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The Structure of the U.S. Sweetener Industry

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ABSTRACT

The sweetener industry is divided into several segments, based on geography, the plant (beet, cane, or corn) from which the sweetener is obtained, and the functions performed by different producers. The production and marketing of sugar in the United States have been controlled by a quota system since 1934. This system, supported by the domestic sugar industry, has been administered so that U.S. sugar prices have usually been well above those in the world market. Individual sugar producers apparently have not had sufficient market power to affect the general level of prices over a long period of time. Producers of corn sirup and dextrose have benefited to some extent from the protection received by the sugar industry, since these products compete with sugar. Saccharin, the principal noncaloric sweetener, competes to some extent with sugar.

Key Words: Sugar, quota, raw, refined, beet, cane, structure, market power, corn sirup, dextrose, saccharin.

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SUMMARY

Sweeteners, primarily sugar, corn sirup, and dextrose, provide about 16 percent of the calories consumed by the people of the United States. The industry producing these products is divided into several segments based on geography, the plant (beet, cane, or corn) from which the sweetener is obtained, and the functions performed by different producers.

The main substitutes for sugar are corn sweeteners in many uses and products. An important difference between the sugar and corn sweetener industries is that sugar operates under a quota system established by the U.S. Government. No similar system applies to the corn sweetener industry. Also, the United States is a large importer of sugar, while small quantities of corn sirup and dextrose are exported each year.

Because of sugar imports, U.S. producers have long been concerned with obtaining protection by Government action; since the 1930's, a quota system has operated which has been beneficial to their operations. Sugar producers, acting individually and through trade associations, have generally been successful in maintaining enough protection to permit the domestic industry to expand production in most areas. This has been accomplished despite divergent interests on some points among segments of the industry.

Producers of corn sirup and dextrose have no doubt benefited from the protection accorded the sugar industry. Higher sugar prices have enabled producers of corn sirup and dextrose either to charge higher prices than they could have obtained otherwise or to increase their volume of sales by keeping their prices below those for sugar. Actual market strategy appears to have involved a combination of both procedures.

Both the general level of U.S. sugar prices and their geographic pattern have been markedly affected by the sugar quota law and the various changes that have been made in domestic area quotas since World War II. There is little evidence, however, that any producer has exercised sufficient market power to have any observable effect on the general level of sugar prices over a long period of time. Short-range effects sometimes appear, which may be important in certain areas. The lack of differentiation among industry products doubtless is a factor in producing these results.

Likewise, the ability of individual producers of corn sweeteners to produce long-range effects on the prices of their products appears limited. Short-range effects are more common and are sometimes initiated by smaller producers. The degree of differentiation in the products produced by various companies is not sufficient to give any important advantage to one producer over another.

THE STRUCTURE OF THE U.S. SWEETENER INDUSTRY

by
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INTRODUCTION

The U.S. sweetener industry consists of several seemingly separate industries, which are related through competition among their products in the sweetener market. Together, they provide about 16 percent of the calories consumed by the people of the United States.

A few companies produce two or more of the common types of sweeteners--sugar, corn sirup, dextrose, and saccharin--but most firms manufacture only one type. Consequently, they usually can be classified into one of the several subindustries which are collectively referred to as the sweetener industry.

Competitive practices and operating efficiency of firms in the industry are influenced by the number, size, and geographic location of the firms, and by product characteristics, type and degree of Government regulation, and other circumstances. These characteristics will be examined in detail to provide a better view of the factors influencing industry performance, both under present circumstances and with changes that may occur in the future.

The structural characteristics of the sweetener industry have changed considerably in some respects since the end of World War II, but have remained remarkably constant in other ways. Throughout the period, the performance of the industry's various segments has been closely related to the forms of Government regulations which have influenced their actions. The effect of these regulations will be analyzed for each segment of the sugar industry.

CHARACTERISTICS OF THE SUGARCANE AND RAW SUGAR SEGMENTS

Each major segment of the sweetener industry possesses certain distinctive characteristics with respect to the number, size, and location of plants, the degree of concentration of ownership of production facilities, and relationships with suppliers of raw materials and purchasers of the products. The cane sugar industry, for this discussion, consists of firms growing sugarcane and those manufacturing it into raw sugar for sale to cane sugar refiners.

Sugarcane production is the first step in a chain of events which leads to refined sugar. Sugarcane is a member of the grass family growing in tropical and semitropical areas. It is a perennial and a single planting, under commercial conditions, yields several successive crops (sometimes at intervals of more than a year) before the roots are plowed out and the field replanted. In nearly all cases, sugarcane is not grown in rotation with other crops, but occupies the same fields continually.

Much U.S. sugarcane is grown by firms which also own and operate raw sugar mills, but some is purchased by mill owners from independent growers. The degree of integration at this point in the production process varies considerably among the four domestic cane sugar areas--Louisiana, Florida, Hawaii, and Puerto Rico. This and other factors have resulted in substantial differences in the structure of the industry in different areas.

Louisiana

Since the end of World War II, Louisiana sugarcane production has been characterized by a rapid decline in the number of farms producing cane and an increase in the output of the remaining farms on which the crop is grown. Total acreage planted to cane and total production of sugar have both increased considerably (table 1).

Hand labor has been substantially replaced by machinery in sugarcane production. This, together with increased yields per acre, has resulted in a drop of nearly 75 percent since 1948 in the number of man-hours of labor required to produce enough sugarcane to yield 1 ton of sugar.

USDA's Agricultural Stabilization and Conservation Service reports that 36 farms in Louisiana had 1,000 or more acres in cane in 1967. 1/ These farms produced 28.5 percent of the cane processed for sugar. Seventy-four farms had 500 to 999 acres in cane and produced 16.3 percent of the State's output of sugarcane. At the other extreme in size were 193 farms, each with less than 10 acres of cane. They provided only 0.2 percent of Louisiana's cane supply. Most of the larger sugarcane farms are owned by companies or individuals having an ownership interest in a sugarcane mill. Their cane is commonly delivered to this mill.

The number of factories processing sugarcane in Louisiana declined by 15 mills during 1948-69, a drop of about 20 percent. Mills operating in 1967 included an experimental mill operated by Louisiana State University and a small mill operated by the State penitentiary. One company operated four mills and another, three. The remaining companies each operated a single mill. The largest company, judging by 1968 marketing allotments published by USDA, produced 11.4 percent of Louisiana's sugar crop in that year. The next largest produced 6.8 percent. The companies with the five largest allotments supply 31 percent of the State's output.

1/ Campbell, Joe R. Returns, Costs, and Profits for Family-Type Sugar Cane Farms in Louisiana: 1967 Crop Year. La. Agr. Expt. Sta. D.A.E. Res. Rpt. No. 401, July 1969.

Table 1.--Trends in the structure of the Louisiana sugar industry, 1948-69

Year	Farms growing sugarcane	Sugarcane area harvested	Production of sugar 1/	Man-hours of labor per ton of sugar 2/	Factories processing cane
	Number	1,000 acres	1,000 tons	Number	Number
1948	5,957	274	397	112	59
1949	5,559	279	416	95	54
1950	5,028	273	456	77	54
1951	4,833	258	297	102	54
1952	4,463	274	451	66	54
1953	4,010	280	481	59	54
1954	3,883	247	478	56	53
1955	3,861	232	455	56	52
1956	3,703	203	432	49	50
1957	3,343	226	398	53	49
1958	2,908	219	443	48	48
1959	2,686	250	441	51	47
1960	2,547	255	470	41	46
1961	2,534	277	650	32	46
1962	2,413	254	472	39	46
1963	2,308	295	759	32	46
1964	2,301	325	573	41	48
1965	2,218	288	550	38	47
1966	2,080	288	565	30	47
1967	1,912	294	743	23	46
1968	1,794	282	666	24	46
1969	1,687	235	539	25	44

1/ Raw value.
2/ All labor used in the production of sugarcane.

Source: Econ. Res. Serv. Sugar Statistics and Related Data. Vol. 2. U.S. Dept. Agr. Statis. Bul. No. 244, 1969.

Each of the multiple-mill companies operates a cane sugar refinery as a part of one of its sugarcane processing plants. One single-mill company also operates a refinery. These three refineries are small compared with the other three refineries in the New Orleans area. In each case, they process the raw sugar they produce and commonly buy raw sugar produced in other mills in Louisiana and sugar arriving in New Orleans from other domestic and foreign areas. There are also a few mills in Louisiana producing direct-consumption sugar--that is, sugar which is partially but not completely refined and is commonly used by certain industrial users with no further refining.

Nearly all of the companies operating processing plants grow part or all of the cane processed in their mills. Although precise data are not available, persons conversant with the industry have estimated that about half the cane grown in Louisiana is "administration" cane--cane grown by the owners of the

mill. These owners would include members of cooperatives and, in a few cases, principal owners of milling companies who also grow cane as individuals.

Smaller growers, most of whom sell their cane to a mill in which they have no financial interest, usually do not have much freedom in selecting the mill. Frequently, only one or two mills may be situated close enough to their farms to permit economical delivery. In any event, the prices offered are likely to be identical. USDA determines a minimum price for Louisiana sugarcane each year. This price is established by a formula related to the quality of the sugarcane and the market price of raw sugar for a specified period of time. In practice, this minimum price has become the actual price in nearly all cases. The independent grower's ability to influence the price of sugarcane largely depends on the evidence he can present to the Sugar Act administrators who determine minimum prices.

Except for companies that refine the raw sugar they produce, or sell direct-consumption sugar, milling companies that process sugarcane sell raw sugar to cane sugar refineries, usually those in the New Orleans area. Many of the companies that sell raw sugar contract for delivery of a year's production at a price based on market quotations in New York for a specified period of time. Others sell individual lots at current prices.

Selling sugar on an annual contract with the price based on market quotations over a period of time is, in effect, a way of hedging or protecting the firm from shortrun price fluctuations. The risk involved in such fluctuations is transferred to the refiner who purchases the sugar. The refiners, if they wish, may hedge such purchases in the futures market. Also, buying sugarcane on the basis of minimum prices established by USDA largely standardizes the cost of acquiring cane from independent growers for all processors.

In addition to considerable integration of cane growing and processing, and three cases of an integrated raw sugar-refined sugar operation, the two companies with the largest cane processing capacity are controlled by larger corporations not otherwise engaged in the sugar business. For the largest corporation, this relationship began in the 1930's when a manufacturer of building supplies purchased certain sugar properties in Louisiana, partly to obtain use of the bagasse produced by the mills for the production of wallboard and other building material. The original parent corporation has since become a subsidiary of a corporation active in the building industry. It retains control of the sugar company in Louisiana.

A majority of the stock in the second largest company is owned by a firm in the petroleum industry. This sugar company, under new management, is reported to be actively engaged in acquiring ownership interests in other companies outside the sugar industry.

Another factor of importance in the recent development of the Louisiana sugar industry has been the development of profitable oil wells in several parts of the sugarcane growing area. A number of firms operating sugarcane plantations in the State are reported to receive substantial income from oil royalties.

Firms engaged in producing and processing sugarcane in Louisiana appear to be slowly becoming somewhat more diversified, in considerable part because of outside interest in their activities. However, the smaller ones are mostly one-product companies.

Florida

It was not until the 1930's that commercial production of sugar in Florida became established on a permanent basis. Until 1960, there were only three mills in the State, two in the Everglades area south of Lake Okeechobee and one, which has ceased operation, about 80 miles north of the lake. Beginning in 1960, when the United States ceased importing sugar from Cuba, the Florida sugar industry expanded rapidly. Its production in recent years sometimes has exceeded Louisiana's.

In 1967, eight companies were growing and processing sugarcane in Florida. The largest company operated two mills, and the rest one each. The company with two mills accounted for more than one-third of the State's output in 1967, and the smallest one for about 3 percent.

Only 153 farms in Florida were reported to be growing sugarcane in 1967, down from a peak of 182 in 1964. About 190,000 acres of sugarcane were harvested in 1967, more than five times the area harvested in 1948. In 1967, 52 farms in Florida had 500 or more acres in cane. Although exact data are not readily available, it appears that a larger proportion of the cane grown in Florida is controlled by companies operating cane processing plants than is the case in Louisiana.

Three of the plants in Florida produce direct-consumption sugar. One plant produces liquid sugar from the raw sugar it produces and also purchases additional raw sugar from other plants for conversion to liquid sugar. There is one small refining plant in the State which operates entirely on purchased raw sugar. Most of the raw sugar produced in Florida, however, is shipped to a refinery in Georgia. Refined sugar produced in Florida is mostly consumed in that State.

One company--a subsidiary of a large conglomerate--with a mill in Florida has a large mill in the Dominican Republic and until recently operated a mill in Puerto Rico.

Two other mills in Florida are owned and operated by companies having other interests. One company has liquid-sugar plants in Florida and in St. Louis, Mo., and a cane sugar refinery in Louisiana. Another, owned by an international sugar broker, was recently acquired by a large sugar company in Hawaii which is a subsidiary of a still larger company. Several companies operating sugarcane processing plants in Florida are also in the cattle business. Cattle operations appear to serve two purposes; cattle make use of land that might otherwise be idle and consume part of the molasses produced as a byproduct in the sugar mills.

Puerto Rico

In contrast to sugar production in other domestic areas, sugar production in Puerto Rico has been declining since reaching a peak of 1,372,000 tons in 1952. The 1968 crop of 645,000 tons was 53 percent below the 1952 output.

Increasing wage rates, together with increasing industrialization and urbanization, have been important factors in this decline. Higher wage rates have increased the need for mechanizing the production and harvesting of sugarcane. Machinery is not well adapted for use on small irregularly shaped fields or fields on steep hillsides--both of which are common in Puerto Rico. This has been an important factor in causing reduced sugarcane acreage in certain areas. The growth of urban population in northern Puerto Rico and the establishment of industrial plants with the accompanying needed housing facilities in various parts of the island have also reduced sugarcane acreage. As a result of these developments, the same level of sugar prices that has encouraged a marked increase in sugar production in mainland areas has not been high enough to prevent a marked reduction in Puerto Rico and the closing of the single mill operating in the Virgin Islands.

Historically, most of the sugarcane in Puerto Rico was grown by a large number of independent growers, most of whom had only small acreages. A few large farms were usually operated in connection with a sugar mill. A large decline in sugar production, together with the introduction of some laborsaving machinery, has altered this situation somewhat. The maximum number of farms on which sugarcane was grown in Puerto Rico was 19,833 in 1952/53. By 1968/69, this had declined 67 percent to 6,531. The decline for the smallest farms, those with 10 acres or less of cane, was from 15,357 to 4,518--a drop of 71 percent. The number of farms with sugarcane acreage ranging from 10 to 500 acres declined 66 percent to 1,976. The number of farms with over 500 acres in cane declined from 56 in 1952/53 to 37 in 1968/69.

The number of farms that grow sugarcane has declined since World War II, along with the number of man-hours of labor required to produce the sugarcane needed to yield a ton of sugar. As of 1967, the decline in man-hours was about 28 percent. However, the 80.21 man-hours used in 1967 was 2.7 times that for Louisiana, which used the next highest amount of labor. Also, the hours of labor used increased in both 1968 and 1969.

The number of factories processing sugarcane in Puerto Rico declined from 34 in 1952, the year of maximum production, to 17 in 1969. The number of mills ceasing operation has been comparatively larger in the northeastern part of the island than in other sections.

The Land Authority of Puerto Rico operates three or four mills. Refined or direct-consumption sugar is also produced in three mills which process sugarcane.

All raw sugar produced in Puerto Rico is shipped to the mainland, except for the amounts needed to produce the refined sugar consumed on the island and to fill Puerto Rico's comparatively small refined-sugar quota for the continental United States. Since 1960, much of the raw sugar shipped from Puerto Rico

has been unloaded at refineries in the New Orleans area. Prior to 1960, such cargoes were unloaded mostly at northeastern ports, and New Orleans refiners used raw sugar from Cuba.

Sugarcane processors in Puerto Rico purchase cane from independent growers, usually at the minimum price established by USDA under the terms of the Sugar Act, much as processors do in Louisiana and Florida, although with certain differences in detail. The quality of cane and the price of raw sugar in New York for a specified period are the major factors determining the price of sugarcane.

Hawaii

Sugarcane is grown on the four largest islands in Hawaii. The acreage harvested each year since World War II has varied from about 100,000 acres in 1948 to nearly 112,000 in 1967, although, because of the effect of a strike, it fell to 84,000 in 1958. The number of farms in Hawaii, as determined by USDA for the purpose of administering the Sugar Act, has varied from 884 in 1957 to 529 in 1966.

All sugarcane was processed in 24 mills in 1969, compared with 31 in 1948. These mills are all independent companies but, with one exception, are represented by an agency or parent company--commonly called factors--in Honolulu. These factors perform such functions as purchasing, accounting, and consulting on various management problems. Most of them also engage in other types of business. One indirectly owns a sugar mill in Florida. All raw sugar produced in Hawaii is delivered to a cooperative whose members are the sugarcane processing companies in Hawaii. The cooperative operates a large refinery near San Francisco, Calif., and a small one in Hawaii, and is part owner of a refinery in Texas. Most of the raw sugar produced in Hawaii is shipped to the California plant; some goes to the plant in Texas. Enough raw sugar is refined in Hawaii to fill the consumption requirements of the State and its refined sugar quota for the continental United States.

As a result of these arrangements, the Hawaiian sugar industry is more highly integrated than the sugarcane and raw sugar industries of other domestic areas. Receipts of firms producing raw sugar come primarily from sales of refined sugar in the continental United States, rather than from sales of sugar to refiners as in other areas.

Six companies in Hawaii act as agent or parent companies for the sugarcane processing companies. These six companies have an ownership interest, sometimes a majority interest, in several processing companies. In some cases, their commercial interests outside the Hawaiian sugar industry appear to be larger than their investment in that industry.

REFINED CANE SUGAR

Cane sugar refiners convert raw cane sugar into refined sugar of various types, which is largely sold to industrial food processors and wholesalers throughout the United States. The raw sugar used by mainland refiners in 1969 came from domestic and foreign areas in the following quantities:

Area	1,000 tons, raw value	Percent
Mainland cane	1,051	14.1
Hawaii and Puerto Rico	1,502	20.2
Foreign countries	4,886	65.7
Total	7,441	100.0

All of this sugar, except that produced in the mainland cane area, arrives by ship and is unloaded at one of the small number of ports where a cane sugar refinery is located (table 2). New Orleans, with 28 percent of the total offshore arrivals, had the largest receipts of any port in 1969, although about 171,000 tons of the raw sugar arriving at New Orleans harbor was transferred to barges and moved to St. Louis and Chicago for refining. However, refiners in the New Orleans area also processed most of the raw sugar (543,000 tons) produced in Louisiana; thus, they handled about 2,258,000 tons in 1969. The northeastern ports of Boston, New York, Philadelphia, and Baltimore had combined receipts of 3,212,000 tons, 52 percent of the U.S. total. Domestic receipts at San Francisco all originated in Hawaii and all were delivered to the refinery near San Francisco, the only cane sugar refinery on the Pacific coast. The refinery at Savannah received most of its supplies from raw sugar producers in Florida.

In 1968, Florida crops amounted to 546,000 tons. However, part of this was refined in Florida plants and data showing the amount sent to Savannah are not available. There were 16 companies operating 24 cane sugar refineries in the United States in 1969. The largest refiner operated five plants, another three, and two other companies, two each. Most of the plants operated by these companies are located at harbor sites where raw sugar can be transferred directly from ship to factory. These sites are Boston, New York, Philadelphia, Baltimore, Savannah, New Orleans, and San Francisco. Exceptions are (1) a plant at Sugar Land, Tex., for which raw sugar is unloaded at Galveston, (2) two plants in Louisiana which are not located adjacent to deep water, (3) two plants in St. Louis and Chicago which received mainly offshore sugar transferred to barges in New Orleans, and (4) three refining plants in Florida, which use raw sugar produced in that State.

Data showing receipts of raw sugar by companies are not available, but it is possible to approximate these figures from available information. For instance, 751,000 tons of raw sugar were received at San Francisco. Since there is only one refinery in the area and the company owning the refinery has only one mainland plant this may be taken as the total raw sugar receipts of the company in the continental United States. However, this company has an ownership interest in the only refinery in Texas. The largest U.S. cane sugar refiner owns the only refinery located in Baltimore. This company owns one of the two refineries located in Philadelphia and Boston.

Data published by a sugar trade association show that in 1969 the three largest refining plants in New Orleans received about three-fourths of the offshore raw sugar unloaded at that port (table 3). Another 11 percent went by barge to plants in St. Louis and Chicago, leaving only 14 percent for the three smaller refiners. However, total receipts of these smaller companies are certainly much larger than their receipts of offshore raw sugar. Each of them produces raw sugar which they refine in addition to purchased raw sugar. Their

Table 2.--Receipts of raw sugar at U.S. ports, by areas of origin, 1969

Area of origin	Boston 1/	New York	Philadelphia	Baltimore	Savannah	New Orleans 2/	Galveston	San Francisco	Total
	1,000 tons								
Domestic:									
Hawaii		11	22	11	24	128	208	751	1,155
Puerto Rico		39	19	20	12	121			211
Foreign:									
Philippines		475	232	90	11	173		138	1,119
Dominican Republic	193	134	112	176	21	37	20		693
Mexico	32		54	124		381	52	12	655
Brazil	16	139	135	54		280	17		641
Peru	29	84	54	42	7	84			300
British West Indies	24	75	48	11		69			227
Australia	49	54	44			46			193
Other	161	224	158	67	1	396			1,007
Total	504	1,235	878	595	76	1,715	297	901	6,201

1/ Includes sugar that entered at Searsport, Maine.
2/ Includes sugar destined for inland refineries.

Source: U.S. Dept. Agr., Agr. Stabilization and Conserv. Serv. Sugar Report No. 203, Apr. 1969.

Table 3.--Receipts of offshore raw sugar by companies at New Orleans, 1969

Company	Amount	Percent
	1,000 tons	
1	496	33.1
2	359	24.0
3	287	19.1
4	171	11.4
5	87	5.8
6	53	3.5
7	47	3.1
Total	1,500	100.0

Source: American Sugar Cane League of the U.S.A. The Sugar Bulletin, Jan. 15, 1970.

raw sugar production in 1968 amounted to 134,000 tons, or about 20 percent of the Louisiana crop that year. In addition, each of these companies purchases raw sugar from other Louisiana producers, as do the other New Orleans refiners. It is not possible to determine the amount purchased by each company, but the three companies that produce raw sugar are believed to buy a substantial part of the total. Transportation costs from raw sugar mills to these refineries are usually lower than to the more distant plants located on the east bank of the Mississippi River, while transportation costs of offshore raw sugar to the inland plants are higher.

No data are available on the quantity of sugar refined in Florida. However, the three plants in that State are all located in the southern part of Florida and probably distribute very little sugar outside the State. Also, the refinery at Savannah probably distributed considerable quantities of sugar in northern Florida. These circumstances, together with the small quantity of sugar from offshore areas unloaded at Savannah, suggest that the larger part of Florida's sugar crop goes to the refinery at Savannah.

There are four refineries in or near New York. Little definite data are available with which to estimate the division of receipts at New York harbor among them. However, one plant produces only liquid sugar and another does not package sugar for retail trade. The capacity of the plant owned by the largest refiner is reported to be considerably larger than that of any of other plants.

Available information suggests that the two largest refiners manufactured nearly one-half of the refined sugar produced in the United States in 1969. None of the other refiners supplied more than 6 or 7 percent. Sugar refined in San Francisco by one of the two largest companies is largely delivered in the western part of the United States, where the other large refiner has no plants. Therefore, the latter company's share of the refined cane sugar market in the

eastern part (east of the Mississippi River) is somewhat larger and its market influence greater than for the country as a whole.

SUGARBEETS AND BEET SUGAR

There are several differences between the production and processing of sugarcane and sugarbeets which are reflected in the structure of the beet industry. Beets are grown in rotation with other crops, rather than continuously on the same field as is common with sugarcane. The necessity for rotating crops to maintain yields makes it necessary for sugarbeet growers to produce other crops. Also, they frequently maintain livestock enterprises. Consequently, their economic activities are less specialized than is common among sugarcane growers. Because of this diversification in farming, companies processing sugarbeets own little farmland and grow few beets for themselves. Processors' activities in beet growing are almost entirely confined to research done at experiment stations they maintain and to the production of sugarbeet seed, which they sell to farmers who grow beets for their plants. As a result, the integration of growing and processing the crop by a single owner, which is important in the cane sugar industry, is lacking in the beet sugar industry.

Another important difference between the cane and beet sugar industries is that the product of mills processing sugarbeets is refined sugar which is sold directly to consumers, rather than raw sugar delivered to separate refining plants. As a result, sugarbeet processors are in direct competition with cane sugar refiners in the sale of sugar.

Sugarbeets were grown in about 24 States in 1969. U.S. production amounted to 28,518,000 tons. Production by States varied from 6,110,000 tons in California to 1,000 tons in Arkansas. The number of farms on which sugarbeets were grown in 1969 varied from 2,727 in Idaho to three in Arkansas. Sugarbeets were grown on 18,424 farms in the United States in 1969, a decline of 51 percent from the post-World War II peak of 37,328 reached in 1950.

In 1969, sugarbeets were processed in 59 plants in 19 States. The total processing capacity of these plants was rated by the industry at 193,105 tons of beets daily. About one-fifth of this capacity was located in California, 13 percent in Colorado, 11 percent in Idaho, and 10 percent in Minnesota. These mills were owned and operated by 12 companies, of which five had one mill each. The largest sugarbeet processor had 17 mills, including two operated by a wholly owned subsidiary.

According to data published by an industry trade association, the four largest companies accounted for 66 percent, and the six largest for 88 percent of the total beet sugar manufactured in the United States in 1969. The processing plants of each company, even the largest ones, tend to be concentrated in one or a few adjoining States (table 4). About 75 percent of the sugar produced by the largest processor in 1969 was manufactured in adjacent areas in Colorado and Nebraska and 17 percent in Montana and Wyoming. The remaining 8 percent was produced in Ohio. This company manufactured 89 percent of the sugar produced in Colorado and Nebraska and 46 percent of the Montana-Wyoming output. Another large sugarbeet processor owns all the mills in Minnesota, North Dakota, and Iowa, where 9 percent of the 1969 U.S. beet sugar crop was manufactured.

Table 4.--Production of beet sugar by companies and States, 1970

Company, listed by size	Arizona, California	Idaho, Oregon, Washington, Utah	Montana, Wyoming	Colorado, Nebraska, Kansas	Minnesota, North Dakota, Iowa	Michigan, Ohio	Texas	United States
	1,000 tons, raw value							
1			121	539		61		721
2	562							562
3	264		142	22			62	490
4		416						416
5	56			47	304			407
6		317						317
7	185							185
8						139		139
9						61		61
10						25		25
Total	1,067	733	263	608	304	289	62	3,323

Source: United States Beet Sugar Association, Circular, Washington, D.C., Apr. 9, 1971. Figures have been converted to short tons, raw value.

All the mills in Washington, Oregon, Idaho, and Utah are owned by two companies. Neither has any mills outside these States. Concentration of mill ownership in California is spread among four companies, two of which have only one mill each. There is only one mill in Arizona. The company owning this mill produced 53 percent of the beet sugar manufactured in 1969 in Arizona and California.

In general, few beet growers have more than one outlet for any sugarbeets they may grow. In many areas, the distance to a plant owned by a competing processor is great enough that transportation costs make delivery uneconomical. Even when growers are situated within a reasonable distance from mills operated by different companies, they seldom have much choice concerning the company to which they deliver beets. Beets are grown under the terms of annual contracts between grower and processor. If a grower wishes to shift to another company, that company may be reluctant to sign a contract with him because of possible retaliatory measures the competing processor might take. The company may also wish to avoid resentment among the growers from whom it has been purchasing beets, some of whom might wish to increase their acreage above the amount the company had been willing to accept.

The principal bargaining power of the growers comes from their membership in a growers' association. There are a number of these in the United States. Their primary function is to bargain with processors concerning the price of sugarbeets and other provisions of the grower-processor contracts. With a loyal membership, growers' associations have considerable bargaining power. A processor can seldom if ever obtain a sufficient supply of beets from new growers, and his plant is of no value except for processing beets. Growers, on their part, usually are able to substitute some other crop for sugarbeets for a year or more without reducing their income nearly as much as the processor's income is reduced when he has no beets from which to manufacture sugar.

Since 1960, several of the larger sugarbeet processing companies have diversified outside the sugar industry. Control of the largest processor was obtained about 1967 by outside interests, and in following years, the company has developed several business activities in addition to sugar. An attempted merger in the late 1960's of another processing company with two corporations producing other products was rejected by the stockholders of the sugar company.

One large processing company that produces about 13 percent of the beet sugar manufactured in the United States is a subsidiary of the largest refiner of cane sugar.

VOLUME OF OUTPUT OF REFINED SUGAR

The quantity of refined cane sugar produced by each company in 1969 is not definitely known but may be approximated from published information; that for beet sugar is known from published data used in determining the marketing allotment of beet processors. The only other refined sugar going to U.S. consumers is a small amount--about 2 percent of total deliveries in 1969--coming from offshore areas and not readily assignable to individual companies.

The three largest companies provided 40 to 50 percent of this country's sugar supply in 1968 (table 5).

Table 5.--Approximate distribution of volume of sugar handled, by size of companies, 1969

Companies, grouped by size	Cane	Beet	Total
	Percent	Percent	Percent
Largest 3	46	37	44
Next 8	27	42	33
Next 8	23	10	18
Smallest 7	4	11	5
Total	100	100	100

Source: U.S. Dept. Agr., Agr. Stabilization and Conserv. Serv. Sugar Reports, and various trade reports.

Concentration of production in the hands of one or two companies is considerably greater in certain producing areas than for the United States as a whole. For instance, sugar production in the northeastern United States, nearly all of it by cane sugar refiners, accounted for about one-third of total U.S. output in 1968. More than half of this came from four plants owned by the largest refiner, all in the Northeast. This was about four times the proportion supplied by any other company in the area.

About one-fourth of the U.S. supply of sugar in 1968 was produced in the following Western States: Arizona, California, Oregon, Washington, and Idaho. Almost two-thirds of this was beet sugar produced by five companies. The remaining third was cane sugar from Hawaii which was refined in California.

East of this area--largely in Colorado, Montana, Wyoming, Nebraska, Kansas, Texas, North Dakota, and Minnesota--sugarbeet processors produced about 13 percent of the U.S. supply of sugar in 1969. About half of this was manufactured by one processor.

About one-fourth of the U.S. sugar supply came from cane sugar refined in various Southern States. Most of this output came from plants in the New Orleans area, although there was one refinery in Texas, another in Georgia, and three small plants in Florida. Concentration of production in individual companies is considerably less in the South than in other major producing areas. The two largest producers provided only about 40 percent of the area's total output.

In addition to the major producing areas mentioned, Michigan and Ohio produce small quantities of beet sugar and there is a small cane sugar refinery in Chicago. This production is much less than the quantity of sugar consumed in the area. Producers in Michigan and Ohio compete with producers shipping in from other areas.

INFLUENCE OF GOVERNMENT REGULATION

U.S. production of sugarcane and sugarbeets and the marketing of sugar produced from these crops have been regulated by sugar quota legislation since 1934. The same legislation regulates the import of raw and refined sugar, so the operations of cane sugar refiners are also affected by the sugar quota system. 2/

The Sugar Act, which established the quota system, directs the Secretary of Agriculture to determine U.S. sugar consumption requirements each year and to revise his determination as he may find necessary during any year. The Sugar Act also provides rules for dividing consumption requirements among supplying areas, both domestic and foreign. Each area's allotment is known as its quota. Separate quotas for the domestic industry are provided for the sugarbeet area, the mainland cane area (Louisiana and Florida), Hawaii, and Puerto Rico. Quotas are also established for each country exporting sugar to the United States. The Secretary is directed to establish marketing allotments for domestic area sugar quotas whenever they are needed to ensure orderly marketing. He also has power to establish acreage limitations for individual growers in any domestic area to keep production in the area in line with quota limitations.

The Sugar Act also provides for subsidy payments to U.S. sugarcane and sugarbeet growers. The most important of these are known as conditional payments and are made only to growers who meet specified conditions. These conditions are:

1. That the grower has not marketed cane or beets in excess of the proportionate share for the farm, as determined by the Secretary of Agriculture;

2. That no child labor (except members of the family) has been employed on the farm;

3. That all employed labor has been paid in full at not less than the minimum wage determined by the Secretary;

4. That growers who are also processors have paid other growers for purchased cane or beets at prices not less than those determined by the Secretary.

The first of these conditions under which payments are made provides a powerful financial incentive for growers to observe the acreage limitations imposed by the Secretary when this is needed to restrict production in line with the

2/ For a discussion of U.S. sugar quotas, see: Ballinger, Roy A. A History of Sugar Marketing. U.S. Dept. Agr., Agr. Econ. Rpt. No. 197, ch. XI. Feb. 1971.

quota for any domestic area. This is the principal device in the law for obtaining compliance with any limitation on production in a domestic area.

Conditional payments are made at the basic rate of 80 cents per 100 pounds of sugar recoverable from the cane or beets grown on farms producing less than 350 tons of sugar, raw value. The rate declines by stages to 30 cents per 100 pounds for all sugar in excess of 30,000 tons produced on a farm. In addition, growers may receive payments for abandoned acreage at the rate of one-third the normal yield for the farm; payments may also be received for crop deficiencies resulting from drought, flood, storm, freezing, disease, or insects which result in yields below 80 percent of normal. Generally, abandonment and deficiency payments are much smaller than the conditional payments received for sugarcane and sugarbeets marketed.

In 1968, Sugar Act payments amounted to 11 percent of total payments received by growers in the mainland cane area and 14 percent for sugarbeet growers. The share for Puerto Rico was 13 percent. Because of the integrated structure of its industry, comparable figures are not available for Hawaii.

An excise tax is levied on sugar at the rate of 50 cents per 100 pounds, raw value. This tax is collected on all sugar marketed in the United States, whether produced domestically or imported. Receipts from the tax in recent years averaged somewhat over $100 million per year, and payments to sugarcane and sugarbeet growers averaged 15 percent less than the tax.

Sugar Act payments and the sugar excise tax are legally separate; that is, either one could be amended or repealed without affecting the other.

Except during 1962-65, sugar has been imported into the United States at the same level of prices that have been paid for domestically produced sugar. During 1962-65, the Government imposed a fee on certain sugar imports which enabled the Treasury to capture part or all of the premiums paid by U.S. importers for such sugar. Sugar prices in the United States generally have been much higher than those prevailing in the world market (table 6). Only in years when world prices have been unusually high because of some emergency such as the outbreak of war in Korea in 1951 or the worldwide sugar shortage in 1963 has the world price averaged higher than the U.S. price.

High U.S. prices have made this country a highly desirable market for countries exporting sugar, especially those which do not have other preferred markets such as the United Kingdom or France. The value of the U.S. sugar market to an exporting nation is also affected by the proportion of a country's exports which can be sold in the United States and by the importance of sugar exports to the country's economy.

In recent years, four countries--the Philippines, Brazil, the Dominican Republic, and Mexico--have supplied nearly two-thirds of U.S. sugar imports. About 70 percent of the sugar produced in the Philippines is exported, practically all of it to the United States. The economy of the Dominican Republic is also highly dependent on sugar exports to the United States. About 71 percent of the sugar produced there is exported, most of it to the United States.

Table 6.--Raw sugar prices in New York and the world market, 1948-70

Year	Raw sugar in New York	World sugar 1/	Difference: New York over world
	Cents per pound		
1948	5.54	5.13	0.41
1949	5.81	5.03	.78
1950	5.93	5.82	.11
1951	6.06	6.66	-.60
1952	6.26	5.08	1.18
1953	6.29	4.27	2.02
1954	6.09	4.14	1.95
1955	5.95	4.19	1.76
1956	6.09	4.47	1.62
1957	6.24	6.10	.14
1958	6.27	4.36	1.19
1959	6.24	3.86	2.38
1960	6.30	4.09	2.21
1961	6.30	3.85	2.45
1962	6.45	3.87	2.58
1963	8.18	9.41	-1.21
1964	6.90	6.79	.11
1965	6.75	3.07	3.68
1966	6.99	2.81	4.18
1967	7.28	2.95	4.33
1968	7.52	2.96	4.56
1969	7.75	4.37	3.38
1970	8.07	4.88	3.19

1/ Adjusted to the New York delivery base.

Source: U.S. Dept. Agr., Agr. Stabilization and Conserv. Serv. Sugar Reports.

The situation in Brazil is considerably different. About 75 percent of the sugar produced there is consumed domestically and only 60 percent of the exports come to the United States. Mexico is similar to Brazil in consuming domestically most (77 percent) of its sugar production, but about four-fifths of its exports go to the United States.

Although the U.S. sugar quota provides a smaller share of the income received by producers in Brazil than such quotas do in the Philippines, the Dominican Republic, or even Mexico, the premium price Brazilian producers have received for more than 600,000 tons of sugar annually in recent years is an important source of revenue.

The U.S. quota situation for the remaining 25 or so countries from which the United States imports sugar varies somewhat like that among the four principal suppliers. In every case, the U.S. sugar quota is valuable to the producers and nearly all exporters would like a much larger quota. Nearly all exporting nations have made more or less continual efforts to obtain larger U.S. quotas. Their efforts have intensified whenever Congress has considered amendments to the Sugar Act which were likely to change quotas for domestic and foreign areas. Such efforts have sometimes aroused criticism, but the adjustment in quotas from time to time is a powerful factor in encouraging the efforts.

The operation of the sugar quota system has affected the performance of the sugar industry in various other ways, particularly after the end of World War II. The determination of consumption requirements sets a limit on the total quantity of sugar that can be marketed in the United States in any year. This is an important means of influencing sugar prices in this country. During the Korean war (August 1950-October 1951), the world price of sugar was continually above the U.S. price. World sugar prices also were high during the first 6 months of 1957, when the Suez Canal was closed by hostilities between Israel and Egypt. The latest period of high world sugar prices lasted from February 1963 through May 1964, because of a worldwide shortage of sugar caused by reduced production in Western Europe and Cuba.

In all these cases, world sugar prices rose sharply. U.S. prices also rose, but much more moderately. In each case, the Secretary of Agriculture increased the U.S. sugar consumption requirement level, to make more sugar available to consumers here. In 1950, the increase was from 7.5 million to 8.7 million tons; in 1957, from 8.8 million to 9.3 million tons; and in 1963, from 9.8 million to 10.4 million tons.

The increased supply of sugar for U.S. consumers restricted the price rise. However, increasing supplies for the United States by increasing imports decreased supplies available for other importing countries and caused world prices to rise even further than they otherwise might have. Since the United States is by far the world's largest importer of sugar, taking 20 to 25 percent of the total in world trade, unexpected changes in the volume of this country's imports have an appreciable effect on other sugar importing countries as well as on exporters.

While U.S. sugar prices since the end of World War II have usually been maintained above the world market level, it does not follow that U.S. prices would have declined to the world level if quotas had not existed and import duties were unchanged. With no quotas, U.S. prices would have declined and those in the world market would have risen until they matched.

No measurement of the two prices' relative extent of movement under various conditions is available. Higher U.S. prices have no doubt benefited the domestic sugar industry and increased the average prices paid by sugar users. Under the quota system, sugar prices have been unusually stable compared with prices of other agricultural products. This has been an additional benefit to the domestic sugar industry and has partly offset the disadvantage of higher sugar prices.

The quantity of sugar marketed in the United States from various domestic and foreign supplying areas has varied considerably since quotas were reinstated in 1948. In general, supplies (quota charges that may be less than the quota) coming from the mainland sugarbeet and sugarcane areas have increased more rapidly than receipts from other areas (tables 7 and 8). Production in Puerto Rico has declined since 1956; it has increased moderately in Hawaii since 1960. Imports have increased, but not as rapidly as production in mainland beet and cane areas.

Most of the increase in sugar production in the mainland sugarcane area occurred after 1960 in Florida. In the years following cessation of sugar imports from Cuba, quotas for domestic areas were increased, removing one deterrent to increased production.

The increase in beet sugar production since 1960 was also encouraged by the Cuban situation and by increased quotas for domestic areas. The growth rate of the beet sugar industry has varied widely among regions. The most rapid increase after 1948 was in the Red River Valley area in Minnesota and North Dakota. In these States, sugarbeet acreage, nearly all of which is in the valley area, quadrupled between 1948 and 1968. The next largest increase was in the Pacific Northwest--Idaho, Washington, and Oregon--where the acreage more than doubled. California acreage increased about 120 percent in 1948-64. It declined in each of the next 3 years and then recovered somewhat, but in 1968 was about 27 percent below the 1964 peak.

Since 1964, a new mill has been constructed in western Texas and another in Arizona; formerly, no mills were located in these States. Both mills were built under the acreage reserve provision of the Sugar Act for sugarbeets; the provision was in effect in 1962-66 to encourage the establishment of the sugarbeet industry in new areas. Because of these milling facilities, the acreage planted to sugarbeets in these States and New Mexico has increased rapidly in recent years, although it is still small compared with that in other areas. The increase in areas east of the Mississippi River, mainly Michigan and Ohio, and in the Rocky Mountain area, where Colorado, Kansas, Nebraska, Wyoming, Montana, and Utah have the largest acreages, has been slower than in the other areas where beets are grown.

WHOLESALE PRICES OF REFINED SUGAR

The pattern of wholesale prices of refined sugar throughout the United States is closely related to the geographic distribution of sugar production, shifts in the relative quantities produced in various areas, and degree of concentration of production facilities ownership in each area. Although refined sugar is sold in a wide variety of liquid and dry forms, relatively little difference exists among the products distributed by the various companies. Sugar sells mostly on the basis of price and service.

Sugar is sufficiently expensive to transport that shipping costs largely determine the area where a given plant's output is sold, although the boundaries of the area may change with shifts in competitive conditions. However, transportation costs are not sufficiently high to prevent sugar moving over long distances where local production exceeds consumption and the nearest deficit area

Table 7.--Annual quota charges by areas of supply, 1948-70

Year	Beet	Mainland cane	Hawaii	Puerto Rico 1/	Imports	Total
	1,000 tons, raw value					
1948	1,656	456	714	1,017	3,255	7,098
1949	1,488	557	769	1,095	3,699	7,608
1950	1,749	522	1,145	1,063	3,811	8,290
1951	1,730	457	941	966	3,698	7,792
1952	1,559	579	972	990	3,939	8,039
1953	1,749	513	1,088	1,130	3,814	8,294
1954	1,803	501	1,040	1,092	3,811	8,247
1955	1,797	599	1,052	1,089	3,964	8,401
1956	1,955	602	1,091	1,147	4,200	8,995
1957	2,066	636	1,037	927	4,255	8,921
1958	2,240	681	630	829	4,702	9,082
1959	2,241	578	977	970	4,479	9,245
1960	2,165	619	845	902	4,995	9,526
1961	2,608	750	1,045	996	4,302	9,701
1962	2,415	780	1,084	915	4,598	9,792
1963	2,966	1,070	1,033	890	4,559	10,518
1964	2,699	911	1,110	808	3,591	9,119
1965	3,025	1,100	1,137	834	3,825	9,921
1966	3,025	1,100	1,200	717	4,315	10,357
1967	2,824	1,169	1,253	705	4,433	10,384
1968	3,095	1,204	1,192	504	4,967	10,962
1969	3,216	1,170	1,160	341	4,850	10,737
1970	3,577	1,308	1,145	352	5,178	11,560

1/ Includes small quantities from the Virgin Islands prior to 1967. There have been no receipts from the Virgin Islands since 1966.

Source: U.S. Dept. Agr., Agr. Stabilization and Conserv. Serv. Sugar Reports.

Table 8.--Trends in quota charges by area of supply, 1948-70

Area	Average annual change	
	1,000 tons	Percent 1/
Sugarbeets	87.7	3.8
Mainland cane	39.1	5.1
Hawaii	13.8	1.3
Puerto Rico 2/	-28.0	-3.2
Imports	53.8	1.3
Total	166.4	1.8

1/ Percentage of arithmetical mean.
2/ Includes the Virgin Islands.

Source: Calculated from table 7.

is distant. The best example of this is the shipment of sugar from the Pacific Northwest to users in Chicago or further east. These shipments have increased in recent years because of a more rapid increase in sugar production in this area than in the volume that could be marketed nearby.

The multiple basing point zone system used in selling refined sugar at wholesale is also closely related to the problem of distribution. The major effect of the pricing system is to equalize the prices paid by users, regardless of the sugar's source. This is accomplished by a system of prepays. The seller pays the freight to the destination specified by the buyer, but adds to the price a prepay calculated to make the delivered price to the buyer equal to the price of sugar plus the lowest cost of transportation from the origin to the delivery point.

This is illustrated by the market situation in Chicago, where the metropolitan area provides a very large market for sugar. At various times, supplies have reached Chicago from the Rocky Mountain and Pacific Coast States, from New Orleans, and from the northeastern United States, chiefly New York. Large quantities of beet sugar produced in Colorado are shipped to Chicago at a freight cost larger than the prepay. In this case, the seller's net return is lower than the quoted price. For nearby destinations such as Denver, the prepay exceeds the freight and the seller has a freight gain. In other instances, notably deliveries in the major port cities where cane refineries are located, no freight gain or loss ordinarily accrues to the seller.

The calculation of prepays to Chicago ordinarily takes no account of the cost of moving sugar to that city from the minor producing areas in Michigan and Ohio. Sugar produced in these States is sold in areas closer to the mills than Chicago is.

In practice, this pricing system frequently does not work as neatly as has been described. Competitive conditions may cause a group of sellers to offer, openly or secretly, various concessions which result in prices lower than published quotations. Prices in Chicago are sometimes cited as an example of this. The situation in Chicago appears to be largely the result of increasing supplies of beet relative to cane sugar since 1957. This has led to the sale of rapidly increasing quantities of beet sugar in that area and much slower growth in cane sugar sales (table 9). Developments in California since World War II have been somewhat similar to those in Chicago, although the increase in the beet share of sugar consumed there has not been as great as in Chicago.

The increasing quantity of beet sugar marketed in the United States in relation to total sales of refined sugar, especially after 1957, has been a major factor causing shifts in sugar price relationships among various sections of the country. The significant fact is not that the increased supplies came from beets rather than cane, but that most of the increased output occurred in areas of surplus production from which it had to be shipped long distances to market.

A general indication of the price effect of increasing beet sugar supplies, largely from the Western States, on the geographic pattern of wholesale prices of refined sugar can be obtained from published price quotations for refined sugar for various areas of the country since 1949. In general, wholesale prices of sugar outside the northeastern States have declined substantially since 1949, relative to New York prices (table 10). Since the quotations used represent basing point prices rather than delivered prices to buyers, the differences between quotations for New York and other areas are significant primarily in indicating the trend in price differences rather than measuring actual differences.

The Chicago-West territory, as previously indicated, is an area of major competition between cane sugar from the South and East and beet sugar from the West. The Chicago price relationship with the New York sugar price is regarded as an important indicator of market conditions by the sugar trade. Prices for refined beet sugar in Chicago-West have declined substantially relative to New York prices during the years, as beet sugar deliveries in Chicago have grown relative to total sugar deliveries there (fig. 1). The decline has averaged 3.5 cents per 100 pounds of sugar for each increase of 1 percentage point in the share beet sugar has constituted of total sugar deliveries in Chicago. This relationship omits the years 1963-64 because world sugar prices were unusually high during those years. Prices of cane sugar in the Chicago-West territory have been affected to about the same extent as those for beet sugar.

Sugar prices in other marketing regions generally have declined relative to New York prices since 1949, but by smaller amounts than those in the Chicago-West territory. Geography and transportation costs directed a large part of the increased supply of beet sugar, most of which was produced in Western States, to the Chicago area, where it could be sold only by reducing the price relative to that prevailing in New York. The only alternative was to ship the sugar further

Table 9.--Distribution of beet and cane sugar in Illinois, California, and the United States, 1948-70

Year	Illinois				California			
	Beet	Cane	Total	Beet	Beet	Cane	Total	Beet
	--- 1,000 tons refined ---			Percent	--- 1,000 tons refined ---			Percent
1948	303	308	611	49.6	226	325	551	50.1
1949	248	418	666	37.6	300	257	557	53.9
1950	288	439	727	39.6	319	283	602	53.0
1951	287	352	639	44.9	337	312	649	51.9
1952	246	428	674	36.5	324	340	664	48.8
1953	339	426	765	44.3	348	382	730	47.7
1954	325	322	647	50.2	369	329	698	52.9
1955	340	390	730	46.6	386	346	732	52.7
1956	358	451	809	44.3	467	351	818	57.1
1957	448	366	814	55.0	441	365	806	54.7
1958	462	376	838	55.1	490	314	804	60.9
1959	454	411	865	52.5	499	366	865	57.7
1960	427	420	847	50.4	465	356	821	56.6
1961	494	437	931	53.1	532	355	887	60.0
1962	500	477	977	51.2	525	391	916	57.3
1963	625	461	1,086	57.6	591	355	946	62.3
1964	528	435	963	54.8	581	382	963	60.3
1965	703	384	1,087	64.7	645	350	995	64.8
1966	671	438	1,109	60.5	683	388	1,071	63.8
1967	649	473	1,122	57.8	589	446	1,035	56.9
1968	751	521	1,272	59.0	615	513	1,128	54.5
1969	727	428	1,155	62.9	621	462	1,083	57.3
1970	835	551	1,386	60.2	855	306	1,161	73.6

--Continued

Table 9.--Distribution of beet and cane sugar in Illinois, California, and the United States, 1948-70--Con.

Year	Other States				United States			
	Beet	Cane	Total	Beet	Beet	Cane	Total	Beet
	--- 1,000 tons refined ---			Percent	--- 1,000 tons refined ---			Percent
1948	1,019	4,685	5,704	17.9	1,548	5,318	6,866	22.5
1949	843	5,018	5,861	14.4	1,391	5,693	7,084	19.6
1950	1,021	5,377	6,398	16.0	1,628	6,099	7,727	21.1
1951	991	4,953	5,944	16.7	1,615	5,617	7,232	22.3
1952	887	5,333	6,220	14.3	1,457	6,101	7,558	19.0
1953	941	5,477	6,418	14.7	1,628	6,285	7,913	20.6
1954	993	5,325	6,318	18.6	1,687	5,976	7,663	22.0
1955	956	5,509	6,465	14.8	1,682	6,245	7,927	21.2
1956	1,052	5,696	6,748	15.6	1,877	6,498	8,375	22.4
1957	1,043	5,740	6,783	15.4	1,932	6,471	8,403	23.0
1958	1,143	5,695	6,838	16.7	2,095	6,385	8,480	24.7
1959	1,145	5,744	6,889	16.6	2,098	6,521	8,619	24.3
1960	1,132	5,895	7,027	16.1	2,024	6,671	8,695	23.3
1961	1,411	5,796	7,207	19.6	2,437	6,588	9,025	27.0
1962	1,243	5,998	7,241	17.2	2,268	6,866	9,134	24.8
1963	1,556	5,785	7,341	21.2	2,772	6,601	9,373	29.6
1964	913	6,234	7,147	12.8	2,022	7,051	9,073	22.3
1965	1,481	5,842	7,323	20.2	2,829	6,576	9,405	30.1
1966	1,473	6,018	7,491	19.7	2,827	6,844	9,671	29.2
1967	1,402	6,069	7,471	18.8	2,640	6,988	9,628	27.4
1968	1,526	6,335	7,861	19.4	2,892	7,369	10,261	28.2
1969	1,657	6,122	7,779	21.3	3,005	7,012	10,017	30.0
1970	1,653	6,433	8,086	20.4	3,343	7,290	10,633	31.4

Source: Econ. Res. Serv. Sugar Statistics and Related Data, volume 2 (revised), and various issues of U.S. Dept. Agr., Agr. Stabilization and Conserv. Serv. Sugar Reports.

Table 10.--Comparative trends in wholesale prices of refined sugar in various areas of the United States, 1949-70

Year	New York price of refined cane sugar	Difference from New York price						
		Cane sugar				Beet sugar		
		Chicago-West	Pacific Coast	Gulf	Southeast	Chicago-West	Pacific Coast	Eastern
	Cents per pound							
1949	7.97	+0.04	+0.06	+0.04	0	-0.11	-0.04	-0.16
1950	8.00	0	+.09	0	0	-.20	-.01	-.18
1951	8.38	0	+.07	0	-.01	-.26	-.01	-.20
1952	8.62	-.01	+.05	-.07	-.02	-.21	-.06	-.20
1953	8.72	-.12	-.02	-.12	-.04	-.30	-.12	-.16
1954	8.72	-.16	-.22	-.17	-.13	-.37	-.32	-.22
1955	8.59	-.10	-.06	-.09	-.11	-.30	-.16	-.20
1956	8.77	-.19	-.02	-.17	-.13	-.39	-.12	-.25
1957	9.15	-.33	-.03	-.20	-.15	-.53	-.13	-.52
1958	9.27	-.38	-.06	-.31	-.14	-.59	-.14	-.66
1959	9.33	-.45	-.23	-.05	-.14	-.66	-.23	-.62
1960	9.43	-.46	-.47	-.04	-.03	-.66	-.47	-.64
1961	9.40	-.64	-.56	-.17	-.15	-.81	-.56	-1.04
1962	9.60	-.45	-.53	-.57	-.43	-.65	-.53	-.53
1963	11.94	-1.04	-1.23	-.64	-.49	-1.60	-1.23	-1.36
1964	10.68	-1.10	-.83	-.86	-.78	-1.30	-.83	-1.30
1965	10.22	-.87	-.98	-.78	-.67	-1.07	-.98	-1.07
1966	10.36	-.72	-.81	-.49	-.47	-.92	-.81	-.92
1967	10.62	-.80	-.51	-.38	-.30	-.92	-.51	-.92
1968	10.84	-.90	-.49	-.39	-.25	-.90	-.49	-.90
1969	11.44	-1.21	-1.30	-.94	-.59	-1.21	-1.30	-1.21
1970	11.97	-.89	-1.18	-.93	-.56	-.89	-1.18	-.89

Source: U.S. Dept. Agr., Agr. Stabilization and Conserv. Serv. Sugar Reports.

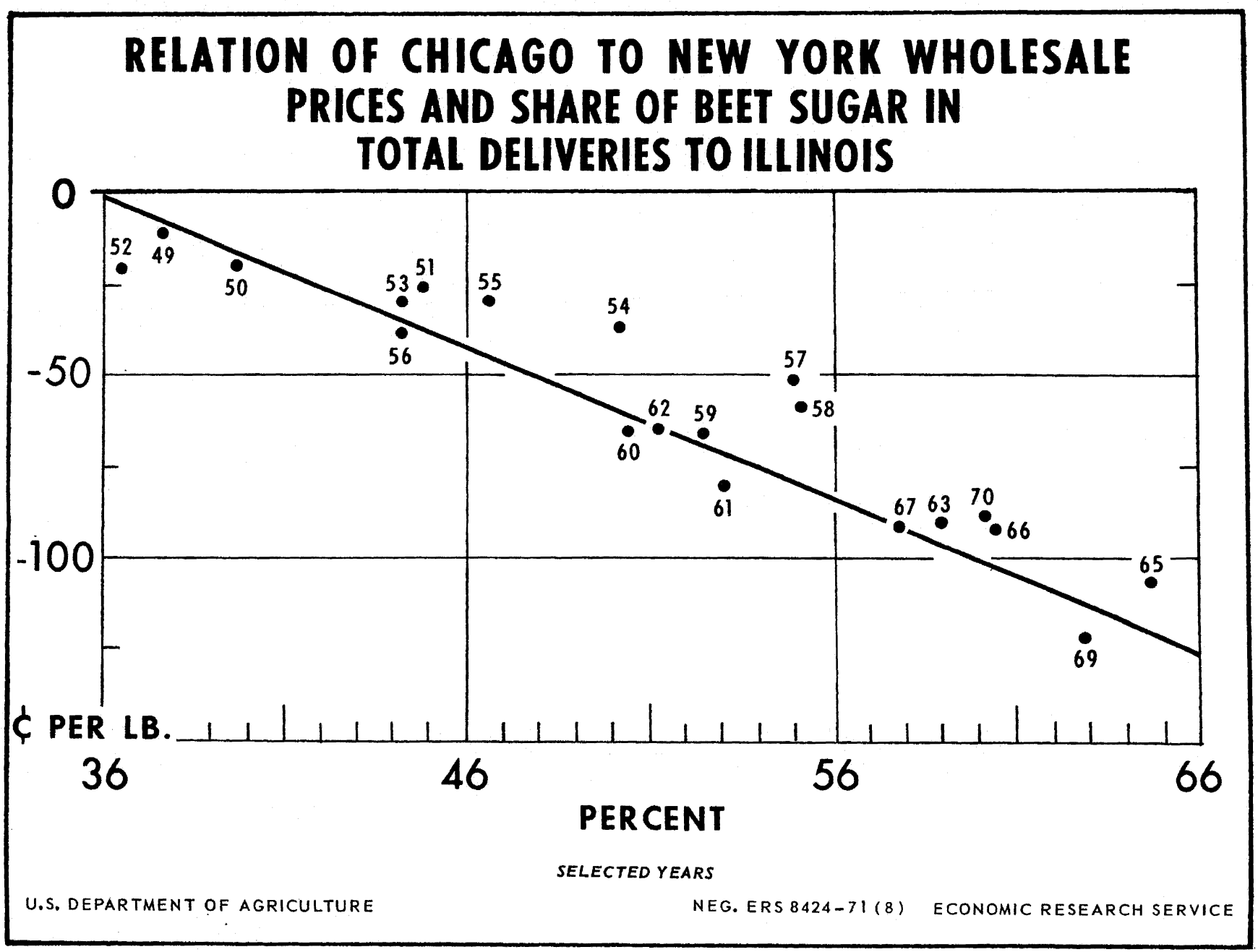
RELATION OF CHICAGO TO NEW YORK WHOLESALE PRICES AND SHARE OF BEET SUGAR IN TOTAL DELIVERIES TO ILLINOIS
0
-50
-100
¢ PER LB.
36
46
56
66
PERCENT
52
49
50
53
51
56
55
54
57
58
62
59
60
61
67
63
70
66
65
69
SELECTED YEARS
U.S. DEPARTMENT OF AGRICULTURE
NEG. ERS 8424-71 (8)
ECONOMIC RESEARCH SERVICE

Figure 1

east at increased freight cost. Some shipping was done, but not enough to prevent a rapid increase in receipts of beet sugar relative to cane sugar in the Chicago area.

The changing pattern of wholesale prices for refined sugar is closely related to beet sugar marketing increases which have followed increases in the beet quota. These quota increases, made by Congress, were desired by the beet industry as a means of expanding its production and marketing. Despite price declines relative to the New York market, prices for beet sugar appear to have been generally high enough to encourage continued expansion of the beet industry. Representations made to the Congress by the beet industry, as disclosed in congressional hearings and elsewhere, were important factors influencing both the quota and price policies of the Government. Cane growers also actively tried to get their quotas increased.

The structure and geographic distribution of the domestic sugar industry were important factors giving weight to the recommendations of the domestic sugar industry relative to both the provision of the Sugar Act and its administration. All segments of the domestic sugar industry have from their beginning favored some form of protection which they believed would increase profitability and enable them to expand output. A significant difference of interest exists between the cane sugar refiners and sugarbeet growers and processors. U.S. beet sugar is produced in refined form and any increase in the proportion of beet sugar in the total supply for the country necessarily reduces the volume of business that cane sugar refiners would otherwise receive. The position of refiners also differs from that of producers of raw cane sugar in domestic areas, although to a lesser degree than for beet sugar producers. Refiners, in general, welcome imports of raw sugar and desire protection only from competition of imported refined sugar. Raw cane sugar producers desire protection from sugar imports of any sort.

Differences among segments of the domestic sugar industry have been muted to a considerable extent by the fact that certain companies have interests in two or more segments of the industry. The largest refiner of cane sugar is also a large producer of beet sugar. The second largest refining company is owned by producers of raw sugar in Hawaii. There are other cases involving smaller quantities of sugar.

INDUSTRIES PRODUCING NONSUGAR SWEETENERS

The sugar industry, perhaps more than most others, has been relatively free during most of its life from serious competition with substitutes. The older substitutes--such as honey, maple sugar and sirup, cane sirup, and various types of molasses--have not been of major commercial importance and, with the exception of honey, have been declining in use in recent years. However, the growth in consumption of starch and noncaloric sweeteners in recent years has added to the competition encountered by sugar.

Corn Sirup and Dextrose

Nearly all starch sweeteners produced in the United States are manufactured from corn, although one plant is equipped to process either grain sorghum or corn. Nearly all plants where corn sirup and dextrose are produced also sell part of their starch output as starch without converting it to sirup or dextrose. In addition, some companies that manufacture and sell starch do not convert any of it to sirup or dextrose.

About 10 U.S. companies produce corn sirup; three of them also produce dextrose. Data showing the output of individual companies are not available. In general, competition exists not only among producers in the corn wet milling industry but also between it and the sugar industry. With one exception, all the plants producing corn sirup or dextrose are in the Corn Belt; the largest number are in Iowa and Illinois. The advantage of having a plant in the Corn Belt--close to its supply of raw material--is increased by the nearness of Chicago, where there is a large market for corn sirup.

Several companies that produce corn sweeteners are part of a diversified corporate complex. Corn sweeteners appear to be comparatively minor products for six companies.

Noncaloric Sweeteners

The principal noncaloric sweeteners produced and used in the United States in recent years are saccharin and cyclamate. Beginning in October 1969, the Food and Drug Administration issued a series of regulations prohibiting the use of cyclamates in food products. These actions also changed the market position of saccharin, since many products had been sweetened with a mixture of saccharin and cyclamate. Such mixtures can no longer be used.

There are two producers of saccharin in the United States. In addition, imports have at times been large enough to provide substantial competition to domestic producers. The ease with which imports have been increased within a relatively short time in recent years whenever prices in this country were high enough to make such shipments profitable, appears to be an important factor limiting the market power of saccharin producers in this country.

PRODUCT DIFFERENTIATION

Little effective product differentiation occurs among producers of sugar, although the larger ones sell sugar in a variety of types and packages to cater to the needs of various classes of buyers. Some producers sell sugar to industrial users in liquid form, either with none of the sucrose inverted or with various degrees of inversion as desired by the buyers. Dry sugar is sold in bulk and 100-pound sacks to industrial users. Sugar for the retail trade is put up in a wide variety of packages, which may contain white sugar which is granulated, powdered, or in loaf form. Granulated white sugar is packaged in a number of grain sizes, commonly referred to as standard granulated, fine granulated, etc. Also, so-called soft sugars in varying shades of brown are available for

consumers. In addition, mixtures of liquid sugar and corn sirup are available for industrial users. This list is by no means complete, although most of the more important types have been mentioned.

Probably no single cane sugar refiner or sugarbeet processor produces all the various types of sugar available to users. The larger ones offer most of the types for sale and, if demand were sufficient to make the action profitable, could produce the rest with little difficulty. The result is that sugar is a relatively undifferentiated product and competition prevents any producer from selling much of it at a price higher than that being charged by other sellers in a given area.

Product differentiation among producers of corn sirup is somewhat greater than in the sugar industry, but is not of major significance. This differentiation is possible because the chemical composition of corn sirup can be varied somewhat, depending on the exact procedures used in converting starch to sirup. However, most producers manufacture a variety of sirups and no single producer appears to have any important monopolistic advantage.

Price and service are the principal competitive factors in the market. Although data are scanty, they do seem to indicate that price changes are not always initiated by one of the larger producers. In 1967, one of the smaller producers instituted extensive price reductions in the Chicago market, which were followed by other producers of corn sirup.

PRODUCT SUBSTITUTION

None of the principal sweeteners--sugar, corn sirup, dextrose, saccharin--are complete substitutes for any of the others. Each sweetener has certain properties not possessed in the same degree by any other sweetener. Each sweetener is preferred in certain uses. However, considerable substitution is possible in many cases. Under these circumstances, the market for sweeteners is larger than it would be if any of the sweeteners were not available for use. However, the substitution among sweeteners broadens the area of competition and tends to reduce the market power of individual producers.

The use of mixtures of two or more sweeteners by industrial food processors is quite common, particularly in producing canned fruits, ice cream, and various types of candies. The most common mixtures contain liquid sugar and corn sirup in varying proportions. The purposes of these mixtures are to improve product quality or to lower the cost of sweeteners used or both. Use of a mixture of corn sirup and liquid sugar--rather than either sweetener exclusively--to improve product quality generally increases the total amount of sweetener used and may result in little substitution of one sweetener for another. However, use of corn sirup in a sweetener mixture for the purpose of reducing the cost of the sweetener is a clear case of substitution of corn sirup for sugar.

When corn sirup is mixed with liquid sugar, it is frequently difficult to distinguish whether it is being used as a substitute or for quality improvement. In some cases, elements of both uses are present in the same production operation. The use of corn sirup in the production of hard candy provides an example of a sweetener both expanding the size of the market and serving in part as a

substitute for sugar. It is difficult and relatively expensive to manufacture good quality hard candy without using 40 percent or more corn sirup in the raw material. Without corn sirup, or some satisfactory substitute, production of hard candies might be considerably smaller. However, the proportion of corn sirup in the mixture can be varied somewhat without materially affecting quality, providing the basis for some substitution between the two sweeteners.

No measurement is available of the extent to which each sweetener services an independent market or the extent of competition or substitutability among sweeteners. It is probable that the extent of substitution among sweeteners is being continually modified by new developments in technology and that users gradually learn how to take advantage of these developments. As a result, the competitive position of sweetener producers is continually changing.

BARRIERS TO ENTRY

There are two types of barriers to entry into the business of growing sugarcane or sugarbeets or of manufacturing sugar in the United States. These are the restraining effects of U.S. sugar quota legislation and the sizable capital requirements for manufacturing. Sugar quota legislation places an annual ceiling on how much sugar can be marketed in each U.S. quota region. These quantities vary somewhat from year to year with changes in consumption requirements and in the law. These changes have seldom been large in any year.

Whenever sugar production in any area seems likely to exceed the area's quota, USDA imposes limits on the quantity that can be marketed by each processing firm. If necessary, USDA also places acreage limitations on individual growers of sugarcane and sugarbeets. The size of these marketing and acreage limitations for individual firms and growers is determined largely on the basis of their past performance. New producers are likely to be at a disadvantage because of their lack of production history. The importance of this barrier has varied from time to time. It probably reached its point of least effectiveness in 1960 and 1961, when the United States ceased importing sugar from Cuba and quotas for the mainland cane and beet areas were generally expected to be increased when the sugar quota law was amended. Several new producers appeared in Florida about this time. New production facilities were also built in the sugarbeet area, but some of these represented expansion by existing firms. Barriers to further expansion of this type effectively reappeared with amendments to the Sugar Act which became law in 1965.

The capital costs of constructing new facilities for processing sugarcane and sugarbeets or for refining raw sugar are sufficiently high--reportedly $20 million to $30 million per plant of economic operating capacity--to discourage some who might otherwise choose to enter the business, but they are hardly high enough to prevent such entries.

There are no Government quotas to act as barriers to the entry of new companies into the business of manufacturing corn sirup and dextrose. Capital costs, however, appear to be about as high as those in the sugar industry. Two new producers have entered the industry, each on a comparatively small scale, since World War II.

MARKET PERFORMANCE

Two aspects of the market performance of firms in the sugar industry are of particular interest. One concerns the firms' influence on legislation which they believe to be important to the industry; the other involves market actions and strategy of individual firms. Firms manufacturing and selling corn sirup and dextrose are not directly involved with legislation to nearly the same extent as are those in the sugar industry because there is no quota system for their products and imports are not important.

The activities of processors and growers of sugarcane and sugarbeets with respect to sugar quota legislation have been primarily undertaken by various groups rather than individual firms. Sugarbeet processors, cane sugar refiners, and raw sugar producers in the mainland sugarcane area, Hawaii, and Puerto Rico each have a trade association with an office in Washington, D.C., used partly to assist the producers in presenting their views on legislative proposals to other groups representing sugar producers and to the Federal Government. Some of the organizations representing sugarbeet growers also have similar representatives in Washington, D.C.

The effectiveness of the domestic sugar industry in obtaining sugar quota legislation beneficial to its interest is apparent from the increased deliveries made by domestic areas, chiefly mainland cane and sugarbeets under the quota system. The total quantity of sugar made available annually for consumption in the United States (technically, charges against quotas) increased about 31 percent from 1948-52 to 1966-70 (table 7). The increase for beet sugar was 92 percent; for mainland cane, 131 percent; and for Hawaiian cane, 31 percent. Puerto Rico sustained a decline of 49 percent. The increase for all domestic areas amounted to 48 percent; for imports, it was 39 percent. The increase for domestic areas would have been much greater, and that for imports smaller, if Puerto Rico had filled its quota in 1965-69. The declared deficits in quota supplies during 1965-69 averaged about 54 percent of total quota for Puerto Rico and 6 percent for the United States. All of these deficits were assigned to foreign countries. There were no deficits in the Puerto Rican quota during 1948-52. If there had been no deficits in the Puerto Rican quota during 1965-69, the increase for imports from 1948-52 would have been 12 percent and that for the domestic areas 73 percent.

The effect of the market strategy employed by individual firms in the sugar industry on sugar prices and distribution is much more difficult to evaluate than their combined influence on legislation. The two types of behavior are, of course, related. For instance, the increase in the beet sugar quota at a more rapid rate than U.S. sugar consumption has, as previously shown, altered the geographic pattern of refined sugar prices. These changes in volume and price relationships among the various segments of the sugar industry doubtless benefited certain producers and restricted the economic opportunity of others.

While the increase in the quota for mainland cane sugar has been even more rapid than that for beet sugar, the effects on sugar prices within the United States have been minor. The largest increase was in Florida; most of the raw sugar produced there is either refined and sold in Florida or is shipped to a refinery near Savannah, Ga. This refinery has obtained an increased share of

its supply from Florida and has reduced its receipts from offshore areas. This change has not affected the distribution patterns of refined sugar produced by the refinery.

Price leadership in selling refined sugar has not been confined to any single company. Sugar company brand names, except in retail trade, have relatively little importance. The appearance of private brands for sugar in numerous chain stores in recent years suggest that company brands are also of limited importance even in retail markets.

The market performance of firms producing corn sirup and dextrose appears to have been conditioned considerably by prices and practices in the sugar market. This follows from the competition among sweeteners and the fact that sugar is sold in much the larger volume. The relationship between the price of dextrose and sugar is a clear indication of this. Since 1962, the price of dextrose, dry basis, has fluctuated between 83 and 86 percent of the wholesale price of refined sugar in New York. The only exceptions were in 1963 and 1964, when New York sugar prices were unusually high because of very high prices in the world market.

The price of corn sirup, dry basis, has generally declined relative to the price of sugar since 1952. In 1952, it averaged 106 percent of the price of sugar; in 1969, only 68 percent. This change is the result of an increase of about 23 percent in the price of sugar, and a decline of 18 percent in the price of corn sirup. During this period, consumption of corn sirup increased much more rapidly than that of sugar. This increased usage was doubtless encouraged by the decline in prices relative to those for sugar.

As with sugar, there is no evidence of any individual firm having sufficient market power to influence market prices over any long period of time. Corn sirup is not a sufficiently differentiated product to enable a single firm to gain much market advantage over its competitors in this respect.

CONCENTRATION IN THE PURCHASE OF SWEETENERS

Performance in the sweetener market is affected by the volume of purchases of larger buyers of sweeteners and the manner in which these are made, as well as by the structure and conduct of firms producing one or more sweeteners. Relatively little information is available concerning the selling side of the market. It is known that an increasingly large proportion of the sugar consumed in the United States in recent years has been used by industrial food processors and a declining proportion has been sold for household consumption. The proportion delivered directly to industrial users rose from 42 percent in 1949 to 65 percent in 1969.

A single industrial user commonly purchases a much larger quantity of sugar per year than is consumed by many individual households. Buyers for industrial concerns probably pay considerably more attention to price and, in some cases, to quality than household consumers do.

Some of the effects of this trend toward greater industrial consumption are apparent. An increasingly large proportion of refined sugar deliveries are now made in dry bulk and liquid forms. Less is being packaged in 100-pound sacks and small containers. Refined sugar is still largely bought through brokers, but the relative importance of wholesalers is declining, since all but the smallest industrial users purchase through brokers or directly from primary distributors who nearly always are cane sugar refiners or sugarbeet processors.

One of the corporations that produces soft drinks owns and operates a refinery which produces liquid sugar. The corporation uses the sugar produced in this refinery in its own soft-drink plants which are situated close enough to its New York refinery so that deliveries can be made at a cost no greater than that for sugar purchased elsewhere. Purchased sugar is used in other company plants. In addition, the refinery sells liquid sugar to other users in New York.

Other corporations which use large quantities of sugar are reported to use various devices, not readily available to smaller users, which they hope will enable them to obtain sugar at favorable prices. These include operations in the market for raw sugar, either futures or spot, by which the industrial user in effect purchases raw sugar and arranges with a refiner to refine the sugar and deliver it to the user for a fee.

The extent of such operations and their effect on the cost of sugar to the concerns using them is unknown. They do, however, provide some variety in the bargaining between refiners and industrial sugar users as well as in the competition among users in attempting to obtain sugar at the lowest possible cost.

Sugar, of course, is only one of the raw materials purchased by industrial food processors. The cost of sugar relative to that of other materials used varies widely, depending largely on the particular product being made. In many cases, the actual price paid for the sugar used is of less importance to industrial users than obtaining sugar at a price no higher and preferably lower than prices paid by their competitors. A general increase in sugar prices usually can be recovered by an increase in the selling price of the product being manufactured, since all producers are affected by the higher cost. However, this remedy is not generally available to a firm using higher cost sugar than its competitors.

Even in sales through retail stores, primary distributors meet competition for their brands from private label brands sold by various chain stores. Packages with brand names belonging to chain store organizations first became common in the middle and late 1960's. Originally, the sugar was packaged by some of the smaller refiners, including those in Puerto Rico, who sold little or no packaged sugar under their own brands. Later some of the larger U.S. refiners offered to package sugar under private labels. The general effect of private labels seem to have been to restrain what the chain stores regarded as an attempt by primary sugar producers to raise the price of sugar sold in small packages above the price charged industrial users by more than the cost of packaging.

It is not at all certain that the interaction of large buyers dealing with large sellers results in the same prices that would be expected to prevail under conditions of perfect competition, but it is apparent that each side serves as something of a check on the market power of the other.