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# **The Comparative Performance of Cooperatives and Investor-Owned Firms: The Louisiana Sugar Manufacturing Industry**

by

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Cane sugar manufacturing is the oldest and largest food processing industry in Louisiana. The performance of this industry is important in terms of the state's economic objectives. The total value of production from the industry's twenty manufacturers of raw cane sugar exceeded \$300 million in 1987. These sugar factories represent major employers in the rural parishes where they are located. Local purchases of materials and supplies contribute significantly to these rural economies. Further, these firms provide an essential local market for the state's sugar cane crop.

In recent years, the U.S. cane sugar industry has been subjected to market and non-market forces that threaten its survival. Competition from domestic beet sugar, imported sugars, and alternative sources of sweeteners has placed constraints on cane sugar's share of the domestic sweeteners market. International food manufacturers buy sugar at low world market prices and export finished food products to the United States, further undermining the demand for domestic cane sugar. The industry's historical reliance on federal protection and support programs is currently under critical review by the Administration and some members of Congress. Several proposed policy

changes could seriously compromise the industry's survival. Regardless of the future direction of U.S. sugar policy, the current atmosphere of uncertainty could have a negative impact on the level of investment the industry is able to attract or finance internally. Given these market and public policy impacts, many participants within the U.S. cane sugar industry have concern for their economic survival. These concerns are expressed in the need to become more efficient.

As the Louisiana sugar industry addresses questions of efficiency, one must consider its somewhat unique organization structure. Half of the raw sugar manufacturers in Louisiana are organized as cooperatives. This feature gives rise to an important question relative to the Louisiana industry's competitive position. What is the relationship between the type of firm organization (i.e., private versus cooperative) and economic performance? This paper explores this relationship and its impact on the Louisiana cane sugar manufacturing industry. Specifically, the three objectives of this analysis are to:

- (1) provide a conceptual argument for evaluating the economic performance of alter-

native business organizations (i.e., private versus cooperative);

- (2) describe the organizational features of the Louisiana cane sugar manufacturing industry; and
- (3) evaluate the economic performance of private and cooperatively owned sugar mills in Louisiana.

This paper proceeds by first discussing the conceptual frameworks and methodologies for evaluating alternative business organizations. Second, selected structural and organizational features of the sugar manufacturing industry in Louisiana over the past decade are described. These features include the number of firms, type of firms, average daily grinding capacities (size), and share of total output. Finally, empirical results and proposed conclusions concerning the relationship between firm organization and performance in the Louisiana sugar manufacturing industry are presented.

#### **Conceptualizing Economic Performance of Alternative Business Organizations**

Two broad conceptual frameworks are useful in exploring the economic performance of alternative business organizations: the analytical institutional framework and the industrial framework. Analytical institutional economics requires a "total inquiry" attempting to link rules, policy, and social norms to economic performance by focusing on behavioral elements [4]. The theory sets forth a relationship between situation, structure, and performance with various "intermediate products." Situation implies sources of interdependence between behavior and performance, while structure represents the institutional alternatives in terms of varieties of property rights and their distribution. Institutional theory is intended to guide empirical inquiry into the substantive consequences of alternative institutions, rather than a comparison to determine whether one alternative is more or less efficient [6]. As a result, analytical institutional economics has been applied to a broad set of problems relating institutional factors to performance.

Industrial organization focuses primarily on market organization and market performance [4,5]. The basic industrial organization paradigm holds that the market structure, or the basic conditions of the industry, influences the conduct of firms which in turn influences market performance, which can be economic or

non-economic. The latter depends on the objectives and expectations of market participants. Likewise, economic performance is multidimensional. Elements of economic performance can be drawn from at least three sources: economic theory, industry standards, and societal goals. Industrial organization theory can provide a framework for appraising economic performance, primarily efficiency. However, industry and society often recognize different elements of economic performance. Industry participants may find profit and loss a meaningful measure, while society views measures of equity and distribution of economic power more seriously. Appraisals of economic performance require that the researcher distinguish between economy-wide goals and policies on the one hand and a criteria appropriate for individual industries on the other.

A treatment of cooperatives in a generalizable framework for analyzing and evaluating the performance of cooperatives when non-economic elements are included is lacking. Although several new theories of cooperatives have recently emerged, they essentially treat the cooperative as a firm, and then proceed to develop and explain, conceptually, the resulting economic performance [2,8]. Likewise, applications of industrial organization theory to cooperatives generally view the cooperative as having essentially the same economic features (i.e., profit orientation and central decision unit) as other business organizations. Cotterill expands the traditional industrial organization model by including the capital market/ownership structure category in the environmental stage, an organizational structure stage, and a firm-level performance category in the performance stage [3]. This expanded framework explicitly includes cooperatives as part of the ownership/capital market structure category. From the traditional industrial organization framework and to a lesser extent modified versions of the I/O model, several empirical studies within food markets have attempted to explore the relationship between cooperative ownership and economic performance [7,1].

For purposes of this analysis, dimensions of economic performance were derived using the industrial organization paradigm to identify meaningful measures of economic performance, given the industry's organizational structure. Subsequently, two measures of economic performance were evaluated: average total costs per pound of raw sugar produced, and the profit-volume ratio, or net income per dollar of sales. The first considers economic efficiency in the employment of resources, the second

measures the firm's profit performance. Unlike the typical private firm, cooperatives often have objectives other than profit maximization. Consequently, the profit comparisons must take into consideration the unique nature of cooperative organizations.

In addition to these two economic measures, a measure of technical efficiency, widely used by industry participants, was added to the analysis to identify any differences in technical performance between cooperative and private manufacturers that might affect the economic measures. Technical efficiency was measured by the average pounds of raw sugar produced per ton of sugar cane processed, or the commercial recoverable sugar ratio (CRS).

To examine the relationship between firm organization and the economic performance of raw sugar manufacturers, the above measures were calculated for the ten cooperative sugar manufacturers and eight of the ten private sugar manufacturers for each of the 1979-87 manufacturing seasons. The average of each measure across groups provided paired means for each of the nine years. Differences between means (null-hypothesis) were evaluated with the t-test.

#### **Organizational Features of the Louisiana Sugar Manufacturing Industry**

Louisiana's cane sugar manufacturing industry, like its competitors in Hawaii, Florida, Puerto Rico, and Texas, is characterized by an adjustment toward fewer but larger manufacturing firms (Table 1). The Louisiana industry has, however, several unique features. First, the Louisiana industry is made up of nearly as many firms as the other four regions combined. Second, production is much more seasonally constrained in Louisiana. The crop is typically processed within 80 days, while manufacturers in the other regions generally operate two and three times as long. Given fixed daily grinding capacities, longer grinding seasons translate to greater total grinding capacities. Finally, as mentioned earlier, half of the firms in the Louisiana industry are organized as cooperatives. This contrasts to the Hawaiian and Puerto Rican industries which have no cooperatives, and the Florida and Texas industries with one each. The sugar manufacturing industry in Louisiana developed from over 2,000 small, plantation-oriented, manufacturing enterprises. Slightly more than a century ago, the industry started the transition toward larger, off-farm, centralized, commercial processing. Not only did this allow size economies to be realized on the processing side, but sugar cane production

was no longer constrained by on-farm processing capabilities. Since that time, the number of sugar manufacturers has steadily declined, while the size of the crop slowly, but steadily, increased. Milling capacities were increased as the number of tons of sugar cane ground by surviving firms increased. Today, twenty-one firms process Louisiana's sugar cane crop. All but one produce primarily raw sugar and final molasses. The remaining processor produces primarily edible syrups.

Historically, the industry was primarily characterized by privately-held firms. Cooperatives traditionally represented a small minority. As late as 1959, private mills outnumbered cooperatives, approximately four to one (Table 2). However, as the total number of manufacturers fell sharply over time, the number of cooperatives remained relatively stable. This development should not, however, generate the conclusion that cooperatives represent a vastly more stable form of organization. Stability in the number of cooperatives is at least partially due to some number of failed private mills being reorganized by local growers as cooperatives. Conversely, failed cooperatives have not been reorganized as private firms. Thus, while both types of mills have experienced attrition in their ranks, the total number of cooperatives has remained more stable over time. Furthermore, any consequences cooperative organization might have had on a manufacturer's survival in the past seems to have been muted in recent years. The last three manufacturers to exit the industry were cooperatives. Neither group has experienced a closure since 1981. Traditionally, cooperative manufacturers were on average larger than their private counterparts, if only by a small margin. However, during the past decade, the daily grinding capacity of the private firms grew disproportionately faster than cooperative mills (Table 2). Private manufacturers on average expanded their grinding capacity approximately 189 percent over the past thirty years, while the average grinding capacity for cooperatives increased only 93 percent.

Due to their smaller numbers, cooperatives have historically produced a minor portion of the state's raw sugar. As the number of firms in each group became more evenly balanced, their respective shares of total output have also become more balanced. Finally, with ten members in each group, their shares are virtually identical (Table 2). However, in 1987, the private manufacturers controlled

**Table 1**

**Number and Size of Firms Participating in the U.S. Raw Cane Sugar Manufacturing Industry by State, 1960-1987**

**Number of Sugar Cane Processing Firms and Their Average Capacity in Tons of Cane Ground per 24 Hours**

Year	Florida		Hawaii		Texas		Puerto Rico		Louisiana	
	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons
1960	3	4800	27	N/A	0	0	23	4104	47	2323
1965	10	6550	23	2759	0	0	24	N/A	47	2951
1970	7	8929	23	2978	0	0	16	N/A	43	3404
1975	7	11871	15	3823	1	8500	10	5150	35	4060
1980	6	13050	14	4025	1	8500	7	5143	24	4411
1987	6	18917	11	4911	1	8500	4	4875	20	5585

Source: Gilmore Sugar Manuals

N/A denotes data not available.

**Table 2**

**Selected Organizational Characteristics of Louisiana Raw Sugar Manufacturers, 1959-1987**

Year	Number of Processors		24 Hour Grinding Capacity Average		Percentage State's Raw Sugar	
	Coop (number)	Private	Coop (tons)	Private	Coop (percent)	Private
1959	9	38	2461	2111	N/A	N/A
1965	11	36	3445	2718	N/A	N/A
1970	11	43	3805	3050	33.0	67.0
1975	14	21	3796	3666	45.2	54.0
1980	13	14	4071	4583	51.3	48.7
1985	10	10	4245	5160	49.7	50.3
1987	10	10	4750	6100	49.6	50.4

N/A denotes data not available.

approximately 28 percent more grinding capacity than their cooperative counterparts.

Sugar payments to cane growers by the two groups of manufacturers are similar. Growers basically receive 60 percent of the raw sugar produced, while manufacturers retain 40 percent.

The evidence suggests several conclusions regarding the structural organizational characteristics of raw sugar manufacturers in Louisiana. First, if the cooperative form of organization has contributed to the stability of firms so organized, these contributions seem to have become academic during the past decade. Second, private manufacturers as a group have expanded their grinding capacities at a greater rate than their cooperative counterparts, and to a significantly greater level. Finally, although the two manufacturing groups produce approximately equal quantities of raw sugar, cooperatives on average operate at levels closer to capacity than do their private counterparts.

### **Empirical Results**

Operating cost, income, and physical data for Louisiana's ten cooperative raw sugar manufacturers for 1979 through 1987 were provided by the Jackson Bank for Cooperatives. The corresponding data for eight of the ten privately-held manufacturers in Louisiana were collected by personal interviews with factory managers during the summers of 1986 and 1988.

The data were used to calculate the CRS, the average total cost per pound of raw sugar produced, and the profit-volume ratio for each firm each of the nine years. The firms were sorted by organizational structure (i.e., cooperative versus private), and the group mean for each measure was calculated for each year (Table 3). To identify significant differences between paired means, the null-hypothesis was evaluated using the t-test. The results were mixed.

No significant differences exist between the average CRS of the cooperative group and the private group at the 1.0 percent level. It appears that firm organization has no measurable impact on the manufacturers' cane to sugar transformation process. The two groups are bound by a common state of technology.

Average per unit cost for the two groups over the nine years were significantly different. Private manufacturer costs were, on average, higher with higher annual per unit cost for six

of the nine years. Yet, the data demonstrate that either group is subject to operating at per unit costs well above the other. In 1986, the private group averaged 2.9 cents higher than the cooperative group, the greatest mean difference during the nine years. In 1982, the cooperative group averaged 2.3 cents per pound higher than their private counterparts. This divergence represented the second greatest mean difference during the nine years. This similarity may suggest that too few years were considered for reaching conclusive results.

The cost of sugar cane represents a large portion of the raw sugar manufacturer's total cost. This relationship is generally true across most food manufacturing industries. The per unit total cost less the cost of cane, or per unit operating costs, for the two groups were compared, and their means were significantly different. Cooperative processors on average exhibited the higher per unit cost. Private manufacturers operated at lower cost only two of the nine years examined. During 1984, per unit operating costs for the two groups were equal.

The analysis was expanded to determine whether mean component cost differences existed. Average per unit variable costs and average per unit fixed costs for either group were tested for differences. Average per unit fixed costs were not significantly different at the 1.0 percent level. This result appears inconsistent with the earlier conclusion that the private group operates with relative excess capacities.

Average per unit variable costs for the two groups were significantly different. Given similar CRS ratios, similar volumes of output, and a single cane payment level, per unit variable cost differences could be due to dissimilar input prices, management resources, and/or transportation requirements (manufacturers generally bear the cost of hauling sugar cane).

Profit-volume ratios were significantly different between the two groups. Private manufacturers averaged higher ratios for the nine-year period, with higher annual ratios five of the nine years. Considering near uniform product pricing under current government programs and operational similarities, differences in the profit-volume ratios are inconsistent with earlier conclusions concerning cost differences.

**Table 3**

**Selected Performance Measure Averages for Cooperative and Privately Held Raw Sugar Manufacturers in Louisiana, 1979-1987.**

Year	Commercial Recoverable Sugar <sup>ab</sup>		Total Cost per Pound of Raw Sugar		Total Cost Less Cost of Cane per Pound of Raw Sugar		Profit-Volume Ratio <sup>c</sup>	
	Coop (pounds per ton)	Private	Coop	Private	Coop	Private	Coop <sup>d</sup> (percent)	Private
1979	181.4	181.6	.190	.174	.074	.066	.034	.106
1980	164.6	168.0	.264	.279	.095	.086	.035	-.020
1981	197.4	187.4	.182	.185	.075	.072	.037	.035
1982	190.0	182.2	.201	.178	.078	.068	.047	.156
1983	186.1	183.4	.214	.213	.085	.079	-.094	.047
1984	179.3	174.6	.225	.226	.098	.098	-.025	-.038
1985	173.6	175.1	.199	.208	.082	.087	-.064	-.115
1986	179.9	171.8	.168	.197	.062	.078	-.016	.064
1987	217.8	207.8	.182	.189	.058	.058	.049	.236

<sup>a</sup>pounds of sugar produced per ton of sugar cane ground.

<sup>b</sup>ttest indicates no significant difference at the 1.0 percent level.

<sup>c</sup>net income divided by net sales.

<sup>d</sup>reflects net income prior to patronage refund.

## Summary

The current market and non-market forces affecting the U.S. cane sugar industry place increasing pressure on participating firms to operate more efficiently. The Louisiana industry is unique in that half of its manufacturers operate as cooperatives. The Louisiana sugar industry consists of a relatively mature market which links production of sugar cane to the processing of raw sugar. A comparison of economic performance measures for Louisiana's cooperative and private manufacturers was made in an attempt to identify relationships between firm organization and economic performance. The costs and returns from the past nine grinding seasons suggest that private processors on average operated at higher total costs per unit. Yet for some years, cooperatives operated at an average total cost significantly higher than their private counterparts. The analysis demonstrated that the source of these cost differences were primarily variable components. When the cost of cane was removed from the analysis, cooperative firms on average operated at higher per unit cost over the nine years. Results of the comparative evaluation of performance across economic and technical dimensions suggest that the presence of a cooperative business form exerts some discipline on the privately owned mills which implies some "competitive yardstick" effects.

The disparate profit-volume ratios, which favor the private manufacturers, are difficult to explain. However, the willingness of cooperatives to accept lower profit-volume ratios, due to organizational objectives, could serve to dampen the industry's profit environment. Higher cane payments in the form of patronage refunds could affect payments by private mills. As long as private manufacturers operate with excess capacities and higher average costs, they can be expected to seek greater throughputs of cane. As private mills offer premiums to attract greater volumes of cane, traditional cane payment arrangements may give way to more market-oriented arrangements. Profit-volume ratios suggest these premiums are available. While higher cane payments may serve cooperative objectives in the short run, their overall impact may be to inhibit the local industry's long run competitive position. It would be useful to compare Louisiana's profit-volume ratios with those of the other four cane sugar producing regions to investigate further the impact of cooperatives on Louisiana's competitive position. Firm level cost and return data

from the other regions are, however, not readily available.

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