

The Memphis Dairy Exchange, by adopting a universal bottle, eliminated the expense of exchanging milk bottles by distributors. Purchase of certain supplies for the entire market enables the Exchange to obtain volume discounts which are more beneficial to small than to large distributors. The Exchange acts as a reservoir for certain supplies from which distributors can draw at any time.

Memphis-Shelby County Health Department¹²

The Memphis grade A milk ordinance is patterned on the model ordinance developed by the U. S. Public Health Service. It is administered by the Bureau of Sanitation of the Memphis-Shelby County Health Department through a system of licenses and periodic inspections of producers and distributors.

The Bureau of Sanitation advises dairymen of the latest techniques in barn construction, sanitation and cooling. Various improvements have been suggested in cleaning, handling and lighting. If a farmer does not meet the requirements of the Health Department, his permit to ship milk to the Memphis market is

¹¹ Cases for paper containers have been purchased by individual distributors, since all plants did not "go into paper" at the same time.

¹² This section is based on information obtained from Mr. Everett C. Handorf, Director, Bureau of Sanitation, Memphis-Shelby County Health Department.

suspended until such requirements are met. The Health Department has followed a policy of encouraging increased local production of grade A milk. In past years large quantities of milk have been imported to meet local demand. The quality of imported milk was below the average of local milk as indicated by laboratory analysis.¹³ Recently milk imports have decreased markedly.

In addition to inspections of dairy farms and plants, samples of milk from each producer are taken and laboratory tests are made for bacteria count and sediment. The finished products from plants are also analyzed in the laboratory for bacteria and butterfat content.

Memphis received a superior rating in milk sanitation by the U. S. Public Health Service in 1952. This rating placed Memphis on the Public Health Service's "Honor Roll of Milk Sanitation."

Federal Order for the Memphis Area¹⁴

Federal Order No. 18, regulating the handling of milk in the Memphis, Tennessee Marketing Area, became effective October 1, 1950. A provision in Order No. 18 which is unique as far as Federal Orders are concerned is intended to protect the cooperative association: If a handler purchases his Class I supplies from the association during the short production season and fails to purchase his Class I supplies from the association during the flush season, a percentage adjustment in money is made against the independent producers supplying this particular handler and paid over to the association. The reason for this is that the cooperative association agrees to supply all handlers in this market with their Class I needs 12 months out of the year. During the short production season, if receipts from producers are not sufficient to supply all cooperating handlers with their Class I needs, the cooperative association agrees to purchase milk from other sources and deliver to handlers at the Class I prevailing price in the Memphis Market.

Other salient features of this Order are:

(1) Milk is classified according to its use. Class I milk is all skim milk and butterfat disposed of in the form of milk, skim milk, buttermilk, flavored milk, flavored milk drinks, cream, and any other product required by the appropriate health authority in the marketing area to be made from Grade A milk, and all skim milk and butterfat not specifically accounted for in Class II. Class II milk is defined as all skim milk and butterfat (a) used to produce any product other than those specified in Class I milk, (b) disposed of for livestock feed, (c) in shrinkage up to 2 percent of receipts from producers, and (d) in shrinkage of other source milk on a pro rata basis.

¹³ The Memphis Milkshed 1952, Bureau of Sanitation, Memphis-Shelby County Health Department, Memphis, Tennessee, 1952.

¹⁴ This section is based on information obtained from Mr. C. I. Dunn, Administrator of Order No. 18.

(2) Handlers are required to make customary reports concerning receipts and use of milk to the market administrator.

(3) A uniform price is computed for each handler by the market administrator.

(4) Provisions are made for a base-rating plan.

(5) The basic formula price to be used in determining Class I price is based on the highest of (a) prices paid by a group of mid-western condenseries adjusted to 4.0 percent butterfat value, or (b) price computed by using a butter-powder formula, or (c) price computed by using a cheddar cheese-butter formula.

(6) Class II prices are based on local manufacturing prices paid for ungraded milk.

The Federal Milk Marketing Order for Memphis has been well administered and appears to have been instrumental in bringing about orderly marketing of milk.

Memphis Dairy Council¹⁵

The Memphis Dairy Council, an affiliate of the National Dairy Council, has been in existence since 1931. It is stated that, "The objects and purposes of the Memphis Dairy Council of Tennessee shall be to associate together all persons, firms or corporations in the Memphis area or territory who produce or distribute milk and who manufacture and distribute ice cream and other dairy products, and other interested persons for the promotion of the general health and welfare of the people of the community."

The promotion mentioned above is accomplished through a general program of nutrition education. No advertising is done as such, but the Council works closely with newspapers and radio stations in supplying them with nutrition information. Major emphasis is placed on the program conducted in the schools of Memphis and Shelby County. Materials are also supplied upon request to schools located in the Memphis Milkshed.

The Council maintains a poster service to factories and offices, offers the services of its nutritionists for P.T.A. and other club programs, prepares exhibits for such occasions as the Mid-South Fair and for professional meetings. It also carries out a June Dairy Month Program for the industry and makes regular mailings of material on nutrition research to the professional people of Memphis, as well as periodically offering materials that the Council feels would be of interest and value to them.

The Memphis Dairy Council is organized with 18 members on its Board of Directors. Six of these are milk producers, and the rest are representatives from each of the 12 fluid milk or ice cream plants in Memphis.

The Council is financed by deductions of \$.02 per hundred-weight of milk sold by producers and by a check off of \$.021 per hundredweight of Class I sales by Shelby County distributors. The

¹⁵ This section is based on information obtained by interview and correspondence from Mrs. Frances Crain, Director of the Memphis Dairy Council.

dues of each ice cream member is determined by its share of total ice cream sales in the market, and they are adjusted from time to time in order to keep contributions from ice cream members at about 10 percent of total collections.

The funds received by the Memphis Dairy Council are used to promote better diets in the Memphis area. It is believed that this method of indirect advertising will maintain milk sales at a higher level than otherwise would exist.

DEMAND FOR FLUID MILK

Fluid milk presents a difficult marketing problem due to its perishability. It cannot be stored in its natural form as can many other farm products. Also, there is a continual supply of milk instead of an annual harvest. When the supply of fluid milk exceeds demand, the surplus is manufactured into less perishable products.

Milk consumed in fluid form is an important food. It is generally considered a necessity for children old enough to drink fluid milk and in this use has no close competitor.¹⁶ It would be expected that the demand for milk utilized in this manner would be relatively inelastic, or that this consumption of milk would be relatively unresponsive to price changes. As a beverage for adults, however, fluid milk competes with coffee, tea, soft drinks and some alcoholic beverages. It would appear that the demand for milk to be used as a beverage by adults would be more elastic, or that consumption would be more responsive to price, than that consumed by children.

Demand for fluid milk used as a complementary food — with coffee, tea, and some desserts—would be expected to be relatively inelastic since the cost of milk is but a small part of the total cost. Demand for milk would be expected to change with demand for the food complemented.

Fluid milk used in cooking has close substitutes hence consumption would be expected to be responsive to price change. Dampening this responsiveness would be inertia and the relatively small cost of milk used in preparation of many dishes.

Many factors influence the consumption of fluid milk in the market. These factors include income, races and nationalities, seasons, and the retail price of milk.¹⁷ Consumption of milk usually increases as family income rises. However, consumption of milk within a given income range may vary between families due to differences in size of the families, ages of the members and their preferences.

Composition of the population in a market in terms of races and nationalities influences milk consumption. Native-White, Northern European, and Jewish groups tend to be relatively heavy consumers of milk compared with Negroes and Southern Europeans.

¹⁶ Evaporated milk is normally consumed by infants until they are old enough to drink fluid milk.

¹⁷ These factors are discussed in *What Makes the Market for Dairy Products*, p. 19, Bulletin 477, Agricultural Experiment Station, University of Wisconsin, 1948.

Negroes appear to be the only major group which does not increase milk consumption as incomes rise.

Milk sales vary throughout the year. These variations probably can be attributed to such factors as family vacations, holidays, and school vacation.

Results of Other Studies of Elasticities of Demand

The problem of measuring the price elasticity of demand for a commodity is difficult. A number of economists have attempted to do so for fluid milk and all have concluded that the demand is relatively inelastic.

Brinegar¹⁸ reported an estimated short-run price elasticity of demand of $-.73$ in April 1948, $-.38$ in September 1948, and $-.32$ in March 1949; or a simple average of $-.48$.¹⁹ Changes in consumption were studied on the basis of amounts purchased during the four-week period before and after price changes.

Gaumnitz and Reed²⁰ found an average price elasticity of demand for milk of $-.28$. This average is based on a summary of sales and price changes in the markets of Boston, Detroit, Evansville, Grand Rapids, and Kalamazoo, during 1934 and 1935. Data were analyzed by comparing the sales in the calendar months preceding the price change with the sales in the calendar month following the price change after adjusting to 30-day months and for average seasonal variation in sales.

Blanford²¹ found price elasticity of demand of $-.33$ in New York City among families in low income areas in 1938-40. In high income areas of New York City, during the same period, price changes appeared to have no effect on purchases of milk.

Ross²² concluded that the demand for milk shows very little elasticity when the consuming public becomes accustomed to a retail price which changes occasionally. Also, the retail price of milk can be advanced one cent at a time with very little effect on sales, although there is probably a limit beyond which the price cannot be advanced without a sharp fall in quantity taken. Conversely, lowering the price does not greatly stimulate consumption. If it did, surplus grade "A" production during the flush production season might be utilized in Class I sales.

Cassels²³ analyzed the effects of price changes on quantities of milk sold in Boston, Baltimore, and Connecticut, from 1922 to

¹⁸ Brinegar, G. K., *Effect of Changes in Income and Price on Milk Consumption*, Bulletin 280, Storrs Agricultural Experiment Station, University of Connecticut, Storrs, Connecticut, 1951.

¹⁹ A price elasticity of demand of $-.48$ indicates that for each one percent change in price, consumption would change .48 percent in the opposite direction.

²⁰ Gaumnitz, E. W., and Reed, O. M., *Some Problems Involved in Establishing Milk Prices*, United States Department of Agriculture, Marketing Information Series, DM-2, 1937, pp. 44-45.

²¹ Blanford, C. J., *The Demand for Milk and Cream as Revealed by Consumer Purchases at Retail Stores in New York City*, Bulletin 765, Agricultural Experiment Station, Cornell University, Ithaca, New York, 1941.

²² Ross, H. A., *The Demand Side of the New York Milk Market*, Bulletin 459, Agricultural Experiment Station, Cornell University, Ithaca, New York, 1927. The approach taken by Ross in studying the demand for milk was nearest to that used in this study.

²³ Cassels, J. M., *A Study of Fluid Milk Prices*, Harvard University Press, Cambridge, Massachusetts, 1937, pp. 99-110.

1931. He concluded that the statistical evidence indicated a demand of inelastic character.

The effects of price changes on quantities of milk sold in the Memphis Market were analyzed. This analysis was made for each fluid milk product and the results are discussed in later sections of this report.

OVER-ALL FLUID MILK SALES IN THE MEMPHIS MARKET

Trend in Total Class I Sales

Total sales of Class I milk in the Memphis Market ranged from about 3,250,000 quarts equivalent to 5,750,000 per month from January 1943 through December 1952. The trend was generally upward from 1943 until the middle of 1949, when it leveled off. Total sales tended to drift downward after the start of 1951.

Daily average sales of Class I milk sold in containers of less than one gallon ranged from about 100,000 quarts equivalent to about 186,000 during the ten year period, January 1943 through December 1952 (figure 2, page 5). The trend in daily average sales was generally upward until the end of 1950, from which time sales drifted downward.

Relative Volume of Sales of the Fluid Milk Products

The trend in sales of individual fluid milk products often moved in the opposite direction from the general trend of total Class I sales (table 4). Homogenized milk, Bulgarian buttermilk²⁴, skim milk and special creams were relatively more important in 1952 than in 1943, while standard milk, extra rich milk, plain buttermilk, chocolate milk and light cream were less important.

Standard milk accounted for a larger share of total sales than did any other product until 1952, but the trend as a percentage of total Class I sales was downward after 1943. The decline in standard milk sales was accelerated by the introduction of homogenized milk on the market in 1947.

Sales of extra rich milk increased during the war when supplies of cream were limited to consumers. After the supply of cream products became more plentiful and the general level of milk price started to rise, sales of extra rich milk declined sharply. By the end of 1952 extra rich milk was a product of minor importance in the Memphis Market.

The trend in plain buttermilk sales was generally upward through 1948 but turned down after that time. Bulgarian buttermilk sales remained less than 2 percent of total Class I sales during the entire period, but had a slight tendency to increase.

With some year to year fluctuation, chocolate milk sales became relatively less important. Skim milk sales never amounted to as much as 1 percent of total Class I sales during the period studied¹

²⁴ Bulgarian buttermilk is produced from whole milk, but plain buttermilk is skim milk product.

TABLE 4.—*Proportion of Total Class I Sales Represented by Individual Fluid Milk Products in Memphis, Tennessee, Market by Years, 1943-1952*

Fluid Milk Products	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952
Whole Milk Products				Percent						
Standard	62.94	60.60	58.73	54.91	55.75	50.43	42.18	39.45	38.76	34.08
Homogenized	—	—	—	—	1.96	17.47	24.67	29.99	36.03	42.72
Extra rich	13.10	17.58	18.40	20.90	17.84	8.18	9.22	6.94	3.59	2.67
Total Sweet Whole Milk	76.04	78.18	77.13	75.81	75.55	76.08	76.07	76.38	78.38	79.47
Bulgarian buttermilk	1.25	1.35	1.51	1.69	1.72	1.83	1.89	1.84	1.67	1.70
Total whole milk	77.29	79.53	78.64	77.50	77.27	77.91	77.96	78.22	80.05	81.17
Skim Milk Products										
Plain buttermilk	14.14	14.24	14.61	14.71	14.76	14.94	14.33	14.22	13.37	12.60
Chocolate	6.21	4.42	4.78	5.35	5.40	4.79	4.91	5.11	4.32	3.93
Skim milk	.04	.01	.02	.09	.10	.13	.63	.43	.47	.58
Total skim milk	20.39	18.67	19.41	20.15	20.26	19.86	19.87	19.76	18.16	17.11
Creams										
Light cream	2.28	1.79	1.93	2.26	2.06	1.68	1.57	1.48	1.26	1.24
Heavy cream	—	—	—	.04	.35	.39	.43	.43	.36	.32
Special creams	.04	.01	.02	.05	.06	.16	.17	.11	.17	.16
Total creams	2.32	1.80	1.95	2.35	2.47	2.23	2.17	2.02	1.79	1.72
Grand total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Although skim milk sales increased percentagewise, this product was one of very minor importance.

The sales of cream accounted for only a small percentage of the total volume of Class I sales. Sales of light cream fluctuated between one percent and two percent of total Class I sales with the trend being generally downward. Sales of heavy cream were somewhat less than 0.5 percent of total Class I sales and downward slightly during 1951 and 1952. In no year did the sales of special cream account for as much as 0.2 percent of total Class I sales.

Trends in Sales of Whole Milk Products, Skim Milk Products, and Creams

Whole milk products sold in the Memphis Market included extra rich milk (about 5 percent butterfat content), standard milk, homogenized milk, and Bulgarian buttermilk. Daily average sales of these whole milk products ranged from about 85,000 quarts equivalent to about 147,000 during the period studied (figure 5). The trend in sales was generally upward until about the end of 1949, after which it apparently leveled off, with seasonal variation.

Quarts Equivalent
(Thousands)

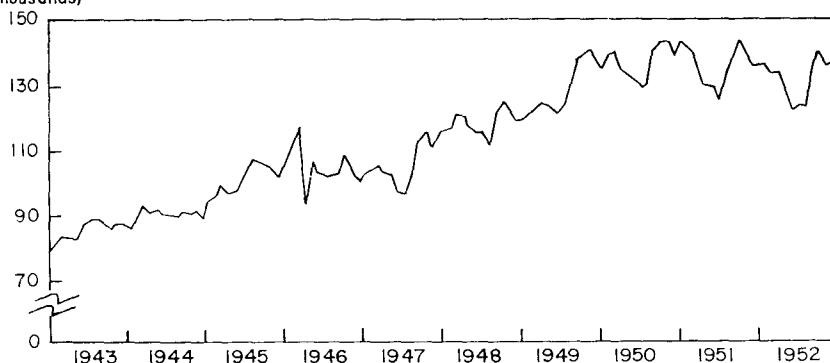


Figure 5.—Daily average sales, quarts equivalent, of whole milk products¹ in containers of less than one gallon, Memphis, Tennessee, market, by months, January 1943 - December 1952

¹ Includes extra rich, standard, homogenized milk and Bulgarian buttermilk.

Skim milk products included skim milk, chocolate milk and plain buttermilk. Daily average sales of these products ranged from about 17,000 quarts equivalent to nearly 38,000 during the ten year period (figure 6). The trend was upward from 1943 until the fall of 1950, after which it declined sharply.

During the ten year period, daily average sales of light and heavy cream ranged from 1800 quarts equivalent to about 3800 with considerable seasonal variation (figure 7). From January 1943 until early 1946, no heavy cream was sold in the market. ²

Quarts Equivalent
(Thousands)

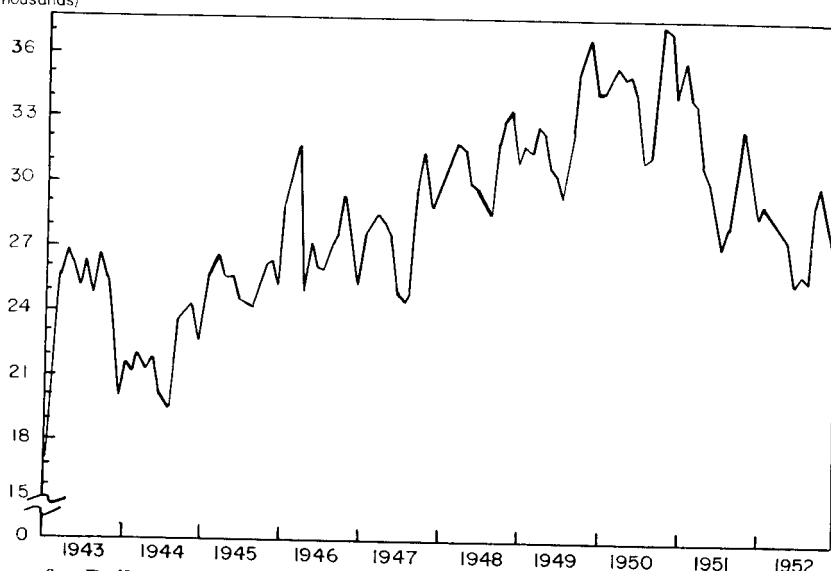


Figure 6.—Daily average sales, quarts equivalent, of skim milk products¹ in containers of less than one gallon, Memphis, Tennessee, market, by months, January 1943 - December 1952

¹ Includes skim and chocolate milk and plain buttermilk.

Quarts Equivalent
(Thousands)

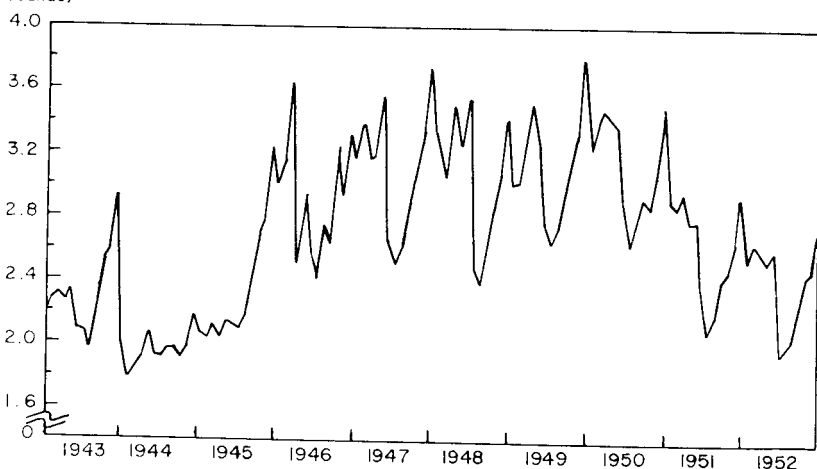


Figure 7.—Daily average sales, quarts equivalent, of light and heavy cream in containers of less than one gallon, Memphis, Tennessee, market, by months, January 1943 - December 1952

of light and heavy creams in 1946 through 1950 fluctuated around the same general level. A sharp decline in sales of both light and heavy cream was experienced in 1951 and 1952.

Sales of Class I Milk by Size of Container

From 1943 through 1952 Class I milk was sold in several different sizes of both glass and paper containers. The sizes included one-half gallon, quart, pint, one-third quart, and one-half pint. At the end of 1952, only paper containers were used for the one-half gallon size, but quarts and one-half pints were sold in both paper and glass.

The most important size was the quart. During the period studied, between 72 and 86 percent of the Class I milk was sold in quart containers. The percentage of total sales in quart containers rose sharply in late 1943 and the first half of 1944. From that time until the fall of 1952, quart sales fluctuated between about 80 and 85 percent of total sales. During the last three months of 1952, two or three milk dealers in the market started promoting one-half gallon containers. This resulted in a decline of quart sales from 87 percent to about 80 percent of total sales. It is likely that quart sales will continue to decline as a percentage of total sales.

The one-half gallon paper container was introduced on the Memphis Market in 1951. By December 1952 sales in this size container accounted for over 7 percent of total Class I sales.

The volume of Class I sales in containers of less than one quart ranged from about 10 to 20 percent of the total volume during the period studied. In most periods, either the one-third quart or one-half pint was used. Discontinuing sales of one-third quarts, substituting one-half pints, early in 1951 accounted for the sharp decline in the volume of milk sold in containers of less than one quart; approximately the same number of units was sold, but the difference in the size of containers resulted in a drop in volume of milk sold in the small container.

During the 12-month period, April 1950 through March 1951, sales of Class I milk in less than one quart containers were 25,367,-812 one-third quarts and 6,228,474 one-half pints or a total of 31,596,286 units. From April 1951 through March 1952, only 1,406,264 one-third quarts were sold, but 30,335,768 one-half pints were sold. The total was 31,742,032 units or an increase of 0.46 percent in the number of units.²⁵ However, the volume of milk, in terms of quarts equivalent decreased by 19.6 percent. This amounted to a decline in daily average sales of about 5,370 quarts equivalent. Since daily average sales of total Class I milk decreased about 9,170 quarts equivalent in the latter 12-month period, the shift from one-third quart to one-half pint containers accounted for nearly 60 percent of the total decline in sales.

²⁵ The 12-month periods of April 1950-March 1951, and April 1951-March 1952 were selected for comparison because these periods represented the year before and the year after the major shift from one-third quart to one-half pint containers occurred.

SEASONALITY OF CLASS I MILK SALES

The seasonal index of daily average sales of standard milk in quart containers ranged from 96.7 for July to 103.8 in October, and for homogenized milk in quart containers the range was from 96.0 in July to 105.6 for October. For extra rich milk in quart containers the variation was from 96.6 in February to 106.5 for September, with a second peak of 103.3 in March (figure 8).

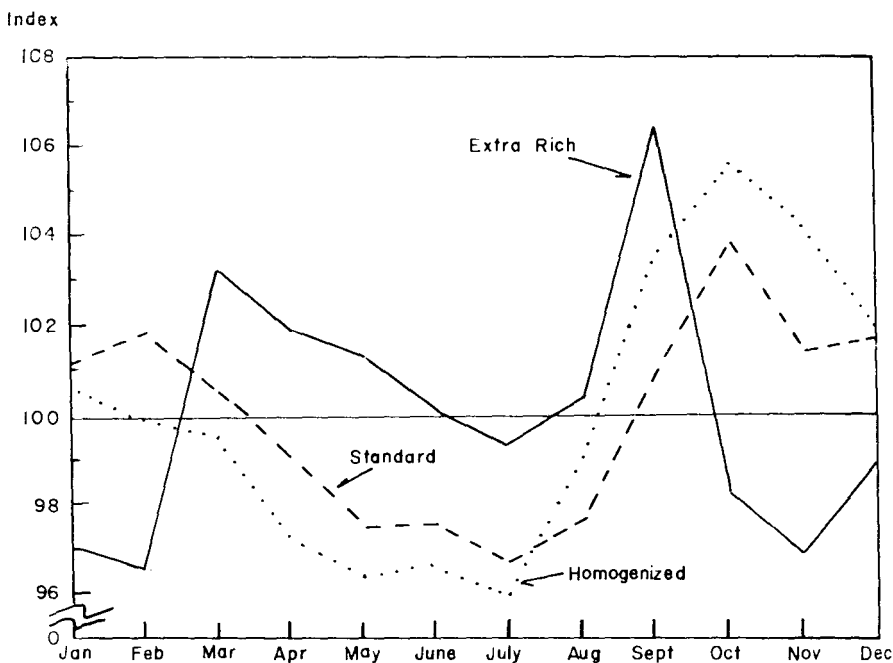


Figure 8.—Seasonal index of daily average sales of standard, homogenized, and extra rich milk in quart containers in the Memphis, Tennessee, market¹

¹ 1946-52=100 for standard and extra rich milk; 1948-52=100 for homogenized milk.

The seasonal indexes of daily average sales of these three fluid milk products in one-third quart and one-half pint containers varied more than the same product in one quart containers, but followed the same general pattern.

The index of daily average sales of Bulgarian buttermilk in quart containers varied from 93.4 for December to 104.4 in September, and the variation for plain buttermilk was from 89.0 in July to 106.9 for January. The seasonal variation for chocolate milk ranged from 83.6 in February to 122.6 in August and for skim milk, from 91.3 in December to 110.5 in April (figure 9). Bulgarian buttermilk is a popular hot weather drink and maintains an acceptable flavor longer than fresh milk, which makes it particularly desirable in homes without refrigeration. Its sales were highest

during the summer and fall months. One important use made of plain buttermilk is in baking. It would seem logical that baking by housewives would decrease during the summer months. Thus, it would appear that the decrease in plain buttermilk sales in the summer may be associated with a decrease in baking.

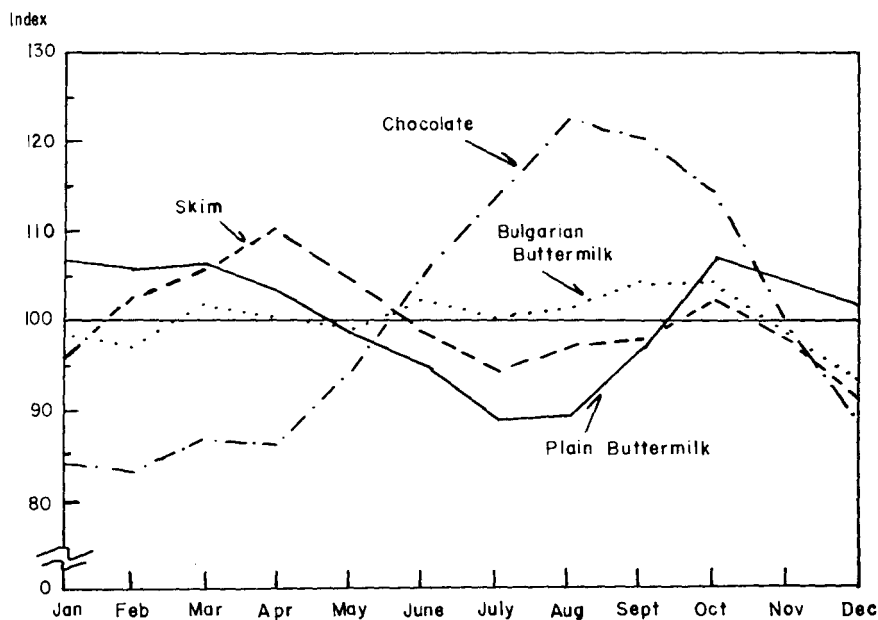


Figure 9.—Seasonal index of daily average sales of Bulgarian buttermilk, plain buttermilk, chocolate, and skim milk in quart containers in the Memphis, Tennessee, market

The seasonal index of daily average sales of Bulgarian buttermilk, plain buttermilk, and chocolate milk in one-third quart and one-half pint containers followed the same general pattern as sales in quart containers. Skim milk was sold in appreciable quantities in quart containers only.

The seasonal index of daily average sales of light cream in quart containers varied from 80.0 in July to 116.8 for December and for heavy cream the variation was from 83.4 in January to 182.5 in December, and was 121.3 in April and 109.0 in May (figure 10). The spring peak in sales was probably associated with Easter and the fresh strawberry season; and the December peak with the Christmas-New Year Holiday season.

The seasonal index of daily average sales of light cream in one-third quart and one-half pint containers ranged from 93.0 in July to 106.1 in December, a much narrower range than for quart sales. This may be due to light cream sales in small containers going almost entirely (ultimately) to homes as contrasted with sales in quart containers, going mainly to institutions.

The seasonal index of daily average sales of heavy cream in small containers ranged from 70.8 in October to 160.9 in May (figure 11), the spring peak probably being associated with Easter

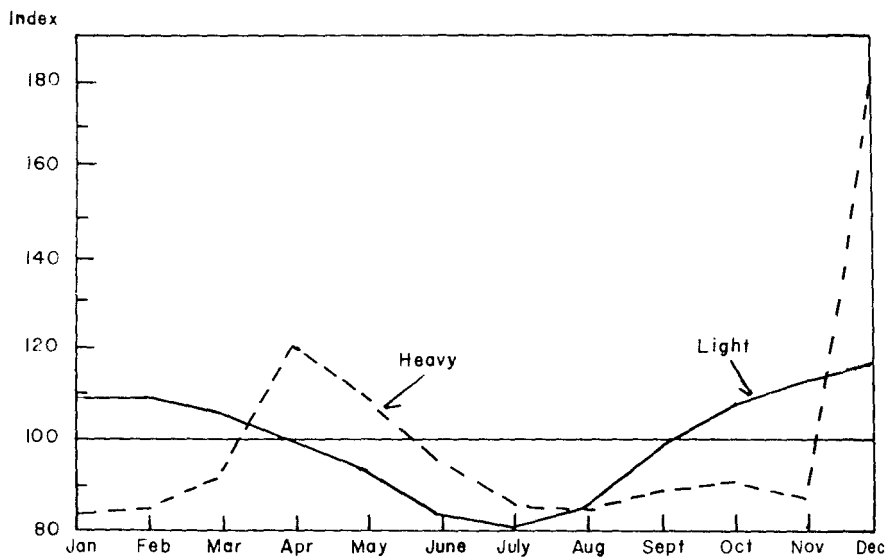


Figure 10.—Seasonal index of daily average sales of light and heavy creams in quart containers, in the Memphis, Tennessee, market

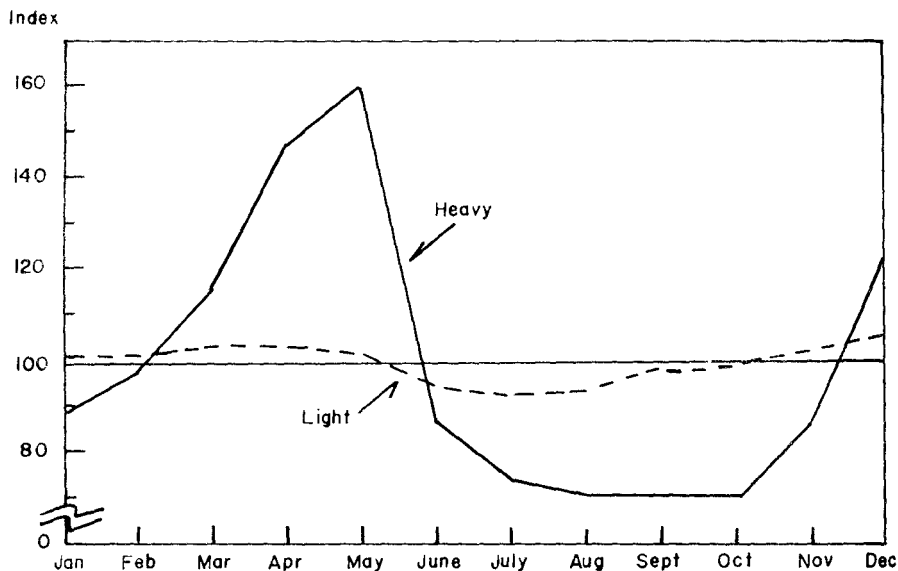


Figure 11.—Seasonal index of daily average sales of light and heavy creams in one-third quart and one-half pint containers, in the Memphis, Tennessee, market

and the fresh strawberry season, and the December peak with the Christmas-New Year Holiday season.

The seasonal variation of sales in both quart and less-than-quart containers followed the same general pattern, but the December peak for quart sales was relatively more important than the spring peak, while the opposite was true for sales in the smaller containers. Inasmuch as most heavy cream sold in the smaller containers (one-third quart and one-half pint) was consumed in homes, it would appear that heavy cream was a much more popular item for consumption in the home during Easter and the fresh strawberry season than during the Christmas-New Year Holiday season, whereas, the opposite appeared true for heavy cream, in quart containers, which went primarily to restaurants and other institutions.

AGGREGATE SALES OF SWEET WHOLE MILK

Combined sales of standard, homogenized, and extra rich milk accounted for 75.6 to 79.5 percent of total Class I sales, by years, from 1943 through 1952. Daily average sales in containers of less than one gallon ranged from 77,120 quarts equivalent in January 1943 to 141,178 in October 1951.

In January 1943, standard milk accounted for over 80 percent of sweet whole milk sales (figure 12). Extra rich milk was the only other sweet whole milk product sold at that time, and its sales tended to increase at the expense of standard milk through 1946.

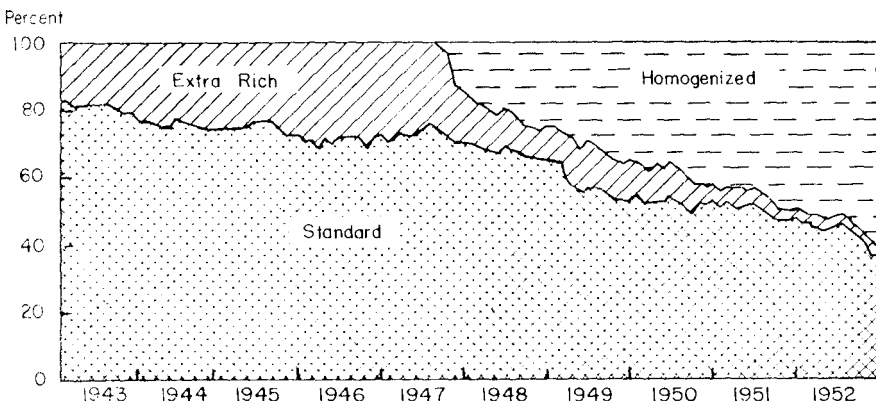


Figure 12.—Percentages that sales of standard, extra rich and homogenized milk were of total sweet whole milk sales in containers of less than one gallon, Memphis, Tennessee, market, by months, January 1943 - December 1952

The one quart container was by far the most important size used in the sales of sweet whole milk. The combined sales of standard, homogenized, and extra rich milk in quart containers accounted for 58.2 to 71.9 percent of Class I sales during the period studied.

Eliminating the war years 1943 through 1945, the range was from 61.5 to 66.7 percent (table 5).

TABLE 5.—*Proportion of Class I Sales Represented by Combined Sales of Standard, Homogenized and Extra Rich Milk in Quart Containers in the Memphis, Tennessee, Market, by Years, 1943-52*

Year	Proportion of Class I sales percent	Year	Proportion of Class I sales percent
1943	58.2	1948	64.9
1944	71.9	1949	61.5
1945	64.3	1950	64.1
1946	64.3	1951	66.2
1947	63.2	1952	66.7

Extra rich sales in quart containers tended to increase through the war years at the expense of standard milk. However, the introduction of homogenized milk on the market resulted in decreased sales of both standard and extra rich milk. By October 1952, homogenized milk sales in quart containers were more important than the combined sales of standard and extra rich milk in quart containers.

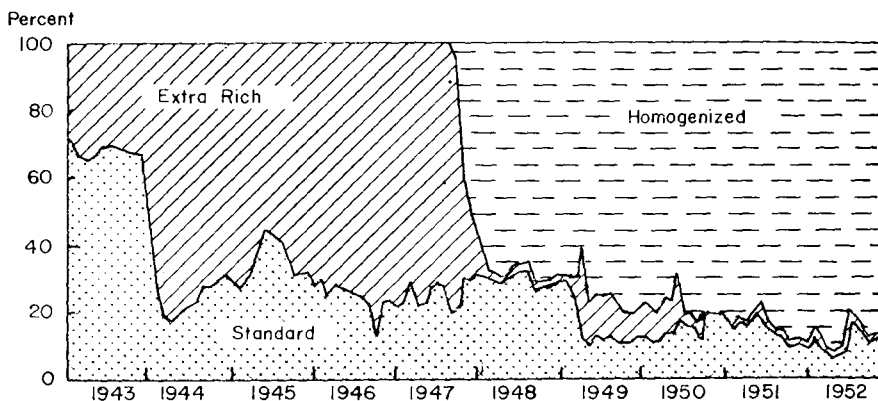


Figure 13.—Percentages that sales of standard, extra rich and homogenized milk were of total sweet whole milk sales in containers of less than one quart, Memphis, Tennessee, market, by months, January 1943 - December 1952

Sales of milk in one-half gallon containers were started in August 1951, and increased from about 300 units (600 quarts equivalent) per day in the first month to about 6,000 units (12,000 quarts equivalent) by December 1952. One-half gallon sales of homogenized milk ranged from about 59 percent of sweet whole milk sales of that size at the outset to over 90 percent in November and December 1952.

In addition to sales in quart and one-half gallon containers, sweet whole milk was sold in pint, one-third quart, and one-half pint containers during the period studied. The volume of milk sold

in these smaller containers dropped sharply following the discontinuance of sales in pints, then volume tended to drift downward, but again declined sharply when sales in one-third quarts were discontinued. The number of units sold generally did not decline, but the difference in volume resulted from substituting a smaller size of container for the one discontinued.

Price Changes and Quantities Purchased in Quart Containers

The retail price of milk in quart containers changed 18 times during the period studied. However, three of these changes occurred just prior to and at the termination of O.P.A. regulations. Therefore only 15 price changes were studied, all occurring after the new level of milk prices was reached.

In order to analyze the effects of price changes on total sales of standard, homogenized, and extra rich milk in quart containers, the weighted average price was computed for each price change. The weighted average price per quart ranged from 17.4 to 23.6 cents between November 1946 and December 1952.

Changes in total sales of standard, homogenized, and extra rich milk in quart containers were analyzed by comparing daily average sales during the month before and the month after a change in milk prices. The effects of both trend and season were removed. It was assumed that if the effects of these two factors were eliminated, other factors could be considered equal from one month to the next. The range in sales variations in months of zero price change was wider than that for months following price changes, but this could be due to a larger number of observations in the zero price change group. The results of this analysis indicated that price changes did not significantly affect sales of sweet whole milk in quart containers.

There seemed to be a possibility that the response of sales to price change might be delayed to the second or even the third month following a price change. This was analyzed by comparing daily average sales during the month before a price change with sales during the second and third months following the price change.²⁶ The results of these analyses indicated that price changes did not significantly affect sales of sweet whole milk in quart containers during the second and third months following a price change.

An additional analysis was made by comparing daily average sales during the month before and after a price change, but months of zero price change were not included. The results of this analysis also indicated that price changes did not significantly affect sales of sweet whole milk in quart containers.²⁷

It seemed that the response of sales to price change might differ considerably from time to time. In order to study this proposition, the sales response following each price change was examined.

²⁶ The longer time lag weakens the assumption that only trend and season were important factors influencing daily average sales.

²⁷ See appendix table 1.

The 15 price changes studied included 10 price increases and five decreases. It was expected that a change in price would be followed by a change in the opposite direction in daily average sales. Sales response was "rational"² in 10 of the 15 cases (table 6). Of the five exceptions, three occurred following price increases and the other two followed decreases.

TABLE 6.—*Short-run Response of Sales to Price Change for sweet Whole Milk¹ Sold in Quart Containers in Memphis, Tennessee, Market for 15 Periods, 1946-1952*

Price Increases				Price Decreases			
Date	Change in		Estimated sales response	Date	Change in		Estimated sales response
	price	quantity			price	quantity	
	percent	percent			percent	percent	
1946 Dec.	5.70	-1.12	-.20	1947 May	-6.11	.70	-.11
1947 Oct.	6.50	-0.20	-.03	1950 Jan.	-9.66	-2.64	.27
1948 Aug.	11.21	-5.27	-.47	1951 May	-4.56	1.03	-.33
1950 Oct.	4.98	-0.50	-.10	1952 Apr.	-4.22	1.73	-.41
Dec.	5.10	1.92	.38	Nov.	-6.12	-5.22	.85
1951 Feb.	4.78	.60	.13				
Oct.	4.97	1.58	.32				
Nov.	4.65	-1.17	-.25				
1952 Jan.	4.44	-1.10	-.25				
Aug.	4.49	-0.88	-.20				

¹ Total of standard, homogenized and extra rich milk.

Sales responses which did not appear "rational" followed price increases in December 1950 and February and October 1951, and price decreases in January 1950 and November 1952. The price increases which occurred in December 1950 and February 1951 bracketed January 1951 during which Memphis consumers went on a spending spree, as indicated by the index of department store sales (see figure 3, page 15). The factors that caused consumers to make unusually large purchases in department stores may well explain their apparent "irrational" reaction to these two particular increases in the price of milk. Possible explanations for the increase in sales following the October 1951 price increase were not indicated by data available.

The price decrease in January 1950 was the only decrease of two cents per quart and it was followed by a decrease in sales. There was one other two cent price change during the period studied—an increase in August 1948. The sales response was "rational" in the latter case but was relatively large. Daily average sales in quart containers decreased following the price decline of November 1952. However, conditions could hardly be called "normal" in the Memphis Milk Market during that period. A new milk distributor entered the market in October 1952. A price war started, primarily at the wholesale level and continued through 1952 and into 1953. The retail price for most products declined

² The term "rational" is used in the sense that if the price of milk changes, then it is reasonable to expect milk sales to change in the opposite direction.

one cent per quart in November 1952, but homogenized milk declined two cents, which eliminated the price differential between standard and homogenized milk. The price of milk in one-half gallon containers declined relatively more than milk sold in quart containers.

SALES OF STANDARD MILK

Trends in Sales by Size of Container

Daily average sales of standard milk fluctuated between 62,000 and 72,000 quarts equivalent during 1943 and 1944 (figure 14). During 1945 and early 1946, daily average sales fluctuated more widely—65,000 to over 81,000 quarts equivalent. Daily average sales from May 1946 through August 1947 stabilized at about 72,000 quarts equivalent, then moved up to nearly 82,000 quarts equivalent in March 1948. From that time sales declined, with seasonal variation, and in December 1952, daily average sales of standard milk were less than 50,000 quarts equivalent.

Quarts Equivalent
(Thousands)

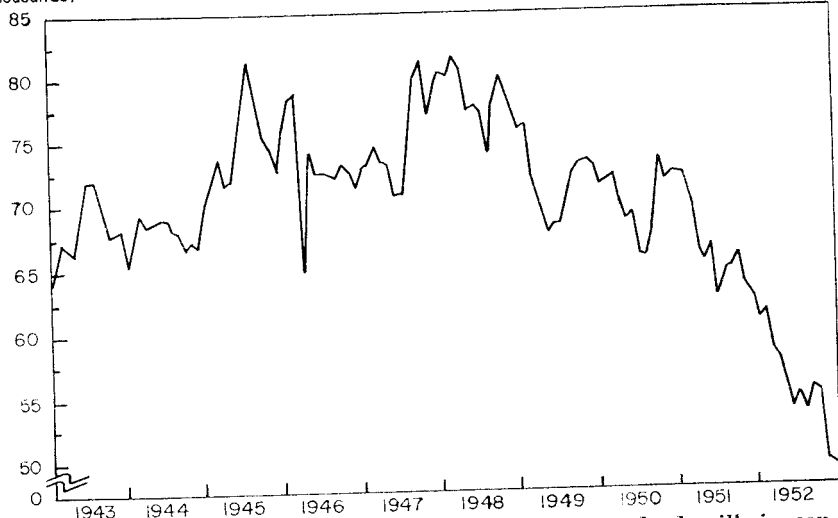


Figure 14.—Daily average sales, quarts equivalent, of standard milk in containers of less than one gallon, Memphis, Tennessee, market, by months, January 1954 - December 1952

Standard milk was first sold in Memphis in one-half gallon containers in August 1951. Daily average sales from that time through December 1952 ranged from about 150 units to 550 units or 300 to 1100 quarts equivalent. During that 17 month period, the volume of sales in one-half gallon containers did not amount to more than about 2 percent of standard milk sales.

The one quart container was by far the most important size of container used in the sale of standard milk during the period

studied. Sales in quarts accounted for 90 to 95 percent of total volume in most months during the 10 years, 1943 through 1952. Due to this factor, the trend in daily average sales in quarts was practically the same as for total sales of standard milk.

Standard milk was sold in pint containers during the first three years of the period studied. During 1943 daily average sales amounted to about 15,000 pints, but in 1945 and 1946 they dropped to less than 1,000. The sale of standard milk in pint containers was discontinued in January 1946.

Standard milk was also sold in one-third quart and one-half pint containers. Sales in these small containers were primarily to restaurants, schools and other institutions. Sales of appreciable amounts in one-third quart containers began in 1946 but were discontinued in April 1951. Sales of standard milk in one-half pint containers were made throughout the 10-year period, but only negligible quantities of this size were sold from April 1949 through September 1950.

The volume of standard milk sold in small containers declined sharply when the pint container was nearly discontinued in early 1944 (figure 15). The volume of sales fluctuated during the war years, depending upon the supply of milk available. In the spring of 1949 the volume of sales of standard milk in small containers dropped by about one-half. This was caused by the discontinuance of sales of standard milk in one-half pint containers with no increase in sales of standard milk in one-third quart containers. Discontinuance of one-third quart containers in the spring of 1951 caused an increase in sales of standard milk in one-half pint containers, but a decline in total sales of standard milk in small containers. Sales of standard milk in small containers drifted downward through 1952 as homogenized milk gained popularity.

Quarts Equivalent
(Thousands)

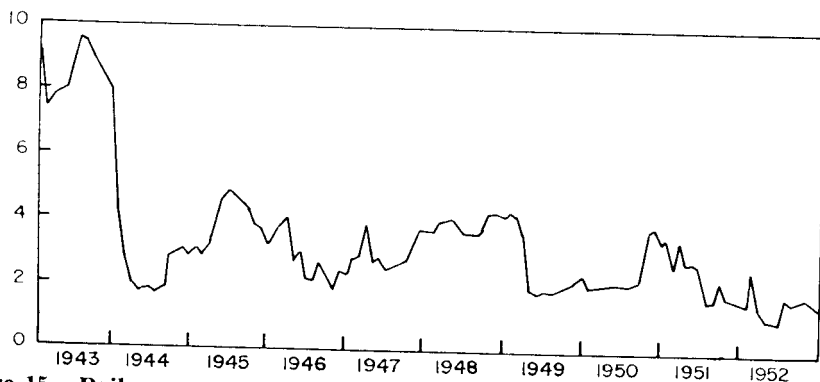


Figure 15.—Daily average sales, quarts equivalent, of standard milk in containers of less than one quart, Memphis, Tennessee, market, by months, January 1943 - December 1952

Price Changes and Quantities Purchased in Quart Containers

The price per quart for standard milk in Memphis ranged from 12.5 to 23 cents during the period studied (figure 16). The retail price of standard milk in quart containers changed 18 times. The price changes which occurred just prior to and at the termination of O.P.A. regulations were eliminated and only 15 price changes were studied.

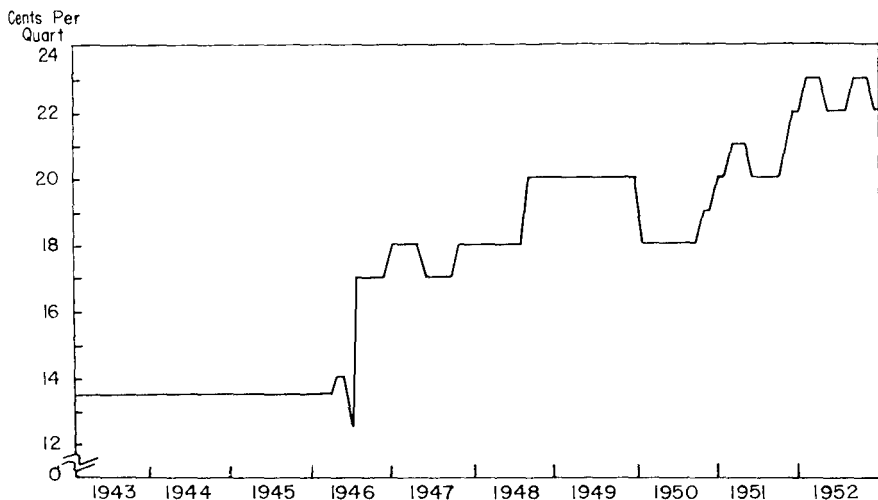


Figure 16.—Retail price per quart for standard milk, Memphis, Tennessee, market, by months, January 1943 - December 1952

TABLE 7.—Short-Run Response of Consumption to Price Change For Standard Milk Sold in Quart Containers, in the Memphis, Tennessee, Market for 15 Periods, 1946-1952

Price Increases				Price Decreases			
Date	Change in price	Change in quantity	Estimated sales response	Date	Change in price	Change in quantity	Estimated sales response
	percent	percent			percent	percent	
1946 Dec.	5.88	-1.42	-.24	1947 May	-5.56	4.33	-.78
1947 Oct.	5.88	.89	.15	1950 Jan.	-10.00	2.27	-.23
1948 Aug.	11.11	-4.90	-.44	1951 May	-4.76	-4.81	1.01
1950 Oct.	5.56	1.01	.18	1952 Apr.	-4.35	1.10	-.25
Dec.	5.26	1.99	.38	Nov.	-4.35	-5.86	1.35
1951 Feb.	5.00	1.76	.35				
Oct.	5.00	1.41	.28				
Nov.	4.76	-.20	-.04				
1952 Jan.	4.55	-1.10	-.24				
Aug.	4.55	2.20	.48				

The 15 price changes studied included 10 price increases and five decreases. It was expected that a change in the price of standard milk would result in a change in the opposite direction in daily average sales. Sales response was "rational" in seven of the 15 cases (table 7). Of the eight exceptions, six followed price

increases and two followed decreases. Statistical analysis indicated that price changes did not affect sales of standard milk in quart containers during the month following a price change.²⁹

It seemed possible that the response of sales to price change might differ at various price levels and perhaps explain part of the apparent irrationality. In order to study this, prices were arrayed and the resulting responses examined (table 8). However, no pattern appeared to emerge since at each price where there were two or more observations, at least one appeared to be "irrational."

When arrayed chronologically it appeared that "rational" observations tended to be together and "irrational" observations together. Five of the eight apparently "irrational" responses occurred from October 1950 through October 1951. Four of these five apparently "irrational" responses which occurred during this period followed price increases. There were indications that consumer incomes shifted unusually during this period.

The assumption was made that seasonal variation in the price of milk during the period studied would not significantly affect the results obtained. In view of the apparently "irrational" response of sales to price change at some times, it seemed desirable to construct an index of seasonality of price. This was done, but the seasonal variation in price of standard milk in quart containers was not significant.

TABLE 8.—*Price of Standard Milk Arrayed by Magnitude and Chronologically and Compared With the Resulting Sales Response,¹ in the Memphis, Tennessee, Market for Period, 1946-1952*

Arrayed by Magnitude of Price			Prices Arrayed Chronologically		
Months of price change	Price per quart	Estimated sales response	Months of price change	Price per quart	Estimated sales response
	cents			cents	
Dec. 1946	17	— .24	Dec. 1946	17	— .24
Oct. 1947	17	.15	May 1947	18	— .78
May 1947	18	— .78	Oct. 1947	17	.15
Aug. 1948	18	— .44	Aug. 1948	18	— .44
Oct. 1950	18	.18	Jan. 1950	20	— .23
Dec. 1950	19	.38	Oct. 1950	18	.18
Jan. 1950	20	— .23	Dec. 1950	19	.38
Feb. 1951	20	.35	Feb. 1951	20	.35
Oct. 1951	20	.28	May 1951	21	1.01
May 1951	21	1.01	Oct. 1951	20	.28
Nov. 1951	21	— .04	Nov. 1951	21	— .04
Jan. 1952	22	— .24	Jan. 1952	22	— .24
Aug. 1952	22	.48	Apr. 1952	23	— .25
Apr. 1952	23	— .25	Aug. 1952	22	.48
Nov. 1952	23	1.35	Nov. 1952	23	1.35

¹ Estimated sales response was computed by dividing the percentage change in sales (adjusted for trend and season) from the month before a price change to the month following the price change by the percentage change in price.

SALES OF HOMOGENIZED MILK

Trends in Sales by Size of Container

Homogenized milk was first sold in Memphis in August 1947. Daily average sales increased rapidly from that time and exceeded 80,000 quarts equivalent in December 1952 (figure 17). Standard milk sales, by comparison, were less than 50,000 quarts equivalent per day in December 1952. Daily average sales of homogenized milk reached nearly 20,000 quarts equivalent during the fifth month (December 1947) that it was offered for sale in the market. The rate of increase was less rapid from 1948 until the last five months of 1952, when it increased from about 62,000 in August to over 80,000 in December.

Quarts Equivalent
(Thousands)

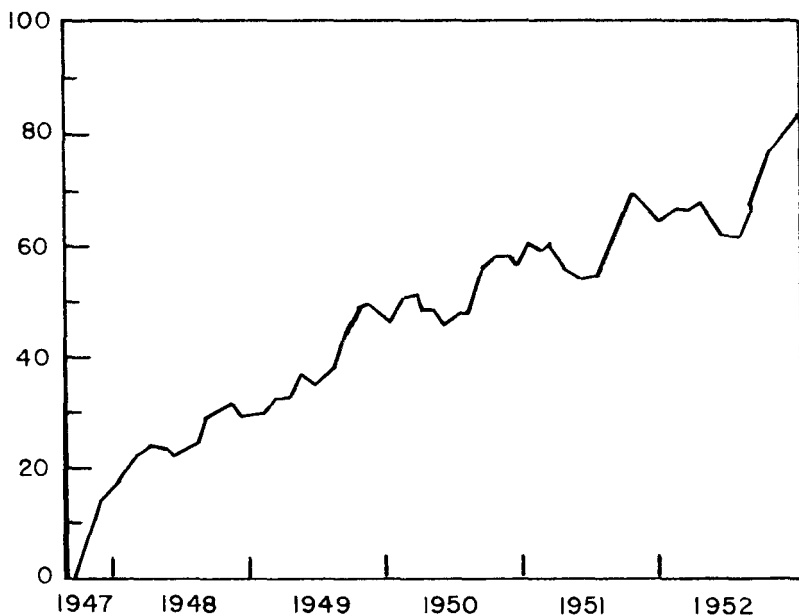


Figure 17.—Daily average sales, quarts equivalent, of homogenized milk in containers of less than one gallon, in the Memphis, Tennessee, market, by months, August 1947 - December 1952

Homogenized milk was first sold in one-half gallon containers in Memphis in August 1951. Daily average sales from that time through September 1952 were less than 1,000 units or 2,000 quarts equivalent. Promotion of milk in one-half gallon containers started in October 1952 with the entry of a new dealer into the market. Daily average sales increased from about 1,000 units in September to 1,500 units in October (2,000 to 3,000 quarts equivalent), and approximately tripled from October to November, then rose again in December to about 5,500 units or 11,000 quarts equivalent. About

13 percent of homogenized sales in December 1952 was in one-half gallon containers.

The one quart container was, however, the most important size used in the sale of homogenized milk. Sales in quart containers accounted for 55 to 82 percent of the total volume of homogenized milk sales. The percentage decreased during the late months of 1952 due apparently to the increased sales in one-half gallon containers (figure 18).

Homogenized milk was also in one-third quart and one-half pint containers. The volume of homogenized milk sold in these small containers increased through January 1951, with seasonal variation, and then tended to drift downward (figure 19). Part of this decline was due to the sharp drop in sales in one-third quart containers in April 1951 and the discontinuance of sales in this size of container in September 1951, without a corresponding increase in the volume of milk sold in one-half pint containers.

Quarts
(Thousands)

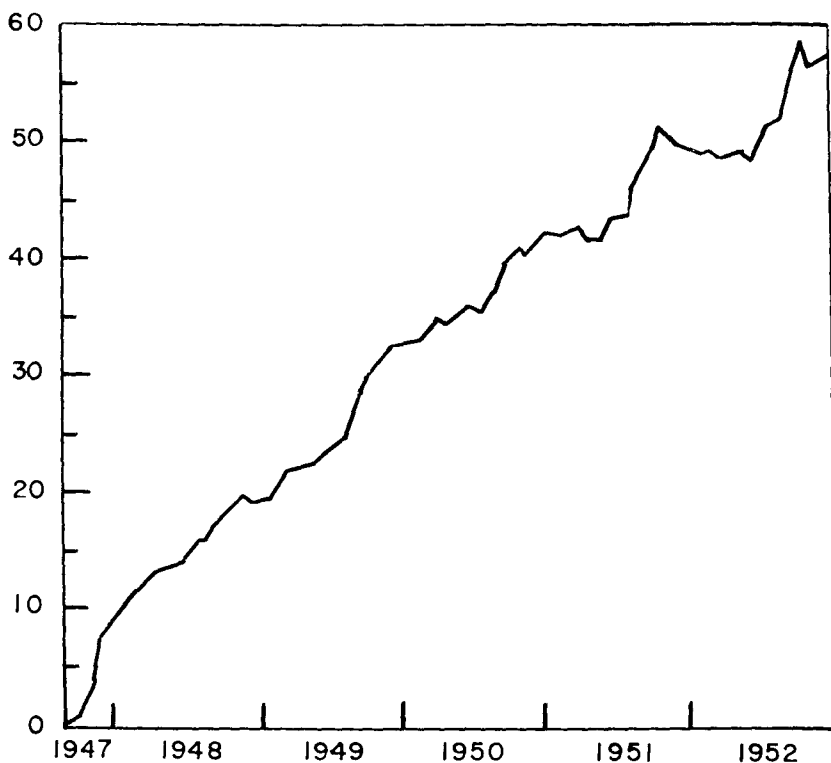


Figure 18.—Daily average sales of homogenized milk in quart containers, in the Memphis, Tennessee, market, by months, August 1947 - December 1952

Quarts Equivalent
(Thousands)

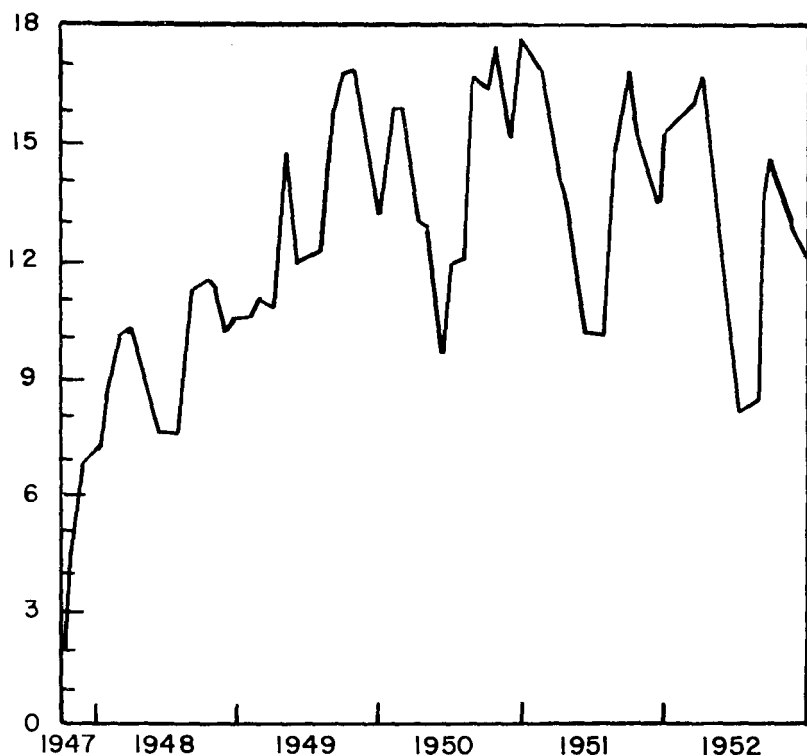


Figure 19.—Daily average sales, quarts equivalent, of homogenized milk in containers of less than one quart, in the Memphis, Tennessee, market, by months, October 1947 - December 1952

Price Changes and Quantities Purchased in Quart Containers

The retail price per quart for homogenized milk in Memphis ranged from 19 to 24 cents during the period studied (figure 20), and moved parallel, but one cent higher, to that of standard milk until the price change of November 1952. This change eliminated the price differential between standard and homogenized milk.

The range in sales variation in months of zero price change was wider than for months following price changes. Changes in sales of homogenized milk in quart containers were analyzed by comparing daily average sales during the month before and the month after a price change. The effects of both trend and season were removed. The results of this analysis indicated that price changes did not affect sales of homogenized milk in quart containers during the month following a price change.³⁰

³⁰ See appendix table 2.

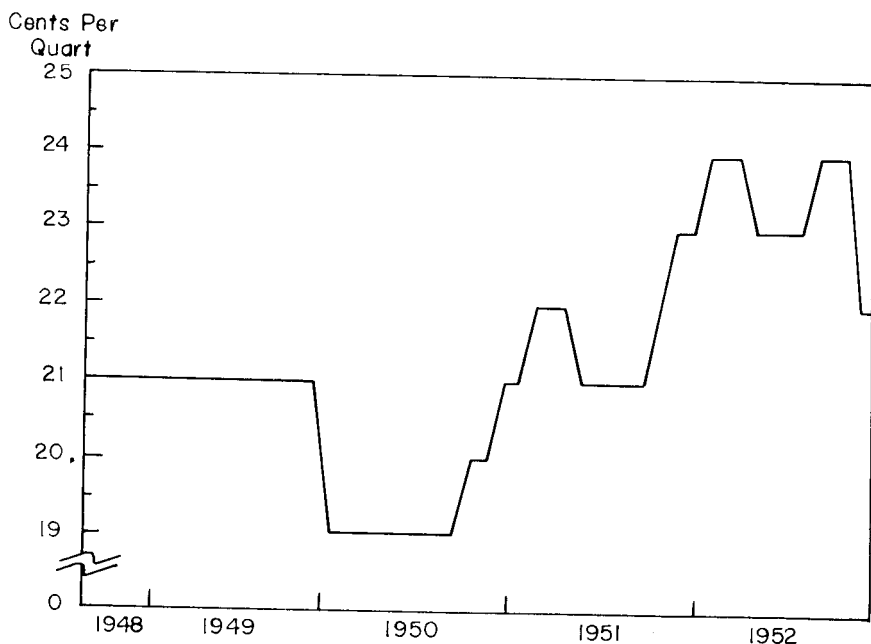


Figure 20.—Retail price per quart for homogenized milk, in the Memphis, Tennessee, market, by months, August 1948 - December 1952

In about five years homogenized milk, a new product on this market, became the most important fluid milk product sold. Consumers apparently were shifting to homogenized milk with little regard for the small price differential. The price of this new product generally was about 5 percent higher than standard milk until the price change of November 1952, at which time the price of both products became the same.

SALES OF EXTRA RICH MILK

Trends in Sales by Size of Container

Daily average sales of extra rich milk (about 5 percent butterfat content) ranged from about 4,000 quarts equivalent during the last half of 1952 to over 35,000 in March 1946 (figure 21). Sales of extra rich milk increased through the years of World War II, and the peak year was 1946 during which nearly 21 percent of all fluid milk sold was extra rich. After 1946, sales decreased each year except 1949, and by 1952 they were less than 3 percent of total fluid milk sales.

One reason that sales of extra rich milk increased during the war period may have been that this was one means by which consumers could obtain cream to offset in part the withdrawal of heavy cream from sales. Following the termination of wartime controls, heavy cream was again offered for sale and extra rich

milk began to decline in importance. This decline continued with fluctuations through February 1949. In that month daily average sales were 11,000 quarts equivalent, but the next month they jumped to about 16,000, almost entirely at the expense of standard milk. Approximately 85 percent of this increase was due to an increase in sales in quart containers, and nearly all of the remainder to sales in one-half pints. In April 1949, daily average sales jumped to over 19,000 quarts equivalent, and was due to increased sales in one-third quarts and one-half pints. Then in May, sales dropped back approximately to the March level. This was due almost entirely to the sharp decline in sales in one-third quarts. Daily average sales declined slowly from that time through September 1950 to about 13,000 quarts equivalent, then dropped abruptly to about 8,000 in October. Sales declined steadily through December 1952.

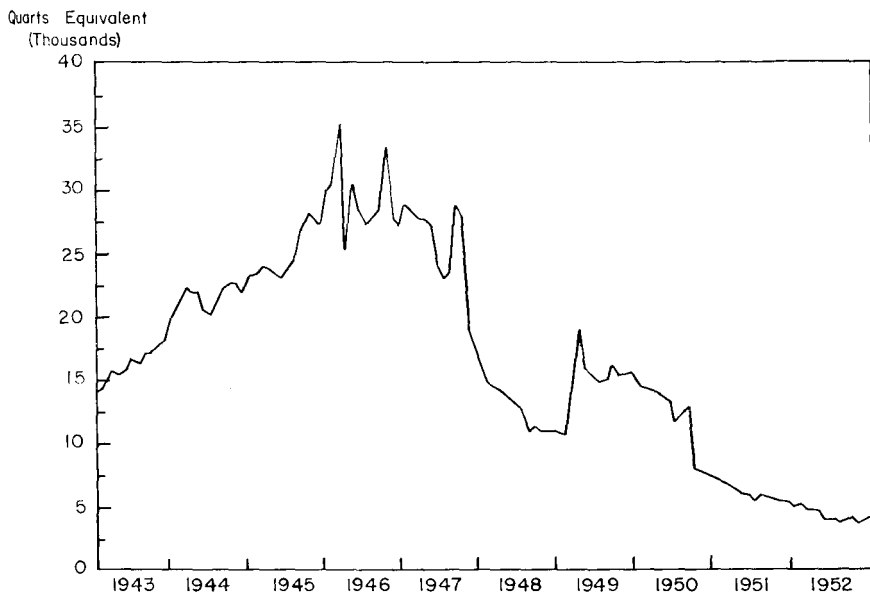


Figure 21.—Daily average sales, quarts equivalent, of extra rich milk in containers of less than one gallon, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

The quart container was the most important size used in the sale of extra rich milk (figure 22). Quart sales accounted for between 65 and 99 percent of the volume from 1943 through 1952, and after October 1950, over 99 percent of all extra rich milk was sold in quart containers. Daily average sales of this size increased during World War II and reached a peak of nearly 23,000 quarts in March 1946, but by December 1952, they dropped to only 4,000 quarts.

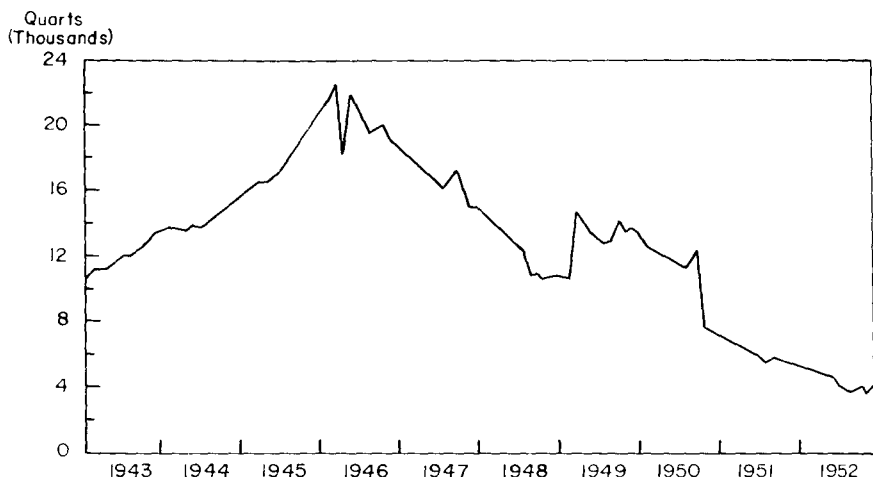


Figure 22.—Daily average sales of extra rich milk in quart containers, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

Extra rich milk was sold in pint containers during the first three years of the period studied. During 1943, daily average sales were about 300 pints (150 quarts equivalent), but declined to between 30 and 50 pints in 1944 and 1945. Sales in pints were discontinued in January 1946.

Extra rich milk was also sold in one-third quart and one-half pint containers. Sales in one-third quarts began in 1946 but were discontinued in April 1951. Sales of extra rich milk in one-third quarts were important in 1947 only.

Sales of extra rich milk in one-half pint containers were made each month from January 1943 through July 1947, with the exception of five months. From August 1947 through February 1949, sales were made in only three months (daily average sales during these three months were 65, 17, and 3 one-half pints). Sales of extra rich milk in one-half pint containers were resumed in March 1949, discontinued in October 1950, resumed again in April 1951 and continued through December 1952. In every month of 1952, however, daily average sales were less than 50 one-half pints.

Extra rich milk was sold in containers of less than one quart during every month from 1943 through 1952 (figure 23). Peak sales amounted to more than 13,000 quarts equivalent per day in October 1946, but less-than-quart sales of extra rich milk declined sharply soon after the introduction of homogenized milk on the market in August 1947.

Available data do not explain the jump in less-than-quart sales of extra rich milk in April 1949. From October 1950 through December 1952, daily average sales in small containers were less than 100 quarts equivalent and in 1952 averaged about 10 quarts equivalent.

Quarts Equivalent
(Thousands)

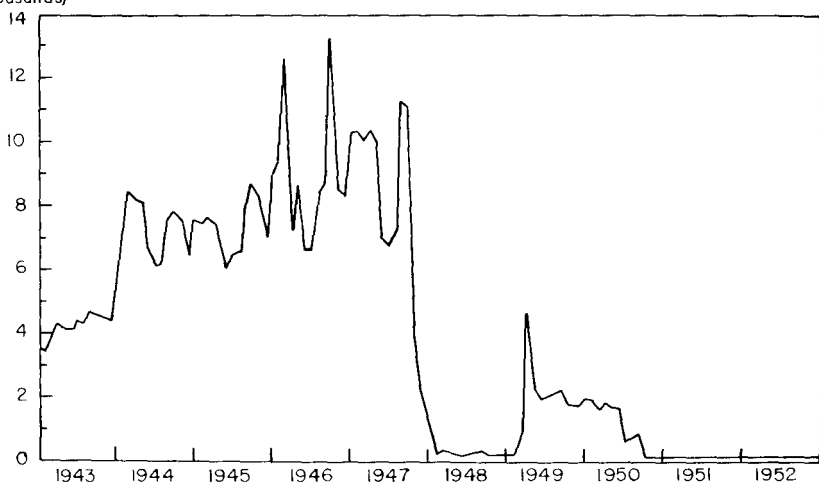


Figure 23.—Daily average sales, quarts equivalent, of extra rich milk sold in containers of less than one quart, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

Cents Per

Quart

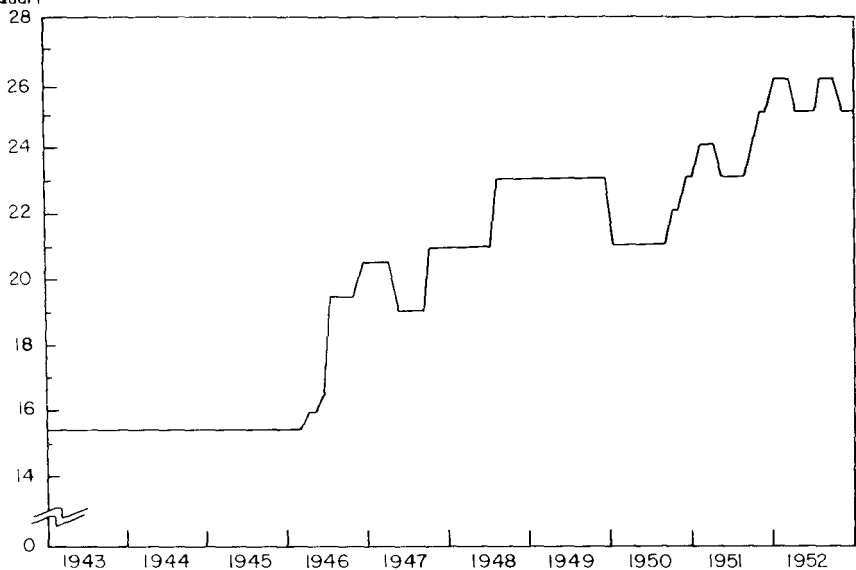


Figure 24.—Retail price per quart for extra rich milk, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

Price Changes and Quantities Purchased in Quart Containers

The price per quart for extra rich milk in Memphis ranged from 15.5 to 26 cents during the period studied (figure 24). The

price was 15.5 cents per quart from January 1943 through March 1946. Price increases of 0.5 cent in April and in May, and 3 cents in June 1946 brought the price to 19.5 cents per quart, at which level it remained through November 1946. In December 1946 the price was raised to 20.5 cents per quart and remained there through April 1947, and in May declined 1.5 cents compared with a 1.0 cent decline for standard milk. The price rose to 2.0 cents per quart in October 1947, at which time the price of standard milk was raised but 1.0 cent. The price of extra rich milk from October 1947 through December 1952 fluctuated with the price of standard milk, keeping at a premium of 3.0 cents per quart.

Of the 15 price changes studied, 10 were increases and five decreases. It was expected that a change in the price of extra rich milk would result in a change in the opposite direction in daily average sales. The response of sales to price change appeared to be "rational" in eight of the 15 cases. Of the seven exceptions, five occurred following price increases and other two following decreases. Analysis indicated that price changes did not affect sales of extra rich milk during the month following a price change.³¹

In about six years sales of extra rich milk declined from nearly 21 percent of total fluid milk sales to less than 3 percent for the year of 1952. After 1947 homogenized milk was gaining popularity and was 2 cents per quart cheaper and became 3 cents per quart cheaper in November 1952. In addition, part of the decline in popularity of extra rich milk may be attributed to the availability of creams in adequate quantities. It is possible that reducing the differential (3 cents per quart) between extra rich milk and standard and homogenized milk might result in some increase in sales. However, it would appear that extra rich milk is likely to disappear from the market under present conditions.

SALES OF BULGARIAN BUTTERMILK

Trends in Sales by Size of Container

Daily average sales of Bulgarian buttermilk (a wholemilk product) ranged from about 1,250 quarts equivalent in April 1943 to about 3,600 in October 1950 (figure 25). Sales of Bulgarian buttermilk increased during World War II, declined in 1946, moved upward again in 1947, and stabilized at the general level of about 3,200 quarts equivalent daily in 1949 and 1950. Early in 1951 they declined and appeared to stabilize around 2,800 quarts equivalent in the last half of 1951 and 1952.

Sales of Bulgarian buttermilk in quart containers accounted for about one-half of the total Bulgarian buttermilk sales during the period studied. Daily average sales in quart containers ranged from 632 in May 1943 to 1,584 in July 1952 (figure 26). Sales in quart containers increased until early 1946, declined through the

³¹ See appendix table 2.

Quarts Equivalent
(Thousands)

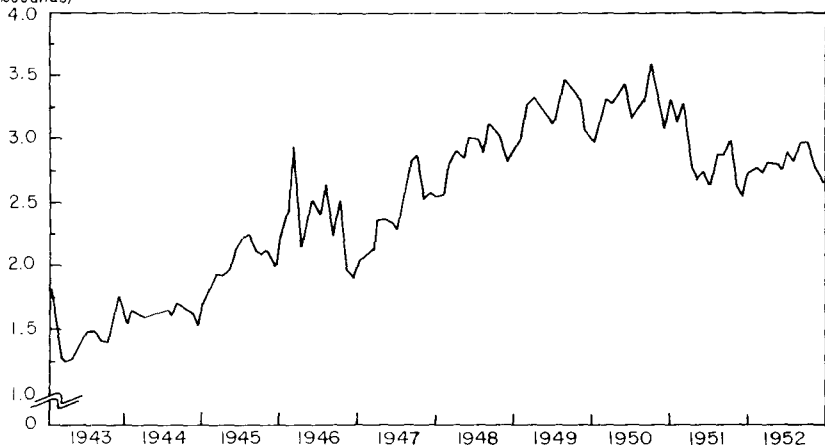


Figure 25.—Daily average sales, quarts equivalent of Bulgarian buttermilk in containers of less than one gallon, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

Quarts
(Thousands)

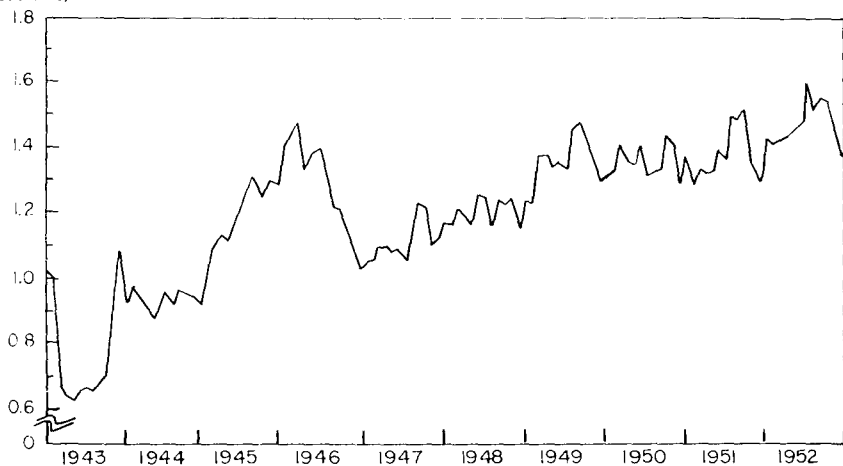


Figure 26.—Daily average sales of Bulgarian buttermilk in quart containers, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

remainder of that year, and then, in early 1947, started upward again and increased generally through 1952.

Bulgarian buttermilk was sold in pint containers during the first three years of the period studied. During 1943 daily average sales ranged between 523 pints and 1711 pints (262 to 856 quarts equivalent). During 1944 and 1945 daily average sales were less than 100 pints (50 quarts equivalent) during every month but

one. December 1945 was the last month in which Bulgarian butter milk was sold in pint containers.

Bulgarian buttermilk was also sold in one-third quart and one half pint containers. Sales in these containers were made primarily to restaurants, schools and other institutions. Sales in one-third quart containers were first made in 1946, and were made in appreciable quantities continuously from December 1946 through March 1951. Sales in one-third quart containers were discontinued in June 1951.

Bulgarian buttermilk was sold in one-half pint containers during all but seven months between January 1943 and December 1952. However, during those months in which sales in one-third quart containers were made in considerable volume, sales in one-half pint containers were negligible. From April 1951 through December 1952, sales of Bulgarian buttermilk in one-half pint containers fluctuated around a level of about 5500 units (1375 quarts equivalent) per day.

Aggregate sales of Bulgarian buttermilk in containers smaller than one-quart (pint, one-third quart, and one-half pint) increased, with fluctuations, from 1943 through March 1951 (figure 27). Most of the drop in volume which followed was due to a shift from one-third quart to one-half pint containers. The number of units sold changed very little.

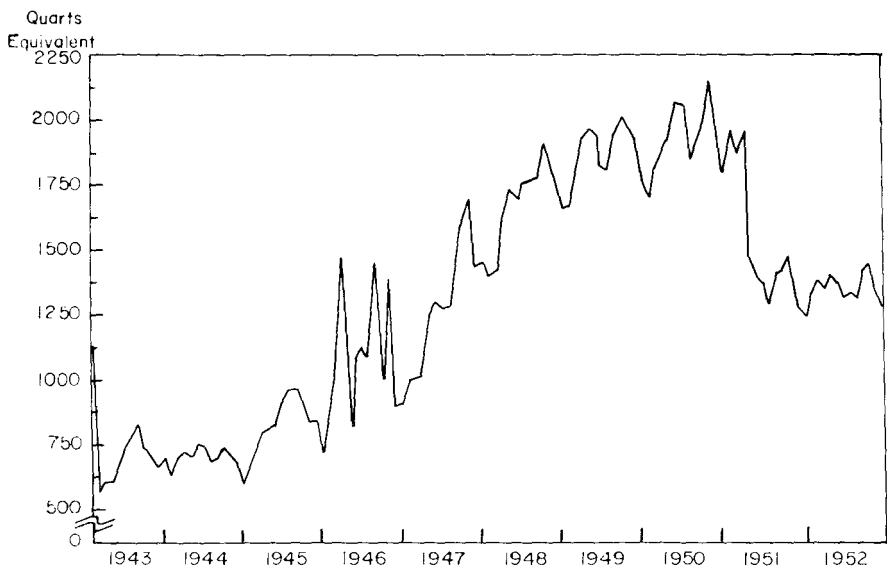


Figure 27.—Daily average sales, quarts equivalent, of Bulgarian buttermilk in containers of less than one quart, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

Price Changes and Quantities Purchased in Quart Containers

The price per quart for Bulgarian buttermilk ranged from 15.5 to 24 cents during the period studied (figure 28). Of the 15 price changes studied, 10 were price increases and five decreases.

It was expected that a change in the price of Bulgarian buttermilk would result in a change in the opposite direction in daily average sales. The response of sales appeared to be "rational" in nine of the 15 cases. Of the six exceptions three occurred following price increases and three followed decreases. Analysis indicated that price changes did not affect sales of Bulgarian buttermilk during the month following a price change.³²

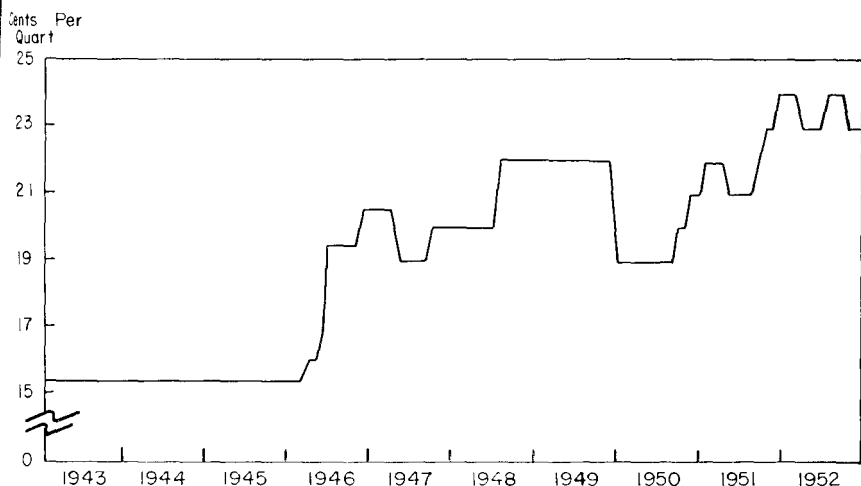


Figure 28.—Retail price per quart for Bulgarian buttermilk, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

SALES OF PLAIN BUTTERMILK

Trends in Sales by Size of Container

Daily average sales of plain buttermilk (a skim milk product) ranged from about 8,600 quarts equivalent in January 1943 to about 26,500 in November 1949 (figure 29). Sales of plain buttermilk moved upward with seasonal variation from 1943 through 1950, then declined in 1951 and 1952. It was the third most important fluid milk product sold in Memphis in 1952, accounting for about 12.6 percent of Class I sales. This compared with 42.7 percent of Class I sales for homogenized milk and 34.1 percent for standard milk.

The one quart container was by far the most important size used in the sale of plain buttermilk. Sales in quart containers accounted for 90 to 98 percent of the volume during the period

³² See appendix table 2.

studied. Daily average sales increased with seasonal variation from 1943 to a peak of about 26,400 quarts in November 1949, after which time sales tended to drift downward.

Quarts Equivalent
(Thousands)

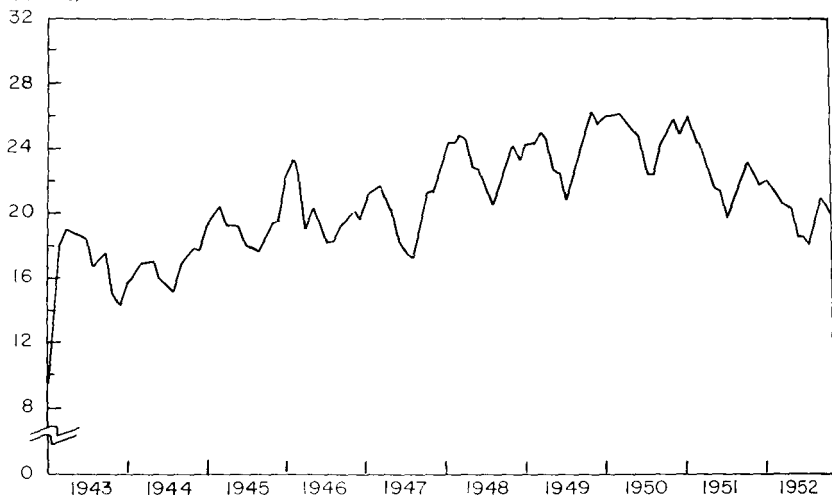


Figure 29.—Daily average sales, quarts equivalent, of plain buttermilk in containers of less than one gallon, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

Plain buttermilk was sold in pint containers during the first three years of the period studied. During 1943 daily average sales ranged between 775 pints and 1375 pints, but declined to 15 to 60 pints per day in 1944 and 1945. Sales in pints were discontinued in January 1946.

Small quantities of plain buttermilk were also sold in one-third quart and one-half pint containers. These sales were made to restaurants, schools, and other institutions. Plain buttermilk was sold in one-third quart containers during four different and relatively brief periods between January 1943 and December 1952.

Plain buttermilk was sold in one-half pint containers in all months but three between January 1943 and December 1952. Daily average sales varied from nothing to 536 units (134 quarts equivalent).

Aggregate sales of plain buttermilk in containers smaller than one quart declined sharply early in 1944 and remained at a very low level through December 1952, never exceeding 10 percent of the total sales of plain buttermilk. By contrast, sales of Bulgarian buttermilk in small containers accounted for about one-half of the total sales of that product, and were about 10 times as great as plain buttermilk sales in small containers.

Price Changes and Quantities Purchased in Quart Containers

The price per quart for plain buttermilk ranged from 9 to 16 cents during the period studied (figure 30). Plain buttermilk was made from a less expensive raw material (skim milk) than was Bulgarian buttermilk (whole milk). The price per quart for plain buttermilk ranged from 6.5 to 9.0 cents less than Bulgarian buttermilk, reflecting the value of butterfat in whole milk. Of the 14 price changes included in this study, nine were increases and five decreases.

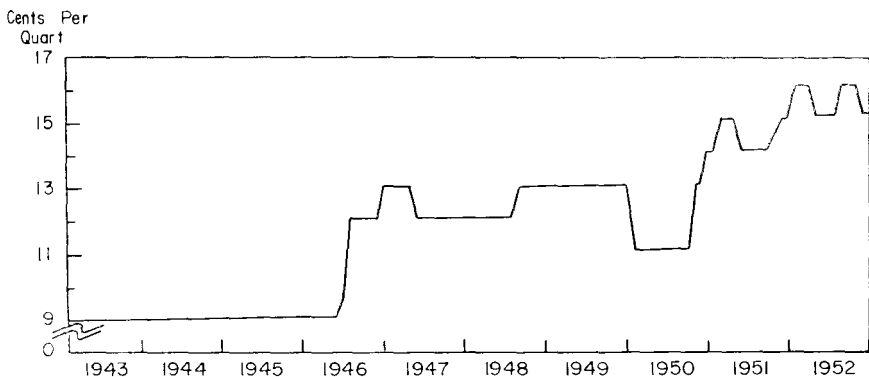


Figure 30.—Retail price per quart for plain buttermilk, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

It was expected that a change in the price of plain buttermilk would be followed by a change in the opposite direction in daily average sales. The response of sales appeared to be "rational" in nine of the 14 cases. Of the five exceptions, three followed price increases and two followed decreases.

The range in sales variation in months of zero price changes was approximately the same as that for months following price changes. Changes in sales of plain buttermilk in quart containers were analyzed by comparing daily average sales during the month before and the month after a price change. The effects of both trend and season were removed. The results of this analysis indicated that price changes did not affect sales of plain buttermilk during the month following a price change.³³

SALES OF CHOCOLATE MILK

Trends in Sales by Size of Container

Daily average sales of chocolate milk³⁴ in containers of less than one gallon ranged from 4,075 quarts equivalent in June 1944 to about 11,600 in October 1950 (figure 31). During 1943 daily average sales fluctuated between 7,000 and 9,000 quarts equivalent,

³³ See appendix table 2.

³⁴ Technically, most of this product was chocolate drink, or a product containing less than 2.0 percent butterfat.

Quarts Equivalent
(Thousands)

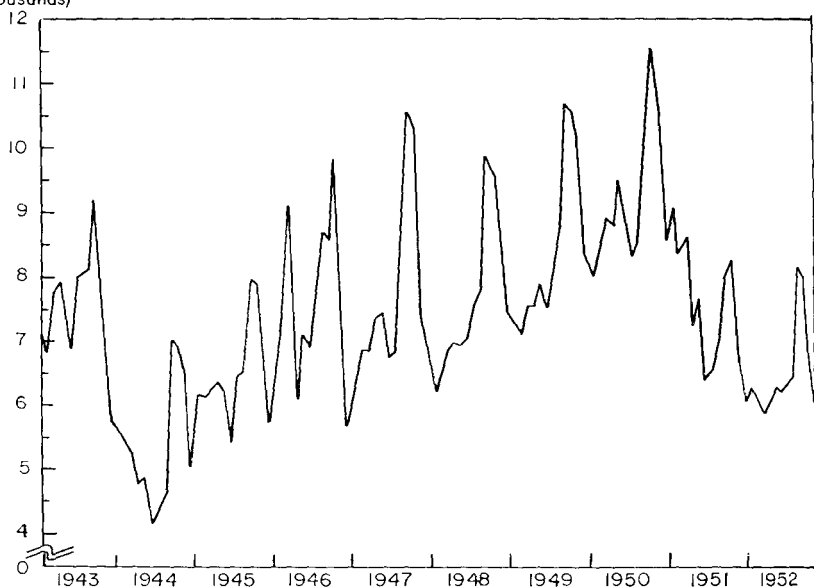


Figure 31.—Daily average sales, quarts equivalent, of chocolate¹ milk in containers of less than one gallon, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

¹ Includes 8,744 pints in August 1943 and 83 pints in July 1945 of cherry milk.

Quarts
(Thousands)

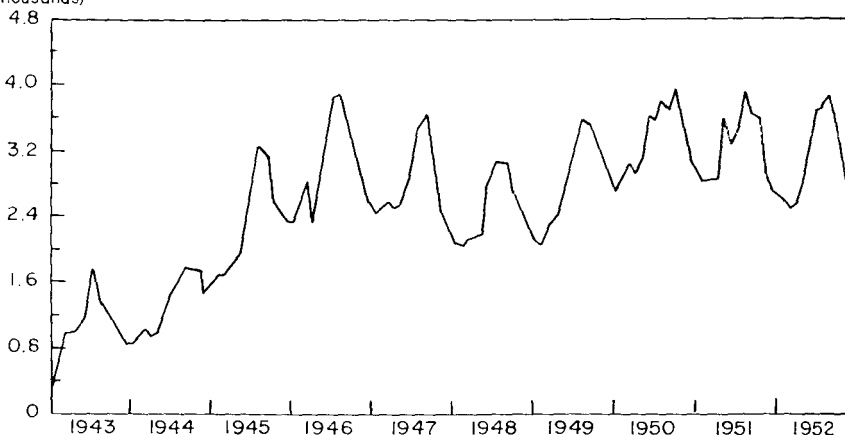


Figure 32.—Daily average sales of chocolate milk in quart containers, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

between 4,000 and 7,000 quarts equivalent in 1944, then tended upward with wide fluctuations. Sales declined to a lower level in 1951 and 1952, fluctuating between about 6,000 and 8,000 quarts equivalent.

Sales of chocolate milk in quart containers accounted for between 15 and 50 percent of total chocolate milk sales (annual basis). Sales in quart containers became relatively more important with the passage of time. They increased with seasonal fluctuation from 1943 through 1946, then drifted downward slightly in 1947 and again in 1948 (figure 32). Daily average sales increased to and stabilized around a level of 3,200 quarts from 1949 through 1952.

Chocolate milk was sold in pint containers from January 1943 through December 1946 and again from May 1949 through September 1950. Daily average sales ranged from 119 pints in December 1946 to 10,519 pints in August 1943 (60 to 5,260 quarts equivalent). Sales of chocolate milk in pint containers was important in 1943 only.

Chocolate milk was sold in one-third quart containers in March, August, and October 1946. Then sales were made continuously in one-third quart containers from December 1946 through June 1951. Daily average sales ranged from 83 units in June 1951 to 21,198 units in October 1950 (28 to 7,166 quarts equivalent).

Sales were made in one-half pint containers during all but six months between January 1943 and December 1952. During those months in which sales were made in one-third quart containers, sales of chocolate milk in one-half pint containers were negligible.

Quarts Equivalent
(Thousands)

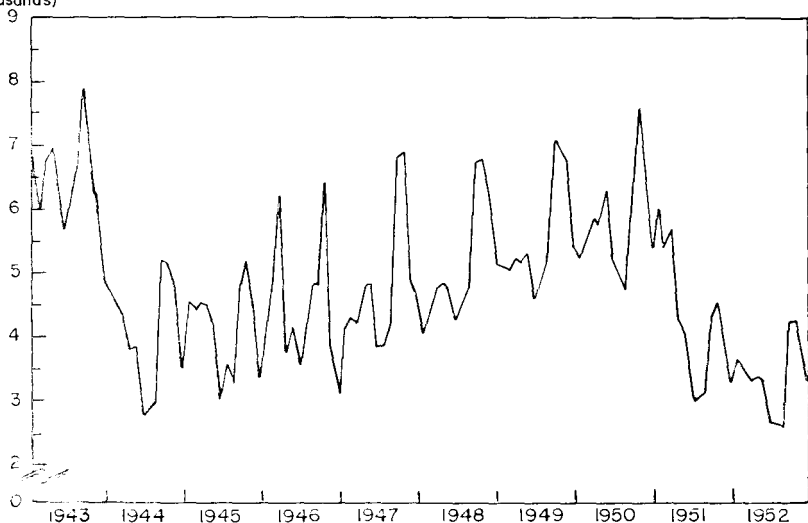


Figure 33.—Daily average sales, quarts equivalent, of chocolate¹ milk in containers of less than one quart, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

¹Includes 8,744 pints in August 1943 and 83 pints in July 1945 of cherry milk.

The volume of sales of chocolate milk in containers smaller than one quart declined early in 1944 as a result of the sharp curtailment of sales in pint containers (figure 33). Daily average sales increased with fluctuations, from 1944 through 1950. The volume of sales declined early in 1951, mostly as a result of the shift from one-third quart to one-half pint containers.

Price Changes and Quantities Purchased in Quart Containers

The retail price per quart for chocolate milk ranged from 15.5 to 23.5 cents per quart during the period studied (figure 34), and there were 15 price changes included in this study. Of these, 10 were price increases and five decreases. It was expected that a change in the price of chocolate milk would be followed by a change in the opposite direction in daily average sales. The response of sales appeared to be "rational" in 10 of the 15 cases. Of the five exceptions, three occurred following price increases and two followed decreases. The range in sales variation in months of zero price change was greater than that for months following price changes. Analysis indicated that price changes did not affect sales of chocolate milk during the month following a price change.³⁵

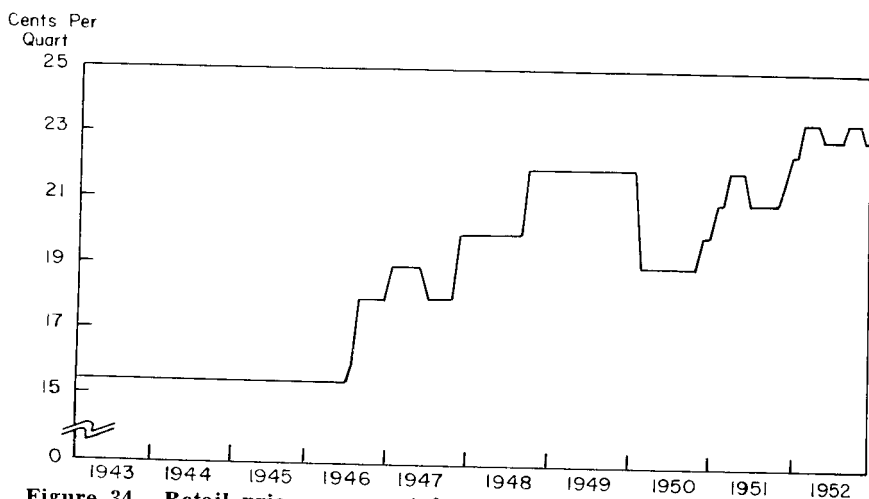


Figure 34.—Retail price per quart for chocolate milk, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

SALES OF SKIM MILK

Trends in Sales by Size of Container

Skim milk was sold every month between January 1943 and December 1952. Sales were made almost entirely in quart containers, although skim milk was sold in one-half pint containers during a total of eight months in 1951 and 1952. However, daily

³⁵ See appendix table 2.

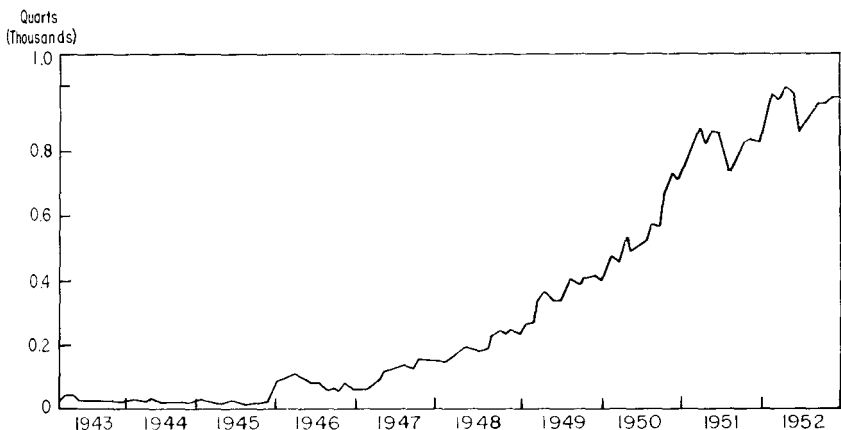


Figure 35.—Daily average sales of skim milk in quart containers, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

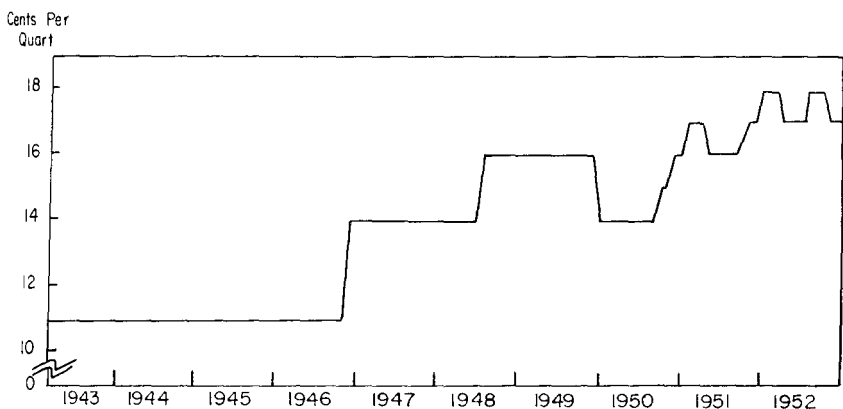


Figure 36.—Retail price per quart for skim milk, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

average sales in one-half pint containers never reached 160 units (40 quarts equivalent) during the period.

Daily average sales of skim milk in quart containers ranged from 11 in December 1943 to 998 in April 1952 (figure 35). From January 1943 through October 1945, daily average sales stabilized around a level of about 20 quarts. Sales increased rapidly from November 1945 through December 1952. However, sales of skim milk never amounted to as much as one percent of total Class I sales (annual basis).

Price Changes and Quantities Purchased in Quart Containers

The price per quart of skim milk ranged from 11 to 18 cents during the period studied (figure 36), and 12 changes in the retail price were studied. These price changes included eight

increases and four decreases. The response of sales appeared to be "rational" in five of the twelve cases. Of the seven exceptions, six followed price increases and the other a decrease. The range in sales variation in months of zero price change was greater than that for months following price changes. Analysis indicated that price changes did not affect sales of skim milk during the month following a price change.³⁶

SALES OF LIGHT CREAM

Trends in Sales by Size of Container

Daily average sales of light cream³⁷ ranged from about 1500 quarts equivalent in June 1952 to 3650 quarts equivalent in March 1946 (figure 37). Daily average sales increased sharply in the last half of 1945. From early 1946 through 1952, sales of light cream tended to drift downward. Light cream sales ranged from 1.2 percent of total Class I sales in 1952 to 2.3 percent in 1943.

Quarts Equivalent
(Thousands)

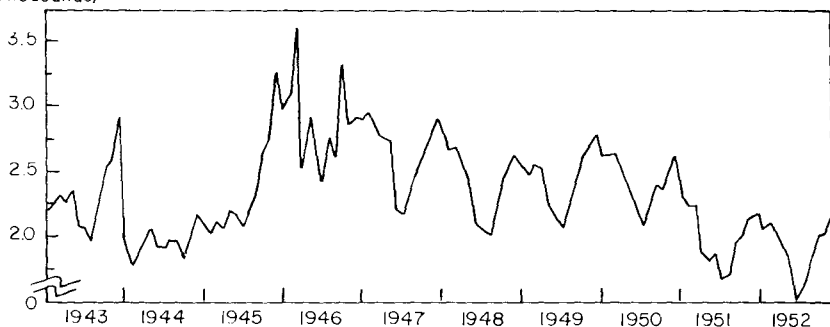


Figure 37.—Daily average sales, quarts equivalent, of light cream in containers of less than one gallon, in the Memphis, Tennessee, market, by months, January 1943 - December 1952

Sales of light cream in quart containers accounted for 51 to 62 percent of total light cream sales (on an annual basis) during the period studied. Daily average sales in quart containers ranged from 887 in June 1952 to 2,115 in December 1943 (figure 38). They fluctuated considerably with the seasons, but tended to drift downward from 1946 through 1952.

Light cream was sold in pint containers in only 14 months from January 1943 through December 1952. In only one month did daily average sales exceed 50 pints (25 quarts equivalent). Sales were made in one-third quart containers in March, August and October, 1946, and then continuously in that size from December 1946 through March 1951. Light cream was sold in one-half pint containers during all but seven months between January 1943

³⁶ See appendix table 2.

³⁷ Light cream is a fluid product generally containing from 18 to 30 percent butterfat. It is often referred to as coffee cream or single x cream.

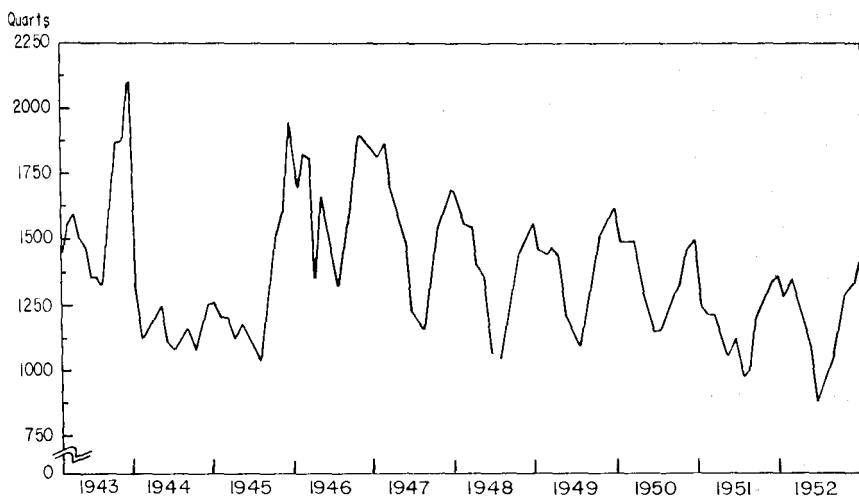


Figure 38.—Daily average sales of light cream in quart containers in the Memphis, Tennessee, market, by months, January 1943 - December 1952

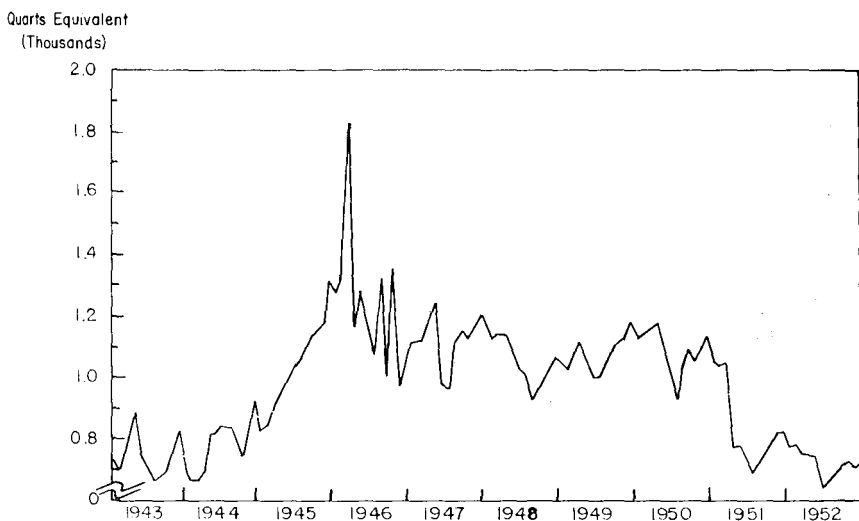


Figure 39.—Daily average sales, quarts equivalent, of light cream in containers of less than one quart in the Memphis, Tennessee, market, by months, January 1943 - December 1952

and December 1952. During most of the months in which sales were made in one-third quart containers, one-half pint sales were negligible. A change from one-third quart to one-half pint containers usually did not change the number of units sold, but the volume of cream sold was reduced.

The volume of sales of light cream in containers smaller than one quart increased sharply in 1945 and reached a peak of 1,831 quarts equivalent per day in March 1946 (figure 39). Later in

1946 daily average sales declined and stabilized at a level of about 1100 quarts equivalent through 1950. The shift from one-third quart to one-half pint containers resulted in a decline in volume to about 750 quarts equivalent per day.

Price Changes and Quantities Purchased in Quart Containers

The price per quart for light cream ranged from 36 to 70 cents during the period studied (figure 40). The 15 price changes studied included 10 increases and five decreases. The response of sales appeared to be "rational" in 10 of the 15 cases. Of the five exceptions, four occurred following price increases and one followed a decrease.

The range in sales variation in months of zero price change was greater than that for months following price changes. Changes

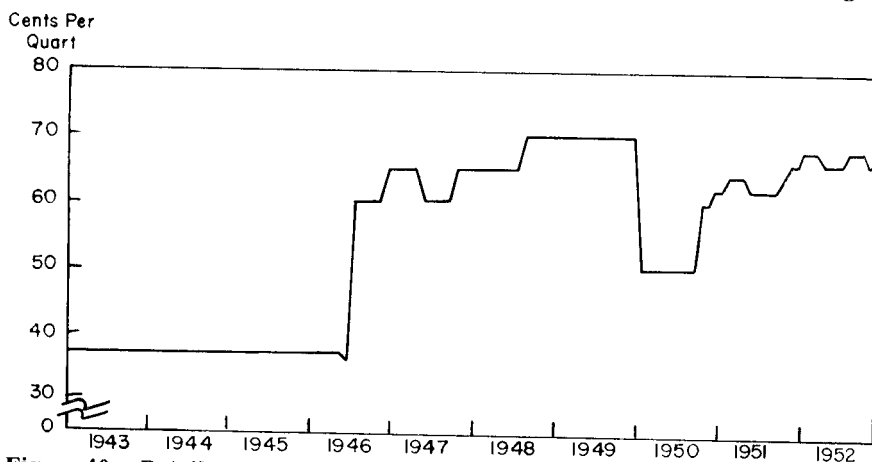


Figure 40.—Retail price per quart for light cream in the Memphis, Tennessee, market, by months, January 1943 - December 1952

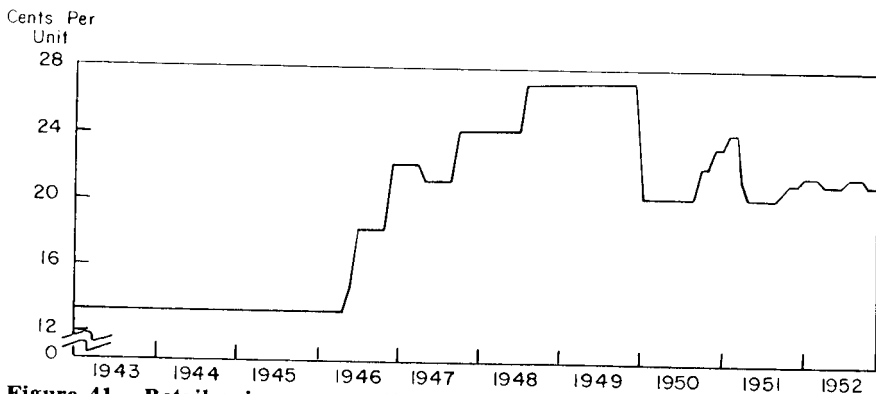


Figure 41.—Retail price per one-third quart or one-half pint of light cream in the Memphis, Tennessee, market, by months, January 1943 - December 1952

in sales of light cream in quart containers were analyzed by comparing daily average sales during the month before and the month after a price change. The effects of both trend and season were removed. The result of this analysis indicated that price changes did not affect sales of light cream in quart containers during the month following a price change.³⁸

Price Changes and Quantities Purchased in Containers Other Than One Quart

The price per unit of light cream sold in one-third quart and one-half pint containers ranged from 13 cents to 27 cents during the period studied (figure 41). The changes in price for light cream in small containers followed the same general pattern as did those for light cream sold in quart containers.

It was expected that a change in the price of light cream sold in small containers would be followed by a change in the opposite direction in daily average sales. The response of sales appeared "rational" in seven of the 15 cases. Of the eight exceptions, four followed price increases and four followed decreases.

Quarts Equivalent
(Thousands)

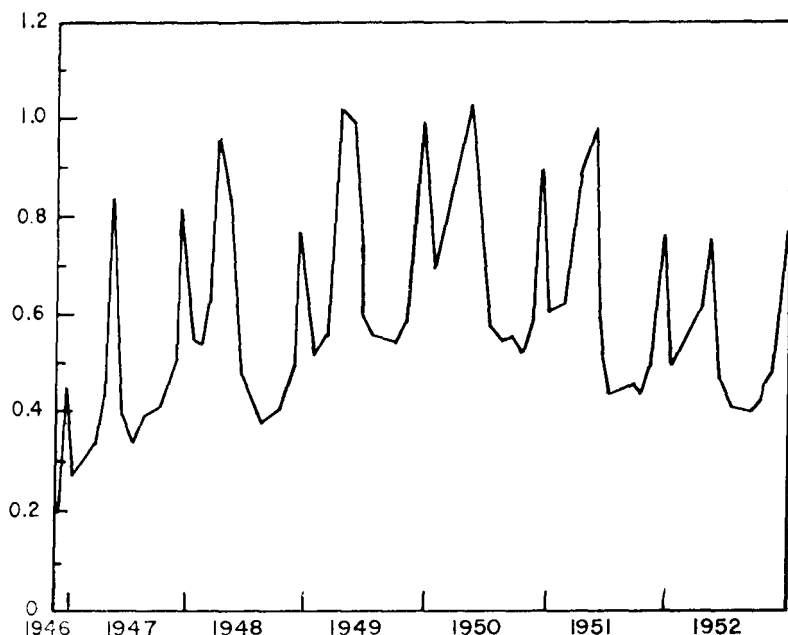


Figure 42.—Daily average sales, quarts equivalent, of heavy cream in units of less than one gallon in the Memphis, Tennessee, market, by months, November 1946 - December 1952

* See appendix table 2.

Quarts

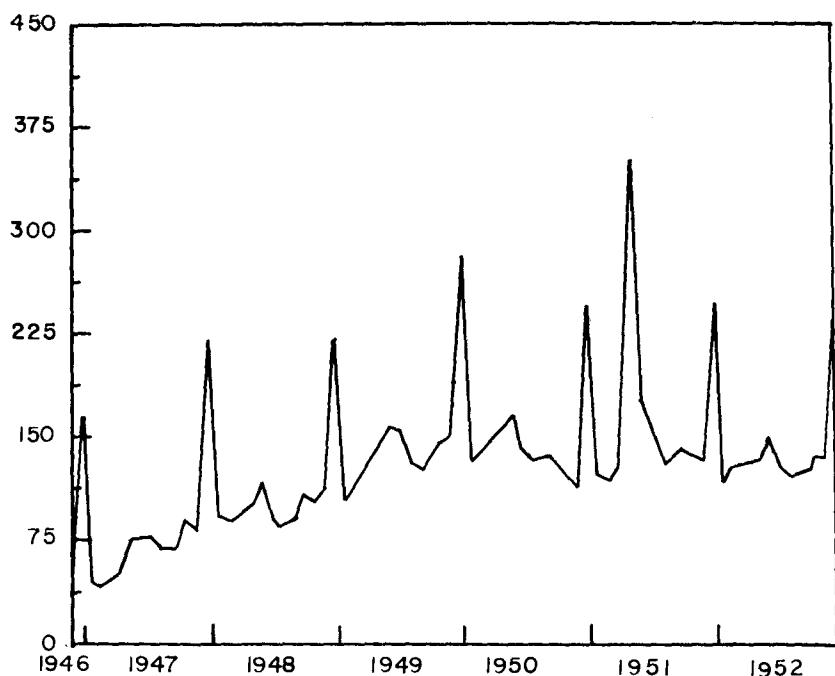


Figure 43.—Daily average sales of heavy cream in quart containers in the Memphis, Tennessee, market, by months, November 1946 - December 1952

The range in sales variation in months of zero price change was greater than that for months following price changes. Analysis indicated that a 10 percent change in the price per unit of light cream sold in one-third quart and one-half pint containers was associated with a change in sales of about 1.4 percent in the opposite direction. Light cream sold in one-third quart or one-half pint containers, was the only product on which price changes had any significant effect on sales.³⁹

SALES OF HEAVY CREAM

Trends in Sales by Size of Container

Heavy cream⁴⁰ was not available for sale in the Memphis Market during World War II, but sales of this product were resumed in November 1946. During the period studied the sales of heavy cream never accounted for as much as one-half percent of total Class I sales (annual basis). Daily average sales of heavy cream ranged from about 60 quarts equivalent in November 1946 to about 1,030 in April 1949 and May 1950 (figure 42). They

³⁹ See appendix table 2.

⁴⁰ Heavy cream is a fluid product containing not less than 30 percent butterfat. It is often referred to as whipping cream or xx cream.

Quarts Equivalent
(Thousands)

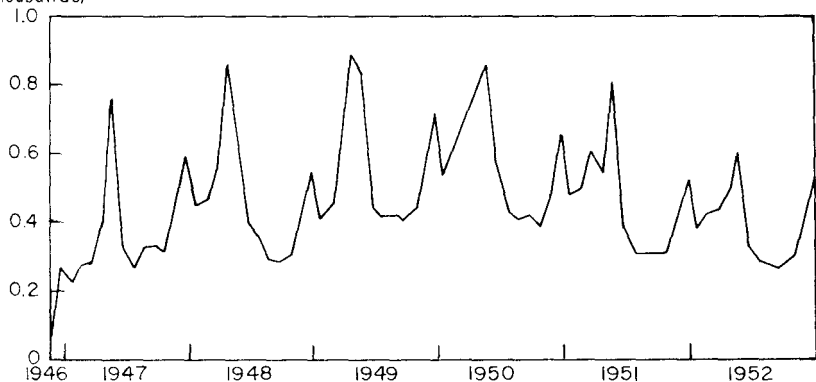


Figure 44.—Daily average sales, quarts equivalent, of heavy cream in containers of less than one quart in the Memphis, Tennessee, market, by months, November 1946 - December 1952

tended to increase in 1947 and 1948, appeared to stabilize in 1949 and 1950, then drifted downward in 1951 and 1952.

Heavy cream was sold in one-quart, one-third quart, and one-half pint containers in the Memphis Market during the period studied. Daily average sales in quart containers ranged from 11 in November 1946 to 356 in April 1951 (figure 43). They tended to increase in 1947, 1948, and early 1949, then to fluctuate seasonally around a stabilized level from 1950 through 1952.

Heavy cream was sold in one-third quart containers from December 1946 through April 1951. Daily average sales ranged from 504 units (168 quarts equivalent) in January 1947 to 2501 units (834 quarts equivalent) in April 1948. Sales were made in one-half pint containers in all but four months from November 1946 through December 1952. Daily average sales ranged from 11 units (3 quarts equivalent) in October 1947 to 3,218 units (804 quarts equivalent) in May 1951. During those months in which sales were made in one-third quart containers in considerable volume, sales in one-half pint containers were negligible.

Aggregate sales of heavy cream in one-third quart and one-half pint containers ranged from 47 quarts equivalent per day in November 1947 to 884 in April 1949 (figure 44), after which they tended to decline. However, part of this was due to the shift from one-third quart to one-half pint containers.

Price Changes and Quantities Purchased in Quart Containers

The price per quart for heavy cream ranged from 95 cents to \$1.20 (figure 45), and changed 12 times during the period studied. These price changes included eight increases and four decreases. The response of sales appeared "rational" in five of the 12 cases. Of the seven exceptions, five followed price increases and two fol-

Cents Per
Quart
130

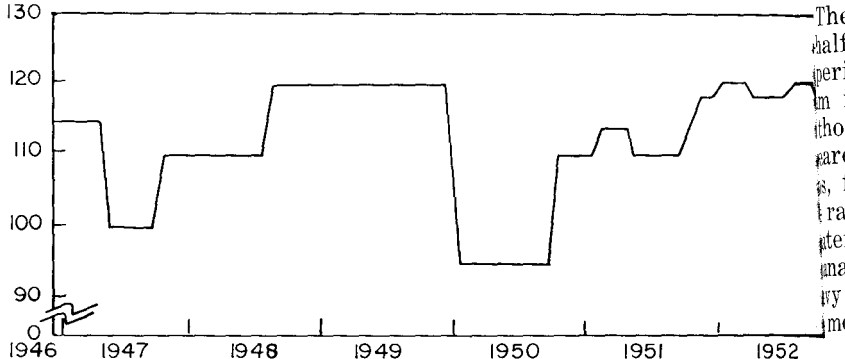


Figure 45.—Retail price per quart for heavy cream in the Memphis, Tennessee market, by months, December 1946 - December 1952

Cents Per
Unit

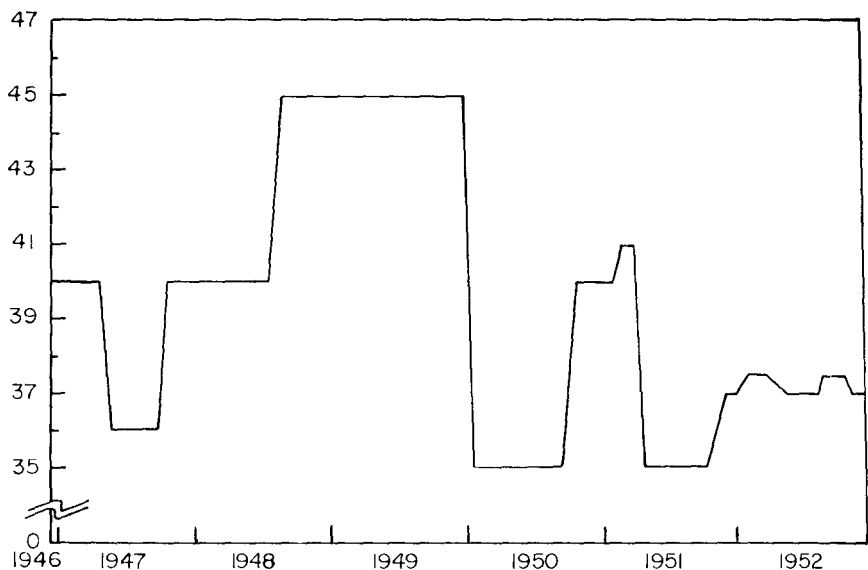


Figure 46.—Retail price per one-third quart or one-half pint of heavy cream in the Memphis, Tennessee, market, by months, December 1946 - December 1952

lowed decreases. The range in sales variation in months of zero price change was greater than that for months following price changes. The results of analysis indicated that price changes did not affect sales of heavy cream in quart containers during the month following a price change.¹¹

¹¹ See appendix table 2.

Price Changes and Quantity Purchased in Containers Other Than One Quart

The price per unit of heavy cream sold in one-third quart and one-half pint containers ranged from 35 cents to 45 cents during the period studied (figure 46). The 12 changes in price for heavy cream in small containers followed the same general pattern as did those of heavy cream sold in quart containers. Sales response appeared "rational" in four of the 12 cases. Of the eight exceptions, five followed price increases and three followed decreases. The range in sales variation in months of zero price change was greater than that for months following price changes. The results of analysis indicated that price changes did not affect sales of heavy cream in one-third quart and one-half pint containers during the month following a price change.⁴²

⁴² See appendix table 2.

APPENDIX TABLE 1. *Summary of Results Obtained by Regression Analysis of Effect of Milk Price Change on Sales of Sweet Whole Milk in Quart Containers in the Memphis, Tennessee, Market, 1946-52*

Observations	Lag of sales after price change		Change in sales for each one percent change in price		Coefficient of determination	Level of significance
	no.	month	percent	percent		percent
Excluding months of zero price change	15	1	— .006	.0029		10
Including months of zero price change	77	1	— .034	.0022		30
Including months of zero price change	76	2	+ .086	.0101		60
Including months of zero price change	75	3	— .038	.0023		30

APPENDIX TABLE 2. *Summary of Results Obtained by Regression Analysis of Effects of Milk Price Changes on Sales of Fluid Milk in Month Following Price Change in the Memphis, Tennessee, Market, 1946-52*

Product	Size of container	Observations	Change in sales for each one percent change in price		Coefficient of determination	Level of significance
			no.	percent		percent
Sweet whole milk ¹	Quart	77		— .034	.0022	30
Standard Milk	Quart	77		— .034	.0015	20
Homogenized	Quart	55		— .088	.0149	40
Extra rich	Quart	77		— .288	.0151	70
Bulgarian buttermilk	Quart	77		— .136	.0090	50
Plain buttermilk	Quart	77		+ .052	.0031	30
Chocolate	Quart	77		— .370	.0335	80
Skim	Quart	77		+ .283	.0089	50
Light Cream	Quart	77		— .099	.0074	50
Light Cream	½ Pint					
	⅓ Quart	77		— .136	.0377	95
Heavy Cream	Quart	65		+ .179	.0015	20
Heavy Cream	½ Pint					
	⅓ Quart	65		+ .341	.0222	70

¹ Includes standard, homogenized, and extra rich milk.