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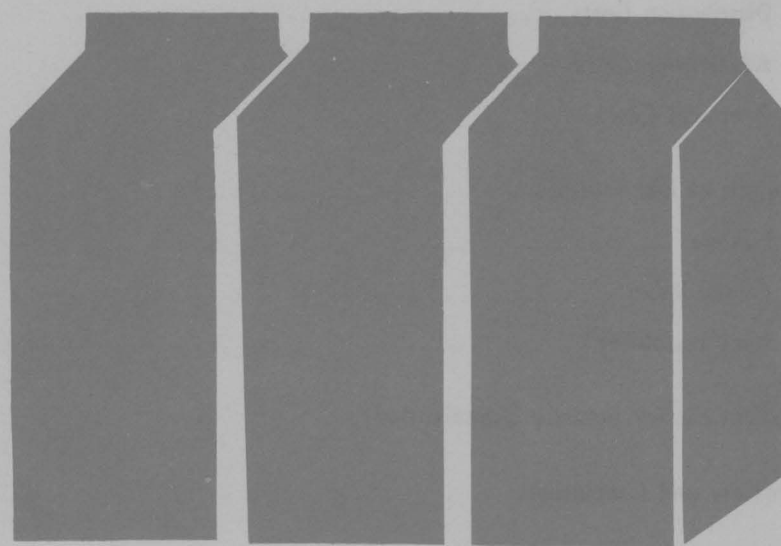

COSTS AND MARGINS

in Minnesota Fluid Milk Plants

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Costs and Margins in Minnesota Fluid Milk Plants

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The Minnesota fluid milk industry is undergoing substantial changes in terms of numbers of firms and distribution techniques. From 1956 to 1963, the number of fluid milk processing plants declined from 289 to 155—a 46-percent decrease in only 7 years. According to table 1 data, all size categories of plants handling less than 10 million pounds of milk per year experienced 30- to 60-percent declines in plant numbers. However, the number of plants handling 10 million pounds or over increased from 19 in 1956 to 26 in 1963.

This trend toward fewer and larger plants raises questions regarding the place of the small volume plant in the fluid milk industry. As generally conceded, the fluid milk industry is a decreasing cost industry. In other words, larger volume plants can achieve lower unit costs than can their smaller volume competitors. The size of these economies and the extent to which they are achieved should greatly affect the competitive position of firms of various sizes and types.

The purpose of this publication was twofold:

♦ To provide information on the level of, variation in, and the factors affecting costs and margins of Minnesota fluid milk plants located

Table 1. Number of fluid milk processing plants according to size, Minnesota, 1956 and 1963

Annual volume of milk processed (1,000 pounds)	Number of plants 1956	Number of plants 1963	Percent change, 1956-63
Under 500	77	31	−59.7
500- 999	73	35	−52.1
1,000-2,499	72	35	−51.4
2,500-4,999	27	18	−33.3
5,000-9,999	21	10	−52.4
10,000 and over	19	26	+36.8
Total	289	155	−46.4

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outside the Minneapolis-St. Paul and Duluth federal order marketing areas.

♦ To provide insight, with the aid of cost and margin analysis, into the reasons for and implications of structural changes taking place in the industry.

Sources of Cost Variation

Considerable insight into the reasons for variability in unit costs and, thus, into the competitive position of various size firms is provided by a hypothetical analysis. This analysis concerns how changes in the volume of milk processed and distributed affect unit costs of operation.

Within a given plant, unit costs generally are assumed to fall as the volume of milk processed increases. Also, larger plants potentially can achieve lower unit costs than smaller plants. Inefficient organization of plant resources is an additional source of cost variation. Finally, costs can vary because certain firms may supply inputs such as labor at less than the going market price. A hypothetical illustration of each factor's effect on unit costs of operation is presented in figure 1.

First, both Plants A and B can lower their costs per hundredweight (cwt.) by increasing the volume of milk processed up to full capacity. For example, Plant A can lower its costs from $3.50 (point V on its average cost curve) to $2 (point W) by increasing its annual milk volume from 2 to 8 million pounds. These lower costs may result from several sources. As excess capacity is increasingly utilized, fixed costs of operation are spread over a larger volume, thereby reducing average fixed costs. In addition, plant labor can be utilized more efficiently and larger volume purchases can be made—both lowering unit costs in a given plant.

Second, lower unit costs can be achieved by building a larger volume plant and using larger, more efficient equipment. Plant B, by increasing its output to full capacity, can achieve lower unit costs than Plant A (point Y on its average cost curve). These economies occur because many operating costs, such as the costs of pasteurization and bottling equipment, are fixed. The costs of such equipment generally do not rise in proportion to plant size. Therefore, by building a larger volume plant and operating at full capacity, unit operating costs can be lowered.

In this example, Plant B potentially can achieve lower unit costs than can Plant A. Nevertheless, if Plant B does not process more than 8 million pounds of milk per year, operating at only two-thirds capacity, it has higher costs per cwt. than Plant A when it operates at full capacity. Plant B then operates at point X on its cost curve and Plant A at point W. In the fluid milk industry the size of the potential sales area probably is the most important determinant of the quantity of packaged milk sold by a plant. So, as shown in this hypothetical example, plant size must be suited to the sales area size in order to achieve the lowest possible unit costs.

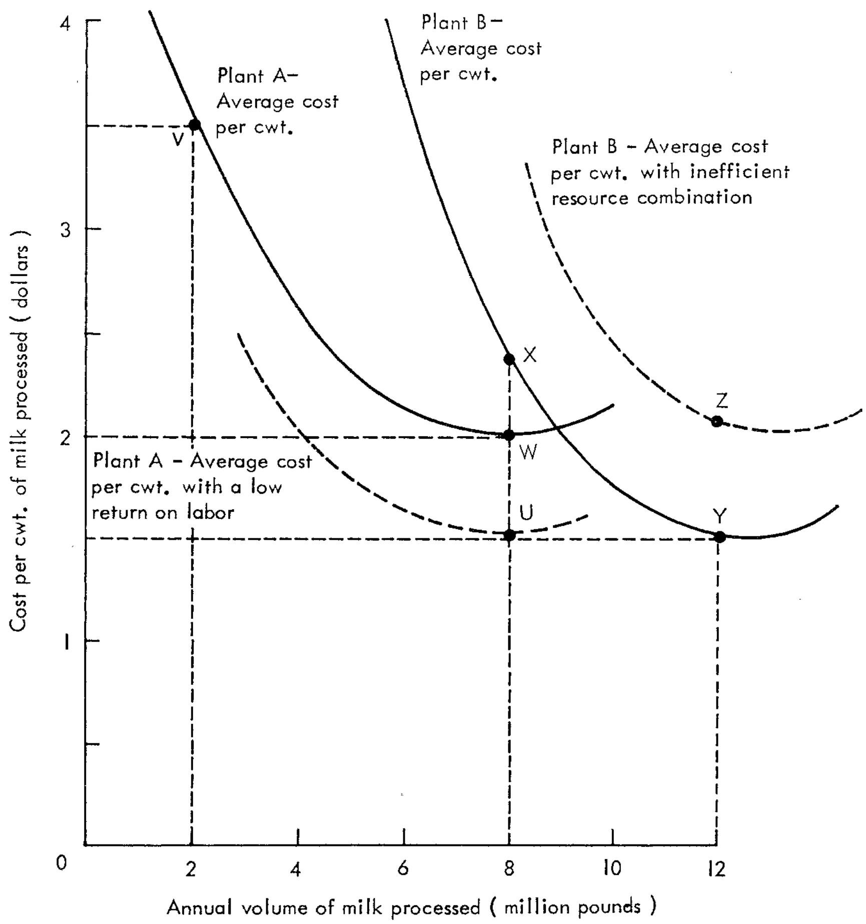


Figure 1. A hypothetical cost-volume relationship illustrating the effect of changes in volume on unit costs within a given plant and between plants of different sizes.

A third source of variation in costs occurs because resources are not always used efficiently in processing and distributing fluid milk. For example, labor efficiency could be increased by reorganizing a plant's layout so that less time is required for a specific task. And both labor and truck costs might be saved by eliminating milk delivery route overlap and by combining existing routes.

An inefficient resource combination due to poor plant layout, route overlap, poor management, etc., raises the average cost curve above the level achieved by a more efficient resource combination. In figure 1, the Plant B manager could lower his costs from point Z on the cost curve representing an inefficient resource combination to point Y on the cost curve representing an efficient resource combination.

A fourth source of cost variation occurs because some plant managers charge or accept a price lower than the prevailing market price for certain resources such as labor, management, and capital contributed by themselves and their families. As shown in figure 1, the Plant A proprietor can lower his costs from point W to point U by underpricing his own labor and management. By accepting low returns on certain resources, small and otherwise high cost firms may retain their competitive positions in the industry.

Because of the limitations of accounting data, a cost curve isolating the effects of volume, inefficiency, and family labor on costs could not be derived. However, the magnitude of these effects for the plants and volumes studied and, thus, their relative importance in affecting unit costs of operation and net margins can be indicated.

Scope and Procedure

One purpose of this study was to determine: (1) the level of costs and margins existing in the Minnesota fluid milk industry and (2) those factors significantly influencing these costs and margins. To achieve this objective, the analysis was divided into two parts: cost relationships and profits. Although the movement of milk from producer to consumer involves three steps—procurement, processing, and distribution—this study is concerned only with processing and distribution.

An analysis was made of the income and expense statements of 27 Minnesota fluid milk packaging plants located outside the federal milk marketing order areas of Minneapolis-St. Paul and Duluth. All costs included in the study were actual costs incurred by the firms. No processing, distribution, or overhead costs were imputed for family or proprietor's labor or for capital used in the firm's operation. Therefore, costs and margins incurred by plants using family or proprietor's labor but not charging it off as a cost could be compared with plants charging off all labor as a cost.

The analysis also indicates the size of return which proprietors must accept on their labor, management, and capital in order to compete in the industry. Plants using family or proprietor's labor generally were proprietorships or partnerships and were small in size. Plants that did not use family or proprietor's labor usually were corporations.

A preliminary survey indicated which Minnesota plants had sufficient cost data for the study. All plants having sufficient cost data and willing to cooperate in the study were included. This sampling procedure may have resulted in lower costs than actually existed in the industry inasmuch as plants not having good cost records might have had higher costs than the plants studied. Although the following cost data may not completely represent fluid milk plants in Minnesota, they should provide a reasonable basis for comparison of costs in the industry. The sample of 27 plants—17 percent of the fluid milk plants in Minnesota—included a wide range of plant sizes (see table 2).

Table 2. Size distribution of 27 fluid milk plants, Minnesota, 1961-63*

Average annual volume of milk processed (1,000 pounds)	Number of plants	Percent of all fluid milk plants in Minnesota, 1963
999 and under	5	8
1,000-2,499	8	23
2,500-4,999	7	39
5,000-9,999	3	33
10,000 and over	4	15
Total	27	17

* All size and cost data refer to 3-year averages, 1961-63, for the 27 plants included in the study.

Costs of the 27 plants were allocated into processing, distribution, advertising, and overhead cost centers. After summarization of data and derivation of unit costs and profits, correlation and regression analyses were used to identify variables which might be related significantly to costs and profits.

In the present study, processing costs included all costs associated with the processing of milk from the time it reached the plant until it was placed in the coldroom ready for distribution. Processing costs did not include distribution, raw material, procurement, and overhead costs.

Unit processing costs were derived by dividing total processing costs by the volume of milk processed during the year. Most of these costs are stated in terms of cost per cwt. This unit of measure was chosen because of the difficulty of securing data on the quantity of various products produced and of standardizing these products on a quart unit basis.

Distribution costs included costs associated with moving the milk from the coldroom to the dairy's wholesale and/or retail customers and jobbers. Unit distribution costs were derived by dividing total delivery costs by the volume of milk distributed during the year. For plants purchasing milk packaged in paper containers from other plants, the volume of milk distributed differed from the volume of milk processed by the quantity of prepackaged milk.

Advertising costs included direct advertising expenses as well as donations and expenditures for trading stamps and special promotions of the firm's products. Unit advertising costs were derived in the same manner as unit distribution costs because advertising expenditures normally were used to promote the firm's products in general rather than just those products actually processed by the dairy.

Overhead costs included all costs associated with management and office functions which were not directly attributable to processing or distribution. Unit overhead costs also were derived in the same manner as unit distribution costs.

ANALYSIS OF COST RELATIONSHIPS

In the following analysis, processing, distribution, advertising, and overhead cost centers are treated separately. Emphasis is first placed on the cost components or accounts within each center. Then the variation in total costs within each center is analyzed for the 27 plants. All cost data refer to 3-year average costs, 1961-63, for the plants studied.

Processing Costs

Processing costs accounted for nearly 50 percent of the total operating costs for the 27 plants. In the analysis, processing costs were divided into five components: labor, containers and supplies, repairs, depreciation, and utilities (see table 3).

Processing Cost Components

Labor—Labor costs accounted for almost 35 percent of total processing costs or 67 cents per cwt. of milk processed. Among the 27 plants, labor costs ranged from virtually nothing to $1.16 per cwt. A principal reason for this wide variation was the use of family or proprietor's unpaid labor in some plants. Plants utilizing family labor were generally small in size, not exceeding an annual volume of 4 million pounds of milk. For the 20 plants using no family labor, labor costs ranged from 36 cents to $1.16 per cwt. and averaged 70 cents per cwt.

An additional source of variation in labor costs arose from the relationship between the annual volume of milk packaged per plant worker and the annual volume of milk packaged per plant. Annual volume per plant worker varied from less than 200,000 pounds for one small plant to over 2 million pounds for one large plant (see figure 2).

Table 3. Average processing costs per cwt. of milk in 27 fluid milk plants, Minnesota, 1961-63

Cost component	Average cost per cwt. (dollars)	Percent of total processing costs
Labor	0.67	34.5
Containers and supplies	0.71	36.6
Repairs	0.08	4.0
Depreciation*	0.28	14.9
Utilities†	0.19	10.0
Total	1.93	100.0

* Includes all depreciation on plant equipment as well as rental expenses on packaging equipment. Because of problems involved in the allocation of building depreciation between the plant and distribution, all building depreciation was allocated to overhead.

† Includes all fuel, water, steam, and electricity costs.

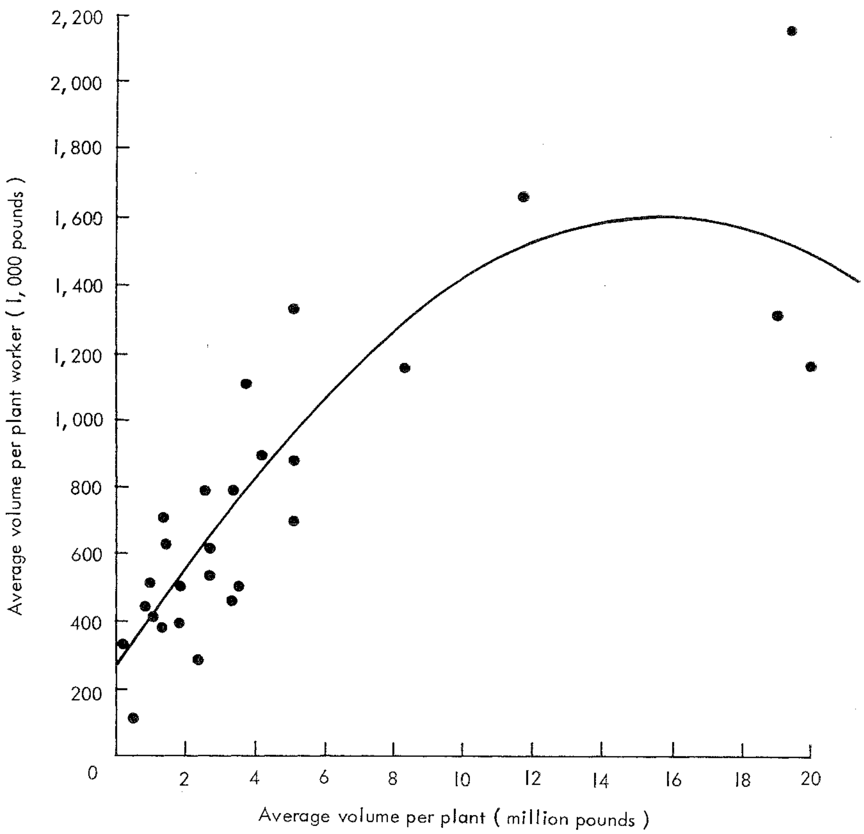


Figure 2. Relationship between average annual volume of milk processed per plant worker and average volume of milk processed per plant, 27 fluid milk plants, Minnesota, 1961-63. (The regression equation which was fitted by least squares is $Y = 230.9 + 170.5 X - 53.2 X^2$ where Y = average volume per plant worker in 1,000 pounds and X = average volume per plant in million pounds; $r^2 = 0.69$.)

Volume per plant worker rose sharply to a plant volume of about 8 million pounds per year and then leveled off. The increased volume per worker was possible primarily because larger plants utilized more automatic and greater capacity equipment than did smaller plants.

Wider variation in the milk volume handled per worker existed among plants handling over 10 million pounds per year than among smaller plants. According to figure 2, two of the largest volume plants were no more efficient in labor use than were plants less than half their size. Nevertheless, two other large volume plants did achieve comparatively high levels of efficiency, indicating that output per worker can increase in large plants.

Several factors may have caused the wide variation in output per worker among the large volume plants. For example, most small volume plants used labor at a uniformly intensive rate. However, among larger volume plants, the number of employees varied greatly even though the plants were at about the same stage of automation. Therefore, labor may have been retained in certain plants even after automated, laborsaving equipment had been added. Such plants probably had a considerably lower volume per worker than did plants where management had trimmed excessive plant labor.

Containers and Supplies—The cost of containers and supplies accounted for almost 37 percent of total processing costs or 71 cents per cwt. for the 27 plants. For the eight plants packaging milk exclusively in paper containers, container costs averaged 85 cents per cwt. For the five plants packaging milk exclusively in glass containers, the average cost was 46 cents per cwt.

Low container costs for glass result largely because of the multiple-trip container. Although these containers are initially more expensive than paper containers, their cost can be spread over several trips. So the average cost per trip is substantially below that of the single-trip paper container. In addition, glass container costs are sometimes reduced by requiring customers to pay bottle deposits. However, the low costs for glass containers may be offset by the expense of washing and handling them. This point is discussed later.

Variation in paper container costs results primarily from two sources. The preformed paper container is more expensive than the container which is formed and filled in the milk plant. Moreover, small volume plants usually have higher container costs than do large volume plants because they cannot take advantage of the substantial quantity discounts offered by suppliers.

Other Expenses—Utilities, repairs, and depreciation on processing equipment accounted for 29 percent of total processing expenses or 55 cents per cwt. Depreciation, utility, and repair expenses averaged 28, 19, and almost 8 cents per cwt., respectively.

Variation in Total Processing Costs

Total processing costs were significantly related to the volume of milk processed, the use of family labor, and the combination of packages used.

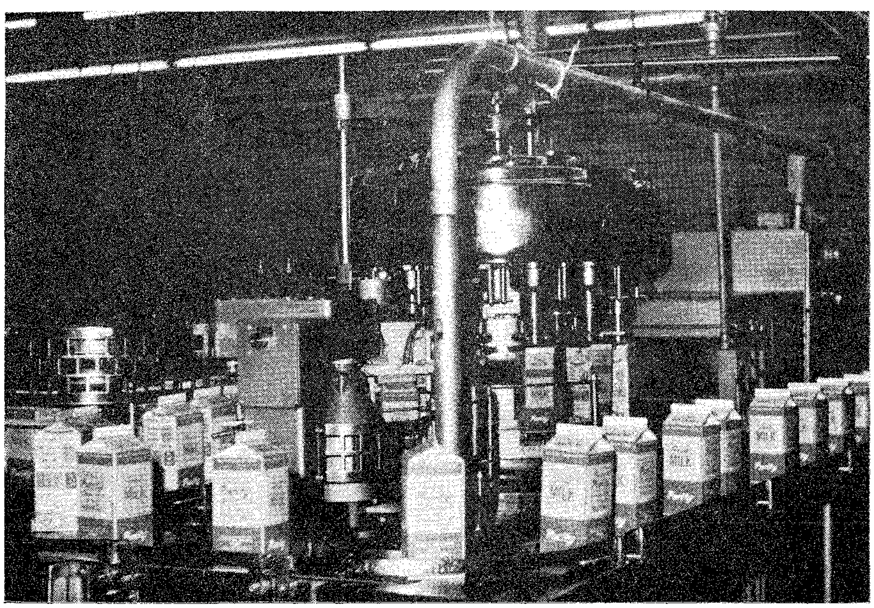
Volume—As discussed previously, both the percentage utilization of capacity in a given plant and the size of plant should affect plant costs. In other words, unit costs generally can be reduced in a given plant if sales can be increased to permit full utilization of capacity. In addition, larger plants generally have the capacity to achieve lower unit costs than do smaller plants.

Although the two effects could not be separated in this study, average processing costs generally declined as the annual volume of milk pack-

Table 4. Average processing costs per cwt. of milk by annual volume of milk processed and type of labor used in 27 fluid milk plants, Minnesota, 1961-63

Average annual volume of milk processed (1,000 pounds)	Average cost per cwt. for plants (dollars)	
	Using family labor	Not using family labor
999 and under	1.84	2.51
1,000-2,499	1.84	2.22
2,500-4,999	1.44	2.01
5,000-9,999	...	1.88
10,000 and over	...	1.71
Plant average	1.73	2.03

aged increased, whether or not family labor was used (see table 4). For the 20 plants not using family labor, costs declined from an average of $2.51 per cwt. for plants handling under 1 million pounds of milk per year to $1.71 for plants handling at least 10 million pounds. In other words, processing costs per cwt. averaged about 30 percent less for the largest plants than for the smallest plants. These costs are equivalent to about 10.8 cents per half-gallon for the smallest plants and 7.4 cents for



Low unit costs can be obtained only if equipment size is suited to the plant's volume of sales.

the largest plants. The largest decline in costs occurred up to a plant size of about 5 million pounds per year.

These average costs must be interpreted carefully because, as shown in figure 3, processing costs varied considerably within each volume group. Each point in the figure represents the 3-year average volume and average processing cost for 1 of the 20 plants not using family labor. Costs tended to fall as the volume of milk processed increased, at least up to a volume of 5 million pounds of milk per year. Thirty-nine percent of the variation in costs was attributable to variation in output.

Although the number of observations was relatively small, figure 3 shows that costs varied most among plants packaging over 10 million pounds of milk per year. For example, among the largest volume plants,

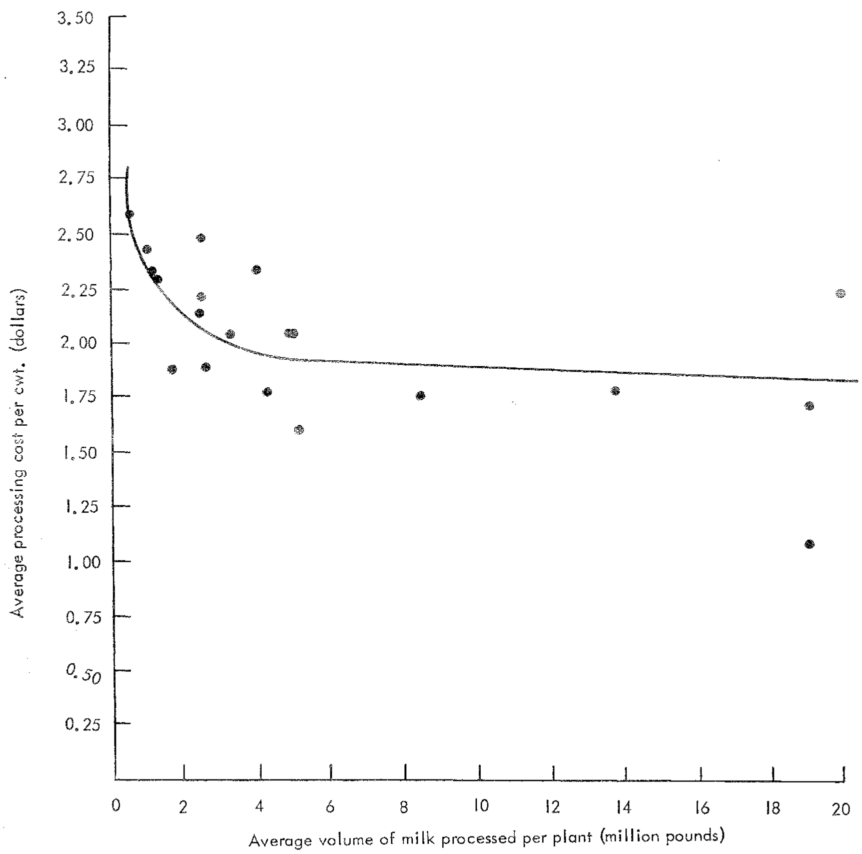


Figure 3. Relationship between average processing cost per cwt. and average volume of milk processed per plant, 20 fluid milk plants not using family labor, Minnesota, 1961-63. (The regression equation which was fitted by least squares is $Y = 1.827 + \frac{0.468}{X}$ where Y = average processing cost per cwt. and X = average volume of milk processed per plant; $r^2 = 0.39$.)

costs ranged from less than $1.25 to over $2.25 per cwt. Both these plants handled about 20 million pounds of milk annually. The high cost plant had costs greater than plants less than half its size. Since labor costs accounted for over one-third of total processing costs, this variation in total processing costs probably resulted mainly from the variation in labor utilization. These plants also varied greatly in their utilization of plant capacity. For example, the lower cost plant might have tripled its output with no major plant changes. The other plants operated much closer to full capacity with the lowest cost plant very near full capacity.

Variations in plant layout, management efficiency, and product diversification also may have contributed to this wide cost variation among large volume plants. *Size alone does not result in low unit costs.* A plant's size must be suited to its sales volume. To achieve low unit costs, management must select the size of equipment which is consistent with sales. In addition, only the amount of labor essential for efficient equipment operation must be utilized.

Family Labor—In 7 of the 27 plants studied, use of unpaid family or proprietor's labor resulted in low labor costs per cwt. These low labor costs were reflected in substantially lower total processing costs per cwt. for the seven plants as compared with similar size plants not using family labor.

As shown in table 4, the average processing costs for all plants using family labor and for plants processing over 10 million pounds of milk per year were nearly equal. But small volume plants that did not provide labor at a low price were at a substantial cost disadvantage compared with these larger volume plants.

Although accounting costs were lower for small volume plants where managers accepted a low labor return, these plants would probably have had substantially higher costs than larger volume plants if this labor had been valued at its market price. (This situation will be discussed later.) However, the downward trend in the number of plants handling less than 5 million pounds of milk per year indicates that plant managers are becoming less willing to supply their labor at less than its market price.

Packages—As noted previously, container costs constituted more than one-third of total processing costs for the plants studied. Although container costs were nearly 50 percent lower for plants using glass compared to those using paper, labor, depreciation, and utility costs were higher with glass. Thus, the advantage of the glass container was not as great when total processing costs were used as the basis for comparison.

As expected, combination glass-paper operations usually had higher unit costs than all-glass or all-paper operations. Where two lines of equipment existed, often neither line could be maintained at a sufficient volume to reduce unit costs to as low a level as in a single operation plant. For example, in three combination plants processing from 2.5 to 10 million pounds of milk annually, the average processing cost was

$2.09 per cwt. For four similar size, all-paper operations, the average cost was $1.87 per cwt.

Advantages of a single packaging operation were especially evident in plants with volumes of less than 5 million pounds per year. In this volume range, costs per cwt. fell rapidly as plant size increased. These plants could not achieve maximum efficiency by operating both glass and paper packaging equipment.

Many small volume plants, particularly those having only glass equipment and using high priced, preformed cartons in their paper operation, would find it profitable to run only a single package line and buy milk packaged in the other container from another plant. According to recent trends, packaging specialization is even occurring in larger volume packaging operations. All-glass and all-paper packaging plants frequently exchange milk in order to gain the economies of size involved in single line operations.

Distribution Costs

Fluid milk distribution systems vary widely from plant to plant throughout Minnesota. Some plants distribute all of their milk directly to wholesale and retail customers; others rely entirely or in part on jobbers.

Distribution Cost Components

In 1961-63, distribution costs accounted for nearly 33 percent of total operating costs in Minnesota fluid milk plants. The five components of distribution costs were labor, trucks, truck depreciation, bad debts, and miscellaneous expenses (see table 5).

Labor—Labor, accounting for nearly 70 percent of distribution costs, averaged 88 cents per cwt. As with processing costs, unit labor costs for distribution ranged widely among plants—from 20 cents to nearly $2 per cwt. In this case, the main factor influencing costs was the proportion of milk distributed to jobbers.

For this study, a jobber was defined as a buyer who purchased milk from the plant to distribute it to wholesale and retail customers. Distributing milk through jobbers substantially lowered the quantity of labor required in a plant's distribution operation. Therefore, labor costs per cwt. declined from an average of $1.19 per cwt. for plants distributing all of their milk themselves to an average of 37 cents per cwt. for plants distributing over 50 percent of their milk through jobbers (see table 6).

Trucks—Truck expenses, including costs of gas, oil, repairs, and tires, averaged nearly 20 percent of total distribution costs or 25 cents per cwt. Truck expenses of plants varied greatly, from 4 to nearly 50 cents per cwt., depending mainly on the proportion of milk distributed through jobbers.

Table 5. Average distribution costs per cwt. of milk in 27 fluid milk plants, Minnesota, 1961-63

Cost component	Average cost per cwt. (dollars)	Percent of total distribution costs
Labor	0.88	69.8
Trucks	0.25	19.9
Truck depreciation	0.09	7.1
Bad debts	0.01	0.8
Miscellaneous	0.03	2.4
Total	1.26	100.0

Table 6. Average delivery labor costs per cwt. according to the proportion of milk distributed through jobbers, 26 fluid milk plants, Minnesota, 1961-63*

Percent of milk distributed through jobbers	Number of plants	Average labor cost per cwt. (dollars)
0	11	1.19
1-25	6	0.85
26-50	5	0.79
51-100	4	0.37
Plant average	26	0.91

* Because one plant in the study distributed nearly all of its milk through its own dairy stores, this plant was eliminated from the present analysis.

Truck Depreciation—Accounting for 7 percent of distribution expenses, truck depreciation averaged 9 cents per cwt. If plants rented their trucks, these expenses were included with depreciation expenses. Although the rental expenses of these plants apparently were higher than depreciation expenses of plants owning trucks, variation in rental contract terms makes this comparison relatively inadequate.

Bad Debts—While bad debt expenses averaged only 1 cent per cwt. of milk distributed, in one plant they were as high as 14 cents per cwt. High bad debt expenses indicated poor management of accounts receivable. No relation existed between the size of bad debts and the type of customer served or the size of plant.

Variation in Total Distribution Costs

Volume—Volume of milk distributed apparently did not directly affect total distribution costs. However, large volume plants often had lower distribution costs because a high proportion of their milk was distributed through large volume chainstores and jobbers. To the extent that these plants had these advantages in terms of size and type of customer, they enjoyed an indirect distribution cost advantage.

Jobber Distribution—As shown in table 7, distribution costs declined from $1.59 per cwt. for plants distributing no milk through jobbers to 58 cents per cwt. for plants distributing over 50 percent of their milk through jobbers.

Since the jobber performs many distribution functions of the supplying plant, the plant receives a lower price for jobber distributed milk. The jobber price is generally lower than either the wholesale or retail price. But can this lower jobber price offset the lower distribution costs for the supplying plant? If the decrease in the jobber price is greater than the decrease in distribution costs, a switch from plant distribution to jobber distribution would be questionable.

As the proportion of milk distributed through jobbers increased, plant receipts per cwt. fell faster than did distribution costs per cwt. (see table 7). For the plants studied, the margin remaining to cover costs other than distribution declined from $7.17 to $6.54 per cwt. for plants distributing from none to over 50 percent of their milk through jobbers, respectively.

Once a route is established, distribution on the plant's own routes tends to yield a higher return than distribution through jobbers. So if costs involved in market expansion are not substantially higher than costs involved in operating the other plant routes, internal expansion would probably be more profitable than expansion through jobbers. But if costs involved in market establishment are higher than the reduction in revenue due to jobber distribution, expansion through jobbers is the better alternative.

Table 7. Average gross receipts, distribution costs, and margin to cover other expenses according to the proportion of milk distributed through jobbers, 26 fluid milk plants, Minnesota, 1961-63*

Percent of milk distributed through jobbers	Number of plants	Average gross receipts per cwt.	Average distribution cost per cwt.	Average margin per cwt. to cover other costs and net margin
		- - - -	- dollars	- - - -
0	11	8.76	1.59	7.17
1-25	6	8.31	1.31	7.00
26-50	5	8.18	1.24	6.94
51-100	4	7.12	0.58	6.54
Plant average	..	8.35	1.30	7.05

* Because one plant in the study distributed nearly all of its milk through its own dairy stores, this plant was eliminated from the present analysis.

Distributing milk under different labels for jobbers or chainstores may bring a plant close to full capacity and reduce unit processing costs.

Of course, savings in distribution costs are not the only cost benefits resulting from increased sales through jobbers. As indicated previously, plants operating at less than full capacity may substantially reduce average processing and overhead costs per cwt. as output increases. Therefore, expansion of output by addition of either a jobber or an internal route may substantially lower both average processing and overhead costs.

In any case, jobber distribution apparently is becoming increasingly important in Minnesota, mainly because it represents a logical alternative for plants which quit bottling milk. Small volume plants often can buy prepackaged milk for less than they can package it themselves; therefore, they switch from bottling to jobber distribution. Such jobbers are attractive outlets for milk of supplying plants because the jobbers have established clientele and generally allow the plant to utilize excess capacity.

Moreover, some plants shift to jobber distribution to avoid increasingly high distribution costs, particularly for labor. And jobber distribution also permits a plant to expand sales without the management problems involved in internal route expansion over an enlarged distribution area.

Jobber Characteristics

For the 27 plants studied, jobber distribution accounted for over 20 percent of the milk processed. In some plants, over 50 percent of the milk processed was jobber distributed. Thus, a brief discussion of some characteristics of jobber distribution seems appropriate. Information in this section was derived from interviews with a sample of 14 jobbers for the 27 plants studied.

Typically, jobbers become established in a particular area in one of two ways.

1. When a fluid milk plant stops bottling milk, it frequently becomes a jobber for another plant. The plant that stops bottling may either be purchased by the supplying plant and leased to the jobber or it may retain its independent status. Large volume plants apparently have an advantage in obtaining plants that have ceased bottling. Compared to small volume plants, they generally can offer milk to jobbers at a lower price and are often in better financial condition to buy dairies that are going out of business.

2. The supplying plant frequently helps a jobber get established in a market and assists him in obtaining customers. However, the risk of business failure still appears to be largely upon the jobber.

The 14 jobbers surveyed distributed milk on an average of three routes with a range of from one to eight routes per jobber. While trucks and coolers generally were owned by the jobber, they were owned by suppliers in a few instances.

Five of the 14 jobbers received milk with their own label on the package. These jobbers, usually large in size, generally had well-known brand names in the market areas.

In 1963, prices paid by jobbers averaged 27.4 cents per half-gallon of milk and ranged from 25 to 30 cents. Although larger jobbers generally received milk for a lower price than did smaller jobbers, suppliers sometimes received the same price regardless of jobber size. Prices paid by jobbers appeared relatively uniform over the state. But higher wholesale and retail prices in the north than in the south resulted in wider jobber margins (the difference between the price paid and the price received by jobbers).

In northern Minnesota, margins per half-gallon were about 15 cents at retail and 8 cents at wholesale as compared to about 10 cents at retail and 6 cents at wholesale in southern Minnesota. The 1963 average retail price for milk was 42 cents per half-gallon in the north and 39 cents in the south. At the same time, the average wholesale price was 36.5 cents in the north and 34 cents in the south.

There are two alternative explanations for this situation. First, low prices in the south may have reflected the low milk prices in the Minneapolis-St. Paul markets—traditionally the lowest prices in the nation.

The competition of Twin Cities dealers in several outstate markets probably helped decrease retail and wholesale prices in the south and, consequently, jobber margins.

A closely related explanation is that milk prices in the south were subject to substantially greater instability than in the north. This instability resulted in frequent downward adjustments in prices. When downward price flexibility was experienced in the north, the original price level generally was restored within a relatively short time. Since jobber prices were about the same over the state, higher, more stable wholesale and retail prices in the north resulted in wider jobber margins there than in the south.

Distribution cost differences could account for price differences between northern and southern Minnesota. However, differences in distribution costs were not statistically significant for plants studied in the two areas.

Advertising Costs

Unlike other costs, advertising expenses are not essential to the operation of a fluid milk plant. A manager's decision concerning advertising can be relatively independent of the plant's output. As a result, the range in advertising costs was wide—from 0 to 17 cents per cwt. However, these costs were relatively low, averaging only 2 percent of total operating costs or 7 cents per cwt.

Price stability in the area where the plant distributed milk apparently influenced advertising costs more than any other factor. Where area prices were unstable, distributing plants had average advertising costs of 10 cents per cwt. But in areas where prices were stable, advertising costs averaged only 6 cents per cwt. Thus, increased price competition apparently was related to increased nonprice competition in the form of advertising. From the standpoint of consumer welfare, some increased advertising may be desirable in order to assure the consumer of current price information.

Moreover, larger volume plants usually spent more on advertising than did smaller volume plants. For example, five plants handling less than 1 million pounds per year had an average advertising cost of 3 cents per cwt. as compared to 11 cents per cwt. for seven plants handling over 5 million pounds per year.

Overhead Costs

Overhead costs accounted for 15 percent of total operating costs or 58 cents per cwt. of milk distributed. In this study, overhead costs were divided into four components—salaries of management and office labor, taxes and insurance, office supplies, and office and building depreciation (see table 8).

Table 8. Average overhead costs per cwt. of milk in 27 fluid milk plants, Minnesota, 1961-63

Cost component	Average cost per cwt. (dollars)	Percent of total overhead costs
Salaries of management and office labor	0.26	44.8
Taxes and insurance	0.17	29.3
Office supplies	0.13	22.4
Office and building depreciation	0.02	3.5
Total	0.58	100.0

Overhead Cost Components

Salaries—Wages and salaries for the manager, directors, and other office personnel accounted for 45 percent of overhead costs or 26 cents per cwt. of milk distributed. In small plants where the manager and sometimes his wife supplied all office and managerial labor, overhead costs often were nearly zero. The only return to such labor and management was the firm's profit. In large, highly integrated operations, management and office salaries amounted to as much as 75 cents per cwt.

Taxes and Insurance—This component included all taxes except payroll taxes and all insurance normally carried on the plant, equipment, employees, or trucks. This component accounted for 29 percent of overhead costs or 17 cents per cwt.

Other Overhead Costs—Office supplies averaged 13 cents per cwt. or 22 percent of total overhead costs; depreciation averaged only 3.5 percent of total overhead costs or 2 cents per cwt.

Variation in Total Overhead Costs

Volume of milk handled, family labor, and the proportion of milk sold to jobbers all influenced total overhead expenses per cwt.

Volume—A large proportion of overhead costs are fixed; they occur regardless of the volume of milk distributed. Therefore, overhead costs should decline as the volume of milk distributed increases. This general tendency existed in the plants studied, particularly if no unpaid family labor was used in managerial and office operations (see table 9).

In plants not using family labor, overhead costs declined from an average of $1.13 per cwt. for the smallest plants to 59 cents per cwt. for the largest plants. The range for these plants was from $1.37 to 40 cents per cwt. And the plant with the smallest volume had the highest overhead cost per cwt. while the plant with the largest volume had the lowest overhead cost.

Table 9. Average overhead costs per cwt. of milk by annual volume of milk processed and type of labor used, 27 fluid milk plants, Minnesota, 1961-63

Average annual volume of milk processed (1,000 pounds)	Average cost per cwt. for plants (dollars) Using family labor	Not using family labor
999 and under	0.38	...
1,000-2,499	0.38	1.13
2,500-4,999	0.26	0.81
5,000-9,999	...	0.75
10,000 and over	...	0.59
Plant average	0.33	0.80

Family Labor—Plants using family labor in managerial or office capacities had substantially lower overhead costs than the other plants. The average overhead cost per cwt. for all plants using family labor was only about half the average overhead cost of the largest plants not using family labor.

Jobber Distribution—Jobber distribution of milk also lowered overhead costs. For example, plants not using family labor and distributing from 1 to 50 percent of their milk through jobbers had average overhead costs of $1.03 per cwt. However, plants distributing over 50 percent of their milk through jobbers had average overhead costs of 48 cents per cwt. This reduction in costs probably resulted largely from savings in administrative and office personnel due to jobber distribution. Savings in taxes, insurance, and office supplies also may have been substantial.

ANALYSIS OF NET MARGINS

The purpose of this section is to indicate factors related to the level of net margins. In this study, net margin refers to accounting profits; that is, net income as it appears on the firm's profit and loss statement. Net margins were defined as gross receipts minus the costs of raw milk, processing, distribution, selling, and overhead including allowances for depreciation and the manager's salary where it was paid.

As a tool of analysis, profit has several limitations. First, in a corporation or cooperative, managerial salaries are part of overhead costs. However, in a proprietorship, the manager's return comes out of profits. In the analysis, therefore, proprietorships or plants using proprietor's or family labor were treated separately.

Second, it was assumed that both cooperatives and noncooperatives strive to maximize profits. Although this assumption may be reasonable for noncooperatives, it may not be for cooperatives. The cooperative's goal generally is assumed to be maximization of returns to its patrons rather than maximization of returns to the cooperative itself. But for this analysis, it was assumed that the cooperative maximizes its profits in order to maximize returns to the producer—a view generally accepted by cooperative leaders.

Other limitations of profit as an analytical tool, such as variation in depreciation allowances and different accounting methods, are not easily reconciled. However, these effects were assumed to be small and tended to average out among the plants studied.

For the 27 plants, net profits averaged $15,952 annually or 42 cents per cwt. in 1961-63. This amount equaled 4.6 percent of sales. Only one plant had a loss in all 3 years, two plants had a loss in 2 years, and seven plants had a loss in 1 of the 3 years. Therefore, 37 percent of the plants studied experienced a loss in at least 1 of the 3 years studied. Only 4 of the 27 plants experienced an average loss for the 3 years. This loss varied from over $40,000 a year for one firm to $700 a year for another. Profits, on the other hand, ranged from over $120,000 per year (10 percent of sales) for one firm to $500 per year in another.

Although volume influenced the level of total profits, price stability and the use of family or proprietor's labor affected profitability per cwt. the most. If small plant managers did not supply their labor at little or no cost to the firm, their costs were substantially higher and their margins substantially lower than those of other firms.

Volume

Larger volume plants generally had higher total profits than did smaller volume plants (see table 10). Among plants not using family or proprietor's labor, profits varied from an average loss of $3,038 to an average profit of $40,066 per year.

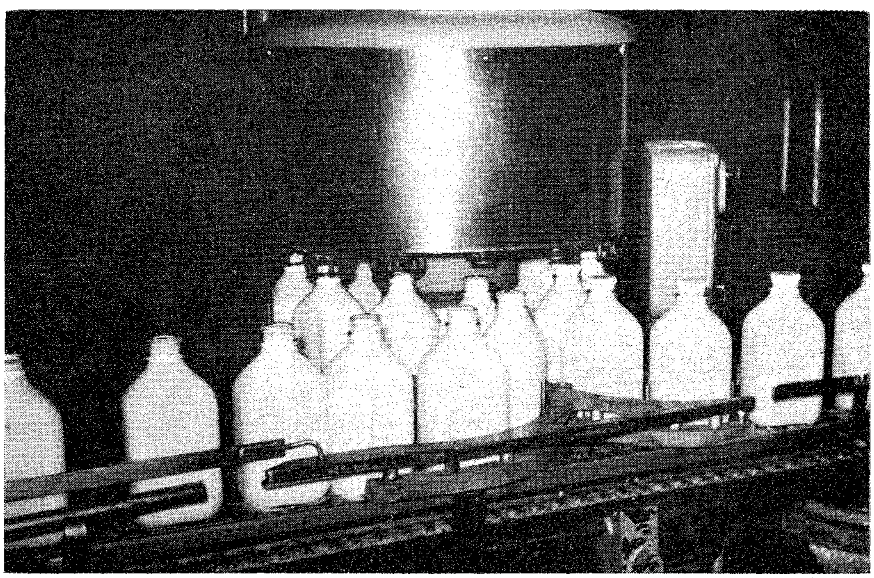
Three of the four plants in the 1-2.5 million pound class and not using family labor incurred losses during the 3 years. These three

Table 10. Total net margin and net margin per cwt. of milk by annual volume of milk processed and type of labor used, 27 fluid milk plants, Minnesota, 1961-63

Average annual volume of milk processed (1,000 pounds)	Plants using family labor*		Plants not using family labor	
	Net margin	Net margin per cwt.	Net margin	Net margin per cwt.
	- - - - - - dollars - - - -			
999 and under	7,109	0.95	.....	...
1,000-2,499	5,759	0.33	—3,038	—0.26
2,500-4,999	25,913	0.84	8,406	0.22
5,000-9,999	.....	...	38,204	0.68
10,000 and over	.....	...	40,066	0.20
Plant average	11,193	0.72	19,758	0.16

* Net margins for plants using family labor were computed before the manager was paid for labor and managerial skill.

plants were combination glass-paper operations which, as noted previously, generally had high processing costs. The single plant with a profit in this size group was an all-paper operation. These small size firms have had the most rapid rate of exit from the industry since 1956; they have difficulty competing at existing price levels (see table 1).



Single line glass or paper operations were more profitable than combination glass-paper operations.

In plants distributing from 2.5 to 5 million pounds of milk per year and not using family labor, the average profit was $8,406 per year. Only one plant in this group incurred a loss and that loss was for only 1 year out of the 3. The return as a proportion of sales for this group was only 2.4 percent.

Plants handling over 5 million pounds of milk per year had substantially higher profits than did smaller plants. Although two plants incurred a net loss in 1 of the 3 years, price wars rather than inefficient operation were the cause.

In terms of profitability per cwt., size and profit were not directly related. Although larger plants tended to have higher profits per cwt., this relationship was not significant.

Family Labor

As indicated in table 10, plants using family labor generally had a higher level of profit per cwt. of milk than did plants of similar size not using family labor. However, profits were computed before the manager and his family were paid a return for labor and managerial skill. But if it was arbitrarily decided that a plant manager should receive $8,000 a year in return for his and his family's labor, these plants under 2.5 million pounds would operate at a loss, just as did plants not using family labor. Therefore, these plants survive largely because the manager accepts a low return. The number of these plants continues to decline rapidly; two of them went out of business since the study began.

Price Instability

In an industry where prices sometimes are highly unstable, profits of both small and large firms fluctuate widely from year to year. This condition was particularly evident in the present analysis. Both large and small plants suffered substantial losses during periods of price instability. In this study, price instability was defined as a condition in which prices fell to unusually low levels for a relatively long time. This definition concerns more than just a price adjustment in response to supply and demand. Price instability generally is characterized by frequent downward changes in prices—a price war condition.

Ten firms operating under conditions of price instability had average net margins of $8,402 per year or 12 cents per cwt. Five of them had losses in 1 or more years and four had losses in 2 or more years. Losses for these plants were as high as $40,000 per year.

On the other hand, 17 firms operating under relatively stable market conditions had average net margins of $20,393 per year or 59 cents per cwt. Only four of these firms experienced losses. And the loss, generally less than $5,000 per year, was never for more than 1 of the 3 years.

IMPLICATIONS FOR INDUSTRY ORGANIZATION

Purposes of this section are to:

♦ Provide insight into the reasons for the changes in numbers and sizes of firms.

♦ Indicate the chances for survival of small as well as large firms.

As shown in table 1, the number and size distributions of plants in the fluid milk industry have changed substantially during recent years. The variation in costs and margins found in this study provides some insight into this situation.

For the 27 milk plants, processing and overhead costs per cwt. tended to decline as the volume of milk handled per plant increased. As shown in table 11, this decline in costs put small volume plants at a cost disadvantage. Since neither advertising nor distributing costs were related to volume, the cost disadvantage due to processing and overhead costs provides an estimate of the total cost disadvantage faced by different size firms.

The average plant handling from 1 to 2.5 million pounds of milk had average costs of $1.05 per cwt. higher than plants handling over 10 million pounds of milk per year. This cost disadvantage equaled about 4.5 cents per half-gallon. As the volume of milk handled per plant increased, the cost disadvantage declined rapidly. Nevertheless, even plants handling from 2.5 to 5 million and from 5 to 10 million pounds of milk per year had costs averaging 2.3 and 1.4 cents per half-gallon higher, respectively, than plants handling over 10 million pounds of milk per year.

Although small plants not using family labor had higher costs than large plants, their higher costs were offset somewhat by their higher gross receipts per cwt. These higher gross receipts resulted because a large proportion of the small plant's milk generally was distributed to

Table 11. Average cost disadvantage per cwt. of milk in 14 Minnesota fluid milk plants not using family labor in processing or overhead, by annual volume of milk, 1961-63

Average annual volume of milk processed (1,000 pounds)	Average cost disadvantage per cwt.*		
	Processing	Overhead	Total
	- -	dollars	- -
1,000-2,499	0.51	0.54	1.05
2,500-4,999	0.30	0.22	0.52
5,000-9,999	0.17	0.16	0.33
Plant average	0.33	0.30	0.63

* The cost disadvantage was derived from tables 4 and 9 by subtracting the cost for each size category from the cost for plants handling over 10 million pounds of milk per year. Thus, the $0.51 for the lowest size category was derived from table 4 by subtracting $1.71 from $2.22.

retail and wholesale customers rather than to jobbers. However, plants not using family labor and handling less than 2.5 million pounds of milk per year had an average loss of about $3,000 or 26 cents per cwt. Unless managers of these plants accept a very low return on their labor, management, and capital, chances of survival in the industry are limited. Table 1 data on changes in plant numbers support this conclusion; plant numbers declined by 51 percent from 1956 to 1963 for plants handling from 1 to 2.5 million pounds of milk per year.

Plants handling less than 1 million pounds of milk per year, primarily plants using family or proprietor's labor, had an average rate of decline of about 55 percent between 1956 and 1963. Therefore, plant managers must be becoming less willing to accept a low return on their labor, management, and capital. Even though labor costs are nil in some small plants, other costs are so high that they cannot compete in the industry and still get an acceptable return on their resources.

Although plants handling from 2.5 to 10 million pounds also had higher costs than plants handling over 10 million pounds, these higher costs were offset by higher product returns per cwt. due to a higher proportion of milk distributed to wholesale and retail customers. Most plants of this size earned a positive profit margin. Nevertheless, their numbers declined by over 40 percent from 1956 to 1963. There may be a number of alternative explanations for these declines.

1. Because of their size and limited distribution area, small plants are probably less able to withstand the effect of price instability than are large plants.

2. Because plants handling from 2.5 to 10 million pounds are reasonably profitable, they are probably attractive to large firms as merger possibilities. A plant handling from 15 to 20 million pounds of milk per year may substantially improve its cost and profit situation by purchasing a smaller volume plant.

3. Some plants handling from 5 to 10 million pounds of milk per year may be moving into the over 10 million pound size category. Similar growth probably hasn't been experienced by firms handling less than 2.5 million pounds of milk per year.

As long as the number of smaller plants continues to decline, distribution costs continue to rise, and great excess capacity continues to exist, jobber distribution of fluid milk is likely to increase. To many plant managers going out of the packaging business, jobber distribution probably offers the best alternative source of employment. Many small plants can purchase prepackaged milk at a lower price than it costs them to bottle it themselves. Excess capacity in the larger volume supplying plants provides reasonable assurance that jobber prices will stay at a relatively low level. However, most plants in the study that distributed milk on their own routes probably would not find a switch to jobber distribution profitable.

SUMMARY AND CONCLUSIONS

This study was designed primarily to determine the level of costs and margins in Minnesota fluid milk plants and the factors which significantly influenced these costs and margins. Accounting cost data from 27 fluid milk plants were analyzed. Costs were divided into processing, distribution, advertising, and overhead centers. Variations in cost components in each center and in total costs in each center were studied.

The two largest components of processing costs were labor and container costs. As plant size increased, labor costs for plants not using family labor declined rapidly, reflecting the higher volume per plant worker achieved in larger plants.

Total processing costs declined from an average of $2.51 to $1.71 per cwt. for plants packaging less than 1 million pounds to those packaging over 10 million pounds of milk per year. Since wide variations in cost existed among the largest volume plants studied, size alone did not result in the lowest possible costs. Plant size must be suited to market size so the plant can operate at or near full capacity.

Compared to all-glass or all-paper operations, plants packaging milk in both containers tended to have higher costs. Small plants with both lines could not utilize either efficiently and, therefore, incurred significantly higher costs than similar size plants packaging milk in only glass or only paper containers.

Distribution costs were more closely related to the proportion of milk distributed through jobbers than to the total volume of milk distributed. When the amount of milk distributed through jobbers rose from zero to over 50 percent, distribution costs declined from $1.59 to 58 cents per cwt. However, because of the lower price received for jobber milk, plant receipts per cwt. fell faster than distribution costs as the proportion of milk distributed through jobbers increased.

Advertising costs, averaging 7 cents per cwt., were significantly higher in areas where price instability existed during the study period.

For plants not using unpaid family labor, overhead costs declined from an average of $1.13 per cwt. for the smallest plants to 59 cents per cwt. for the largest plants. Where the plant owner supplied his managerial skill without charge, costs were substantially lower.

Profits averaged nearly $16,000 a year for the 27 plants studied. However, 37 percent of the plants incurred net losses in at least 1 of the 3 years from 1961 to 1963. Plants most apt to incur losses were those handling less than 2.5 million pounds of milk per year, those not using family or proprietor's labor, and those operating with combination glass-paper equipment in an area of price instability. Plants of this size using family labor accepted a relatively low return on that labor.

Plants fitting the above characteristics have had the highest rate of exit from the industry. However, low profit rates were not limited to the smallest plants; in cases of price instability and price wars, even the largest plants incurred net losses. Nevertheless, large plants generally can weather such price disturbances over longer periods than can their smaller volume competitors.

According to study findings, managers of all size plants could improve their costs and, thus, their competitive positions by:

♦ Suiting the size of their equipment and plants to the size of their sales when building a plant or buying equipment. High fixed costs spread over a small volume invariably result in high operating costs.

♦ Keeping labor costs at a minimum since they are a substantial part of total costs.

♦ Specializing in either glass or paper; such specialization generally yields substantially lower costs than does operation of both equipment lines in a single plant, particularly in small plants.