Agricultural Economic Report No. 226

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Prices and Consumption of Dairy Products

With Price Supports and Milk Orders

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PRICES AND CONSUMPTION OF DAIRY PRODUCTS WITH PRICE SUPPORTS AND MILK ORDERS

Agricultural Economic Report 226

Dairy Division - Agricultural Marketing Service

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PRICES AND CONSUMPTION OF DAIRY PRODUCTS WITH PRICE SUPPORTS AND MILK ORDERS

By Edmund E. Vial[1]

I. INTRODUCTION

The price that every milk producer receives for his milk and the price that every consumer pays for dairy products is affected by price actions taken by the Secretary of Agriculture. Two legislative acts confer upon the Secretary special duties in regard to prices of milk and dairy products that are not duplicated for other foods. The price-making forces in the dairy industry are unique.

The key provision of the Agricultural Act of 1949 in regard to dairy prices is in Section 201 (c).

> "*The price of whole milk, butterfat and the products of such commodities,* respectively, *shall be supported* at such level not in excess of 90 percentum nor less than 75 percentum of the parity price therefore as the *Secretary determines* necessary in order to assure an *adequate supply*....."[2]

The key provision of the Agricultural Marketing Agreement Act of 1937 in regard to milk prices is in Section 608 c (18).

> ".....whenever the *Secretary finds.....that the parity prices of such commodities are not reasonable* in view of.....economic conditions which affect market supply and demand for milk and its products in the marketing area to which.....the.....contemplated.....order.....relates; *he shall fix such prices* as he finds will.....insure *a sufficient quantity* of pure and wholesome milk and be in the public interest....."

(Emphasis supplied)

These key sentences also give the principal guidelines for establishing prices under the two acts. There are some similarities between them. Both mention parity and supply and state that prices are to be established which will bring forth adequate supplies. Under the Agricultural Act the Secretary is required to support prices between 75 and 90 percent of parity as he determines necessary to "assure an adequate supply". Under the Agricultural Marketing Agreement Act when parity prices are not reasonable in any specific marketing area, he is required to fix such prices as will "insure a sufficient quantity of pure and wholesome milk and be in the public interest"[3]. For all practical purposes establishing prices to "assure an adequate supply" and to "insure a sufficient quantity" are identical.

The program developed to carry out the dairy price support provisions of the Agricultural Act of 1949 for manufacturing milk is known as the "Dairy Price Support Program"; while the program developed to carry out the provisions of the Agricultural Marketing Agreement Act of 1937 in regard to milk eligible for fluid use is known as the "Federal Milk Marketing Order Program". The dairy industry has operated under both of these pricing programs simultaneously for nearly a quarter of a century.

The milk producers whose milk was priced, the handlers who purchased the milk and processed it into a variety of dairy products, the consumers of the products and the agencies involved in administering the programs have a direct interest in how the programs worked.

The purpose of this study was to portray the prices, price relationships and price structures that developed in carrying out the mandates of these two legislative acts as well as the reactions of consumers as measured by consumption. The analysis is divided into 5 parts: (a) prices, price relationships and price support purchases under the price support program, (b) prices, price relationships and price structure under the milk order program, (c) price differentials

[1] The author, Dr. Edmund E. Vial, is an economist in the Dairy Division, Agricultural Marketing Service, U.S. Department of Agriculture.

[2] The Agricultural Act of 1970 suspended until April 1, 1974, the mandatory requirement to support butterfat in farm-separated cream.

[3] The concept of "public interest" in establishing prices under the Agricultural Marketing Agreement Act is discussed in Report to the Secretary of Agriculture by the Federal Milk Order Study Committee, produced through the facilities of the U.S. Department of Agriculture, December 1962, p. 90 and footnote 1, pp. 90-91.

paid producers and charged handlers, (d) retail prices and price relationships for dairy products, (e) consumption of the two components of milk, butterfat and solids not fat, in products with minimum prices to producers established under the price support program and consumption of butterfat and solids not fat in products with minimum prices to producers established under the milk marketing order program.

Some of the important matters the study covers are the impact of the milk order and price support program on:

- The retail price of milk and dairy products relative to the price of other foods.
- Competition between Class I (fluid milk) products and Class II products such as packaged nonfat dry milk and dry mixes containing dry milk; and the extent to which certain Class II products have affected consumption of Class I products.
- Changes in the consumption of butterfat and solids not fat in various milk and dairy products.
- Changes in the margin of the price for Class I milk over the price of milk for manufacturing.
- Changes in the relative price and value of the butterfat and solids not fat components of milk.

The report contains basic information that will be of use in further study of improvements that can be made in the milk pricing system. It provides insight on fundamental matters such as:

- The appropriate relationship between Class I (fluid milk) and Class II (manufacturing milk) prices.
- Pricing the components of milk.
- The interrelationship between price supports and Federal milk orders.
- Product price formulas.

II. PRICE SUPPORT PROGRAM

In some respects the price support program has had more far reaching effects on the price of dairy products and producer returns than the marketing order program. With price supports, definite nationwide floors have been established under the market prices of butter, Cheddar cheese and nonfat dry milk. Because of the ease with which milk can be diverted from one use to another these floors in turn have established, for all practical purposes, floors under the price of manufactured dairy products not actually purchased under the support program such as cream, whole condensed milk, skim condensed milk, cheeses other than Cheddar and so on.

Prices that can be returned to producers for milk utilized in manufactured dairy products have a direct effect on the prices that can be obtained for fluid milk (Class I) in practically all fluid markets, those regulated under the marketing orders program as well as nonregulated markets.

While the support program and the milk orders are often considered as two independent programs established to carry out the provisions of two different legislative acts, there are interrelationships between them.

Under the authority of the Agricultural Act, the Secretary of Agriculture generally announced before the beginning of each marketing year (April 1) the price of manufacturing milk and the price of butterfat (in farm-separated cream) that were to be maintained during the following marketing year together with the level of these prices as a percent of parity.

The price support program has been carried out primarily by Commodity Credit Corporation (CCC)[4] purchases of butter, Cheddar cheese and nonfat dry milk. At or before the beginning of each marketing year (April 1), and whenever the support level was raised during the year, the Secretary announced the prices at which CCC would buy these products in bulk containers. All offers in carlot quantities meeting CCC specifications were accepted.

[4]The Commodity Credit Corporation (CCC) is an agency within the U.S. Department of Agriculture, subject to the direction of the Secretary.

Support Levels in Relation to Parity

The Agricultural Act of 1949 specified that the price of milk and butterfat shall be supported not higher than 90 nor lower than 75 percent of parity[5]. The U.S. Department of Agriculture publishes each month an index number of the prices paid by farmers. This index includes commodities bought for use in production (feed, seed, fertilizer, farm machinery and so on), commodities bought for use in family maintenance (food, clothing, house furnishings, autos and so on), interest payable per acre, taxes payable per acre and wage rates for farm labor. This overall index is known as the Parity Index.

During the 20-odd years that the support program was in effect the support level for both butterfat and manufacturing milk varied between 90 and 75 percent of parity (table 1). Thus, it is clear that prices have been supported at both the maximum and the minimum specified in the law as well as at intermediate levels. At times the support level for both butterfat and milk was the same, but in most of the years there was a difference.

In the early years the general tendency was for milk to be low in relation to butterfat. For example, in 1950-51 the support level for manufacturing milk was 80 and for butterfat 87 percent of parity. This was in striking contrast to 1968-69 when the support level for milk was 89 and butterfat 77. In that year milk was near the upper limit of the permissible range and butterfat near the lower limit.

In over half the years, butterfat was supported at a relatively low level in relation to parity, while milk was supported at a relatively high or intermediate level in relation to parity (table 2). The general tendency was to raise the support level for milk in relation to butterfat. When milk was supported at a higher level than butterfat, the difference had to be made up by a compensating increase in the purchase price of nonfat dry milk.

[5]The method of computing the parity equivalent prices of manufacturing milk is set forth in Dairy Price Support and Related Programs 1949-68, Harlan J. Emery et al., Agricultural Economic Report No. 165, Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture, July 1969, p. 51.

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TABLE 1. SUPPORT LEVEL FOR MANUFACTURING MILK AND BUTTERFAT IN TERMS OF PARITY AND CCC PURCHASE PRICES FOR BUTTER, NONFAT DRY MILK AND CHEDDAR CHEESE, 1949-50 TO 1971-72

Marketing Year April 1-March 31	Support level percent of parity[1]		Purchase prices (cents per pound)[2]			Nonfat price percent of butter
	Milk	Butterfat	Butter New York City	Nonfat dry milk (spray)	Cheddar cheese	
1949-50	87.5	89.2	60.53	12.48	31.50	20.6
1950-51	80.0	87.0	60.00	12.50	31.00	20.8
1951-52	86.0	89.0	66.00	15.00	36.00	22.7
1952-53	90.0	90.0	67.75	17.00	38.25	25.1
1953-54	89.0	90.0	66.50	16.00	37.00	24.1
1954-55	75.0	75.0	58.25	15.72	32.97	27.0
1955-56	80.0	76.0	58.25	16.00	33.25	27.5
1956-57	83.9	80.8	60.16	16.00	34.95	26.6
1957-58	82.0	79.0	60.50	16.00	35.00	26.4
1958-59	75.0	75.0	58.75	14.25	32.75	24.3
1959-60	77.0	77.0	58.75	14.25	32.75	24.3
1960-61	78.5	78.2	60.10	13.79	33.67	22.9
1961-62	83.0	81.0	61.25	16.25	36.38	26.5
1962-63	75.0	75.0	58.75	14.40	34.60	24.5
1963-64	75.0	75.0	58.75	14.40	35.60	24.5
1964-65	75.0	75.0	58.75	14.40	35.60	24.5
1965-66	75.0	75.0	59.75	14.60	36.10	24.4
1966-67	86.2	81.0	65.89	18.86	42.65	28.1
1967-68	87.0	81.0	67.25	19.60	43.75	29.1
1968-69	89.0	77.0	67.25	23.10	47.00	34.3
1969-70	83.0	75.0	68.50	23.10	48.00	33.7
1970-71	85.0	75.0	70.75	27.20	52.00	38.4
1971-72	85.0	([3])	68.75	31.70	54.75	46.1

[1] When the support level was changed during the marketing year the data here given are the average for the period of time each one was in effect.
[2] When the purchase price was changed during the marketing year the data here given are the average for the period of time each price was in effect.
[3] The Agricultural Act of 1970 suspended until April 1, 1974 the mandatory requirement to support butterfat in farm-separated cream.

TABLE 2. NUMBER OF YEARS SUPPORT LEVELS FOR BUTTERFAT AND MANUFACTURING MILK WERE HIGH, LOW AND INTERMEDIATE IN RELATION TO PARITY, 1949 - 70

Support level percent of parity	Butterfat	Milk
86-90 High	5	7
80-85 Intermediate	4	7
75-79 Low	13	8
Total	22	22

Parity Index Versus Other Well-Known Indexes

The parity index was a major factor in establishing the support level for milk and butterfat and the purchase prices for butter, cheese and nonfat dry milk. Because of its importance, it is pertinent to compare it with other widely used indexes to determine whether it has any pronounced peculiarities.

There was a marked upward trend in the parity index from 1947, the first year after the elimination of wartime controls, to 1970. The index increased

62 percent. It was only on rare occasions that the index declined from one year to the next.

The parity index, the index of prices received by farmers and the parity ratio are widely used to portray economic conditions in agriculture. The consumer price index of the Bureau of Labor Statistics is widely used to portray economic developments affecting consumers. The movements in the consumer price index were similar to the movements in the parity index. Since there is considerable overlapping in items purchased by farmers and by urban consumers for family living and since both groups purchased products in their finished form, ready for immediate consumption or use, the similarity in the movements of the two indexes is not surprising.

An index of prices paid by dairy farmers in New York State[6] including taxes, interest, wages and other items used by dairy farmers in producing milk also showed much the same changes as the parity index. Because of this similarity and due to the fact that the parity index includes the items used by dairy farmers in milk production, it is probable that the parity index and an index number of prices paid by dairy farmers on a national basis would also be quite similar.

The Bureau of Labor Statistics index of all wholesale prices differed from the parity index. From the late forties to the late fifties the index of wholesale prices moved more or less in unison with the parity index. However, from the late fifties to the late sixties the wholesale index was unusually stable. With the inflation of the late sixties it also increased, but the percentage gain was less than for the other indexes. The stability of the wholesale price index from 1957 to 1965 was unique as compared to the consistent rise in the other indexes (table 3, figure 1).

[6]Published by the Department of Agricultural Economics, Cornell University. Since January 1960 this index has been called Prices Paid by New York Dairy Farmers; prior to that time it was called Index of Costs in Dairy Farming.

TABLE 3. PARITY INDEX, CONSUMER PRICE INDEX, WHOLESALE PRICE INDEX AND INDEX OF PRICES PAID BY NEW YORK DAIRY FARMERS, 1947-70

Year	Parity index[1]		Consumer index[2]	Wholesale index[2]	New York dairy index[3]
	1910-14=100	1957-59=100	1957-59=100		
1947	240	82	78	81	80
1948	260	89	84	88	85
1949	251	86	83	84	81
1950	256	88	84	87	80
1951	282	96	90	97	88
1952	287	98	92	94	93
1953	277	95	93	93	92
1954	278	95	94	93	92
1955	276	94	93	93	92
1956	278	95	95	96	94
1957	287	98	98	99	97
1958	294	100	101	100	100
1959	298	102	102	101	103
1960	300	102	103	101	105
1961	302	103	104	100	105
1962	307	105	105	101	107
1963	312	107	107	100	109
1964	313	107	108	100	110
1965	321	110	110	102	113
1966	334	114	113	106	118
1967	342	116	116	106	118
1968	354	121	121	109	121
1969	373	127	128	113	126
1970	390	133	135	117	132

[1] Published by the U.S. Department of Agriculture.
[2] Published by the Bureau of Labor Statistics.
[3] Published by the Department of Agricultural Economics, Cornell University.

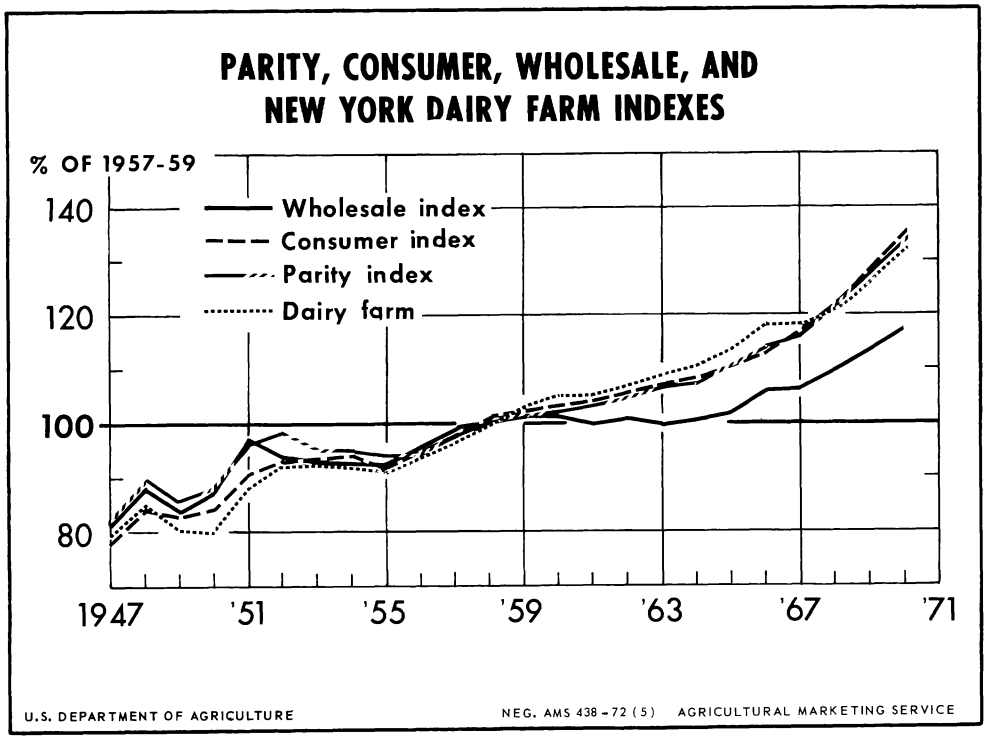

FIGURE 1.—With the exception of the wholesale price index the movements of the other indexes were similar.

The similarities in movement of the parity, consumer and New York indexes, on a 1957-59 base, is vividly portrayed by comparing their levels in 1947, 10 years prior to the beginning of the base period, and in 1970, 11 years after the end of the base period. In 1947 they were 82, 78 and 80 respectively, and in 1970, 133, 135 and 132. In contrast, the wholesale index in 1970 was 117.

These 4 indexes, on a 1957-59 base, for 1947 and 1970 are summarized as follows:

	Parity index	Consumer index	New York Dairy	Wholesale Price index
1947....	82	78	80	81
1957-59 .	100	100	100	100
1970....	133	135	132	117

CCC Purchase Prices of Dairy Products and Wholesale Prices of Foods

From 1949 to 1970 the parity index rose 55 percent. Thus, in order to support the price of manufacturing milk and butterfat at not more than 90 percent nor less than 75 percent of parity, there were marked increases in CCC purchase prices. However, there were marked differences between the three products, butter, cheese, and nonfat dry milk, in the magnitude of the increase.

In order to facilitate comparisons and to portray the net change in prices which occurred under the support program, index numbers of the purchase price of each product were calculated using the 3 years at the beginning of the program as a base

(1949-51=100). Since each of the products was purchased by CCC in carload lots, an index number of wholesale prices of all foods was also calculated on the same base, in order to facilitate the comparison between the purchase prices of dairy products and food prices generally (figure 2).

During the first three years (1949-51) the purchase price of nonfat dry milk spray process averaged 13.1 cents per pound. Then for 6 years, 1952-57, it was maintained at 16.1 cents, 23 percent higher than in the earlier years. Thereafter, the purchase prices were lowered and for a period of

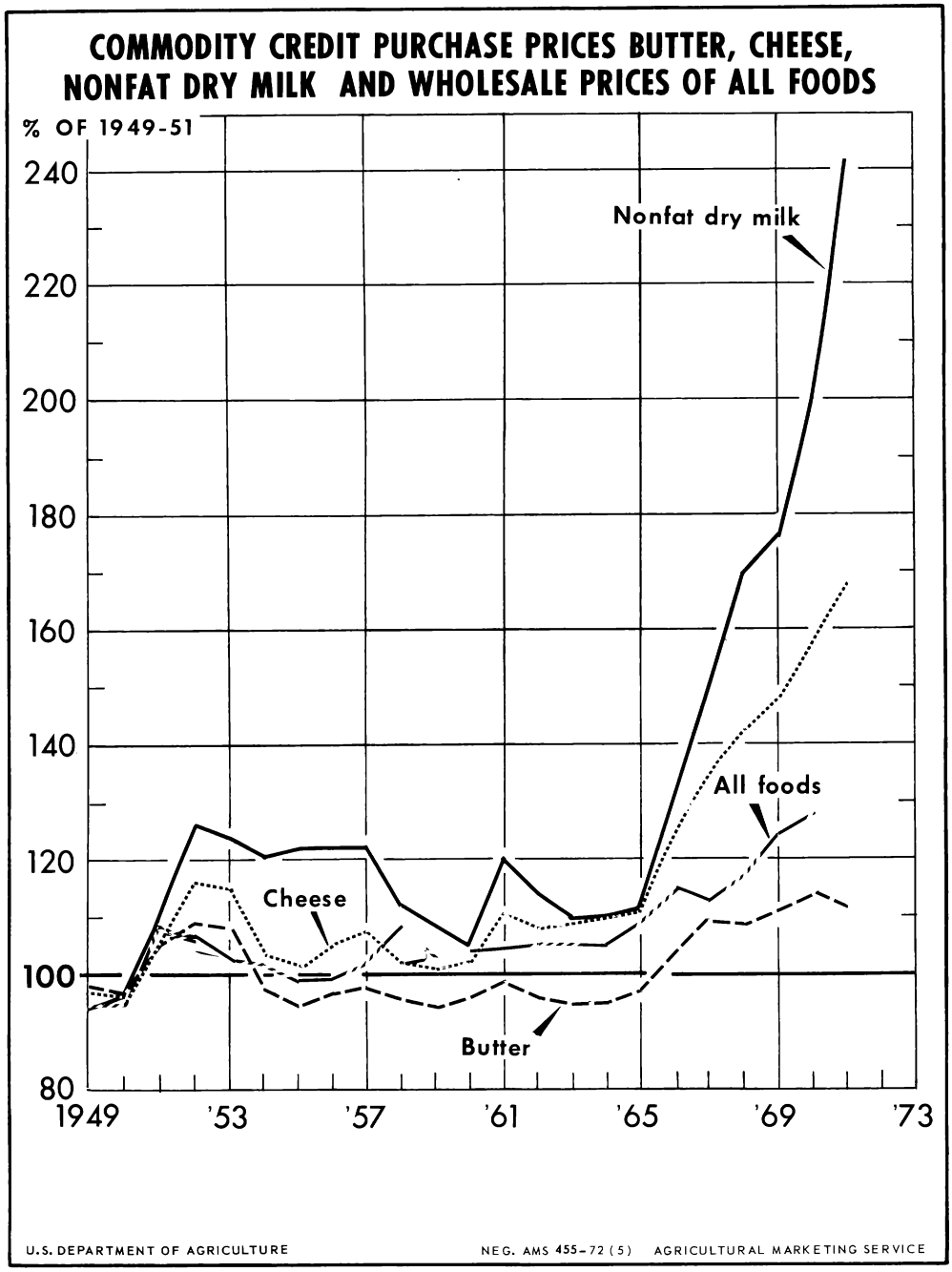

FIGURE 2.—There was little net change in prices from the early fifties to 1965, but thereafter, sharp increases in nonfat and Cheddar cheese and modest increases in butter and all foods.

8 years, with the exception of 1960, averaged 14.7 cents, 12 percent higher than in the first three years.

Beginning in 1966 there were successive increases which carried the price to the highest point on record, more than double the prices of the early years (figure 2). The percentage increase in the purchase price of nonfat was much greater than that for either cheese or butter.

The purchase price of cheese averaged 32.5 cents in the early years (1949-51). The index rose to 115 in 1952-53. In 1954 there was a marked decline, and for the following 11 years the index fluctuated in a narrow range between a low of 101 and a high of 111 percent of the beginning price. From 1965 to 1971 (April) the purchase price of cheese rose about 50 percent, to an index of 168. Cheese ranked second to nonfat in magnitude of price change.

The purchase price of butter fluctuated the least. The index of the purchase price of butter rose to 109 in 1952-53, then declined to 98 in 1954. During the 12-year period 1954-65 the price was unusually stable at a level slightly lower than at the beginning. During the period of general inflation of the late sixties the butter price rose about 15 percent and in April 1971 was only 12 percent higher than when the support program started.

The change in the price of a single commodity over a period of time is not too significant by itself. For many purposes how the price changes for the single product compared with changes in a large group of commodities is more important, in this case wholesale prices of all foods. This all-food index rose to a peak of 108 in the Korean conflict, then declined to about 100 in the mid-fifties and, after a moderate rise in the late fifties, remained remarkably stable until 1964. With the general inflation, food prices rose about 25 percent from 1964 to 1970.

The index of the price of nonfat dry milk deflated by the index of wholesale food prices stood at 100 in the period 1949-51. During the early fifties it averaged 120, as contrasted with 106 for the 8 years 1958-65. Since 1965 it rose rapidly and was 188 in April 1971 (figure 3).

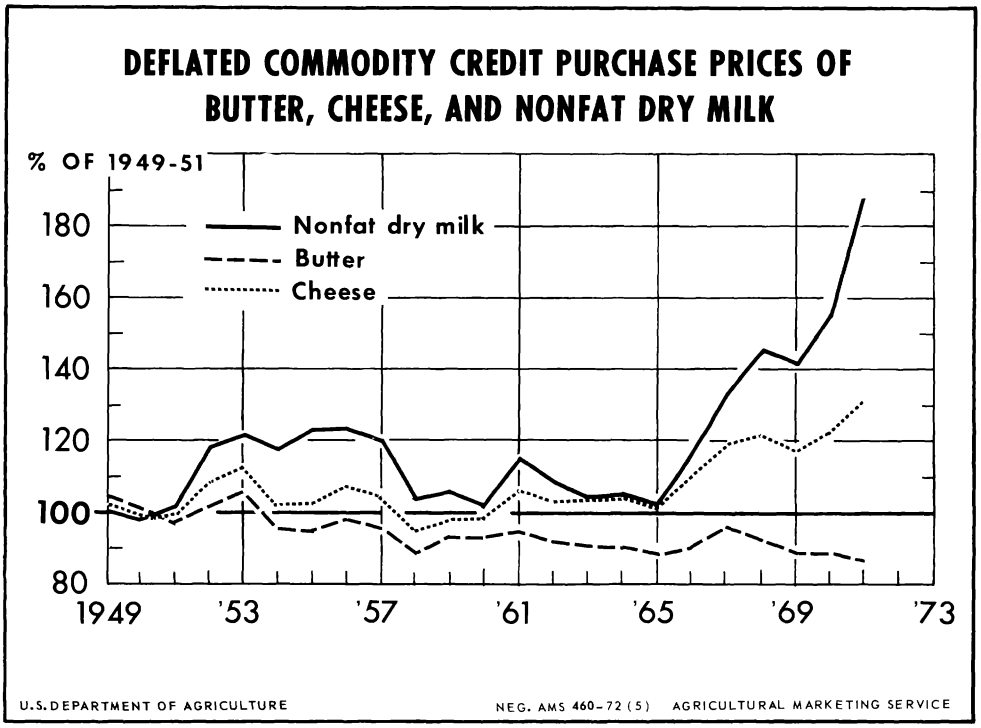

FIGURE 3.—In the late sixties nonfat showed a phenomenal increase, Cheddar cheese a sharp increase, while butter declined moderately.

The index of the deflated purchase price of cheese rose to a high of 112 in the early fifties, then averaged 102 for the 12 years 1954-65. During the late sixties it rose sharply and was 131 in April 1971.

The deflated price of butter rose to 106 in the early fifties, declined to 89 in 1958, and remained at about that level.

The indexes of the purchase prices which became effective April 1, 1971, and portray the net change since the program started, together with the deflated prices which portray the movements in purchase prices in relation to all foods, are summarized as follows:

	CCC Purchase price April 1971	Deflated price April 1971
Butter	112	87
Nonfat	242	188
Cheese	168	131
All food	128	100

Butter prices increased the least and the deflated price actually declined. In striking contrast nonfat prices increased the most, more than doubling. Nonfat prices rose sharply in relation to all foods; the deflated purchase price in April 1971 was 88 percent higher than at the beginning of the program. Purchase prices for cheese increased 68 percent and the deflated price 31 percent.

CCC Purchase Prices and Market Prices

The prices at which the Commodity Credit Corporation bought butter, Cheddar cheese and nonfat dry milk under the support program set a floor under the market prices of these products. At times supply and demand conditions in the dairy industry resulted in market prices being above CCC purchase prices, but never significantly below them.

There is some difficulty in comparing market prices with purchase prices. The commodities purchased by CCC had to meet definite grade and packaging standards. In many cases market quotations are not available for exactly the same grade of product in the same type of package that are purchased under the support program. In this analysis market quotations have been used which correspond as closely as possible with the government purchase price.

The purchase prices were announced ahead of time and were to be paid for certain periods of time thereafter while the market prices were those which actually existed after the CCC prices were announced (table 4, figure 4).

Butter

In the early fifties there were 3 consecutive years when the market price exceeded CCC prices by relatively large amounts, 3.9, 6.6 and 2.0 cents per pound respectively. There were also 2 years in the mid-sixties when market prices exceeded purchase prices by 2.2 and 2.5 cents. In over 2 decades there were only 5 years when market prices exceeded purchase prices by more than 2.0 cents per pound, but even in those years, there were often individual months when the two prices were practically identical. For all practical purposes, the market price never dropped below the CCC price. Thus, during the period the support program has been in effect, most of the major changes and many of the minor changes in the market price of butter paralleled the government purchase price.

Cheese

The market price of cheese exceeded the purchase price by a relatively wide margin in the early fifties. Then for 6 years they were almost identical. Beginning in 1959-60, however, the market price exceeded the purchase price in every year. The largest difference was in 1969-70 when the market price exceeded the purchase price by 5.6 cents per pound. Since the late fifties the market price of cheese exceeded supports more often and by larger amounts than butter (figure 5). Even with these differences the major changes in market prices more or less paralleled the changes in the CCC prices.

Nonfat Dry Milk

The correlation between market prices and purchase prices for nonfat dry milk was different than for butter or cheese. In the first place, the market never exceeded the purchase price by a significant amount and in all years but two, the market was slightly lower. In this case, the CCC purchase prices were for extra grade powder with a relatively low

TABLE 4. CCC PURCHASE PRICES AND MARKET PRICES OF BUTTER, CHEDDAR CHEESE AND NONFAT DRY MILK, 1949-50 TO 1970-71

	Butter (per lb.)			Cheddar cheese (per lb.)			Nonfat dry milk (per lb.)		
	Purchase price	Market[1]	Market exceeds purchase	Purchase price	Market[2]	Market exceeds purchase	Purchase price[3]	Market[4]	Market exceeds purchase
	cents	*cents*	*cents*	*cents*	*cents*	*cents*	*cents*	*cents*	*cents*
1949-50	60.5	61.4	0.9	31.5	31.4	-0.1	12.5	12.3	-0.2
1950-51	60.0	63.9	3.9	31.0	34.3	3.3	12.5	12.5	0.0
1951-52	66.0	72.6	6.6	36.0	38.6	2.6	15.0	15.1	0.1
1952-53	67.8	69.8	2.0	38.2	39.8	1.6	17.0	16.7	-0.3
1953-54	66.5	66.3	-0.2	37.0	36.8	-0.2	16.0	15.4	-0.6
1954-55	58.2	58.6	0.4	33.0	33.1	0.1	15.7	15.1	-0.6
1955-56	58.2	58.2	0.0	33.2	33.2	0.0	16.0	15.4	-0.6
1956-57	60.2	60.5	0.3	35.0	34.7	-0.3	16.0	15.3	-0.7
1957-58	60.5	60.6	0.1	35.0	34.8	-0.2	16.0	15.3	-0.7
1958-59	58.8	59.4	0.6	32.8	33.3	0.5	14.2	13.5	-0.7
1959-60	58.8	60.6	1.8	32.8	34.0	1.2	14.2	13.5	-0.7
1960-61	60.1	60.5	0.4	33.7	36.8	3.1	13.8	13.5	-0.3
1961-62	61.2	61.2	0.0	36.4	37.2	0.8	16.2	15.9	-0.3
1962-63	58.8	58.8	0.0	34.6	36.1	1.5	14.4	14.2	-0.2
1963-64	58.8	59.0	0.2	35.6	37.1	1.5	14.4	14.2	-0.2
1964-65	58.8	59.9	1.1	35.6	38.0	2.4	14.4	14.2	-0.2
1965-66	59.8	62.0	2.2	36.1	40.0	3.9	14.6	14.4	-0.2
1966-67	65.9	68.4	2.5	42.6	46.3	3.7	18.9	18.8	-0.1
1967-68	67.2	67.5	0.3	43.8	45.3	1.5	19.6	19.5	-0.1
1968-69	67.2	67.8	0.6	47.0	48.4	1.4	23.1	22.8	-0.3
1969-70	68.5	68.8	0.3	48.0	53.6	5.6	23.1	23.0	-0.1
1970-71	70.8	71.0	0.2	52.0	55.2	3.2	27.2	26.8	-0.4

[1] 92-score butter at New York City.
[2] Wisconsin State Brand Cheddars, car or trucklots, f.o.b. Wisconsin assembly points 1949-50 to 1961-62; beginning 1962-63 price for 40 lb. Blocks.
[3] Spray process.
[4] Price of spray process nonfat dry milk f.o.b. manufacturing plants Chicago area.

moisture content, slightly less than the Federal standard. On the other hand, the market prices were average prices f.o.b. manufacturing plant in the Chicago area. Furthermore, the package customarily used in commercial sales may have been of somewhat lower cost than that required for sale to CCC. Nevertheless, the variations in the purchase price and the market price of nonfat dry milk were more closely related than for either butter or cheese (table 4, figure 4).

Thus, it is abundantly clear that during the 20-odd years that the price support program has been in effect (1) the CCC purchase prices were effective floors under the market and, (2) except for the early fifties, most of the major changes in the market prices of butter, Cheddar cheese and nonfat have paralleled the changes in purchase prices.

Support Purchases

The CCC accepted all offers of butter, Cheddar cheese and nonfat dry milk that met specifications. The question of whether or not the support prices were relatively close to the market prices that would have been established by supply and demand factors is indicated by the volume of purchases by CCC under the program.

If the purchases of cheese were negligible at the same time that the purchases of butter or nonfat were of significant proportions it would not be an indication that cheese prices would have been the same without the support program. Only when the total purchases of all three products combined were small or negligible is it an indication that CCC purchase prices were probably not greatly different

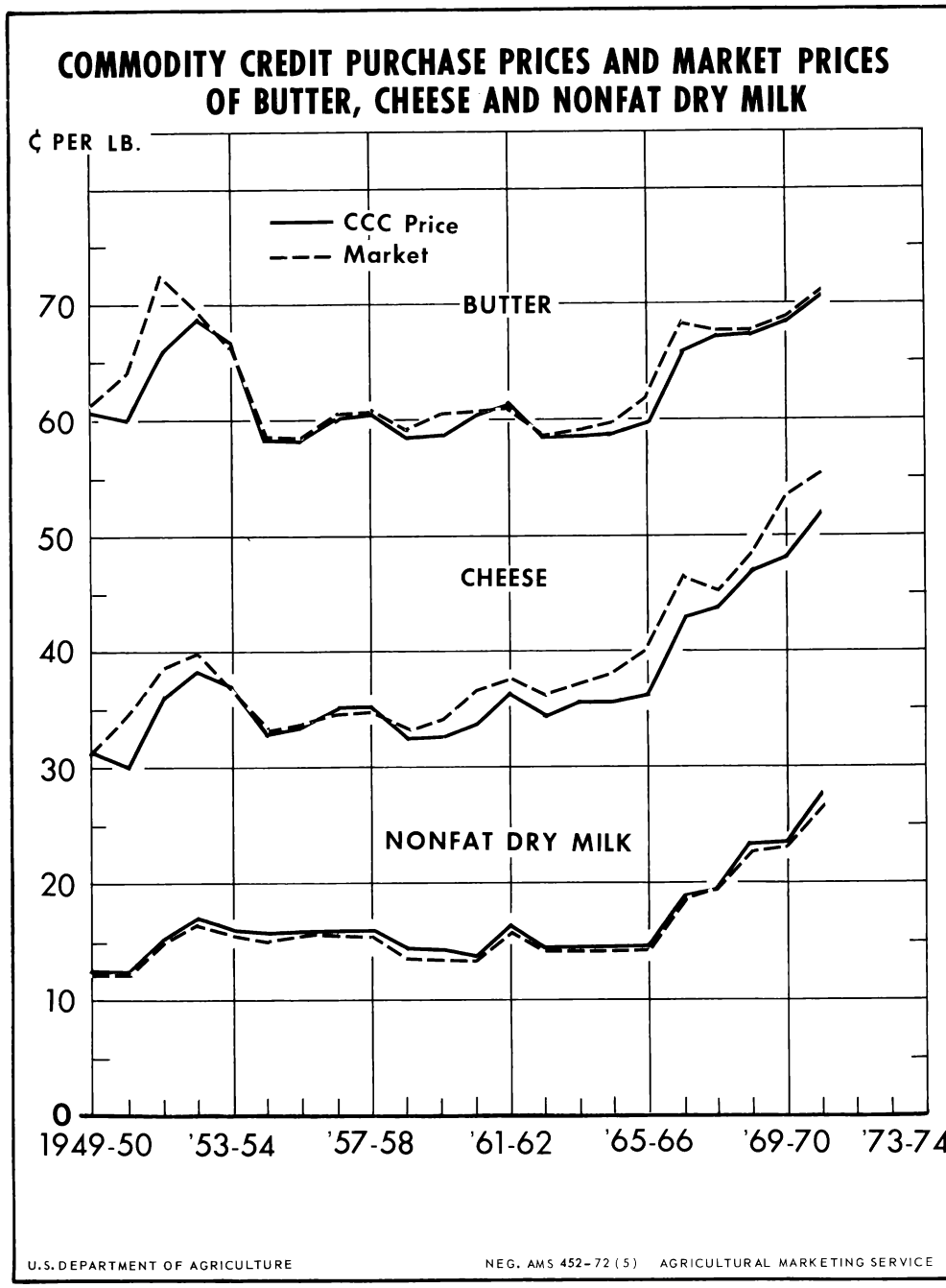

FIGURE 4.—Most of the major changes in the market prices paralleled the changes in purchase prices. However, market prices of both butter and cheese often exceeded the CCC prices.

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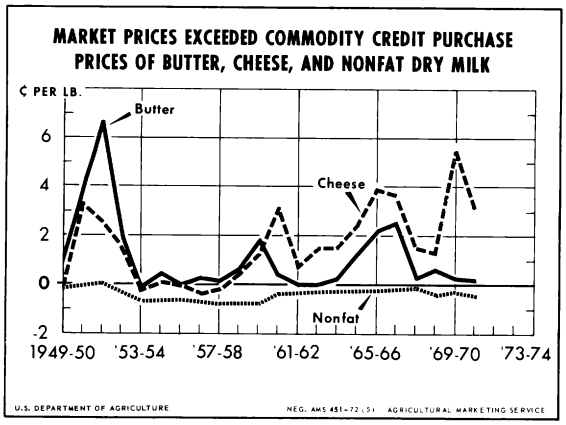

FIGURE 5.—Except for the early fifties cheese prices exceeded purchase prices more often and by larger amounts than butter. Nonfat never exceeded the purchase price.

from the prices that might have resulted from regular commercial demand and supply forces in the market.

On the other hand, when CCC purchases were large it was clear that market prices would have been much lower if the support program had not been in operation.

Butter purchases during the first year of the program amounted to 123 million pounds. Two years later they were negligible, only 0.2 million pounds. Ten years later they were 435 million pounds, by far the highest on record. In the 1970-71 season they were 305 million pounds, 70 percent as large as the peak (figure 6).

In the early years of the program 1949-50 to 1957-58 the volume of cheese and butter purchases were much the same, fluctuating from negligible amounts in 1951-52 to an all-time high of 387 million pounds in 1953-54. In the last decade, however, cheese purchases were by far the lowest of the three products. Purchases in 1970-71 of 57 million pounds were only 19 percent as large as butter and 13 percent as large as nonfat.

Nonfat purchases increased phenomenally from the early fifties to the early sixties, stayed at an unusually high level for 4 years, declined abruptly in the mid-sixties and during the last 5 years averaged about 500 million pounds per year. It is abundantly clear that the price support purchases were highly variable and in each year since the early fifties they were a significant factor in removing supplies from the commercial market.

The volume of these purchases are not too significant by themselves. It is their relationship to production which is more meaningful in indicating their relative size. In the case of butter there was only 1 year, 1951-52, when support purchases were less than 1 percent of production. On the other hand, there were 7 years when support purchases exceeded 20 percent of production. In fact, since 1951-52 there was not a single year when purchases were less than 9 percent of production. This indicates very clearly that support purchases were an important factor which resulted in market prices staying close to purchase prices (figure 7).

In 1951-52 the cheese purchases under the support program were negligible, only 0.1 percent of production. Two years later however, they reached a peak and were 36 percent as large as production. After reaching this peak, the general trend in CCC purchases of cheese expressed as a percentage of production was downward and in the most recent year CCC purchases were only 3.9 percent of production.

Purchases of nonfat in relation to production were much different. In fact, there was not a single year when purchases were less than 9 percent of production and there were 6 years when over 50 percent of the production was purchased by CCC (figure 7). The large percentage of the production purchased by CCC indicates the predominating influence of government purchases on the market price and is an indication of why the market price and the CCC purchase price were so closely related.

During the 22 years the program has been in effect there was only 1 year when butter purchases were less than 1 percent of production and only 2 years when cheese purchases were less than 1 percent of production, and, in not a single year were purchases of nonfat of negligible proportions (table 5). On the other hand, there were 7 years when butter purchases were more than 20 percent of production, 2 years when cheese purchases were more than 20 percent of production, but 21 years when nonfat purchases were more than 20 percent of production. This is an indication of the importance of CCC purchases in providing outlets for butter, cheese and nonfat.

Production, Commercial Sales and Sales to CCC

Since the price support program was carried out primarily by purchases of butter, cheese and nonfat dry milk by Commodity Credit Corporation, it

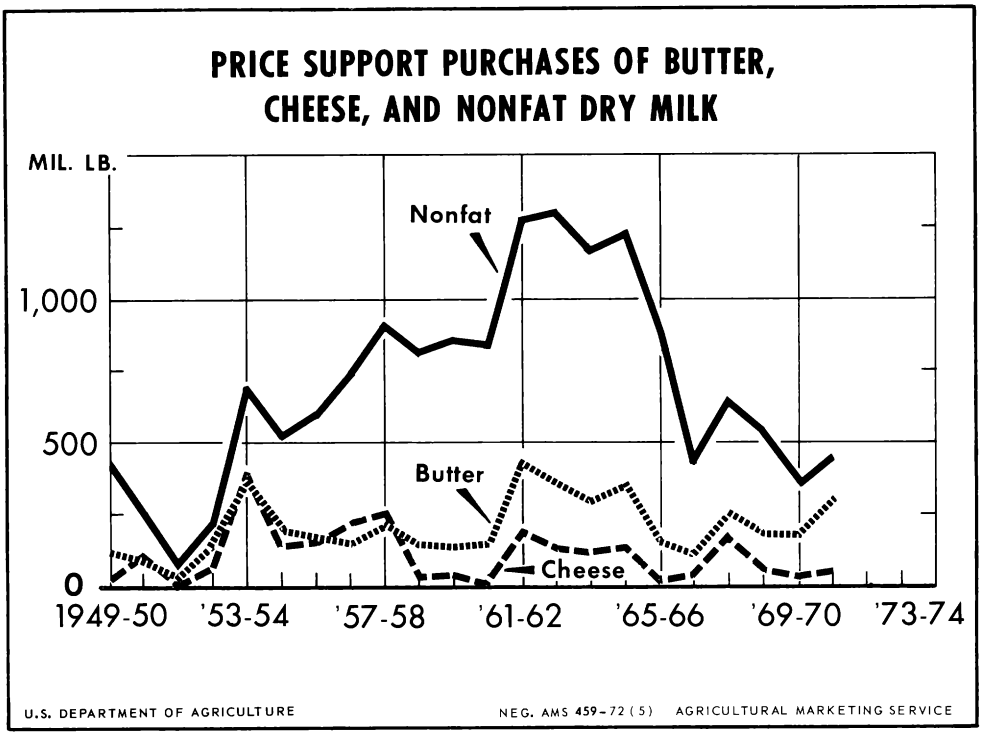

FIGURE 6.—Purchases of nonfat dry milk exceeded those for butter and cheese by a wide margin. Purchases of each of the products varied greatly from year to year.

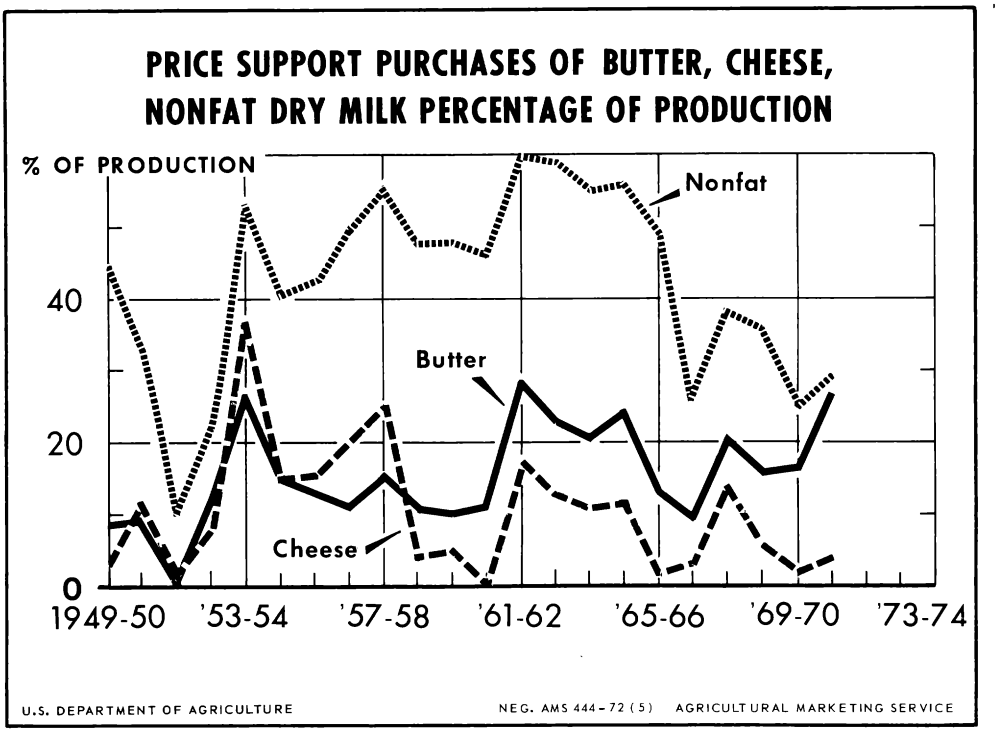

FIGURE 7.—In some years over half the production of nonfat dry milk was purchased by CCC. In a few years over 25 percent of the production of butter and cheese was purchased. In recent years purchases of butter have seldom been less than 10 percent of production, while in several years cheese purchases were less than 5 percent of production.

TABLE 5. NUMBER OF YEARS SUPPORT PURCHASES OF BUTTER, CHEESE AND NONFAT WERE SPECIFIED PERCENTAGES OF PRODUCTION, 1949-50 TO 1970-71

Percent	Butter	Cheese	Nonfat
Less than 1.0	1	2	0
1.0- 4.9	0	6	0
5.0- 9.9	3	3	1
10.0-14.9	7	5	0
15.0-19.9	4	4	0
20.0-29.9	7	1	4
30.0-39.9	0	1	3
40.0-49.9	0	0	8
50.0-59.9	0	0	5
60.0-69.9	0	0	1
Total	22	22	22

might be expected that some of the most noticeable effects of the program would be portrayed in the production, commercial sales[7] and sales to CCC of these three products. Since many of the most significant changes in the dairy industry occur over a period of years, it is the trends that are the most significant rather than any unusual developments from year to year[8].

During the 22-year period that the program was in effect, the production of butter fluctuated between a low of 1.1 and a high of 1.5 billion pounds per year. The long-time tendency was for butter production to decline slightly. However, there was a distinct downward trend in commercial sales. The sales to CCC fluctuated widely from year to year and there was some tendency for them to increase (figure 8).

The pattern for cheese was almost the reverse of that for butter. There was a striking upward trend in production which was practically paralleled by the upward trend in commercial sales (figure 9). The largest sales of cheese to CCC occurred in 1953-54, while during the sixties they were relatively small.

[7]Commercial sales were calculated by deducting sales to CCC from production.

[8]The trend lines shown in Figures 8, 9, 10, 11, 12 were fitted mathematically to the annual data for the years 1949-50 to 1969-70.

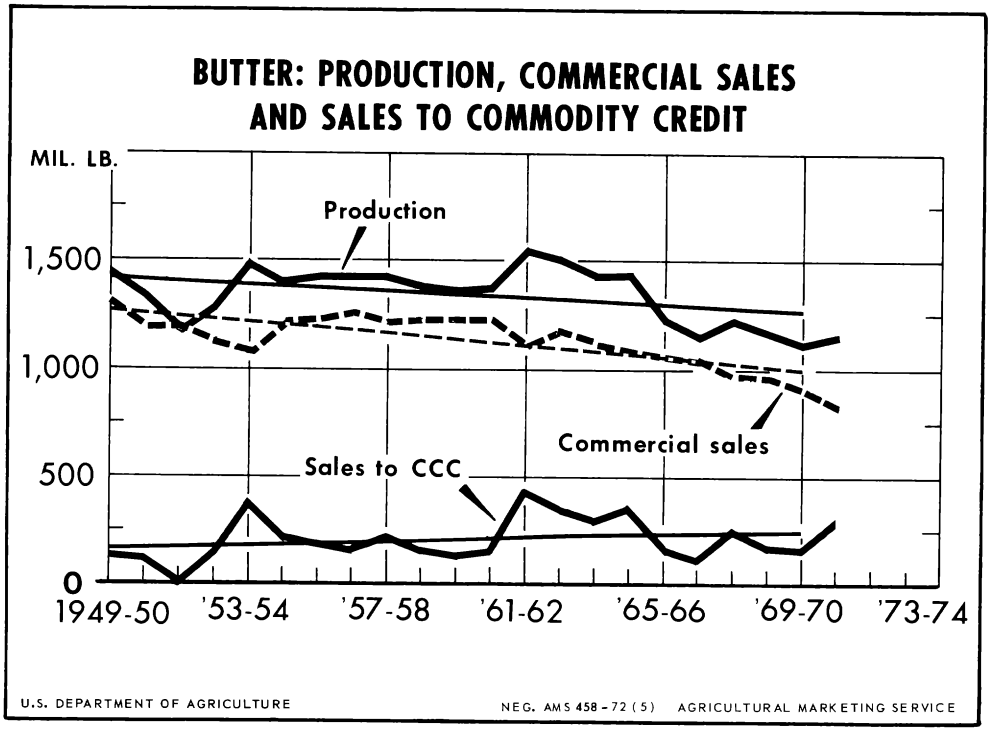

FIGURE 8.—There was a marked downward trend in commercial sales, a more modest decline in production, but a modest upward trend in sales to CCC.

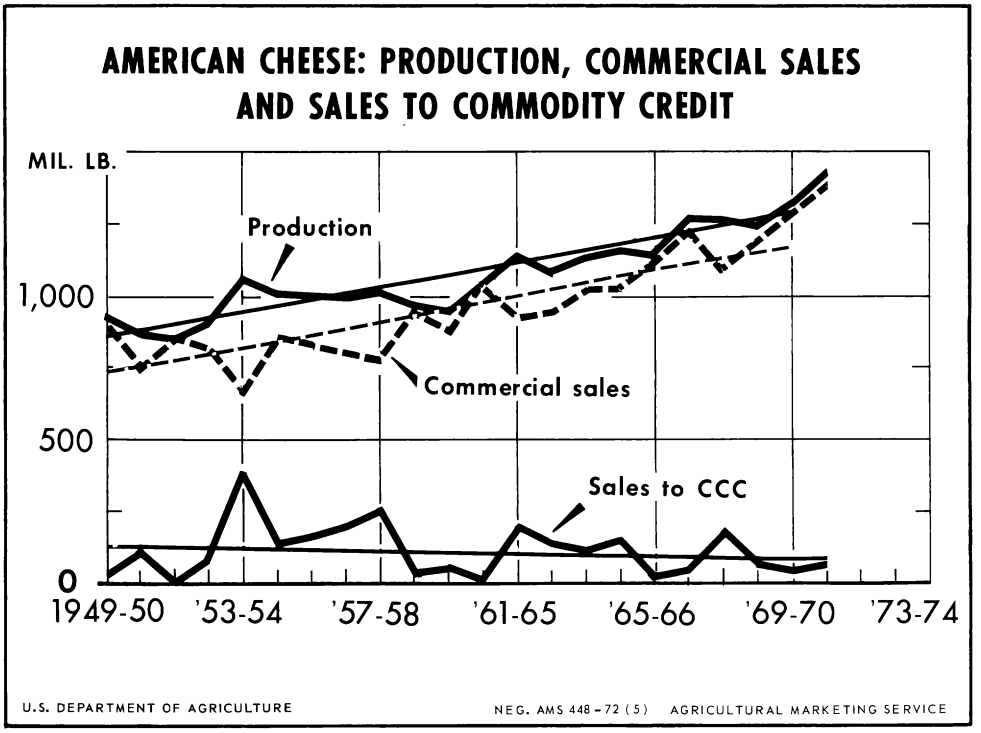

FIGURE 9.—There were striking upward trends in both production and commercial sales, but a modest downward trend in sales to CCC.

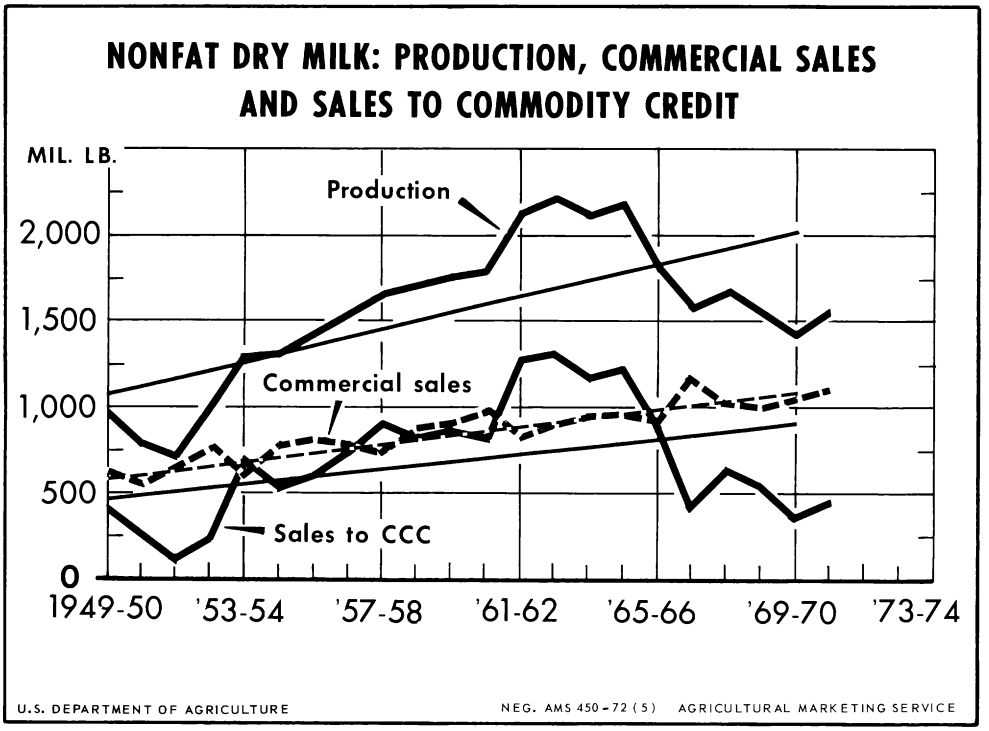

FIGURE 10.—Production, commercial sales and sales to CCC all rose rapidly up to the mid-sixties. In the late sixties production and sales to CCC declined sharply but the upward trend in commercial sales continued.

The long-time tendency was for sales to CCC to decline.

Since the trends under price support for butter and for cheese were almost the antithesis of each other, one might expect that the third product, nonfat dry milk, would resemble either one or the other. However, this was not the case. Nonfat had a unique pattern. Production rose phenomenally as farmers shifted from the sale of farm-separated cream to the sale of whole milk. From the early fifties to the early sixties production of nonfat dry milk nearly tripled, and then remained at this peak level for 4 years. This period of high production was, in turn, followed by 5 years of rapid decline.

Commercial sales were decidedly less than production but showed a steady and persistent increase throughout the entire period (figure 10). The gain in commercial sales averaged about 25 million pounds per year.

Sales to CCC fluctuated widely from a low of 72 million to a peak of 1303 million pounds per year. There were 6 years when the sales to CCC exceeded commercial sales. These sales were extremely high in the early sixties when production was highest and then declined abruptly in the late sixties when production declined at the same time that commercial sales continued to expand. Sales to CCC during 1969-70 were the smallest since 1952-53.

On the other hand, the upward trend in commercial sales of nonfat dry milk proceeded more or less uniformly throughout the entire period. For the period as a whole, the trend in sales to CCC was upward, but here again there was a phenomenal gain from the early fifties to a peak in the early sixties, and since then an abrupt decline to the lowest level in more than a decade.

The extremely high level of production of nonfat dry milk in relation to commercial sales in the fifties is an outstanding example in the history of American agriculture of a market supply of a high grade food product being created far in advance of commercial outlets at the prevailing prices.

This summarizes the principal developments for the individual products which were purchased. However, cheese purchases might be low when butter purchases were high because of certain price relationships and vice versa. It is pertinent to summarize the developments for the two principal components of milk, butterfat and solids not fat.

The total butterfat contained in the butter, American cheese and nonfat dry milk produced showed no consistent long-time tendency to increase or decrease (figure 11). The downward trend in butter production was largely offset by the rising trend in cheese production, so that there was little net change in the total.

The commercial sales of butter, American cheese and nonfat combined, on a butterfat basis, also showed a modest decline. The rather sharp decline in butter was nearly offset by the upward trend in commercial sales of American cheese.

Lastly, the total sales of butterfat to CCC showed a slight upward trend. Thus, even though the price support legislation required the support of milk and butterfat prices between 75 and 90 percent of parity as needed to obtain an adequate supply, the trend in sales of butterfat to CCC has shown a modest rise, with sales in the 1970-71 marketing year just about the same as the long-time trend.

The total nonfat solids contained in the production of nonfat dry milk and American cheese showed much the same characteristics as nonfat alone. The solids not fat content of cheese was relatively small as compared with the solids not fat content of nonfat dry milk. The nonfat solids content of commercial sales of cheese and nonfat dry milk showed a steady and persistent upward trend that was apparently little affected by the marked gyrations in production. It persisted when production was rising rapidly and also when production fell rapidly in the late sixties.

With the phenomenal changes in production and the steady uptrend in commercial sales, the sales to CCC were, of course, highly erratic. In the early sixties there were a few years when sales to CCC were larger than domestic sales, but in recent years commercial sales exceeded sales to CCC by a wide margin (figure 12). From the late forties to the mid-sixties the surplus of solids not fat sold to CCC expanded rapidly, subsequently declined sharply, but nevertheless remained large.

Thus, even though the price criteria under the support program are to support prices at a level between 75 and 90 percent of parity necessary to assure an adequate supply, purchases by CCC removed significant amounts of butterfat and solids not fat from the commercial channels of trade.

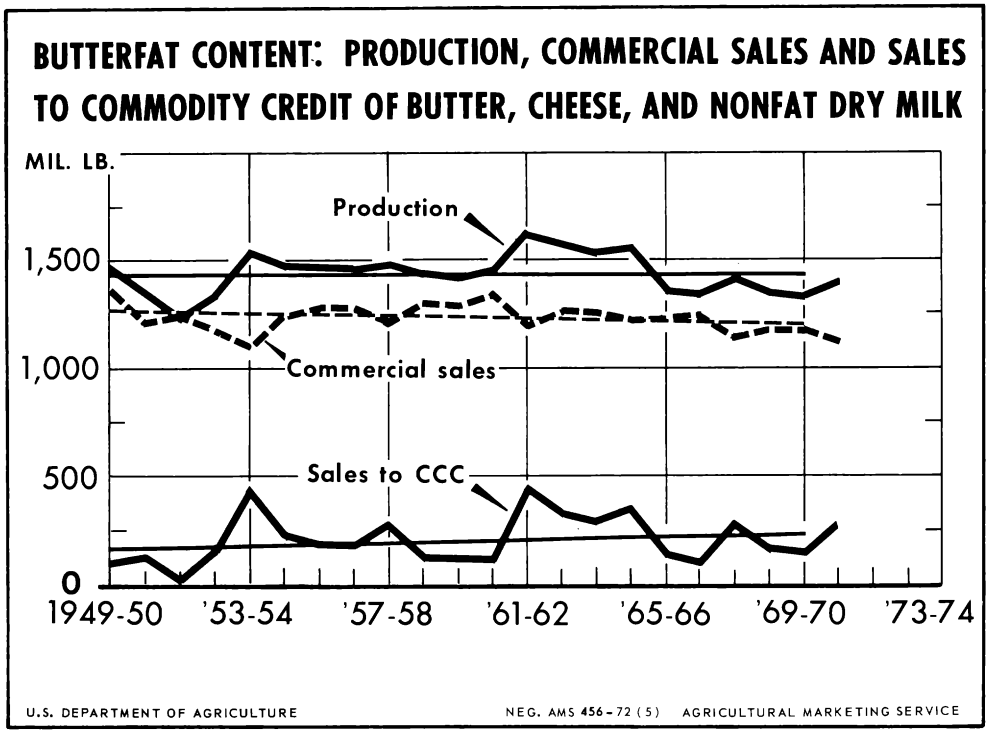

FIGURE 11.—The trend in production was flat, in commercial sales slightly downward, and in sales to CCC slightly upward.

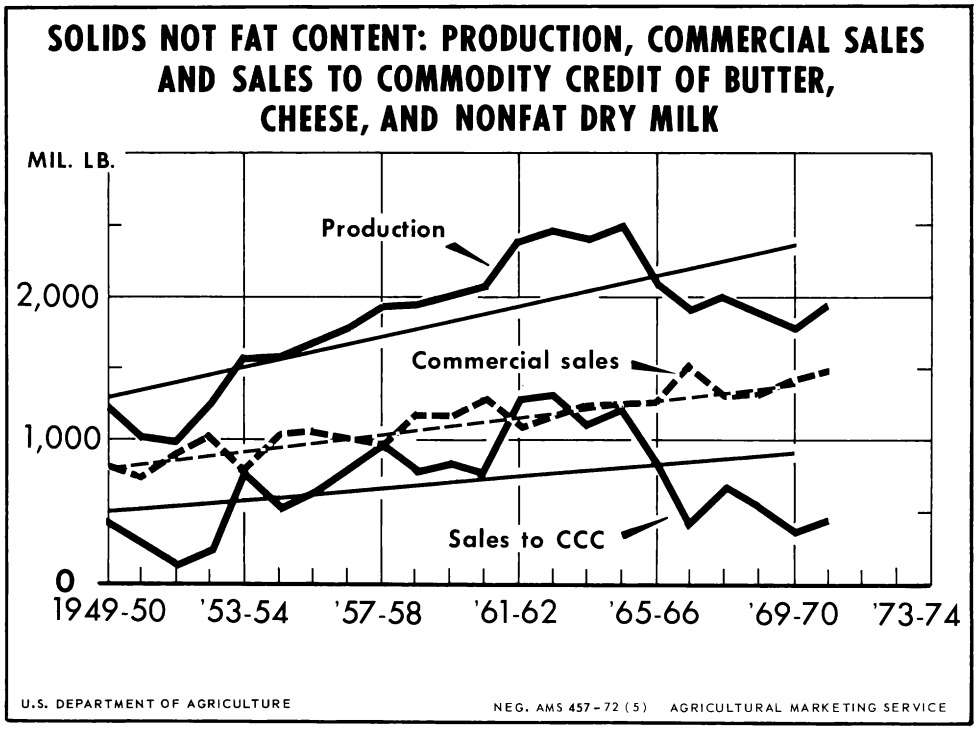

FIGURE 12.—There was a marked upward trend in commercial sales. There were also marked upward trends in production and sales to CCC, but in the last 4 years both production and sales to CCC were far below the long time trend.

Butterfat Utilized In Butter And Solids Not Fat Utilized In Nonfat Dry Milk

Butter and nonfat dry milk are two important dairy products in which the components of milk, for all practical purposes, are completely segregated and each is sold and consumed independently of the other.

Since the price support program has been in effect, practically all the surplus butterfat has ended up in butter and the CCC has purchased the surplus butter. Similarly, the surplus of solids not fat has ended up in nonfat dry milk and the CCC has purchased the surplus of nonfat dry milk. Of course, some surplus butterfat and surplus nonfat solids have been purchased by CCC in the form of Cheddar cheese, but these volumes were small compared to butter and nonfat dry milk.

Over the years there was little change in the production of butterfat in relation to solids not fat. Nevertheless, there were marked differences in the importance of butter as an outlet for butterfat and in the importance of nonfat dry milk as an outlet for nonfat solids.

Butterfat

In the late thirties approximately one-third of the butterfat produced ended up in butter. This percentage declined rapidly during the war years and amounted to only 20 percent in 1946, the lowest on record. Then for a period of more than two decades the percentage remained relatively stable and showed little net change. The percentages for 1947-48 and 1968-69 were 22.1 and 21.4 respectively. During the intervening years the peak in the proportion of the butterfat produced that was utilized in butter, 26.2 percent, occurred in 1962 when the peak in price support purchases occurred. On the other hand, the recent low, 20.2 percent, occurred in 1966 when there was a drastic decline in milk production and price support purchases of butter dropped to the lowest level since the Korean conflict (table 6).

It is surprising that this percentage should show so little change when there were marked declines in the consumption of butterfat in the form of fluid cream, fluid whole milk, condensed and evaporated milk, together with the rapid expansions and contractions in the imports of foreign butterfat in the form of ice cream, Junex, chocolate crumb and so on which were used extensively in the ice cream industry. When the imports of foreign fat increased, domestic butterfat was diverted from ice cream to butter, and when the imports were curtailed by establishing quotas, and so on, domestic butterfat was diverted from butter back to ice cream.

Solids Not Fat

Nonfat dry milk has never utilized as large a proportion of the solids not fat produced as butter has utilized of the butterfat produced. In the late thirties the percentages were 2.5 and 32.9, respectively. However, during the war years and also in the postwar period up until the early sixties the relative importance of nonfat dry milk showed a consistent and persistent increase. This was a period when the relatively high prices of milk compared to butterfat in farm-separated cream caused dairy farmers to shift from the sale of cream to milk. The delivery of solids not fat to plants in the form of milk increased sharply in relation to total milk production.

The peak in the use of nonfat solids in nonfat dry milk occurred in 1962 when 19.7 percent was so used. Since then the trend has been downward. Total milk production declined, cheese production increased, consumption of lowfat milks and fluid skim milk increased. Each of these developments tended to reduce the utilization of nonfat solids in nonfat dry milk.

The principal shifts in the percentage of the butterfat produced utilized in butter and in the percentage of solids not fat produced utilized in nonfat dry milk are summarized as follows:

	Butter	Nonfat dry milk
Late thirties 1935-39	32.9	2.5
End of wartime controls 1946	19.9	6.1
Change	-13.0	+3.6
Postwar		
Early years (1947-48)	22.1	6.4
Recent years (1968-69)	21.4	14.5
Change	-0.7	+8.1
Postwar high 1962	26.2	19.7
Lows of the sixties (butter 1966, nonfat 1969)	20.2	13.8

TABLE 6. BUTTERFAT PRODUCED AND UTILIZED IN BUTTER; SOLIDS NOT FAT PRODUCED AND UTILIZED IN NONFAT DRY MILK, UNITED STATES, 1935-70

Year	Butterfat[1]			Solids not fat[1]		
	Produced	Utilized in butter	Percentage in butter	Produced[2]	Utilized in nonfat dry milk	Percentage in nonfat
	Million pounds	*Million pounds*	*Percent*	*Million pounds*	*Million pounds*	*Percent*
1935	4095	1342	32.8	9034	180	2.0
1936	4132	1338	32.4	9131	215	2.4
1937	4116	1335	32.4	9087	235	2.6
1938	4271	1444	33.8	9427	278	2.9
1939	4310	1431	33.2	9504	258	2.7
1940	4426	1475	33.3	9735	310	3.2
1941	4650	1503	32.3	10222	353	3.5
1942	4779	1417	29.7	10514	544	5.2
1943	4711	1344	28.5	10347	490	4.7
1944	4701	1195	25.4	10324	561	5.4
1945	4796	1095	22.8	10543	618	5.9
1946	4717	941	19.9	10362	629	6.1
1947	4691	1067	22.7	10311	652	6.3
1948	4518	972	21.5	9923	656	6.6
1949	4631	1134	24.5	10214	899	8.8
1950	4646	1113	24.0	10240	848	8.3
1951	4529	966	21.3	10044	676	6.7
1952	4492	954	21.2	10011	830	8.3
1953	4667	1134	24.3	10473	1168	11.2
1954	4725	1163	24.6	10627	1283	12.1
1955	4730	1110	23.5	10680	1314	12.3
1956	4773	1135	23.8	10825	1433	13.2
1957	4744	1135	23.9	10793	1562	14.5
1958	4658	1116	24.0	10659	1645	15.4
1959	4588	1072	23.4	10540	1658	15.7
1960	4628	1102	23.8	10637	1749	16.4
1961	4715	1192	25.3	10861	1943	17.9
1962	4718	1234	26.2	10895	2146	19.7
1963	4649	1140	24.5	10792	2026	18.8
1964	4699	1158	24.6	10945	2094	19.1
1965	4597	1064	23.1	10704	1913	17.9
1966	4425	893	20.2	10323	1520	14.7
1967	4384	984	22.4	10226	1615	15.8
1968	4305	935	21.7	10082	1534	15.2
1969	4274	900	21.1	10006	1377	13.8
1970	4305	915	21.3	10099	1385	13.7

[1] Includes the butterfat and solids not fat content of milk produced on farms and not produced on farms.

[2] Calculated by using a solids not fat test based on the formula, Solids not fat = 7.01 + 0.434 Fat.

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Components of Milk and Component Pricing

The components of milk, aside from water, are butterfat and milk solids not fat. Butter contains, for all practical purposes, butterfat, a minimum of moisture and nothing else. Nonfat dry milk contains solids not fat and nothing else. Consequently, the market prices of the two components can be readily calculated from market prices of butter and nonfat dry milk.

In announcing CCC purchase prices for these products, there was no attempt to keep a fixed relationship between them. In fact, there was a definite policy to alter the relationship. For example, in 1950-51 the CCC price of butter was 60.0 cents and nonfat dry milk 12.5 cents. Five years later, 1955-56, the prices were 58.25 and 16.0 cents per pound respectively. The purchase price of butter was lowered 1.75 cents while that for nonfat was raised 3.5 cents. With these changes the gross revenue which a handler could obtain from the butter from a hundredweight of milk at CCC prices (4.2 pounds) was decreased $0.07, while the revenue from the nonfat dry milk (8.2 pounds) was increased by $0.29. The support price of manufacturing milk (at average test) was increased $0.08. In this case the value of one component decreased, but the other increased more than enough to offset the decline in the first so that the support price of milk was increased.[9]

A different type of shift occurred in the late sixties. Between 1964-65 and 1970-71 the purchase price of butter was increased 12.0 cents and the support price of nonfat 12.8 cents per pound. The changes in prices per pound were much the same, but the percentage increases were 20 and 89 respectively. The value of the butter from a hundredweight of milk at support prices rose $0.50 while that for nonfat rose $1.05. The support price of manufacturing milk was increased $1.51. In this case the price of both components rose, but about one-third of the increase in the support price of milk was attributable to the butterfat and two-thirds to the solids not fat.

[9]The details of the calculation of CCC support buying prices of dairy products for the 1968-69 marketing year are set forth in Dairy Price Support and Related Programs 1949-68, Agricultural Economic Report No. 165, Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture, Harlan J. Emery et al pages 55-57, July 1969.

Since the support program has been in effect the general trend has been to raise the price of solids not fat in relation to butter. This has altered the relationship between the value of the butterfat and solids not fat that can be obtained from a hundredweight of milk.

In 1949, at the beginning of the price support program, the value at support prices of the butter and nonfat dry milk from a hundredweight of milk was $2.54 and $1.02 respectively, giving a total of $3.56. Nonfat made up 28.7 percent of the total.

Based on the support prices effective April 1, 1971 the total value of the butter and nonfat from a hundredweight of milk was $5.49; nonfat made up 47.4 percent of the total. Between 1949 and 1971 there was a tremendous increase in the price of nonfat dry milk compared with butter.

The values of the butter and nonfat dry milk from a hundredweight of milk at support prices at the beginning of the support program in 1949 and on the basis of support prices effective April 1, 1971 together with the relative importance of the two products in making up the total value are summarized as follows:

	Value of butter	Value of nonfat	Total	Percent of total	
				Butter	Nonfat
1949	$2.54	$1.02	$3.56	71.3	28.7
1971	2.89	2.60	5.49	52.6	47.4
Change	0.35	1.58	1.93	-18.7	18.7

From 1949 to 1971 the total value of the products from a hundredweight of milk rose $1.93. Of this total increase only 18 percent was due to higher value of the butter while 82 percent was due to the higher value of the nonfat dry milk.

During the 1949-50 season the support price for butter was 60.5 cents and for nonfat dry milk 12.5 cents. The nonfat price was 20.7 percent of the price of butter. This was the lowest price of nonfat in relation to butter under the support program. At the other extreme, in 1971-72, the support price for nonfat, 31.7 cents, was 46.1 percent of the price of butter (table 1). Prices established under the support program have been the dominant factor in altering the relationship between the market prices of the two components of milk, butterfat and solids not fat.

The price of Cheddar cheese under the support program was established at a level which enabled cheese factories to pay, for all practical purposes,

the same price for milk as butter-powder plants.

In recent years the term "component pricing of milk" has often been used. The dairy price support program is the outstanding example of component pricing of milk. It has permeated the entire dairy price structure.

Important Results of the Price Support Program

The effects of the price support program can be viewed from its effect on producer returns, production, consumption, and commercial sales.

Producer Returns

The relatively large volume of support purchases expressed as a percentage of production verifies the statement made in the publication "Dairy Price Support and Related Programs 1949-68" by Harlan J. Emery et al, Agricultural Economic Report No. 165, Agricultural Stabilization and Conservation Service, July 1969, page 1:

> "Prices received by dairy farmers have been substantially higher since 1949, than they otherwise would have been, as a result of price support purchases of dairy products by Commodity Credit Corporation and other related program activities."

There are two corollaries to this conclusion. With prices received by dairy farmers higher than they otherwise would have been (1) milk production was higher than it otherwise would have been and (2) consumption from regular commercial sources was lower than it otherwise would have been. The continued significant volume of price support purchases supports these corollaries.

Butter-Oleo Relationship

In the legislation authorizing the support program, the price of whole milk, butterfat and the products of such commodities were to be supported not in excess of 90 percent of parity nor less than 75 percent of parity. Oleomargarine is the principal competitor of butter.

During the 3-year period 1949-51 at the beginning of the support program the retail price of oleo averaged 42.6 percent of the retail price of butter as contrasted with 34.2 percent in the 3 years 1966-68. During the years of the support program the retail price of oleomargarine declined in relation to the retail price of butter.

On the other hand, the consumption of oleomargarine rose in relation to the consumption of butter. In the 3-year period 1949-51 consumption of oleo was 37.6 percent of oleo and butter combined, as compared with 65.4 percent for 1966-68. Maintaining butter prices at a relatively high level compared with its principal competitor stimulated the consumption of margarine and depressed the consumption of butter.

Diversion From Sale of Farm-Separated Cream to Whole Milk

Prior to World War II the skim value in manufacturing milk averaged about $0.15 per hundredweight. This increased rapidly during the war period and averaged $0.80 for the 4 years 1943-46. After wartime price controls were eliminated, skim values declined temporarily and averaged only $0.39 during the period 1947-50. By 1970 however, the skim value in manufacturing milk reached an all-time high of $1.60 per hundredweight. The high skim values under the support program greatly stimulated the shift on farms from the sale of farm-separated cream to whole milk.

During the period of price supports the volume of milk skimmed on farms was reduced about 95 percent. The diversion of skim milk from animal feed to human food has, for all practical purposes, been completed. The fantastic increases in nonfat dry milk production from the early fifties to the early sixties are over and cannot be repeated.

SUMMARY

The large volume of price support purchases of butter, cheese and nonfat dry milk in relation to production show that prices received by dairy farmers were substantially higher than they would have been without such purchases.

The sales of nonfat dry milk to CCC reached a peak in the early sixties when they were 60 percent of production. Since then they have declined sharply, but even with the decline, they were 29 percent of production in the 1970-71 marketing year. The sales of butter to CCC during the sixties ranged between a low of 10 percent and a peak of 28 percent of production. In the last decade sales of cheese to CCC have varied from a negligible amount to 17 percent of production.

Since 1949 the commercial sales of butter declined, while the commercial sales of cheese and nonfat dry milk increased.

CCC buying prices for butter, cheese and nonfat dry milk showed relatively little net change from the late forties to the mid-sixties but then increased sharply. During the inflationary period since 1965 the purchase prices of nonfat dry milk rose 118 percent, cheese 52 percent and butter 16 percent. During the same period wholesale food prices rose 18 percent.

One of the outstanding developments under the support program was the shift in relationship between the prices of the two components of milk, butterfat and solids not fat. In the early years of the program the CCC purchase price of nonfat dry milk was 20 percent as great as that for butter, compared with 46 percent for the 1971-72 season. This shift in price relationship has permeated the entire dairy price structure. The price support program is the outstanding example of component pricing of milk.

The Agricultural Act of 1949 required the support of the "price of whole milk, butterfat and the products of such commodities. . . . ." between 75 and 90 percent of parity. The Agricultural Act of 1970 suspended until April 1, 1974, the mandatory requirement to support the price of butterfat in farm-separated cream. The parity index is an index number of the prices paid by farmers for commodities purchased, interest, taxes and wage rates for farm labor.

For over two decades the dairy industry has had component pricing of manufacturing milk, with the level of prices established by an economic formula "75 to 90 percent of parity." For 22 years the support level for manufacturing milk averaged 82 percent of parity, midway between the upper and lower limit.

III. MARKETING ORDER PROGRAM - CLASS I PRICES

Under the price support program the primary concern was the support price for manufacturing milk and the prices which the government (CCC) paid for butter, cheese and nonfat dry milk.

Under the marketing order program, which is confined to milk eligible for fluid use, the primary concern was the prices handlers were required to pay for milk actually used for fluid use (Class I). The prices they were required to pay for surplus milk used in manufactured products were important, but these prices did not vary greatly from the price of manufacturing milk.

Over the years there have been different methods of establishing Class I prices. At the present time the most common method is a differential over the price of manufacturing milk which varies from market to market. The differential is largest in the markets most distant from Wisconsin and Minnesota.

Class I Differential

The Class I differential is the vital link between the price support and the marketing order programs. At times competitive conditions in the industry have forced the price of manufacturing milk above the support level. These conditions were reflected in Class I prices because the differentials were a specified amount over an actual price of manufacturing milk and not the support price. Over the years there was considerable controversy between manufacturing milk producers and fluid milk producers in regard to the magnitude of the Class I differential and its effect on the volume of surplus.

During the period 1948 to 1969 the number of markets with Federal milk orders varied between a low of 30 in 1948 and a high of 83 in 1962. From 1962 to 1970 the number declined from 83 to 62. This decline was due primarily to the consolidation of orders and not to a contraction in the geographic extent of the urban areas under regulation. The variable number of orders together with the marked geographic variation in the magnitude of the Class I differentials, means that the average of Class I prices for all Federal markets was affected by changes in the geographic distribution of the orders.

In order to measure the changes in the margin between the two series of prices as accurately as possible, it is essential to have an average of Class I prices for an identical group of markets over a series of years. Furthermore, the receipts of milk from producers in the identical group of markets should be large enough in relation to the total milk in all regulated markets so that the results can be considered significant.

Twenty-four Identical Markets (1948-69)

There were 24 markets, with the exception of Chicago[10] which were continuously regulated by Federal milk orders from 1948 to 1969[11]. Over the years the marketing areas under these orders were expanded and, in some cases, the names of the orders changed. For example, the New York marketing area in 1948 included New York City and three adjoining New York counties. In the late fifties the marketing area was expanded to include 35 additional New York counties and 13 counties in Northern New Jersey and was designated the New York-New Jersey marketing area. In 1948 the marketing area under the Chicago order included the city of Chicago and the nearby suburban area, as contrasted to the present marketing area under the Chicago Regional order which includes Northern Illinois and the major part of Wisconsin. It includes the marketing areas under the former orders of Chicago, Rock River Valley, Madison, Milwaukee and Northeast Wisconsin as well as some additional territory.

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[10] The Chicago order was terminated April 30, 1966 and the Chicago Regional order became effective July 1, 1968. In compiling the average Class I price for the 24 markets which included Chicago, the price which would have been in effect was used.

[11] The 24 identical markets which were under continuous regulation from 1948-69 with the single exception of Chicago, arranged in alphabetical order according to their designation for 1948 in the Federal Milk Order Market Statistics 1947-56, Statistical Bulletin No. 248, Dairy Division, Agricultural Marketing Service, U.S. Department of Agriculture, May 1959 are as follows: Boston, Chicago, Cincinnati, Cleveland, Columbus, Dayton-Springfield, Duluth-Superior, Fort Wayne, Kansas City, Louisville, Minneapolis-St. Paul, Nashville, New Orleans, New York, Omaha-Lincoln-Council Bluffs, Paducah, Philadelphia, Quad Cities, St. Louis, Sioux City, South Bend-LaPorte, Toledo, Tri-State, Wichita.

In cases where 2 or more of these markets were merged, the applicable prices for the 24 marketing areas as listed in 1948 were continued and used in computing the average.

Importance of Identical Markets

In 1948 the receipts of milk from producers in the 24 markets comprised 98.8 percent of the total receipts at all Federally regulated markets. From 1948 to 1962 the number of Federal milk orders nearly tripled. With this rapid expansion the relative importance of the 24 markets declined and reached a low point in 1963 when they included 59.4 percent of the receipts, 53.3 percent of the Class I volume and 69.6 percent of the surplus (receipts minus Class I) in all Federally regulated markets combined (table 7).

Since the 24 identical markets always included well over half of the total milk, over half of the Class I volume, and over two-thirds of the total surplus in all Federal markets combined, it is a group of markets which can be used to measure the margin or differential of the Class I price over the price of manufacturing milk under Federal orders for the period 1947-70.

In recent years the 24 markets were a minority of the total number of markets even though they contained over half of the milk. The question naturally arises as to the relationship between the Class I and manufacturing milk prices in the majority of the markets.

35 Identical Markets (1960-69)

In 1969 there were 67 Federal orders in effect. Included in this total were the 24 previously mentioned and an additional 35 which were not

TABLE 7. TOTAL NUMBER OF FEDERAL ORDER MARKETS, AND PERCENTAGE OF PRODUCER RECEIPTS, CLASS I AND SURPLUS IN 24 AND 35 IDENTICAL MARKETS, 1948-69[1]

Year	Number of Federal markets[2]	24 markets percent of total			35 markets percent of total		
		Producer receipts	Class I	Surplus[3]	Producer receipts	Class I	Surplus[3]
1948	30	98.8	98.4	99.6			
1949	33	98.5	97.8	99.4			
1950	39	95.2	93.2	98.0			
1951	44	87.6	83.7	94.3			
1952	49	80.0	75.0	88.7			
1953	49	78.4	73.3	86.1			
1954	53	77.8	72.5	85.7			
1955	63	74.8	68.8	84.7			
1956	68	71.7	65.4	82.2			
1957	68	71.0	65.5	80.7			
1958	74	70.6	65.2	80.2			
1959	77	66.3	61.2	76.0			
1960	80	62.5	56.7	73.0	28.2	32.3	20.9
1961	81	60.7	54.7	70.3	27.8	31.5	22.1
1962	83	59.5	53.4	69.2	27.2	30.6	21.9
1963	82	59.4	53.3	69.6	26.9	30.3	21.3
1964	77	61.2	56.1	69.8	27.0	30.0	22.0
1965	73	61.5	56.6	69.6	28.9	31.7	23.9
1966	71	(4)	(4)	(4)	29.9	32.7	24.5
1967	74	(4)	(4)	(4)	29.4	32.2	24.5
1968	67	63.0	59.5	69.4	28.4	31.0	23.6
1969	67	64.3	60.5	71.1	26.7	29.4	21.9

[1] Calculated from data in Annual Summaries of Federal Milk Order Market Statistics, Dairy Division, Consumer and Marketing Service, U.S. Department of Agriculture.
[2] Number of orders in operation in December of each year.
[3] Surplus, calculated by deducting Class I volume from total receipts.
[4] Chicago order suspended.

regulated in 1948 but were under continuous regulation from 1960 to 1969[12].

During the decade of the sixties milk delivered to the 35 markets included 28 percent of the receipts, 31 percent of the Class I volume and 23 percent of the surplus for all Federally regulated markets (table 7). In recent years the 24 markets and 35 markets combined comprised about 90 percent of the receipts, Class I volume and surplus.

The average Class I prices for the 24 markets, the 35 markets, and all Federal order markets combined were used in measuring the differences between the price of manufacturing milk and Class I prices established under Federal orders (table 8).

[12] The 35 additional markets which were under continuous regulation from 1960-69, arranged in alphabetical order according to their designation in Federal Milk Order Market Statistics Supplement for 1960 Milk Marketing Orders Division, Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture, December 1961 are as follows: Appalachian, Austin-Waco Zone 1, Black Hills, Cedar Rapids-Iowa City, Central Arizona, Central Arkansas, Central Mississippi, Central West Texas, Chattanooga, Colorado Springs-Pueblo, Connecticut, Corpus Christi, Des Moines, Eastern South Dakota, Fort Smith, Great Basin, Inland Empire, Knoxville, Memphis, Michigan Upper Peninsula, Mississippi Delta, Neosho Valley, North Central Iowa, North Texas, Northern Louisiana, Oklahoma Metropolitan, Puget Sound, Red River Valley, San Antonio, Southeastern Florida, Southern Michigan, Texas Panhandle, Upstate Michigan, Washington, D.C., Western Colorado.

In cases where two or more of these markets were merged, the applicable prices for the 35 marketing areas as listed in 1960 were continued and used in computing the average.

TABLE 8. PRICE OF MANUFACTURING MILK AND AVERAGE CLASS I PRICES, FEDERAL ORDER MARKETS, 1947-70

(dollars per hundredweight 3.5 milk)

Year	Mfg.[1] milk	Class I prices[2]			Class I exceeds manufacturing			Class I price percent of mfg.		
		Identical markets		All mkts.	Identical markets		All mkts.	Identical markets		All mkts.
		24	35		24	35		24	35	
	$	$	$	$	$	$	$	Percent	Percent	Percent
1947	3.37	4.42		4.53	1.05		1.16	131.2		134.4
1948	3.84	5.05		5.11	1.21		1.27	131.5		133.1
1949	2.80	4.26		4.36	1.46		1.56	152.1		155.7
1950	2.87	4.21		4.34	1.34		1.47	146.7		151.2
1951	3.52	4.87		4.96	1.35		1.44	138.4		140.9
1952	3.71	5.22		5.32	1.51		1.61	140.7		143.4
1953	3.20	4.75		4.88	1.55		1.68	148.4		152.5
1954	2.90	4.45		4.56	1.55		1.66	153.4		157.2
1955	2.90	4.48		4.65	1.58		1.75	154.5		160.3
1956	2.99	4.67		4.91	1.68		1.92	156.2		164.2
1957	3.02	4.60		4.86	1.58		1.84	152.3		160.9
1958	2.93	4.51		4.75	1.58		1.82	153.9		162.1
1959	2.95	4.56		4.75	1.61		1.80	154.6		161.0
1960	3.05	4.61	5.10	4.87	1.56	2.05	1.82	151.1	167.2	159.7
1961	3.15	4.64	5.13	4.91	1.49	1.98	1.76	147.3	162.9	155.9
1962	3.03	4.52	4.94	4.76	1.49	1.91	1.73	149.2	163.0	157.1
1963	3.06	4.53	4.99	4.78	1.47	1.93	1.72	148.0	163.1	156.2
1964	3.13	4.61	5.09	4.81	1.48	1.96	1.68	147.3	162.6	153.7
1965	3.21	4.72	5.15	4.89	1.51	1.94	1.68	147.0	160.4	152.3
1966	3.82	5.37	5.82	5.58	1.55	2.00	1.76	140.6	152.4	146.1
1967	3.91	5.62	6.09	5.85	1.71	2.18	1.94	143.7	155.8	149.6
1968	4.08	5.91	6.34	6.19	1.83	2.26	2.11	144.9	155.4	151.7
1969	4.31	6.16	6.53	6.42	1.85	2.22	2.11	142.9	151.5	149.0
1970	4.56	6.39	6.77	6.64	1.83	2.21	2.08	140.1	148.5	145.6

[1] Three product series 1947 - November 1962, manufacturing grade milk U.S. average December 1962-70.

[2] Compiled from data in Annual Summaries Federal Order Milk Market Statistics, Dairy Division, Consumer and Marketing Service, U.S. Department of Agriculture.

Margin of Class I Price Over Manufacturing

In 1970 the Class I price in the 24 identical market series averaged $6.39 per hundredweight and the price of manufacturing milk $4.56. The Class I price exceeded the manufacturing price by $1.83. This was in marked contrast to 1947 when the margin was only $1.05. During the late forties the margin increased rapidly and was $1.46 in 1949. Since then the year to year changes were more moderate and for the two decades 1949-70 fluctuated between a low of $1.34 and a peak of $1.85. During the first three years of the support program, under the Agricultural Act of 1949, the margin averaged $1.38. During the early fifties the general tendency was for the margin to widen, and it reached a peak of $1.61 in the mid-fifties (1955-57). Thereafter, there was a moderate decline to an intermediate low of $1.48 in the period 1962-64. In the late sixties, the margin again increased and during the 3-year period 1968-70 averaged $1.84. This was the largest absolute margin on record. (table 8, figure 13).

The margins between the prices of Class I milk and manufacturing milk can be expressed in absolute amount as above or on a percentage basis (table 8, figure 14). In 1947-48 the Class I price in the 24 identical markets averaged 131 percent of the manufacturing milk price. Except for some unusual changes in 1949-50 the general trend in this percentage was upward during the early fifties and reached an all time peak of 156 percent in the mid-fifties. From the mid-fifties to the late sixties the general tendency was for the percentage to decline and in the late sixties it was about the same as in the early fifties.

The principal changes in the absolute margin of the Class I price over the manufacturing price, together with the percentage that the Class I price was of the manufacturing price are summarized by 3-year periods as follows:

		Actual margin	Class I percent of mfg.
Beginning of support program	1949-51	$1.38	145.7
High, mid-fifties	1955-57	1.61	154.3
Low, mid-sixties	1962-64	1.48	148.2
High, late sixties	1968-70	1.84	142.6

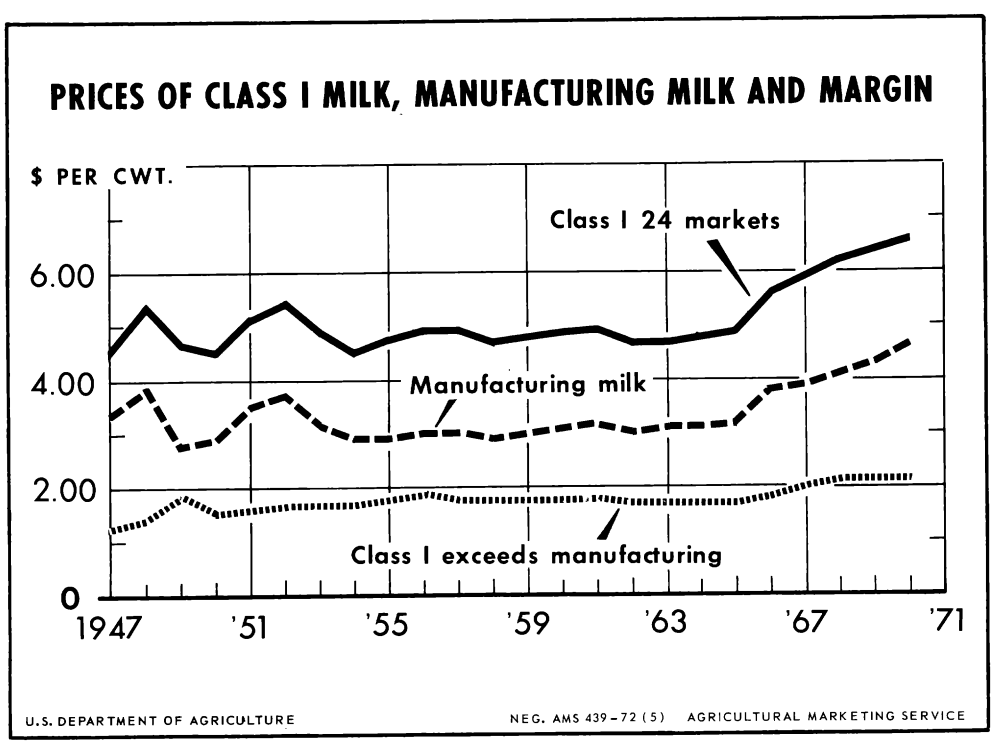

FIGURE 13.—The major movements in the Class I price were quite similar to those in the manufacturing price but with a wide margin between them.

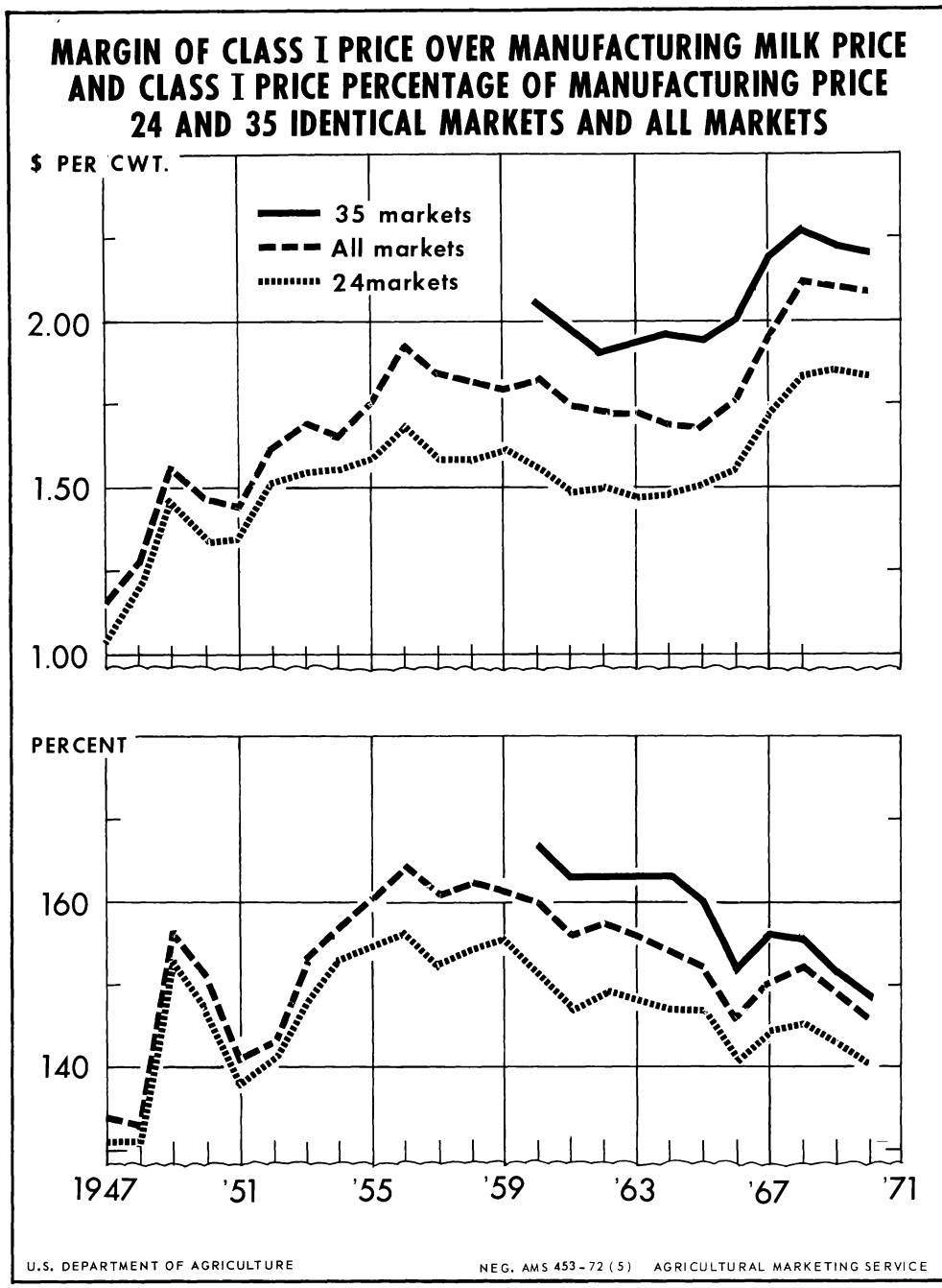

FIGURE 14.—The margin of the Class I price over the manufacturing price was relatively low for the 24 markets and high for the 35 markets, with all markets intermediate.

Class I prices expressed as a percentage of the manufacturing price rose to a peak in the mid-fifties and have since declined.

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Thus, it is clear that in the last 3 years the absolute margin between Class I and manufacturing milk was the highest on record. Nevertheless, the Class I price expressed as a percent of the manufacturing price was relatively low.

There was a marked difference in Class I prices in the two groups of identical markets. For example, in 1970 the Class I price in the 24 markets averaged $6.39 while in the 35 markets it averaged $6.77 (table 8). This difference in Class I prices was due primarily to the differences in the geographic distribution of the markets included in the two groups. The 24-market series included three Northeastern markets and two southern markets; the remaining 19 could be classified as midwestern. In the 35-market series nine were midwestern and 19 were southern markets. The 24-market series was heavily weighted with midwestern markets while the 35-market series was heavily weighted with southern markets[13].

Since the Class I price in the 35 markets averaged $0.38 higher than in the 24 markets it means that the Class I price in the 35 markets exceeded the manufacturing price by $0.38 more than in the smaller group of markets. This difference was relatively uniform during the period 1960-70. The average price in all Federal order markets was intermediate between the 24-market series and the 35.

The margins of the Class I prices over the manufacturing prices for the period since 1960 for the 3 groups of markets are summarized as follows:

24 markets	$1.62
35 markets	$2.06
Average all markets	$1.85

Over the years the differences in these margins remained relatively uniform, so that while there were differences in the magnitude of the margins, the changes were more or less similar. That is, the changes in the margin of the Class I over manufacturing for each group of markets more or less parallelled each other. Furthermore, the Class I prices expressed as a percentage of the manufacturing price also more or less parallelled each other over the years (table 8, figure 14).

Since the receipts in the 24 markets and the 35 markets together approximated 90 percent of the receipts at all regulated markets, 90 percent of the total Class I volume and also 90 percent of the surplus, the average Class I prices for the two groups of markets portray the changes in the relation between prices of manufacturing milk and average Class I prices under Federal orders.

Fat Value and Skim Value of Milk

Under the price support program the CCC purchase price of nonfat dry milk was increased much more than the price of butter. During the years the price support program was in effect, the market value of the butter that could be made from a hundredweight of milk showed relatively little change while the market value of the nonfat dry milk increased greatly.

In the last two decades the consumption of butterfat declined sharply while the consumption of milk solids not fat remained relatively high. The consumption of butter, cream, fluid whole milk and evaporated milk declined while the consumption of lowfat milks, nonfat dry milk, cottage cheese and ice milk increased. The shift in price relationships under the support program and the divergent trends in the consumption of the two components of milk emphasize the importance of subdividing the price of milk into two component parts, a fat value and a skim value.

Method of Subdividing the Price of Milk into Butterfat and Skim Values

A method of determining the butterfat value and skim value of milk involves deducting from the price of milk the value of the butter that could be made from it and calling the remainder the skim value. This method is commonly associated with what is popularly known as butterfat-skim-accounting as contrasted with whole milk-equivalent-accounting. With this method the butterfat differential is based on the price of butter, commonly the Chicago price

[13] The geographic distribution of the number of markets in each series in actual numbers and on a percentage basis are summarized as follows:

Series	Northeast	South	Midwest	Mountain and Pacific
		Number of markets		
24-markets	3	2	19	0
35-markets	2	19	9	5
		Percent of markets		
24-markets	12.5	8.3	79.2	0.0
35-markets	5.7	54.3	25.7	14.3

of 92-score butter multiplied by 0.12. About 4.2 pounds of butter can be made from a hundred pounds of milk containing 3.5 percent butterfat. This is the result of a 20 percent overrun. Since the legal minimum percentage of butterfat is 80 percent, the theoretical yield of butter per pound of butterfat is 1.25. However, due to the fact that commercial butter contains somewhat more fat than the legal minimum and due to losses in receiving milk from producers, losses in skimming, churning, packing and so on, a yield of 1.20 pounds of butter per pound of butterfat is often used. With the use of this method, it is essential to realize that the butterfat differential is, in reality, a weighted differential which states the variation in the price of milk per hundredweight for one-tenth of a percent variation in butterfat content and the concomitant variation in the skim content of the milk.

For example, if the price of 3.5 milk was $5.00 and the butterfat differential $0.10, the skim milk content and the values of milk with 3.5, 3.0 and 0.0 percent butterfat would be as follows:

Percent fat	Percent skim	Price per cwt.
3.5	96.5	$5.00
3.0	97.0	4.50
0.0	100.0	1.50

Thus, deducting 35 points of fat also means adding 3.5 pounds of skim, so that the resulting price of $1.50 is the price of 100 pounds of milk with no butterfat. Conversely, the skim milk content and the values of milk with 3.5, 4.0 and 100.0 percent butterfat would be as follows:

Percent fat	Percent skim	Price per cwt.	Price per lb.
3.5	96.5	$5.00	$0.050
4.0	96.0	5.50	0.055
100.0	0.0	101.50	1.015

These values of $1.50 per hundredweight of skim milk (milk with no butterfat) and $1.015 per pound of butterfat (with no skim) can be recombined to obtain the $5.00 price per hundred pounds of milk that was stipulated in this example, as follows:

Butterfat	3.5 lbs. at $1.015 per lb.	$3.5525
Skim	96.5 lbs. at 1.50 per cwt.	1.4475
Total	100.0 lbs. 3.5 milk	5.0000

Similarly, the butterfat and skim values can be combined to obtain the price of 3.0 percent milk and 4.0 percent milk that coincide exactly with the $5.00 price for 3.5 milk and the butterfat differential of $0.10 per point adjusted to 3.0 percent and 4.0 percent respectively:

3.0 percent milk

Butterfat	3.0 lbs. at $1.015 per lb.	$3.045
Skim	97.0 lbs. at 1.50 per cwt.	1.455
Total	100.0 lbs. 3.0 percent milk	4.500

4.0 percent milk

Butterfat	4.0 lbs. at $1.015 per lb.	$4.060
Skim	96.0 lbs. at 1.50 per cwt.	1.440
Total	100.0 lbs. 4.0 percent milk	5.500

These values are exactly the same as those obtained by taking the $5.00 price for 3.5 milk and deducting the value of 5 points of fat to obtain the price for 3.0 percent milk and, conversely, adding the value of 5 points of fat to obtain the price of 4.0 percent milk.

As long as the butterfat differential is based on the market price of butter, and the factor by which the price of butter is multiplied to obtain the butterfat differential is fairly close to the number of pounds of butter made per pound of butterfat, this method yields a fat value very close to the market value of the butter that could be made from the milk. The skim value, on the other hand, is the residual, the total milk price minus the butterfat value. The skim value determined in this way is not tied in any way to the market prices of nonfat dry milk, while the butterfat value is tied to the butter price and nothing else.

Shortcomings of Method

This method, price of milk minus butter value equals skim value, has the shortcoming of overstating the butterfat value and understating the solids not fat value of milk utilized for butter and nonfat dry milk. For example, in 1970 the price of manufacturing milk was $4.56. The butterfat differential of 0.12 times Chicago butter was $0.083. This gave a fat value for the manufacturing price of $2.96. At the same time the wholesale market value

of 4.2 pounds of butter was $2.92. Thus, the handlers' margin on the butterfat was —$0.04. In striking contrast the skim portion of the manufacturing price was $1.60. The wholesale market value of the 8.2 pounds of nonfat dry milk that could be obtained from the milk was $2.12. This gave handlers a margin on the solids not fat of $0.52 and a total margin of $0.48 ($—0.04 + $0.52 = $0.48) (table 9).

Calculated in this way the handlers' margin on the fat portion of the milk was $0.00 in two years and a small negative amount in each of the other years and for the 24 years averaged —$0.02. On the other hand, the handlers' margin on the nonfat was never less than $0.46 and, in some years was nearly $0.90. For the period as a whole it averaged $0.64. The combined margin on the two components averaged $0.62 (—$0.02 + $0.64). According to this allocation the handlers' margin is attributed, for all practical purposes, entirely to the nonfat dry milk. Thus, if a handler received milk from producers, separated it and sold the cream to a butter manufacturer, he probably could not recover the cost of the fat. The butter manufacturer could not afford to pay slightly more for the butterfat than he could obtain for the butter made from it. On the other hand, the handler might be able to sell the skim milk to a manufacturer of nonfat dry milk and obtain more than his cost, since the calculated margin on the skim was relatively wide.

TABLE 9. PRICE OF MILK FOR MANUFACTURE SUBDIVIDED INTO BUTTERFAT AND SKIM VALUES, VALUE OF BUTTER AND NONFAT DRY MILK (SPRAY) FROM 100 POUNDS OF MILK AND HANDLERS MARGIN ON BUTTER AND NONFAT, 1947-70

Year	Manufacturing milk per cwt.				Value of product		Handler margin		
	Price[1]	Fat value	Skim value	Fat diff.[2]	4.2 lbs. butter	8.2 lbs. nonfat	Butter	Nonfat	Total
1947	$3.37	$2.99	$0.38	$.085	$2.96	$0.92	$-0.03	$0.54	$0.51
1948	3.84	3.17	0.67	.090	3.16	1.25	-0.01	0.58	0.57
1949	2.80	2.57	0.23	.073	2.57	1.01	0.00	0.78	0.78
1950	2.87	2.60	0.27	.074	2.59	1.01	-0.01	0.74	0.73
1951	3.52	2.92	0.60	.083	2.90	1.19	-0.02	0.59	0.57
1952	3.71	3.07	0.64	.087	3.04	1.34	-0.03	0.70	0.67
1953	3.20	2.78	0.42	.079	2.77	1.29	-0.01	0.87	0.86
1954	2.90	2.53	0.37	.072	2.51	1.24	-0.02	0.87	0.85
1955	2.90	2.43	0.47	.069	2.41	1.27	-0.02	0.80	0.78
1956	2.99	2.50	0.49	.071	2.49	1.25	-0.01	0.76	0.75
1957	3.02	2.54	0.48	.072	2.51	1.25	-0.03	0.77	0.74
1958	2.93	2.47	0.46	.070	2.47	1.14	0.00	0.68	0.68
1959	2.95	2.53	0.42	.072	2.51	1.10	-0.02	0.68	0.66
1960	3.05	2.50	0.55	.071	2.48	1.11	-0.02	0.56	0.54
1961	3.15	2.58	0.57	.073	2.54	1.26	-0.04	0.69	0.65
1962	3.03	2.47	0.56	.070	2.46	1.21	-0.01	0.65	0.64
1963	3.06	2.47	0.59	.070	2.45	1.16	-0.02	0.57	0.55
1964	3.13	2.50	0.63	.071	2.48	1.17	-0.02	0.54	0.52
1965	3.21	2.54	0.67	.072	2.53	1.17	-0.01	0.50	0.49
1966	3.82	2.84	0.98	.080	2.80	1.44	-0.04	0.46	0.42
1967	3.91	2.84	1.07	.080	2.80	1.60	-0.04	0.53	0.49
1968	4.08	2.85	1.23	.080	2.81	1.79	-0.04	0.56	0.52
1969	4.31	2.89	1.42	.081	2.84	1.88	-0.05	0.46	0.41
1970	4.56	2.96	1.60	.083	2.92	2.12	-0.04	0.52	0.48
Aver.	3.35	2.69	0.66	.076	2.67	1.30	-0.02	0.64	0.62

[1] Average price of milk for manufacture, 3-product series 1947 to November 1962, and United States average price for manufacturing milk December 1962 to December 1970, 3.5 percent butterfat.
[2] Chicago butter times 0.12.

Overall, he might come out all right with the total margin. At least over the years handlers actually paid the manufacturing price. Of course, a handler is primarily interested in the overall results, rather than results on butterfat as contrasted with the solids not fat. In buying milk from producers the handler always obtains whole milk and is interested primarily in the results of the overall operation. However, if a handler separates the milk and sells the butterfat to an ice cream manufacturer in the form of cream and the skim to a cottage cheese manufacturer, he has to price the fat portion by itself and the skim portion by itself. With this method of allocation realistic sale prices of the two products cannot bear the same relationship to the order cost.

Even though this method has this shortcoming it is used extensively in this analysis. This method is commonly used in milk orders to determine the classification value of the handler's receipts of milk from producers and his pool obligation and for this purpose it is completely accurate.

Reason for Overvaluation of Butterfat

The butterfat value of milk is overstated with this method because the fat value is the same as the gross market value of the butter that could be made from a hundredweight of milk containing 3.5 percent butterfat. There is no manufacturing allowance allocated to the butterfat value. The overstatement of the fat value could be eliminated by deducting an appropriate manufacturing allowance from the butter price before calculating the butterfat differential.

For some orders the price handlers were required to pay for milk utilized in butter and nonfat dry milk was determined by a formula that used the market price of butter minus 3.0 cents and the price of nonfat dry milk minus 5.5 cents per pound. These deductions together with the yields of 4.2 pounds of butter and 8.2 pounds of nonfat gave a manufacturing allowance of 57.7 cents per hundredweight of 3.5 milk. Later this handling allowance was reduced by 10 cents to 47.7 cents, and subsequently rounded off to 48.0 cents.

If this handling allowance is subdivided between butter and nonfat in the same proportions as in the original formula, it would result in allowances applicable to the butterfat and solids not fat of 10.5 and 37.5 cents per hundredweight of milk respectively. These allowances in turn can be divided by the pounds of product to give an adjusted making allowance for butter of 2.5 cents and for nonfat dry milk of 4.6 cents per pound.

The allowances in the original formula and in the present formula can be summarized per pound of product and per hundredweight of milk as follows:

Product	Original allowance 57.7 cents per cwt. of milk			Adjusted allowance 48.0 cents per cwt. of milk	
	Per lb. of product ¢	*Per cwt. of milk* ¢	*Percent of total*	*Per cwt. of milk* ¢	*Per lb. of product* ¢
Butter 4.2 lbs.	3.0	12.6	21.8	10.5	2.5
Nonfat 8.2 lbs.	5.5	45.1	78.2	37.5	4.6
		57.7	100.0	48.0	

In many orders where a butter-powder snubber[14] is used, the handling allowance per hundredweight of milk is $0.48 or $0.477. Deducting a 2.5 cent making allowance from the price of butter prior to calculating a butterfat differential would, according to this method, merely reduce the butterfat value of manufacturing milk by 10.5 cents (4.2 X 2.5 = 10.5) per hundredweight of milk and would increase the skim value by an equivalent amount (table 10). Dividing the manufacturing milk price into a fat value and a skim value which yields the handler a margin on the butter as well as on the nonfat dry milk has some virtues as contrasted with one which yields a slight negative margin on butter and a relatively large margin on nonfat.

[14] In several orders where the Class II price is the Minnesota-Wisconsin price of manufacturing milk adjusted to a 3.5 percent butterfat basis, there is a proviso that in no event can the Class II price exceed the value of 4.2 pounds of butter plus the value of 8.2 pounds of nonfat dry milk minus $0.48. This limitation is commonly known as a "butter-powder snubber".

TABLE 10. PRICE OF MILK FOR MANUFACTURE SUBDIVIDED INTO BUTTERFAT AND SKIM VALUES WITH BUTTERFAT DIFFERENTIAL OF CHICAGO BUTTER MINUS 2.5 CENTS TIMES 0.12, VALUE OF BUTTER AND NONFAT DRY MILK (SPRAY) FROM 100 POUNDS OF MILK AND HANDLERS MARGIN ON BUTTER AND NONFAT, 1947-70

Year	Manufacturing milk per cwt.				Value of product		Handlers margin		
	Price[1]	Fat value	Skim value	Fat diff.[2]	4.2 lbs. butter	8.2 lbs. nonfat	Butter	Nonfat	Total
1947	$3.37	$2.89	$0.48	$.082	$2.96	$0.92	$0.07	$0.44	$0.51
1948	3.84	3.07	0.77	.087	3.16	1.25	0.09	0.48	0.57
1949	2.80	2.46	0.34	.070	2.57	1.01	0.11	0.67	0.78
1950	2.87	2.50	0.37	.071	2.59	1.01	0.09	0.64	0.73
1951	3.52	2.82	0.70	.080	2.90	1.19	0.08	0.49	0.57
1952	3.71	2.97	0.74	.084	3.04	1.34	0.07	0.60	0.67
1953	3.20	2.68	0.52	.076	2.77	1.29	0.09	0.77	0.86
1954	2.90	2.43	0.47	.069	2.51	1.24	0.08	0.77	0.85
1955	2.90	2.33	0.57	.066	2.41	1.27	0.08	0.70	0.78
1956	2.99	2.40	0.59	.068	2.49	1.25	0.09	0.66	0.75
1957	3.02	2.44	0.58	.069	2.51	1.25	0.07	0.67	0.74
1958	2.93	2.36	0.57	.067	2.47	1.14	0.11	0.57	0.68
1959	2.95	2.44	0.51	.069	2.51	1.10	0.07	0.59	0.66
1960	3.05	2.40	0.65	.068	2.48	1.11	0.08	0.46	0.54
1961	3.15	2.47	0.68	.070	2.54	1.26	0.07	0.58	0.65
1962	3.03	2.37	0.66	.067	2.46	1.21	0.09	0.55	0.64
1963	3.06	2.37	0.69	.067	2.45	1.16	0.08	0.47	0.55
1964	3.13	2.41	0.72	.068	2.48	1.17	0.07	0.45	0.52
1965	3.21	2.45	0.76	.069	2.53	1.17	0.08	0.41	0.49
1966	3.82	2.74	1.08	.077	2.80	1.44	0.06	0.36	0.42
1967	3.91	2.74	1.17	.077	2.80	1.60	0.06	0.43	0.49
1968	4.08	2.75	1.33	.077	2.81	1.79	0.06	0.46	0.52
1969	4.31	2.79	1.52	.078	2.84	1.88	0.05	0.36	0.41
1970	4.56	2.86	1.70	.080	2.92	2.12	0.06	0.42	0.48
Aver.	3.35	2.59	0.76	.073	2.67	1.30	0.08	0.54	0.62

[1] Average price of milk for manufacture, 3-product series 1947 to November 1962, and United States average price for manufacturing milk December 1962 to December 1970, 3.5 percent butterfat.
[2] Chicago butter minus 2.5 cents times 0.12.

Fat and Skim Values in Class I (24 Identical Markets) and Manufacturing Milk

In 1970 the Class I price (24 markets) was $6.39, the manufacturing price was $4.56 and the butterfat differential $0.083 (Chicago butter 69.4 cents X 0.12). Using these data and the method outlined above, the fat value and skim value in Class I and manufacturing milk for 1970 were as follows:

	Price	Fat value	Skim value	Fat exceeds skim	Percent of total price	
	$	$	$	$	*Fat*	*Skim*
Class I	6.39	3.03	3.36	–0.33	47.4	52.6
Manufacturing milk	4.56	2.96	1.60	1.36	64.9	35.1
Class I exceeds manufacturing milk	1.83	0.07	1.76			

The Class I price of $6.39 was made up of a fat value of $3.03 and a skim value of $3.36. The skim value exceeded the fat value by $0.33 per hundredweight of milk. The skim was over half of the total value of the milk, 52.6 percent.

These relationships were quite different from those for manufacturing milk. For the same period the manufacturing price was $4.56, made up of a fat value of $2.96 and a skim value of $1.60. For manufacturing milk the fat value exceeded the skim value by $1.36. This is the opposite of the relationship for Class I where the skim value exceeded the fat. For manufacturing milk the fat value made up 64.9 percent of the total. This was a much higher proportion of the total than for Class I. Thus, it is abundantly clear that the relationship between fat and skim values in Class I was entirely different from that in manufacturing milk.

Another important relationship is portrayed by comparing the constituents of the margin between Class I and the manufacturing price. For example, the Class I price exceeded the manufacturing price by $1.83; the Class I fat value exceeded the fat value in manufacturing milk by $0.07, while the skim value in Class I exceeded manufacturing skim by $1.76. About 96 percent of the total margin of the Class I over the manufacturing price was attributable to the skim and only 4 percent to the fat.

Throughout the entire period, since the end of World War II price controls, the Class I price exceeded the manufacturing price by a wide margin. Nevertheless, the fat value in Class I milk and in manufacturing milk were much the same, and fluctuated closely together. For the 24-year period 1947-70 they averaged $2.74 and $2.69 respectively, per hundred pounds of 3.5 milk.

On the other hand, the skim values were greatly different. For the 24-year period they averaged $2.14 and $0.66 per hundred pounds of 3.5 milk. The Class I skim value was 3.2 times as great as that for manufacturing milk (table 11, figure 15).

There was a striking difference between the longtime trends in fat and skim values. During the first three years that the support program and the marketing order program were operating simultaneously, the fat values in Class I milk averaged $2.75 as compared with $2.96 in the last three years. This was an increase of only $0.21 or 8 percent, a modest increase. The increase in the fat value of manufacturing milk was much the same.

During the same period of time the Class I skim value rose $1.49 per hundred pounds of 3.5 milk. This was an increase of 88 percent. For manufacturing milk the increase in skim value was 284 percent. These fat values and skim values in Class I and manufacturing milk in the early years and latest years are summarized in dollars per hundred pounds of 3.5 milk as follows:

	Fat value		Skim value	
	Class I	Manufacturing	Class I	Manufacturing
Early years 1949-51	$2.75	$2.70	$1.70	$0.37
Latest years 1968-70	2.96	2.90	3.19	1.42
Increase				
Actual	0.21	0.20	1.49	1.05
Percent	8	7	88	284

It is abundantly clear that the dynamic portion of the milk price was the skim value. This means, of course, that the percentage of the total price that was attributed to the butterfat as contrasted to the skim has changed greatly and that these relationships differ between Class I and manufacturing milk (figure 16).

For manufacturing milk the butterfat value made up over 80 percent of the total price throughout the entire period 1947 until 1964. Then the percentage of the price attributable to the butterfat declined sharply and in 1970 it was the lowest on record, 65 percent. The skim value made up the remainder and represented less than 10 percent of the total price in 1949 and 1950. It increased in relative importance more or less consistently from then to the mid-sixties when it got up to about 20 percent of the total and then rose rapidly in the late sixties to 35 percent of the total in 1970.

For Class I milk, the fat value represented a much smaller percentage of the total price than for manufacturing milk. During the fifties and early sixties the butterfat value was between 50 and 65 percent of the total price. Then, in the late sixties it

TABLE 11. CLASS I PRICE, BUTTERFAT AND SKIM VALUES 24 IDENTICAL FEDERAL ORDER MARKETS, AND MANUFACTURING MILK PRICE, BUTTERFAT AND SKIM VALUES PER HUNDREDWEIGHT OF 3.5 PERCENT MILK, 1947-70

Year	Class I			Manufacturing milk			Class I exceeds mfg.		
	Price[1]	Fat[2]	Skim	Price[3]	Fat[2]	Skim	Price	Fat	Skim
	$	$	$	$	$	$	$	$	$
1947	4.42	3.03	1.39	3.37	2.99	0.38	1.05	.04	1.01
1948	5.05	3.22	1.83	3.84	3.17	0.67	1.21	.05	1.16
1949	4.26	2.62	1.64	2.80	2.57	0.23	1.46	.05	1.41
1950	4.21	2.65	1.56	2.87	2.60	0.27	1.34	.05	1.29
1951	4.87	2.97	1.90	3.52	2.92	0.60	1.35	.05	1.30
1952	5.22	3.12	2.10	3.71	3.07	0.64	1.51	.05	1.46
1953	4.75	2.83	1.92	3.20	2.78	0.42	1.55	.05	1.50
1954	4.45	2.59	1.86	2.90	2.53	0.37	1.55	.06	1.49
1955	4.48	2.49	1.99	2.90	2.43	0.47	1.58	.06	1.52
1956	4.67	2.56	2.11	2.99	2.50	0.49	1.68	.06	1.62
1957	4.60	2.59	2.01	3.02	2.54	0.48	1.58	.05	1.53
1958	4.51	2.52	1.99	2.93	2.47	0.46	1.58	.05	1.53
1959	4.56	2.59	1.97	2.95	2.53	0.42	1.61	.06	1.55
1960	4.61	2.56	2.05	3.05	2.50	0.55	1.56	.06	1.50
1961	4.64	2.63	2.01	3.15	2.58	0.57	1.49	.05	1.44
1962	4.52	2.52	2.00	3.03	2.47	0.56	1.49	.05	1.44
1963	4.53	2.52	2.01	3.06	2.47	0.59	1.47	.05	1.42
1964	4.61	2.56	2.05	3.13	2.50	0.63	1.48	.06	1.42
1965	4.72	2.60	2.12	3.21	2.54	0.67	1.51	.06	1.45
1966	5.37	2.89	2.48	3.82	2.84	0.98	1.55	.05	1.50
1967	5.62	2.90	2.72	3.91	2.84	1.07	1.71	.06	1.65
1968	5.91	2.91	3.00	4.08	2.85	1.23	1.83	.06	1.77
1969	6.16	2.95	3.21	4.31	2.89	1.42	1.85	.06	1.79
1970	6.39	3.03	3.36	4.56	2.96	1.60	1.83	.07	1.76
Aver.	4.88	2.74	2.14	3.35	2.69	0.66	1.53	.05	1.48

[1] Arithmetic average of Class I prices 24 identical markets.
[2] Based on a butterfat differential of Chicago butter x 0.12.
[3] Three-product series January 1947-November 1962, manufacturing grade milk U.S. average December 1962-December 1970.

declined and in 1970 was 47.4 percent. The skim values in Class I made up a much larger part of the price than in manufacturing milk. During the 15-year period from 1950 to the mid-sixties, the skim value in Class I made up 37 to 45 percent of the Class I price. In 1968 skim exceeded fat in relative importance and in 1970 represented 53 percent of the Class I price.

Another way of portraying the increasing importance of the skim value in both Class I and manufacturing milk, is to determine the importance of the butterfat value and the skim value in accounting for the change in prices from the beginning of the support program up to 1970. For example, the price of manufacturing milk increased from $2.80 to $4.56, an increase of $1.76. The

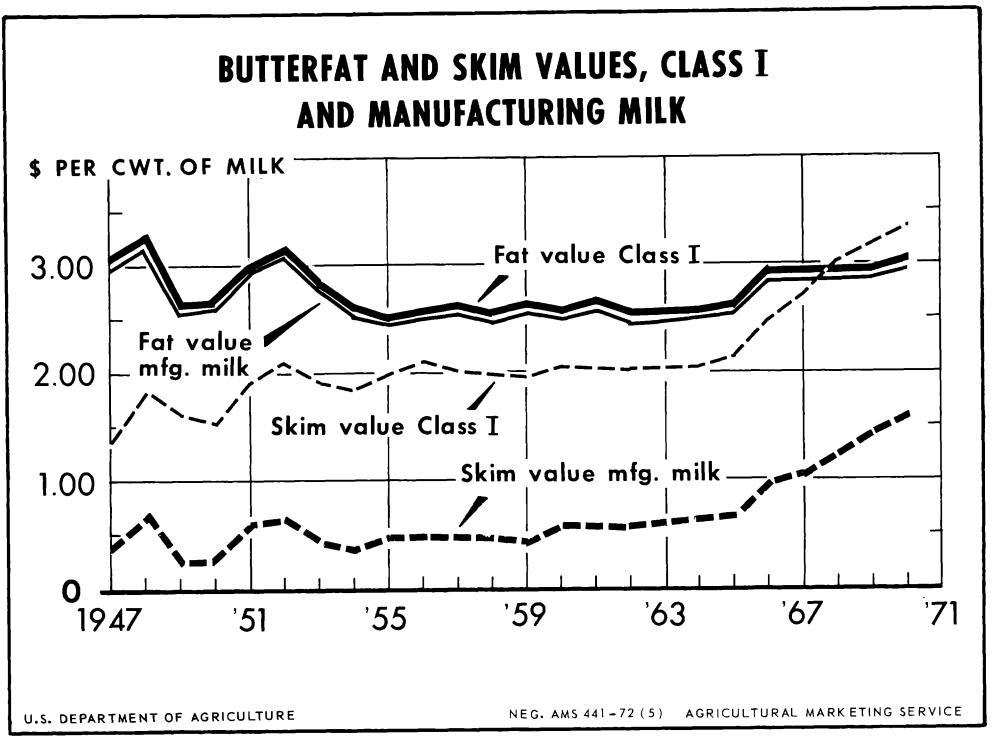

FIGURE 15.—The fat values were much the same, but the skim value in Class I exceeded that for manufacturing milk by a wide margin.

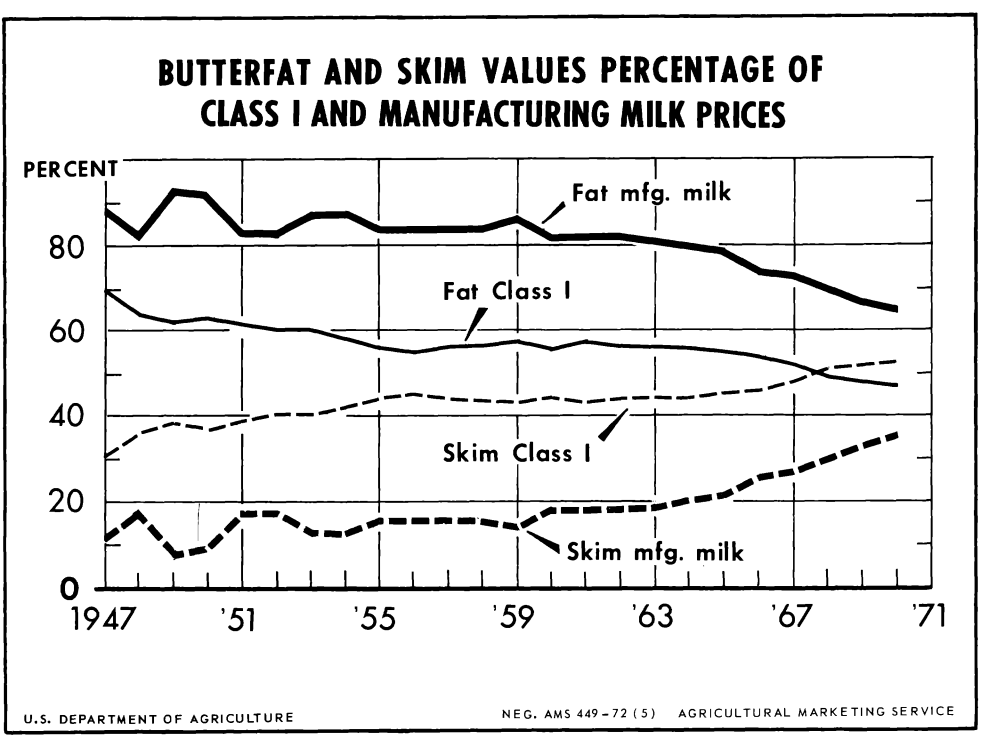

FIGURE 16.—By far the major proportion of the manufacturing milk price was made up of the fat value and a minor proportion by the skim value. For Class I milk, fat and skim values were much more nearly equal.

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increase in the fat value accounted for 22 percent of the gain and the increase in the skim value 78 percent. This is an indication of the predominant effect of the skim values in accounting for the change in prices. These prices for manufacturing milk, subdivided into butterfat and skim values at the beginning of the support program and in the most recent year, are summarized as follows:

	Price	Fat value	Skim value	Fat exceeds skim	Percent of total Fat	Percent of total Skim
1949	$2.80	$2.57	$0.23	$2.34	91.8	8.2
1970	4.56	2.96	1.60	1.36	64.9	35.1
Increase	1.76	0.39	1.37			

Between 1949 and 1970 the Class I price (in 24 identical markets) increased $2.13. Of this total increase only 19 percent was attributed to the fat value while 81 percent was due to the increase in the skim value of Class I milk. These Class I prices, together with the subdivision of the price between butterfat and skim values for the two years 1949 and 1970, are summarized as follows:

	Price	Fat value	Skim value	Fat exceeds skim	Percent of total Fat	Percent of total Skim
1949	$4.26	$2.62	$1.64	$0.98	61.5	38.5
1970	6.39	3.03	3.36	−0.33	47.4	52.6
Increase	2.13	0.41	1.72			

Fat and Skim Values by Markets

The price of manufacturing milk is relatively uniform across the country. The prices paid by CCC under the support program for cheese and nonfat dry milk are uniform from coast to coast and there is only a moderate geographic variation in the price paid for butter. On the other hand, there is a marked geographic variation in Class I prices. In many respects an average Class I price for all Federal markets covers up or obliterates some of the most distinguishing features of the price structure under milk orders.

As mentioned earlier, a common method of determining the Class I price is to add a differential or margin to the manufacturing price. Even though the same basic manufacturing price may be used for many markets, the magnitude of the differential varies from market to market. The Class I price and the Class II price[15] in each of 66 Federal order markets in September 1969 were divided into the butterfat value and skim value using the butterfat differential applicable in the individual market.

For example, in September 1969 the Class I price for the New York-New Jersey market was $6.82 and the butterfat differential $0.080. This gave a Class I fat value per pound of $0.8402 and a Class I skim value of $4.02 per hundredweight. Thus, the Class I price can be divided into its two components as follows:

3.5 lbs. of Class I butterfat at $0.8402	$2.9407
96.5 lbs. of Class I skim at $4.02 per cwt.	3.8793
100.0 lbs. of Class I milk 3.5 percent butterfat	$6.8200

The same type of calculation was made for Class II and for each of the 66 Federal orders for September 1969. The fat value for Class I milk ranged between a low of $2.74 for Upstate Michigan and a high of $3.35 for Central Arizona. About 71 percent of the markets had Class I fat values between $2.90 and $3.09 with an average of $3.00 (table 12, figure 17).

The skim values in Class I showed a different pattern, fluctuating over a much wider range, between a low of $2.36 for Duluth-Superior and a high of $4.73 for Southeast Florida. The most common skim value was between $3.10 and $3.29; 16.7 percent of the markets were in this range (table 12, figure 17). The lowest Class I skim values were less than the lowest Class I fat values. However, in

[15] In the few markets where there were three classes, the Class III price was used.

TABLE 12. PERCENTAGE OF FEDERAL ORDER MARKETS WITH CLASS I AND CLASS II BUTTERFAT AND SKIM VALUES AT SPECIFIED LEVELS SEPTEMBER 1969[1]

Fat[2] and skim[3] values dollars per cwt. of 3.5 milk		Percentage of markets with values at specified levels			
		Class I		Class II	
Range	Midpoint	Fat	Skim	Fat	Skim
Dollars	*Dollars*	*Percent*	*Percent*	*Percent*	*Percent*
0.90–1.09	1.00				0.0
1.10–1.29	1.20				4.5
1.30–1.49	1.40				36.4
1.50–1.69	1.60				50.0
1.70–1.89	1.80				9.1
1.90–2.09	2.00				0.0
2.10–2.29	2.20		0.0		
2.30–2.49	2.40		1.5	0.0	
2.50–2.69	2.60	0.0	9.1	3.0	
2.70–2.89	2.80	7.6	4.5	87.9	
2.90–3.09	3.00	71.2	15.1	9.1	
3.10–3.29	3.20	18.2	16.7	0.0	
3.30–3.49	3.40	3.0	13.6		
3.50–3.69	3.60	0.0	7.6		
3.70–3.89	3.80		6.1		
3.90–4.09	4.00		7.6		
4.10–4.29	4.20		7.6		
4.30–4.49	4.40		7.6		
4.50–4.69	4.60		1.5		
4.70–4.89	4.80		1.5		
4.90–5.09	5.00		0.0		
Total		100.0	100.0	100.0	100.0

[1] Based on 66 markets.
[2] Value of 3.5 pounds of butterfat.
[3] Value of 96.5 pounds of skim milk.

about one-third of the markets the skim values exceeded the highest fat value.

For Class II 87.9 percent of the markets had fat values between $2.70 and $2.89. They were highly concentrated in a relatively narrow range. In addition, the skim values in Class II were fairly concentrated with 50 percent of the markets having a value between $1.50 and $1.69. The highest skim value in Class II was less than the lowest fat value in Class II. There was no overlapping of fat and skim values in Class II as there was in Class I (table 12, figure 17).

Thus, it is clear that there was little difference in fat values in Class I and Class II either in magnitude or in variability. On the other hand, Class I skim values were much higher and much more variable than Class II skim values.

These results can also be summarized by comparing the Class I and Class II prices and their component parts together with their respective variabilities. The magnitude of the fat values in Class I and Class II were much the same: $3.00 and $2.85 respectively and the variability of the two were the same and low (table 13).

On the other hand, the skim values in the two classes were greatly different; $3.44 and $1.53 respectively, also the coefficient of variability of the two were greatly different; 17 and 11 respectively. Thus, it is clear that under Federal orders the skim values in Class I were, by far, the most variable part

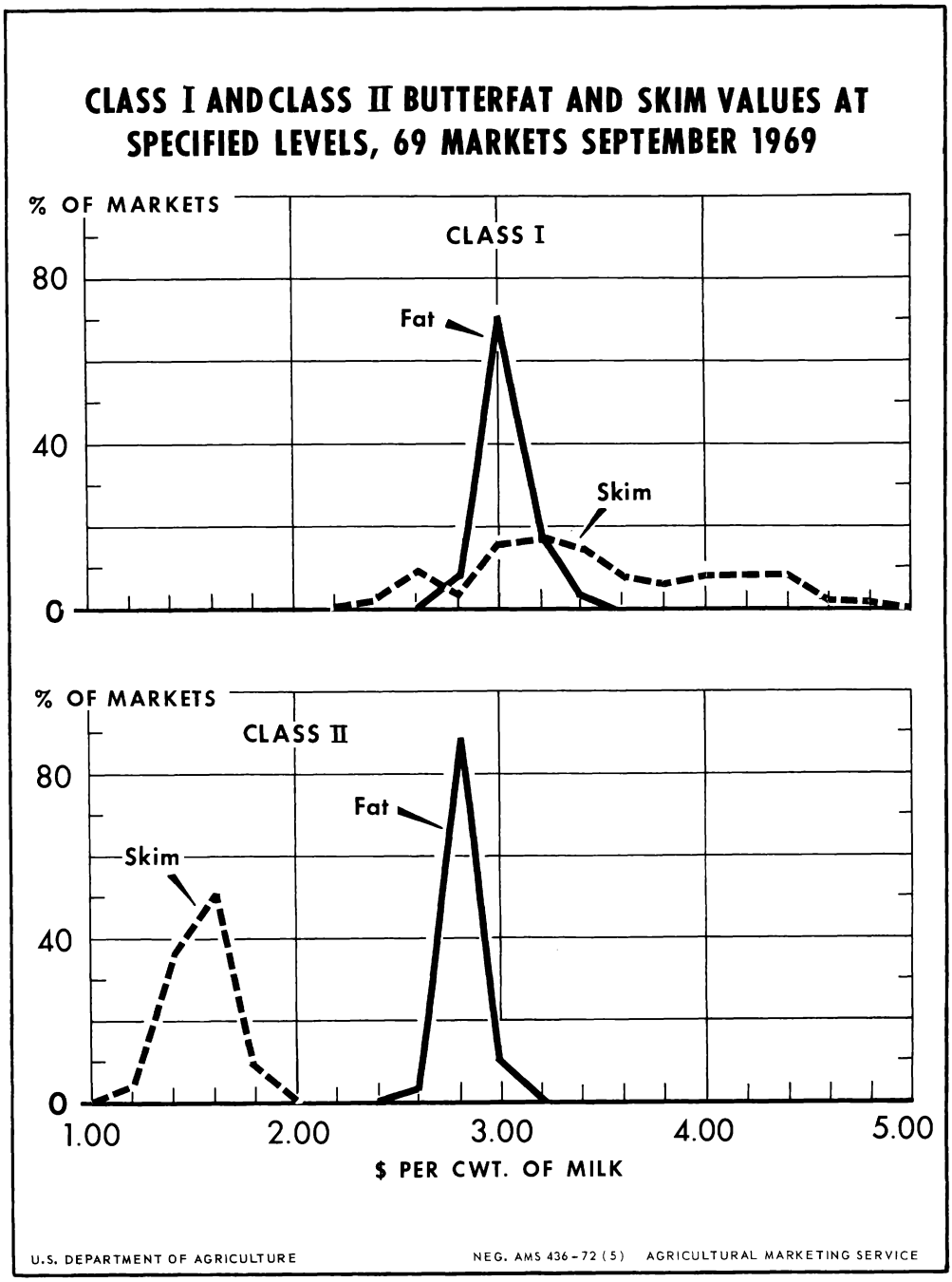

FIGURE 17.—Class I fat values were highly concentrated while skim values were much more variable, in some cases exceeding the fat value (top).

Both Class II fat and skim values were highly concentrated and the skim values were always less than the fat values (bottom).

TABLE 13. CLASS I AND CLASS II FAT AND SKIM VALUES, 66 FEDERAL ORDERS SEPTEMBER 1969

(per hundredweight of 3.5 milk)

	Price	Fat value	Skim value	Fat exceeds skim
Averages for 66 markets				
Class I	$6.44	$3.00	$3.44	$-0.44
Class II	4.38	2.85	1.53	1.32
Class I exceeds Class II	2.06	0.15	1.91	
Coefficients of variability				
Class I	8	2	17	
Class II	4	2	11	

of the price structure, with skim value in Class II the second most variable, and with very little variation in fat values in either Class I or Class II.

Fat and Skim Values by Geographic Areas

Under Federal orders the lowest Class I prices are in the North Central States, that is, the markets closest to the center of the great supplies of surplus Grade A milk and of manufacturing milk. Prices at other markets exceed this area by about the cost of shipping milk from Wisconsin to the particular market. Consequently, if Federal order Class I prices are classified by their magnitude, it is, for all practical purposes, a classification of the markets by distance from Wisconsin. For example, in September 1969 there were four Federal markets with Class I prices between $5.40 and $5.59 (table 14). These four markets were Duluth-Superior, Minneapolis-St. Paul, Minnesota-North Dakota, and Southeast Minnesota-Northern Iowa. On the other hand, there were four markets with Class I prices $2.00 higher, that is, between $7.40 and $7.59. These four markets were Massachusetts-Rhode Island-New Hampshire, Connecticut, Southeast Florida and Corpus Christi, Texas. Except for the area west of the Rocky Mountains, these markets were at the maximum distance from the low price area.

A comparison of prices in these high-priced markets with the low-priced markets clearly indicates that most of the variation in price was due to the skim value. For example, the average Class I price in the high-priced markets in September 1969 was $1.96 higher than in the low-priced markets. The skim value in the high-priced markets exceeded that in the low-priced markets by $2.02. The Class I fat value in the high-priced markets was actually $0.06 per hundredweight of milk less than in the low-priced markets. It is also interesting to note the relation between the Class I fat and skim values in the two groups of markets. In the high-priced

TABLE 14. CLASS I BUTTERFAT AND SKIM VALUES 66 FEDERAL ORDER MARKETS CLASSIFIED BY THE MAGNITUDE OF THE CLASS I PRICE SEPTEMBER 1969

Class I Range	Markets		Class I			Percent of Class I price	
	No.	Percent	Price	Fat value	Skim value	Fat	Skim
$			$	$	$		
5.40–5.59	4	6.1	5.49	2.99	2.50	54.5	45.5
5.60–5.79	5	7.5	5.70	2.99	2.71	52.5	47.5
5.80–5.99	9	13.6	5.91	2.92	2.99	49.4	50.6
6.00–6.19	9	13.6	6.09	2.97	3.12	48.8	51.2
6.20–6.39	8	12.1	6.30	3.00	3.30	47.6	52.4
6.40–6.59	4	6.1	6.49	3.08	3.41	47.5	52.5
6.60–6.79	6	9.1	6.68	3.14	3.54	47.0	53.0
6.80–6.99	6	9.1	6.90	3.09	3.81	44.8	55.2
7.00–7.19	7	10.6	7.11	3.01	4.10	42.3	57.7
7.20–7.39	4	6.1	7.27	2.88	4.39	39.6	60.4
7.40–7.59	4	6.1	7.45	2.93	4.52	39.3	60.7
Total or aver.	66	100.0	6.44	3.00	3.44	46.6	53.4

markets, the fat value was $1.59 less than the skim value per hundredweight of milk. On the other hand, in the low-priced markets the fat value exceeded the skim value by $0.49. Thus, it is clear that the relation between fat and skim in the high-priced markets differed greatly from that in the low-priced markets. These price comparisons per hundredweight of milk for the two groups of markets are summarized as follows:

	Class I	Fat	Skim	Fat exceeds skim
4 highest priced markets	$7.45	$2.93	$4.52	-$1.59
4 lowest priced markets	5.49	2.99	2.50	+0.49
High exceeds low	1.96	-0.06	2.02	

In September 1969 for all Federal order markets the Class I skim value increased, on the average, $0.20 per hundredweight for every $0.20 increase in the Class I price (table 14, figure 18). On the other hand, the fat value was constant at all levels of the Class I price. Thus, under the present pricing system the geographic variation in Class I prices is reflected in the skim value; there is no geographic variation in the butterfat value.

A corollary to this relationship is that the fat values are a relatively large part of the Class I price in those markets with the lowest Class I prices, while the reverse is true for the skim values. For example, in September 1969 in the high-priced markets, $7.20 or more, the Class I skim values made up about 60 percent of the Class I price and the fat value was only 40 percent.

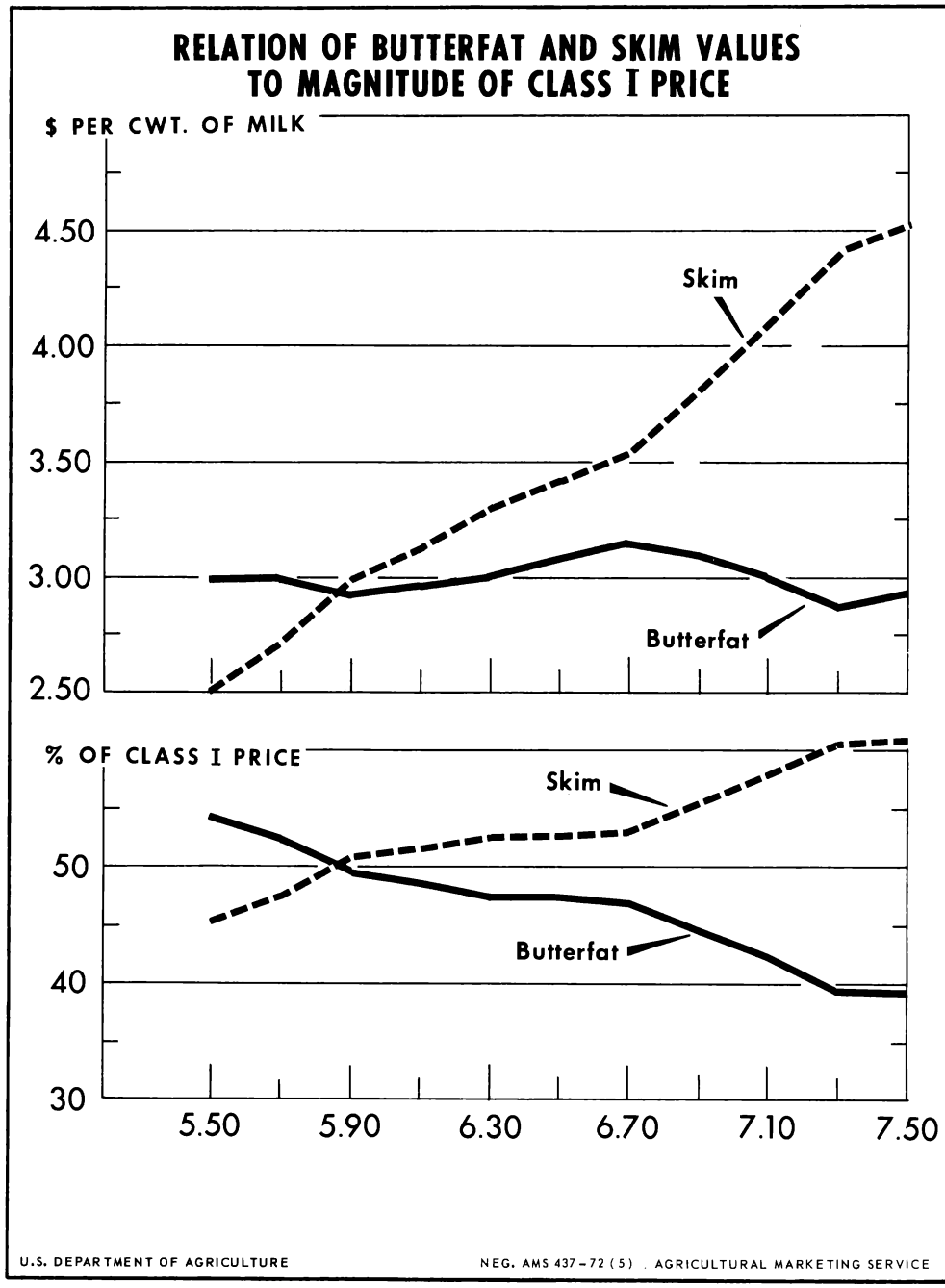

FIGURE 18.—The skim value was directly related to the magnitude of the Class I price while the fat value was stable (top). The higher the Class I price the higher the proportion of the price represented by the skim and the lower by the butterfat (bottom).

SUMMARY

Under the marketing order program, the principal pricing problem was the establishment of prices to be paid by handlers for milk used for fluid use, Class I.

The most common method of establishing Class I prices was a premium over the price of manufacturing milk. This premium, in absolute amount, rose from the early fifties to a high in the mid-fifties, declined somewhat in the mid-sixties, and then during the late sixties rose to the highest level on record. However, this premium expressed as a percentage of the price of manufacturing milk presented a different picture. From the late forties to the mid-fifties it rose from 46 percent of the manufacturing price to 54 percent. Since then the trend has been downward. With the inflation of prices in the late sixties, the Class I premium expressed as a percentage of the manufacturing price declined to about the level of 1951-52.

With the present method of dividing the price of milk between the fat value and the skim value, practically all of the premium of the Class I price over the price of manufacturing milk is attributable to the skim value and only a minor part to the fat value.

During the period that the support program was in effect, there was little net change in the fat value of Class I milk or manufacturing milk. The increase in the price of manufacturing milk and the price of Class I milk was attributable primarily to the increase in the skim values.

From the mid-fifties to the mid-sixties, a little over 50 percent of the Class I price under Federal orders was attributable to the butterfat value and a little less than half to the skim value. In the late sixties, this relationship was reversed.

For manufacturing milk, the major proportion of the price was made up of the fat value and the minor proportion of the skim value. However, the relative importance of the fat value has declined and skim increased. In 1970 the division was 65 percent fat and 35 percent skim.

Class II prices under Federal orders varied relatively little from market to market. The fat values in Class II milk were much the same in all markets while the skim values showed a greater variation.

There was a marked geographic variation in Class I prices. They increased as the distance from Wisconsin increased and reflected the cost of transporting milk. The geographic variation in Class I prices was reflected in Class I skim values. Under Federal orders the skim values in Class I were the most variable part of the price structure, with skim values in Class II the second most variable, and with little variation in fat values in either Class I or Class II.

IV. BUTTERFAT DIFFERENTIALS AND MULTIPLE DIFFERENTIALS

The butterfat content of milk is much more variable than the solids not fat content; the butterfat is also higher priced. These two factors, together with a readily available and accurate method of testing milk for its fat content, have made butterfat differentials an important adjunct to milk prices.

With the marked rise in the price of nonfat dry milk in relation to butter under the support program, the question arises as to whether or not a multiple differential based on both the butterfat and the solids not fat content of milk would differ greatly from the customary butterfat differential and be more appropriate.

Relationship of Butterfat to Solids Not Fat in Milk

Butterfat and milk solids not fat are produced jointly, and over the years there was little change in the relative amounts produced. The relationship between the solids not fat and butterfat content of milk was expressed by the equation

$$SNF = 7.01 + 0.434\,F$$ [16],

SNF = percentage of solids not fat

F = percentage of butterfat

The solids not fat content is positively related to the fat content. Thus, high testing milk contains not only more butterfat but also more solids not fat than low testing milk. However, milk varies much more in fat than in solids not fat content. On the average, for each 1.0 percent variation in fat, the nonfat content varies only 0.434 percent.

The difference in the variability of the two components of milk can be portrayed by comparing the butterfat and the solids not fat content of low test milk with high test milk. In this example 3.0 percent milk was compared with 4.5 percent milk.

[16] Estimating the Solids-Not-Fat Content of Milk, Marketing Research Report No. 65, Agricultural Marketing Service, U.S. Department of Agriculture, Louis F. Herrmann, Elsie D. Anderson and Frank A. Bele, Summary and Conclusions, May 1954. "The equation for estimating solids-not-fat from fat alone is in practical agreement with those of Jack et al., Heinemann et al., and Jacobson."

			4.5 exceeds 3.0 percent milk percent
Fat percent	3.0	4.5	50.0
SNF percent	8.31	8.96	7.8
Total solids percent	11.31	13.46	19.0
Fat, percent of total solids	26.5	33.4	26.0
SNF, percent of total solids	73.5	66.6	-9.4
SNF, per pound of butterfat, lb.	2.77	1.99	-28.2

It is clear that 4.5 percent milk contains 50 percent more butterfat than 3.0 percent milk. In striking contrast the solids not fat content of the high test milk was only 7.8 percent greater than the low test milk. In total solids the high test exceeded the low by 19.0 percent.

These relationships show that the proportion of butterfat in the total solids is also variable. In the high testing milk, butterfat was 33.4 percent of the total solids, as contrasted with 26.5 percent in the low testing milk. Thus, the percentage of the total solids in milk made up of butterfat varies with the test of milk. Conversely, the percentage of the total solids made up of nonfat varies inversely with the test of milk. In the high test milk, 66.6 percent of the total solids were solids not fat as contrasted with 73.5 percent for the low test milk.

These relationships can also be portrayed by showing the pounds of solids not fat per pound of butterfat in milk of various tests. For example, in the low test milk there were 2.77 pounds nonfat solids per pound of butterfat as contrasted with only 1.99 pounds in the high test milk.

Thus, factors that are positively related to the butterfat test of the milk are:

1. The percentage of solids not fat.
2. The percentage of total solids.

3. The proportion of the total solids made up of butterfat.

Factors that are inversely related to the fat test are:

1. The proportion of the total solids made up of nonfat.

2. The pounds of solids not fat per pound of butterfat.

These varying relationships between the components of milk of various tests and the varying relationships between the prices of the components, butter and nonfat dry milk, together with the premiums of Class I prices over the price of manufacturing milk complicate the problem of determining adequate differentials for milk of various tests.

Variability of Prices of the Components of Milk

The two components of milk differ greatly in price. With mandatory price supports there were marked differences in the variability of their prices.

For the twenty years prior to World War II, the price of butter and nonfat dry milk at New York City averaged 35.8 and 8.7 cents per pound respectively (table 15). The price of butter was 4.1 times that for nonfat. In the last two decades (1949-70), the price of nonfat averaged 100 percent higher than in the earlier period, while butter was only 77 percent higher. Even with the greater percentage increase in prices of nonfat dry milk than butter, the price of butter was still 3.6 times as great as the price of nonfat.

During the twenty years prior to World War II, the variability of the prices of the two components of milk was much the same, 25.1 and 23.0, respectively. This is in striking contrast to the postwar period when the coefficients of variability of the two prices were 6.6 and 20.6 respectively. In the recent period with mandatory price supports, the variability of butter prices was only about one-third as great as that for nonfat prices.

Due to the high correlation between Chicago prices and New York City prices, the variability of prices in the two areas is practically the same (table 15).

In the earlier years, the variable component of milk, butterfat, and the nonvariable component, solids not fat, had about equally variable prices. Since World War II, with mandatory price supports, the variable component of milk had stable prices while the nonvariable component had variable prices.

Butterfat Differential

A common method of computing a butterfat differential is to multiply the Chicago price of 92-score butter by 0.12. Since 1.2 pounds of butter can be made per pound of butterfat (20 percent overrun), multiplying the market price of butter by 1.2 merely represents the market value of the butter that can be made from a pound of butterfat. Butterfat differentials are expressed as a specified amount per point of butterfat, which is a tenth of a percent. (The difference between milk of 3.5 and 3.6 percent butterfat content is one point of butterfat). Thus, the differential per point gives the value of the additional butter that can be made from a hundredweight of milk for each additional point of butterfat. For each point variation in

TABLE 15. BUTTER AND NONFAT DRY MILK PRICES AND VARIABILITY OF PRICES AT NEW YORK AND CHICAGO SELECTED PERIODS, 1921-70

	Butter price		Nonfat dry milk price	
	Per pound	Coefficient of variability	Per pound	Coefficient of variability
New York City	*Cents*		*Cents*	
1921-40	35.8	25.1	8.7	23.0
1949-70	63.4	6.6	17.4	20.6
Chicago				
1949-50 to 1970-71[1]	62.7	6.9	16.2	22.4

[1] 9 months April to December 1970.

butterfat content, the solids not fat content varies 0.0434 percentage points[17].

Regular nonfat dry milk contains 97.0 percent solids not fat. There are, of course, some losses in manufacture. In this analysis it is assumed that one pound of nonfat dry milk can be produced for each additional pound of nonfat solids in the milk received from producers. Thus, multiplying the market price of nonfat dry milk per pound by 0.0434 gives the value of the additional nonfat dry milk that can be made for each additional point of butterfat.

Multiple Differential

In 1970 the price of butter at Chicago and the price of spray process nonfat dry milk Chicago area averaged 69.4 and 25.9 cents per pound respectively. Differentials applicable per hundredweight of milk per point of butterfat based on these prices would be as follows:

		Percent of total
Butterfat (butter X 0.12)	$0.083	88.3
Solids not fat (nonfat X 0.0434)	0.011	11.7
Multiple differential per point of butterfat	$0.094	100.0

The customary butterfat differential would be $0.083. A comparable differential for solids not fat per point of butterfat would be $0.011 and the total of the two, which might be termed a multiple differential or multiple component differential, would be $0.094. In this connection it is pertinent to note that even with the high prices of nonfat dry milk in 1970, 88 percent of the multiple differential of $0.094 was attributable to the butterfat differential and 12 percent to the solids not fat differential.

[17] See footnote 15.

Since both the butterfat differential and the nonfat solids differential are based on the market prices of the respective products, their relationship is not constant. During the 24 years 1947-70 the regular butterfat differential (based on Chicago butter X 0.12) varied between a low of $0.070 and a high of $0.090 (table 16). On the other hand, a solids not fat differential would have varied between a low of $0.005 and a high of $0.011. Thus, over the years, the magnitude of a multiple differential based on the market prices of butterfat and nonfat dry milk was due primarily to the butterfat component.

Regular Differential Versus Multiple Differential

Another way to portray the differences between the regular fat differential and a multiple differential is to indicate how much the price of 3.5 percent milk would be adjusted for tests from 3.0 to 4.5 percent. In 1970 the regular fat differential was $0.083, the solids not fat differential $0.011 and the multiple differential $0.094. Thus, for 3.0 percent milk the price would be lower than the 3.5 price by $0.415 on the basis of the regular differential and by $0.470 on the basis of the multiple differential. Thus, for milk testing below 3.5 percent, the price based on a multiple differential would be lower than that based on the customary fat differential. Conversely, the price of milk above 3.5 percent would be enhanced by the use of a multiple differential as compared with the regular fat differential.

These variations in adjustment in the basic price of 3.5 percent milk for the regular fat differential, a solids not fat differential and a multiple differential based on 1970 prices are summarized below: (figure 19).

	Adjustment in 3.5 price per hundredweight of milk for various differentials		
Test of milk	Regular fat diff. $0.083	Solids not fat diff. $0.011	Multiple diff. $0.094
	$	$	$
3.0	-0.415	-0.055	-0.470
3.5	0.000	0.000	0.000
4.0	+0.415	+0.055	+0.470
4.5	+0.830	+0.110	+0.940

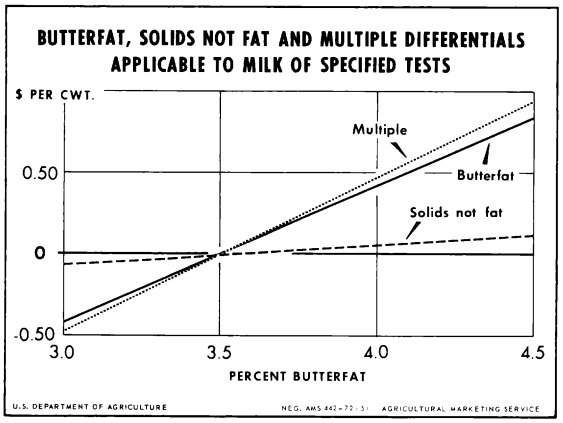

FIGURE 19.—Adjustments due to butterfat were much larger than those due to solids not fat.

In 1969 the price of manufacturing milk (3.5 percent) was $4.31. The same price adjusted to a 3.0 basis using the regular fat differential would have been $3.905 and using a multiple differential $3.855. Thus, the price based on the multiple differential was $0.050 less than the price based on the customary differential. During the 23-year period 1947-69 the price based on the multiple differential would have averaged $0.034 less than that based on the customary differential (table 17).

On the other hand, the price of manufacturing milk adjusted to a 4.5 percent basis using the multiple differential would always have been higher than that based on the regular fat differential. For example, in 1969 the price of manufacturing milk

TABLE 16. BUTTERFAT AND MULTIPLE COMPONENT DIFFERENTIALS BASED ON CHICAGO PRICES OF BUTTER AND CHICAGO AREA SPRAY PROCESS NONFAT DRY MILK 1947-70

Year	Butter times 0.12	Nonfat times 0.0434	Butter[1] -2.5¢ times 0.12	Nonfat[1] -4.6¢ times 0.0434	Differentials per point of butterfat Multiple component		
					Butterfat	Gross value of fat and SNF	Net value of fat and SNF
	$	$	$	$	$	$	$
1947	0.085	0.005	0.082	0.003	0.085	0.090	0.085
1948	0.090	0.007	0.087	0.005	0.090	0.097	0.092
1949	0.073	0.005	0.070	0.003	0.073	0.078	0.073
1950	0.074	0.005	0.071	0.003	0.074	0.079	0.074
1951	0.083	0.006	0.080	0.004	0.083	0.089	0.084
1952	0.087	0.007	0.084	0.005	0.087	0.094	0.089
1953	0.079	0.007	0.076	0.005	0.079	0.086	0.081
1954	0.072	0.007	0.069	0.005	0.072	0.079	0.074
1955	0.069	0.007	0.066	0.005	0.069	0.076	0.071
1956	0.071	0.007	0.068	0.005	0.071	0.078	0.073
1957	0.072	0.007	0.069	0.005	0.072	0.079	0.074
1958	0.070	0.006	0.067	0.004	0.070	0.076	0.071
1959	0.072	0.006	0.069	0.004	0.072	0.078	0.073
1960	0.071	0.006	0.068	0.004	0.071	0.077	0.072
1961	0.073	0.007	0.070	0.005	0.073	0.080	0.075
1962	0.070	0.006	0.067	0.004	0.070	0.076	0.071
1963	0.070	0.006	0.067	0.004	0.070	0.076	0.071
1964	0.071	0.006	0.068	0.004	0.071	0.077	0.072
1965	0.072	0.006	0.069	0.004	0.072	0.078	0.073
1966	0.080	0.008	0.077	0.006	0.080	0.088	0.083
1967	0.080	0.008	0.077	0.006	0.080	0.088	0.083
1968	0.080	0.010	0.077	0.008	0.080	0.090	0.085
1969	0.081	0.010	0.078	0.008	0.081	0.091	0.086
1970	0.083	0.011	0.080	0.009	0.083	0.094	0.089
Aver.	0.076	0.007	0.073	0.005	0.076	0.083	0.078

[1] The 2.5 cents is the making allowance per pound of butter and the 4.6 cents is the making allowance per pound of nonfat dry milk when the total making allowance is $0.48 per hundredweight of 3.5 milk. The derivation of these making allowances is set forth on page 31.

TABLE 17. PRICE OF MANUFACTURING MILK AT 3.5 TEST AND PRICE ADJUSTED TO 3.0 PERCENT AND 4.5 PERCENT TEST ON BASIS OF REGULAR BUTTERFAT DIFFERENTIAL AND MULTIPLE COMPONENT DIFFERENTIAL (GROSS VALUE) 1947-69

(dollars per hundredweight)

Year	Manufacturing milk 3.5 percent	3.0 Percent			4.5 Percent		
		Regular fat diff.	Multiple diff.	Multiple exceeds regular	Regular fat diff.	Multiple diff.	Multiple exceeds regular
	$	$	$	$	$	$	$
1947	3.37	2.945	2.920	-0.025	4.220	4.270	0.050
1948	3.84	3.390	3.355	-0.035	4.740	4.810	0.070
1949	2.80	2.435	2.410	-0.025	3.530	3.580	0.050
1950	2.87	2.500	2.475	-0.025	3.610	3.660	0.050
1951	3.52	3.105	3.075	-0.030	4.350	4.410	0.060
1952	3.71	3.275	3.240	-0.035	4.580	4.650	0.070
1953	3.20	2.805	2.770	-0.035	3.990	4.060	0.070
1954	2.90	2.540	2.505	-0.035	3.620	3.690	0.070
1955	2.90	2.555	2.520	-0.035	3.590	3.660	0.070
1956	2.99	2.635	2.600	-0.035	3.700	3.770	0.070
1957	3.02	2.660	2.625	-0.035	3.740	3.810	0.070
1958	2.93	2.580	2.550	-0.030	3.630	3.690	0.060
1959	2.95	2.590	2.560	-0.030	3.670	3.730	0.060
1960	3.05	2.695	2.665	-0.030	3.760	3.820	0.060
1961	3.15	2.785	2.750	-0.035	3.880	3.950	0.070
1962	3.03	2.680	2.645	-0.035	3.730	3.800	0.070
1963	3.06	2.710	2.680	-0.030	3.760	3.820	0.060
1964	3.13	2.775	2.745	-0.030	3.840	3.900	0.060
1965	3.21	2.850	2.820	-0.030	3.930	3.990	0.060
1966	3.82	3.420	3.380	-0.040	4.620	4.700	0.080
1967	3.91	3.510	3.465	-0.045	4.710	4.800	0.090
1968	4.08	3.680	3.630	-0.050	4.880	4.980	0.100
1969	4.31	3.905	3.855	-0.050	5.120	5.220	0.100
Av.	3.29	2.914	2.880	-0.034	4.052	4.120	0.068

on a 4.5 basis with the regular butterfat differential would have been $5.12 and with the multiple differential $5.22; in that year the multiple differential yielded a price of $0.10 higher. For the 23-year period as a whole the multiple differential yielded a 4.5 percent price which averaged $0.068 higher than that based on the regular fat differential (table 17).

These differences represent somewhere near the maximum differences which would occur. In 1969 there was only 0.4 of 1 percent of the milk in the New York pool which tested less than 3.1 percent butterfat and only 1.3 percent of the milk which tested 4.5 percent and over.

Multiple Differential Based on Net Value Versus Gross Value

The differentials previously described were based on the market value of the extra butter and extra nonfat dry milk that could be made from milk of 3.6 percent as compared to 3.5 percent butterfat. Such differentials might be designated as based on the gross value of the products because no making allowance was deducted.

Another way of calculating the differentials would be to deduct a making allowance from the market price of butter and nonfat dry milk and then calculate the differentials from these "net values".

In 1970 the Chicago price of butter was 69.4 cents. This price minus the making allowance of 2.5 cents was 66.9 cents. For the same period the price of nonfat dry milk was 25.9 cents and minus the making allowance of 4.6 cents was 21.3 cents. The butterfat differential and the nonfat differential based on the gross value and on the net values can be compared as follows:

	Gross value	Net value
Butterfat (regular fat differential)	$0.083	
Butterfat		$0.080
Solids not fat	0.011	0.009
Total multiple differential	0.094	0.089

The regular butterfat differential calculated from the market price of butter was $0.083, while the butterfat differential based on the net value of butter was $0.080. The two differentials for solids not fat were $0.011 and $0.009 respectively. Of course, the deduction of a making allowance from the market price resulted in the differentials based on net values being lower than those based on the gross values (table 16).

In all cases the solids not fat differential was small compared with the butterfat differential. This was due to the fact that the price of butterfat was about 4 times that for nonfat and that the butterfat content of milk is more variable than the solids not fat.

In some respects the differentials based upon the market price of butter and nonfat dry milk minus a making allowance attributable to each product gives a more realistic differential and reflects what handlers could afford to pay for the extra fat and solids not fat per point of butterfat for utilization of milk in butter and powder.

In this connection it is pertinent to note that for the 24-year period 1947-70, the multiple component differential based on the net value of fat and solids not fat averaged $0.078 as contrasted with the regular butterfat differential of $0.076. A multiple component differential based on net values of fat and solids not fat was often the same as the butterfat differential calculated by multiplying the price of butter by 0.12 and in no year did the multiple component differential based on net values exceed the customary butterfat differential by more than $0.006. There was a very minor difference between the two (table 16).

Thus it is clear that there would be only minor differences in prices based on the most equitable multiple differential and the customary or regular butterfat differential.

In the following analysis in comparing the differences between a customary butterfat differential and a multiple differential, the differentials based on the gross values will be used. This was done in order to portray the maximum difference.

Class I Price At Average Test

In order to appraise the net effect of a multiple differential versus the customary differential, it is essential to consider not only the relative magnitude of the two differentials over the years, but also the changes in the average test of milk.

The average test of Class I milk in Federal order markets declined from 3.80 percent in 1950 to 3.47 percent in 1969.

In 1950 the average price of Class I milk in Federal order markets was $4.34. In that year the customary butterfat differential (Chicago butter times 0.12) was $0.074, while the multiple component differential based on butter and solids not fat was $0.079. The average price of Class I milk at the average test was $4.562 with the customary differential and $4.577 with the multiple differential. The multiple differential yielded a price only $0.015 per hundredweight higher than the regular differential. This was the largest difference between the two for the entire period 1950-69 (table 18).

In 1969, when the average test was slightly below 3.5 and the Class I price was $6.42, the prices at the average test were $6.396 and $6.393, a trivial difference. Thus, as far as Class I prices are concerned a multiple differential would have had an insignificant effect on the average Class I price at the average test (table 18).

While the above differences are based on the average test of all markets, the effect in individual markets might be much greater because of the test of milk in the particular market area. In 1969 there were only 7 Federal order markets, or 11.7 percent of the total, which had Class I milk testing in excess of 3.59 percent butterfat (table 19). On the other hand, there were 20 markets, or one-third of the total, where the test was 3.39 percent or less.

In the lowest testing markets with an average butterfat test of 3.27 percent for Class I milk the

TABLE 18. PRICE OF CLASS I MILK FEDERAL ORDERS, AVERAGE BUTTERFAT TEST AND AVERAGE PRICE AT AVERAGE TEST BASED ON REGULAR BUTTERFAT AND MULTIPLE COMPONENT DIFFERENTIAL 1950-69

Year	Class I[1]		Price at average test		
	Price	Test	Regular fat differential	Multiple differential	Multiple exceeds regular
	$	Percent	$	$	$
1950	4.34	3.80	4.562	4.577	0.015
1951	4.96	3.68	5.109	4.120	0.011
1952	5.32	3.64	5.442	5.452	0.010
1953	4.88	3.62	4.975	4.983	0.008
1954	4.56	3.62	4.646	4.655	0.009
1955	4.65	3.58	4.705	4.711	0.006
1956	4.91	3.57	4.960	4.965	0.005
1957	4.86	3.57	4.910	4.915	0.005
1958	4.75	3.58	4.806	4.811	0.005
1959	4.75	3.58	4.808	4.812	0.004
1960	4.87	3.57	4.920	4.924	0.004
1961	4.91	3.56	4.954	4.958	0.004
1962	4.76	3.56	4.802	4.806	0.004
1963	4.78	3.53	4.801	4.803	0.002
1964	4.81	3.52	4.824	4.825	0.001
1965	4.89	3.52	4.904	4.906	0.002
1966	5.58	3.52	5.596	5.598	0.002
1967	5.85	3.50	5.850	5.850	0.000
1968	6.19	3.49	6.182	6.181	-0.001
1969	6.42	3.47	6.396	6.393	-0.003

[1] Average Class I price all Federal markets.

customary butterfat differential reduced the 3.5 price by $0.186, while the reduction with the multiple differential would have been $0.209. Thus, for the low testing markets the price of Class I milk at the average test would have been $0.023 less than it was with the customary differential. On the other hand, in the high testing markets averaging 3.83 percent butterfat, the price of Class I milk would have been $0.033 higher than with the customary differential.

These differences in the adjustments of the 3.5 price in the low testing markets and in the high testing markets to obtain the price at the average test can be summarized as follows:

	Class I percent fat	Adjustment in 3.5 price: Regular fat differential	Adjustment in 3.5 price: Component differential	Component exceeds regular
Low test markets	3.27	$-0.186	$-0.209	$-0.023
High test markets	3.83	0.267	0.300	0.033

As far as Class I prices are concerned, the use of a single differential which reflected both the butterfat and solids not fat content of milk as contrasted with the customary differential would have had only minor effects.

Producers New York Pool 1969

Producers differ widely in the average test of milk they produce. Thus, in analyzing the effect of a component differential in contrast to a regular

TABLE 19. FEDERAL ORDER MARKETS CLASSIFIED ACCORDING TO THE BUTTERFAT TEST OF CLASS I MILK 1969[1]

Butterfat test Class I milk	Markets		
Range percent	Average test percent	Number	Percent
3.10–3.19		0	0.0
3.20–3.29	3.27	4	6.7
3.30–3.39	3.35	16	26.7
3.40–3.49	3.44	17	28.2
3.50–3.59	3.52	16	26.7
3.60–3.69	3.64	3	5.0
3.70–3.79		0	0.0
3.80–3.89	3.83	4	6.7
Total		60	100.0

[1] Compiled from Federal Milk Order Market Statistics Annual Summary For 1969, Statistical Bulletin Number 453, Dairy Division, Consumer and Marketing Service, U.S. Department of Agriculture, pages 98-113 and 32-35, May 1970.

butterfat differential, it is pertinent to estimate the degree to which returns to individual producers would be affected.

In 1969, 14 percent of the 29,000 producers in the New York pool had milk testing between 3.40 and 3.49 percent (averaging 3.45) and 20 percent had milk testing between 3.50 and 3.59 (averaging 3.55). The weighted average uniform price in 1969 was $5.632. This price, adjusted to a 3.45 test, would have been $5.592 with the regular differential and $5.586 with the multiple differential. For this group of producers, the component differential lowered the price by $0.006; for the producers whose milk tested 3.55 percent the multiple differential would have enhanced the price by an equal amount. Thus, for 34 percent of the producers in the New York pool, the use of a multiple differential as contrasted with the regular differential would have altered their price by less than a cent per hundredweight (table 20). Furthermore, 60 percent of the producers would have had their price changed by less than two cents and 76 percent of the producers by less than three cents. Thus, it is clear that for the great majority of producers, the use of a multiple differential instead of a single butterfat differential would have affected their price by a relatively minor amount. With an average uniform price of $5.63, a three-cent difference is only about one-half of one percent. In 1969 the average test of milk produced in the United States was 3.67 percent. Due to the similarity in these tests, the data for the New York pool is indicative of results on a nationwide basis.

These differences and the percent of producers can be summarized as follows:

Difference in price	Percent of producers
1 cent or less	34.4
2 cents or less	59.7
3 cents or less	75.6
4 cents or less	84.6

During the period covered by this analysis the Secretary of Agriculture was required to support the price to producers for milk and butterfat at not less than 75 percent nor more than 90 percent of parity. The Agricultural Act of 1970 suspended until April 1, 1974 the mandatory requirement to support butterfat at not less than 75 percent of parity. Thus, future relationships between the support price of butter and the support price of nonfat dry milk may be considerably different from those in the past. If nonfat dry milk prices are increased in relation to butter the component differential would be enhanced in relation to the customary butterfat differential. Thus, the effect of a component differential might be greater in the future than that portrayed for the period 1947-70.

Separate Differentials for Butterfat and Solids Not Fat

In the preceding analysis the multiple component differential was based on the butterfat content of milk and the concomitant variation in the solids not fat content of milk. It was based on the relationship between the butterfat and solids not fat set forth in the equation[18]

$$SNF = 7.01 + 0.434F$$

The same investigators who developed this equation indicated that the standard error of estimate was 0.29. They also reported that when the specific gravity was included in the equation the standard error of estimate was reduced to 0.20.

$$SNF = 0.307 + 0.219F + 0.237L$$

where L is specific gravity in lactometer degrees

[18] op. cit.

TABLE 20. PRODUCERS IN THE NEW YORK POOL CLASSIFIED BY BUTTERFAT TEST OF THEIR MILK AND UNIFORM PRICE AT EACH TEST ADJUSTED ON BASIS OF REGULAR BUTTERFAT DIFFERENTIAL AND MULTIPLE COMPONENT DIFFERENTIAL, 1969

Butterfat test percent		Producers		Uniform price[2]		Multiple exceeds regular
Range[1]	Mid-point	Number[1]	Percent of total	Regular[3] differential $0.081	Multiple[3] differential $0.091	
				$	$	$
0.00-3.09	3.05[4]	198	0.6	5.268	5.222	-0.046
3.10-3.19	3.15	329	1.2	5.348	5.314	-0.034
3.20-3.29	3.25	819	2.8	5.430	5.404	-0.026
3.30-3.39	3.35	2,054	7.1	5.510	5.496	-0.014
3.40-3.49	3.45	4,130	14.3	5.592	5.586	-0.006
3.50-3.59	3.55	5,818	20.1	5.672	5.678	0.006
3.60-3.69	3.65	5,247	18.2	5.754	5.768	0.014
3.70-3.79	3.75	3,790	13.1	5.834	5.860	0.026
3.80-3.89	3.85	2,273	7.8	5.916	5.950	0.034
3.90-3.99	3.95	1,311	4.5	5.996	6.042	0.046
4.00-4.09	4.05	818	2.9	6.078	6.132	0.054
4.10-4.19	4.15	521	1.8	6.158	6.224	0.066
4.20-4.29	4.25	372	1.3	6.240	6.314	0.074
4.30-4.39	4.35	299	1.0	6.320	6.406	0.086
4.40-4.49	4.45	253	0.9	6.402	6.496	0.094
4.50 and over	4.55[5]	687	2.4	6.482	6.588	0.106
Total		28,919	100.0			

[1] Compiled from Market Administrator's Bulletin New York-New Jersey Milk Marketing Area, Volume 30, No. 8, page 22.
[2] Weighted average uniform price for 1969, 3.5 milk 201-210 mile zone $5.632.
[3] Regular differential, Chicago butter price times 0.12; multiple component differential, Chicago butter price times 0.12 plus Chicago area spray powder price times 0.0434.
[4] Not actual midpoint but one class interval below preceding class.
[5] One class interval above preceding class.

There are also indications that the solids not fat cannot be determined from the fat content alone with sufficient accuracy to warrant the payment of a single differential to reflect both the butterfat and solids not fat value of milk.[19] If differentials in addition to butterfat are to be paid for the solids not fat or other components of milk there would have to be a separate test. Many people in the industry believe that the technological advances in testing have developed methods where the nonfat solids or protein can be determined accurately at reasonable cost.

Thus, if there is need for differentials based on factors other than butterfat it is necessary to have separate differentials rather than a single one. Changing price relationships between the market values of the components of milk might stimulate this development.

[19] Stewart Johnson, Protein Price Differentials For Milk, Part II, Dairy Marketing, University of Connecticut, February 1971, p. 3

Differentials – General Considerations

Desirable characteristics of differentials might be summarized as follows:

1. To reflect back to individual producers in the price they receive for their milk the market value of the components of the milk which they sold to handlers.
2. To reflect in the price to handlers the differences in the market returns they can obtain for the butterfat and solids not fat in the milk which they receive from producers.

Thus, in order to carry out the principles outlined above, it is desirable to have:

1. Readily available market prices of each component for which differentials are paid. The value of butterfat can be computed from the market price of butter and the value of solids not fat from the market price of nonfat dry milk.
2. An efficient method, at reasonable cost, for determining the quantity of the component in producer milk for which the differential is paid. Reliable tests for butterfat have been available for many years and with the present technology other components of producer milk can be determined.
3. A differential based upon a component of milk which is variable enough so that the difference between high test producers and low test producers multiplied by the differential is a significant amount.
4. Differentials based on the same factors for which the standards for milk and other dairy products are expressed, that is, butterfat and solids not fat.

SUMMARY

A butterfat differential calculated by multiplying the price of butter by 0.12 (or approximately this amount) reflects the variation in the value of the butter that can be made from a hundredweight of milk per 0.1 percent variation in butterfat content.

The solids not fat content of milk varies with the butterfat content but not in direct proportion to it. On the average, the solids not fat content increases 0.434 percent per one percent increase in butterfat content.

With the marked increases in the price of nonfat dry milk in relation to butter there has been interest in a differential that would reflect the variation in the value of both the butter and nonfat dry milk that could be made from one hundred pounds of milk per 0.1 percent variation in butterfat content.

Based on Chicago prices in 1970, butter of 69.4 cents and nonfat dry milk of 25.9 cents per pound, the customary butterfat differential would be $0.083 while a solids not fat differential based on the concomitant variation in solids not fat content of the milk would be $0.011, and the multiple differential per point of butterfat $0.094. The butterfat portion of the multiple differential made up 88.3 percent of the total and the solids not fat 11.7 percent.

A multiple differential based upon the market prices of butter and nonfat dry milk might be designated as based on the gross value of the products because no making allowance was deducted. Multiple differentials could be calculated by deducting a making allowance from the market price of butter and a making allowance from the market price of the nonfat dry milk and then calculating a multiple differential based on these net values. This multiple differential varied little from the customary butterfat differential calculated by multiplying the price of butter by 0.12.

Over the years the average butterfat test of Class I milk declined, and in recent years it dropped below 3.5 percent. Based on the average test of Class I in 1950 of 3.80 percent, the use of a multiple differential would have increased the price at average test $0.015 per hundredweight. This was the maximum effect.

Based on the range in the butterfat test of milk actually delivered by producers under the New York-New Jersey pool, in 1969, the use of a multiple differential would have affected the price to 34 percent of the producers by less than 1 cent and to 85 percent of the producers by 4 cents or less per hundredweight.

The use of a multiple differential based on butterfat and the concomitant variation in solids not fat, based on average relationships, would have had minor effects on returns to producers, as contrasted with the use of the customary butterfat differential.

V. RETAIL PRICES OF DAIRY PRODUCTS

The prices at which CCC purchased butter, nonfat dry milk and Cheddar cheese were established so that plants making these products and competing among themselves and with other plants for milk supplies would pay, on the average, not less than the support price for manufacturing milk. Under milk orders the Class I price as well as the other class prices were minimums required to be paid by handlers.

Retail Prices and Prices Established by Supports and Marketing Orders

While CCC purchase prices and Class I prices were established primarily to assure certain returns to milk producers they had direct repercussions on the retail prices that consumers paid.

Butter

The butter price of interest to consumers is the price for quarter pound prints in the dairy case of the chain store, and not the price of solid pack butter in 62-68 pound blocks in carload lots as purchased by CCC.

There are marked differences between the two prices. For example, in 1970 the support price of butter was 70.2 cents, while the retail price in food stores was 86.6 cents per pound. Consumers paid 16.4 cents more than the support price; that is, they paid 123 percent of the support price. The higher price paid by consumers was for packaging and the marketing services involved in moving the butter from where it was produced to the dairy case in the chain store in the amounts required by consumers. The cost to the consumer of these marketing services was determined by competitive forces.

Since the price support program has been in effect the cost to consumers of marketing services that were superimposed on the support price were 18 to 27 percent of the support price. Over the years there has not been any pronounced tendency for the price of these marketing services to rise or to decline in relation to the support price (table 21).

Cheese

The price of processed American cheese in half pound cellophane-wrapped packages in the dairy case at the grocery store is a much different price than the one for Cheddars in carlots at Wisconsin assembly points. In 1970 the consumer price of cheese was 100.8 cents per pound while the support price was 51.0 cents. The consumer price was 198 percent of the support price.

Since the support program has been in effect, consumers increased their consumption of cheese and decreased their consumption of butter. Wholesale prices of cheese rose in relation to the support price and in relation to butter; milk was diverted from butter to cheese. In the case of cheese, the packaging and marketing services purchased by consumers were much greater in relation to the support price than for butter. While the support price was set by the Secretary, the packaging and marketing services which were, in reality, superimposed on the support price were established by competitive forces.

Since the support program has been in effect the consumer price has varied between a low of 180 and a high of 208 percent of the support price. The general tendency was for the consumer price of cheese to rise in relation to the support price (table 21).

Fluid Milk

Each milk marketing order provides for the establishment of Class I prices which handlers are required to pay producers for milk which the consumer buys as pasteurized milk. Consumers are interested in the price of pasteurized milk at grocery stores. In 1970 the retail price of milk in half gallon paper containers at stores averaged 57.4 cents. During the same year the Class I price for the amount of milk needed to fill a half gallon container was 29.1 cents. Consumers paid 197 percent of the Class I price established under marketing orders (table 22). For fluid milk the processing and distribution costs included in the retail price were about as great as the price of the raw milk. The price charged consumers for these marketing services is the result of competitive forces in the distribution industry.

TABLE 21. RETAIL PRICES AND SUPPORT PRICES OF BUTTER AND CHEESE 1949-70

(cents per pound)

Year	Butter				Cheese			
	Retail price	Support price	Retail minus support	Retail percent of support	Retail price	Support price	Retail minus support	Retail percent of support
1949	72.1	60.4	11.7	119.4		31.8		
1950	72.5	60.0	12.5	120.8	57.8	31.0	26.8	186.5
1951	81.4	64.5	16.9	126.2	66.0	34.8	31.2	189.7
1952	85.0	67.3	17.7	126.3	67.8	37.7	30.1	179.8
1953	78.9	66.8	12.1	118.1	67.8	37.3	30.5	181.8
1954	72.1	60.3	11.8	119.6	64.8	33.9	30.9	191.2
1955	70.4	58.2	12.2	121.0	64.4	33.2	31.2	194.0
1956	71.7	59.7	12.0	120.1	64.4	34.5	29.9	186.7
1957	73.7	60.4	13.3	122.0	65.0	35.0	30.0	185.7
1958	73.5	59.2	14.3	124.2	65.0	33.3	31.7	195.2
1959	74.4	58.8	15.6	126.5	65.2	32.8	32.4	198.8
1960	73.9	59.5	14.4	124.2	67.8	33.2	34.6	204.2
1961	75.2	61.2	14.0	122.9	71.8	35.9	35.9	200.0
1962	73.9	59.4	14.5	124.4	71.4	35.1	36.3	203.4
1963	73.6	58.8	14.8	125.2	71.4	35.4	36.0	201.7
1964	74.1	58.8	15.3	126.0	73.2	35.6	37.6	205.6
1965	74.8	59.5	15.3	125.7	74.8	36.0	38.8	207.8
1966	81.2	64.0	17.2	126.9	83.8	40.7	43.1	205.9
1967	83.1	67.2	15.9	123.7	87.2	43.8	43.4	199.1
1968	83.6	67.2	16.4	124.4	88.8	46.2	42.6	192.2
1969	84.6	68.2	16.4	124.0	94.0	47.8	46.2	196.7
1970	86.6	70.2	16.4	123.4	100.8	51.0	49.8	197.6

Consumers buy dairy products at prices which are determined partly by a government agency carrying out the provisions of legislative acts and partly by competitive forces.

Retail Prices Of Dairy Products Versus All Foods

With the unique price making forces in the dairy industry—that is, the prices handlers were required to pay for milk for manufacturing purposes as well as for milk for fluid use being largely determined by price actions taken by the Secretary of Agriculture—one might think that the trend in the retail prices of dairy products would be significantly different from the trend in the retail prices of all foods.

This, however, was not the case. The index number of the retail prices of all foods in 1970, with the years 1949-51 considered as 100, stood at 149 while the index number of the retail price of dairy products was 148. That is, for all practical purposes, the increase in the retail prices of dairy products was identical with that for all foods. In fact, there was a striking similarity in the price movements of the two groups of products during the entire period 1950-70 (table 23).

Retail Prices Of Individual Dairy Products Versus All Foods

A single index of the retail prices of dairy products obliterates the divergent trends in the prices of the individual items.

During the period that the dairy price support program and the marketing order program were both in effect the general trend in retail prices of fluid milk, evaporated milk, American cheese and cottage cheese was upward. This trend was not unique because the general trend of retail prices of

TABLE 22. RETAIL PRICE OF MILK AT STORES IN PAPER CONTAINERS AND AVERAGE CLASS I PRICE FEDERAL ORDER MARKETS, 1947 - 70

(cents per half gallon)

Year	Retail price	Class I price[1]	Retail minus Class I	Retail percent of Class I
1947	34.5	19.9	14.6	173.4
1948	38.4	22.4	16.0	171.4
1949	36.7	19.1	17.6	192.1
1950	35.7	19.1	16.6	186.9
1951	40.2	21.8	18.4	184.4
1952	42.1	23.4	18.7	179.9
1953	41.8	21.4	20.4	195.3
1954	41.3	20.0	21.3	206.5
1955	41.5	20.4	21.1	203.4
1956	42.8	21.6	21.2	198.1
1957	44.5	21.3	23.2	208.9
1958	45.5	20.9	24.6	217.7
1959	46.1	20.9	25.2	220.6
1960	47.4	21.4	26.0	221.5
1961	47.5	21.6	25.9	219.9
1962	47.4	20.9	26.5	226.8
1963	47.4	21.0	26.4	225.7
1964	47.6	21.1	26.5	225.6
1965	46.9	21.5	25.4	218.1
1966	49.7	24.5	25.2	202.9
1967	51.6	25.7	25.9	200.8
1968	53.7	27.2	26.5	197.4
1969	55.1	28.2	26.9	195.4
1970	57.4	29.1	28.3	197.3

[1] Price of 4.39 pounds of Class I milk.

all foods was upward. A dairy product which showed a unique trend at retail was butter which was relatively stable at a low level from the mid-fifties to the mid-sixties and then showed a modest increase. Ice cream also differed greatly from the other dairy products, in that it declined in price from the early fifties to the mid-sixties and then showed only a minor increase (figure 20).

Under the support program the price of nonfat dry milk was raised more than any other dairy product. However, retail prices of nonfat dry milk are not available.

More important than the actual prices of the individual dairy products is their price in relation to all foods. In order to facilitate comparison and to show the major changes which have occurred since

TABLE 23. INDEX NUMBERS OF RETAIL PRICES OF DAIRY PRODUCTS AND ALL FOODS[1] 1947-70

(1949-51 = 100)

Year	Dairy products	All foods	Year	Dairy products	All foods
1947	96.7	91.8	1959	114.4	113.2
1948	106.3	99.5	1960	116.9	114.4
1949	96.9	95.6	1961	118.7	115.8
1950	95.9	96.8	1962	117.9	116.9
1951	107.0	107.7	1963	117.6	118.6
1952	111.6	109.6	1964	118.6	120.1
1953	109.6	107.9	1965	118.9	122.8
1954	106.1	107.7	1966	126.6	128.9
1955	106.0	106.1	1967	132.2	130.0
1956	108.7	106.9	1968	136.6	134.7
1957	111.9	110.4	1969	141.0	141.6
1958	113.6	115.0	1970	147.8	149.4

[1] Calculated from U.S. Bureau of Labor Statistics Index Numbers of Retail Prices of Dairy Products and all Foods on a 1957-59 base.

these dairy programs have been in effect, index numbers of the deflated prices were calculated for each product using the years 1949-51=100. The index of the deflated price of milk rose to a high of 110 in 1960. During the following decade, however, the general trend was downward and in 1970 it was 102. In two decades there was little net change in the price of milk in relation to all foods. Evaporated milk, on the other hand, showed a moderate decline.

The deflated price of American cheese had an unusual pattern. It declined during the fifties and in 1958, at 91, was the lowest in two decades. Thereafter it rose and in 1970, at 109, was the highest of any dairy product. Cottage cheese, however, was much more stable and showed only minor variations in relation to all foods.

The general trend in the deflated price of butter was downward throughout the entire period. It dropped from 116 in 1947 to 77 in 1970. Ice cream was the other dairy product with a sharp downward trend. In 1970 it was about 65 percent as high as in the early fifties (figure 21).

Even though the Secretary has unusual powers in regard to the prices of dairy products, cheese is the only one which has increased in price significantly in relation to all foods. Milk showed practically no net change. The retail prices of cottage cheese and evaporated milk showed modest declines while butter and ice cream showed major declines.

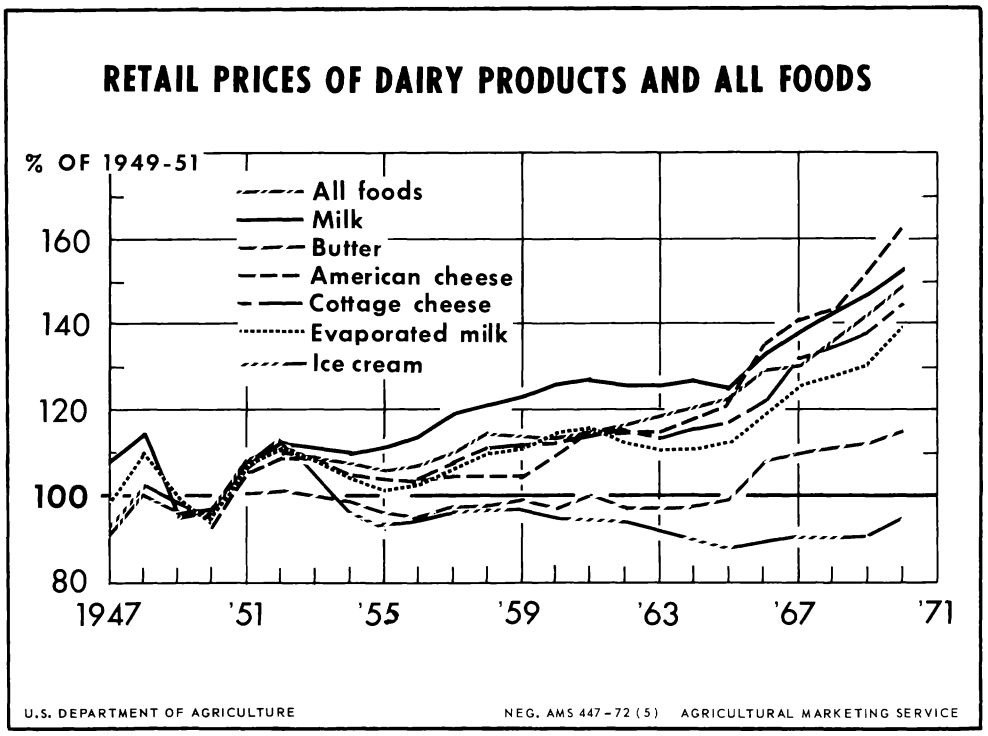

FIGURE 20.—During the two decades 1950-70 the increases in retail prices of American cheese, cottage cheese, fluid milk and evaporated milk were somewhat similar. Butter showed only a modest increase and ice cream declined.

The index numbers of the actual prices of dairy products and the deflated prices for 1970 when 1949-51=100 are summarized as follows:

	Actual price	Deflated price
Fluid milk	153	102
Butter	115	77
Cheese (American process)	163	109
Evaporated milk	140	93
Ice cream	95	64
Cottage cheese	145	97
All foods	149	100

Lowfat Milks, Prices and Nutrients

During the sixties there was a decline in the consumption of regular milk and a phenomenal increase in the consumption of lowfat milks. This shift naturally raises the question about the retail prices of lowfat milks and skim milk as compared with regular milk. The retail prices of these products at stores in half gallon paper containers were tabulated from USDA's Fluid Milk And Cream Report for all markets where the three prices were reported and are summarized as follows:

	1967	1968	1969	1970	Ave.
	cents per half gallon				
Milk	51.4	52.8	55.1	57.3	54.2
Lowfat milks	50.0	50.7	52.5	55.0	52.0
Skim milk	45.5	46.8	49.1	51.8	48.3
	Amount less than whole milk (cents per half gallon)				
Lowfat	1.4	2.1	2.6	2.3	2.2
Skim milk	5.9	6.0	6.0	5.5	5.9
	Percent of whole milk price				
Lowfat	97.3	96.0	95.3	96.0	95.9
Skim milk	88.5	88.6	89.1	90.4	89.1

The price of lowfat milks averaged 2.2 cents per half gallon less than whole milk, while the price of skim milk averaged 5.9 cents less. The price differences certainly were large enough to cause some shift.

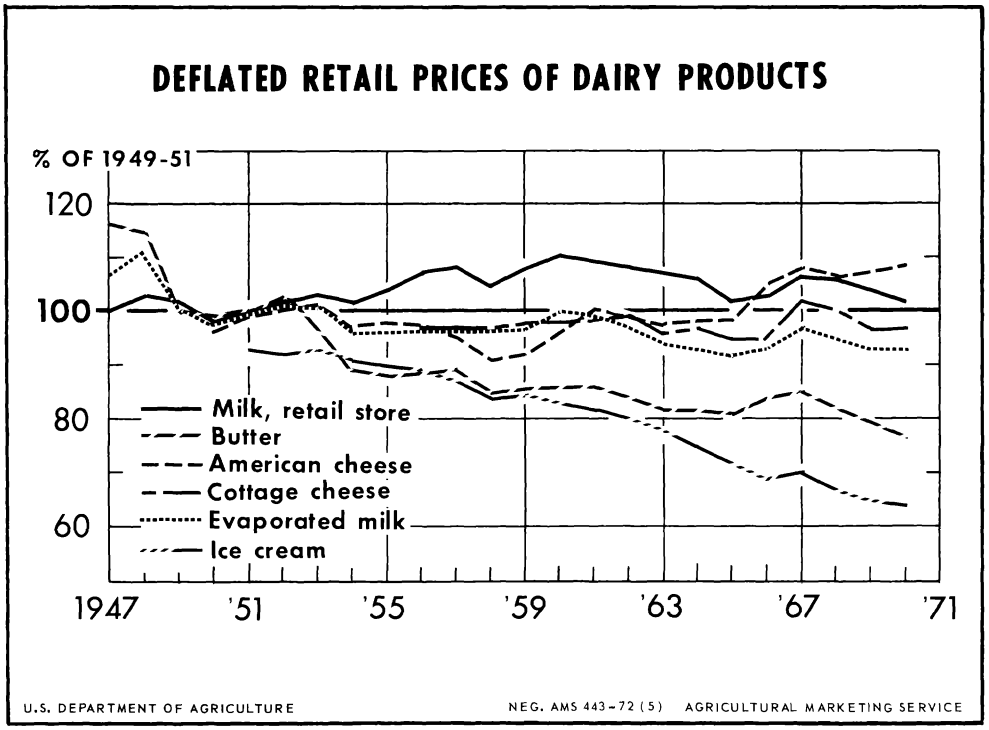

FIGURE 21.—During the period 1950-70 there was little net change in the deflated prices of milk, evaporated milk, American cheese and cottage cheese, but marked declines in butter and ice cream.

While it is easy enough to record the price differences, the real question is what is the consumer getting for his money at these price differences.

The calories in a quart of skim milk, 0.1 percent butterfat, was about 56 percent as great as in a quart of whole milk. The butterfat and the vitamin A in the skim milk was only 3 percent as great as in the whole milk (table 24). However, for all the other nutrients: protein, carbohydrates; minerals: calcium, phosphorous, iron, sodium, potassium; and the vitamins: thiamine, riboflavin, niacin and ascorbic acid, there was practically the same amount in the skim milk as in the whole milk. If a person wanted to reduce his intake of calories and butterfat, but maintain his intake of the other ingredients of milk, he could do so by shifting to skim milk from whole milk, and, in addition, obtain the skim milk at nearly 10 percent less cost than the whole milk (table 25).

On the other hand, a person could shift from whole milk to lowfat milk, 2 percent fat with added solids, and obtain practically the same number of calories, energy, per quart with about half of the fat and vitamin A, but about the same amount of iron and ascorbic acid, roughly 20 percent more protein and carbohydrates, 20 percent more minerals, calcium, phosphorous, sodium and 20 percent more thiamin and riboflavin and 50 percent more niacin. This could be done and with a saving of about one cent a quart. Depending on the objectives in altering the diet, this might be an attractive shift.

The rapid increase in consumption of lowfat milks and the concomitant decline in whole milk were undoubtedly stimulated by what the consumer obtained for his money in these three products, which can be substituted for one another. It is not known how much of the shift was due to the relative prices and how much was due to a better knowledge of nutrition and conscious efforts to decrease the consumption of certain nutrients, and increase others.

TABLE 24. FOOD NUTRIENTS PER QUART OF REGULAR MILK, SKIM MILK AND LOWFAT MILK WITH ADDED SOLIDS[1]

Nutrient	Regular milk 3.5 percent fat	Skim milk 0.1 percent fat	Lowfat milk 2.0 percent[2] fat	Percent of regular milk	
				Skim	Lowfat
Energy calories	634	352	582	56	92
Protein grams	34.2	35.2	41.4	103	121
Fat grams	34.2	1.1	19.7	3	58
Carbohydrates grams	47.7	49.9	59.0	105	124
Calcium mg.	1,150	1,186	1,408	103	122
Phosphorous mg.	907	931	1,102	103	121
Iron mg.	0.4	0.4	0.4	100	100
Sodium mg.	488	510	601	105	123
Potassium mg.	1,406	1,421	1,723	101	123
Vit. A value Int. units	1,398	43	803	3	57
Thiamine mg.	0.32	0.35	0.41	109	128
Riboflavin mg.	1.68	1.73	2.04	103	121
Niacin mg.	0.6	0.6	0.9	100	150
Ascorbic acid mg.	11	11	11	100	100

[1] Compiled from Composition of Foods Agricultural Handbook No. 8, Agricultural Research Service, U.S. Department of Agriculture, page 96, December 1963.
[2] With 2 percent nonfat milk solids added.

TABLE 25. PRICES OF MILK, LOWFAT MILK AND SKIM MILK AT STORES IN HALF GALLON PAPER CONTAINERS, UNITED STATES, 1967-71[1]

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Aver.
Whole milk (cents per half gallon)													
1967	51.2	52.0	50.7	50.7	50.5	50.3	51.3	51.3	52.0	52.5	52.3	52.6	51.4
1968	52.8	51.3	51.3	51.6	52.2	52.5	53.3	53.6	53.6	53.9	53.9	53.9	52.8
1969	54.4	54.9	54.5	54.5	54.6	54.5	55.2	55.5	56.0	55.9	55.7	55.8	55.1
1970	56.5	56.6	56.8	56.8	57.1	57.1	57.3	57.5	57.6	57.8	57.8	58.3	57.3
1971	58.1	58.1	58.1	58.4	58.4	58.6	58.6	58.7	58.6	58.5	58.4	58.3	58.4
Lowfat milk (cents per half gallon)													
1967	49.1	50.0	49.9	49.9	49.2	49.8	50.5	49.9	50.2	50.4	50.3	50.7	50.0
1968	50.7	49.4	49.4	49.4	49.8	50.6	50.9	51.1	51.4	51.8	51.8	51.8	50.7
1969	52.0	52.6	51.9	51.9	52.3	51.9	52.5	52.5	53.3	53.1	53.0	53.1	52.5
1970	54.2	54.4	54.6	54.6	54.6	54.8	55.0	55.2	55.2	55.6	55.5	56.0	55.0
1971	56.0	55.9	55.8	55.9	56.2	56.4	56.6	56.7	56.7	56.5	56.5	56.4	56.3
Skim milk (cents per half gallon)													
1967	45.1	45.8	45.6	45.4	44.7	44.4	44.5	45.5	45.6	46.4	46.3	46.6	45.5
1968	46.8	45.6	45.6	45.8	46.3	46.6	46.7	46.9	47.3	47.8	47.8	47.8	46.8
1969	48.3	49.1	48.7	48.8	49.0	48.6	49.1	49.2	49.9	49.6	49.7	49.7	49.1
1970	50.8	51.1	51.4	51.4	51.4	51.7	51.9	52.1	52.1	52.4	52.4	52.7	51.8
1971	52.8	52.6	52.6	52.7	52.8	52.9	53.2	53.2	53.3	53.3	53.4	53.3	53.0
Amount lowfat milk was less than whole milk (cents per half gallon)													
1967	2.1	2.0	0.8	0.8	1.3	0.5	0.8	1.4	1.8	2.1	2.0	1.9	1.4
1968	2.1	1.9	1.9	2.2	2.4	1.9	2.4	2.5	2.2	2.1	2.1	2.1	2.1
1969	2.4	2.3	2.6	2.6	2.3	2.6	2.7	3.0	2.7	2.8	2.7	2.7	2.6
1970	2.3	2.2	2.2	2.2	2.5	2.3	2.3	2.3	2.4	2.2	2.3	2.3	2.3
1971	2.1	2.2	2.3	2.5	2.2	2.2	2.0	2.0	1.9	2.0	1.9	1.9	2.1
Amount skim milk was less than whole milk (cents per half gallon)													
1967	6.1	6.2	5.1	5.3	5.8	5.9	6.8	5.8	6.4	6.1	6.0	6.0	5.9
1968	6.0	5.7	5.7	5.8	5.9	5.9	6.6	6.7	6.3	6.1	6.1	6.1	6.0
1969	6.1	5.8	5.8	5.7	5.6	5.9	6.1	6.3	6.1	6.3	6.0	6.1	6.0
1970	5.7	5.5	5.4	5.4	5.7	5.4	5.4	5.4	5.5	5.4	5.4	5.6	5.5
1971	5.3	5.5	5.5	5.7	5.6	5.7	5.4	5.5	5.3	5.2	5.0	5.0	5.4
Percent price of lowfat milk was of whole milk													
1967	95.9	96.2	98.4	98.4	97.4	99.0	98.4	97.3	96.5	96.0	96.2	96.4	97.3
1968	96.0	96.3	96.3	95.7	95.4	96.4	95.5	95.3	95.9	96.1	96.1	96.1	96.0
1969	95.6	95.8	95.2	95.2	95.8	95.2	95.1	94.6	95.2	95.0	95.2	95.2	95.3
1970	95.9	96.1	96.1	96.1	95.6	96.0	96.0	96.0	95.8	96.2	96.0	96.1	96.0
1971	96.4	96.2	96.0	95.7	96.2	96.2	96.6	96.6	96.8	96.6	96.7	96.7	96.4
Percent price of skim milk was of whole milk													
1967	88.1	88.1	89.9	89.5	88.5	88.3	86.7	88.7	87.7	88.4	88.5	88.6	88.5
1968	88.6	88.9	88.9	88.8	88.7	88.8	87.6	87.5	88.2	88.7	88.7	88.7	88.6
1969	88.8	89.4	89.4	89.5	89.7	89.2	88.9	88.6	89.1	88.7	89.2	89.1	89.1
1970	89.9	90.3	90.5	90.5	90.0	90.5	90.6	90.6	90.5	90.7	90.7	90.4	90.4
1971	90.9	90.5	90.5	90.2	90.4	90.3	90.8	90.6	91.0	91.1	91.4	91.4	90.8

[1] Compiled from Fluid Milk and Cream Report. Each city for which there was reported a price at stores in half gallon paper containers for whole milk, lowfat milk and skim milk was included.

SUMMARY

The prices established by the U.S. Department of Agriculture to be paid to producers for fluid milk and to manufacturers of butter, cheese and nonfat dry milk have direct effects on prices paid by consumers. The prices paid by consumers include the price for many processing, packaging and marketing services which are determined by competitive forces and are superimposed on the prices established by USDA.

The retail price of milk at stores averaged about twice as great as the Class I price required to be paid producers. The retail price for process American cheese was about double the support price for Cheddar cheese. On the other hand, the retail price for butter was only 25 percent greater than the support price.

With the single exception of ice cream, there were marked increases in the retail prices of milk, American cheese, cottage cheese, evaporated milk and butter, during the period 1947-70. These increases were not unique since retail prices of all foods rose, particularly during the sixties.

American cheese is the only dairy product whose price has risen significantly in relation to all foods. The retail price of milk rose in relation to all foods during the fifties, but declined during the sixties, so that there was little net change during two decades. The retail price of cottage cheese and evaporated milk declined slightly in relation to all foods, while butter and ice cream declined sharply.

During the last 4 years the retail price of lowfat milks averaged about 4 percent less than whole milk while skim milk averaged 10 percent less.

VI. CONSUMPTION OF BUTTERFAT AND SOLIDS NOT FAT IN FLUID MILK PRODUCTS AND MANUFACTURED MILK PRODUCTS

Since Class I prices are established primarily by adding a differential to the price of manufacturing milk, the question arises as to the consumption of the products included in Class I as contrasted to those products made from manufacturing milk and the surplus from fluid markets.

The nutritionists, in recommending the use of certain amounts of milk, say that the milk may be whole milk, lowfat milk, skim milk, buttermilk, evaporated milk or nonfat dry milk. Then they go a step further and say that a certain amount of ice cream may be substituted for milk and a certain amount of cheese may be substituted for milk.

Under milk marketing orders whole milk, lowfat milks, skim milk, buttermilk and milk drinks are included in Class I. However, evaporated milk, nonfat dry milk, ice cream and cheese are included in Class II. Thus, the interchangeability that the nutritionists mention is not only among the products included in the same class, but also among products in different classes.

Butterfat

Furthermore, since there were such marked changes in the relationships between the prices of the two components of milk, butterfat and solids not fat, it is necessary to determine the consumption of each component in products priced at approximately the manufacturing milk price level, as well as at the Class I price level in order to portray some of the most significant changes.

Fluid Milk Products—Class I

The authors of the USDA publication "The Dairy Situation" have published an excellent series of data entitled "Fluid Milk Product Sales, Various Measures, United States 1950-68".[20] The volume of fluid milk products, product weight, is given in three categories: (1) fluid whole milk, (2) lowfat milk, which includes skim milk, buttermilk and flavored milk drinks, and (3) cream which includes milk and cream mixtures. In all Federal orders the first two categories, whole milk and lowfat milks, are included in Class I. Furthermore, in most Federal orders, fluid cream, including milk and cream mixtures, is included in Class I. These data on fluid milk product sales are for the country as a whole. The milk used by farm families as fluid milk and cream on farms where the milk was produced was not included. The per capita data were determined by dividing the total sales by the population using fluid milk products from purchased sources. The butterfat content and the solids not fat content of these fluid milk products was also reported.

The definition of fluid milk products is not precisely synonymous with the definition of Class I products in Federal orders, though the difference is relatively small. The sales of fluid milk products are, for all practical purposes, an accurate measure of the total Class I volume on a nationwide basis, including both regulated and nonregulated markets. In this analysis the "sales of fluid milk products" and the volume of Class I milk are considered synonymous.

The data on fluid milk product sales were published in the Dairy Situation for the period 1950 to date. In this analysis they were extended back to 1924. While the data for the period 1924-49 cannot be considered as accurate as those for 1950 to date, it is believed that the earlier data do portray the major changes that took place.

From the mid-twenties to the outbreak of World War II, there was a modest increase in the per capita consumption of butterfat in fluid milk products. This was followed by an abrupt increase during the war period when a combination of factors resulted in the "Golden Age" for milk consumption. Many foods were rationed but milk was not, subsidies to milk dealers and milk producers and ceiling prices kept the retail price of milk low. Immediately after the end of the wartime controls there were 3 years of relatively sharp decline and then a period of stability until the late fifties. Since then there was a

[20] U.S. Department of Agriculture, Economic Research Service, Dairy Situation, May 1969, p. 21.

steady and persistent decline which accompanied the decline in consumption of cream and whole milk and the rapid expansion in the use of lowfat milks. In the late sixties the per capita consumption of butterfat in Class I products was lower than it was in the depression of the thirties (table 26, figure 22).

Manufactured Products—Class II

The butterfat content and the solids not fat content of the consumption of condensed and evaporated milk (case goods), all cheeses including cottage cheese and all frozen desserts including ice cream, ice milk, sherbet and so on, and butter were calculated and then reduced to a per capita basis. USDA donations of manufactured products purchased under the support program were not included in consumption. The purpose in this analysis was to measure consumption from commercial sources only. All of the individual items included in fluid milk products can be purchased in food stores. In order to have comparable data for the manufactured products only those which are packed in

TABLE 26. PER CAPITA CONSUMPTION OF BUTTERFAT IN FLUID MILK PRODUCTS (CLASS I) AND MANUFACTURED DAIRY PRODUCTS (CLASS II) UNITED STATES, 1920-70

Year	Fluid[1] milk products	Manufactured products[2]						Grand total	Percent	
		Evap.[3]	Nonfat dry[4]	All[5] cheese	Ice cream[6]	Butter	Total		Fluid products	Manufactured products
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*		
1920		0.6		1.2	0.8	11.9	14.5			
1921		0.7		1.3	0.8	13.1	15.9			
1922		0.8		1.3	0.9	13.7	16.7			
1923		0.8		1.4	1.0	14.3	17.5			
1924	9.7	0.9		1.4	1.0	14.3	17.6	27.3	35.5	64.5
1925	9.9	0.8		1.4	1.1	14.5	17.8	27.7	35.7	64.3
1926	10.1	0.8		1.4	1.0	14.7	17.9	28.0	36.1	63.9
1927	10.2	0.8		1.4	1.1	14.7	18.0	28.2	36.2	63.8
1928	10.5	0.9		1.4	1.1	14.1	17.5	28.0	37.5	62.5
1929	10.8	0.9		1.4	1.2	14.1	17.6	28.4	38.0	62.0
1930	10.8	1.0		1.4	1.1	14.1	17.6	28.4	38.0	62.0
1931	10.7	1.0		1.4	0.9	14.7	18.0	28.7	37.3	62.7
1932	10.8	1.0		1.4	0.7	14.8	17.9	28.7	37.6	62.4
1933	10.6	1.0		1.4	0.7	14.6	17.7	28.3	37.5	62.5
1934	10.0	1.1		1.5	0.8	14.5	17.9	27.9	35.8	64.2
1935	10.2	1.2		1.6	0.9	14.1	17.8	28.0	36.4	63.6
1936	10.6	1.1		1.7	1.0	13.5	17.3	27.9	38.0	62.0
1937	10.6	1.2		1.7	1.2	13.4	17.5	28.1	37.7	62.3
1938	10.6	1.3		1.8	1.1	13.1	17.3	27.9	38.0	62.0
1939	10.7	1.3		1.8	1.2	13.3	17.6	28.3	37.8	62.2
1940	10.8	1.4		1.8	1.3	13.4	17.9	28.7	37.6	62.4
1941	10.8	1.4		1.8	1.6	13.0	17.8	28.6	37.8	62.2
1942	11.6	1.6		2.1	1.8	13.1	18.6	30.2	38.4	61.6
1943	12.1	1.7		1.8	1.6	10.7	15.8	27.9	43.4	56.6
1944	12.7	1.8		2.0	1.7	11.2	16.7	29.4	43.2	56.8
1945	13.8	1.8		2.1	1.9	9.9	15.7	29.5	46.8	53.2
1946	13.6	1.4		2.1	2.6	8.7	14.8	28.4	47.9	52.1
1947	12.8	1.5		2.1	2.3	9.1	15.0	27.8	46.0	54.0
1948	12.4	1.5	0.0	2.2	2.1	8.2	14.0	26.4	47.0	53.0
1949	12.4	1.4	0.0	2.2	2.0	8.5	14.1	26.5	46.8	53.2

Continued

TABLE 26. (Cont'd.) PER CAPITA CONSUMPTION OF BUTTERFAT IN FLUID MILK PRODUCTS AND MANUFACTURED DAIRY PRODUCTS UNITED STATES, 1920-70

Year	Fluid[1] milk products	Manufactured products[2]						Grand total	Percent	
		Evap.[3]	Nonfat dry[4]	All[5] cheese	Ice cream[6]	Butter	Total		Fluid products	Manufactured products
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*		
1950	12.4	1.5	0.0	2.4	2.0	8.7	14.6	27.0	45.9	54.1
1951	12.4	1.4	0.0	2.3	2.1	8.0	13.8	26.2	47.3	52.7
1952	12.4	1.3	0.0	2.4	2.1	7.1	12.9	25.3	49.0	51.0
1953	12.3	1.3	0.0	2.3	2.2	6.8	12.6	24.9	49.4	50.6
1954	12.3	1.2	0.0	2.4	2.1	7.0	12.7	25.0	49.2	50.8
1955	12.4	1.2	0.0	2.3	2.2	6.8	12.5	24.9	49.8	50.2
1956	12.4	1.1	0.0	2.4	2.2	6.6	12.3	24.7	50.2	49.8
1957	12.3	1.1	0.0	2.3	2.2	6.5	12.1	24.4	50.4	49.6
1958	12.0	1.0	0.0	2.4	2.2	6.1	11.7	23.7	50.6	49.4
1959	11.8	1.0	0.0	2.5	2.3	5.9	11.7	23.5	50.2	49.8
1960	11.6	0.9	0.0	2.6	2.2	5.7	11.4	23.0	50.4	49.6
1961	11.2	0.9	0.0	2.7	2.2	5.3	11.1	22.3	50.2	49.8
1962	11.1	0.8	0.0	2.6	2.2	5.3	10.9	22.0	50.5	49.5
1963	11.1	0.8	0.0	2.7	2.3	4.9	10.7	21.8	50.9	49.1
1964	11.0	0.7	0.0	2.8	2.3	4.9	10.7	21.7	50.7	49.3
1965	10.9	0.7	0.0	2.9	2.3	4.7	10.6	21.5	50.7	49.3
1966	10.7	0.6	0.0	3.0	2.3	4.4	10.3	21.0	51.0	49.0
1967	10.4	0.6	0.0	3.0	2.3	4.0	9.9	20.3	51.2	48.8
1968	10.1	0.5	0.0	3.1	2.3	4.0	9.9	20.0	50.5	49.5
1969	9.8	0.5	0.0	3.2	2.3	3.7	9.7	19.5	50.3	49.
1970[7]	9.5	0.4	0.0	3.5	2.3	3.5	9.7	19.2	49.5	50.5

[1] Data for 1950-70 compiled from the Dairy Situation, for 1924-49, estimated. Includes fluid whole milk, fluid skim milk, buttermilk, lowfat milks, flavored milk drinks, cream and milk and cream mixtures.
[2] Manufactured products used in homes.
[3] Includes evaporated milk case goods, sweetened condensed milk case goods and evaporated skim milk case goods.
[4] Includes nonfat dry milk, dry whole milk and dry buttermilk in consumer packages and prepared dry mixes and sales to institutions.
[5] Includes American cheese, other cheese, cottage cheese and skim milk cheese.
[6] Includes ice cream, ice milk, milk sherbet, other frozen dairy products and "mellorine-type" frozen desserts.
[7] Preliminary.

consumer packages were included. For example, condensed and evaporated milk, case goods were included but plain condensed whole milk and plain condensed skim milk in bulk were not.

Except for a decline in the depression years of the thirties the per capita consumption of butterfat in manufactured dairy products, exclusive of butter, showed a marked upward trend, rising from about 3 pounds in the early twenties to about 6 pounds at the end of the War. Thereafter, it leveled off and was unusually stable for 25 years. The stability in the per capita consumption of butterfat in manufactured products that can be used in place of milk or substituted for milk is in striking contrast to the decline in butterfat consumption in Class I products.

In the earlier years, the twenties and thirties, the per capita consumption of butterfat in the form of butter greatly exceeded the consumption in either fluid milk products or manufactured products except butter, i.e., evaporated milk, cheese and ice cream. However, since the early forties the consumption of butter declined rapidly and persistently and during the last 5 years was only 28 percent as

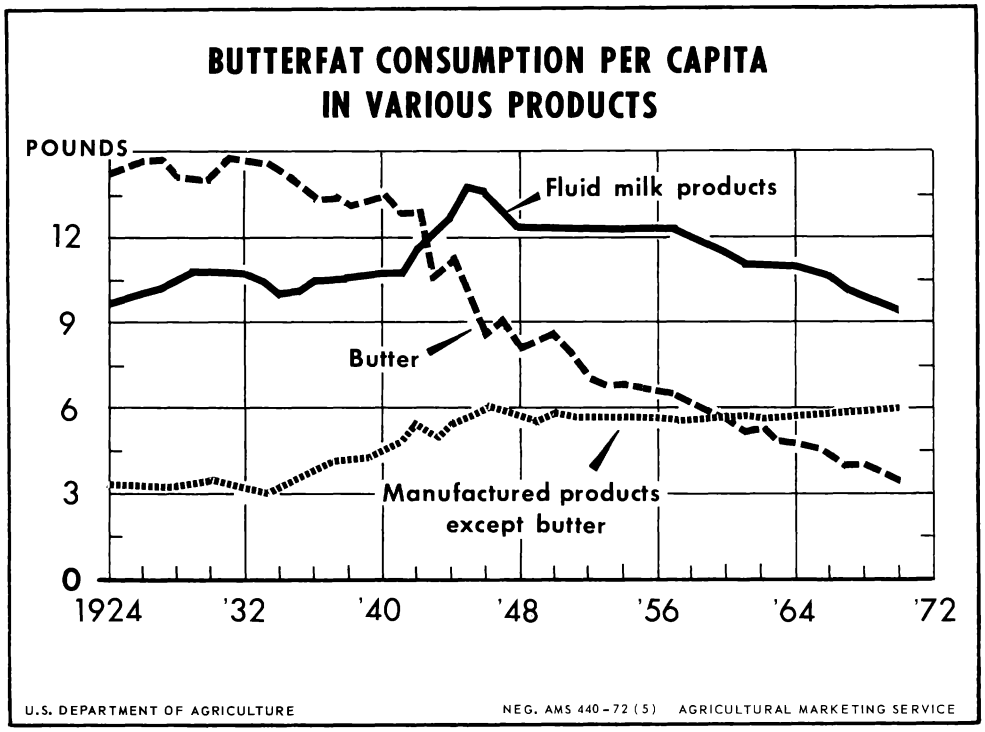

FIGURE 22.—Since the end of World War II there were drastic declines in consumption of butterfat in the form of butter and fluid milk products, but stable consumption in manufactured products except butter.

large as in the earlier years. In recent years the consumption of butterfat in the form of butter was decidedly less than in either other manufactured products or Class I (table 26, figure 22).

The use of butterfat in what were the two major forms of consumption, butter and fluid milk, declined drastically since the end of World War II. It was only in manufactured products exclusive of butter where consumption was stable.

Evaporated Milk, Cheese, Ice Cream

Combining the consumption of butterfat in condensed and evaporated milk, all cheeses and frozen desserts into one figure covers up some of the striking shifts which took place. Except for a decline in ice cream consumption during the depression of the thirties, there was an upward trend in the per capita consumption of butterfat in each of these three products during the twenties and thirties. During 1944-45 there was a striking similarity in the consumption of butterfat in these three products, canned milk 1.8 pounds, frozen desserts 1.8 and cheese 2.0 pounds.

Thereafter the similarity disappeared, and since then each product has had a separate trend. The peak in evaporated consumption (butterfat basis) occurred in 1944-45 and since then the trend has been consistently downward, with consumption in 1969-70 being only about one-quarter as large as the peak. Butterfat consumption in the form of frozen desserts increased from the mid-forties to the mid-fifties and then has leveled off. Cheese, on the other hand, increased from the mid-forties to the mid-fifties and then increased about 50 percent.

The consumption of butterfat in these three groups of products in the mid-forties, the mid-fifties and 1970, in pounds per capita are summarized as follows:

	1944-45	1955-56	1970
Evaporated milk	1.8	1.2	0.4
Frozen desserts	1.8	2.2	2.3
All cheeses	2.0	2.3	3.5
Total	5.6	5.7	6.2

The stable consumption in the three products resulted from the fact that the gains in frozen

desserts and cheese just about offset the decline in evaporated milk.

With the drastic shifts and general decline in the consumption of butterfat, there were marked changes in the relative importance of butterfat from Class I products as compared with butterfat from manufactured products. During the twenties and thirties when such a large part of the butterfat consumed was in the form of butter, Class I butterfat was only 38 percent of the total consumption. During the decade of the forties, with the rapid decline in butter consumption and the rise in fluid milk, the relative importance of Class I butterfat rose. Since the early fifties about 50 percent of the butterfat consumed has been from Class I products. This proportion has been unusually stable at this level for 15 years (table 26, figure 23).

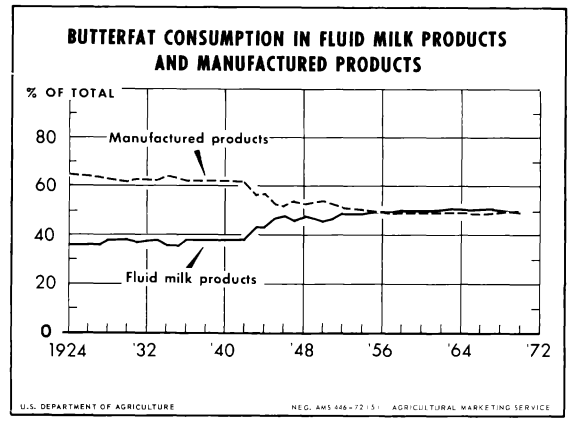

FIGURE 23.—During the twenties and thirties Class I butterfat was about 38 percent of the total. During the forties Class I increased in relative importance and in recent years was 50 percent of the total.

Solids Not Fat

It was not until after World War II that nonfat dry milk in consumer packages was generally available in grocery stores and could be purchased readily by housewives for use in the home. In this analysis of consumption of Class I products versus Class II products, the primary objective was to measure consumption of those dairy products which are purchased by housewives.

End Uses Of Nonfat Dry Milk

The American Dry Milk Institute publishes a valuable "Census of Dry Milk Distribution" which gives the major trends in the industry in regard to production and use.

The end uses for nonfat are given for 12 different categories. In this analysis they have been grouped into three major classes. The 1969 volumes in these three uses are summarized in millions of pounds as follows:

	Million pounds		Percent of total	
1. Competitive with Class I milk				
Packaged for home use	324.3		31.9	
Institutions	4.1		0.4	
Prepared dry mixes	101.7		10.0	
Total		430.1		42.3
2. Constituent of dairy foods				
Ice cream, cottage cheese, etc.		282.6		27.8
3. Constituent of nondairy foods				
Bakery products	187.0		18.4	
Meat processing	44.7		4.4	
Soup manufacture	4.1		0.4	
Confectionery	19.3		1.9	
Soft drinks	6.1		0.6	
Chemicals	1.0		0.1	
All other uses	32.5		3.2	
Total		294.7		29.0
4. Animal feed		9.1		0.9
Grand total		1,016.5		100.0

Nonfat dry milk in consumer packages is a use that competes directly with fluid milk. It can be reconstituted and used as a beverage. It can also be used in cooking as a substitute for fluid milk or evaporated milk.

In the same way persons in charge of feeding programs in institutions can use nonfat dry milk in place of fluid milk or fluid milk products. Thus, the sales of nonfat to institutions may be considered as an outlet that competes with fluid milk in the same way as nonfat in consumer packages competes with fluid milk in homes.

There was a marked expansion in prepared dry mixes for use in the home in the preparation of pancakes, cakes, pies and so on. In such cases the nonfat dry milk in these mixes can be considered as a substitute for fluid milk or evaporated milk in cooking. Some housewives who are excellent cooks and who formerly made pies and cakes in the home from fluid milk and other ingredients have switched to dry mixes. Studies of the use of milk in homes indicate that in the early fifties about 75 percent was used as a beverage, about 20 percent for cooking and 5 percent for other uses.[21]

Nonfat dry milk in consumer packages, sales to institutions and the volume in prepared dry mixes have been grouped together and considered as uses which compete with fluid milk products. The volume so used has expanded phenomenally. It increased from 20 to 430 million pounds in the period 1948-69. This was more than a twentyfold increase in 21 years (figure 24).

A second use of nonfat is in the manufacture of other dairy foods, such as cottage cheese, ice cream and milk drinks. This use has also expanded rapidly, increasing about threefold in 20 years.

For many years the use of nonfat in nondairy foods such as bakery products, meats, soup, confections, soft drinks and so on comprised the principal

[21] Daniel A. Swope, Factors Associated With Level of Fluid Milk Consumption, A Summary of the Literature on Research Findings, Department of Agricultural Economics and Rural Sociology, Agricultural Experiment Station, The Pennsylvania State University, A. E. & R. S. No. 3, March 1956, pp. 3-4.

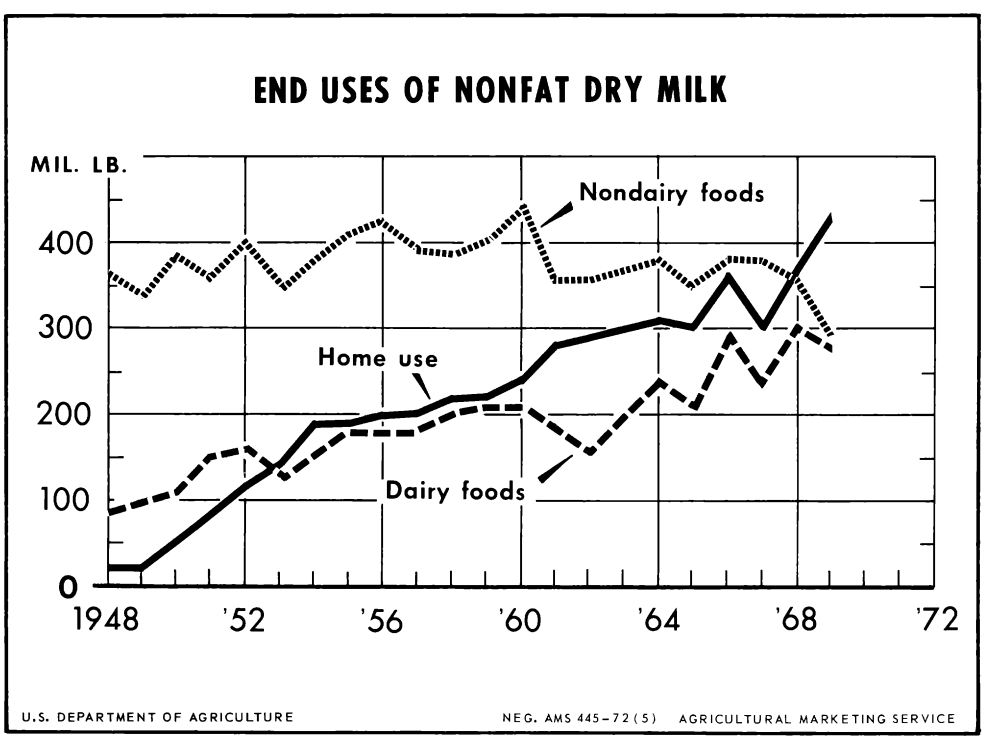

FIGURE 24.—From 1948 to 1968 the use of nonfat in nondairy foods was high and relatively stable but declined to a low level in 1969. The use of nonfat in homes and in dairy foods expanded phenomenally.

outlet. In 1948 and 1949 these uses made up 75 percent of the total, as contrasted with only 29 percent in 1969. The actual volume in these uses during the period 1948-68 fluctuated between a low of 340 million pounds in 1949 and a peak of 440 million pounds in 1960. In 1969, however, there was a unique change. The use in these outlets dropped to 295 million pounds, by far the lowest on record.

In calculating the consumption of solids not fat in manufactured dairy products to compare with the solids not fat in fluid milk products only the nonfat dry milk considered competitive with fluid milk products was used as a separate item (table 27). The nonfat dry milk used in the production of ice cream and cheese and for fortification of fluid milk products was included in the solids not fat content of the specific products.

Fluid Milk Products—Class I

The annual per capita consumption of solids not fat in the form of fluid milk products was fairly stable at about 20 pounds during the late twenties and thirties. Then during the early forties with many special wartime controls which stimulated the

TABLE 27. PER CAPITA CONSUMPTION OF SOLIDS NOT FAT IN FLUID MILK PRODUCTS (CLASS I) AND MANUFACTURED DAIRY PRODUCTS (CLASS II) UNITED STATES, 1920-70

Year	Fluid[1] milk products	Manufactured products[2]						Grand total	Percent	
		Evap.[3]	Nonfat dry[4]	All[5] cheese	Ice cream[6]	Butter	Total		Fluid products	Manufactured products
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*		
1920		1.4		1.3	0.8	0.1	3.6			
1921		1.6		1.3	0.8	0.1	3.8			
1922		1.8		1.3	0.9	0.1	4.1			
1923		1.9		1.4	0.9	0.1	4.3			
1924	18.4	2.0		1.5	0.9	0.1	4.5	22.9	80.3	19.7
1925	18.9	1.9		1.5	1.0	0.1	4.5	23.4	80.8	19.2
1926	19.3	2.0		1.5	1.0	0.1	4.6	23.9	80.8	19.2
1927	19.5	1.9		1.5	1.0	0.1	4.5	24.0	81.2	18.8
1928	20.1	2.0		1.4	1.0	0.1	4.5	24.6	81.7	18.3
1929	20.8	2.2		1.5	1.1	0.1	4.9	25.7	80.9	19.1
1930	20.7	2.2		1.5	1.0	0.1	4.8	25.5	81.2	18.8
1931	20.5	2.2		1.5	0.9	0.1	4.7	25.2	81.3	18.7
1932	20.6	2.3		1.5	0.7	0.1	4.6	25.2	81.7	18.3
1933	20.4	2.3		1.5	0.6	0.1	4.5	24.9	81.9	18.1
1934	19.2	2.5		1.6	0.8	0.1	5.0	24.2	79.3	20.7
1935	19.6	2.7		1.7	0.9	0.1	5.4	25.0	78.4	21.6
1936	20.4	2.6		1.8	1.0	0.1	5.5	25.9	78.8	21.2
1937	20.4	2.8		1.8	1.1	0.1	5.8	26.2	77.9	22.1
1938	20.4	2.9		1.9	1.1	0.1	6.0	26.4	77.3	22.7
1939	20.5	3.0		2.0	1.2	0.1	6.3	26.8	76.5	23.5
1940	20.7	3.2		2.0	1.3	0.1	6.6	27.3	75.8	24.2
1941	20.7	3.3		2.0	1.5	0.1	6.9	27.6	75.0	25.0
1942	22.8	3.6		2.3	1.8	0.1	7.8	30.6	74.5	25.5
1943	24.7	3.9		2.0	1.6	0.1	7.6	32.3	76.5	23.5
1944	26.3	4.1		2.2	1.7	0.1	8.1	34.4	76.5	23.5
1945	27.8	4.0		2.4	1.9	0.1	8.4	36.2	76.8	23.2
1946	27.3	3.2		2.4	2.5	0.1	8.2	35.5	76.9	23.1
1947	26.0	3.4		2.4	2.2	0.1	8.1	34.1	76.2	23.8
1948	25.4	3.4	0.2	2.5	2.1	0.1	8.3	33.7	75.4	24.6
1949	25.9	3.3	0.2	2.6	2.0	0.1	8.2	34.1	76.0	24.0

Continued.

TABLE 27. (Cont'd.) PER CAPITA CONSUMPTION OF SOLIDS NOT FAT IN FLUID MILK PRODUCTS AND MANUFACTURED DAIRY PRODUCTS UNITED STATES, 1920-70

Year	Fluid[1] milk products	Manufactured products[2]						Grand total	Percent	
		Evap.[3]	Nonfat dry[4]	All[5] cheese	Ice cream[6]	Butter	Total		Fluid products	Manufactured products
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*		
1950	26.4	3.4	0.4	2.8	2.0	0.1	8.7	35.1	75.2	24.8
1951	26.9	3.1	0.5	2.7	2.1	0.1	8.5	35.4	76.0	24.0
1952	27.2	3.0	0.8	2.8	2.2	0.1	8.9	36.1	75.3	24.7
1953	27.1	2.9	0.9	2.8	2.3	0.1	9.0	36.1	75.1	24.9
1954	27.3	2.8	1.2	2.9	2.3	0.1	9.3	36.6	74.6	25.4
1955	27.6	2.7	1.2	2.9	2.4	0.1	9.3	36.9	74.8	25.2
1956	27.9	2.5	1.2	3.0	2.4	0.1	9.2	37.1	75.2	24.8
1957	27.9	2.4	1.2	2.9	2.4	0.1	9.0	36.9	75.6	24.4
1958	27.5	2.3	1.3	3.0	2.5	0.1	9.2	36.7	74.9	25.1
1959	27.1	2.2	1.2	3.1	2.6	0.1	9.2	36.3	74.7	25.3
1960	26.8	2.1	1.4	3.3	2.6	0.0	9.4	36.2	74.0	26.0
1961	26.3	2.0	1.6	3.3	2.6	0.0	9.5	35.8	73.5	26.5
1962	26.2	1.9	1.6	3.3	2.7	0.0	9.5	35.7	73.4	26.6
1963	26.4	1.8	1.6	3.4	2.7	0.0	9.5	35.9	73.5	26.5
1964	26.5	1.7	1.7	3.4	2.8	0.0	9.6	36.1	73.4	26.6
1965	26.6	1.6	1.5	3.6	2.8	0.0	9.5	36.1	73.7	26.3
1966	26.6	1.5	1.8	3.7	2.8	0.0	9.8	36.4	73.1	26.9
1967	26.1	1.4	1.5	3.7	2.8	0.0	9.4	35.5	73.5	26.5
1968	26.2	1.3	1.9	3.9	2.9	0.0	10.0	36.2	72.4	27.6
1969	26.2	1.1	2.2	4.0	2.9	0.0	10.2	36.4	72.0	28.0
1970[7]	25.8	1.0	2.2	4.3	2.9	0.0	10.4	36.2	71.3	28.7

[1] Data for 1950-70 compiled from the Dairy Situation, for 1924-49, estimated. Includes fluid whole milk, fluid skim milk, buttermilk, lowfat milks, flavored milk drinks, cream and milk and cream mixtures.
[2] Manufactured products used in homes.
[3] Includes evaporated milk case goods, sweetened condensed milk case goods and evaporated skim milk case goods.
[4] Includes nonfat dry milk, dry whole milk and dry buttermilk in consumer packages and prepared dry mixes and sales to institutions.
[5] Includes American cheese, other cheese, cottage cheese and skim milk cheese.
[6] Includes ice cream, ice milk, milk sherbet, other frozen dairy products and "mellorine-type" frozen desserts.
[7] Preliminary.

use of fluid milk, consumption rose abruptly to about 28 pounds in 1945. After the end of the wartime programs in 1946, consumption dropped for 3 years until 1949. Thereafter consumption increased gradually to the mid-fifties when, on a per capita basis, it equaled the peak during the war period. Since then the trend was moderately downward. Thus for the period since the end of World War II per capita consumption of solids not fat in fluid milk products, Class I products, has fluctuated moderately but at the highest level in history, between 26 and 28 pounds per capita (table 27, figure 25).

Manufactured Products—Class II

In the three year period 1967-69, the per capita consumption of solids not fat in manufactured dairy products was much less than in fluid milk products, 9.9 and 26.0 pounds respectively.

Nevertheless the consumption in the form of manufactured products has shown a more consistent, upward trend than in the form of fluid products. During the early twenties per capita consumption in manufactured products was 4.0 pounds, just prior to World War II 6.4 pounds, in the late forties 8.2 pounds and in the late sixties 9.9

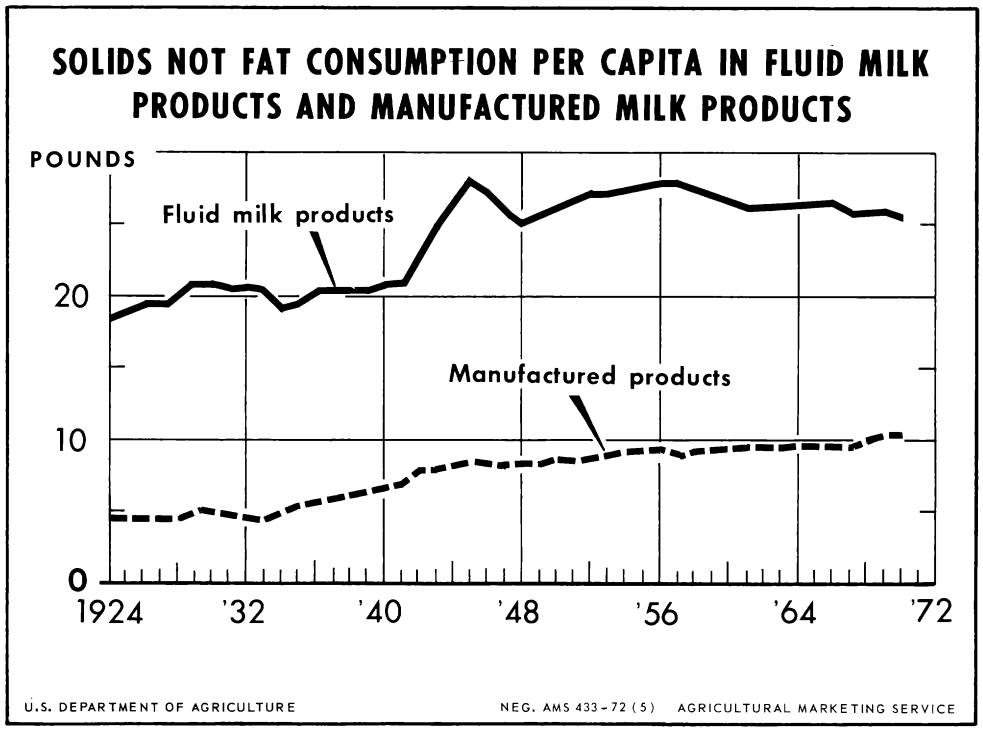

FIGURE 25.—The consumption of solids not fat in fluid milk products was much larger than in manufactured products.

pounds (table 27, figure 25). Per capita consumption more than doubled.

The proportion of the total solids not fat from fluid milk products (Class I) was relatively high and has shown relatively little change. In the early postwar years 1947-49 the proportion was 76 percent and in the late sixties 72 percent (figure 26).

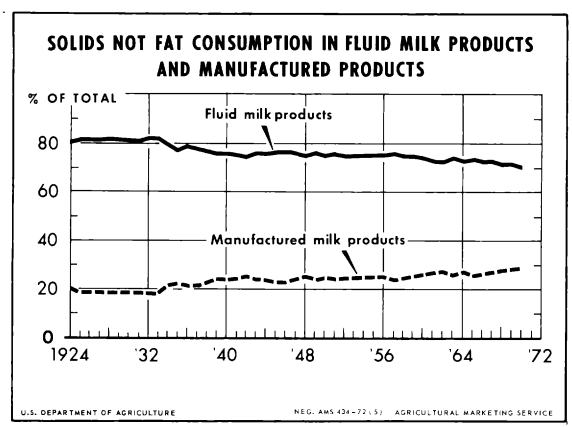

FIGURE 26.—In the early years consumption in the form of fluid products made up 80 percent of the total but this percentage declined moderately while the percentage from manufactured products increased moderately.

Relationship of Butterfat and Solids Not Fat in Manufactured Products to Fluid Products

These data on the consumption of butterfat in various products and the consumption of the solids not fat in various products make it possible to portray what has happened to the consumption of products included in Class I as compared with those made from manufacturing milk or surplus milk from fluid milk markets.

In 1949-50 the consumption of butterfat in fluid milk products averaged 12.4 pounds per capita. The consumption of butterfat in evaporated milk, frozen desserts and all cheeses averaged 5.8 pounds. Thus, the consumption of butterfat in manufactured products, exclusive of butter, was 47 percent as large as the consumption of butterfat in the form of fluid milk products.

In 1969-70 the consumption of butterfat in fluid milk products was 9.7 pounds while the consumption in manufactured products, exclusive of butter, was 6.1 pounds. In this period the butterfat in the manufactured products (exclusive of butter) was 63 percent as large as the butterfat in fluid milk products. Thus, it is abundantly clear that the consumption of butterfat in those manufactured products which the nutritionists say may be used as a source of milk, or substituted in part for it, has expanded significantly in relation to fluid milk products (figure 27).

In 1949-50, the consumption of solids not fat in fluid milk products averaged 26.2 pounds per capita, while in manufactured dairy products it averaged 8.4. For this period the consumption of solids not fat in Class II products was 32 percent as large as from fluid milk products. In 1969-70 it was 40 percent as large. Thus, there was an increase in the relative importance of manufactured products as compared with fluid products as a source of nonfat solids.

The changes cited above indicate the shift which occurred since the beginning of the support program. In this connection it is pertinent to note the shifts during the specific periods of time. The percentages of the butterfat and solids not fat in manufactured products, except butter, expressed as a percentage of the fat and solids not fat respectively in Class I products are summarized for selected years as follows:

	Butterfat	Solids not fat
1939-40	41	31
1949-50	47	32
1956-57	45	32
1969-70	63	40

Immediately prior to World War II, the butterfat in manufactured products (excluding butter) was 41 percent as large as the butterfat in Class I. At the time the support program started this percentage was up to 47; then for a period of 7 years there was practically no net change. In striking contrast to this stability there was a gain of 18 percentage points in

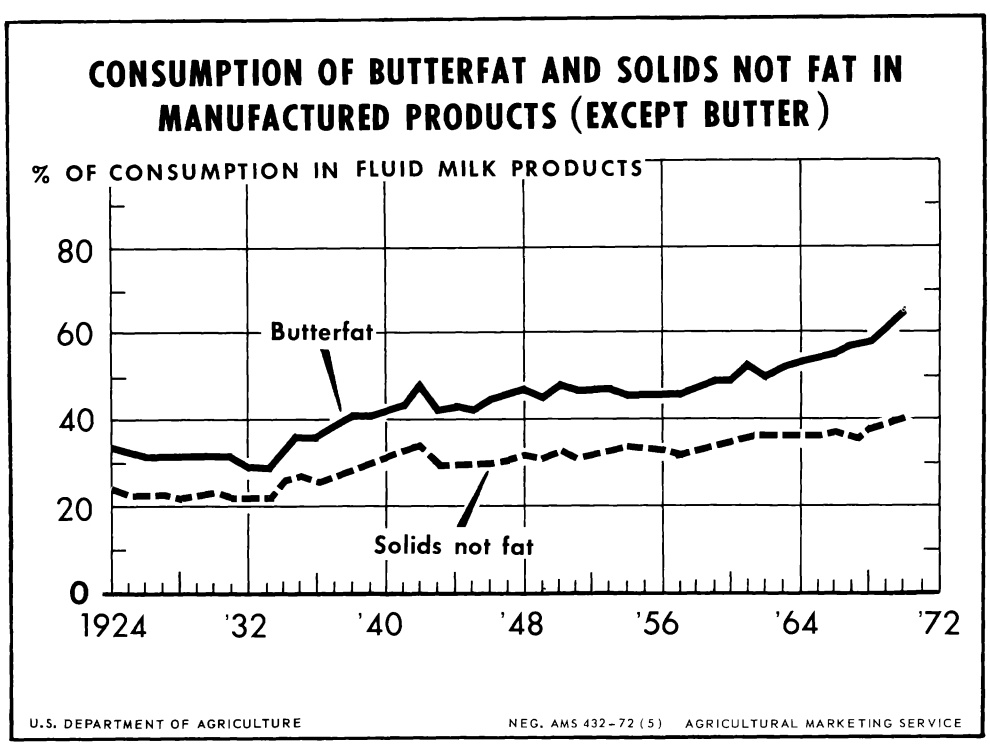

FIGURE 27.—The long time tendency was for the consumption of both butterfat and solids not fat in the form of manufactured products to rise in relation to fluid products. A larger proportion of the butterfat is from manufactured products than solids not fat.

the following 13 years. That is, the phenomenal change in butterfat consumption in manufactured products compared with fluid products occurred since the mid-fifties.

For solids not fat the consumption in manufactured products was 31 percent as large as in fluid products just prior to World War II, and approximately the same as a decade later. From the early fifties to the mid-fifties there was no change. However, from the mid-fifties to the late sixties there was an increase of 8 percentage points. That is, the change since the mid-fifties was in striking contrast to the stability of the previous two decades.

Thus it is clear that the rise in the consumption of Class II butterfat and solids not fat in relation to Class I butterfat and solids not fat was especially pronounced from the mid-fifties to the late sixties (figure 27).

Lowfat Products Versus Standard Products

From 1950 to 1970 the per capita consumption of butterfat in the form of fluid milk products declined 23 percent, while the per capita consumption of solids not fat in the same products declined only 3 percent. The sharp decline in butterfat and the modest decline in solids not fat indicate a marked shift in the relative importance of the products in the group, i.e. the "product-mix".

Fluid Milk Products

The fluid milk products are classified into three categories: (1) regular milk, (2) lowfat milks including lowfat milk with or without added solids, skim milk with or without added solids, buttermilk and milk drinks, and (3) cream and mixtures of milk and cream, including light, medium and heavy cream, and half and half. The three categories can be characterized as the standard or most common item, the lowfat products and the high fat products.

During the thirties, fluid milk made up 92 percent of the total volume of these fluid products (table 28). In fact, this percentage was remarkably stable up to the mid-fifties, never dropping below 90. In the late fifties there was a modest decline in the relative importance of milk, 1.3 percentage points. The rapid shift occurred in the sixties, the decline being 3.0 percentage points in the early sixties and 8.0 in the late sixties. The decline in the relative importance of milk from 1965 to 1970 was greater than occurred in the previous 35 years (table 28).

With the decline in the average butterfat test of milk produced, and with standardization there was also a decline in the average butterfat content of Class I milk.

During the thirties and forties lowfat milks made up about 5 percent of the total fluid products (pounds of product). By the mid-fifties this percentage increased to 6.3, and by 1960 to 7.7. During the sixties there was a phenomenal increase to nearly 20 percent of the total. The rapid increase in lowfat milks has been confined to a large extent to the last decade.

In the earlier years when cream was used extensively as a coffee whitener and on cereals and berries, it made up nearly 4 percent of the total fluid products (pounds of product). However, with the growth of coffee whiteners made with vegetable fats, the relative importance of cream and mixtures of milk and cream declined about one-half.

With the decline in the relative importance of heavy cream and the increased use of mixtures of milk and cream, particularly half and half, there was a decline in the average butterfat content of these products.

The decline in the relative importance of milk and cream and the rapid increase in the relative importance of lowfat milks portray the changes in the product-mix which has resulted in the drastic decline in butterfat consumption in the form of fluid products and only a modest change in the consumption of solids not fat in the same products.

Frozen Desserts

Frozen desserts include a variety of products which can be divided into three categories in somewhat the same way as fluid milk products. First, and by far the most important single item, is ice cream which contains a minimum of 10 percent butterfat, second, and by far the most important lowfat item in the group, is ice milk with about 4 percent butterfat, and third, the remaining products which included sherbet with 2 percent butterfat and mellorine-type frozen desserts which contain vegetable fat and no butterfat and a miscellaneous group of products called "other frozen products".

TABLE 28. FLUID MILK PRODUCTS, FROZEN DESSERTS AND ALL CHEESES, EACH SUBDIVIDED INTO MAJOR ITEM, PRINCIPAL LOWFAT ITEM AND REMAINDER SELECTED YEARS, 1930-70

Year	Fluid milk products (million lbs.)				Percentage of total		
	Milk	Lowfat milks	Cream and mixtures	Total	Milk	Lowfat milks	Cream and mixtures
1930	22,533	1,127	903	24,563	91.7	4.6	3.7
1935	21,840	1,092	874	23,806	91.7	4.6	3.7
1940	24,309	1,215	975	26,499	91.7	4.6	3.7
1945	33,727	1,681	1,316	36,724	91.8	4.6	3.6
1950	37,280	2,100	1,490	40,870	91.2	5.1	3.7
1955	43,710	3,020	1,450	48,180	90.7	6.3	3.0
1960	47,360	4,080	1,560	53,000	89.4	7.7	2.9
1965	49,750	6,390	1,430	57,570	86.4	11.1	2.5
1970	45,885	11,525	1,130	58,540	78.4	19.7	1.9
	Frozen desserts (million lbs.)				Percentage of total		
	Ice cream	Ice milk	Other	Total	Ice cream	Ice milk	Other
1930	1,201	--	--	1,201	100.0	--	--
1935	1,030	--	23	1,053	97.8	--	2.2
1940	1,501	50	65	1,616	92.9	3.1	4.0
1945	2,166	56	442	2,664	81.3	2.1	16.6
1950	2,633	177	147	2,957	89.0	6.0	5.0
1955	3,017	433	407	3,857	78.2	11.2	10.6
1960	3,358	697	497	4,552	73.8	15.3	10.9
1965	3,634	1,109	572	5,315	68.4	20.8	10.8
1970	3,674	1,333	603	5,610	65.5	23.8	10.7
	All cheeses (million lbs.)				Percentage of total		
	American	Cottage	Other	Total	American	Cottage	Other
1930	390	98	188	676	57.7	14.5	27.8
1935	475	110	193	778	61.1	14.1	24.8
1940	573	174	216	963	59.5	18.1	22.4
1945	644	285	250	1,179	54.6	24.2	21.2
1950	809	411	335	1,555	52.0	26.5	21.5
1955	795	601	414	1,810	43.9	33.2	22.9
1960	945	834	529	2,308	41.0	36.1	22.9
1965	1,106	889	656	2,651	41.7	33.6	24.7
1970	1,391	1,034	898	3,323	41.9	31.1	27.0

In the early thirties, ice cream was the only frozen product for which production was reported. The production of ice milk was reported in 1940 for the first time. In 1940, ice cream made up 92.9 percent of the total frozen desserts. During the war period there were restrictions on the use of dairy products in the production of ice cream. As a result, there was a phenomenal increase in the production of sherbet. By 1945, ice cream was only 81.3 percent of the total frozen desserts and milk sherbet 15.4 percent.

When the wartime restrictions were eliminated, ice cream regained its pre-war importance and sherbet declined drastically. The relative proportions in 1946 were ice cream 94.9 percent, sherbet 2.2, ice milk 2.1 and other frozen desserts 0.8

percent of the total. After the initial postwar recovery, the relative importance of ice cream declined steadily and in 1970 made up 65.5 percent of the total frozen desserts. Ice milk, on the other hand, increased and in 1970 was 23.8 percent of the total. The other frozen desserts, primarily sherbet and mellorine-type frozen desserts, comprised 10.7 percent of the total (table 28).

Thus, it is clear that among the frozen desserts the standard or most common item in the group, ice cream, has declined in relative importance while the lowfat item has increased. This is the same type of shift which occurred in the fluid products.

Cheeses

There are many varieties of cheese. Nevertheless they can be subdivided into three categories in much the same way as fluid products and frozen products.

American cheese, which is primarily Cheddar is, by far, the most important single variety. Cottage cheese is, by far, the most important lowfat cheese. Commercial Cheddar cheese contains about 32.2 percent butterfat while creamed cottage cheese contains 4.2 percent. The other varieties of cheese, mostly foreign types, have a considerable variation of fat content and solids not fat, but on a weighted average basis they do not differ greatly from Cheddar cheese. The fat content, the solids not fat content and the pounds of solids not fat per pound of butterfat in the three categories of cheese are summarized as follows:

	Butterfat	Solids not fat	Pounds of solids not fat per pound of butterfat
Cheddar cheese	32.2	30.8	1.0
Creamed cottage cheese	4.2	17.5	4.2
Other varieties (weighted average 1968)	27.8	29.7	1.1

Cheddar cheese contained about 1 pound of solids not fat per pound of butterfat. The other varieties, exclusive of cottage cheese, contained less butterfat and also less solids not fat than Cheddar cheese, but the pounds of solids not fat per pound of butterfat did not differ greatly from Cheddar. Creamed cottage cheese, however, contained about 4.2 pounds of solids not fat per pound of butterfat. The lowfat item had much more solids not fat per pound of butterfat than the other varieties of cheese.

During the thirties nearly 60 percent of the total cheese consumption (product weight) was American cheese. This proportion declined and in the decade of the sixties was only 41.5 percent of the total. That is, the relative importance of the most important single item in the cheese group declined (table 28).

In contrast to the lowfat milk and ice milk, cottage cheese was a relatively important item in the thirties, making up nearly 15 percent of the total cheese. It expanded during the war period and in the early postwar years and in 1950 made up 26.5 percent of the total. There was also rapid expansion during the fifties and in 1957 the relative importance of cottage cheese reached an all-time high of 37.9 percent. Since then the consumption of cottage cheese has expanded, but not as rapidly as American cheese and other cheese, and by 1970 it made up 31.1 percent of the total. This is the only case among these three groups of products where the relative importance of the lowfat item declined in the last decade.

The other cheeses, which are primarily foreign types, made up 25 percent of the total consumption during the thirties. This proportion declined somewhat during the war period and in 1945 made up 21 percent of the total. Since then the consumption of other cheeses has expanded rapidly and in 1970 made up 27 percent of the total. Their percentage of the total in the thirties and late sixties was approximately the same.

In 1970 there were marked differences among the three groups of products in the relative importance of the principal item. Regular milk held a much more dominant position among the fluid products than ice cream did among the frozen desserts or American cheese among the cheeses. There were also marked differences in the relative importance of the lowfat item. Cottage cheese held

a much more important position among the cheeses than ice milk among the frozen desserts which, in turn, was more important than lowfat milks among the fluid products.

The relative importance of the principal item and the lowfat item for fluid products, frozen desserts and cheeses is summarized for 1970 on a percentage basis as follows:

	Principal product	Lowfat	Other
Fluid products (milk and lowfat milks)	78.4	19.7	1.9
Frozen desserts (ice cream and ice milk)	65.5	23.8	10.7
Cheeses (American and cottage)	41.9	31.1	27.0

Average Butterfat and Solids Not Fat Content of Fluid Products, Frozen Desserts and Cheeses

During the thirties the average butterfat content of the fluid products was 4.5 percent, while in 1970 it was 3.3 percent. The average butterfat test in 1970 was 73.3 percent as high as in the thirties (table 29, figure 28). The decline in the fat content was especially sharp during the war period when the sales of heavy cream were prohibited and there were some restrictions on the sale of light cream. After the wartime controls were eliminated there was a modest but short-lived recovery in the fat content of fluid milk products due entirely to a temporary recovery in cream consumption. However, after the late forties there was a persistent decline in the fat content of fluid milk products to an all-time low.

During the thirties frozen desserts as a whole contained nearly 11 percent butterfat. Here again, during the war period with wartime restrictions there was a sharp decline. After these controls were eliminated the butterfat content of frozen desserts made a striking recovery and practically regained the prewar level in 1946-47. However, during the fifties and sixties there was a decline in the average fat content of frozen desserts which practically parallelled the decline in the butterfat content of fluid milk products (table 29, figure 28).

The changes in the average butterfat content of all cheese (product weight) showed a different pattern. From the late forties to the late fifties the average butterfat content of all cheeses declined from 23.3 to an all-time low of 19.7 percent. This low coincided with the period in which cottage cheese reached its peak in relative importance among all cheeses. Since the late fifties there has been a modest recovery in the fat content of all cheeses combined. The cheeses are the only one of these three groups of products where there has been any recovery in average fat content.

The average butterfat content of these 3 groups of products during the thirties and in 1970, is summarized on a percentage basis as follows:

	Average 1930's	1970	1970 percent of 1930's
Fluid milk products	4.5	3.3	73.3
Frozen desserts	10.8	8.3	76.9
All cheeses	26.0	21.3	81.9

TABLE 29. AVERAGE BUTTERFAT AND SOLIDS NOT FAT CONTENT OF FLUID MILK PRODUCTS, FROZEN DESSERTS AND ALL CHEESES SELECTED YEARS, 1930-70

Year	Fluid milk products		Frozen desserts		All cheeses	
	Butter-fat	Solids not fat	Butter-fat	Solids not fat	Butter-fat	Solids not fat
	Per-cent	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*
1930-39 Av.	4.5	8.6	10.8	10.3	26.0	27.9
1930	4.5	8.6	11.0	10.5	26.1	27.9
1935	4.5	8.6	10.8	10.3	26.3	28.0
1940	4.5	8.6	10.5	10.3	25.3	27.6
1945	4.2	8.6	9.5	9.2	23.6	26.9
1950	4.1	8.7	10.2	10.3	22.9	26.9
1955	3.9	8.6	9.2	10.1	21.2	25.9
1960	3.7	8.7	8.9	10.3	20.3	25.6
1965	3.6	8.7	8.5	10.4	20.9	26.0
1970	3.3	8.8	8.3	10.4	21.3	26.4
	Indexes 1930-39 = 100					
1930	100.0	100.0	101.9	101.9	100.4	100.0
1935	100.0	100.0	100.0	100.0	101.2	100.4
1940	100.0	100.0	97.2	100.0	97.3	98.9
1945	93.3	100.0	88.0	89.3	90.8	96.4
1950	91.1	101.2	94.4	100.0	88.1	96.4
1955	86.7	100.0	85.2	98.1	81.5	92.8
1960	82.2	101.2	82.4	100.0	78.1	91.8
1965	80.0	101.2	78.7	101.0	80.4	93.2
1970	73.3	102.3	76.9	101.0	81.9	94.6

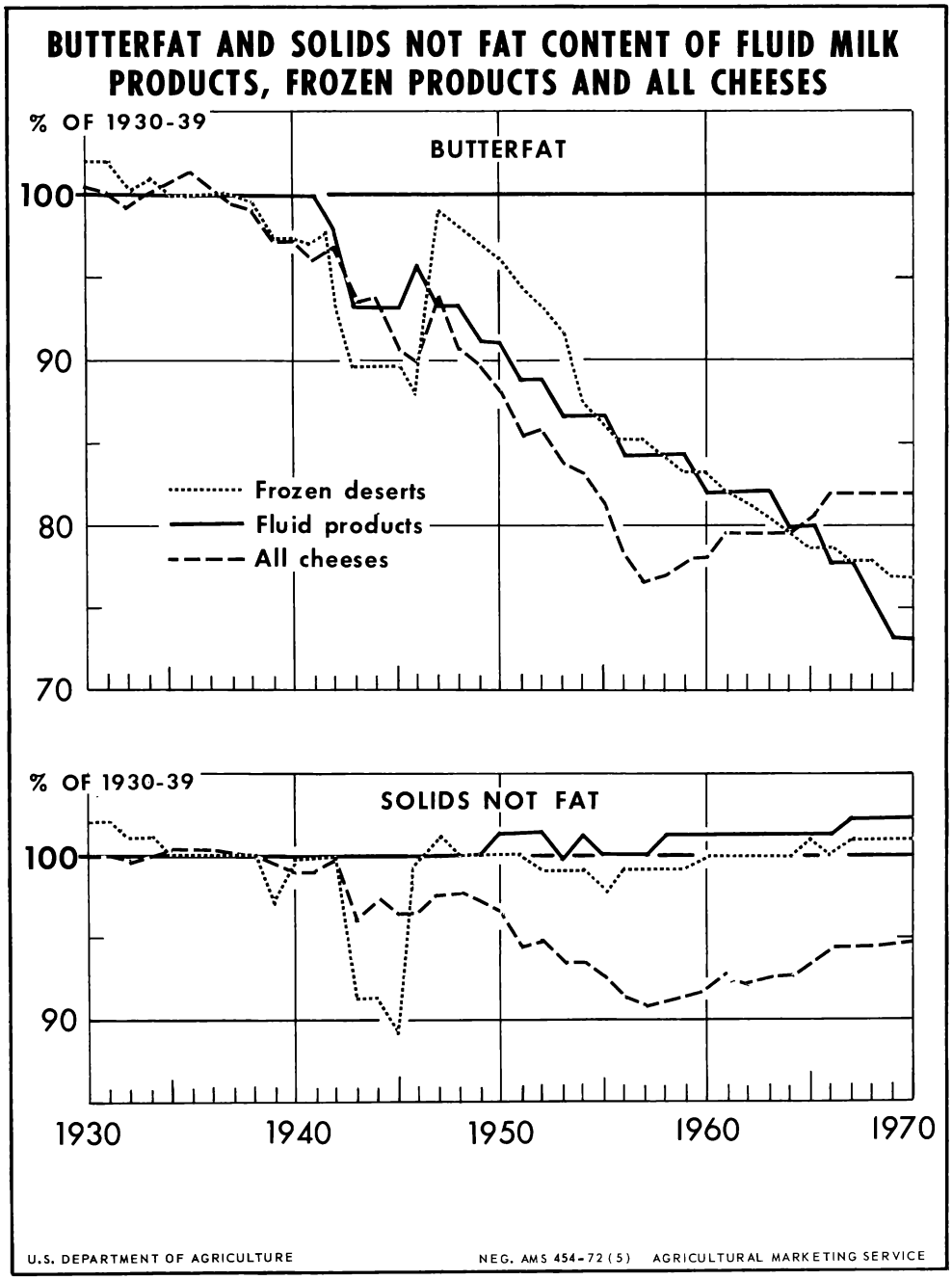

FIGURE 28.—There were marked and quite similar declines in the average butterfat content of fluid milk products, frozen desserts and all cheeses. On the other hand, there were relatively minor changes in the solids not fat content of these products.

These changes in butterfat content were in striking contrast to the solids not fat content of the same groups of products. For fluid products the decline in the average butterfat test was accompanied by some decline in the average solids not fat test. However, with the expansion in the use of lowfat milks and with their increased fortification the average solids not fat content of fluid milk products in 1970 was 2 percent higher than in the thirties.

Ice milk contains more solids not fat than ice cream. Thus, with the increased consumption of ice milk, together with some expansion in the consumption of mellorine-type desserts, the average solids not fat content of all frozen desserts combined in 1970 was somewhat higher than in the thirties.

In contrast the solids not fat content of all cheeses declined nearly 10 percent from the thirties to the late fifties. This was due to the increased importance of cottage cheese which contains a smaller percentage of solids not fat than American or the other cheeses. Since the late fifties there was some recovery. Even so, the solids not fat content of all cheese in 1970 was about 5 percent less than in the thirties.

The average solids not fat content of these three groups of products during the thirties and in 1970 is summarized on a percentage basis as follows:

	Average 1930's	1970	1970 percent of 1930's
Fluid milk products	8.6	8.8	102.3
Frozen desserts	10.3	10.4	101.0
All cheeses	27.9	26.4	94.6

These modest increases in solids not fat content for fluid products and frozen desserts and the modest decline for all cheese were in striking contrast to the marked declines in butterfat content of each group of products (table 29, figure 28).

Consumption Pounds of Product Butterfat and Solids Not Fat Content

Due to the fact that the average butterfat and solids not fat content of fluid milk products, frozen desserts and all cheeses has changed over the years because of the changes in the product-mix within each group of products, it is necessary to measure consumption in different ways in order to portray the changes which have taken place.

For example, from 1950 to 1970 the per capita consumption of fluid milk products declined from 304 to 291 pounds. This was a decline of 4 percent. However, the consumption of butterfat in these products declined 23 percent while the solids not fat declined only 3 percent.

For frozen desserts per capita consumption (pounds) increased 40 percent from 1950 to 1970. In the case of these products, the marked increase in the pounds of product consumed was more than enough to offset the marked decline in the average butterfat test, so that the per capita consumption of butterfat in the form of frozen desserts actually increased 15 percent.

Cheese consumption, pounds per capita, increased 57 percent from 1950 to 1970. On a fat basis the increase was 46 percent and on a solids not fat basis 54 percent.

Total butterfat consumption in these three groups of products combined declined 8 percent at the same time that the solids not fat consumption increased 5 percent (table 30).

Stable Total Consumption, but Marked Shifts in Products[22]

Consumers have shifted their consumption among various dairy products so as to decrease greatly their total consumption of butterfat, but at the same time maintain their consumption of solids not fat at or near peak levels. In addition, they shifted their consumption among various food products so as to maintain, at a relatively stable level, the total consumption of a particular nutrient, but at the same time make important changes in the source of the nutrient.

A classic example of such a shift, which was of vital importance to the dairy industry, was the shift in the use of table fats, butter, margarine, mayonnaise and salad oils. One might think that with the increased knowledge of nutrition, widespread concern about obesity, and the interest in diets, dieting and weight reduction that the total consumption of table fats would have declined. This, however, is not the case. The annual consumption of table fats in 1966-68 averaged 20.6 pounds per capita. This was only 0.8 pounds or 4 percent less than in the late twenties, and only 3 percent less than in the late thirties.

Per capita consumption of table fats declined during the War period when there was rationing,

[22] The data here given on consumption of table fats, sources of table fats, consumption of calories and sources of calories are taken from Food Consumption, Prices, Expenditures, Stephen J. Hiemstra, Agricultural Economic Report No. 138, U.S. Department of Agriculture, Economic Research Service, July 1968, pages 64, 94, 95, extension of table 39, pages 95-97, kindly furnished to the author by mail, and Supplement to Agricultural Economic Report No. 138 Stephen J. Hiemstra, Food Consumption, Prices, Expenditures, January 1970, pages 14, 31, 32, 33.

TABLE 30. PER CAPITA CONSUMPTION OF FLUID MILK PRODUCTS, FROZEN DESSERTS, AND ALL CHEESES EXPRESSED IN POUNDS OF PRODUCT, BUTTERFAT AND SOLIDS NOT FAT CONTENT, 1950 AND 1970

	1950	1970	*Percent change*
Product Pounds			
Fluid milk products	304.3	290.7	-4
Frozen desserts	19.6	27.4	40
All cheeses[1]	10.3	16.2	57
Total	334.2	334.3	0
Butterfat (pounds)			
Fluid milk products	12.4	9.6	-23
Frozen desserts	2.0	2.3	15
All cheeses[1]	2.4	3.5	46
Total	16.8	15.4	-8
Solids Not Fat (pounds)			
Fluid milk products	26.4	25.6	-3
Frozen desserts	2.0	2.8	40
All cheeses[1]	2.8	4.3	54
Total	31.2	32.7	5

[1] Includes cottage cheese.

price ceilings and subsidies, but recovered in the postwar period to about the prewar level. Even though the total consumption was remarkably stable, there were marked shifts in the relative importance of the various fats. In the late twenties butter was the predominant table fat making up 84 percent of the total, but in recent years it was only 27 percent. On the other hand, margarine increased from 11 to 52 percent of the total, and mayonnaise and salad oils from 5 to 21 percent. The predominant shift was from animal fat to vegetable fat.

The per capita consumption of table fats, pounds per year, and the percentage from each source for selected periods are summarized as follows:

Period	Per capita consumption lbs.	Percent of total: Butter	Margarine	Mayonnaise and salad oils
1925-29	21.4	84.1	11.2	4.7
1935-39	21.2	80.2	13.7	6.1
1949-51	19.1	53.9	32.5	13.6
1966-68	20.6	27.1	51.5	21.4

With the widespread interest in weight control, and even though total table fat consumption was relatively constant, it might be thought that there were enough changes in the consumption of other foods so that total calorie consumption declined.

However, calorie consumption was remarkably stable. In the late thirties, the late forties, and late sixties the per capita consumption of calories was almost identical. Even though the total consumption was stable, there were marked shifts in the sources of the calories. In the late thirties flour and cereals were the most important single source and they contributed 28.2 percent of the total as contrasted with only 20.1 percent in the late sixties. On the other hand, meats increased in relative importance. In the late thirties meats contributed about one-half as many calories as flour and cereals, as contrasted to about the same amount in 1966-68. This was a phenomenal shift. In the late thirties all fats and oils, table fats and cooking fats combined, furnished 15.4 percent of the total calories, as contrasted with 17.2 percent in the late sixties. The position of fats and oils as a source of calories increased moderately during the past two decades.

The consumption of calories per day per capita, and the percentage of the total from selected foods is summarized as follows:

Period	Calories per day	Percent of total from: Flour and cereals	Meats	Fats and oils
1935-39	3,270	28.2	14.5	15.4
1949-51	3,207	23.6	17.2	15.0
1966-68	3,210	20.1	19.9	17.2

In the milk industry there have been some striking shifts between regular milk, lowfat milks and nonfat dry milk in consumer packages. In the early fifties the per capita consumption of regular milk was 282 pounds per year, and in the late sixties 243 pounds. This was a decline of 14 percent. However, if whole milk, lowfat milks and the fluid skim equivalent of nonfat dry milk were added together, the consumption in the two periods was 304 and 310 pounds per capita respectively, a gain of 2 percent.

The per capita consumption in the early fifties, early sixties and late sixties, together with the

percentage from each source with nonfat dry milk on a fluid skim equivalent basis are summarized as follows:

Period	Consumption pounds	Percent of total from Whole milk	Lowfat milks	Nonfat dry milk
1950-52	304	92.6	5.6	1.8
1960-62	311	87.0	8.2	4.8
1967-69	310	78.5	15.5	6.0

This is a case of 3 individual dairy products with widely different trends in consumption which, when added together, showed a remarkably stable per capita consumption for 2 decades (figure 29).

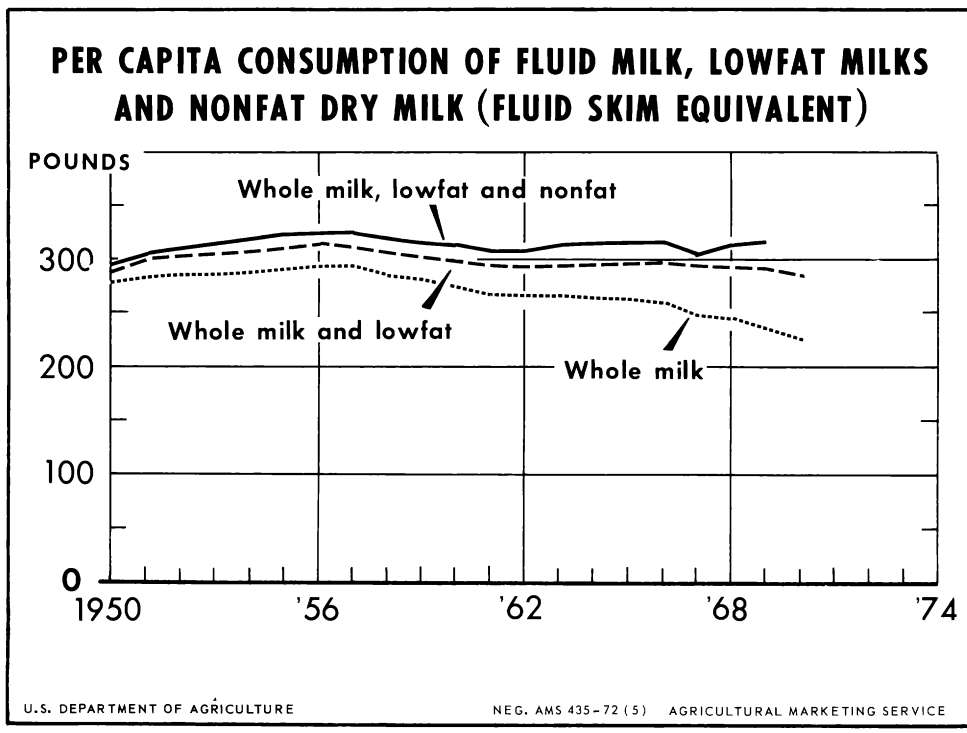

FIGURE 29.—The consumption of fluid whole milk declined but whole milk, lowfat milks and nonfat combined were stable.

SUMMARY

The per capita consumption of butterfat in the form of butter declined sharply and persistently from the thirties to the seventies. Per capita consumption of butterfat in the form of fluid milk products reached an alltime high in the latter part of World War II, but since the late fifties declined persistently. In striking contrast, the per capita consumption of butterfat in the form of manufactured products, except butter, reached a relatively high level in the late forties and since then remained stable.

During the fifties and sixties, about half of the butterfat consumed was in the form of fluid milk products (Class I) and half in the form of manufactured products (Class II).

The consumption of nonfat dry milk in consumer packages expanded greatly. The use of nonfat dry milk in making dairy foods such as cottage cheese, ice cream and milk drinks also expanded. The use of nonfat in nondairy foods such as bakery products, meat products, soup, confectionery and so on was at a relatively high level during the fifties and early sixties but declined in the late sixties.

The per capita consumption of solids not fat in the form of fluid milk products expanded rapidly during the war period, and then more or less stabilized at a high level. Since the late thirties, the per capita consumption of solids not fat in the form of manufactured dairy products showed steady and consistent upward trend. In the late sixties, 72 percent of the consumption of solids not fat was in the form of fluid milk products (Class I) and 28 percent in the form of manufactured products. Over the years the percentage in the form of manufactured products showed a concomitant increase.

Among the fluid milk products the consumption of lowfat milks expanded rapidly and increased in relative importance. Among the frozen desserts, ice milk increased rapidly and increased in relative importance. Among the cheeses, cottage cheese increased in relative importance. Among these three groups of products the consumption of the lowfat items increased in relation to the other products in the group.

During the last two decades the total per capita consumption of whole milk, lowfat milks, and nonfat dry milk (fluid skim equivalent) was remarkably stable, with lowfat milks and nonfat increasing in relative importance.

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