A MARKET STRUCTURE STUDY OF THE
QUERETARO FLUID MILK INDUSTRY

A research paper
submitted to the graduate faculty
of the
North Dakota State University
of Agricultural and Applied Science
at Fargo, North Dakota

BY
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In partial fulfillment of the requirements
for the degree of Master of Science

The Department of Agricultural Economics

July, 1979
Mr. Burton B. Brandrud, Registrar  
Office of the Registrar - Old Main 100  
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Dear Mr. Brandrud:

The duly appointed examining committee for Francisco Soto  
candidate for the degree of Master of Science in Agricultural  
Economics, has this day examined the candidate as to competence,  
both in thesis (special papers) and programmed course work. The  
undersigned members of this committee hereby signify approval of  
the candidate, and recommend that subject to the regular require-  
ments, the student be awarded the degree, Master of Science.

Gordon W. Eldridge, Chairman  
Michael D. Houtz  
Sandra E. Schubert  
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Fred R. Taylor

Copy to: Dean, Graduate School  
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<table>
<thead>
<tr>
<th>Quarter</th>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall '77</td>
<td>AgEc 350</td>
<td>Production Economics</td>
<td>3</td>
<td>Dr. William Nelson</td>
</tr>
<tr>
<td></td>
<td>Stat 360</td>
<td>Introduction/Statistics</td>
<td>3</td>
<td>Dr. Doris Hertsgaard</td>
</tr>
<tr>
<td></td>
<td>Econ 361</td>
<td>Intermediate Econ Theory</td>
<td>Audit</td>
<td>Dr. Jong Heum Park</td>
</tr>
<tr>
<td></td>
<td>AgEc 598</td>
<td>Graduate Seminar</td>
<td>2</td>
<td>Dr. Fred Taylor</td>
</tr>
<tr>
<td>Winter '78</td>
<td>AgEc 502</td>
<td>Research Methodology</td>
<td>3</td>
<td>Dr. Donald Anderson</td>
</tr>
<tr>
<td></td>
<td>AgEc 520</td>
<td>Adv. Production Econ</td>
<td>3</td>
<td>Dr. Larry Leistritz</td>
</tr>
<tr>
<td></td>
<td>AgEc 598</td>
<td>Graduate Seminar</td>
<td>1</td>
<td>Dr. Roger Johnson</td>
</tr>
<tr>
<td></td>
<td>Stat 461</td>
<td>Regression Analysis</td>
<td>3</td>
<td>Dr. Doris Hertsgaard</td>
</tr>
<tr>
<td>Spring '78</td>
<td>AgEc 510</td>
<td>Quantitative Exer/Ec Theory</td>
<td>3</td>
<td>Dr. Larry Leistritz</td>
</tr>
<tr>
<td></td>
<td>AgEc 530</td>
<td>Market Structure Analysis</td>
<td>3</td>
<td>Dr. Gordon Erlandson</td>
</tr>
<tr>
<td></td>
<td>AgEc 598</td>
<td>Graduate Seminar</td>
<td>1</td>
<td>Dr. Donald Anderson</td>
</tr>
<tr>
<td></td>
<td>Econ 363</td>
<td>Intermediate Econ Theory</td>
<td>Audit</td>
<td>Dr. Jong Heum Park</td>
</tr>
<tr>
<td>Summer '78</td>
<td>AgEc 597</td>
<td>Research Paper</td>
<td>3</td>
<td>Dr. Gordon Erlandson</td>
</tr>
<tr>
<td></td>
<td>P.E. 204</td>
<td>Tennis</td>
<td></td>
<td>Dr. Thomas Barnhart</td>
</tr>
<tr>
<td>Summer '78</td>
<td>AgEc 597</td>
<td>Research Paper</td>
<td>3</td>
<td>Dr. Gordon Erlandson</td>
</tr>
<tr>
<td></td>
<td>Econ 152</td>
<td>Prin/Econ - Macro</td>
<td>Audit</td>
<td>Dr. David Rees</td>
</tr>
<tr>
<td>Fall '78</td>
<td>AgEc 468</td>
<td>Marketing Topics I</td>
<td>3</td>
<td>Dr. Gordon Erlandson</td>
</tr>
<tr>
<td></td>
<td>AgEc 503</td>
<td>Research Techniques</td>
<td>3</td>
<td>Dr. Roger Johnson</td>
</tr>
<tr>
<td></td>
<td>AgEc 597</td>
<td>Input-Output Analysis</td>
<td>1</td>
<td>Dr. Thor Hertsgaard</td>
</tr>
<tr>
<td></td>
<td>Econ 551</td>
<td>Adv Economic Theory</td>
<td>3</td>
<td>Dr. David Rees</td>
</tr>
<tr>
<td>Winter '79</td>
<td>AgEc 597</td>
<td>Farm Management</td>
<td>3</td>
<td>Mr. Rodney Ehni</td>
</tr>
<tr>
<td></td>
<td>AgEc 597</td>
<td>Research Paper</td>
<td>3</td>
<td>Dr. Gordon Erlandson</td>
</tr>
<tr>
<td></td>
<td>Comm 241</td>
<td>Intro Photography</td>
<td></td>
<td>Mr. Mark Strand</td>
</tr>
<tr>
<td>Spring '79</td>
<td>Econ 553</td>
<td>Adv. Economic Theory</td>
<td>3</td>
<td>Dr. William Gerdes</td>
</tr>
<tr>
<td></td>
<td>AgEc 597</td>
<td>Research Paper</td>
<td>3</td>
<td>Dr. Gordon Erlandson</td>
</tr>
<tr>
<td>Summer '79</td>
<td>AgEc 597</td>
<td>Research Paper</td>
<td>3</td>
<td>Dr. Gordon Erlandson</td>
</tr>
</tbody>
</table>
This Graduate Research Paper is Approved by:

Gordon W. Erlandson, Adviser

July 13, 1979

Fred R. Taylor, Chairman
Department of Agricultural Economics

(Date)
ABSTRACT

Soto Ramirez, Francisco, M.S., North Dakota State University, July 1979

A Market Structure Study of the Queretaro Fluid Milk Industry

Major Advisor: Dr. Gordon W. Erlandson

Processing of fluid milk began operations in Queretaro in 1950, processing 3,500 liters per day. This figure increased to 523,000 liters daily in 1976. The two largest of the 11 plants process 60 percent of the total production. Most of the fluid milk was shipped to Mexico City, only 17 percent was sold in Queretaro. Processing costs are generally high in the industry, due to the low volume of milk processed in each plant. Milk prices, which are fixed by a Government agency, have increased over the years, but probably less than they would have without control. Bulk handling and improvements in roads and trucks have been major technological developments in the industry. The fluid milk industry is expanding but production of milk lags far behind the rapidly increasing population. Imports of dairy products increased 650 percent between 1965 and 1975.
ACKNOWLEDGMENTS

I wish to express my gratitude to Dr. Fred R. Taylor, Chairman, and to each member of the Department of Agricultural Economics for making my graduate program such a rewarding experience.

I owe a great debt of gratitude to Dr. Gordon W. Erlandson, major advisor, whose patience and assistance were always immediately available. His guidance and constant encouragement made this study possible.

I extend sincere thanks to my reading committee: Dr. Helgeson, Prof. Petry, Dr. Curley, and Dr. Erickson for their recommendations and constructive criticism.

Appreciation is also expressed to my instructors of North Dakota State University for their contribution toward my professional preparation.

But finally, my deepest appreciation goes to my family -- to my wife, Consuelo P. de Soto, and to my children, Monica, Hugo, and Patricia -- for their love and sacrifice. It is to them I dedicate this study.

F.S.R.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>History and Problem</td>
<td>4</td>
</tr>
<tr>
<td>Need for the Study</td>
<td>6</td>
</tr>
<tr>
<td>Objectives of the Study</td>
<td>7</td>
</tr>
<tr>
<td>Scope</td>
<td>8</td>
</tr>
<tr>
<td>Sources of Data</td>
<td>8</td>
</tr>
<tr>
<td>Organization of Study</td>
<td>9</td>
</tr>
<tr>
<td>II. ANALYTICAL FRAMEWORK</td>
<td>10</td>
</tr>
<tr>
<td>The Structure of Fluid Milk Markets</td>
<td>11</td>
</tr>
<tr>
<td>Size and Number of Firms</td>
<td>12</td>
</tr>
<tr>
<td>Concentration</td>
<td>13</td>
</tr>
<tr>
<td>Product Differentiation</td>
<td>14</td>
</tr>
<tr>
<td>Entry and Exit</td>
<td>15</td>
</tr>
<tr>
<td>Firm Location</td>
<td>16</td>
</tr>
<tr>
<td>Market Conduct</td>
<td>17</td>
</tr>
<tr>
<td>Prices and Pricing</td>
<td>18</td>
</tr>
<tr>
<td>Nonprice Competition</td>
<td>19</td>
</tr>
<tr>
<td>Market Performance</td>
<td>19</td>
</tr>
<tr>
<td>Efficiency</td>
<td>20</td>
</tr>
<tr>
<td>Profit</td>
<td>20</td>
</tr>
<tr>
<td>Price Policies and Their Impacts</td>
<td>22</td>
</tr>
<tr>
<td>III. MARKET STRUCTURE</td>
<td>23</td>
</tr>
<tr>
<td>Number of Firms</td>
<td>23</td>
</tr>
<tr>
<td>Size of Firms</td>
<td>26</td>
</tr>
<tr>
<td>Concentration</td>
<td>27</td>
</tr>
<tr>
<td>Product Differentiation</td>
<td>29</td>
</tr>
<tr>
<td>Conditions of Entry</td>
<td>31</td>
</tr>
<tr>
<td>Firm Location</td>
<td>31</td>
</tr>
<tr>
<td>Summary</td>
<td>32</td>
</tr>
<tr>
<td>IV. MARKET CONDUCT</td>
<td>34</td>
</tr>
<tr>
<td>Pricing Policies</td>
<td>34</td>
</tr>
<tr>
<td>Queretaro Milk Price Control</td>
<td>35</td>
</tr>
<tr>
<td>Effects of Price Control</td>
<td>35</td>
</tr>
<tr>
<td>Chapter</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Non-Price Competition</td>
<td>36</td>
</tr>
<tr>
<td>Merchandising Methods</td>
<td>39</td>
</tr>
<tr>
<td>V. MARKET PERFORMANCE</td>
<td>42</td>
</tr>
<tr>
<td>Efficiency</td>
<td>42</td>
</tr>
<tr>
<td>Processing Cost</td>
<td>43</td>
</tr>
<tr>
<td>Delivery Cost</td>
<td>45</td>
</tr>
<tr>
<td>Overhead Costs</td>
<td>46</td>
</tr>
<tr>
<td>Plant Capacity</td>
<td>48</td>
</tr>
<tr>
<td>Profit Margins</td>
<td>49</td>
</tr>
<tr>
<td>Other Factors Outside the Firm</td>
<td>50</td>
</tr>
<tr>
<td>Changes in Transportation</td>
<td>51</td>
</tr>
<tr>
<td>Changes in the Distribution Routes</td>
<td>52</td>
</tr>
<tr>
<td>Noneconomic Considerations</td>
<td>53</td>
</tr>
<tr>
<td>Summary</td>
<td>53</td>
</tr>
<tr>
<td>VI. SUMMARY, IMPLICATIONS, AND CONCLUSIONS</td>
<td>55</td>
</tr>
<tr>
<td>Summary</td>
<td>55</td>
</tr>
<tr>
<td>Implications</td>
<td>57</td>
</tr>
<tr>
<td>Conclusions</td>
<td>59</td>
</tr>
<tr>
<td>Consumption of Milk and Dairy Products</td>
<td>61</td>
</tr>
<tr>
<td>Importance of the Dairy Industry in the Mexican Economy.</td>
<td>62</td>
</tr>
<tr>
<td>LITERATURE CITED</td>
<td>64</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Production Per Cow, Number of Cows, and Total Milk Production, Queretaro, Selected Years</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>Number of Processing Plants, Volume Processed, and Percentage of Milk Processed, Queretaro, Selected Years</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Size Distribution of Fluid Milk Processing Plants, Queretaro, 1976</td>
<td>27</td>
</tr>
<tr>
<td>4</td>
<td>Relative Position of the Two Largest Plants, Five Largest Plants, and Eight Largest Plants in the Queretaro Fluid Milk Industry in 1976</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>Pricing Behavior in Queretaro Market Fluid Milk Producer and Retail Prices, Selected Years, 1950 to 1976</td>
<td>36</td>
</tr>
</tbody>
</table>

# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Location of the Principal Milk Supply Regions for the Mexico City Market</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Fluid Milk Retail Price in Queretaro, Selected Years From 1950 to 1976 (Price in Pesos per Liter)</td>
<td>37</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

Significant changes in production, processing, and consumption have occurred in the dairy sector of the agricultural region surrounding Queretaro. The focus of this study deals mainly with the changes in the structure and organization of the fluid milk industry in this area. This analysis will investigate the nature of these changes and the adjustments that have been required of milk producers, milk processors, handlers, and other marketers as a result of these changes.

Of major importance has been the increase in population. In 1960, the population in Queretaro City was 67,277;\(^1\) in 1976, 16 years later, this number increased to 145,000.\(^2\) This tremendous increase in Queretaro's population has arisen from two sources. First, more than 200 new manufacturing firms have been established bringing manpower from other states. The second factor influencing population is the birthrate which is one of the highest in the world; 3.4 percent annually\(^3\) in the Mexican Republic.

Dairy farmers have made adjustments to meet the increased need for dairy products. Milk production has increased from 173,496 liters per day in 1950 to 544,800 liters in 1976.\(^4\)

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\(^1\) Tamayo, J. L., *Geografia General de Mexico*, Instituto Mexicano de Investigaciones Economicas, Tomo III, Mexico, 1962, 0. 404.


\(^3\) This population indicator was calculated by considering 4.3 of birthrate minus .9 of the death rate annually, thus the 3.4 is the natural rate of increase.

\(^4\) Data supplied by Agriculture and Animal Husbandry, Queretaro State Office.
The increased milk production has put pressure on milk processors and handlers. The rapid increase in capacity has occurred at the same time that technological advances in handling fluid milk products have appeared. Markets for milk are changing. Local milk markets have essentially changed to regional or national markets. Transportation has had an impact on the transition in the milk market.

Plant operations are being converted to a continuous flow process. Sanitation requirements have become more stringent. The first legislation regarding the pasteurization of milk and dairy products was promulgated for Federal districts and territories excluding the states in 1931. However, this law was never enforced, for unknown reasons. Despite the lack of enforcement of this law, pasteurization of milk and dairy products has been required in Queretaro.

Government policy has not always contributed strongly and directly to the smooth transition from a situation where the region was self-sufficient in production to one where a large proportion of the dairy production was shipped to Mexico City. Eighty-three percent of the total state milk production was shipped to Mexico City and only 17 percent was supplied for Queretaro consumption (see Figure 1 for location of markets).

It is in this context that this study addresses the problems of an increasing demand for dairy products, coupled with increasing volumes in processing, and technological advances in milk marketing. These market

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6. Data supplied by Agriculture and Animal Husbandry, Queretaro State Office.
aspects are considered in conjunction with uncertainties associated with activities taken by government policy makers. All of these factors contributed to drastic market changes occurring within a short time span of 26 years.

**History and Problem**

It is believed that the first five cows on the American Continent were brought over by Hernan Cortez, on his first expedition to Veracruz in 1519 and that these came originally from Andalucia, Spain. Both breeding and the importation of cattle from Spain were increased during colonization. Nevertheless, the cattle population registered a marked decrease between 1850 and 1922 due first to the wars of reform, and subsequently to the revolution of 1910. But since 1922, when there were approximately 2.5 million cows in the nation, dairy cattle raising has been intensified to achieve a total of 7 million cows in 1960.\(^7\)

Queretaro has been characterized as a small state, limited in agricultural production, having few milk cows whose milk production was largely consumed or sold at the farm directly to consumers. Milk consumption in the state was very low and in some zones nothing between 1920 and 1940. However, as population increased and cities grew, the number of milk cows increased, production and consumption became separated, necessitating a marketing system that has become increasingly elaborate.

Today, specialization has progressed to the extent that the functions of milk production, assembly, processing, and distribution to the final consumer are frequently performed by separate entities.

\(^7\)Ramos, C. M., *op. cit.*, p. 28.
From a very modest beginning a considerable industry has grown, supplying dairy products to thousands of consumers, as well as income to dairy farmers and dairy processors. By 1925 there were approximately 1,625 cows in the entire state. This number increased to 126,705 cows in the next 50 years. Yet, this number of cows is very low compared with that which is required to satisfy local consumption and to provide for Mexico City's increasing population. This milk shortage for the 13 million inhabitants in the world's largest city has provoked a tremendous imbalance in the state consumption and the general welfare of society. The retail milk price in the zone has increased about 400 percent, or about 15 percent annually, between 1950 and 1976. This is due to the following factors: 1) increase in consumer incomes (estimated at over 9 percent per year); 2) the inflation rate (discussed in Chapter V); and 3) Queretaro's annual population increase (estimated at 4.4 percent between 1950 and 1976).

The impact of technology, population increase, and changes in merchandizing have caused changes in the market structure of the fluid milk industry. This has led to changes in marketing operations which, in turn, raises questions about market performance in the dairy industry.

There is no doubt that the dairy industry has a big role to play in the economy of Queretaro. A large number of people are directly involved and depend on the various aspects of this particular industry for their livelihoods.

Actually, more than 50 percent of the total population in the country is under 20 years old, and every year this percentage increases

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8 Agriculture and Animal Husbandry, Queretaro State Office.
9 The retail price in 1950 for a milk liter was $1.10, in 1976 the price was $5.50.
due to the high birthrate. To meet the demand for fluid milk, the Mexican government has increased the importations year by year in such a way that in 1975 the amount for dairy products was $75 million, and it is estimated that this amount will be doubled by 1985 if the domestic production continues at the same slow rate of increase.

It is imperative that a social and economic atmosphere be created that will permit Mexico to supply the nation's needs with the nation's produce, and free itself from these importations which damage the national economy and impoverish the rural population.

It is not the purpose of this study to make a detailed investigation to fulfill all the problems that are indicated. However, it is desirable to proceed a little further with the analysis in order to have more than "single points" to work against in examining the changes in the market organization of the firms. The study will assemble secondary data on milk production (provided by the Agricultural and Animal Husbandry Commissioner in Queretaro), processing, and so forth, but it will also review the literature on industrial organization or market structure in such a way that it will outline the approach that would be feasible to pursue when a more complete study is undertaken.

Need for the Study

Dairy producers are continually confronted with marketing operations and price policy problems. Due to the lack of information on production characteristics, it has been difficult to determine which is the major problem. An outline of the present status and trends of dairying at the farm level is needed to aid in directing future dairy marketing research.
This type of information will provide a basis for determining what the major problems are and their possible solution.

Important aspects of the problem of the fluid milk industry to be actually considered are: 1) the attitudes of dairy producers and their responses to agricultural programs and policies, and 2) the marketing operations and price policy. Greater knowledge of these factors and analysis of the future expectations of the structure of the fluid milk industry should help reveal problems which may be encountered in the future competition of dairy producers.

Objectives of the Study

Since no recent studies of the structure of the fluid milk industry in Queretaro have been made, the purpose of this investigation is to describe structural changes in the Queretaro fluid milk industry. Market structure and market conduct are analyzed to measure the industry's performance in satisfying the welfare of the market participants as well as society.

The specific objectives of this study are:

1. To describe the nature and trends of certain dimensions of the market structure of the Queretaro fluid milk industry, and to define the character of the interrelationships among variables such as: the size and number of firms; conditions of entry; the location of firms; concentration; and product differentiation.

2. To identify the competitive practices followed by these firms in their marketing operations with the purpose of providing basic information for the guidance of future research in dairy marketing in Queretaro.
3. To determine performance measures which analyze the economic results of their business activity.

**Scope**

This study was designed to describe structural changes of the Queretaro fluid milk industry, considering their effects on competition and market performance between 1950 and 1976. Although the dairy industry involves many operations, such as production, processing, distribution, as well as other concerns such as costs and sanitary regulations, the focus of this analysis is primarily to describe marketing operations and price behavior characteristics of the industry in Queretaro. Other factors that are affecting the industry's performance, and the response of buyers and sellers in the market according to pricing milk policies will also be addressed.

**Sources of Data**

Agriculture and Animal Husbandry, Queretaro State Office provided much of the statistical data for this study. Most of the data were obtained directly by the investigator through special efforts of the office of the state Agriculture and Animal Husbandry Commissioner in Queretaro, Mexico.

Information about the population, production, and consumption of milk for the whole country was obtained from the Food and Agriculture Organization of the United Nations, Rome, as well as the United States Department of Agriculture.
Organization of Study

Chapter II of this study includes a review of previous studies, and the methodology used in analyzing the findings presented in this paper. Theoretical considerations of market structure, market conduct, and market performance are included in Chapter III. Chapters IV and V describe market structure and market performance variables as well as analytical results of the study. The final chapter, Chapter VI, is devoted to a summary of the major findings and the conclusions of the study.
CHAPTER II

ANALYTICAL FRAMEWORK

The purpose of this chapter is to briefly discuss some of the theoretical concepts and previous research that are relevant to this study, and to formulate hypotheses regarding measures of structure, conduct, and performance as they apply to the fluid milk industry in Queretaro. The initial set of hypotheses gained from this approach is examined with the guidance of economic theory, industries studies, and a priori knowledge of the dairy industry. This approach was also used to formulate an economic model for use in later chapters.

This method of "analysis" is useful because of its efficiency in identifying specific (economic) elements and the impact these elements have on conduct and the influence on performance by both the structure and conduct of the market.

With the guidance and assistance of this approach, this study will appraise and evaluate the following questions:

1. How and to what extent has the structure and institutional framework of the fluid milk industry changed during the past years? Answers to this question required an investigation of changes in the number and size firms of both buyers and sellers of the dairy industry in Queretaro, and the relationship between these buyers and sellers.

2. What has been the effect of the observed structural changes upon competition within the dairy industry segments during the last fifteen years? Answers to this question require an investigation of changes in the extent and degree of market power
possessed by both buyers and sellers within the industry, i.e., market conduct.

3. Finally, what has been the consequent effect of such changes upon market performance, i.e., market results?

The Structure of Fluid Milk Markets

The characteristics most frequently emphasized by a majority of authors and mainly by Bain about the salient aspects of market structure are:

1. The Degree of Seller Concentration, described by the number and size distribution of sellers in the market.

2. The Degree of Buyer Concentration, described by the number and the size distribution of buyers in the market.

3. The Degree of Product Differentiation, describing the extent to which the outputs of sellers are viewed as nonidentical by buyers.

4. The Condition of Entry to the Market, referring to the relative ease or difficulty with which new sellers may enter the market as determined generally by the advantages which established sellers have over potential entrants.

5. The Location of the Firm, in relation to other firms, in relation to size of city in which it is located, and in relation to the intensity of farming in the area.

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1 Market structure refers to "those characteristics of the organization of a market which seem to influence strategically the nature of competition and pricing within the market; including characteristics of both buyers and sellers." Bain, Joe W., Industrial Organization, John Wiley and Sons, Inc., New York, 1966, p. 9.

2 Ibid., p. 10.
The finding and conclusions of a market structure analysis are important, since they aid industrial personnel, legislative groups, regulatory agencies, and the management of individual fluid milk firms in making decisions affecting the industry.  

Size and Number of Firms

The size and number of firms in the dairy industry are considered jointly since they measure concentration; the extent to which output of a product is controlled by the largest firms in the industry. By studying concentration levels in the industry, the market power of the largest firms can be determined, measured by a combination of size and number of firms. Manchester has stated that a typical fluid milk market (in this case, Queretaro) is supplied by a small number of producers and processors with a major portion of the sales made by a handful of firms. Therefore, it is hypothesized that the four largest firms in Queretaro process over 60 percent of the fluid milk products.

Size is also associated with the utilization and efficient use of the firm's resources. Theoretically, there is a tendency for firms of any industry to adjust their size and number so as to maximize efficiency or minimize unit costs. Bain has found "Larger firms will always be more

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efficient than smaller plants up to a point."  The critical or best size may be designated as the lowest cost per unit volume for the firm.

Concentration

Theoretically, "concentration" is one element of market structure which may affect an industry's performance. Highly concentrated industries are likely to perform poorly because they allocate resources inefficiently." Fluid milk products typically are sold in local markets. An important factor in analyzing concentration and competition in local markets is the extent of intermarket movement of packaged fluid milk. Some markets, which several years ago were relatively isolated and competitively self-contained, have been and are being invaded by processors who bring in milk from packaging plants located in other markets. Small markets have been more affected than large markets according to this study. The two principal factors which appear to be responsible for this effect are: 1) the largest firms have plants in the smaller markets, but have consolidated operations and now supply milk from a more efficient plant elsewhere, and 2) distribution efficiency has improved to a point where entrance into smaller markets is a profitable means of market expansion.

6 Bain, op. cit., p. 147.
7 Concentration means "the extent to which the larger sellers control the bulk of the industry's sales."
9 National Commission on Food Marketing, op. cit., p. 73.
The evidence that the number of wholesale fluid milk sellers in Queretaro has decreased and a larger share of the market is controlled by the largest four firms would suggest that competition among these firms has lessened. This conclusion is based on the belief that seller concentration in a market affects competition.

Product Differentiation

"Product differentiation" refers to the ability of a firm to vary its products from those of competitors through use of brand names, quality or physical differences, price differences, and advertising expenditures. Since the firms in the fluid milk industry are restricted in their competitive actions by state and federal regulations to meet standard sanitary requirements and in setting resale price, advertising and brand names are methods by which firms are permitted to differentiate their individual products.

Although dairy firms can use these methods to convince the public that their product is superior to their competitor's, opportunities to differentiate fluid milk, like many other agricultural products, are limited. Milk is a homogeneous product with such physical and chemically uniform characteristics, that consumers cannot easily perceive differences among brands. Clarke states that "the only effect product differentiation can have must be in the quantities that can be sold on the market by individual firms," based on a California dairy industry study. 10

10 Clarke, D. A., Structural Changes in the California Fluid Milk Industry, Experiment Station, Berkeley, California, June, 1964, p. 37.
Under these circumstances, the hypothesis pertaining to product differentiation is that large firms advertised and sold more products under a private label than smaller firms due to the large-scale production and market power\textsuperscript{11} held by the largest processors.

\section*{Entry and Exit}

Barriers to entry comprise another major segment of the firm's economic environment. Caves points out the "just as concentration reflects the number of actual market rivals of a firm, so the condition of entry tells the story about potential rivals."\textsuperscript{12}

The conditions of entry to an industry, Bain says, essentially refers to the degree of advantage (generally in prices obtainable or costs incurred) which sellers established in an industry have over potential new entrant sellers. It thus determines the competitive relationship between established and potential entrant sellers, and the effectiveness of the threat of new competition as a force governing the policies of established sellers.\textsuperscript{13}

Entry is important because of the changes in the competitive complexion if a supermarket chain or a large national dairy firm enters a market by acquiring processing facilities. Exit is important to the competitive situation depending upon the manner in which the volume of the exiting firm is divided among the on-going firms.\textsuperscript{14}

\textsuperscript{11}Market Power refers to "the ability of a company or organization to influence price or other terms of trade in a market," Manchester, A. C., \textit{Organization and Competition in the Dairy Industries}, the Iowa State University Press, 1970, p. 329.

\textsuperscript{12}Caves, \textit{op. cit.}, p. 22.


\textsuperscript{14}National Commission on Food Marketing, \textit{op. cit.}, p. 85.
According to a survey made by the National Commission of Food Marketing in the Chicago area, they concluded that firms leaving fluid milk packaging have tended to be small and primarily in home delivery distribution. Data for 70 markets for the city of Chicago indicate that 40 percent or more had fewer than five routes. Less than one-third had ten or more routes. Seventy-one percent of those firms leaving the market from 1957 to 1965 were primarily in home delivery in Chicago. Of the total routes operated by firms leaving the fluid milk packaging business in the 70 federal order markets between 1958 and 1962, 63 to 68 percent were retail home delivery routes.

According to the evidence pointed out above, theoretically we expect smaller firms to leave the business to merge to form larger firms or to be bought out by a larger firm. Accordingly, there would be a tendency for smaller firms to disappear and larger firms to appear and remain.

Firm Location

The main factors to be considered in the aspects of plant location are the density of population and the level of production. There are two densely population areas — Queretaro City and San Juan del Rio in Queretaro. However, there is another city that must be included for the Queretaro market, even though it is outside of the immediate geographic area. Mexico City represents the largest consumption market

15 Federal milk marketing order is a legal instrument issued to regulate transactions between farmers and buyers of fluid milk. Basically, these orders indicate that milk dealers must pay specified minimum prices to farmers for milk used for different purposes. Only the dealers are regulated and only minimum farm prices are established, Ibid., p. 41.
with more than 13 million people and is located only 220 kilometers (140 miles) from Queretaro.

With this configuration, it is expected that proximity to the consumer market is an important consideration in determining plant location. It is hypothesized that firms marketing their product at a distance from their processing plants will have a higher average cost curve, and will, therefore, be at a competitive disadvantage. 16

Queretaro became an important dairy state during the last decade. Production within the state is concentrated in the plain between Queretaro City and San Juan del Río. It is expected this zone would contain a relatively large number of fluid milk plants, because of ready access to the raw milk supply.

Market Conduct 17

Competition among sellers in a market is not only affected by market structure and legal and social controls, but also by market conduct. This aspect of the market studies the behavior of firms in an industry with regard to prices, output, selling costs, research expenditures, and product design. 18


17 Market conduct refers to "the patterns of behavior which enterprises follow in adapting or adjusting to the markets in which they buy or sell," Bain, Industrial Organization, op. cit., p. 11.

18 Bain, op. cit., p. 266/
Caves identifies three main practices assessed in market conduct:
1. Policies toward setting prices;
2. Policies toward setting the quality of the product; and
3. Policies of action toward rivals.\footnote{Caves, op. cit., p. 37.}

Prices and Pricing

Many practices such as price fixing, price discrimination, and tying contracts have been declared illegal under the Clayton Act, whenever they have served to lessen effective competition. There is some evidence that price policies in the dairy industry have at times taken the form of price wars followed by price enhancement by the remaining firms or by geographic price discrimination.\footnote{U.S. Congress, House, \textit{Hearing Small Business Problems in the Dairy Industry}, 86th Congress, 1st-2nd Sessions, 1959-50, Washington, D.C., Government Printing Office, pp. 16-33.} However, we have to consider this pattern of conduct as illegal when minimum prices are set by law.

Triffin has stated that "The oligopolists may be afraid of unleashing unpredictable reactions, and are thus frozen into a policy of routine and immobilism. Or on the contrary, they may feel in a fighting spirit and launch an undercutting policy in the hope of ruining their rivals and driving them out of the field. Or again, they may accept, tacitly or expressly, unreservedly or only within some more or less definite range, the lead of one of them and abstain from price competition."\footnote{Triffin, R. A., \textit{Monopolistic Competition and General Equilibrium Theory}, Harvard University Press, Cambridge, 1962, p. 123.}

This statement outlines the range in pricing behavior that may be expected in the fluid milk industry. Erlandson points out that in some areas, firms may be expected to interact by peaceful coexistence; in
other areas, by active price wars, by price leadership, or by any of an infinite number of intermediate actions. If, indeed, there has been an increase in concentration within the fluid milk industry, it is very likely that this will be exhibited by oligopolistic pricing behavior.  

Nonprice Competition

Nonprice competition refers to the competition among sellers or buyers involving nonprice factors. In the specific case of the dairy industry, the amount of advertising per unit of fluid milk processed is the nonprice competition measure utilized. Nevertheless, this amount does not include expenditures by the firms for the purpose of increasing the total demand for the entire industry, but includes expenses designed to increase the firm's share of the market.

Leftwich has stated that the purpose of advertising is to increase the firm's share of the market; therefore, if one firm increases its advertising outlay, other firms will increase theirs to meet competition.  

Market Performance

Market performance measures the end results of how well the industry is performing. It compares these results with the economic goals of society.

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22 Erlandson, op. cit., p. 40.
24 Market performance refers to "the composite of end results in the dimensions of price, output, production costs, selling costs, product design, and so forth, which enterprises arrive at in any market as the consequences of pursuing whatever lines of conduct they espouse," Bain, Industrial Organization, op. cit., p. 11.
The broad aspects of market performance include: 1) productive efficiency and 2) price-cost margins and profit rates.

Efficiency

Production efficiency as related to market performance compares actual industry costs for production and distribution with the lowest attainable costs for the outputs produced and distributed. These efficiency measurements are determined by external as well as internal factors (physical characteristics of an industry and managerial ability, respectively). A second measure of efficiency includes a measurement of the resource used in advertising and sales promotion efforts.

Bain has stated that there is some virtual tendency for firms of any industry to adjust sizes and numbers so as to maximize efficiency or minimize costs per unit of production. This assertion rests in turn on two related propositions: 1) that there are forces at work which virtually induce firms to seek maximal efficiency; and 2) that the degree of efficiency will be systematically influenced by the size that a firm attains.25

On the basis of Bain's observation, Erlandson concludes26 that the efficiency of production will have an impact on both the conduct and structure of the fluid milk industry.

Profit

The end result of the market performance of an industry may be measured according to profitability or equitable return on owner's

25 Bain, op. cit., p. 146.
26 Erlandson, op. cit., p. 46.
investment. Theoretically, resources are efficiently allocated in
response to profits and losses. Profit rates above or below normal pro-
fits signal poor market performance and improper resource allocation.27
In other words, where private owners operate their business for a profit,28
profit rates for all firms in the industry are expected to equal a basic
rate of return on owner's investment.

The main purpose of investigating changes in the wholesale and retail
market environment is to evaluate the influence of these changes on the
degree of competition among the market participants. In a purely compe-
titive environment, participants have no discretion over price or other
profit-determining variables beyond the physical operation of the firm.
Therefore, all participants bargain on equal terms in the market. When
features of the market environment allow participants to exercise some
degree of control over profit-determining variables, the degree of compe-
tition may vary through many graduations from pure competition to pure
monopoly.29

27 Caves, op. cit., p. 102.
28 Profit will be used in this study referring to the difference by
which revenue exceeds costs, Bain, op. cit., p. 364.
29 "Pure or perfect competition is "an economical model of a market
possessing the following characteristics: each firm is so small relative
to the market that it can exert no perceptible influence on price; the
product is homogeneous; there is free mobility of all resources, includ-
ing free and easy entry and exit of business firms into and out of an
industry; and all economic agents in the market possess complete and per-
fect knowledge," Ferguson, C. E. and Maurice, S. Ch., Economic Analysis,
exists when there is only one producer in a market. There are no direct
competitors or rivals in either the popular or technical sense, Ibid.,
p. 272.
Price Policies and Their Impacts

Changes in the production and marketing of milk have created increased demand by processors and others in the dairy industry for government participation in milk pricing.

Most of the public policy measures taken to insure "fair" but competitive prices in the dairy industry have been aimed directly at seller's conduct by the Queretaro State Government. The most intensive of these has been the regulation of producers' and distributors' prices. Resale price maintenance laws can be positive instruments in encouraging the development of efficiency and so improving some aspects of welfare only if this resale price control can be administered in good shape. This is admittedly difficult. The difficulty of administering the program caused its abandonment in New York State in 1937. 30 Spencer and Christensen have written that "resale price control can and has caused serious distortion in market structure as evidenced by the development of the captive creameries and captive supermarkets in California." 31

More might be done by the government to encourage the growth of small businesses as a means of maintaining a favorable structural environment in Queretaro industry. Two possible measures include a favorable tax structure and greater financial aid for small businesses. These measures help the smaller firms to withstand the competitive pressures of their larger competitors.

30 Spencer, L. and Christensen, K., Milk Control Program of the Northeastern States, Part II, Northeast regional publications 23, Cornell University, Agricultural Experiment Station, Ithaca, 1955, p. 116.
31 Ibid., p. 291.
CHAPTER III
MARKET STRUCTURE

This chapter is directed to the satisfaction of the first objective: to describe the nature and trends of certain dimensions of the market structure of the Queretaro fluid milk industry, and to define the character of the interrelationships among variables. An economic description of the fluid milk industry in Queretaro is provided by an analysis of the following structural characteristics of the market:

1. number of firms;
2. size of firms;
3. product differentiation;
4. concentration;
5. condition of entry; and
6. firm location.

Number of Firms

Three types of firms,¹ or individual decision-making units operate within the fluid milk industry. These firms are: dairy farms; processing plants; and distributors. All three have undergone major structural changes over the last fifteen years. Dairy farms, relatively atomistic in structure, are excluded from consideration in this study, which focuses attention on the processing plants and distributors.

The first plant for pasteurization of milk and dairy products in the Mexican Republic was established in Mexico City in 1923, and began

¹Firm refers to "a legal entity which controls and operates and usually owns, one or more plants or establishments."
processing 25,000 liters daily.2 However, it was not until 1950 that the first processing plant started operations in Queretaro. There were two processing plants in the state, each processing 4,000 liters per day in 1964.3

Total production amounted to 173,500 liters per day in 1950 (Table 1).4 Most of the product was sold by dairy farmers directly to consumers either delivered or through intermediaries in the local community. Inspection and regulation of these enterprises were in the hands of local governmental agencies, but generally speaking, the regulations were not compulsory. Regulations requiring all milk sold in Queretaro to retail customers to be pasteurized has been enacted since 1973.5 This delay to promulgate and enforce a compulsory pasteurization law has been due to the lack of transportation facilities to assemble 20,000 liters per day from small towns located in areas with no easy access.

### TABLE 1. PRODUCTION PER COW, NUMBER OF COWS, AND TOTAL MILK PRODUCTION, QUERETARO, SELECTED YEARS.

<table>
<thead>
<tr>
<th>Year</th>
<th>Production Per Cow (liters)</th>
<th>Number Of Cows</th>
<th>Total Milk Production Per Day (liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>3.3</td>
<td>52,757</td>
<td>173,500</td>
</tr>
<tr>
<td>1955</td>
<td>3.3</td>
<td>64,525</td>
<td>212,900</td>
</tr>
<tr>
<td>1960</td>
<td>3.4</td>
<td>74,500</td>
<td>253,300</td>
</tr>
<tr>
<td>1965</td>
<td>3.4</td>
<td>83,905</td>
<td>285,200</td>
</tr>
<tr>
<td>1970</td>
<td>3.5</td>
<td>90,540</td>
<td>316,100</td>
</tr>
<tr>
<td>1975</td>
<td>4.1</td>
<td>123,850</td>
<td>507,700</td>
</tr>
<tr>
<td>1976</td>
<td>4.3</td>
<td>126,705</td>
<td>544,800</td>
</tr>
</tbody>
</table>

SOURCE: Agricultural and Animal Husbandry, Queretaro Office.

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3Ibid., p. 30.

4Agricultural and Animal Husbandry, Queretaro Office.

5Milk Pasteurization Law in Project since 1973, Public Health Statutes, Queretaro Legislation.
From a single plant pasteurizing milk for fluid use in 1950, the number has increased to 11 in 1976 (Table 2). The number of firms increased by more than one thousand percent during that period of time. This increase in plant numbers has been the result of an expansion in the number of milk cows in the area. There were 52,575 milk cows in 1950, increasing to 121,100 by 1976. Both the number of milk cows and total production increased, but at different rates. The number of milk cows increased annually by 8.9 percent, while total milk production increased by 12.1 percent per year.

### Table 2. Number of Processing Plants, Volume Processed, and Percentage of Milk Processed, Queretaro, Selected Years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number Of Processing Plants</th>
<th>Daily Volume Processed (liters)</th>
<th>Percentage Processed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>1</td>
<td>3,500</td>
<td>2.0</td>
</tr>
<tr>
<td>1955</td>
<td>2</td>
<td>8,000</td>
<td>3.8</td>
</tr>
<tr>
<td>1960</td>
<td>2</td>
<td>9,800</td>
<td>3.9</td>
</tr>
<tr>
<td>1965</td>
<td>3</td>
<td>13,600</td>
<td>4.8</td>
</tr>
<tr>
<td>1970</td>
<td>7</td>
<td>208,400</td>
<td>65.9</td>
</tr>
<tr>
<td>1975</td>
<td>10</td>
<td>478,100</td>
<td>94.1</td>
</tr>
<tr>
<td>1976</td>
<td>11</td>
<td>523,000</td>
<td>95.9</td>
</tr>
</tbody>
</table>

**Source:** Agricultural and Animal Husbandry, Queretaro Office.

However, the average output yield was very poor. Production per cow increased from 3.3 liters to 4.3 liters per day from 1950 to 1976. At this low-increase rate the projected yield of milk production per cow would be about 5.0 liters per day in 1985. This means that production costs for milk are high. Those factors which tend to increase production per cow and lower costs must be analyzed. Those factors may include:

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6 Agricultural and Animal Husbandry, Queretaro Office.
7 Ibid.
8 These figures were obtained by dividing total milk production per day by total number of milk cows older than two years.
1) feeding improved rations; 2) more widespread use of good sires through artificial insemination; 3) a decline in the number of small herds that tend to have lower than average production per cow; and 4) other improved management techniques. Although the focus of this study does not include the analysis of these factors, they must be considered in future studies due to their importance in the dairy industry.

**Size of Firms**

The size of each fluid milk processor was measured by the annual volume of milk, which the plant utilized for fluid milk products (Table 2). This information was assembled by the Agricultural and Animal Husbandry, Queretaro Office.

The distribution of plant-size categories has been altered by changes in plant numbers and total volume processed. The only two plants pasteurizing milk in the state during 1964 were established near and within the city, respectively. Of the 11 plants operating in the state, 8 plants were operating near the nucleus of production in 1976. This new location of firms contributed to increased efficiency of operation.

The 11 processing plants were divided into four size groups (Table 3). The daily average volume processed by each plant was 47,500 liters. Only three plants processed more than the average. Two of these firms comprised 60 percent of the total of all plants. Therefore, it was concluded that the greatest share of the fluid milk processed in Queretaro during 1976 was done by relatively few firms.

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<table>
<thead>
<tr>
<th>Daily Volume Of Milk Bottled (liters)</th>
<th>Number of Plants</th>
<th>Percent Of Total Percent Plants</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 9,000</td>
<td>3</td>
<td>27.3</td>
<td>5.3</td>
</tr>
<tr>
<td>9,000 - 25,000</td>
<td>3</td>
<td>27.3</td>
<td>9.2</td>
</tr>
<tr>
<td>25,000 - 50,000</td>
<td>3</td>
<td>27.3</td>
<td>26.0</td>
</tr>
<tr>
<td>50,000 and Over</td>
<td>2</td>
<td>18.1</td>
<td>59.5</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

SOURCE: Agricultural and Animal Husbandry, Queretaro Office.

Concentration

Concentration ratios are frequently used as a measure of size and number of firms in market structure studies. Concentration ratios (a measure of the market power of the largest firms) were measured in terms of the share of total volume processed within the market area in this analysis. The two largest firms, in the Queretaro market, processed 60 percent of the total, while the five largest firms accounted for 85 percent of the total production (table 4).

<table>
<thead>
<tr>
<th>Size Group of Firms</th>
<th>Total Volume</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Largest</td>
<td>311,000</td>
<td>59.5</td>
</tr>
<tr>
<td>5 Largest</td>
<td>447,000</td>
<td>85.5</td>
</tr>
<tr>
<td>8 Largest</td>
<td>495,000</td>
<td>94.6</td>
</tr>
<tr>
<td>All Firms (11)</td>
<td>523,000</td>
<td>100.0</td>
</tr>
</tbody>
</table>

SOURCE: Agricultural and Animal Husbandry, Queretaro Office.

The influence of the largest two firms, along with other technological and economic changes, has affected firm growth patterns and thus the level of concentration in the processing sector in Queretaro's fluid
milk industry. Specialization of this industry has tended to shift the emphasis of large firms toward wholesale operations and that of small firms toward retail operations.

A tentative classification of the dairy industry in Queretaro was made. Since the largest five firms control roughly 70 to 85 percent of total output, and the two largest roughly 50 to 65 percent, the fluid milk industry reached "high-moderate" concentration, according to Bain's classification. This means that the industry tends to be oligopolistic rather than "competitive."\(^{10}\)

The National Commission on Food Marketing has supplied the following reasons for the high concentration levels of firms processing fluid milk products:\(^{11}\)

1. By concentrating processing volume in fewer but larger plants, many firms are able to reduce operating costs;

2. Large processors are in a better position to sell to large retailers than are small firms, since they can offer the product volume and variety which the retailer needs;

3. Improved transportation facilities and new refrigeration equipment have significantly reduced transportation costs of fluid milk products; and

4. Many small processing firms have discontinued processing but continue to distribute milk processed for them by a larger firm.

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\(^{11}\) National Commission on Food Marketing, *op. cit.*, p. 84.
An important factor in analyzing concentration and competition in local markets is the extent of intermarket movement of packaged fluid milk. Many markets, which several years ago were relatively isolated and competitively self-contained, have been and are being invaded by processors who sometimes bring in milk from packaging plants located in other markets. Two principal factors appear to be responsible: 1) the major firms once had plants in the smaller markets, but have consolidated operations and now supply milk from a more efficient plant elsewhere and 2) distribution efficiency has improved to a point where entrance into smaller markets is a profitable means of market expansion.

One of the reasons that the Queretaro fluid milk industry had a higher level of concentration was that a local market generally is more concentrated than a larger one when measured in absolute numbers (largest 2, 5, 8 firms, etc.). The Queretaro market is indeed small when compared to the Mexico City market or other state markets handling higher volumes of output.

Product Differentiation

By definition, an undifferentiated product is one whose consumers cannot perceive any differences among brands. Within the dairy industry, not much can be done to physically differentiate one firm's product from

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another's. Milk is considered essentially a homogeneous product. Nevertheless, firms are using some method to differentiate their products like:

1. brand names;
2. types of container; and
3. advertising.

In the dairy industry, it is common that manufacturers' brands are owned and controlled by themselves. On the other hand, private labels are owned by retailers and products bearing these labels are sold exclusively in their own stores. Therefore, the importance of brands is derived mainly from the responses of final consumers who generally are not experts in product quality, but associate quality differentials with different brands. In large part, the importance of processor brands has been declining with the development of large supermarket chains because these have taken the responsibility for guaranteeing product quality and have convinced the consumers of this fact. However, this situation is different in the Queretaro area because most of the product is sold by home delivery. There is no distribution among firms regarding brands.

With regard to the type of container, not all firms process milk in both bottles and cartons. Some firms try to differentiate their product using one or the other container, telling the consumer the advantages of each one.

By using different messages to create an impact in the mind of consumers, firms utilize varying advertising methods to differentiate their product. One of the most successful slogans is: "Firm 'X' sold more liters of milk during the last year in the market than any other."
Conditions of Entry

Firms can enter a marketing area by establishing processing operations in the area itself or by shipping in products processed at a distance. The condition of entry (measuring the advantage of established over potential entrant sellers or, more precisely, the ability of established sellers to secure super-competitive prices without attracting new competitors) is difficult to measure precisely from available data. But barriers to entry can nonetheless be meaningfully estimated.

The large capital investment required for the establishment of a processing plant together with the minimum required raw milk volume are important barriers to entry.

The National Commission on Food Marketing found 31 firms began fluid milk processing in an area where they did not previously have operations. Of these firms, one-fifth were supermarket chains and one-fourth were dairy store operations. Of the 31 new market entrants between 1958 and 1964, all of those started by chain stores were still in operation at the end of the six-year period. Local firms that operated dairy stores and specialized in milk processing facilities had a high rate of failure. Almost half of those operating dairy stores and nearly one-third of the specialized dairy processing firms that attempted new market entry apparently were unsuccessful.¹⁵

Firm Location

As has already been pointed out, the two early fluid plants in Queretaro were located near the city limits. Because farmers were living

¹⁵ National Commission on Food Marketing, op. cit., p. 91.
beyond a convenient driving distance, most of the product was sold by the dairy farmers directly to consumers. Today, other locational aspects are likewise important, such as state order markets\textsuperscript{16} and transportation facilities.

It was discovered that the six largest cities,\textsuperscript{17} which accounted for 35 percent of Queretaro's population had 9 of the processing plants and the plants processed 94 percent of the total production during 1976.

Therefore, the location of plants in these six cities was implied to be related to the density of population and dairy cattle near the plants. The six respective municipalities in which the cities were located contained 88 percent of Queretaro's potential production.

\textbf{Summary}

In this chapter the market structure variables, number and size of firms, product differentiation, concentration, condition of entry, and plant location, have been discussed as to their individual importance and operations in the Queretaro fluid milk industry.

The number of processing plants has increased from one to eleven, and the processing milk volume has increased from 3,500 to 523,000 liters per day in the 26-year period. Concentration level in the Queretaro fluid milk industry was found to be high to moderate suggesting

\textsuperscript{16}State order markets refers to "a legal instrument issued to regulate transactions between farmers and buyers of fluid milk in specified geographic areas. Essentially, they required that milk dealers must pay specified minimum prices to farmers for milk used for different purposes, \textit{National Commission on Food Marketing}, op. cit., p. 41.

\textsuperscript{17}The cities were: Queretaro City, San Juan del Rio, Cadereyta, E. Montes, Tegquisquiapan, and V. Corregivora.
an oligopolistic tendency of the firms. Services and advertising are important sources of product differentiation on the retail level so long as brands and amount sold by a firm are important on the manufacturing level. The main barriers to entry are the acquisition of capital required to establish and operate a business as well as the minimum volume of raw milk required to operate at low cost. The location of the processing plants implied that the firms are established near production and not necessarily near consumption centers.

Likewise, it is evident that fluid milk operations in Queretaro tend to specialize rather than to integrate into production.

In the remaining chapters, market structure variables are discussed in relationship to the conduct and performance of the fluid milk industry.
CHAPTER IV
MARKET CONDUCT\(^1\)

Selected characteristics of market conduct of the Queretaro fluid milk industry are analyzed in this chapter as to the nature and consequences of competitive behavior expressed in various forms of price and nonprice competition.

Competition among sellers in a market is not only affected by market structure and legal and social control, but also by market conduct which roughly means "acts, practices, and policies" of sellers used in arriving at "what prices to charge, what outputs to produce, what selling costs to incur, what product designs to offer, and so forth."\(^2\)

An industry comprised of a limited number of firms may illustrate this distinction. In one case, each firm in the industry makes its output decisions independently and thus decides for itself how much to produce at the price generated by market forces.\(^3\)

Pricing Policies

Many practices, such as price fixing, price discrimination, and tying contracts, have been declared illegal in the free enterprise system whenever they have served to lessen effective competition.

This pattern of conduct is illegal when minimum prices are set by law. In Queretaro fluid milk industry, therefore, the price control system has substantially reduced the possibility for industry-determined price policies or practices.

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\(^{1}\) Market conduct refers to "the patterns of behavior which enterprises follow in adapting or adjusting to the markets in which they buy or sell," Bain, Joe S., Industrial Organization, John Wiley and Sons, Inc., 1968, p. 9.

\(^{2}\) Ibid., p. 303.

Queretaro Milk Price Control

The Queretaro producers, processors, and distributors were regulated as to the price which each received for his respective product by the Queretaro state legislature during 1970-1975. In its function of the establishment of prices, the legislature based its decision upon the average per unit costs for each individual liter of fluid milk produced, processed, and distributed within the boundaries of Queretaro. The cost and price conditions prevalent in this market were suggestions enough to expand the number of milk cows and processing plants. Therefore, the invasion of competitors' accounts, which may be attempted by nonprice competition, was not a surprise in the Queretaro dairy industry.

Effects of Price Control

It is hypothesized that federal milk order programs and state milk control have affected structure and competition in the dairy industry. States which set farm and resale prices have tended to price at a higher level than adjoining areas. This has caused outside milk plants to seek ways of sharing in the higher prices in the state-controlled markets. The National Commission on Food Marketing found that the original motivation for many state trade-practice laws has been to protect the small firms with limited resources from the larger firms which possess a greater capacity to engage in unfair practices. However, the result has been adverse since states cannot control interstate commerce and discourage the entry of milk from outside markets.

Since 1970, when state milk control started to regulate transactions between producer and processor in Queretaro, setting minimum producer and resale prices, more than four small firms have gone out of business. The main criticism for this program has been the lack of a price control commission which analyzes in-depth factors, such as cost of processing and distribution, optimum size of processing plant, transportation, etc. which are required to establish an effective state milk control. The intervention of price control has kept prices from going as high as they would have gone in the absence of regulation. The prices that have prevailed in Queretaro are shown for selected years in Table 5. These data are reproduced in graphic form in Figure 2.

**TABLE 5. PRICING BEHAVIOR IN QUERETARO MARKET FLUID MILK PRODUCER AND RETAIL PRICES, SELECTED YEARS, 1950 TO 1976.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Producer Price Per Liter (pesos)</th>
<th>Retail Price Per Liter (pesos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>0.90</td>
<td>1.10</td>
</tr>
<tr>
<td>1955</td>
<td>1.40</td>
<td>1.60</td>
</tr>
<tr>
<td>1960</td>
<td>1.80</td>
<td>2.10</td>
</tr>
<tr>
<td>1965</td>
<td>2.10</td>
<td>2.40</td>
</tr>
<tr>
<td>1970</td>
<td>2.60</td>
<td>3.00</td>
</tr>
<tr>
<td>1975</td>
<td>3.40</td>
<td>4.10</td>
</tr>
<tr>
<td>1976</td>
<td>4.39</td>
<td>5.50</td>
</tr>
</tbody>
</table>

**Nonprice Competition**

Various forms of nonprice competition\(^5\) are used by firms to attract customers and increase sales, such as: cooperative advertising, refrigeration, and storage facilities, free milk and other dairy products for

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\(^5\)Nonprice competition refers to "the competition among sellers involving nonprice factors, the value of which may not be readily determined by buyers," Manchester, A. C., *Organization and Competition in the Midwest Dairy Industries*, the Iowa State University Press, Iowa, 1970, p. 333.
specific consumers, and financing. However, it is hypothesized that the amount of advertising per unit of fluid milk processed represents the most common nonprice competition measure utilized in the dairy industry.

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According to the data provided by the Agricultural and Animal Husbandry, Queretaro Office, the average advertising expenditures for the 11 firms involved in the processing and distribution of fluid milk products was estimated to be 93.50 (pesos) per 1,000 liters of milk processed in 1976, or 0.0935 per liter. This amount represents 1.7 percent of the retail price of the product during 1976.

Another factor utilized to measure the nonprice competition in this industry is the amount of the firm's total production sold under its own brand name. This measure was used since, if an individual firm could establish another outlet for its production through the use of a private label, it would be expected that the demand for the firm's product would be increased to some degree.

Based on figures obtained from the Queretaro Agricultural and Animal Husbandry Office it was found that 96 percent of the total sales made by the firms comprising the fluid milk industry were under the firm's own brand names. In spite of the fact that private labeling has little significance on the demand for the product, it is revealing that private labeling practices were done by the largest firms in the industry. A small firm usually does not have private label outlets. Only large firms can handle an adequate volume for private label accounts.

From those two forms of nonprice competition observed by firms in the Queretaro dairy industry, it was concluded that the 11 firms are practicing this advertising form with a view to increasing sales. Nevertheless, it is a fact that due to the shortage of the product that

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7A private label refers to a label which was owned by another distributor, such as a supermarket chain. Brand name label was one which was owned by the processor.
exists not only in the area but even in the whole country, dairy industry firms are using advertising just as a brand name rather than nonprice competition goal. It was found that fluid milk products did not require advertising expenditures to be demanded by consumers.

**Merchandising Methods**

Fluid milk products are distributed to consumers by home delivery and through stores in both glass and carton containers. In the 1950's and 1960's in was not uncommon for over 95 percent of all sales of fluid milk in Queretaro area to be on home delivery routes and 5 percent or less through wholesale outlets. However, in 1976, in the Queretaro urban area, the sales of fluid milk were 60 percent by home delivery and 40 percent through wholesale. Most of the shift from home delivery to store sales has taken place since 1970 and was influenced by the rise of supermarkets and small grocery stores in Queretaro.

The use of glass containers has prevailed for fluid milk distribution in the Queretaro market. Paper containers made their appearance during early 1970, but acceptance has not been widespread. Nevertheless, the increased use of paper and other single service containers has been concurrent in some proportion to the increase in fluid milk sales through retail stores. It was estimated that 70 percent of the fluid product in 1976 was distributed in the Queretaro area in glass containers and 30 percent in single service paper containers. Because bottle deposits and the system of returning empty bottles is more complicated for consumers, now the paper container has become popular in Queretaro.

To determine the primary channel of distribution utilized by processors, percentages of sales including wholesale and retail were analyzed.
It was estimated that 83 percent of the total milk processed in Queretaro was sold at the wholesale level out of state by the seven largest firms. Only 17 percent of the total milk processed was sold by the four smaller firms at the retail or home delivery level in the Queretaro urban areas.

It was found that small firms sell the product in the local markets and larger firms to distant markets. Those small firms accounted for 17 percent of the product sales. This low percentage represents consumption within the state, which has been decreased due to the high retail price.

In a study of Minnesota's fluid milk processing industry, it was discovered that the proportion sold wholesale increased as firm size increased, and that the smaller firms did not have sufficient volume to supply large markets, so the small firm had to rely upon retail and home delivery sales. 8

This same dependency has been observed in the Queretaro dairy industry. Small processors supply local consumption by home delivery service and through small grocery stores. On the other hand, large processors, having transportation facilities, outlets, and equipment to supply large supermarkets, transport the product to those areas where population, sales, and price are higher. This fact has provoked a decrease in the per capita consumption in Queretaro's population.

This section has satisfied the second objective of this study which was to discuss the market conduct of the industry. The pricing policies of the industry regulated by the Queretaro state legislature were discussed.

8 Erlandson, *op. cit.*, p. 89.
Also, it was revealed that advertising costs comprised no great proportion of total cost and no significant difference between firms.

Likewise, it was suggested that the larger the firm, the lower the percentage of sales under its brand name.

In the subsequent chapter, the market performance variables of the industry are discussed. How the variables are involved and their relationship to each other is analyzed.
CHAPTER V

MARKET PERFORMANCE

The measurement of how well the market activity of enterprises contributes to the enhancement of the general welfare is known as market performance. The main purpose in determining market performance is to measure and evaluate such factors as: 1) the efficiency of the industry in terms of size of firms, processing, and distribution; 2) the relationship of price to cost as reflected in the profit rate; and 3) the utilization of plant and equipment to determine the plant's capacity.

An examination of these factors so closely indentified with market performance is essential to a complete analysis of the fluid milk industry.

Efficiency

The relative efficiency of processing and distribution has a considerable impact on the welfare of the enterprises bottling fluid milk. Efficiency is also a matter of concern to the consuming public. Inefficiencies add to costs and add to the price paid by consumer.  

Total operating costs, which were estimated in this analysis, will consist of the following components: costs of processing, delivery, selling, and overhead. It will not include the cost of raw milk.

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1Efficiency in this study is measured by the level of unit costs of production attained by the processing plant in supplying any output that is producing.

Processing costs will include all in-plant expense items such as containers, labor, repair, fuel, and rent. Delivery costs include wages to delivery men, repairs, maintenance and depreciation of delivery vehicles, and similar costs that are involved with the distribution of milk. Selling costs include expenses connected with advertising and promotion, including wages and salaries paid to salesmen, but do not include any remuneration to delivery personnel. All other costs are included in the category of overhead costs. These costs include all administrative and office salaries; all charges such as taxes, interest, insurance, and similar fixed costs that cannot be allocated to one of the other categories.

To get an idea of the relative size and importance of the four components of total operating costs, this study has estimated the following information regarding the Queretaro fluid milk industry:

<table>
<thead>
<tr>
<th></th>
<th>Per Hundred Liters (Pesos)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing</td>
<td>55.0</td>
<td>57.9</td>
</tr>
<tr>
<td>Delivery</td>
<td>24.32</td>
<td>25.6</td>
</tr>
<tr>
<td>Advertising</td>
<td>1.62</td>
<td>1.7</td>
</tr>
<tr>
<td>Overhead</td>
<td>14.06</td>
<td>14.8</td>
</tr>
<tr>
<td><strong>Total Operating Cost</strong></td>
<td><strong>95.00</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Processing Cost

Processing cost in this study includes all the labor, fuel, electricity, containers, repairs, and other similar expense items that are directly connected with the processing and packaging of fluid milk products.

An estimation in this study shows that the processing cost of all 11 plants averaged 55.00 per hundred liters processed during 1976, or
.55 per liter. This percentage was obtained with an average of 47,545 liters processed per day. It was estimated that a variation in cost ranged from a low of 25.00 per hundred liters to a high of 99.50, a figure nearly four times the amount of the lower cost firm. Results also indicate that unit processing cost varies inversely with the volume processed.

A Vermont study demonstrates similar economies of size in fluid milk processing. A plant processing 9,315 pounds daily (21,230 liters) had a processing cost of 61.00 per hundred liters. It concluded that smaller plants had higher cost per unit processed.

Extreme caution must be exercised in interpreting these findings. It is important to realize that in the case of many of these estimations, plants may not be operating at an optimal point on their average cost curves. Many of the plants could double, and a few could triple, their output without any plant expansion. In view of this fact, Erlandson points out that plants which are operating at a small fraction of their capacity are not operating at their low-cost point. Also, he comments that the rational decision in these cases would be to increase production with some risk due to the fact that fluid milk plants operate under market restraints and severe competition exists to limit expansion possibilities. It is the market limitations and cost considerations which place the smaller firms at such disadvantage.

In his Minnesota study, Erlandson found considerable variation in processing costs between four types of ownership. The average of the

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cooperatives was the lowest with $1.83 per hundredweight. The partnerships were higher with $2.02, and the highest was for the sole proprietorship with $2.44.

Delivery Cost

This category of costs include wages and commissions of all delivery personnel; that is, all drivers delivering to both wholesale and retail customers. It also includes costs of repairs, maintenance, operating expenses, and depreciation of delivery vehicles. It does not include any remuneration to salesmen whose primary responsibility is selling rather than delivering milk.

The average delivery cost for the 11 plants was 24.32 (pesos) per hundred liters of milk processed in the plant. No distinction was made for wholesale versus retail delivery, since this information was not available. The range in delivery costs was estimated from a low of 6.20 per hundred liters processed to a high of 67.20.

No pattern of delivery costs is apparent relating to size of plant, due to the fact that small plants sell a high proportion of their output at the retail level (home delivery is costlier than large volume deliveries), and large firms sell a high proportion of their output through wholesale channels.

In a Georgia study, it was found that the unit cost of home delivery decreased from $.14 to $.05 per quart when the volume per customer increased from two quarts to eight quarts per delivery. This same study

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*Purcell, J. C., J. D. Goodwin, and J. C. Elrod, Fluid Milk Distribution in Georgia Costs and Alternatives, Research Bulletin 17, University of Georgia, November, 1967, p. 17.*
reveals a cost saving of $.07 per unit on the wholesale level as volume per customer increased from 10 to 100 quarts.

Referring to type of ownership, Erlandson found in his study\(^7\) that the average delivery costs were very similar between three of the four types of ownership. Cooperatives averaged $.86 per hundredweight as compared with $1.30, $1.59, and $1.56 for proprietorships, partnerships, and corporations, respectively.

It was concluded that delivery cost would be lower for plants which supply other jobbers and distributors. It is also reasonable to expect that plants which distribute in large semi-trailer trucks would have lower delivery costs.

Overhead Costs

Many expense items do not logically fit into the two categories already discussed. Under the heading of overhead costs, all fixed costs such as insurance, interest, office and clerical expense, and other administrative cost items are listed.

The average overhead cost for all plants included in the Queretaro dairy industry was estimated at 14.06 (pesos) per hundred liters processed. But, again, the range in estimates was considerable, from a low of 2.62 to a high of 37.40 (pesos) per hundred liters processed.

Even though the range in overhead costs is exaggerated, no clear pattern of overhead costs in relation to size of plant is discernible.

A relationship between average overhead cost per hundredweight and type of ownership was found in a Minnesota study.\(^8\) Corporations have

\(^7\) Erlandson, op. cit. p. 129.
\(^8\) Ibid., p. 132.
the highest overhead costs of $.98 per hundredweight, while the other three types of ownership have considerably lower costs. Proprietorships are lowest with $.44, followed by partnerships with $.56, and cooperatives with $.59 per hundred weight.

In order to answer the question of efficiency, it is imperative that the sum of all costs of processing, distribution, and promotion must be investigated carefully in order to conclude that firms in the dairy industry are operating efficiently.

In this study, because of the lack of information, it was not possible to determine a reliable level of efficiency in the Queretaro dairy industry. However, on the basis of those figures provided by Queretaro's Agricultural and Animal Husbandry Office, it was estimated that firms operating during 1976 showed a low level of efficiency.

Operating costs for the 11 firms in Queretaro milk industry averaged more than 25 percent of the total cost of the product including raw milk. The range of the operating cost was wide. One plant had an estimated total operating cost of only 43.70 (pesos) while another operated at an annual rate of 146.00 (pesos) per hundred liters processed. These figures seem to indicate that utilization of plant capacity is a very important determinant in reducing processing costs.

It is admitted that several factors are affecting the dairy industry in Queretaro. But also should be admitted the lack of efficiency for those firms in Queretaro whose higher operating costs make the product price higher. As has already been pointed out in Chapter IV, the highest increase observed in the product price during the last 50 years, was in the six-year period from 1970 to 1976. This increase has been attributed to three main factors. First, the fact that neither large
nor small firms have reached an appropriate level of efficiency which is required to operate with lower operating costs. The second factor affecting this industry is the economies of size. Small firms have not reached the minimum size plant which is needed to justify the investment in automated equipment. The last factor, but not least, is the inflation in Mexico's economy which has increased from an annual rate of 3.5 percent in 1970 to about 60.0 percent in 1976. It observed an average annual rate of 22.0 percent during the six-year period. Since then, however, the increase in consumer prices has been slowed to about 15 percent annually.

**Plant Capacity**

A second area of performance that must be investigated in determining the capacity at which plants are operating is percentage of utilization of plant and equipment observed by the firm. This can be done by determining the number of hours per week that firms are currently operating.

In a study carried out in the Minnesota dairy industry 100 hours per week was considered an attainable maximum. This permits 20 hours of daily operations and four hours' cleaning and servicing five days per week, or 140 hours per week, which was considered in that study as the 100 percent capacity. On this basis, it was found that 27 plants were operating at an average rate of less than 41 percent. Therefore, those 27 plants in Minnesota, by merely hiring additional workers and making

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10 Erlandson, op. cit., p. 138.
no changes within the plant, could increase the total output of the industry nearly two and one-half times. This is without taking into account delivery or storage, only processing.

But it is not possible to maintain 100 percent of capacity throughout the year, due to the seasonality of milk production. Milk production during the winter time is lower than summer milk production. Thus, processing plants must have enough of a range in capacity to be able to process the highest amount received during the high-production season.

Returning to the plant's capacity in the Queretaro dairy industry, once again data for this section was not obtainable; therefore, the average rate at which plants in Queretaro are operating cannot be estimated.

**Profit Margins**

Profits have always been an important motive for firms in the free enterprise system. The profit motive should contribute to the national economic growth and the welfare of society. The search for profit provides the incentive, and the accumulation of profit provides some funds for technological innovation.

In this study, profit is defined as the residual after subtracting all costs from total revenue. Costs include raw material costs and all accounting expenses of labor, repairs and maintenance, depreciation, cartons, interest, taxes, and utilities.

The average profit rate for the 11 Queretaro fluid milk plants was estimated to be .16 (pesos) per liter of milk processed, or slightly less than 3 percent of the net profit of sales of fluid milk products.
The highest level was 3 to 4 percent for the firms processing over 20,000 liters per day, while plants under 9,000 liters had a level of 2 to 3 percent net profit as a percent of sales. ¹¹

Since fluid milk prices were administered by the state legislature based upon the industry's average per unit cost of processing and distribution, a firm which operated above the industry's average cost incurred a loss, while a firm below the industry's average cost acquired an economic profit.

In the analysis made by Erlandson ¹² in the Minnesota dairy industry, he found that firms packaging less than 1,400 pounds per day had an average loss of $.48 per hundredweight, while the largest firms packaging 28,000 pounds daily or over had an average profit of $.23 per hundredweight.

Likewise, in a study of the National Commission on Food Marketing, ¹³ it was found that firms having under $50,000 total assets had negative profits in the aggregate while firms with assets of $250 million or more averaged 2.7 percent profit on sales and 9.1 percent on net worth.

This means that both variables, volume processed and investment, have a relationship to profits obtained.

Other Factors Outside The Firm

The past changes in the organization of the Queretaro fluid milk industry have resulted from the interaction of technological, institutional,
and economic developments in the dairy industry. The developments have occurred in all sectors of the dairy industry from farm production to consumption.

At the producer level, technological developments in the form of selective breeding, improved feeds, and better feeding practices have resulted in an increase in production per cow, even though the yield has not reached the same level as that observed by northern firms. Technological developments also have provided for increased mechanization. This trend, aided by rising costs of labor, has resulted in the substitution of capital for labor. The large amount of capital required for technological improvements has resulted in the exit of some marginal producers. At the producer level, the trend is to a smaller number of dairy farms and a smaller total number of cows.

Changes in Transportation

Bulk handling and improvements in roads and trucks have been major technological developments in the dairy industry. For many years, milk was transported in 40-liter cans, which were hauled by individual farmers, trucks from milk plants, or independent truckers. Poor roads and zero or inadequate refrigeration on the farms prevented any long-distance movement of milk between farm and plant.

Improved roads, refrigeration, and transportation equipment have now made it feasible to move milk greater distances. Parallel developments have been the replacement of the 40-liter milk can with farm bulk tanks and new processing techniques. The adoption of new processing techniques created pressure on milk plants to increase the volume of milk handled in order to reduce unit processing costs. One way to do
this was to enlarge the procurement area and buy milk from farmers selling to other plants. In many areas, the competitive pressure for more milk, which is required by the Mexico City market, has led to a crisscrossing and overlapping of farm milk pickup routes and an increase in the cost of milk assembly.

Changes in the Distribution Routes

Fluid milk products are among the few foods that are distributed to consumers in substantial amounts both by home delivery and through stores. For many years the predominant method of selling fluid milk products to consumers was by home delivery and deliveries were usually 6 or 7 days a week. However, during the last five years this situation has changed substantially.

While the sale of milk by home delivery has been declining for some time, this trend may be leveling off and in some areas even changing direction. Home delivery appears to be increasing in high-income suburban communities while declining in the poor and older urban areas.

On the other hand, in the wholesale milk distribution system, there are economies of delivery to large consumers compared to small customers. The wholesale delivery of milk to retail stores is known as full service. With this type of delivery, the route driver obtains the order from the store, arranges the order in the truck, delivers to the store, restacks the dairy case, and makes collections.

Restaurants, schools, hospitals, factories, and industrial cafeterias are wholesale customers that are usually served by full service. In many cases these outlets have limited refrigerated storage space and/or delivery service area that cannot accommodate large equipment.
Noneconomic Considerations

In addition to the economic benefits, there are noneconomic factors that should be considered in the Queretaro dairy industry. Technological changes in the farm sector can increase farm size and specialization, and curb the outward migration from rural areas to large metropolitan areas. The ideology of farming as a way of life can give way to farming as a market-oriented business enterprise.

The fluid milk industry in Queretaro has grown rapidly during the last five years. The employment possibilities for people living in the community is one of the benefits which has been brought in by this enterprise source. Likewise, the tendency of people to migrate to large metropolitan areas has been diminished by establishing businesses in rural or smaller areas, rather than increasing population in over-populated areas like Mexico City. Both investors and the community in Queretaro have been favored by the dairy industry. The businessmen have found rural wages cheaper than in larger cities, and the local community has received better quality products, prices, and service. This multiplier effect has been made possible by producers, processors, and distributors who integrate the industry. The welfare of many individuals has been affected positively by providing or increasing their incomes. Likewise, the market opportunities that dairy farmers lacked, now result in better treatment and benefits.

Summary

In this chapter, the market performance variables — efficiency, profit margins, and utilization — have been discussed.
It was found that efficiency as measured by processing costs was associated with the size of the processing plant. The larger size firms had lower processing costs. The profit rate per pesos sales for the 11 firms in the industry was estimated at 2.9 percent. Also, there appeared to be some relationship between sales volume and profit rate per pesos sales.

In the final chapter of this study, the results are gathered together to analyze implications and areas of further study in the fluid milk industry of Querétaro.
CHAPTER VI

SUMMARY, IMPLICATIONS, AND CONCLUSIONS

Summary

This study analyzed the market structure, conduct, and performance variables related to the organization of the fluid milk industry in Queretaro through the use of a market structure approach.

It was found that the average processor in 1976 utilized 47,500 liters of milk for fluid milk products with three of the 11 firms processing above the average. Two of the firms processed 60 percent of the total production in the industry in 1976. The largest five processed 85 percent, which results in the industry being classified as high to moderate concentration.

The increasing concentration of firms was associated with the exit of small firms and growth of the large firms. Important factors contributing to this trend included processing technologies, innovations in distribution, and changes in merchandising methods.

The number of processing plants is increasing in Queretaro as a result of an increase of milk cows. The number of plants has increased from one to 11 in those 26 years. Meanwhile the number of cows has increased at an annual rate of 9.1 percent, or approximately 2,750 milk cows per year since 1950 to 1976. The tendency is more milk cows but smaller size of the dairy farms.

The largest size farms were situated in the five major shopping center cities in which about 40 percent of Queretaro's population resided, and the six municipalities contained 70 percent of the state's dairy cows.
Since pricing procedures were regulated in the Queretaro dairy industry the market conduct variables analyzed were nonprice competition and merchandising methods. It was found that advertising cost was approximately 1.6 cents per liter of fluid milk with no significant difference between firms.

The average percentage of total production which the industry packaged under the firms' brand names was 96 percent, with the larger firms processing a greater proportion under a private label. The average percentage of sales sold wholesale was 84 percent with significant difference among firms. The larger firms have tended toward wholesale operations and small firms toward retail operation.

It was hypothesized that, as a firm increased its size, the firm's per unit operation costs would decrease. The average operation cost for a liter of homogenized fluid milk was 0.95 pesos, composed of the following per-unit costs: processing, 0.55 pesos; delivery, 0.24 pesos; advertising, 0.16 pesos; and overhead costs, 0.14 pesos. The average of the net profit as a percent of sales was 0.16 pesos per liter of fluid milk sold.

It was concluded that the level of efficiency observed for those processing plants in Queretaro was relatively low. The nonutilization of plant capacity increased processing costs, representing more than 25 percent of the total product cost.

Two factors interact to determine the location of fluid milk plants in Queretaro -- population density and source of milk supply. About one-third of Queretaro's half million people live in the metropolitan areas of Queretaro, San Juan del Rio, Tequisquiapan, Cadereyta, E. Montes, and V. Corregidora. These areas have been setting the minimum
price paid to producers and the maximum retail price. The total volume of fluid milk processed in 1976 was handled by regulated plants. This fact establishes the importance of population on plant location.

Of special importance to the industry have been the changing patterns of milk distribution. Supermarkets and grocery stores have taken over a third of fluid milk merchandising. Paper containers have become popular in Queretaro. It was estimated that 30 percent of the fluid milk was sold in single-service paper containers in 1976.

Because 83 percent of the total milk processed in Queretaro was sold in the wholesale system, it was concluded that small firms were selling the product in the local market and large firms to distant markets.

It was found that federal and state milk control have affected structure and competition in the dairy industry. Since state milk control set farm and resale prices, the prices have tended toward a higher level than in adjoining areas. The average retail price observed during the 26-year period increased 15 percent annually.

Bulk handling and improvements in roads and trucks have been major technological developments in the dairy industry. The location of this new employment source has improved the welfare of people living in small areas by creating jobs as well as curbing the outward migration of people from small to large areas.

Implications

It is believed that since the largest two plants processed 60 percent of the total production of fluid milk products in the Queretaro dairy industry, the remaining production could be processed by three
additional plants equal in size to the average of the two largest. Since there is underutilization of plants and equipment within the industry, any additional output required could be supplied by the five plants by raising their utilization of plant and equipment. Therefore, lower per-unit costs would result due to reduced processing costs, return on investment, and wholesale distribution costs. Nevertheless, with a decrease in the number of plants and an increase in their average size, the employment opportunities within the industry will decrease.

The industry might integrate into production, assembly, or merchandising of fluid milk rather than specialize their operations. Fluid milk was the dominant product in the 11 plants in 1976. Most of their secondary operations tend to process a small amount of fluid milk.

The industry might also do well in providing more funds for research in dairy production. By doing so, both yields per cow and total production could be increased.

Regulatory agencies must review the state milk control programs, analyzing the different costs of the product for setting price.

The need for further study in Queretaro's fluid milk industry is indicated by the estimations made by this outline. Studies to determine the precise market structure, conduct, and performance should be carried out by surveying directly factors which were implicated in this study. To determine optimum size and location of fluid milk processing plants in Queretaro are other needed studies which would be of great benefit in future planning of the industry.
Conclusions

Rapid and important changes have taken place in the Queretaro fluid milk industry in recent years and will continue to take place in the future. With changing size, number, and location of firms, the competitive actions will change also. These changes are likely to bring about changes in the overall performance of the industry.

The fluid milk industry in Queretaro is an expanding industry. The total size of the industry is increasing and the average size of the processing plants is increasing. If present trends continue, it is likely that the average processing plant will be three times as large as it was in 1976. The firms will be located in or near the larger production centers throughout the state.

It was hypothesized in this study that, since the per-unit processing costs decreased as the plant size increased, there were economies of size anticipated. However, as the remaining fluid milk in-plant, distribution costs, and the plant size were not determined due to the lack of data, the optimum plant size was unable to be calculated.

Much inefficiency exists within the industry, and the performance is in question concerning this dimension. Per unit cost of operation would be reduced and profit rates enhanced if there were better utilization of resources. This is an achievable goal for the industry. By merging or by acquisition, two or more smaller firms could gain the benefits of fuller utilization of labor and equipment as well as the economies associated with large size. At the same time, by retaining their original customers (wholesale and retail), their sales volume and market share would be assured. Because the cost reduction is so substantial, the firm divesting its processing facilities could likely
obtain packaged milk at a lower cost than it could process it in its own underutilized plant and could, thereby, enhance its profit position by continuing in business as a distributor only.

If the industry would follow a policy of merger or some other form of cooperative arrangement between firms, concentration would undoubtedly increase. However, this concentration would not necessarily impair the conduct nor the performance of the industry. Efficiency of plant operation would be increased because of fuller utilization of plant and equipment. Profit rates would likely stabilize at a level sufficient to insure adequate reinvestment and replacement of worn-out capital items. Consumer would be assured of an adequate supply of wholesome milk at competitive prices. Finally, local producers would continue to have a market for their dairy production.

Trade associations can provide valuable assistance in promoting efficiency in the processing and distribution of fluid milk products. Information on mergers is especially helpful. Research agencies (public and private) are likewise helpful when accurate, reliable, and pertinent cost analyses are made available as guides to industry decision makers. Studies indicating costs and benefits of substituting capital for labor are especially helpful.

Subsequently, it is suggested that future studies of the fluid milk industry be concerned with the trends firms exhibit in their utilization of the resources -- plant, equipment, and labor; the fluctuations in operating costs; and the competitive actions which firms utilize over a period of years. Also, since it is expected that several firms will enter the industry, a study dealing with plant location and the optimum size of a processing plant would be valuable.
Concerning the location of fewer and larger processing firms, studies determining procurement and distribution/transportation costs would be useful in determining per-unit delivery costs at various distances from the processor, such as 50, 100 km, etc., in both wholesale and retail systems. This would aid in strategically locating producers, processors, and distributors within the market.

Concerning the optimum size of processing plants, future studies should be concerned with the magnitude and relative volume ranges where plant economies occur.

Consumption of Milk and Dairy Products

It is difficult to accurately estimate per capita consumption of milk and dairy products to date due to the lack of information, but it is a certainty that the consumption rate is low. Based on the total fluid milk consumed, domestic plus imported, per capita consumption in 1964 was 102 liters per year, that is, 280 c.c. per day. Nevertheless, it is estimated that actual consumption is lower, since the population in Mexico has increased faster than milk production. According to Mexican nutritionists, the per capita consumption of fluid milk should be 600 c.c. per day. This means that Mexico is hungry and thirsty for milk. During the last five years, milk production has increased steadily; and it is believed that, as the economy of the country expands, the consumption of all types of dairy products will go up even faster.
Importance of the Dairy Industry in the Mexican Economy

Having one of the highest birthrates in the world, the food supply for the Mexican population has become a big problem in the country. Over the last decade, a series of problems in Mexican agriculture reached crisis proportions. A reduction in the increase of public and private investment in agriculture, credit access difficulties, and the lack of a planned agricultural policy has caused a tremendous increase in the price paid by consumers for agricultural products, a decrease in real incomes, and the necessity of importing cereals, milk, and other agricultural food stuffs.

Of the 64 million people living in this country in 1976, 50 percent of them are under 20 years old. Under this situation the fluid milk industry plays a big role in the diets of individuals and in the national economy. During the last two decades the total milk production in Mexico has increased about 100 percent. However, the total milk consumption has not been satisfied and Mexican dairy imports have increased every year. Mexico imported $75 millions worth of dairy products in 1975. Comparing this amount with $10 million in 1965, ten years before, the rate of Mexican imports for dairy products increased 650 percent in the ten-year period.

The importations of dairy products are estimated to reach $150 million annually by 1985, assuming a constant rate. This represents a considerable impact on the economy of Mexico.

An expansion of the study to a regional or larger level is needed. An expanded study could provide valuable information for defining market areas, supply areas, and the prices consistent with intermarket price
alignment. Differences in production costs could be considered in the assembly cost function in order to provide a more meaningful delineation of supply areas. Technological advances in assembly, processing, and distribution, along with the improvement in highways and an increase in the concentration of population in large urban areas, suggest that adjustments in the direction of large plants in a region rather than a state may occur in the not too distant future.
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