GENERAL CHARACTERISTICS OF THE U. S. DAIRY INDUSTRY

by

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BACKGROUND AND ACKNOWLEDGEMENTS

As a part of the NC-117 research project "Who Will Control American Agriculture", the Dairy Subsector Task Force is preparing a manuscript tentatively titled "The Dairy Subsector of American Agriculture: Organization and Vertical Coordination". As part of this project, the author prepared a section describing the general characteristics of the U. S. dairy industry. This paper is a revised version of that paper. The author wishes to acknowledge the helpful comments of the Dairy Subsector of NC-117 and Robert Story. The other members of the committee are:

Hugh L. Cook (Chairman) - University of Wisconsin
Leo Blakley - Oklahoma State University
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Ronald Knudson - Texas A&M University
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When the Subsector Committee completes its manuscript, much of the material in this paper will be deleted in order to provide a document of reasonable length. It is hoped that individuals interested in learning about the dairy industry will benefit from the greater detail in this paper.

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INTRODUCTION

The dairy subsector is large and complex. This paper examines many of the characteristics of the U. S. dairy industry. A review of milk production and production response both regionally and nationally is the starting point for this examination. Past and present consumption of dairy products is reviewed including a discussion of demand elasticities. Price patterns and the importance of international trade are also surveyed. Finally, a summary of governmental regulations and institutions affecting the dairy industry is presented.

NATIONAL PRODUCTION TRENDS

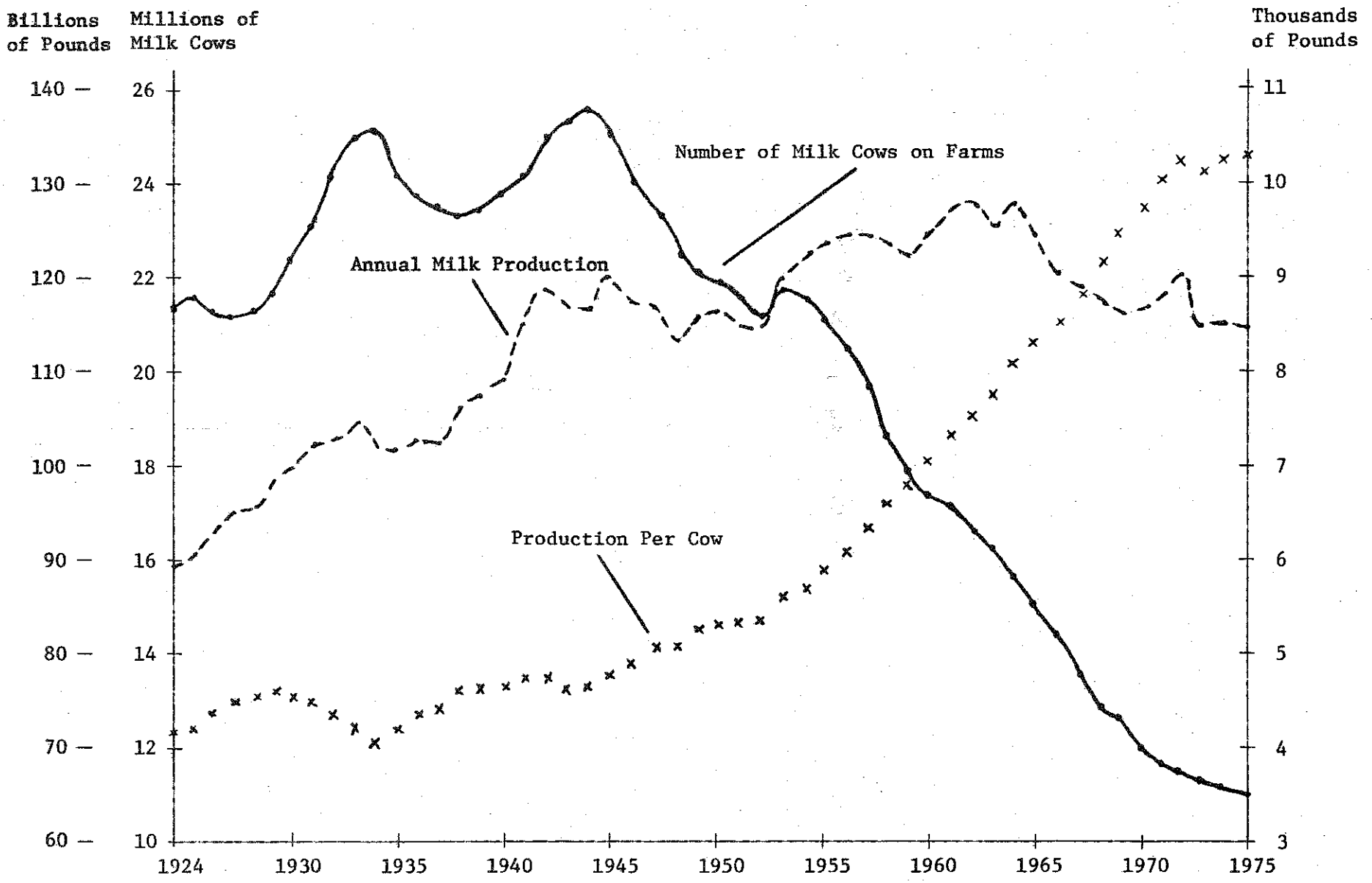
Figure 1 illustrates the trends in total annual milk production, cow numbers, and production per cow from 1924 through 1975 for the United States. Total production generally increased from 1924 until 1964 when the largest production to date of 126,967 million pounds was recorded. Total production has generally fallen since that time. Since World War II production per cow has increased rapidly while the number of cows has correspondingly declined rapidly.

An increasing percentage of the milk marketed in the United States is marketed as Grade A milk.1/ This percentage has increased from 61 in 1950 to 80 in 1975. Figure 2 shows the quantities of Grade A and B from 1950 through 1975. The quantity of Grade B milk marketed has steadily declined since the early 1960's while Grade A milk marketings have generally increased.

Although considerable effort has been invested in the analysis of aggregate milk supply response, little concensus has been reached on either the factors which significantly affect milk production or the magnitude of the price elasticity. Analyses of aggregate U. S. production have typically used econometric analysis. Since the introduction of

1/ Grade A is milk eligible for the fluid market; grade B is manufacturing grade milk.

Figure 1. Number of Milk Cows on Farms, Production Per Cow and Annual Milk Production in the United States, 1924 - 1975.[a/]



a/ Data sources are listed on the following page.

Data Sources for Figure 1.

1924 - 1959: U.S.D.A., Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303, Table 1.

1960 - 1966: U.S.D.A., Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430, Table 6.

1967 - 1971: U.S.D.A., Statistical Reporting Service, Milk Production, Disposition and Income 1970-72, April 1973, Table 1.

1972 - 1973: U.S.D.A., Statistical Reporting Service, Milk Production, Disposition and Income 1972-74, April 1975, Table 1.

1974 - 1975: U.S.D.A., Statistical Reporting Service, Milk Production, February 1976, page 5.

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distributed lag models in the late 1950's[2/], the econometric analyses have been of three types: (1) the simultaneous estimation of equations for cow numbers and production per cow, (2) single equation estimation of total production, and (3) recent attempts to estimate recursive models of the milk production sector.3/ Table 1 provides a summary of the studies of the first two types.

Three studies employ two stage least squares to simultaneously estimate cow numbers and production per cow. Zepp and McAlexander,4/ using yearly changes for these two variables in a simplistic model, obtained prediction results that proved to be better than a recursive programming model. Wilson and Thompson5/ and Prato6/ estimate these two

2/ Prior to the introduction of distributed lag models, the analysis of supply measured only short-run effects. Examples of such studies include Cochrane, W. W., Farm Prices - Myth and Reality, Minneapolis, University of Minnesota Press, 1958 and Halvorson, Harlow W., "The Supply Elasticity for Milk in the Short Run", Journal of Farm Economics, 37:1186-1197, December 1955.

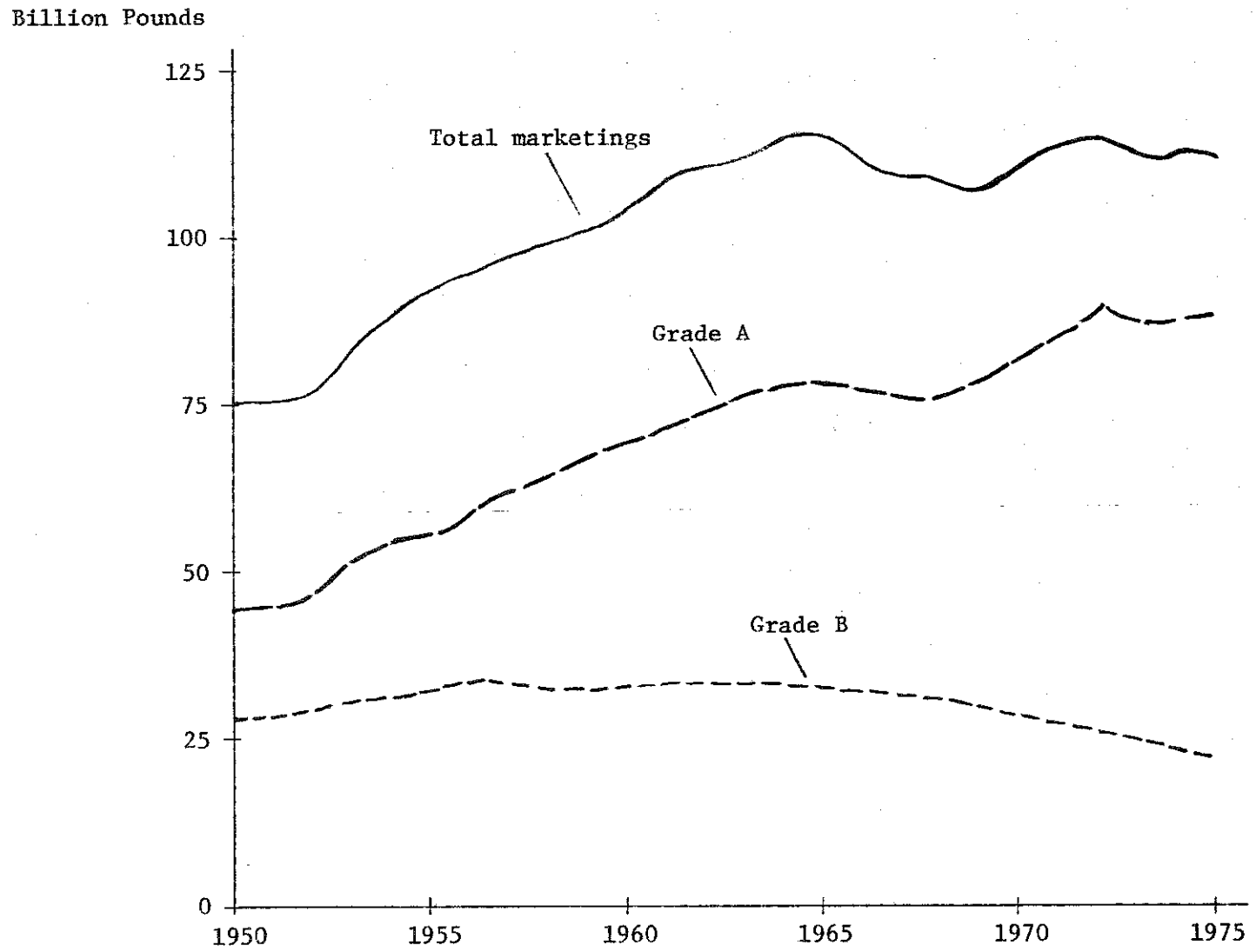
3/ Since the attempts to estimate recursive models of the milk production sector have used a regional rather than a national specification, the studies are discussed in a later section.

4/ Zepp, Glenn A. and Robert H. McAlexander, "Predicting Aggregate Milk Production, An Empirical Study", American Journal of Agricultural Economics, 51:642-649, August 1969.

5/ Wilson, Robert R. and Russell G. Thompson, "Demand, Supply, and Price Relationships for the Dairy Sector, Post-World War II Period", Journal of Farm Economics, 49:360-371, May 1967.

6/ Prato, Anthony A., "Milk Demand, Supply and Price Relationships, 1950-1968", American Journal of Agricultural Economics, 55:217-222, May 1973.

Figure 2. Grade A and Grade B Milk Marketings*, 1950 - 1975.



*Grade A is eligible for the fluid market, Grade B is manufacturing grade.
Source: U.S.D.A., Economic Research Service, Dairy Situation, DS-360, May 1976, Figure 9.

Table 1. Summary of Selected Studies of U. S. Milk Production Response

Author of Study	Time Series	Dependent Variables	Predetermined Variables												Elasticity	
			Milk Price	Lagged Milk Price	Lagged Dependent Var.	Roughage supply	Concentrate supply	Concentrate price	Beef price	Hog price	Production per cow	Cow numbers	Cows bred artificially	Labor Cost	SR	LR
Halvorson[a/]	1927-57	Milk Prod.		S	S	S	I		I	I					.157	.403
Cromarty[b/]	1929-53	Milk Prod.	S			S		S				S			.212	--
Wipf & Houck[c/]	1945-64	Milk Prod.		S	S	S		S	S						.027 to .140	.041 to .192
Prato[d/]	1950-68	Cow Nos.	I		I			I	S		S			I	--	--
		Prod. Per Cow	I		S			I				I	S		--	--
Hammond[e/]	1947-72	Milk Prod.		S	S				S	S			I	S	.039	.145
Wilson & Thompson[f/]	1947-63	Cow Nos.	I	I	S			I	S		I			I	.003	.521
		Prod. Per Cow	I	I								S	S			

I - Included but not significant at 5 percent level of significance.
S - Included and significant at 5 percent level of significance.

Note: Footnotes are listed on the following page.

Footnotes for Table 1.

a/ Halvorson, Harlow, W., "The Response of Milk Production to Price", Journal of Farm Economics, 40:1101-1113, December 1958.

b/ Cromarty, William A., "An Econometric Model for United States Agriculture", Journal of the American Statistical Association, 54:556-574, September 1959.

c/ Wipf, Larry J. and James P. Houck, Milk Supply Response in the United States: An Aggregate Analysis, Report No. 532, Dept. of Agricultural Economics, University of Minnesota, July 1967.

d/ Prato, Anthony A., "Milk Demand, Supply, and Price Relationships, 1950-1968", American Journal of Agricultural Economics, 55:217-222, May 1973.

e/ Hammond, Jerome W., "Regional Milk Supply Analysis", Department of Agricultural and Applied Economics Staff Paper 74-12, University of Minnesota, July 1974.

f/ Wilson, Robert R. and Russell G. Thompson, "Demand, Supply, and Price Relationships for the Dairy Sector, Post-World War II Period", Journal of Farm Economics, 49:360-371, May 1967.

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equations as part of simultaneous equation models of the dairy industry. The resulting inclusion of current milk prices in the structural equation indicated that the use of lagged prices may be more appropriate as this year's price never proved to be statistically significant.

Halvorson[7/], Wipf and Houck[8/], and Hammond[9/] have used the partial adjustment hypothesis on annual U. S. data to estimate total milk production (see Table 1). Wipf and Houck and Hammond found the coefficient of adjustment to be about 0.6 while Halvorson's investigation found it to be about 0.4. All three specifications included milk price lagged one year and found it to be highly significant. Each study found milk supply to be inelastic in the short and long run with Halvorson obtaining a somewhat more inelastic response. Hammond was unable to obtain significance on any

7/ Halvorson, Harlow W., "The Response of Milk Production to Price", Journal of Farm Economics, 40:1101-1113, December 1958.

8/ Wipf, Larry J. and James P. Houck, Milk Supply Response in the United States: An Aggregate Analysis, Report No. 532, Dept. of Agricultural Economics, University of Minnesota, July 1967.

9/ Hammond, Jerome W., Regional Milk Supply Analysis, Department of Agricultural and Applied Economics Staff Paper 74-12, University of Minnesota, July 1974.

cost of production variables while the other two studies had some success, particularly Wipf and Houck with significant coefficients on grain prices and roughage available. Hammond found several measures of opportunity cost--beef price, land value, the unemployment rate, and hog price--to have significant coefficients while Wipf and Houck found the beef price to be very important. As is common with time series analyses of this type, all three studies recorded impressive R^2 values. Graphical ex post verification of the Hammond model provided impressive results.

Although no consensus is reached, it can be concluded from these studies that the short-run response to price is very inelastic due to the large fixed investments on dairy farms and that the long-run response is more elastic but still highly inelastic. Other variables affecting supply response are beef price and input prices particularly for feed.

GEOGRAPHIC DISTRIBUTION AND SHIFTS IN PRODUCTION[10/]

Although milk is produced in all regions of the country, the major production areas are in the Northeast, the Lake States, and California. Each of these regions as well as the minor producing areas possess unique characteristics that have affected the increase or decline in milk production. In this section the distribution and shifts in production are characterized and attempts to isolate the factors contributing to these patterns are summarized.

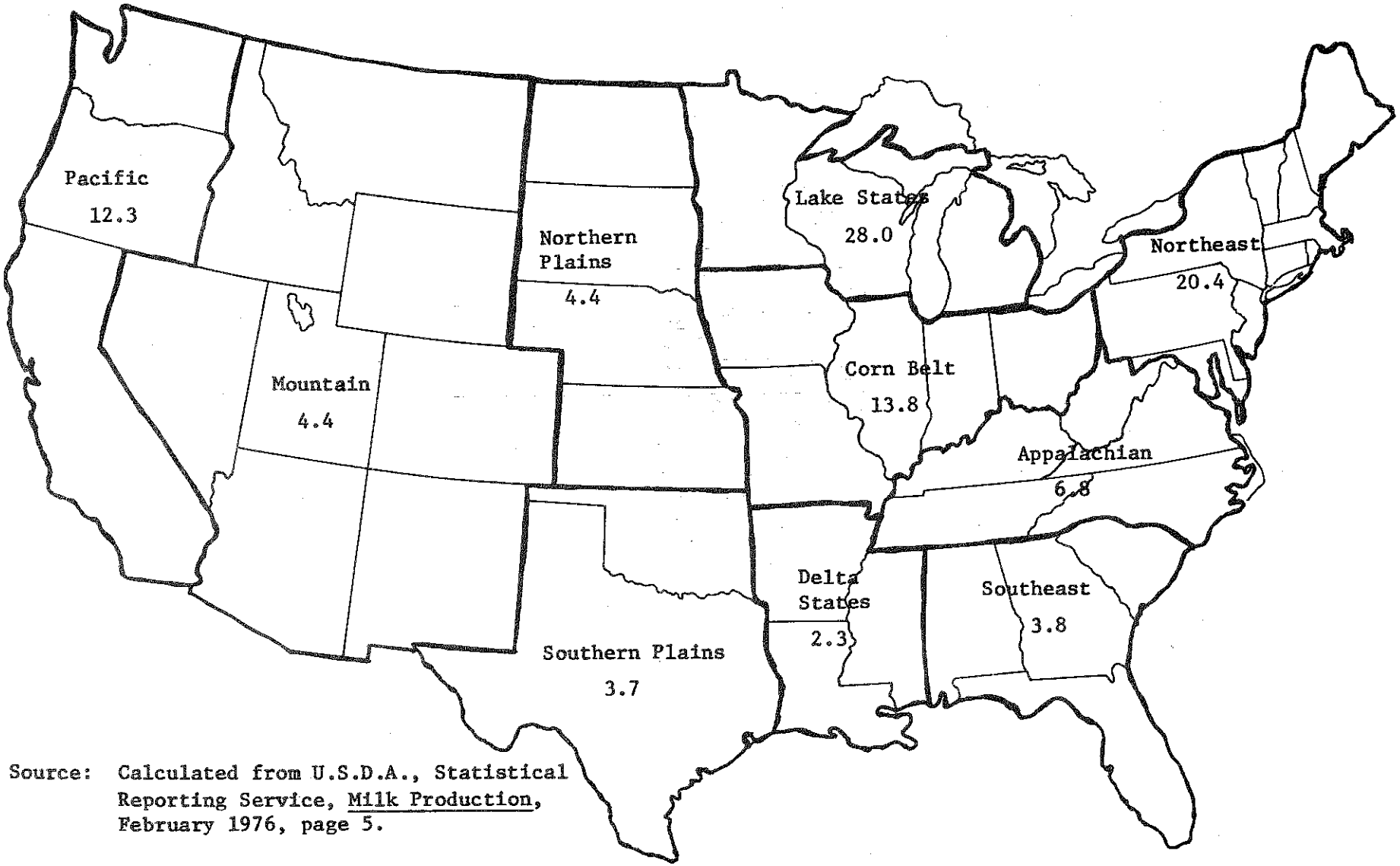
Production by Regions

The ten regions are outlined in Figure 3. The distribution of production by region and percentage change within each region for selected years is summarized in Table 2. An increasing proportion of the milk is produced in the largest producing region, the Lake States (Michigan, Wisconsin, Minnesota). Nearly one-half of the U. S. production is currently produced in the Lake States and the Northeast. Other major producing regions are the Corn Belt where production has been declining rapidly and the Pacific Region (particularly California) where production has been increasing rapidly. The remaining six regions have been producing a steadily declining proportion of total production (25.4 percent in 1975). Production has been increasing in the Southeast and declining steadily in the Northern and Southern Plains.

The proportion of production eligible for the fluid market (Grade A) varies by region. Figure 4 illustrates this proportion by region for 1975. These percentages indicate that a large proportion of the Grade B milk is

10/Unfortunately no single regional breakdown of the fifty states has been used in reporting dairy statistics and research results. Whenever possible the ten region specification currently used by U.S.D.A. in Dairy Situation and elsewhere is used.

Figure 3. Composition of Regions and Percentage of 1975 Production in Each Region.



Source: Calculated from U.S.D.A., Statistical Reporting Service, Milk Production, February 1976, page 5.

Table 2. Percentage of Total Production in Each Region and Changes in Production by Region in Selected Years, 1940-1975.

	Percent of Total Production					Percent Change in Total Production			
	1940	1950	1960	1970	1975	1940: 1975	1950: 1975	1960: 1975	1970: 1975
Northeast	16.8	18.1	20.0	20.7	20.4	+27.6	+11.1	- 4.3	- 3.0
Lake States	23.8	24.3	27.0	27.9	28.0	+24.1	+14.1	- 2.8	- 1.2
Corn Belt	21.0	21.0	18.0	14.8	13.8	-30.6	-34.8	-28.0	- 7.9
Northern Plains	8.5	6.8	5.8	5.0	4.4	-44.7	-35.1	-28.0	-13.1
Appalachian	6.6	7.8	7.2	7.0	6.8	+ 8.8	-13.5	-10.9	- 3.7
Southeast	2.8	3.1	3.1	3.5	3.8	+41.3	+20.1	+14.2	+ 4.7
Delta States	2.9	2.9	2.5	2.4	2.3	-16.0	-23.2	-12.7	- 6.6
Southern Plains	6.0	4.7	3.5	3.7	3.7	-34.9	-21.3	- 1.7	- 0.8
Mountain	4.0	3.6	3.9	4.0	4.4	+15.8	+22.6	+ 7.2	+ 9.2
Pacific	7.5	7.7	9.0	10.7	12.3	+71.7	+57.6	+27.6	+13.2
United States						+ 5.5	- 1.0	- 6.2	- 1.3

Source: Calculated from:

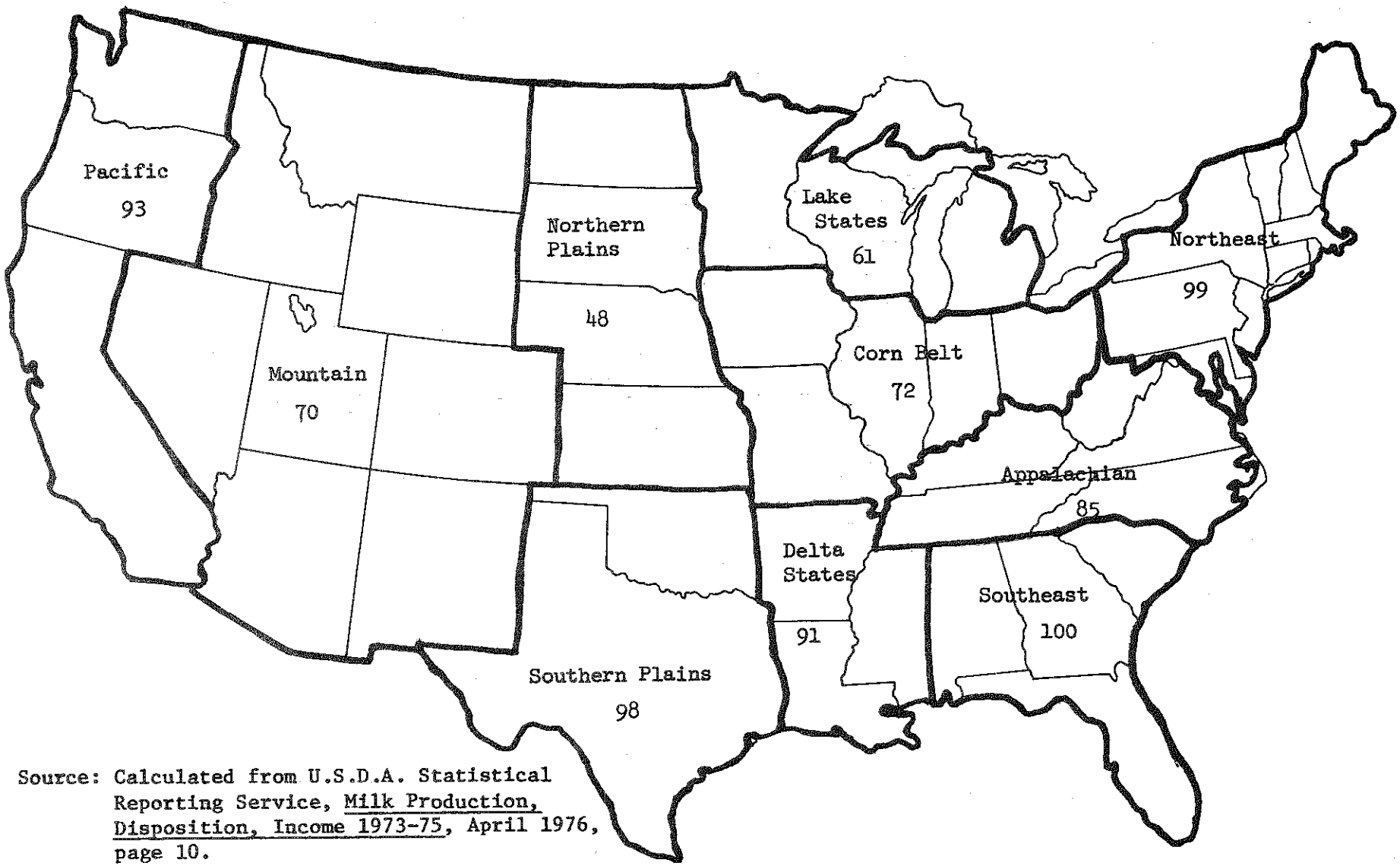
1940 & 1950: U.S.D.A. Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303, Tables 2-49.

1960: U.S.D.A. Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430, Table 4.

1970: U.S.D.A. Statistical Reporting Service, Milk Production, Disposition, and Income, 1970-72, April 1973, Page 6.

1975: U.S.D.A. Statistical Reporting Service, Milk Production, February 1976, Page 5.

Figure 4. Percentage of Milk Sold to Plants and Dealers That Was Fluid Grade Milk (Grade A) by Regions, 1975.



Source: Calculated from U.S.D.A. Statistical Reporting Service, Milk Production, Disposition, Income 1973-75, April 1976, page 10.

produced in the Lake States, Corn Belt, and Northern Plains. Many of these Grade B farms are in Wisconsin and Minnesota. Virtually all milk in the Northeast and Southeast is fluid grade.

Table 3 illustrates the dramatic differences in production per cow by region. The Pacific region has by far the largest production per cow. This average of 13,214 pounds per cow in 1975 was almost double the average in the Delta States region.11/ The two major production regions, the Lake States and the Northeast, have maintained similar production levels per cow; this level has been somewhat above the national average. Production per cow in the Corn Belt has been less than the national average; a factor which may have contributed to the production declines in the region. Production per cow just about doubled between 1940 and 1970 in most regions. Greater proportionate increases were recorded in Appalachian, Southeast, Delta States, Southern Plains, and Mountain regions; however, each of these regions had a very low average in 1940.

Leading States

The ten leading states in total milk production are ranked for selected years in Table 4. The states included have remained remarkably constant over the thirty-five year period; however, significant changes in ranking have occurred. Wisconsin continues to produce almost twice as much milk as any other state. The major ranking changes that have occurred are (a) California has consistently moved up to where it ranked second in 1975, (b) Iowa has declined substantially and (c) Pennsylvania has moved up.

Due to the current predominance of Grade A production, the ranking of the top ten states by 1975 Grade A production differs little from the ranking by 1975 total production; the only difference being that Grade A production in Minnesota is much smaller than in Pennsylvania and approximately the same as in Michigan. This leaves four major Grade A producing states--Wisconsin, California, New York, and Pennsylvania. The leading Grade B producing states are centered in the Lake States and Northern Midwest. They are (production in million pounds)12/: Wisconsin (7,153), Minnesota (4,788), Iowa (2,145), South Dakota (1,037), Missouri (1,012), Idaho (926), California (726), North Dakota (515), Kentucky (506), Illinois (502).

Table 5 contains the ranking of the top ten states in production per cow for the same years. These rankings are much less stable than the total production rankings. California has consistently maintained the highest production per cow. In 1975 the seven leading states were in the Western part of the U. S. Only California of the ten leading states in total

11/Average production per cow in 1975 varied from 7,180 in Mississippi to 13,566 in California.

12/Grade B production is calculated by multiplying (1.0 - percent fluid grade) times quantity of milk sold to plants and dealers in U.S.D.A. Statistical Reporting Service, Milk Production, Disposition, Income 1973-75, April 1976, page 10.

Table 3. Production Per Cow in Each Region and Changes in Production Per Cow by Region in Selected Years, 1940-1975.

	Production Per Cow					Percentage Change in Production Per Cow			
	1940	1950	1960	1970	1975	1940: 1975	1950: 1975	1960: 1975	1970: 1975
Northeast	5,561	6,457	7,909	10,503	10,601	+ 90.6	+ 64.2	+ 34.0	+ 0.9
Lake States	5,530	6,469	8,192	10,223	10,359	+ 87.3	+ 60.1	+ 26.5	+ 1.3
Corn Belt	4,533	5,294	6,957	9,556	10,134	+123.6	+ 91.4	+ 45.7	+ 6.0
Northern Plains	4,117	4,566	6,017	8,657	8,903	+116.2	+ 95.0	+ 48.0	+ 2.8
Appalachian	3,589	4,099	5,165	7,856	9,245	+157.6	+125.5	+ 79.0	+17.7
Southeast	3,254	3,724	5,048	7,937	9,154	+181.3	+145.8	+ 81.3	+15.3
Delta States	2,611	2,881	3,699	6,416	7,578	+190.2	+163.0	+104.9	+18.1
Southern Plains	3,263	3,491	5,238	8,682	9,430	+189.0	+170.1	+ 80.0	+ 8.6
Mountain	5,074	5,630	7,469	10,260	11,248	+121.7	+ 99.8	+ 50.6	+ 9.6
Pacific	6,471	7,186	9,144	12,177	13,214	+104.2	+ 83.9	+ 44.5	+ 8.5
United States	4,622	5,314	7,029	9,747	10,354	+124.0	+ 94.8	+ 47.3	+ 6.2

Sources: Calculated from:
1940 & 1950: U.S.D.A. Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303, Table 2-49.
1960: U.S.D.A. Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430, Table 2 and 5.
1970: U.S.D.A. Statistical Reporting Service, Milk Production, Disposition, and Income, 1970-72, April 1973, page 6.
1975: U.S.D.A. Statistical Reporting Service, Milk Production, February 1975, page 5.

Table 4. Top Ten States in Total Production in Selected Years.

	Rank					1975 Production (million lbs.)
	1940	1950	1960	1970	1975	
Wisconsin	1	1	1	1	1	18,900
California	7	5	4	4	2	10,853
New York	3	2	3	2	3	9,904
Minnesota	2	3	2	3	4	8,946
Pennsylvania	8	6	5	5	5	7,140
Michigan	6	7	7	7	6	4,434
Ohio	9	8	8	8	7	4,254
Iowa	4	4	6	6	8	3,916
Texas	10			9	9	3,221
Missouri		10	10	10	10	3,021
Illinois	5	9	9			2,560

Source: See source for Table 2.

Table 5. Top Ten States in Production Per Cow in Selected Years.

	Rank					1975 Production Per Cow (pounds)
	1940	1950	1960	1970	1975	
California	1	1	1	1	1	13,566
Washington	4	6	6	2	2	12,829
Arizona			2	3	3	12,537
Nevada					4	11,929
Utah	10	7			5	11,633
Colorado					6	11,600
New Mexico					7	11,500
New Jersey	2	2	3	8	8	11,213
Connecticut	9	9	7	4	9	11,145
Hawaii			4	10	10	11,145
Massachusetts	5	8	9	5		10,927
New York	8	5		6		10,800
Rhode Island	3	3	5	7		10,678
Michigan				9		10,557
Alaska			10			10,500
Idaho	6					10,442
Wisconsin	7	4	8			10,430
Pennsylvania		10				10,215

Source: See source for Table 3.

production in 1975 was included in the ten leading states in production per cow. The leading state in total production, Wisconsin, was well below the top ten in average production in 1970 and 1975.

Supply Response

Numerous authors have investigated milk supply response for various regions by econometric and programming analyses. Unfortunately there is little consistency in the regional breakdowns used. Two recent studies have estimated supply response for each region in the U. S.13/ Following a discussion of these two studies, other analyses of particular areas are summarized.

Hammond14/ employed the partial adjustment hypothesis to estimate milk supply response for the nine standard census regions using annual observations for 1947-1972. The supply elasticities and adjustment periods for each region are presented in Table 6. Except for the Pacific region, the elasticities are very inelastic. Other variables found to be significant in many regions were beef price, proportion of cows bred artificially three years previous, index of real estate price, and wage rate. The absence of any variables to reflect feed prices is surprising.

The second regional analysis employs a recursive model of the milk production sector based on biological as well as economic considerations.15/ Jackson16/ estimated such a model for each of the ten regions pictured in Figure 3 and 4. A polynomial lag was used to estimate structural equations for 1950-196917/ for number of cows, yield per cow, concentrates fed per cow, number of heifers, and cull cow numbers. Table 7 summarizes the elasticities obtained. These results suggest a more elastic response than Hammond and other studies with all regions except Lake States and the Northeast exhibiting an elastic response. The pattern of the polynomial response suggests that the use of the partial adjustment hypothesis may be inappropriate.

13/ A third study estimated nine regional production equations; however, prespecified elasticities for lagged milk price and feed price were used. The study was Hallberg, M. C. and R. F. Fallert, Policy Simulation Model for the United States Dairy Industry, Pennsylvania Agricultural Experiment Station Bulletin 805, January 1976.

14/ Hammond, op. cit.

15/ A model of this type was first suggested in Frick, G. E. and W. F. Henry, Production Efficiency on New England Dairy Farms, New Hampshire Agricultural Experiment Station Bulletin 430, August 1956.

16/ Jackson, Geoffrey H., "Milk Supply Response and Some Regional Implications for Dairy Policy in the United States", Unpublished Ph.D. thesis, Cornell University, 1973.

17/ Some equations were estimated for shorter time periods due to data restrictions.

Table 6. Supply Elasticities and Adjustment Periods for Each Region in the Hammond Study.

	Price Elasticity[a/]		
	Short Run	Long Run	Years to Adjust[b/]
New England	.219	.359	3.19
Middle Atlantic	.123	.258	4.59
East North Central	.083	.152	3.76
West North Central	.030	.101	8.75
South Atlantic	.142	.227	3.02
East South Central	.109	.299	6.50
West South Central	.183	.285	2.86
Mountain	.176	.236	2.17
Pacific	.374	1.040	6.71

a/ Although most of the elasticities are significantly different from zero, no test of the significance of the regional differences was performed.

b/ Number of years for 95 percent of total adjustment to occur.

Source: Hammond op. cit., pp. 18 and 21.

Table 7. Supply Elasticities for Each Region in the Jackson Study.

Region	Cow Number Elasticitiesa/ S.R.b/	Cow Number Elasticitiesa/ L.R.c/	Yield Elasticitya/	Total Supply Elasticitiesa/ S.R.d/	Total Supply Elasticitiesa/ L.R.e/
Northeast	0.1254	0.6688	0.1361	0.2615	0.8049
Appalachian	0.6732	1.3107	0.7202	1.3934	2.0309
Southeast	1.3496	3.0659	0.1892	1.5388	3.2551
Lake States	0.0545	0.6537	0.1314	0.1859	0.7851
Corn Belt	0.2180	1.5505	0.4220	0.6440	1.9725
Delta States	0.9949	2.2158	1.7773	2.1722	3.3931
Northern Plains	0.0271	1.1905	0.3745	0.4016	1.5650
Southern Plains	0.6167	1.8721	0.5524	1.1691	2.4245
Mountain	0.4650	1.1566	0.3177	0.7827	1.4743
Pacific	0.5748	0.7068	0.6319	1.2067	1.3387

a/ Although most of the elasticities are significantly different from zero, no test of the significance of the regional differences was performed.

b/ Short run is the sum of periods t and t-1.

c/ Long run is the sum of periods t to t-8.

d/ S.R. total supply elasticity = S.R. cow number elasticity + yield elasticity.

e/ L.R. total supply elasticity = L.R. cow number elasticity + yield elasticity.

Source: Jackson op. cit., page 67.

Table 8 contains a summary of additional estimates of supply elasticities. Although no consensus is reached on the regional elasticities, several hypotheses can be drawn. There is considerable evidence that the long-run supply response in many regions of the country is more elastic than the studies of U. S. production indicated. It is also quite clear that the major producing regions, Lake States and Northeast, have a more inelastic response than other regions of the country. Further, the Western Region, which is rapidly expanding output, is characterised by an elastic supply response. These observations are consistent with expectations based upon the availability of alternative enterprises in the region, the level of commitment of the dairies in the region, and the capital market in the region. It is clear that future attempts to measure milk supply response must develop new approaches that better capture the response of dairymen.

UTILIZATION AND CONSUMPTION

In the previous sections the production of the homogenous product "milk" was discussed; in this section the utilization of this milk and the consumption of dairy products is summarized. Table 9 summarizes the total and per capita sales of milk and dairy products in 1975. By far the most important single use of milk is for fluid consumption.

Utilization

As indicated in Figure 5, between 40 and 50 percent of all milk marketed has been utilized as fluid milk. This proportion has been relatively constant with some decline in recent years. The proportion used to process butter declined steadily from 27.9 in 1962 to 16.6 in 1973 with a slight upturn in the last two years. In the last fifteen years the proportion of total milk used to make cheese has more than doubled while the proportion used in frozen dairy products has increased slightly.

There is considerable variation among regions as to how the milk is actually utilized. Although fluid utilization varies among regions, the actual usage cannot be calculated due to movement across regions.

Table 10 summarizes the production of butter and cheese in each region and the percentage that production is of U. S. production. About half of the butter and cheese is produced in the Lake States. The second largest producing region, the Northeast, is relatively small in production of cheese and butter partly because of the large fluid consumption in the region. The Pacific region is the second largest producer of butter but only a minor producer of cheese.

Table 8. Summary of Additional Selected Elasticity Estimates for Various Regions.

Author of Study	Region or State	Observations	Dependent Variable	Estimation Method	Elasticity S.R.	Elasticity L.R.
Ladd & Winter[a]	Iowa	1926 - 56 Annual	Milk Production	Econometric	.212	--
Chen, Courtney, & Schmitz[b]	California	1953 - 68 Quarterly	Market Milk Production	Polynomial lag	.45	2.541
Milligan[c]	California	1958 - 73 Bimonthly	Milk Production	4-year lag structure	.425[d]	.924[d]
Northeast Dairy Adjustment Committee[f]	Northeast	1960 - 65	Milk Production	Linear Programming	--	.36 to 1.81[e] Ave.=.82

a/ Ladd, George W. and George R. Winter, "Supply of Dairy Products by Iowa Farmers", Journal of Farm Economics, 43:113-122, February 1961.

b/ Chen, Dean, Richard Courtney and Andrew Schmitz, "A Polynomial Lag Formulation of Milk Production Response", American Journal of Agricultural Economics, 54:77-83, February 1972.

c/ Milligan, Robert A., "An Econometric Model of the California Dairy Industry", Unpublished Ph.D. thesis, University of California, Davis, 1975.

d/ This article estimated supply response equations for market milk [Grade A] in five regions of California and for manufacturing milk. He found an inelastic response (.25 to .55 in long-run) for those regions with large, specialized dairies and an elastic response (1.5 to 3.6) for those equations characterized by smaller firms.

e/ Elasticities were computed for 20 districts within the Northeast Region.

f/ Northeast Dairy Adjustments Study Committee, Dairy Adjustment in the Northeast: An Analysis of Potential Production and Market Equilibrium, New Hampshire Agricultural Experiment Station Bulletin 498, June 1968.

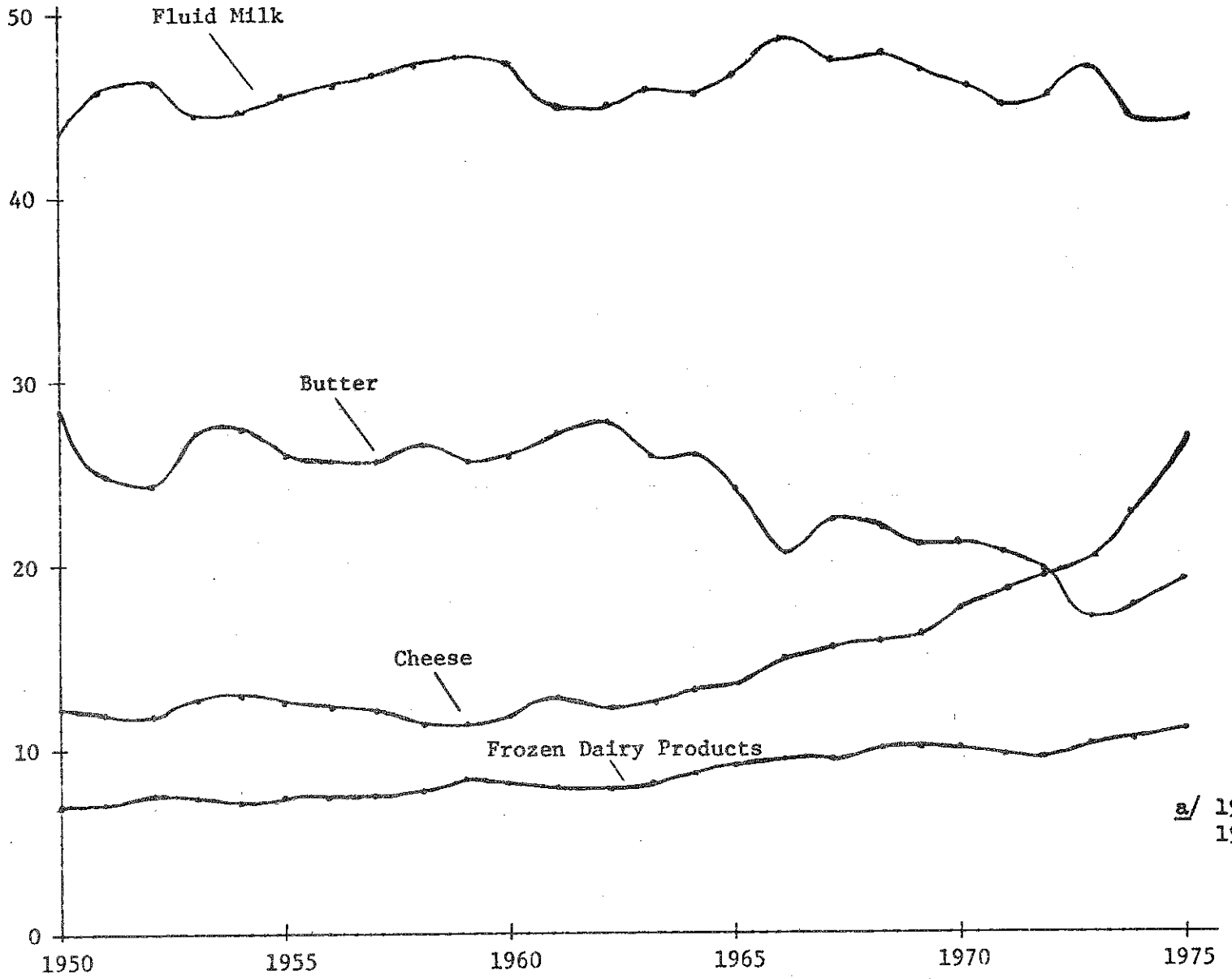
Table 9. Milk and Dairy Product Sales, 1975.a/

	Million Product Pounds	Per Capita Product Pounds
Fluid whole milk	41,170	195
Cream	1,235	5.9
Low-fat milk	17,855	84.7
Total fluid milk products	60,260	286
Butter	944	4.4
Cheese		
American	1,692	7.9
Other hard cheese	1,317	6.2
Cottage cheese	1,066	5.0
Evaporated and condensed		
Whole milk	1,107	5.2
Skimmed and buttermilk	770	3.6
Frozen Products		
Ice cream	4,000	18.8
Ice milk	1,620	7.6
Sherbert	313	1.5
Other	67	0.3
Dry Products		
Whole milk	16	0.1
Nonfat dry milk	661	3.1
Buttermilk	44	0.2
Whey	487	2.3

a/ Preliminary data.

Source: U.S.D.A. Economic Research Service, Dairy Situation, July 1976, Table 3.

Figure 5. Percentage of Total Milk Marketed Utilized as Fluid Milk, Frozen Dairy Products, Butter and Cheese, 1950-1975.a/



a/ 1974 - Preliminary
1975 - Estimated

Source: 1950-65: U.S.D.A. Economic Research Service, Dairy Situation, November 1967.
1966-75: U.S.D.A. Economic Research Service, Dairy Situation, December 1975.

Table 10. Quantity and Percentage of Butter and Cheese Produced in Each Region, 1975.

	Butter		Cheese	
	1,000 Pounds	Percent of Total	1,000 Pounds	Percent of Total
Northeast	65,477	6.7	353,122	12.6
Lake States	453,299	46.2	1,433,231	51.0
Corn Belt	115,394	11.8	394,440	14.0
Northern Plains	44,666	4.6	199,250	7.1
Appalachian	38,350	3.9	85,517	3.0
Southeast	0	0	0	0
Delta States	1,487	0.2	18,558	0.7
Southern Plains	23,178	2.4	9,853	0.4
Mountain	27,774	2.8	134,527	4.8
Pacific	176,451	18.0	139,395	5.0
United States	980,477		2,811,178	

Source: U.S.D.A. Crop Reporting Board, Dairy Products Annual Summary 1975, June 1976, Tables 5 and 7.

Consumption

As Table 11 indicates, consumer preferences for the various dairy products have changed in the last twenty-five years. The most significant change is the continuing decline in per capita consumption of fluid products. In addition, there has been a shift from whole milk to lowfat and skim milk. Further, consumption of butter and evaporated and condensed milk products has declined rapidly. Per capita consumption of cheese has been increasing rapidly; consumption of frozen dairy products increased rapidly until it leveled off in the late 1960's. Consumption of all dairy products (in product pounds) has been declining slowly over the twenty-five year period.

The major trend underlying the shifts in utilization and consumption has been a movement from products containing large quantities of milkfat to those dairy products high in solids-not-fat. This trend is illustrated in Figure 6. While total use of milkfat has been relatively constant over the last thirty-five years, total consumption of solids-not-fat has increased by nearly seventy percent. In recent years the trend to increased consumption of solids-not-fat has shown signs of leveling off or even reversing.

Substitutes

It is often concluded that dairy products have few substitutes. This conclusion is true from a nutritional viewpoint as there are few food substitutes particularly for fluid milk, but from an economic perspective this conclusion is not valid as there are many nonfood substitutes to milk and other dairy products.

When the substitutability of fluid milk is discussed, milk should be considered a beverage with potential substitutes including coffee, tea, soft drinks, fruit drinks, and alcoholic beverages. As indicated in Table 11, per capita consumption of fluid milk products has been steadily decreasing since 1950. During this time period, per capita consumption of soft drinks and alcoholic beverages has been increasing rapidly. Another substitute, which has been of great concern to the dairy industry, is imitation milk. Various products using vegetable fat have been marketed as substitutes for fluid milk. To date the impact has been minimal.

The impact of the substitutability of vegetable and milk fat has been most profound in manufactured dairy products, particularly butter. Figure 7 illustrates the extent to which margarine has replaced butter as the common table spread.

Demand Elasticities

Most studies have concluded that the demand for dairy products, like that for most food items, is both price and income inelastic. Table 12 summarizes several of the more comprehensive studies of the demand for dairy products. Most of the work in this area has been with fluid products; the resulting price elasticities have generally been in the range of -0.2 to -0.6, and the resulting income elasticities have generally been in the

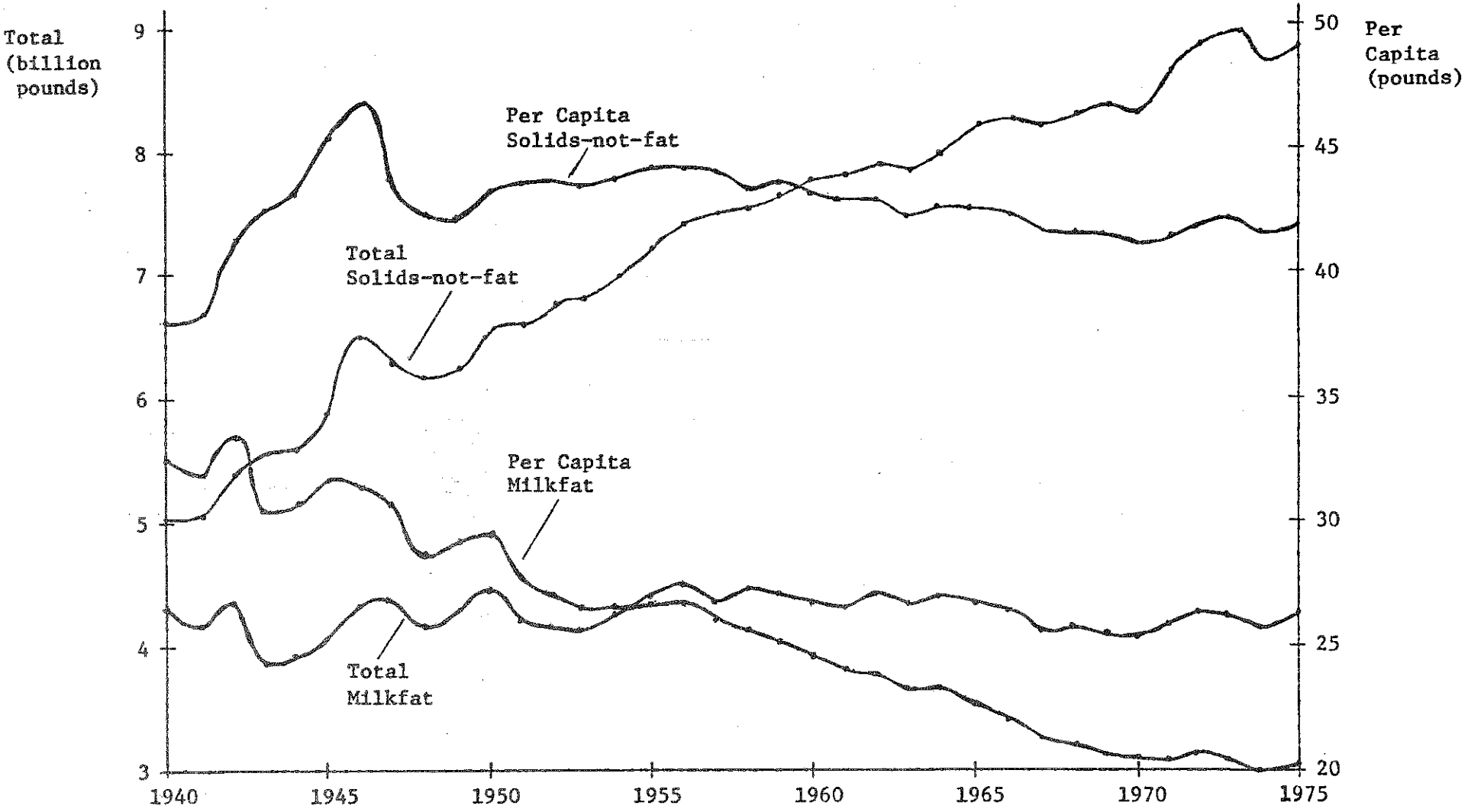
Table 11. Per Capita Consumption of Selected Dairy Products, 1950-1974.

Year	Fluid Milk & Cream	Butter	Cheese	Evaporated & Condensed Milk	Frozen Products	Dry Milk Products	Total Retail Product Weight
				(Pounds)			
1950	348	10.7	10.8	25.2	19.4	4.6	406
1951	350	9.6	10.5	23.1	20.2	4.9	408
1952	350	8.6	11.0	22.3	21.6	5.7	410
1953	346	8.5	11.1	22.2	22.5	5.0	406
1954	346	8.9	11.7	21.7	22.5	5.3	403
1955	348	9.0	11.8	20.9	23.5	6.3	407
1956	348	8.7	12.4	20.3	23.8	6.2	409
1957	344	8.3	12.2	20.0	24.1	6.3	403
1958	337	8.3	12.7	19.0	24.2	6.8	398
1959	330	7.9	12.7	19.0	25.8	7.3	393
1960	322	7.5	13.1	18.2	25.7	7.3	384
1961	312	7.4	13.2	18.1	25.8	7.3	377
1962	308	7.3	13.8	17.3	26.4	7.3	376
1963	307	6.9	13.8	16.1	27.0	7.0	374
1964	304	6.9	14.1	16.1	27.6	7.2	374
1965	302	6.4	14.3	15.7	28.1	7.0	373
1966	297	5.7	14.4	15.1	28.1	7.3	371
1967	285	5.5	14.6	14.1	27.8	7.1	362
1968	280	5.7	15.3	13.7	28.8	7.2	364
1969	272	5.4	15.8	12.8	28.8	7.2	360
1970	264	5.3	16.7	12.1	28.5	6.8	354
1971	259	5.1	17.6	11.9	28.2	6.8	355
1972	263	4.9	18.6	11.1	28.1	6.1	356
1973	257	4.8	19.0	10.4	28.1	6.7	351
1974[a/]	244	4.6	19.3	9.1	27.9	5.8	340

[a/] Preliminary.

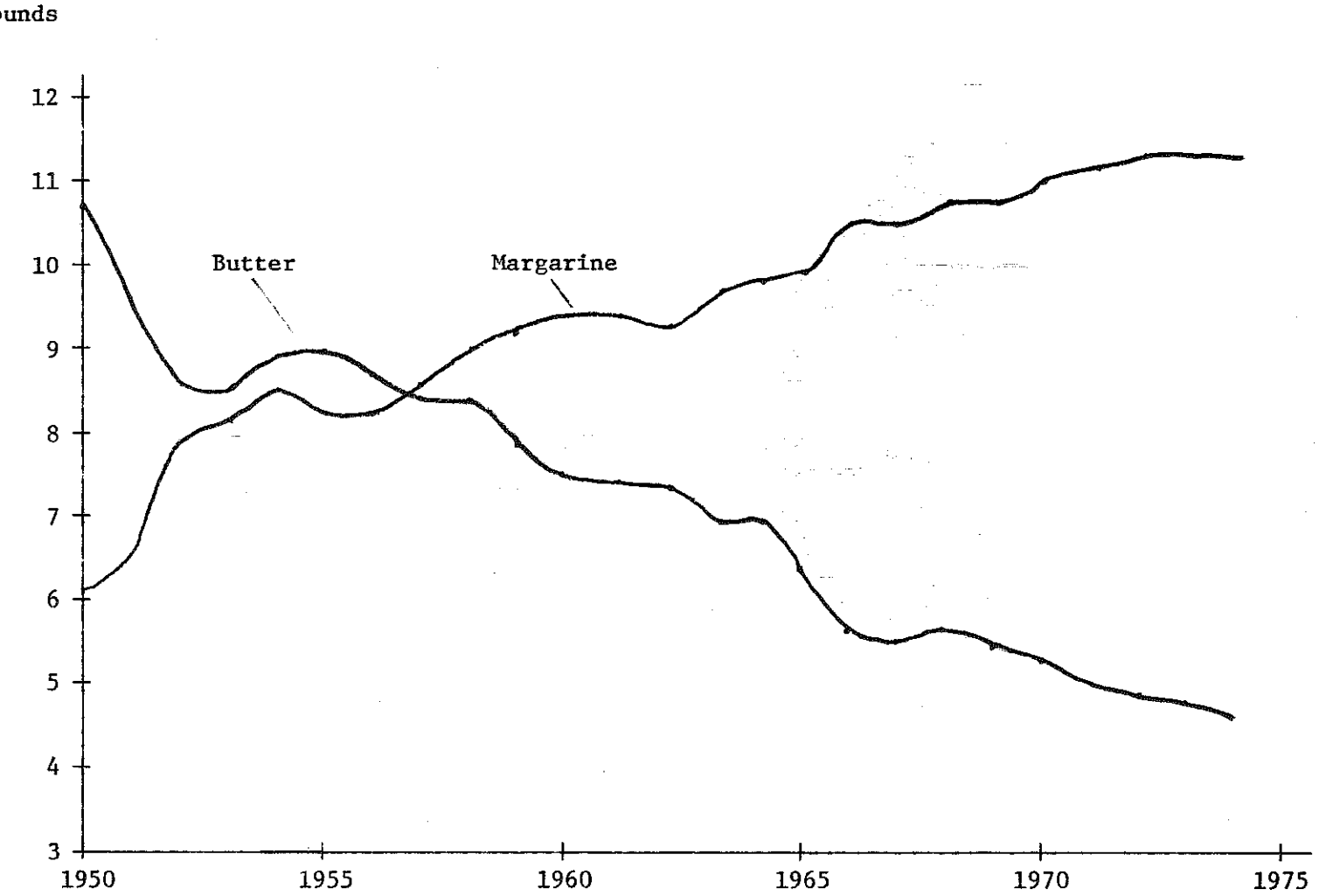
Source: U.S.D.A. Economic Research Service, Food Consumption, Prices, Expenditures, Agricultural Economic Report No. 138 and Supplement for 1974, July 1968 and January 1976, Table 11.

Figure 6. Total and Per Capita Use of Milkfat and Solids-not-fat, 1940-1975.



Source: 1940-49: U.S.D.A. Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303, February 1962, Tables 326 and 327.
1950-59: U.S.D.A. Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430, July 1968, Table 34.
1960-75: U.S.D.A. Economic Research Service, Dairy Situation, May 1976, Table 12.

Figure 7. Per Capita Consumption of Butter and Margarine, 1950-1975.



Source: U.S.D.A. Economic Research Service, Food Consumption, Prices, Expenditures, Agricultural Economic Report No. 138 and Supplement for 1974, July 1968 and January 1976, Table 12.

Table 12. Selected Studies of Price and Income Elasticities for Dairy Products.

Author	Elasticity[a/] Price	Income	Type of Study
	A. Fluid Milk		
Brandow[b/]	-0.285+	0.16+	All food elasticities
George & King[c/]	-0.346+	0.204+	All food elasticities
Prato[d/]	-0.5765*	--	334 Florida households
Boehm & Babb[e/]	-1.628*	0.052	Market Research Corporation of America Data-Cross section
	B. Frozen Dairy Products		
Brandow[b/]	-0.55+	0.35+	All food elasticities
George & King[c/]	-0.528+	0.331+	All food elasticities
Boehm & Babb[f/]	-0.471*	0.07	MRCA - cross section
	C. Cottage Cheese		
Boehm & Babb[f/]	-1.29*	0.168*	MRCA - cross section
	D. Cheese		
Brandow[b/]	-0.7+	0.45	All food elasticities
George & King[c/]	-0.46	0.25	All food elasticities
Boehm & Babb[g/]	-0.851*	0.234*	MRCA - cross section
	E. Butter		
Brandow[b/]	-0.85+	0.33+	All food elasticities
George & King[c/]	-0.65+	0.32+	All food elasticities
Boehm & Babb[g/]	-0.76*	0.17	MRCA - cross section
	F. Nonfat Dry Milk		
Boehm & Babb[g/]	-2.24	-0.03	MRCA - cross section

[a/] An asterisk (*) indicates that the elasticities were found to be significant at the 5 percent level of significance; a (+) indicates no test of significance was possible or was performed.

[b/] Brandow, G. E., Interrelations Among Demands for Farm Products and Implications for Control of Market Supply, Bulletin 680, The Pennsylvania State University, August 1961.

[c/] George, P. S. and G. A. King, Consumer Demand for Food Commodities in the United States with Projections for 1980, Giannini Foundation Monograph No. 26, Berkeley, California, March 1971.

[d/] Prato, Anthony A., Household Demand and Purchasing Behavior for Fluid Milk in Gainesville, Florida, Florida Agricultural Experiment Station, Agricultural Economics Report 19, March 1971.

Footnotes for Table 12. (continued)

e/ Boehm, William T. and Emerson M. Babb, Household Consumption of Beverage Milk Products, Indiana Agricultural Experiment Station Bulletin No. 75, March 1975.

f/ Boehm, William T. and Emerson M. Babb, Household Consumption of Perishable Manufactured Dairy Products: Frozen Desserts and Specialty Products, Indiana Agricultural Experiment Station Bulletin No. 105, September 1975.

g/ Boehm, William T. and Emerson M. Babb, Household Consumption of Storable Manufactured Dairy Products, Indiana Agricultural Experiment Station Bulletin No. 85, June 1975.

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range of 0.0 to 0.5. The recent work by Boehm and Babb18/ using data from the Market Research Corporation of America National Consumer Panel found the demand for fluid products to be very income inelastic but price elastic. Using cross section data they obtained price elasticities that ranged from -0.833 for one percent milk to -1.701 for regular whole milk. Using the same data they estimated a time series model in which the price elasticities ranged from -0.12 to -1.18 with total fluid milk -0.14. They argue that the inelastic results from the time series model give the short-run response, and the elastic response from the cross section is the long-run result.

Most authors have concluded that the demand for most manufactured dairy products is more price and income elastic than the demand for fluid milk. The results reported by Boehm and Babb support the conclusion that the products are more income elastic, but their results did not support the conclusion that fluid products are more price inelastic.19/ They obtained an inelastic price response for most perishable dairy products including all types of frozen dairy products, dairy dips, and yogurt. The demand for cottage cheese, half & half cream, and sour cream, although price elastic, was less elastic than the demand for fluid products.

18/ Boehm, William T. and Emerson M. Babb, Household Consumption of Beverage Milk Products, Indiana Agricultural Experiment Station Bulletin No. 75, March 1975.

19/ These conclusions are reached from the results in Table 12 and from further analysis of the three publications authored by Boehm and Babb. Beside the publication in the previous footnote, the publications are:

(1) Boehm, William T. and Emerson M. Babb, Household Consumption of Perishable Manufactured Dairy Products: Frozen Desserts and Specialty Products, Indiana Agricultural Experiment Station Bulletin No. 105, September 1975.

(2) Boehm, William T. and Emerson M. Babb, Household Consumption of Storable Manufactured Dairy Products, Indiana Agricultural Experiment Station Bulletin No. 85, June 1975.

As might be expected, there was considerable variation in price elasticity of the storable dairy products; nonfat dry milk powder exhibited an elastic response (-2.24), butter was inelastic, and the various cheese products investigated fluctuated around an elasticity of -1.0. Boehm and Babb found the meat price index to have a significant effect on cheese consumption. Similarly, butter and margarine produced a significant positive cross-elasticity.

Commodity Price Patterns

This section provides a brief review of farm-level and retail prices. Figure 8 summarizes the prices received by producers for milk. There was little increase in these prices from the mid-forties to the mid-sixties. Prices rose in the late sixties and jumped in recent years. Table 13 contains the retail price series for selected dairy products.

International Trade20/

Dairy products are not major export or import commodities in the United States. The principal trade issue is the effect of dairy product imports upon the domestic price support program. Imports of manufactured dairy products tend to depress the domestic price of milk used in manufacturing and hence the farm milk price. In recognition of this fact, imports of many dairy products have been directly controlled through the use of quotas and discouraged through the use of tariffs. Of these devices the former is the more significant.

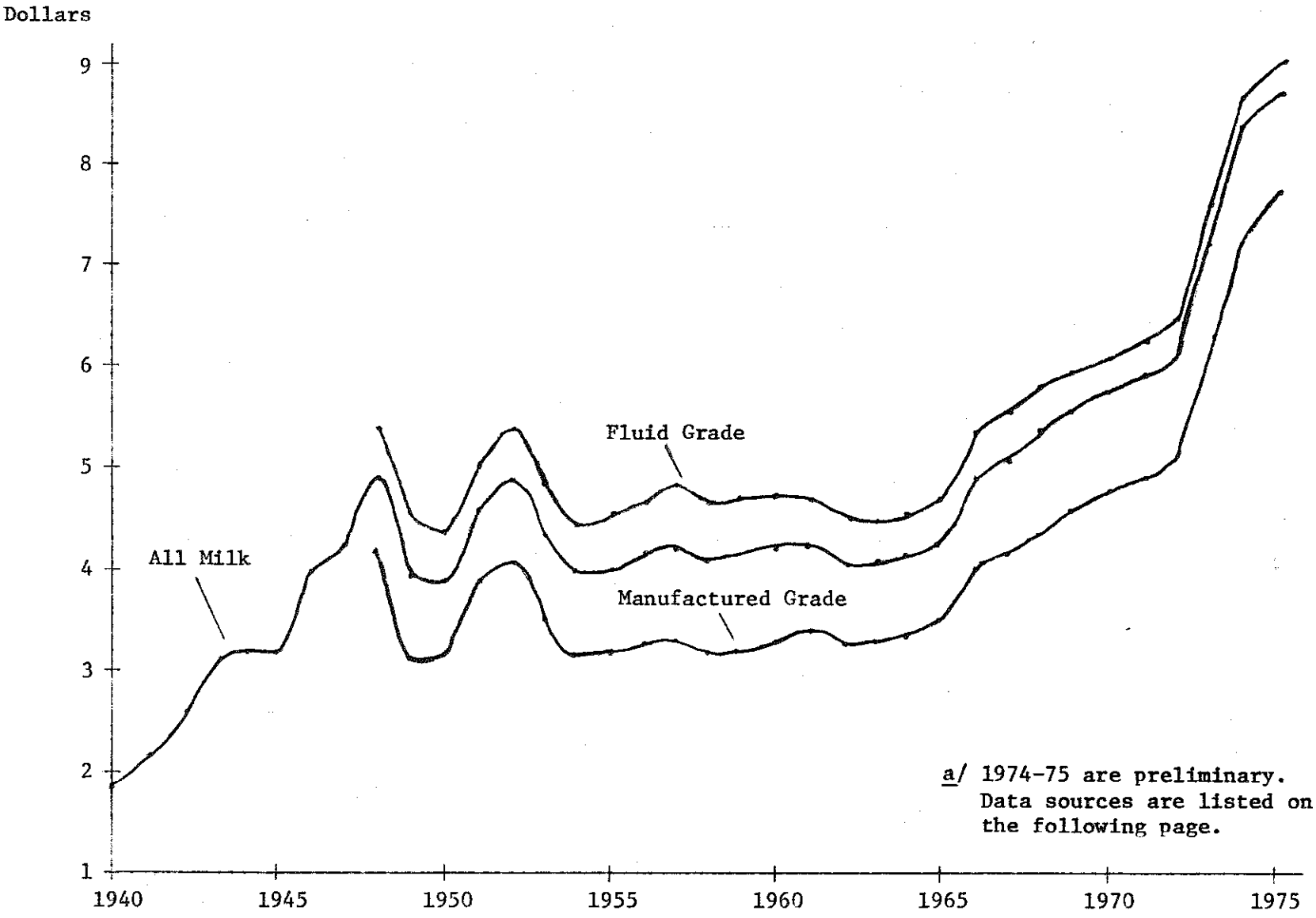
Quotas

The use of import quotas to protect the support program dates back to the early 1950's when the Defense Production Act was employed to control the inflow of certain types of cheese. With the expiration of this act in 1953, quota limitations were continued under the terms of Section 22 of the 1948 Agricultural Act.

During the 1950's the list of quota products was expanded considerably. Existing restrictions on cheddar, Italian, Edam, Gouda, and Blue Mold cheese were augmented in 1953-54 by quotas for butter, dried whole and skim milk, dried buttermilk, and malted milk. In 1957-58 a quota was established for butteroil. With increasing pressure from imports of certain non-quota products from the European Economic Community the list of quota products was extended in 1967 to include colby cheese, butterfat sugar mixtures, frozen cream, chocolate crumb and for evaporated and condensed milk. These quotas were intended to reduce imports from the 3 billion pounds entering the United States in 1967 down to about 1 billion pounds of milk equivalent; however, they only succeeded in reducing imports to roughly 2 billion pounds milk equivalent.

20/ The assistance of Dr. David Blandford of Cornell University in writing this section is acknowledged. For additional trade statistics see Blandford, David and Judith Kramer, International Trade and New York's Agricultural Products, Agricultural Economics Extension 76-22, Cornell University, July 1976.

Figure 8. Prices Received by Milk Producers for All Milk, Fluid Grade Milk, and Manufacturing Grade Milk, 1940-1975.[a/]



a/ 1974-75 are preliminary. Data sources are listed on the following page.

Data Sources for Figure 8.

1940-58: U.S.D.A. Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303, February 1962, Tables 249, 251, 252.

1959-66: U.S.D.A. Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430, July 1968, Table 52.

1967-75: U.S.D.A. Economic Research Service, Dairy Situation, March 1976, Table 4.

Sources and Footnotes for Table 13.

Sources: 1947-1970: U.S.D.A. Economic Research Service, Farm-Retail Spreads for Food Products, Miscellaneous Publication No. 741, January 1972.

1971: U.S.D.A. Economic Research Service, Marketing and Transportation Situation, February 1974.

1972: U.S.D.A. Economic Research Service, Marketing and Transportation Situation, February 1975.

1973: U.S.D.A. Economic Research Service, Agricultural Outlook, October 1975.

1974-1976: U.S.D.A. Economic Research Service, Agricultural Outlook, August 1976.

a/ Obtained from adjusting BLS retail price series as follows:

$$\text{"Current" BLS Price} \times \frac{\left(\sum_{1951}^{1954} \text{USDA Price}\right)}{\left(\sum_{1951}^{1954} \text{BLS Price}\right)} = \text{"Current" Estimate}$$

b/ BLS index of price of American processed cheese--publ. page 167 of Food Consumption, Prices and Expenditures, Agricultural Economic Report No. 138 (ERS).

$$\text{Estimated Price-Year i} = (\text{Index Yr i}) \left(\frac{\text{Price in 1950}}{\text{Index 1950}}\right)$$

Note: BLS price series are reported in Dairy Statistics Through 1960, Statistical Bulletin 303.

Table 13. Retail Prices of Selected Dairy Products, U. S., 1947-1976.

Year	Ice Cream Half Gallon	Cheese American Proc. Half Lb.	Butter 1 Lb.	Evaporated Milk - 14.5 Oz. Can	Milk, Fresh, Sold in Stores Half Gallon	Margarine 1 Lb.
	cents					
1947	N.A.	28.5[b/]	80.0	13.1	34.5	40.5[a/]
1948	N.A.	31.8[b/]	86.2	14.8	38.4	41.1[a/]
1949	N.A.	29.1[b/]	72.1	13.1	36.7	30.6[a/]
1950	N.A.	28.9	72.5	12.7	35.7	32.4[a/]
1951	88.9	33.0	81.4	14.4	40.2	34.4
1952	89.6	33.9	85.0	14.9	42.1	29.1
1953	88.9	33.9	78.9	14.6	41.8	29.3
1954	87.2	32.4	72.1	13.9	41.3	29.6
1955	85.2	32.2	70.4	13.6	41.5	28.4
1956	84.4	32.2	71.7	13.9	42.8	28.4
1957	85.8	32.5	73.5	14.9	45.5	29.3
1958	86.3	32.5	73.5	14.9	45.5	28.6
1959	86.0	32.6	74.4	14.9	46.1	27.1
1960	84.7	33.9	73.9	15.4	47.4	25.9
1961	84.3	35.9	75.2	15.5	47.5	27.4
1962	83.2	35.7	73.9	15.2	47.4	27.1
1963	82.1	35.7	73.6	14.9	47.4	26.1
1964	80.2	36.6	74.1	14.9	47.6	26.0
1965	78.1	37.4	74.8	15.2	46.9	27.6
1966	79.5	41.9	81.2	16.0	49.7	28.3
1967	81.0	43.6	83.1	16.9	51.6	28.3
1968	80.7	44.4	83.6	17.1	53.7	27.9
1969	81.2	47.0	84.6	17.6	55.1	27.8
1970	84.5	50.4	86.6	18.7	57.4	29.8
1971	85.4	52.8	87.6	19.8	59.8	32.7
1972	85.8	54.3	87.1	20.0	59.8	33.1
1973	90.5	59.8	91.2	22.6	64.7	37.7
1974	105.1	75.4	93.5	28.5	80.1	53.9
1975	121.3	74.0	95.5	30.4	77.7	63.7
1976 (Prelim.)	125.9	85.5	120.5	34.1	82.3	51.5

Sources and Footnotes on previous page.

In the early 1970's the expansion of the list of quota products continued to increase. Limitations were placed upon lowfat cheese, ice cream mixtures, chocolate crumb lowfat, and animal feed containing milk derivatives.

Generally, apart from a few readjustments to quota levels and their mode of application, the system as it operated through the 1950's and 1960's was one of increasing restriction upon the inflow of foreign dairy products. However, during 1972-73 emergency action was taken by the President to increase quota levels on cheese, butter, and nonfat dry milk in an attempt to hold down the rapidly escalating price of dairy products in the domestic market. Quotas in 1975 generally reflected a return to the levels of 1971-72.

The relative significance of imports must be kept in perspective. In the year of maximum inflow, 1973, net imports of dairy products in terms of milk equivalent represented a mere 2.8 percent of total domestic milk production. In 1975 with "normal" quotas fully in effect again net imports represented only 1 percent of total production. Table 14 summarizes U. S. imports and exports of dairy products.

Tariffs

From early in its history the U. S. has levied duties on dairy product imports. The first tariff (on cheese) was authorized by Congress in 1790 at a rate of 4 cents per pound. The first duty on butter was authorized in 1824 at a rate of 5 cents per pound. From this early beginning, duty rates tended to increase gradually, reaching a peak in the 1930's.

Since that time tariff rates on dairy products have been negotiated under international trade agreements. Since 1948 such agreements have been sought under the auspices of the General Agreement on Tariffs and Trade (GATT). Substantial reductions have been made in the tariffs on most dairy products under GATT through trade agreement legislation passed by Congress. For many products, tariffs today are less than half their 1930 rate.

One aspect of U. S. tariff policy which is worthy of note is the power available to the President to impose "countervailing duties" upon the products of specific countries when there is reason to believe that these are being unfairly subsidized. During 1975 the threat that imports of certain products from the European Community might be so dutied is believed to have significantly reduced the volume of imports from that economic bloc.

Table 14. U. S. Imports and Exports of Dairy Products, 1975.

	Imports		Exports	
	Quantity (1,000 pounds)	Value (1,000 dollars)	Quantity (1,000 pounds)	Value (1,000 dollars)
Milk & cream, fresh	13,106	3,513	18,189	5,261
Dry whole milk	8	5	34,797	8,540
Nonfat dry milk	2,465	891	125,612	69,904
Butter	526	331	792	664
Cheese, all types	179,483	167,828	8,794	10,157
Casein[a/]	59,031	31,699		
Infants' dietary Supplement[a/]			19,142	18,501
Evaporated milk[a/]			51,557	13,249
Other		11,048		21,570
Total		215,315		147,846

[a/] No entries in two columns because of differences in product categories for exports and imports.

Source: U.S.D.A. Economic Research Service, U. S. Foreign Agricultural Trade Statistical Report, Calendar Year 1975, May 1976, Tables 1 and 5 (exports) Tables 13 and 17 (imports).

GOVERNMENT REGULATIONS[21/]

From the producer to the consumer, government regulations play an important if not dominant role in the dairy industry. The importance of these regulations has often been attributed to the perishability of milk and to the small producer-large processor relationship at the production level. The most obvious form of government regulation is that dealing with the pricing mechanism. In addition, sanitary and environmental regulations affect all sectors of the dairy industry; legal regulation of business organization affect cooperatives and large dairy companies; welfare and international trade regulations affect consumption and consequently the price at all levels of the industry.

Pricing

Both federal and state regulations govern the pricing of milk. The majority of this legislation directly affects the price the producer is paid. Federal regulation is contained in two programs. The first is known as the "Dairy Price Support Program". This program has been developed to carry out the provisions of the Agricultural Act of 1949 which requires that the price of manufacturing milk and certain of its products be supported at between 75 and 90 percent of parity. The second, the "Federal Milk Marketing Order Program", is designed to implement the provisions of the Agricultural Marketing Agreement Act of 1937 which deals with milk eligible for fluid use. In addition many states have regulations concerning the pricing of milk eligible for fluid use (Grade A).

Under the price support program for manufacturing milk the Secretary of Agriculture announces a support price for manufacturing milk, butterfat (in farm-separated cream), butter, cheddar cheese, and nonfat dry milk. The price for manufacturing milk and butterfat is the minimum to be paid manufacturing milk producers (Grade B); the support for the three products is maintained by Commodity Credit Corporation purchases of excess production. The average mnaufacturing milk price (see Figure 8) has seldom been more than ten or twenty cents above the support level.[22/] Because of ease of diverting milk among products, these purchases effectively establish a floor under the price of all manufactured dairy products.

The "Federal Milk Marketing Order Program" regulates the pricing of milk for producers in organized Federal milk orders. In December 1974 there were milk orders in 61 markets handling 78 percent of the milk sold to plants and dealers that was eligible for fluid use and 61 percent of all milk sold to plants and dealers. Table 15 summarizes the growth in the proportion of fluid grade milk marketing in Federal orders.

21/Additional detail and analysis of government regulation is contained in:
- a. Vial, Edmund E., Prices and Consumption of Dairy Products with Price Supports and Milk Orders, U. S. Agricultural Marketing Service, Agricultural Economic Report No. 226, June 1972.
- b. Williams, Sheldon W., et al., Organization and Competition in the Midwest Dairy Industry, The Iowa State University Press, Ames, Iowa, 1970.

22/See U.S.D.A. Economic Research Service, Dairy Situation, May 1976, Table 3.

Table 15. Federal Milk Orders, Number and Production 1947-1975.

Year	Number of Federal Milk Orders	Producer Total ('000 lb.)	Deliveries to Federal Order Plants - As a Percent of Milk Delivered to all Plants and Dealers	
			Fluid Grade	All Milk
1947	29	14,980,301		21
1948	30	15,019,637		22
1949	33	17,049,170		23
1950	39	18,659,790		25
1951	44	20,116,620		27
1952	49	22,998,107		30
1953	49	25,895,718		31
1954	53	27,140,234		31
1955	63	28,948,067		32
1956	68	31,379,533		33
1957	68	33,455,338		34
1958	74	36,355,658		36
1959	77	40,149,083		40
1960	80	44,812,259		43
1961	81	48,802,558		45
1962	83	51,648,248		47
1963	82	52,860,091		48
1964	77	54,447,471		48
1965	73	54,443,675	70	48
1966	71	53,012,094	70	48
1967	74	53,761,000	71	49
1968	67	56,444,000	74	52
1969	67	61,026,000	77	56
1970	62	65,104,000	80	59
1971	62	67,872,000	80	60
1972	62	68,719,000	79	60
1973	61	66,229,000	78	60
1974	56	67,778,000	78	61
1975[a/]	56	69,251,000	78	63

[a/] Preliminary.

Sources: U.S.D.A. Agricultural Marketing Service, Federal Milk Order Market Statistics, Statistical Bulletin Nos. 426,453, 488, 531, 542, Tables 2 & 3.

U.S.D.A. Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303, Table 50.

U.S.D.A. Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430, Table 7.

U.S.D.A. Statistical Reporting Service, Milk Production, Disposition, Income 1973-75, April 1976, Page 3.

In Federal milk orders producers are paid according to a classified pricing system typically with marketwide pooling. The pricing system is based on the manufacturing milk price in Minnesota-Wisconsin and a Class 1 (fluid) differential that is a function of the distance of the order from the Minnesota-Wisconsin market.

In addition to the Federal order system, state milk control laws are in effect in approximately 20 states. California is the only major producing state in which state laws dominate milk pricing with a state agency empowered to establish minimum prices for fluid milk at all levels. Figure 9 summarizes state milk controls.

Sanitary and Environmental Regulations

Milk is produced, processed, and sold under sanitary regulations designed to insure a quality product to the consumer. At the producer level sanitary regulations have differentiated milk for fluid use from milk of manufacturing grade. Sanitary regulations have only recently been emphasized for manufacturing grade milk. The regulation of fluid producers is much stricter and generally consists of on-site inspections and quality tests on deliveries of milk. Sanitary regulation of processing and retailing is in general stricter for the more perishable products. In recent years environmental regulations have become important. These regulations have focused on the smell and runoff associated with manure and with the disposition of by-products resulting from the production of manufactured dairy products.

Legal Regulations of Business Organizations

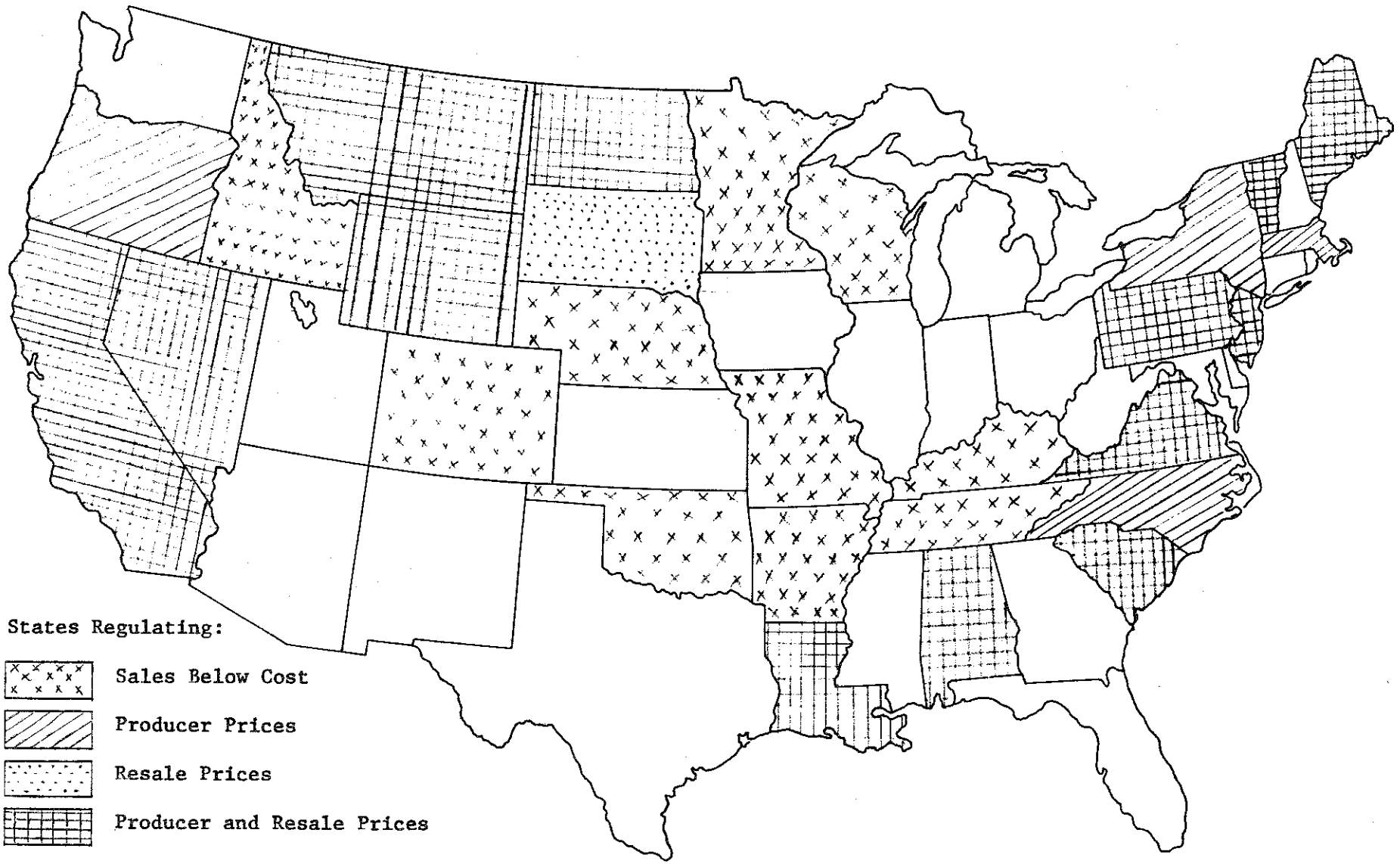
The effect of regulation on business organizations is felt at all levels of the dairy industry. The Clayton and Capper-Volstead Acts authorize farmers to form cooperatives to market their products. Dairy marketing cooperatives have declined in number but increased in importance.

Legislation in the Sherman Act and the Clayton Act, particularly the Celler-Kefauver amendment strengthening prohibitions against mergers, has been employed against large dairy companies and cooperatives. These legal actions have significantly decreased the number of dairy firms purchased by the large dairy companies. Although the large cooperatives may exist without being in violation of antitrust laws, they are subject to antitrust regulation regarding the exercise of monopoly powers.

Welfare Programs and International Trade

The dairy industry is also affected by regulations which affect the demand for dairy products. The quotas and tariffs which affect the export and import of dairy products have already been discussed. Welfare legislation, particularly the Food Stamp Program, also influences the demand.

Figure 9. State Milk Controls



Note: The islands of Oahu and Hawaii in the state of Hawaii regulate producer prices and Puerto Rico regulates producer and resale prices.

Source: A. G. Mathis, D. E. Friedly and S. G. Levine, Government's Role in Pricing Fluid Milk in the U. S., U.S.D.A. Agricultural Economic Report No. 229.