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A Study of Beer Consumption Trends in Montana

Cole Kevan Lovett
The University of Montana

A Study of Beer Consumption Trends in Montana

By

Cole K. Lovett

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Approved by:

J. Holton Wilson
Chairman, Examining Committee

John B. Stewart
Dean, Graduate School

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789 East Eisenhower Parkway
P.O. Box 1346
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CHAPTER I

INTRODUCTION

Purpose

The purpose of this study was to analyze and model beer consumption trends in the state of Montana on both a seasonal and an annual basis. The most appropriate models have been used in generating forecasts of future beer demand in Montana. Forces endogenous and exogenous to the brewing industry have been used in tempering these forecasts; that is, the quantitative forecasts were moderated by qualitative or judgemental factors based on the analysis of the industry presented in Chapter II.

Background

The Early Years

Some form of a beer-like alcoholic beverage has been a part of human culture for at least six thousand years.[1] In ages past there were as many different types of beers as there were venturesome brewers. Each beer was

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[1]Edward H. Vogel et al., The Practical Brewer: A Manual for the Brewing Industry (St. Louis: Von Hoffman Press, 1946), p. 187.

a reflection of the imagination and skill of its brewer, and all were different.

The nature of the brewing process has undergone extensive transformations. Beer was originally brewed by an individual for his own personal consumption by employing a very simple process. Agricultural products left over from the previous harvest were allowed to ferment with a judicious amount of heat and water. Today, the brewing process is highly automated and quality controlled, to the extent that most beers are similar in appearance and taste.[2] There is also evidence that a higher price connotes higher quality.[3]

The work done by a Frenchman, Louis Pasteur, approximately ninety-three years ago foreshadowed the change in the nature of the brewing process. His discovery of the pasteurization process had far-reaching effects on the brewing of beer.

When beer is pasteurized, it does not have to be kept cool in order to retard spoilage. Before the widespread pasteurization of beer, all brewers produced beer

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[2]William F. Glueck, Business Policy: Strategy Formation and Management Action, 2nd ed. (New York: McGraw-Hill Book Company, 1976), p. 570.

[3]See Steward H. Rewoldt, James D. Scott, and Martin R. Warshaw, Introduction to Marketing Management: Text and Cases, revised ed. (Homewood, Illinois: Richard D. Irwin, Inc., 1973), pp. 177-90; Glueck, Business Policy, p. 570; and "An Experimental Examination of the Price-Quality Relationship," Journal of Business, October 1968, p. 442.

only for the local market (or only for their personal consumption) because it quickly spoiled when transported to other markets. Also, the production of beer was highly seasonal because of the requirement for tremendous amounts of ice for cooling in order to retard spoilage. For example, the typical brewer who produced beer for the public, brewed as much beer as possible during the spring and kept it cool with ice gathered throughout the winter. If all worked according to plan, the beer and ice would run out at the same time, usually by the middle of the summer, with little or no spoilage.

Furthermore, the costs associated with the transportation of nonpasteurized beer were probable high enough to prohibit enterprising brewers from attempting to serve other than the local markets. Costs would have increased so steeply (due to higher handling costs, ice for cooling, and high transportation costs for labor and special equipment) that they would not have been able to compete with local brewers endogenous to the new market area. In addition, the residents of the new market areas may not have been receptive to an outsider who was trying to take business away from their friend, the local brewer.

However, Louis Pasteur's discovery of the pasteurization process enabled brewers to expand into other than local markets on a level more competitive with their endogenous rivals. This stimulated considerable change in

the production and marketing of beer.

Beer in America

Beer and the brewing industry have existed in this country since its founding; beer and brewing expertise accompanied the first settlers from Europe. The first brewery in this country was established on Manhattan Island in the early 1600s.[4] It is not an exaggeration to say that beer and distilled spirits helped tame the wild frontier.

However, attitudes toward alcoholic beverages changed, and by the start of the twentieth century, considerable opposition to production and sale of such beverages had developed. On October 28, 1919, Congress passed the Volstead Act which opposed the sale of alcoholic beverages. Then on January 16, 1920, the eighteenth ammendent was ratified, initiating the era of prohibition. Thirteen years later, on March 22, 1933, President Roosevelt signed the Cullen-Harrison Bill, once again legalizing the sale of alcoholic beverages.[5] The twenty-first ammendment, which repealed the eighteenth ammendment, was eventually ratified by all the states ending the era of prohibition or the era of legislated

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[4]The Brewing Industry in the United States: Brewer's Almanac (Washington, D.C.: United States Brewer's Association, Inc., 1975), pp. 76-77.

[5]Vogel, Practical Brewer, pp. 190-1.

abstinence.

The period of prohibition has been researched in detail and has been the subject of many publications.[6] A discussion of prohibition is beyond the scope of this paper, however, there is one point worth mentioning. It took the nation and the brewing industry forty-two years to recover from the effects of prohibition. That is, per capita consumption was at a peak of 21.0 gallons in 1914 and it did not reach that level again until 1975, when it reached 21.4 gallons.[7]

Overview

Chapter II focuses on the economics of the brewing industry as a whole. The movement toward concentration (oligopoly), on a national level, is analyzed. Also, the Lorenz Curve and the Herfindahl Index are employed to illustrate changes in market share by the brewers. Chapter II provides the basis for qualitative imputs to forecasts of future beer consumption in Chapter V.

In Chapter III the general characteristics of the supply and demand of beer in Montana are outlined. The history of the price of a popular brand of beer is traced

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[6]See for example Andrew Sinclair, Prohibition: The Era of Excess (Boston: Little, Brown and Company, 1962).

[7]Brewer's Almanac, 1976, p. 13.

under the assumption that this particular brand is representative of general beer price movements. Legal barriers prohibiting the entry of new beer/liquor establishments into the market are investigated--affecting the supply side. This section is also used in qualitatively tempering the forecasts in Chapter V.

The next section, Chapter IV, contains the quantitative analysis. Two approaches were used, a seasonal analysis and then a yearly analysis of statewide beer consumption trends with quantitative forecasts (that is, the forecasts were not balanced or tempered with the qualitative inputs from Chapters II and III). The main analytical tool involved use of the techniques of multiple regression. In choosing the models of best fit, the standard statistical tests associated with regression analysis were employed.

In the final section, Chapter V, the quantitative forecasts from Chapter IV were moderated by the qualitative (or judgemental) factors facing the brewing industry presented in Chapters II and III. In other words, the forecasts represent a synthesis of the trend toward concentration in the industry with the models arrived at through a statistical analysis of past beer consumption in Montana.

CHAPTER II

THE EVOLUTION AND STRUCTURE OF THE BREWING INDUSTRY

Technological and Sociological Forces

Since about 1940, the nature of the manufacturing sector in the United States has undergone extensive changes, both technological and sociological. Technological changes have been manifested in the form of new methods and materials of production, levels of automation, and skilled versus unskilled manpower requirements. Somewhat in opposition to technological changes are the sociological changes such as management/labor relations (including compensation and working conditions), government regulation of business, and environmental concerns--air, water and noise pollution.

The brewing industry has not been an exception; it has been significantly affected by these changes in the economy in step with the rest of the manufacturing sector. Technological and sociological forces have influenced the brewing industry in two ways: internal (or intraindustry) and external (or interindustry). Internally, brewers are struggling to reduce production costs per barrel through

plant expansion and automation.[1] Because the brewing industry is characterized by intense rivalry among firms, the reduction of production costs per barrel with increased firm size (economies of scale in production) is critical to ensuring the long-run survival and growth of each individual brewing company. The problem is that the small or local brewers lack the capital required for large increases in plant capacity, putting them at a competitive disadvantage in relation to the large brewers.

Externally, there are three main forces impinging the industry. First, there are legal battles between the small and large brewers. Pearl Brewing Company has a lawsuit pending against Anheuser-Busch and Schlitz, charging that predatory pricing by these two large brewers is the primary cause of their significant loss of market share in Texas (6 percent in 1976 versus 23 percent in 1966).[2] The federal government has also taken an interest in the marketing practices of the big brewers, in that the Justice Department, the Securities and Exchange Commission, and the Treasury Department are in the process of conducting investigations to determine if charges (by the regional

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[1] The barrel is the standard unit of measure in the brewing industry. Each barrel contains thirty-one gallons of beer.

[2] "Turmoil Among the Brewers: Miller's Fast Growth Upsets the Beer Industry," Business Week, 8 November 1976, p. 67.

brewers) of payoffs and kickbacks to large retail customers (to get more and better shelf space for their products) are true.[3] The extent of bureaucratic corruption at the Joseph Schlitz Brewing Company has been so severe that the four top executives in the marketing department have been suspended, due to intense government investigations.[4] In response to the governmental allegations of questionable marketing practices at Schlitz, the chairman of the Adolph Coors Company, William K. Coors said, "You can't be in the brewing industry and not know that this type of thing has been going on for years."[5] Other examples are plentiful, leading one to believe that the brewing industry is rather corrupt.

The second force involves environmental questions concerning nonreturnable containers and pull-tab metal containers. Although municipal solid waste is composed of only 6 percent metal and glass containers from beer and soft drinks, the controversy over them is heated.[6] Five states, Michigan, Maine, Vermont, South Dakota and Oregon, have enacted restrictive container legislation. Between

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[3] Ibid.

[4] "Another Setback for Troubled Schlitz," Business Week, 6 September 1976, p. 20.

[5] Ibid.

[6] "Containers, Basic Analysis," Standard & Poor's Industry Surveys, 17 June 1976, p. C117.

them, the laws are quite varied; but, in general, nonreturnable containers require a substantial deposit, some have banned nonreturnable containers entirely, and some have banned metal containers with removable pull-tabs.[7]

It has not been reliably determined if the benefits would exceed the costs of an industry-wide switch to returnable containers. However, if the conversion is required and a 90 percent return rate is realized for all containers, container manufacturers will experience a collective cost increase of $2 billion to $3 billion for facilities conversion. This is likely to result in higher prices to consumers at a time when both the brewing and container industries have been making substantial price increases.

Finally, a shift in the population profile is changing the main beer drinking segment, the 18 to 34 age group. This segment is expected to begin decreasing in size in the 1980s after several years of fast growth.[8] This segment accounts for more than half of all beer consumed.[9]

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[7]See "Beverages, Basic Analysis," Standard & Poor's Industry Surveys, 28 October 1976, p. B72; "Beverages, Current Analysis," Standard & Poor's Industry Surveys, 2 December 1976, p. B53; and "Containers, Current Analysis," Standard & Poor's Industry Surveys, 16 December 1976, p. C97.

[8]"Turmoil Among the Brewers," p. 59.

[9]Ibid., p. 67.

Because of these technological and sociological forces, internal and external to the industry, the brewing industry is becoming more concentrated, or more strongly oligopolistic.

The next section of this chapter describes the changes in the structure of the brewing industry since the end of prohibition. The remainder of this chapter also provides the basis for the qualitative inputs that were used in tempering the quantitative forecasts of beer consumption in Montana in Chapter V.

The Rise of the National Market

In 1934, one year after the end of prohibition, there were approximately 756 breweries in operation in the United States.[10] It is likely that they were all separate brewing companies because the industry was in its infancy in 1934 and it is highly unlikely that there were many, if any, multiplant companies in existence. In contrast, there were ninety-eight breweries composed of forty-nine separate brewing companies in 1976.[11] Table 1 illustrates the

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[10]Walter Adams, ed., The Structure of American Industry, 4th ed. (New York: Macmillan Publishing Co., Inc., 1971), p. 194.

[11]See "Turmoil Among the Brewers," p. 59; and "Geographical Listings," The Brewers' Digest: Buyers' Guide and Directory, section two, January 1976, pp. 18-36.

changes in the number of breweries as opposed to brewing companies in operation for selected years since prohibition.

TABLE 1

BREWERIES AND COMPANIES IN OPERATION FOR SELECTED YEARS SINCE PROHIBITION

Year	Breweries	Companies	Year	Breweries	Companies
1933	31	31*	1958	258	211
1934	756	756*	1963	211	150
1935	750	750*	1967	176	93
1940	611	n.a.	1970	154	n.a.
1947	440	404	1974	118	n.a.
1950	407	n.a.	1975	117	50
1954	301	263	1976	98	49

SOURCES: Brewer's Almanac, 1976, pp. 14 and 26; "Turmoil Among the Brewers," p. 59; The Brewers' Digest, 1976, pp. 18-36; Adams, American Industry, pp. 192-4; and "Beverages, Basic Analysis," p. B63.

*The number of companies was not available for 1933 to 1935; however, it may be assumed that all breweries were separate companies. During these years, the brewing industry was so young that the existence of multiplant companies is doubtful.

**Throughout this study, the abbreviation, n.a., will be used to indicate that data is not available.

Although concrete evidence is not available, it is reasonable to assume that most, if not all, brewers at the end of prohibition served local or regional markets only. However, three major events came into play, more or less simultaneously, enabling brewers to become national in their distribution. The ordering of these factors has no bearing on their relative importance.

First, changes in the nature of the transportation industry provided an impetus for changes in the brewing industry. The tractor-trailer, as opposed to railcar, offering faster and much more flexible delivery of goods, emerged as the primary mode of transportation for many manufactured goods. With the truck, the geographic limits of the market served by each brewer could be extended without building new plants.

Second, the tremendous growth in the mass media since World War II, especially television, stimulated changes in the brewing industry by providing a medium for highly controlled and coordinated national advertising campaingns for the promotion of brand names and images, with the subsequent attainment of brand loyalty.[12]

Third, the post World War II American society was more innovative and affluent than in previous years. This resulted in intraindustry and interindustry technological advances, as well as a greatly increased demand for leisure activities and products which would not be classified as necessities. These events, plus a probable array of others that are less important, have interacted in determining the changes that the brewing industry has experienced since prohibition.

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[12]Douglas F. Greer, "Product Differentiation and Concentration in the Brewing Industry," Journal of Industrial Economics, July 1971, p. 213.

Once the stage had been set by the forces shaping the society in the post World War II environment, far-sighted brewers went national by building or purchasing breweries in various parts of the country. This resulted in brand recognition on a national level, rather than on a local or regional level within the cost-effective radius of a truck-hauling operation from the home brewery/distributor. Taken in perspective, these factors interacted to produce an accelerated "carousel effect", where a slight initial interaction sets the stage for increased interaction, and so on. That is, the mass media (television) made the promotion of brand names relatively inexpensive when considering the subsequent high level of consumer brand recognition and loyalty, which made entry into the national market easier, which created the need for regional distributors dispersed nationally with their fleets of delivery trucks, which created the need for increased advertising, etc. This is referred to as a "carousel effect" because an analyst can go through the above stimulus-response iteration by starting at any point.

The Trend Toward Concentration

As the brewing industry became oriented to the national market rather than to the local or regional market, a trend was started that is still affecting the industry today-- the trend toward concentration. The brewing

industry is becoming more concentrated or more oligopolistic. At the end of prohibition the brewing industry was characterized by a large number of firms of approximately equal size. Now the industry is represented by relatively few very large firms and a fringe of smaller local or regional firms.

The gross number of breweries versus companies was shown in Table 1. Table 2 demonstrates the changes in market share of the top five and top ten brewing companies for selected years since prohibition. From the data in Table 2 (especially when analyzed in conjunction with Table 1) it is seen that the large brewing companies are becoming increasingly dominant in the marketplace at the expense of the smaller companies. In 1940 the five largest companies accounted for 16.3 percent of the beer market; their share had increased to 69.0 percent in 1976.

A Measure of Concentration

A Lorenz Curve can be used to demonstrate the degree of inequality of firm sizes in the brewing industry. Figure 1 illustrates a Lorenz Curve, which provides a measure of relative concentration among all of the firms composing the market (industry). The diagonal (line AC) is the line of absolute equality; that is, if all the companies in the industry possess equal market shares, then the Lorenz Curve is the diagonal. The smallest ten percent

TABLE 2
BARRELAGE OF THE TOP BREWING COMPANIES AS A PERCENTAGE OF TOTAL INDUSTRY SALES FOR SELECTED YEARS

Year	Percent accounted for by--		Year	Percent accounted for by--	
	5 Largest companies	10 Largest companies		5 Largest companies	10 Largest companies
1940	16.3%	23.7%	1970	50.0%	69.0%
1947	19.0	28.2	1971	52.9	70.5
1950	23.4	35.1	1972	56.9	74.6
1954	24.9	38.3	1973	59.0	76.0
1958	28.5	45.2	1974	64.2	80.8
1963	37.5	56.9	1975	67.0	84.8
1967	44.4	65.3	1976	69.0	n.a.

SOURCES: Adams, American Industry, pp. 194-5; "Turmoil Among the Brewers," p. 59; and "Advertising Costs for Beer Ale and Malt Liquor," Advertising Age, 3 November 1975, pp. 28-30.

of the companies would possess 10 percent of the market, the smallest 50 percent would possess 50 percent of the market, and so on. Line ABC represents the case of absolute inequality where one firm possesses 100 percent of the market--the monopoly situation.

The data in Table 3 were used to construct the Lorenz Curve for the brewing industry in 1975. Table 3 is simply a list of the largest seventeen brewing companies and their respective market shares for 1975. Table 4 is a market share inequality table. These data are the basis for the Lorenz Curve.

The Lorenz Curve for the brewing industry for 1975

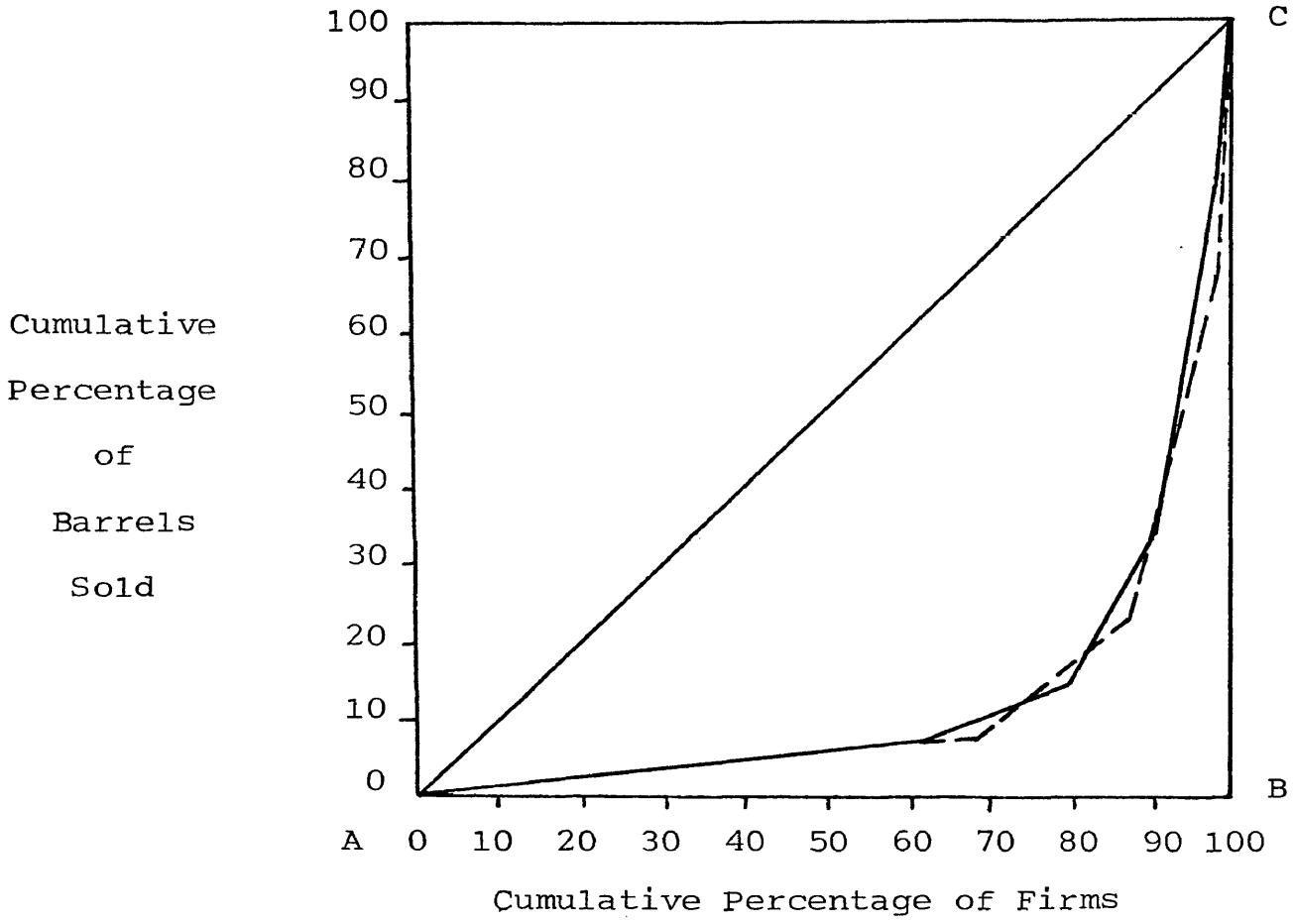

Fig. 1. Lorenz Curve: Market share inequality of brewing companies, 1975 (solid line) and 1963 (dashed line).

indicates that the industry is characterized by a high degree of inequality. A Lorenz Curve for 1963 (determined in the same manner) is also illustrated by a dashed line in Figure 1. It is almost identical to the Lorenz Curve for 1975, which is highly misleading; that is, notwithstanding the fact that the Lorenz Curves are nearly the same, the industry is characterized by a higher degree of market share inequality now than in previous years. The

TABLE 3

MARKET SHARE OF THE TOP 17 BREWING COMPANIES IN 1975

Company	Market share	Company	Market share
Anheuser-Busch	23.9%	Heileman	3.1%
Schlitz	15.8	General	3.0
Pabst	10.6	Schmidt	2.2
Miller	8.7	Genessee	1.5
Coors	8.1	Rheingold	1.3
Schaefer	4.0	Pearl	0.9
Olympia	3.9	Lonestar	0.7
Stroh	3.5	Pittsburgh	0.6
Carling	3.3		

SOURCES: Brewer's Almanac, 1976, p. 56; and Beer Wholesalers' News and Monthly Bulletin of the National Beer Wholesalers' Association of America, Inc., February 1970 and February 1976, p. 1.

NOTE: Industry sales were 147,500,000 barrels in 1975. The market share of the top seventeen brewing companies was approximately 95.0 percent. Another way to state this (to put it in a form that can be plotted on a Lorenz Curve) is that the bottom 66 percent of the brewing companies had 5.0 percent of the market.

TABLE 4

INEQUALITY TABLE, 1975

Cumulative number of breweries	Cumulative percent of breweries	Ranking of firms	Percent share of 1975 sales	Cumulative percent of sales
0	0%	0	0.0%	0.0%
33	66	bottom 33 or 66%	5.0	5.0
40	80	middle 7 or 14%	10.2	15.2
50	100	top 10 or 20%	84.8	100.0

NOTE: The data in this table has been derived from the data in Table 3. The columns that constitute the data points for the Lorenz Curve are the second and the fifth columns. Two more sets of coordinates are easily calculated. The first is that the top five brewers (or 10 percent) possess 67 percent of the market (or, in the proper form, the bottom 90 percent possess 33 percent of the market). The second is that the top brewer (2 percent) has 23.9 percent of the market (or, in the proper form, the bottom 98 percent have 76.1 percent of the market). These coordinates are also shown in Figure 1.

Lorenz Curve is misleading because the total number of brewing companies has decreased since 1963 in step with increases in the market share of the top brewing companies. For every year in which data are available, the Lorenz Curves are almost identical. In other words, the decreases in the number of companies in operation has had an offsetting affect on the increases in the market share of the top companies (relative to the rest of the industry), to such an extent that the market share inequality within the industry, as illustrated through the use of a Lorenz Curve, appears to have maintained a stable relationship. This reveals a limitation in the use of the Lorenz Curve. It is not useful for illustrating changes in market share inequality when the industry is changing with respect to the number of separate companies in operation.

Another measure of the disparity of firm size is provided by the Herfindahl Index.[13] The Herfindahl Index is defined in the following manner:

$$H = \sum_{i=1}^{N} (X_i/T)^2$$

where N is the number of firms, X_i is the absolute size of each individual firm(i), and T is the total size of the market. When all firms are of equal size, H = 1/N. The

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[13]Dean A. Worcester, Jr., Monopoly, Big Business, and Welfare in the Postwar United States (Seattle: University of Washington Press, 1976), p. 127.

Herfindahl Index is a measure of dispersion which varies between 0 and 1. The index approaches 0 when the industry is composed of a very large number of firms of equal size and it is 1 when the industry is a monopoly.[14]

In Table 5 the Herfindahl Indices for the years 1961 through 1975 have been calculated, along with the ratio, 1/N (for years where data was available). The index varies from a low of 0.034 in 1961 to a high of 0.120 in 1975. There is a definite trend toward greater disparity in firm sizes; the ratios, 1/N, also reveal this trend. For instance, in 1963 the Herfindahl Index was 0.041 and in 1975 the Herfindahl Index was 0.120, while the reciprocal of the number of companies (1/N) increased from 0.0067 to 0.020 during the same period. The increase in the Herfindahl Index between 1963 and 1975 coupled with the widening of the difference between the index and the ratio (for each year, respectively) indicates that the brewing industry is becoming more top-heavy (the firms were larger and fewer in number in 1975 than they were in 1963).

Ideally, the Herfindahl Index should be constructed with complete industry data; that is, with data on the market share of every firm in the industry. The indices calculated in Table 5 are approximations because complete

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[14]James V. Koch, Industrial Organization and Prices (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1974), p. 151.

TABLE 5

HERFINDAHL INDEX, THE DATA USED IN ITS CONSTRUCTION AND THE RATIO 1/N, 1961-1975

Year	Thousands of barrels sold (T)	Number of firms in sample	Herfindahl Index	Number of companies in market (N)	1/N
1961	88,681.0	17	0.034	n.a.	. . .
1962	90,657.6	19	.038	n.a.	. . .
1963	93,251.0	19	.041	150	0.0067
1964	97,852.0	19	.043	n.a.	. . .
1965	99,453.9	20	.050	n.a.	. . .
1966	103,853.5	21	.054	n.a.	. . .
1967	106,785.7	22	.060	93	0.0180
1968	111,048.8	24	.068	n.a.	. . .
1969	115,792.8	24	.068	n.a.	. . .
1970	121,600.9	18	.073	n.a.	. . .
1971	126,438.1	18	.080	n.a.	. . .
1972	130,166.1	18	.090	n.a.	. . .
1973	136,822.5	19	.100	n.a.	. . .
1974	144,196.7	19	.110	n.a.	. . .
1975	147,500.0	17	0.120	50	0.0200

SOURCES: Brewer's Almanac, 1976, p. 83; "Turmoil Among the Brewers," p. 59; Adams, American Industry, p. 194; The Brewer's Digest, 1976, pp. 18-36; "Advertising Costs for Beer, Ale and Malt Liquor," Advertising Age, 3 November 1975, pp. 28-30; and Beer Wholesalers' News and Monthly Bulletin of the National Beer Wholesalers' Association of America, Inc., February 1970 and 1976, p. 1.

data were not available in published sources. However, the indices as calculated are an excellent approximation of the actual indices because of the way they are constructed. Firms not included are small, with sales generally of less than a million barrels. Including them in the Herfindahl Index would have an insignificant effect. This is obvious from the equation used to calculate the Index. For

example, the increment to the index for a firm selling 800,000 barrels in 1975 would be only 0.000029, which is insignificant in relation to the total index of 0.120. Assuming the rest of the thirty-three companies in the population/industry also had sales of 800,000 barrels, then the index would be increased by only 0.00097, which is still insignificant.

Causes of Concentration

Forces that have fostered concentration in the brewing industry include the recent Phase IV price controls coupled with raw material price increases (in containers and agricultural commodities), increased vertical integration in the industry, the existence of economies of scale in production, and possible advertising returns to scale. Each will be discussed in turn.

Phase IV Price Controls

President Nixon's Phase IV price controls were implemented at a very inopportune time from the standpoint of the brewing industry. That is, this policy was instituted following more than a year of large increases in the cost of agricultural commodities. Prior to the grain sales to the Soviet Union in 1972, agricultural prices were stable. In the ensuing two years, however, prices increased 116 percent, reaching a peak at the end of

1974.[15] Prices have settled to a more stable level now, but they are still approximately 80 percent higher than before the onset of the Soviet grain deals. Containers have also manifested significant cost increases. From the mid 1960s to the start of the price controls, beer container prices increased at an average of almost 5 percent per year while beer price increases averaged only 2 percent per year.[16] Thus, price controls were put into effect at a time when brewers needed a price increase to offset raw material price increases.

Cost pressures increased during the period of price controls such that within approximately one year following the lifting of the controls in April 1974, the cost of glass bottles increased 35 percent, transportation costs rose 38 percent, and metal container costs were up 35 percent while beer prices rose only 20 percent.[17] The rise in the general level of consumer prices was 11 percent for this period, as measured by the Consumer Price Index. Increases in container costs have continued to outpace beer price increases and the rate of increase in the general level of consumer prices.

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[15]"Liquor, Basic Analysis," Standard & Poor's Industry Surveys, 24 July 1975, p. L62.

[16]"Liquor, Current Analysis," Standard & Poor's Industry Surveys, 24 July 1975, p. L56.

[17]See "Liquor, Basic Analysis," p. L62; and "Liquor, Current Analysis," p. L52.

Cost increases coupled with the governmental regulation of prices had the effect of lowering margins for brewers (see Table 6).[18] After the price controls were lifted, margins recovered to the pre-price control level. It is possible that these financial pressures hastened the failure of several small marginal local or regional brewers; but the data on the number of companies in operation before the price controls and the number in operation after they were lifted was not available in published sources. Lower margins do, however, make it intrinsically more difficult for small brewers to stay in business.

A comparison of the net profit margins by asset class (or size of firm) is made in Table 7. It is apparent that the largest firms have consistently had the highest net profit margins. It would be interesting and revealing to observe the changes in the margins during and after the price controls, but the data was not available from the Internal Revenue Service. It is likely that the margins of the small brewers were quite low (in relation to those of the large brewers) during this period.

Vertical Integration

Due to increased consumer resistance to higher beer prices and a corresponding reluctance by brewers to increase prices in step with increases in the cost of

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[18] "Liquor, Basic Analysis," p. L62.

TABLE 6

NET PROFIT MARGINS* (AFTER TAXES) FOR THE BREWING INDUSTRY, 1946-1976

Year	Brewing industry	All corporations	Year	Brewing industry	All corporations
1946	7.66%	n.a.	1961	2.40%	3.0%
1947	6.51	n.a.	1962	2.20	3.0
1948	5.98	n.a.	1963	2.77	3.1
1949	6.44	n.a.	1964	3.21	3.4
1950	5.11	n.a.	1965	3.28	3.9
1951	3.59	n.a.	1966	3.40	3.9
1952	n.a.	n.a.	1967	3.18	3.7
1953	3.06	3.7%	1968	3.73	3.5
1954	2.83	3.8	1969	3.62	2.7
1955	3.20	4.3	1970	3.22	2.1
1956	2.45	4.0	1971	3.30	2.5
1957	2.62	3.6	1972	2.17	n.a.
1958	2.61	2.9	1973	1.65	n.a.
1959	2.55	3.2	1974	2.44	n.a.
1960	2.46	2.8	1975	3.28	n.a.
			1976	3.23	n.a.

SOURCES: Brewer's Almanac, 1976, pp. 40-41; Greer, "Product Differentiation," p. 206; "The Ratios of Manufacturing," Dun's Review, November 1973, p. 123; "The Ratios of Manufacturing," November 1974, p. 123; "The Ratios of Manufacturing," December 1975, p. 89; and "The Ratios of Manufacturing," December 1976, p. 91.

*The net profit margins were calculated as a percentage of sales.

containers and agricultural commodities, brewers have been attempting to improve margins in two ways;[19] through

[19]In 1975 the public spent $15.8 billion on beer vs. $14.3 billion in 1974, which is an increase of 10.5 percent. The increase in barrelage was only 2.8 percent as given in "Beverages, Basic Analysis," p. B62. The forecasted increase in barrelage was 4.5 percent in "Beer Sales Foaming Higher, but Small Breweries go Dry," Industry Week, 23 October 1972, p. 58. "Consumer resistance to higher priced beer and a tendency to purchase less

TABLE 7

NET PROFIT MARGINS AFTER TAXES EXPRESSED AS PERCENTAGES BY ASSET CLASSES, 1955-1971

Asset class (thousands of dollars)	1955	1956	1957	1958	1959	1960	1961	1962
$0--under 50	-1.1%	1.1%	2.7%	n.a.	n.a.	n.a.	n.a.	n.a.
50--under 100				-0.2%	n.a.	n.a.	n.a.	n.a.
100--under 250				-2.8	0.5%	0.3%	0.3%	n.a.
250--under 500	-0.6	-28.0						n.a.
500--under 1,000	1.0	1.3	1.6	-1.9				n.a.
1,000--under 5,000	0.9	0.6	0.7	0.4	0.6	0.2	-0.2	n.a.
5,000--under 10,000	3.0	2.8	2.5	2.8	1.0	0.7	2.0	n.a.
10,000--under 50,000	3.4	3.0	3.1	3.3	3.0	2.8	2.4	n.a.
50,000--under 100,000	4.0	3.4	1.5	2.6	3.2	2.9	3.0	n.a.
100,000 and over	5.0	4.4	4.2	4.1	3.1	3.2	3.4	n.a.

Asset class (thousands of dollars)	1963	1964	1965	1966	1967	1968	1969	1970	1971
$0--under 50	n.a.	3.0%	3.2%	n.a.	1.5%	3.0%	n.a.	n.a.	0.4%
50--under 100	n.a.	n.a.	n.a.	n.a.	2.2	n.a.	n.a.	n.a.	n.a.
100--under 250	n.a.	n.a.	2.0	n.a.	n.a.	n.a.	n.a.	3.6%	n.a.
250--under 500	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	8.4
500--under 1,000	n.a.	3.6	1.0	3.1%	4.0	2.6	n.a.	n.a.	2.7
1,000--under 5,000	0.5%	1.4	1.6	0.9	1.4	2.4	2.8%	2.4	4.1
5,000--under 10,000	2.2	1.9	3.0	0.5	2.9	4.3	5.4	1.6	n.a.
10,000--under 50,000	2.7	3.3	3.1	3.1	2.8	2.7	2.9	2.5	2.2
50,000--under 100,000	3.4	3.4	2.2	2.3	2.7	2.3	2.2	1.4	0.8
100,000-- and over	3.7	3.7	4.4	4.7	4.5	5.5	4.8	4.7	4.7

SOURCE: Brewer's Almanac, 1967 and 1976, pp. 50 and 52.

vertical integration and by taking advantage of economies of scale in production (the latter will be discussed in the next section).

Vertical integration in the brewing industry has been demonstrated chiefly by the larger brewing companies--the ones generally possessing more capital available for investment in such projects. A few of the large brewers manufacture metal cans for in-house use. Some also own farms where hops, barley, rice and other crops essential to the brewing of beer are grown. The best example is the Adolph Coors Company. Coors produces all of its malt, all of its aluminum cans and builds all of its own facilities. It has acquired reserves of natural gas and coal, it is in the process of acquiring its supplier of glass bottles, and it has the potential to produce rice in quantities sufficient to meet its annual requirements.[20]

Economies of Scale in Production

Since the brewing industry is characterized by low

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appeared in 1975," U.S. Department of Commerce, Domestic and International Business Administration, Bureau of Domestic Commerce, 1976 U.S. Industrial Outlook (Washington, D.C.: Government Printing Office, 1976), p. 208. It was stated that "Consumer resistance to higher prices and a growing tendency to 'trade down' . . . caused some consumers to trade down to a less expensive brand or a cheaper type of packaging," in "Drinkers Think Cheaper as Cost of Beer Climbs," Advertising Age, 24 February 1975, p. 3. Also see, "Liquor, Current Analysis," p. L42; and "Turmoil Among the Brewers," p. 67.

[20]"Beverages, Basic Analysis," p. B64.

margins, it is especially important for brewers to carefully control and monitor per unit costs of production. One approach to reducing and controlling unit costs has been through plant expansion and automation.

Pursuing the goal of achieving economies of scale in production is a more viable objective for the large brewers than for the small brewers because of the great amount of capital required for plant expansion and modernization. During the mid to late 1960s, it was proposed that a brewery should have an annual capacity of at least 500,000 to 1,000,000 barrels in order to be able to realize internal economies of scale.[21] Another author, during the early 1970s, estimated that a plant must have a capacity of at least 1,500,000 barrels per year in order to survive over the long-run.[22]

The second estimate is higher, probably because of increased automation coupled with a continuing refinement of brewing technology. It is likely that plants of moderate capacity, such as those in the first estimate (500,000 to 1,000,000 barrels), were able to realize internal economies of scale in production during the period when the estimate was made, but not to a great extent relative to the economies of scale that are possible with

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[21]Adams, American Industry, p. 200.

[22]Glueck, Business Policy, p. 576.

current technology and levels of automation. In other words, the authors of these estimates probably meant that plants of the sizes mentioned (in the estimates) were capable of realizing internal economies of scale to the extent that the plants would have been able to maintain a competitive position relative to the rest of the industry (and relative to the time period in which the estimates were made). This does not preclude plants of lesser capacity from realizing internal economies of scale; but the economies of scale achievable (by these smaller plants) would probably not be sufficient to ensure their competitiveness and survival over the long-term.

In essence, considering the oligopolistic structure of the brewing industry with intense rivalry, achieving economies of scale in production is essential to ensuring survival and growth.

In demonstrating the importance of brewery size, Kenneth Elzinga set up a "survivor test" based on employment levels.[23] An analysis of Table 8, which contains the data for the "survivor test", reveals that breweries with five-hundred or more employees seem to have the best chance of survival. That is, their numbers have been more or less stable since 1947, indicating that large plants may have significant operational advantages due to size.

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[23]Adams, American Industry, p. 199.

TABLE 8

"SURVIVOR TEST" BASED ON EMPLOYMENT, 1947-1972

Year	Total breweries	Breweries with employment levels of:					
		1-19	20-99	100-499	500-999	1000-1499	2500+
1947	440	47	196	166	23	5	3
1954	301	35	107	120	26	9	4
1958	258	34	88	97	27	9	3
1963	201	21	61	85	23	8	3
1967	185	80		72	21	9	3
1972	167	72		71	15	6	3

SOURCES: Adams, American Industry, p. 199; and Brewer's Almanac, 1974 and 1976, p. 37.

From an empirical analysis of current industry data, breweries with capacities in excess of 1,500,000 barrels seem to possess significant internal economies of scale, enabling them to remain viable over the long-term. This conclusion was arrived at after an examination of levels of employment and capacities of the top seventeen companies. The top seventeen companies was assumed to be an appropriate sample because there is expected to be only a handful of companies in operation in the 1980s, all of which will be from among the current top seventeen (see p. 40). In this sample, the bottom seven companies had employment levels ranging from 450 to 1,000 and capacities ranging from 900,000 to 1,500,000 barrels (each from one plant), which indicates (with the data in Table 8 in mind)

that breweries with employment levels of approximately 500 to 1,000 and with capacities in the realm of 1,500,000 barrels may represent the minimum size firm (where capacity and employment are measures of size) that is able to achieve sufficient internal economies of scale to survive over the long-term. The top end of the sample is characterized by breweries with much greater levels of employment and capacities. For example, Stroh employs 1,525 people with a capacity of 5,500,000 barrels from one plant; and Coors has an employment of 7500 with a capacity of 12,300,000 barrels from one plant.

Large firms in which economies of scale can be realized result in lower unit costs of production. For example, in 1972 Schlitz had the lowest production cost per unit in the industry at $1.08 per barrel with an annual capacity of 4.4 million barrels (from two new plants). In contrast, Falstaff's production cost per unit for the same year was $4.39 per barrel with a capacity of 4.1 million barrels (from four old plants).[24] A difference of this magnitude is bound to have a highly detrimental effect on the profitability of the smaller firm (Falstaff in this example) over the long-term, which accentuates the importance of achieving economies of scale in production.[25]

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[24]Glueck, Business Policy, p. 576.

[25]Part of the cost differential in this example may be attributed to technological factors; that is, the

The data in Table 9 serves to further demonstrate the existence of economies of scale in the industry. This table displays the increases in employee productivity since 1947 for the industry. As the ratio of barrels produced per employee-hour has been increasing, the ratio of wages to value of shipments has been decreasing, leading one to believe that the industry is becoming more capital intensive in an effort to achieve further economies of scale.[26]

In further support of the proposition that the brewing industry is becoming more capital intensive, Table 10 has been included to show the change in the percentage of total wages to total assets from 1955 to 1971. The ratio decreases from 27.78 percent in 1955 to 19.49 percent in 1971, which indicates that total wages are diminishing in importance in relation to the total level of assets. In other words, the industry is investing more in plant and equipment than in manpower, resulting in a more capital intensive position. Over this same period, outlays for total assets increased 113.4 percent as opposed to 49.8 percent for total wages.

It is possible that increases in the real cost of

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newer plants owned by Schlitz may be more advanced than the older plants owned by Falstaff, thus contributing to the cost differential.

[26]"Turmoil Among the Brewers," pp. 61 and 67.

TABLE 9

EMPLOYEE PRODUCTIVITY IN TERMS OF BARRELS PER HOUR AND THE RATIO OF WAGES TO VALUE OF SHIPMENTS, 1947-1974

Year	Barrels per hour	Wages to value of shipments (percent)	Year	Barrels per hour	Wages to value of shipments (percent)
1947	0.62	16.0%	1962	1.12	13.4%
1949	0.75	14.1	1963	1.20	13.1
1950	0.75	14.2	1964	1.28	12.6
1951	0.73	15.0	1965	1.37	12.4
1952	0.75	14.6	1966	1.40	12.4
1953	0.73	15.0	1967	1.49	11.3
1954	0.87	14.0	1968	1.60	11.0
1955	0.85	14.0	1969	1.72	10.5
1956	0.88	14.0	1970	1.79	10.0
1957	0.91	13.8	1971	1.92	9.8
1958	0.97	14.1	1972	2.11	10.1
1959	0.99	14.0	1973	2.21	10.0
1960	1.05	13.6	1974	2.25	9.7
1961	1.07	13.5			

SOURCES: Greer, "Product Differentiation," p. 210; Brewer's Almanac, 1976, pp. 20 and 36; U.S. Department of Commerce, Bureau of the Census, Annual Survey of Manufacturers, 1974: General Statistics for Industry Groups and Industries, pp. 3, 12, 23 and 24; and U.S. Department of Commerce, Bureau of the Census, Census of Manufacturers, 1967, special report series: Concentration Ratios in Manufacturing, part 3: Employment, Payrolls, Capital Expenditures, and Other General Statistics (Washington, D.C.: Government Printing Office, 1971).

assets has been increasing faster than real wage costs which would then account for part of the decrease in the ratio from 1955 to 1971. To investigate this effect, the data is adjusted by the Consumer Price Index in Table 11. Total wages in constant dollars decrease by 1.0 percent, while total assets in constant dollars increase by 41.1

TABLE 10

TOTAL WAGES, TOTAL ASSETS AND THE PERCENTAGE OF TOTAL WAGES TO TOTAL ASSETS FOR THE BREWING INDUSTRY, 1955-1971

Year	Total wages ($1,000)	Total assets ($1,000)	Percentage of total wages to total assets
1955	$436,388	$1,570,968	27.78%
1956	450,832	1,594,498	28.27
1957	445,361	1,685,101	26.43
1958	443,337	1,651,421	26.84
1959	461,140	1,738,431	26.53
1960	461,698	1,716,753	26.89
1961	466,526	1,728,356	26.99
1962	476,758	n.a.	n.a.
1963	470,823	1,796,407	26.21
1964	485,624	1,892,545	25.66
1965	488,056	2,116,744	23.06
1966	509,230	2,138,929	23.81
1967	527,200	2,187,018	24.10
1968	537,000	2,349,914	22.85
1969	570,800	2,868,032	19.90
1970	615,600	3,333,526	18.47
1971	653,600	3,353,354	19.49

SOURCE: Brewer's Almanac, 1967 and 1976, pp. 36 and 47.

percent over this period. From the table, it is reasonable to conclude that the brewing industry is becoming more captial intensive because of the greater investment in assets rather than in manpower; however, it is possible that the real (or constant) cost of assets has been increasing faster than the real cost of wages, thus accounting for part of the decrease in the ratio of total wages to total assets from 1955 to 1971. If the cost of assets has been increasing faster than increases in the

TABLE 11

TOTAL WAGES IN CONSTANT DOLLARS AND TOTAL ASSETS IN CONSTANT DOLLARS FOR THE BREWING INDUSTRY, 1955-1971

Year	Total wages in constant dollars ($1,000)	Total assets in constant dollars ($1,000)
1955	$544,125	$1,958,813
1956	553,848	1,958,843
1957	528,305	1,998,934
1958	511,936	1,906,953
1959	528,524	1,991,330
1960	520,516	1,935,460
1961	520,676	1,928,969
1962	526,223	n.a.
1963	513,438	1,959,004
1964	522,738	2,037,185
1965	516,461	2.239,941
1966	523,899	2,200,544
1967	527,200	2,187,018
1968	515,355	2,255,196
1969	519,854	2,612,051
1970	529,321	2,866,316
1971	538,829	2,764,513

general level of consumer prices (as measured by the Consumer Price Index), then the ratios are skewed slightly upward, thus misrepresenting the true nature of the manpower/capital relationship in the industry. However, it is likely that this affect is minor; the ratios can be assumed to be accurate indicators of the manpower/capital relationship.

A larger percentage of the total asset base of the industry was accounted for by the largest firms in 1971 as opposed to 1955 when the industry's assets were spread more

or less evenly among many different size firms. Table 12 contains the percentage of assets by asset class (size of firm) to total industry assets from 1955 to 1971, and demonstrates this change. In 1955, 67.8 percent of the total assets were accounted for by the three asset classes encompassing the $1,000,000 to $50,000,000 range. In contrast, 66.5 percent of the assets were held by the largest firms (those in the $1000,000,000 and over class) in 1971. By inspecting the rows of data, it is obvious that the smaller asset classes are becoming increasingly less significant. The largest three asset classes accounted for 97.0 percent of the industry assets in 1971. However, it is apparent that the $100,000,000 and over class is the only class which has a good prospect of continued survival and growth.

Figure 2 has been included to more clearly illustrate the change in the dispersion of total assets in the industry. The shift in the Lorenz Curve signifies that a greater proportion of assets were owned by a smaller percent of firms in 1971 than in 1955, revealing a trend toward greater inequality in the share of assets within the industry, which supports the proposition that the industry is becoming more concentrated.

Due to low margins and the resulting importance of production cost per unit, brewers are investing in new large highly automated plants to achieve further economies

TABLE 12

ASSETS AS A PERCENTAGE OF TOTAL INDUSTRY ASSETS, BY ASSET CLASS, 1955-1971

Asset class (thousands of dollars)	1955	1956	1957	1958	1959	1960	1961	1962	1963
$0--under 50	]	]	]	n.a.	n.a.	n.a.	n.a.	n.a.	0.1%
50--under 100	0.4%	0.4%		]	]	]	]	n.a.	]
100-under 250	]	]	1.1%	1.3%				n.a.	
250--under 500	0.6	1.3	]	]	2.4%	3.4%	2.6%	n.a.	2.4
500--under 1,000	2.3	1.8	1.5	1.8	]	]	]	n.a.	]
1,000--under 5,000	12.4	11.2	12.0	9.2	13.1	8.6	9.1	n.a.	8.0
5,000--under 10,000	11.3	11.1	12.1	11.9	8.2	7.3	5.4	n.a.	3.8
10,000--under 50,000	44.1	42.4	36.2	35.7	34.4	36.2	33.2	n.a.	30.0
50,000--under 100,000	9.1	12.3	18.0	13.6	16.5	17.8	21.8	n.a.	26.7
100,000 and over	19.8	19.6	19.0	26.5	25.4	26.6	28.0	n.a.	28.9

Asset class (thousands of dollars)	1964	1965	1966	1967	1968	1969	1970	1971
$0--under 50	n.a.	0.1%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
50--under 100	0.1%	0.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
100--under 250	0.2	0.2	n.a.	n.a.	0.3%	n.a.	0.1%	n.a.
250--under 500	0.4	0.4	0.2%	0.2%	n.a.	n.a.	0.2	0.4%
500--under 1,000	1.6	1.6	1.7	0.6	0.4	n.a.	0.2	0.9
1,000--under 5,000	5.3	3.4	4.1	4.1	3.0	1.7%	3.0	1.7
5,000--under 10,000	2.3	1.5	1.3	0.4	0.3	0.7	0.9	n.a.
10,000--under 50,000	28.8	29.4	27.2	28.3	26.8	19.6	19.1	15.5
50,000--under 100,000	29.9	22.3	19.6	16.6	16.6	20.3	13.1	15.0
100,000 and over	31.4	41.1	46.0	49.9	52.6	57.7	63.4	66.5

SOURCE: Brewer's Almanac, 1967 and 1976, p. 47.

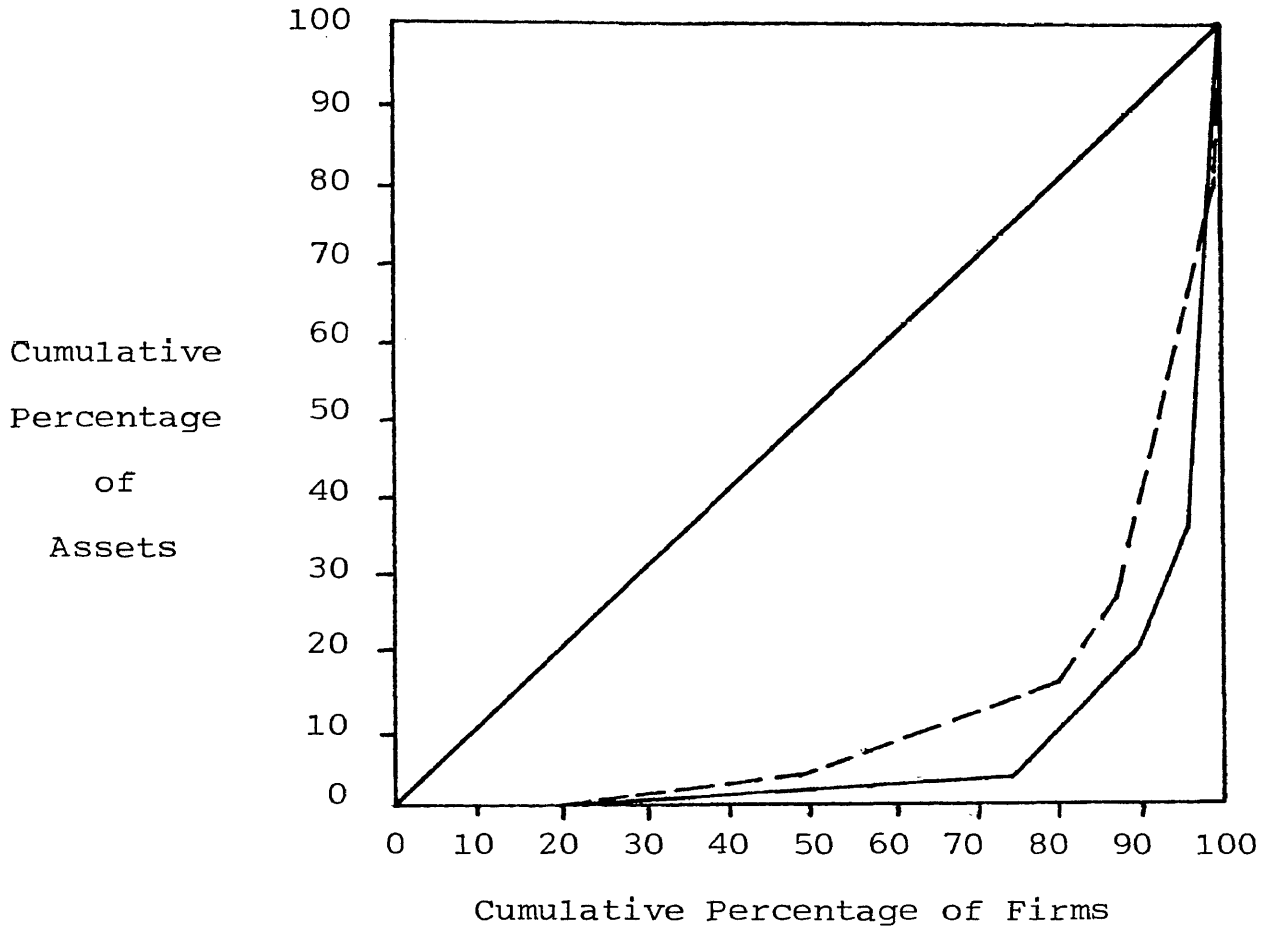

Fig. 2. Lorenz Curve: Inequality of the dispersion of total assets in the brewing industry, 1955 (dashed line) and 1971 (solid line).

of scale. In fact, present plans indicate that total industry capacity will increase by 30 percent within the next five years (capacity will increase 10 percent in 1977 alone) while the demand for beer is expected to increase only 2 to 3 percent per year over the same time span.[27] It has been noted that this may lead to problems of over-capacity (as the economic theory of the firm suggests in

[27]"Turmoil Among the Brewers," pp. 61 and 67.

monopolistic or oligopolistic industries):

> . . . many brewers are going to be seriously hurt, and the ax will fall first on the weaker regionals. The reason is basic economics. The secret to the growth of national brewers has not been the market share they took away from each other through improved marketing techniques but, rather, the market share they took from the regionals by building more sophisticated production facilities.[28]

Because of the competitive cost squeeze amplified by the planned overcapacity in pursuit of further economies of scale, it is expected that only fifteen brewers will be in operation by 1980, and the top five will control 90 percent of the market.[29]

Advertising and Firm Size in the Brewing Industry

The existence of advertising returns to scale in the brewing industry is debatable. Kenneth Elzinga stated,

> The exact implications of extensive advertising are uncertain. But there is evidence of a relationship between rising concentration and rising advertising expenditures. The extent of a casual relationship between these two phenomena is also uncertain. Professor Yang found that the brewing industry has had, over time, an increasing advertising to sales ratio and an increasing share of advertising done by the largest firms.[30]

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[28]Ibid., pp. 61-62.

[29]Ibid., p. 62

[30]Adams, American Industry, p. 209. In making this observation, Kenneth Elzinga was referring to a review of the following publications: H.M. Mann et al., "Advertising and Concentration: An Empirical Investigation," Journal of Industrial Economics, 16:34 (November 1967); and Charles Yang, Economic Concentration, Hearings before the U.S. Senate Subcommittee on Antitrust and Monopoly, Part 5, (Washington, D.C.: 1966), pp. 2153-2163.

This observation that the ratio of advertising to sales was increasing over time was based on data from the mid 1960s and earlier. From an inspection of Table 13, it can be seen that the ratio of advertising to barrels sold increased somewhat steadily through the mid 1960s, as did the ratio of advertising to gross sales, supporting Kenneth Elzinga's observation. However, more recent data (also in Table 13) voids this proposal. Both ratios have decreased significantly in recent years; and if measured in constant dollars, the decline would be quite dramatic. Douglas Greer has explained the relationship in this way,

> . . . the rising concentration and growing advertising outlays do not trace out a perfectly linear positive correlation over the period, but rather one that is curvilinear--the curvature, parabolic in shape, developing in the later years when concentration continues to rise while outlays as a percentage of sales stabilize at a high level, instead of continuing to rise as well. Such a curvilinear correlation is consistent with the view that escalating advertising expenditures, if a cause of concentration, should not continue to rise indefinitely with concentration. . . . once correlation has reached moderately high levels, outlays relative to sales seem to stabilize; and as concentration proceeds even further, advertising expenditures should decline to the monopoly (or collusive) optimum level . . . if moderately concentrated and imperfectly collusive oligopolies may spend more on advertising than is in the interest of the industry as a whole, levels of concentration beyond this point would be expected to hold that kind of cost inflating competition more effectively under control.[31]

Greer's proposition may not be completely valid. The tremendous amount of planned overcapacity in the

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[31]"Turmoil Among the Brewers," p. 62.

TABLE 13

PERCENTAGE OF ADVERTISING TO GROSS SALES AND THE RATIO OF ADVERTISING TO BARRELS SOLD FOR THE BREWING INDUSTRY, 1950-1973

Year	Advertising to gross sales (percent)	Advertising per barrel (dollars)
1950	4.8%	$1.39
1951	5.17	1.61
1952	n.a.	n.a.
1953	5.65	1.86
1954	6.77	2.30
1955	6.73	2.27
1956	6.70	2.31
1957	6.78	2.48
1958	6.84	2.48
1959	6.52	2.47
1960	6.90	2.56
1961	6.84	2.56
1962	6.90	2.44
1963	6.86	2.61
1964	7.05	2.59
1965	6.90	2.62
1966	6.50	2.51
1967	n.a.	n.a.
1968	n.a.	n.a.
1969	n.a.	n.a.
1970	n.a.	n.a.
1971	4.80	1.94
1972	4.30	1.75
1973	4.10	1.67

SOURCES: Greer, "Product Differentiation," p. 211; "Advertising Costs for Beer, Ale and Malt Liquor," Advertising Age, 3 November 1975, pp. 28-30; and Leo Troy, Almanac of Business and Industrial Financial Ratios, 1974-76, p. 22.

industry for the next ten years may result in an even tougher competitive environment. Because of the over-capacity that is likely to occur, expenditures on

advertising will probably increase rapidly and there may be some aggressive price-cutting. This might be expected because the marketing strategies of the beer industry are changing from a reliance on price competition to a reliance on advertising and economies of production.

> Now that the efficient brewers are pitted against one another, price promotion has become a much less important sales tool. "The companies that made it big in this business did so because they built big and the key to growth was productive efficiency," observes Schlitz's Peters. "Now the key to growth is marketing."[32]

This change in the profile and the marketing of the brewing industry may signal the entrance of the industry into the maturity pahse of the product life cycle. Miller, the fifth ranking brewer in 1974, recently started implementing marketing concepts characteristic of the maturity phase--large advertising outlays, new products and segmentation of the market (not just geographically, but also demographically and by taste and product appeal), such as in the cosmetics industry. Miller is now the third ranking brewer. Miller's strategy, which is being followed by the rest of the large brewers, is characteristic of the strategies employed during the maturity phase of the product life cycle. "The appeal calls for dividing up the U.S. beer market into demand segments, producing new products and packages specifically for those segments, and then

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[32]"Turmoil Among the Brewers," p. 62.

spending with abandon to promote them."[33] Coors serves as a contradictory example, in that the demand for their "mysterious" brand consistently outpaces production, with a reliance on medieval marketing practices and very little advertising.

Because the market for beer is relatively mature, it follows that the level of advertising is not as much of a causal factor in the absolute level of beer consumption as it was in previous years; but the share of advertising by each company will have a great effect on the demand for one brand versus the demand for some other brand. In other words, advertising will not be aimed so much at finding new beer drinkers as it will be aimed at convincing current beer drinkers to switch brands.

Summary

Technological and sociological forces, both endogenous and exogenous to the brewing industry, have been responsible for the trend toward concentration of brewers. The industry used to be characterized by many small firms, now it is composed of a few very large firms and a handful of smaller ones. In other words, it is becoming more oligopolistic (as demonstrated through use of the Lorenz Curve), due to several interindustry and intraindustry forces. First, there are legal battles between the large

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[33] Ibid., p. 60.

and small brewing companies and the government concerning antitrust and questionable marketing practices. Second, are environmental issues concerning the desirability (or undesirability) of nonreturnable containers and metal cans with pull-tabs. Third, shifts in the population profile are expected. The main beer drinking segment, the 18 to 34 age group, is expected to stabilize and to eventually decline in numbers.

Specific causes of concentration were analyzed. First, the Phase IV price controls squeezed brewer's margins during a period when the nation was experiencing "double-digit" inflation. Second, there has been increased vertical integration in the industry--in an effort by brewers to lower the costs of containers and agricultural commodities. Third, the largest firms have been striving to attain greater economies of scale in production. The extent of investment and planned investment in new plant and equipment is so great that there will be a threatening overcapacity in 5 to 10 years, resulting in an acute competitive environment. And fourth, the existence of possible advertising returns to scale was discussed. Differing viewpoints were presented, and it was concluded that the presence of returns to scale in advertising is doubtful. The goal of advertising is to take market share away from the small regional brewers; and then, when the industry is highly consolidated (oligopolistic), its

objective will be to ensure that market share is maintained.[34]

Because the industry is becoming highly concentrated and marketing strategies are changing, it was concluded that the industry is entering the maturity phase of the product life cycle.

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[34]Ibid., p. 61.

CHAPTER III

BEER IN MONTANA

The Montana Brewing Industry

In 1863 the first brewery in Montana commenced operations in Virginia City, operated by Henry S. Gilbert. The Kessler Brewing Company, established in 1865 in Helena, was an early leader in the brewing industry. It was the first brewery in Montana to install a refrigerating machine and it was the first brewery in the United States to purchase a carbonic acid gas machine.[1]

Several other breweries serving local markets were established by adventurous entrepreneurs in Montana, with a peak of eleven operating in 1937.[2] Three breweries were located in Great Falls: The Montana Brewing Company, established in 1894; The American Brewing and Malting Company, established in 1892;[3] and the Great Falls

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[1] One Hundred Years of Brewing: A Complete History of the Progress Made in the Art, Science and Industry of Brewing in the World, Particularly During the Nineteenth Century (Chicago: H.S. Rich and Co., 1903; reprint ed., New York: Arno Press, 1974), p. 445.

[2] "Economic Squeeze Gets too Tight: Great Falls Brewery to Close," Great Falls Tribune, 17 July 1968, p. 10.

[3] One Hundred Years of Brewing, no page.

Brewery. These small breweries started shutting down in the 1940s until there was just one brewery left in the state, the Great Falls Brewery.

In 1969, the Great Falls Brewery finally ceased operations. The reason, as explained by Fred G. Wessinger, the brewery's president, was the "Economic conditions beyond our control were responsible." Wessinger also said, "The severe inflationary trend and high production costs brewers are currently experiencing without offsetting price adjustments for the finished product are responsible."[4]

Beer became legal throughout the state of Montana on April 7, 1933, at a 4 percent maximum alcoholic content. In 1933, the state tax was $1.00 per barrel compared to $3.25 per barrel in 1976, which is still well below the national average of approximately $4.70 per barrel. Additionally, the Federal excise tax on beer has increased from $1.00 per barrel in 1862 to $9.00 per barrel in 1976.[5] It appears that the current taxes, both state and Federal, are much lower, on a constant dollar basis, than they were in the early years of the brewing industry. Beer was either overtaxed when the industry was in its infancy or it is undertaxed now.

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[4]"Economic Squeeze," p. 1.

[5]Brewer's Almanac, 1976, pp. 94-106.

Statewide Demand for Beer

Since the repeal of the eighteenth ammendment, per capita consumption of beer in the state of Montana has been steadily increasing. At the end of 1974, Montana had the fourth highest per capita consumption in the nation (at 28.5 gallons); this slipped to 28.3 gallons by the end of 1975, ranking the state in fifth place.[6]

Table 14 has been included in order to clearly display the changes in statewide beer consumption. To facilitate empirical comparisons between population changes and changes in beer demand, percentage increases (or decreases) have been calculated for each category.

Although the total population of Montana has been increasing at an average of only 0.6 percent per year since 1961, adult (over twenty-one) population has been increasing at an average of 1.0 percent per year (almost two times faster). Total beer consumption, on the other hand, has been increasing at an average of 3.5 percent per year (over five times faster than total population). A surprising statistic is that, although adult population is increasing faster than total population (1.0 percent as compared to 0.6 percent), the increase in average adult per capita beer consumption (2.5 percent) is lagging behind average total per capita consumption (3.0 percent). One

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[6]Ibid., p. 59.

TABLE 14

COMPARATIVE STATISTICS FOR MONTANA: TOTAL POPULATION, BEER CONSUMPTION AND PERCENT CHANGES, 1961-1975

Year	Total population (thousands)	Percent change	Beer consumption (barrels)	Percent change
1961	695	. . . .	423,495	. . . .
1962	696	0.1%	432,509	2.1%
1963	701	0.7	444,223	2.7
1964	703	0.3	448,787	1.0
1965	702	-0.1	465,091	3.6
1966	702	. . . .	470,742	1.2
1967	701	-0.1	492,787	4.7
1968	693	-1.1	484,354	-1.7
1969	694	0.1	499,371	3.1
1970	694	. . . .	554,161	11.0
1971	708	1.7	578,905	4.5
1972	719	1.6	580,261	0.2
1973	721	0.3	644,850	11.1
1974	735	1.9	675,771	4.8
1975	748	1.8	683,666	1.2
Total change		7.6%		61.4%
Average change		0.6%		3.5%

TABLE 14--Continued

COMPARATIVE STATISTICS FOR MONTANA: PER CAPITA CONSUMPTION, ADULT POPULATION AND PERCENT CHANGES, 1961-1975

Year	Per capita consumption (gallons)	Percent change	Adult population (thousands)	Percent change
1961	18.8	. . . .	399	. . . .
1962	19.2	2.1%	394	-1.2%
1963	19.6	2.1	395	0.2
1964	19.7	0.5	397	0.5
1965	20.4	3.6	397	. . . .
1966	20.8	2.0	395	-0.5
1967	21.8	4.8	396	0.2
1968	21.7	-0.4	403	1.8
1969	22.3	2.8	400	-0.7
1970	24.1	8.1	405	1.2
1971	25.4	5.4	413	2.0
1972	25.0	-1.6	428	3.6
1973	27.7	10.8	434	1.4
1974	28.5	2.9	447	3.0
1975	28.3	-0.7	459	2.7
Total change		50.5%		15.0%
Average change		3.0%		1.0%

TABLE 14--Continued

COMPARATIVE STATISTICS FOR MONTANA: ADULT PER CAPITA CONSUMPTION, PER CAPITA PERSONAL INCOME AND PERCENT CHANGES, 1961-1975

Year	Adult per capita consumption (gallons)	Percent change	Per capita personal income	Percent change
1961	32.9	. . . .	$1920	. . . .
1962	34.0	3.3%	2207	14.9%
1963	34.9	2.6	2197	-0.4
1964	35.0	0.3	2255	2.6
1965	36.3	3.7	2436	8.4
1966	36.9	1.6	2615	7.3
1967	38.6	4.6	2759	5.5
1968	37.3	-3.4	2917	5.7
1969	38.7	3.8	3124	7.1
1970	42.4	9.6	3381	8.2
1971	43.5	2.6	3479	2.9
1972	42.0	-3.4	3897	12.0
1973	46.1	9.8	4418	13.4
1974	46.9	1.7	4776	8.1
1975	46.2	-1.5	5434	13.8
Total change		40.4%		183.0%
Average change		2.5%		7.8%

SOURCES: Brewer's Almanac, 1967 and 1976, pp. 56,59 and 64; and U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States (Washington, D.C.: Government Printing Office, 1962-1975).

would expect that the average increase in adult per capita consumption would be the larger of the two, especially in light of the fact that the 18 to 34 age group (the age group believed to be the heaviest beer drinking segment) has been increasing much faster than the rest of the population since the early 1960s.[7] The disparity is due to data limitations. First, data are not available on the per capita beer consumption of the 18 to 34 age group. If it was available, it is likely that the average percentage increase per year for this segment would be higher than for any other segment.

Second, the twenty-one and over segment includes the oldest age groups, which do not consume high amounts of beer; and it excludes the 16 to 20 year olds, who consume large amounts of beer, thus distorting the data.

Also, the lowering of the legal drinking age to eighteen in 1971 may have had an effect that is not accounted for by the data. Information on the possible changes in drinking patterns since the lowering of the legal drinking age is not available.

As a note of interest, per capita personal income has been included in Table 14. The average increase has been 7.8 percent per year which is over eleven times greater than the average increase in total population.

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[7] "Liquor, Current Analysis," p. L57.

This indicates that the population is becoming much more affluent (as measured in current dollars). Table 15 reinforces this conclusion. Per capita personal income has been adjusted by the Consumer Price Index to show per capita personal income in constant dollars. The average increase in per capita personal income in constant dollars is 3.4 percent per year (or over five times greater than the average increase in total population).

Increases in affluence coupled with increases in the demand for avocational or leisure activities, changing attitudes toward alcoholic beverages (from negative to positive), lowering the legal drinking age, the growth of the 18 to 34 age group relative to the rest of the population, and more and better advertising and marketing by the brewers have resulted in large increases in the consumption of beer in Montana.[8]

Demand is also related to price but since price is determined in conjunction with supply factors, a discussion of the price of beer in Montana is presented in the next section.

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[8]Ibid., pp. L56-L57.

TABLE 15

COMPARATIVE STATISTICS FOR MONTANA: PER CAPITA PERSONAL INCOME AND PER CAPITA PERSONAL INCOME IN CONSTANT DOLLARS, 1961-1975

Year	Per capita personal income	Percent change	Consumer Price Index	CPI adjusted per capita personal income	Percent change
1961	$1920	. . .	89.6	$2143	. . .
1962	2207	14.9%	90.6	2436	13.7
1963	2197	-0.4	91.7	2396	-1.6
1964	2255	2.6	92.9	2427	1.3
1965	2436	8.0	94.5	2578	6.2
1966	2615	7.3	97.2	2690	4.3
1967	2759	5.5	100.0	2759	2.6
1968	2917	5.7	104.2	2799	1.4
1969	3124	7.1	109.8	2845	1.6
1970	3381	8.2	116.3	2907	2.2
1971	3479	2.9	121.3	2868	-1.3
1972	3897	12.0	125.3	3110	8.4
1973	4418	13.4	133.1	3319	6.7
1974	4776	8.1	147.7	3234	-2.6
1975	5434	13.8	161.2	3371	4.2
Total change		183.0%			57.3%
Average change		7.8%			3.4%

SOURCES: Brewer's Almanac, 1967 and 1976, p. 64; and Helen Axel, ed., A Guide to Consumer Markets: 1975/1976 (New York: The Conference Board, Inc., 1975), p. 242.

Statewide Supply of Beer

Legal Barriers to Entry

The state of Montana has erected legal barriers limiting the entry of new retail liquor/beer establishments into the market through the utilization of a quota system. All incorporated towns receive two basic beer permits

(which includes two basic liquor permits), regardless of population. However, the higher the population within an incorporated area, the greater the number of basic beer/liquor permits available to that incorporated area. An incorporated area is the city plus a circle around the city with a five mile radius (from the city limits, not from the city center). Outside the incorporated areas, permits are granted according to convenience and necessity, which is determined by the Liquor Division of the Department of Revenue in Helena. No applications have been denied to date.

At present, there are no restrictions on the number of permits available for the licensing of retail outlets selling beer for off-premises consumption within incorporated areas; however, permits for on-premises consumption are extremely difficult to obtain because the quotas are all filled, with the exception of one basic beer/liquor permit available in Great Falls. The only way an entrepreneur can start a new beer/liquor outlet is to either purchase an existing outlet (under close coordination with the Liquor Division of the Department of Revenue to ensure that the permit is properly transferred), or to get on the waiting list for permits (licenses will be awarded as permits become available).

As a note of interest, the state charges from $400 to $1200 each year for a basic permit. If two permits are

granted (one for beer and one for liquor), then the fee is double. Also, the city may require a licensing fee, if desired; but it must be less than or equal to the state's fee. Currently, all cities in Montana levy the maximum fee.[9]

Wholesale and Retail Prices

Compared to the rest of the nation, wholesale and retail prices of beer in Montana have been extremely stable.[10] That is, there are no minor local brands employing price-cutting marketing tactics and creating an unstable retail atmosphere. All beer sold within the state of Montana is brewed by large national or regional brewers who seem to be content with the stable nature of the price structure.

Distributors are prohibited by law from granting quantity discounts or other special concessions to their retail customers. Consequently, the distributors (of each particular brand) must charge the same price to each retailer regardless of the size of the order, the quality of the account, etc. Periodically, distributors are allowed

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[9]Information in the previous three paragraphs was obtained during a telephone interview with Thomas J. Mulholland, Liquor Division of the Department of Revenue, Helena, Montana, 3 January 1977.

[10]Interview with Elton M. Andrew, retired, U.S. Brewer's Association, Helena, Montana, 26 January 1977.

to offer specials to their retail customers;[11] but there can be no discrimination--all retail customers must have the opportunity to participate in these specials.[12]

During January 1977, the wholesale price of a case of Olympia was $5.45.[13] The range in retail prices was quite wide. The price charged by Buttrey Food Stores was $6.45 (retail), resulting in a markup (based on the retail selling price) of 15.5 percent; whereas, the price charged by Albertson's Food Center was $6.60, resulting in a markup of 17.4 percent. Circle K Food Stores charged $7.48, which is a markup of 27.1 percent. An indication that beer prices within Montana have been stable over time is that the markup has been stable for several years.[14]

Table 16 provides a listing of wholesale beer prices (for Olympia) for selected years since 1959 in

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[11]Example of a special: when Coors entered the Great Falls market during the first week of December, 1976, the special took the form of an across-the-board price cut for 3 to 4 weeks. The typical six-pack (six 12 oz cans) was priced at $1.59; Coors' price was $1.43.

[12]The information in this paragraph was obtained during an interview with Karl Rembe, Manager, Pennington's, Inc., Great Falls, Montana, 4 January 1977.

[13]Olympia has been chosen because it is the market leader in Great Falls. And from empirical observations, it has a middle-of-the-road stable price that can be assumed to be representative of general beer price movements.

[14]Interview with Robert Bruskotter, Jr., Manager, Buttrey Food Stores, Holiday Village Branch, Great Falls, Montana, 21 January 1977.

TABLE 16

WHOLESALE PRICE PER CASE FOR OLYMPIA BEER FOR SELECTED YEARS, 1959-1977

Year	Wholesale price
1959	$3.55
1962*	3.55
1968	3.65
1969	4.25
1971	4.25
1972	4.60
1973	4.85
1974	5.00
1975	5.25
1976	5.45
1977	5.45

SOURCES: Interview with Karl Rembe, Manager, Pennington's, Inc., Great Falls, Montana, 4 January 1977; and Interview with Robert Bruskotter, Jr., Manager, Buttrey Food Stores, Holiday Village Branch, Great Falls, Montana, 21 January 1977.

*Olympia switched from 11 oz cans to 12 oz cans in 1962.

Great Falls. Data for the missing years was not available.

An inspection of Table 17 reveals that increases in the general level of beer prices (as measured by the wholesale price index for malt beverages) have not been keeping pace with increases in the general level of consumer prices (as measured by the Consumer Price Index). Furthermore, this lag is even more apparent when the wholesale prices are adjusted by the wholesale price index for malt beverages; that is, the wholesale prices in constant dollars have remained relatively stable since 1959, at least in

TABLE 17

CONSUMER PRICE INDEX, WHOLESALE PRICE INDEX FOR MALT BEVERAGES, WHOLESALE PRICE PER CASE FOR OLYMPIA BEER IN CONSTANT DOLLARS, AND PER CAPITA PERSONAL INCOME IN CONSTANT DOLLARS FOR SELECTED YEARS, 1959-1975

Year	Consumer Price Index	Wholesale price index for malt beverages	Wholesale price in constant dollars	Per capita personal income in constant dollars
1959	87.3	97.8	$3.63	$2266
1962	90.6	97.2	3.65	2436
1968	104.2	101.5	3.60	2799
1969	109.8	103.1	4.12	2845
1971	121.3	110.2	3.86	2868
1972	125.3	110.8	4.15	3110
1973	133.1	111.6	4.34	3319
1974	147.7	121.9	4.10	3234
1975	161.2	136.5	3.85	3371

SOURCES: Brewer's Almanac, 1976, p. 54; and Helen Axel, ed., A Guide to Consumer Markets: 1975/1976 (New York: The Conference Board, Inc., 1975), p. 242.

comparison to the general level of consumer prices. From these real prices, beer appears to be a bargain. If the wholesale price index exhibits large increases for 1976 and 1977 (as expected from the trend of past increases), then beer will be priced lower (in constant dollars) than it was several years ago. For example, assume that the wholesale price index for malt beverages is 148.0 for 1976 and 160.0 for 1977 (both being conservative extrapolations). Then the wholesale price in constant dollars would be $3.68 for 1976 and $3.41 for 1977. In other words, consumers (in Great Falls) are spending a smaller percentage of their

personal incomes on beer now than they did several years ago (assuming a constant level of beer consumption, of course). To substantiate this, per capita personal income in constant dollars has been included in Table 17. From this data, it can be seen that the wholesale price of a case of beer in constant dollars was 0.16 percent of per capita personal income in constant dollars in 1959; whereas, it was 0.11 percent in 1975. It is likely that this percentage will decrease even further for 1976 and 1977 (based on the wholesale prices in constant dollars estimated above, and the steep upward trend in per capita personal incomes).

Market Structure

The market structure in Montana seems to fit the monopolistically competitive model better than the other three major market structure models (pure competition, monopoly and oligopoly). The monopolistically competitive model is characterized by low economic profit, product differentiation and many competitors who have little control over price. The characteristics of the Montana market structure are similar in that beer is a relatively low margin product, a large number of brands are available and the prices of the brands are nearly the same at each retail outlet. Major differences in prices are due to service differentials at the various outlets. A convenience outlet such as Circle K Food Stores charges a much higher price

than a large discount outlet such as Buttrey Food Stores.

Each brewer can differentiate its brand from those of rival brewers, primarily through packaging and advertising. More consumer loyalty for a particular brand is dependent on greater differentiation of that brand. Excellent examples are Coors and Miller. Miller, through greatly increased advertising stressing product differentiation, has achieved a large amount of consumer loyalty in recent years. Coors, on the other hand, has a tremendous amount of consumer loyalty with little reliance on advertising. Instead, differentiation was achieved with a product that is actually different; the product is non-pasteurized. Coors is a "mysterious" product in the minds of the consuming public and this is the main contributor to the product's success. Other examples include Budweiser and Michelob. Both are highly differentiated products, attendant with a great amount of consumer loyalty.

Within the state of Montana, each brewer seems to make its marketing decisions independently of other brewers; that is, market action by one brewer does not seem to trigger retaliatory market action by other brewers. For example, when Coors entered the Great Falls market in December of 1976, the price of a six-pack of Coors was generally about sixteen cents less than the average. Prices of other brands remained stable throughout Coors' market penetration phase. Currently, the product is well-

established and priced generally about six cents higher than the average.

In short, the monopolistically competitive model seems to fit the structure of the Montana beer market better than other market structure models; and it is fully consistent with the statewide price stability.

CHAPTER IV

DEMAND CHARACTERISTICS

The consumption of beer exhibits a long-term positive trend with pronounced seasonal variations. The purpose of this chapter is to analyze and model these variations and then to generate forecasts of future beer consumption.

Seasonal Variation

Demand for beer in Montana, and in the rest of the nation, is definitely seasonal. An inspection of Figure 3 reveals this obvious seasonal effect. Consumption is high during the summer when the temperatures are the highest. Conversely, consumption is relatively low during the cold winter months, with one exception--there is a noticeable surge in consumption during the end-of-the-year holidays.

Figure 4, in addition to further demonstrating the seasonal variation, indicates the presence of a positive (or upsloping) trend component in beer consumption.

There is not enough data to determine if a cyclical component is present; that is, per capita beer consumption has been steadily increasing since prohibition (with no long-run peaks and troughs apparent). Therefore, the

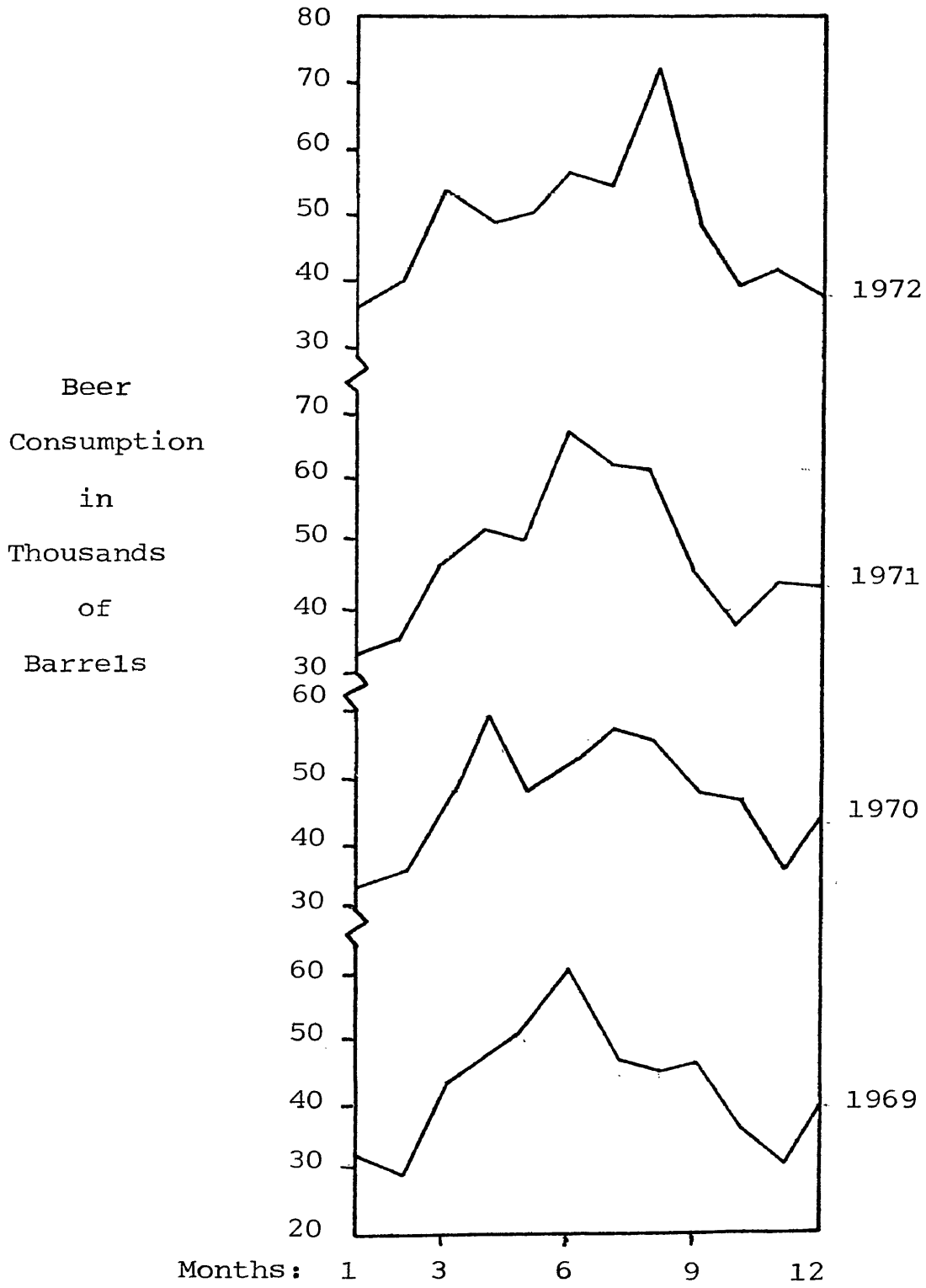

Fig. 3. Monthly beer consumption, Montana, 1969-1975

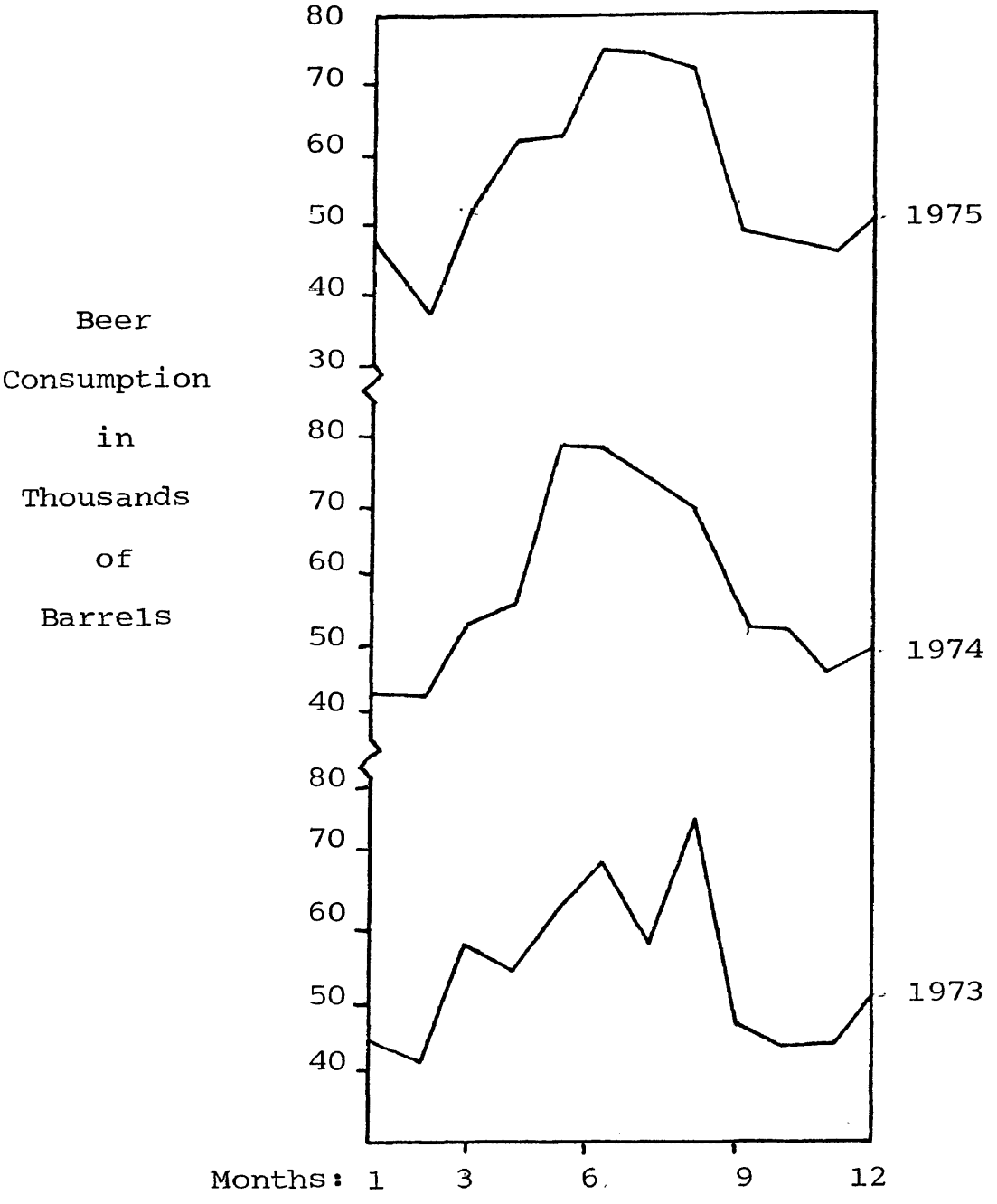

Fig. 3 Continued

SOURCE: Brewer's Almanac, 1976, p. 73.

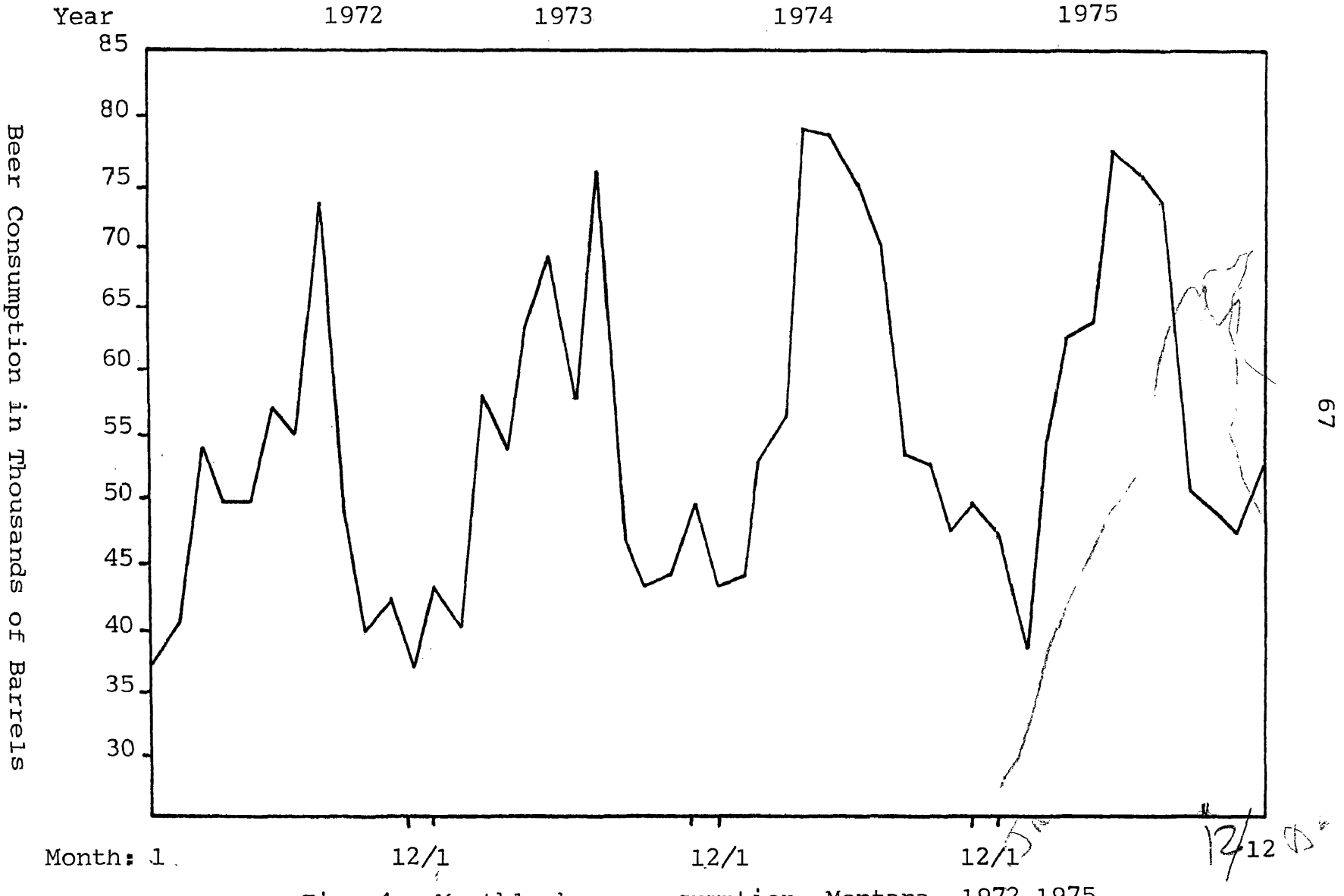

Fig. 4. Monthly beer consumption, Montana, 1972-1975

SOURCE: Brewer's Almanac, 1976, p. 73.

possibility of a long-run cycle in beer consumption will not be considered in this study.

The remainder of this section focuses on an analysis of the seasonal component of the demand for beer in Montana, from three perspectives. First, the seasonal component is isolated by the method of ratio to moving average and a forecast of expected beer consumption is generated. Following this, the seasonal component is isolated through the use of dummy variables (on a quarterly basis as opposed to a monthly bases due to computer limitations), and a forecast is generated. Finally, the unadjusted seasonal data is analyzed with respect to average monthly temperatures in order to determine the extent of correlation between these two variables.

Isolating the Seasonal Component

The Method of Ratio to Moving Average

In this section the method of ratio to moving average is used in isolating the seasonal variation from the time series data (monthly beer consumption in Montana, 1968-1975).

The method is based on the multiplicative assumption of time series data; that is, letting Y = beer consumption, C = the cyclical component, S = the seasonal component, T = the trend component and I = the irregular component, an equation that explains the final demand for

beer is Y = CSTI.[1] Since it is assumed that the cyclical component is not present, Y = STI.

The first step in isolating the seasonal component involves estimating T through the use of a centered twelve month moving average. Next, an estimate of SI is obtained by dividing the original data by T: SI = STI/T. The values of SI are called the specific seasonal relatives; and since they are theoretically free of T (and C, if present), they are very useful in analyzing the nature of the seasonal variation in the time series.

A plot of the specific seasonal relatives is shown in Figure 5.[2] According to this figure, the seasonal pattern appears to be stable; that is, it is not changing over time. An unstable seasonal pattern may present itself by changes in either amplitude or timing, or both. In this data, the timing is stable--the peaks are always in midsummer and the troughs are always in midwinter. Because the amplitude is also stable, it is assumed that the time series is seasonally stable.

Table 18 reinforces this conclusion. Reading the table horizontally, the data appears to be irregular--it

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[1]Ya-Lun Chou, Statistical Analysis: With Business and Economic Applications (New York: Holt, Rinehart and Winston, Inc., 1968), p. 569.

[2]In reference to Figure 5 and Table 18, six months of data were lost at each end of the time series in the computation of the moving average.

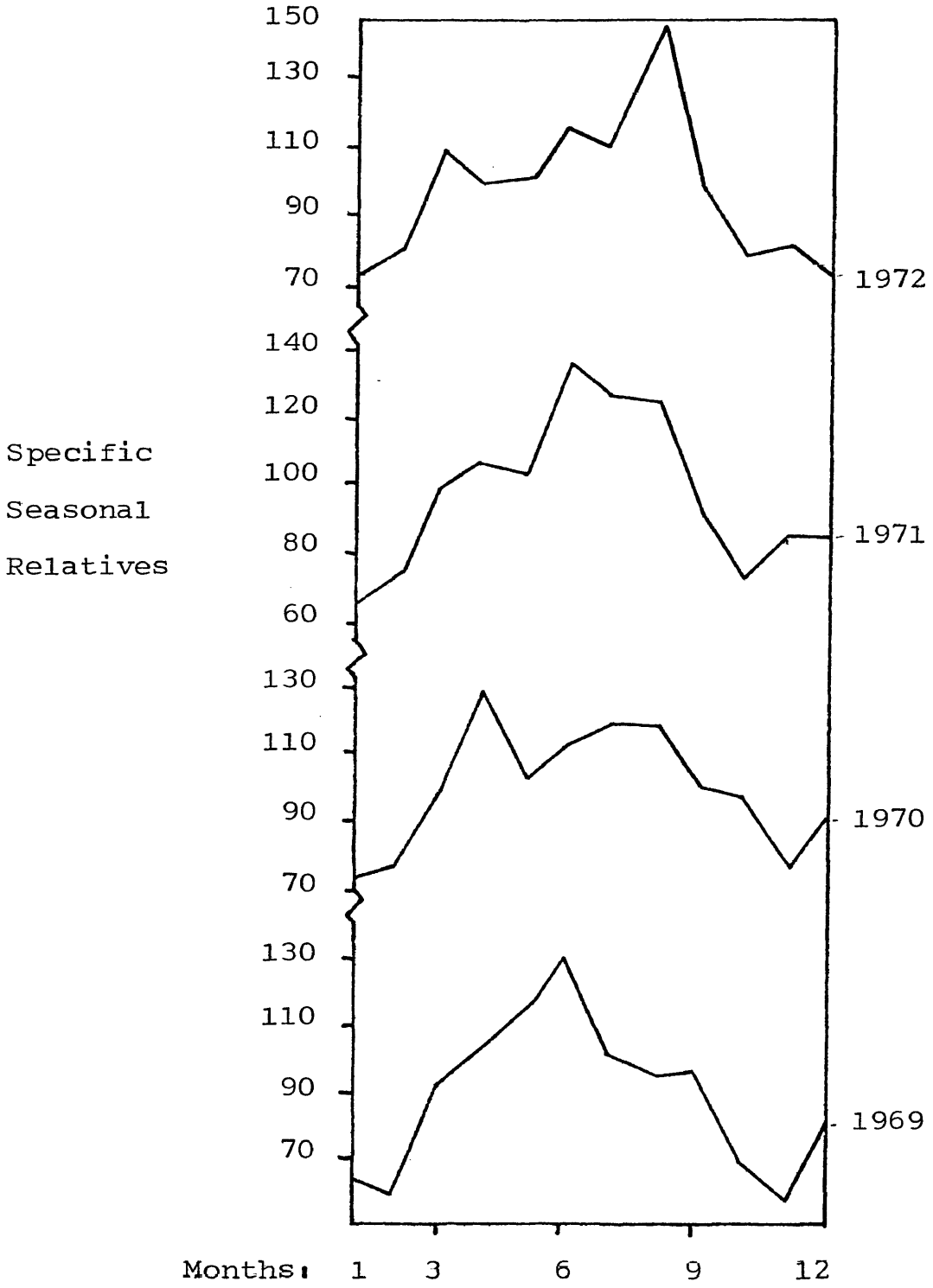

Fig. 5. Specific Seasonal Relatives, 1969-1975

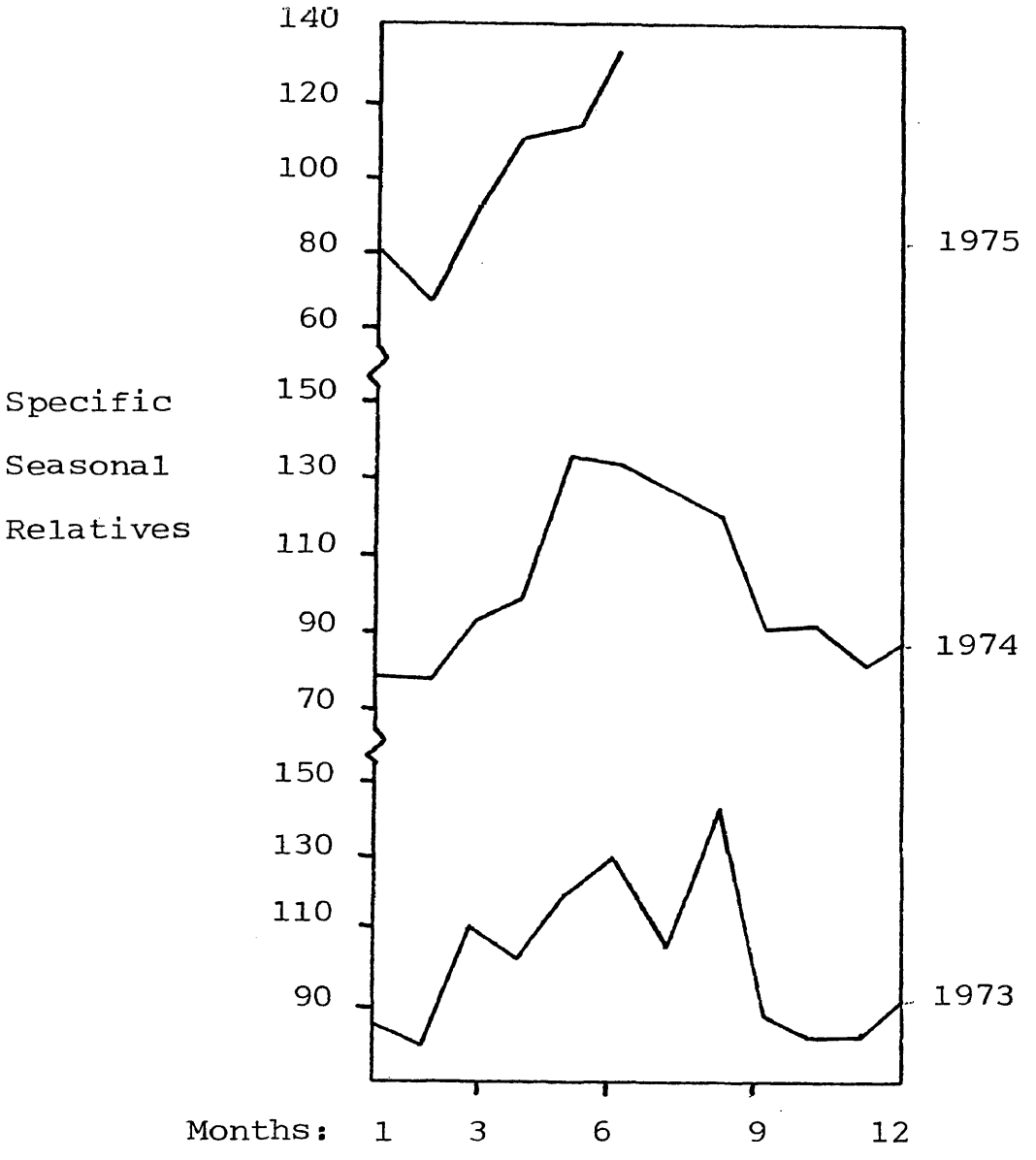

Fig. 5. Continued

TABLE 18

SPECIFIC SEASONAL RELATIVES, 1968-1975

Month	1968	1969	1970	1971	1972	1973	1974	1975
January	. . .	74.3	74.6	67.6	75.4	83.8	76.1	81.6
February	. . .	69.2	78.9	74.2	83.1	77.1	76.3	65.8
March	. . .	102.2	103.8	98.9	110.1	111.6	93.0	91.4
April	. . .	113.7	129.1	108.6	101.7	102.6	97.3	109.6
May	. . .	125.2	103.0	104.9	102.2	119.3	135.7	111.5
June	. . .	143.6	114.8	138.8	116.6	130.8	134.3	135.2
July	135.0	112.5	122.1	128.5	111.8	106.5	127.1	. . .
August	120.9	106.4	120.7	126.0	148.7	140.1	119.4	. . .
September	91.1	107.8	103.1	97.6	100.5	87.8	92.2	. . .
October	77.5	80.7	98.5	74.0	79.4	80.4	90.3	. . .
November	79.2	67.3	75.3	87.6	83.4	81.2	80.6	. . .
December	85.6	91.6	92.5	87.2	70.6	90.0	86.4	. . .

is not steadily increasing or decreasing; which means that there is not a trend component in the amplitude of the specific seasonal relatives, indicating a stable seasonal pattern. If the seasonal variations are not stable, then a more complicated procedure must be used in isolating the seasonal component.

In isolating S from SI, the irregular component is assumed to be normally distributed with a mean of zero;[3] therefore, by using the median of the raw monthly values as an estimate of S, the seasonal component is theoretically isolated. The median is better than the mean for taking the irregular component out because it is not affected by extreme high or low variations in the data.

[3]Ya-Lun Chou, Statistical Analysis, p. 576.

When S, the seasonal component, is isolated, it is called the seasonal index and is used in seasonally adjusting the raw data. See Table 19 for a listing of the seasonal indices.

TABLE 19

SEASONAL INDICES

Month	Seasonal Index
January	74.3
February	75.9
March	101.1
April	112.8
May	118.6
June	128.7
July	119.8
August	127.1
September	97.4
October	85.9
November	77.1
December	81.3

Finally, the seasonally adjusted data is obtained by dividing the raw data by the corresponding seasonal index; or, in the multiplicative form, TI = STI/S. In other words, the seasonally adjusted data is a function of the trend and irregular components.

In search of a good mathematical relationship to describe the seasonally adjusted data, the following models were applied to the portion of the time series from 1971 to 1975: the simple linear regression model of the form $Y = a + b(X)$, where X is time and Y is the seasonally adjusted data; the Cobb-Douglas type of function of the

form $Y = a(X)^b$ or, in linear form, logY = loga + blogX; the polynomial regression model of the form $Y = a + b(X) + c(X)^2 + d(X)^3$; and the exponential regression model of the form $Y = a(b)^X$ or, in linear form, logY = loga + Xlogb.

From an analysis of the regression statistics, the exponential model was the model of best fit. The coefficient of determination (R^2) was 0.431 and the t-values and the F-ratio were significant at the 95 percent confidence level (which was used throughout this study). Also, the Durbin-Watson Statistic indicated that serial correlation was not significant. The estimated regression equation was $Y = \underset{(2634)}{46.2}\underset{(57.3)}{(1.004)^X}$, with January of 1971 as the base period (where X is 1). The t-values for each estimated regression coefficient are shown in parentheses below their respective coefficients. This format was continued throughout this study. Based on the estimated regression equation, the forecasts of monthly beer consumption along with the forecasts at the 95 percent confidence level for twenty-four months are shown in Table 20. The standard error of the estimate was 4.763. With the exponential regression model, beer consumption in Montana is expected to grow at 7.8 percent during 1976 and 5.2 percent during 1977.

Four Quarter Data With Dummy Variables

In this section the seasonal data was grouped on a

TABLE 20

FORECASTED MONTHLY BEER CONSUMPTION AND ESTIMATES AT THE 95 PERCENT CONFIDENCE LEVEL FOR MONTANA IN THOUSANDS OF BARRELS, 1976-1977

1976

Month	Forecast	95 Percent confidence interval	
		Low	High
Jan	44.9	35.4	54.4
Feb	46.0	36.5	55.5
Mar	61.6	52.1	71.1
Apr	69.0	59.5	78.5
May	72.9	63.4	82.4
Jun	79.4	69.9	88.9
Jul	74.3	64.8	83.8
Aug	79.1	69.6	88.6
Sep	60.9	51.4	70.4
Oct	54.0	44.5	63.5
Nov	48.6	39.1	58.1
Dec	51.5	42.0	61.0
Totals	742.2	627.9	856.5

1977

Month	Forecast	95 Percent confidence interval	
		Low	High
Jan	47.3	37.8	56.8
Feb	48.5	39.0	58.0
Mar	64.9	55.4	74.4
Apr	72.8	63.3	82.3
May	76.8	67.3	86.3
Jun	83.7	74.2	93.2
Jul	78.3	68.8	87.8
Aug	83.4	73.9	92.9
Sep	64.2	54.7	73.7
Oct	56.9	47.4	66.4
Nov	51.3	41.8	60.8
Dec	54.3	44.8	63.8
Totals	782.5	668.1	896.7

quarterly basis (starting with January) in order to use dummy variables to facilitate the analysis of the seasonal variation in the time series. See Figure 6 for a plot of the quarterly data. Two regression models were utilized. A linear regression of the form $Y = a + b(X) + c(D_2) + d(D_3) + e(D_4)$ was performed where the Ds represent dummy variables. Also a polynomial regression of the form $Y = a + b(X) + c(X^2) + d(X^3) + e(X^4)$ was performed.

The linear regression model provided the best fit with an R^2 of 0.933, a significant F-ratio and an acceptable Durbin-Watson Statistic. All but one of the t-values were significant--the one for the coefficient of D_2 was not, thus the estimated regression equation was $Y = \underset{}{89.04} + \underset{(22.0)}{1.98(X)} + \underset{(12.6)}{3.73(D_2)} + \underset{(0.9)}{52.55(D_3)} + \underset{(12.8)}{47.21(D_4)} + \underset{(11.5)}{}$, where X is 1 for the first quarter of 1968.[4] The forecasts for 1976 and 1977 are shown in Table 21 along with the estimates at the

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[4]The dummy variables were assigned a value of either 0 or 1 for each quarter as shown below. The pattern is repeated each year.

Year 1				Year 2			
Quarter	D_2	D_3	D_4	Quarter	D_2	D_3	D_4
1	1	0	0	1	1	0	0
2	0	1	0	2	0	1	0
3	0	0	1	3	0	0	1
4	0	0	0	4	0	0	0

Thus, the basic time series regression line $Y = 89.04 + 1.98(X)$ was for fourth quarter sales. Variations due to season were then adjusted for by the respective dummy variables.

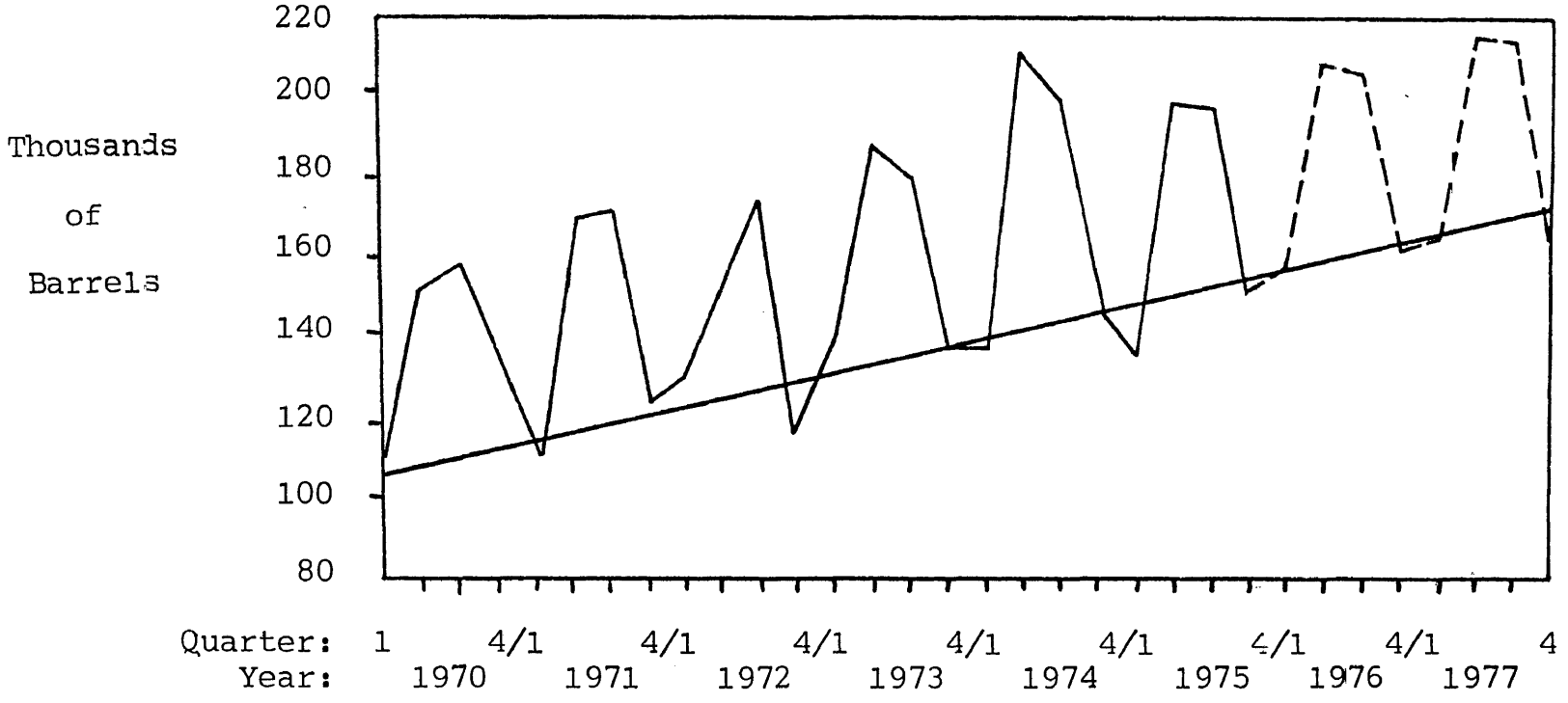

Fig. 6. Quarterly beer consumption with forecasts through 1977 and the fourth quarter trend line, Montana, 1970-1977.

NOTE: The forecast is the dashed line.

TABLE 21

FORECASTED QUARTERLY BEER CONSUMPTION AND ESTIMATES AT THE 95 PERCENT CONFIDENCE LEVEL FOR MONTANA IN THOUSANDS OF BARRELS, 1976-1977

1976			
		95 Percent confidence interval	
Quarter	Forecast	Low	High
1	160.1	143.8	176.4
2	208.9	192.6	225.2
3	205.6	189.2	221.9
4	160.3	144.0	176.6
Totals	734.9	669.6	790.1

1977			
		95 Percent confidence interval	
Quarter	Forecast	Low	High
1	166.0	149.6	182.3
2	216.8	200.4	233.1
3	213.5	197.2	229.8
4	168.2	151.8	184.5
Totals	764.6	696.8	829.7

95 percent confidence level (the standard error of the estimate was 8.173). Also, the actual and forecasted quarterly data plus the fourth quarter trend line are shown in Figure 6. The fourth quarter trend line is a function of the estimated regression equation less the dummy variables, or Y = 89.04 + 1.98(X). Using the linear regression model with dummy variables, beer consumption would be expected to grow 7.4 percent during 1976 and 4.0 percent

during 1977.

The exponential model used in the previous section for forecasting monthly beer consumption had a wider confidence interval than the linear model used in this section for forecasting quarterly beer consumption. The variations for 1976 and 1977 with the exponential model were 26.7 percent and 25.5 percent, respectively, as opposed to variations of 15.2 percent and 16.0 percent for the linear model.

Beer Consumption and Average Monthly Temperatures

This section has been included in order to determine the extent of correlation, if any, that exists between beer consumption and temperature. The temperatures were obtained from the National Weather Service and are monthly averages of readings taken at the Great Falls International Airport.

A series of regressions was performed on the seasonal beer consumption data and the average monthly temperatures. The model of best fit was a linear regression with monthly beer consumption as the dependent variable and time and the average monthly temperature as the independent variables. The R^2 was 0.632 with valid regression statistics, and the estimated regression equation describing this relationship was $Y = \underset{}{23.9} + \underset{(7.8)}{0.21}(T) + \underset{(3.7)}{0.51}(D)$, where T is time (T is 1 for January of 1971) and D is the average monthly temperature in degrees (Fahrenheit).

Annual Variation

Since 1961 there has been an annual increase in the amount of beer consumed in Montana, with the exception of 1968 when consumption decreased slightly. Per capita consumption, both total and adult, has been much more variable than total consumption because of irregularities in the growth of the state's population.[5] Figure 7 illustrates the upsloping trend in beer consumption. It appears that beer consumption is increasing at a constant rate. This is not entirely consistent with the growth rates predicted with the seasonal models above, however. Nor is it consistent with the proposition that the industry is entering the maturity phase of the product life cycle--characterized by growth at a decreasing rate. These inconsistencies were dealt with in Chapter V through a synthesis of the qualitative and quantitative factors.

In an attempt to estimate an equation describing annual beer consumption in Montana, several sets of multiple regressions were estimated. Various combinations of the following variables were employed in this analysis: annual beer consumption, time, total population, 18 to 34 age group, wholesale price per case in constant dollars, total advertising expenditures (of the top 17 to 24

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[5]See Table 14, page 50 above.

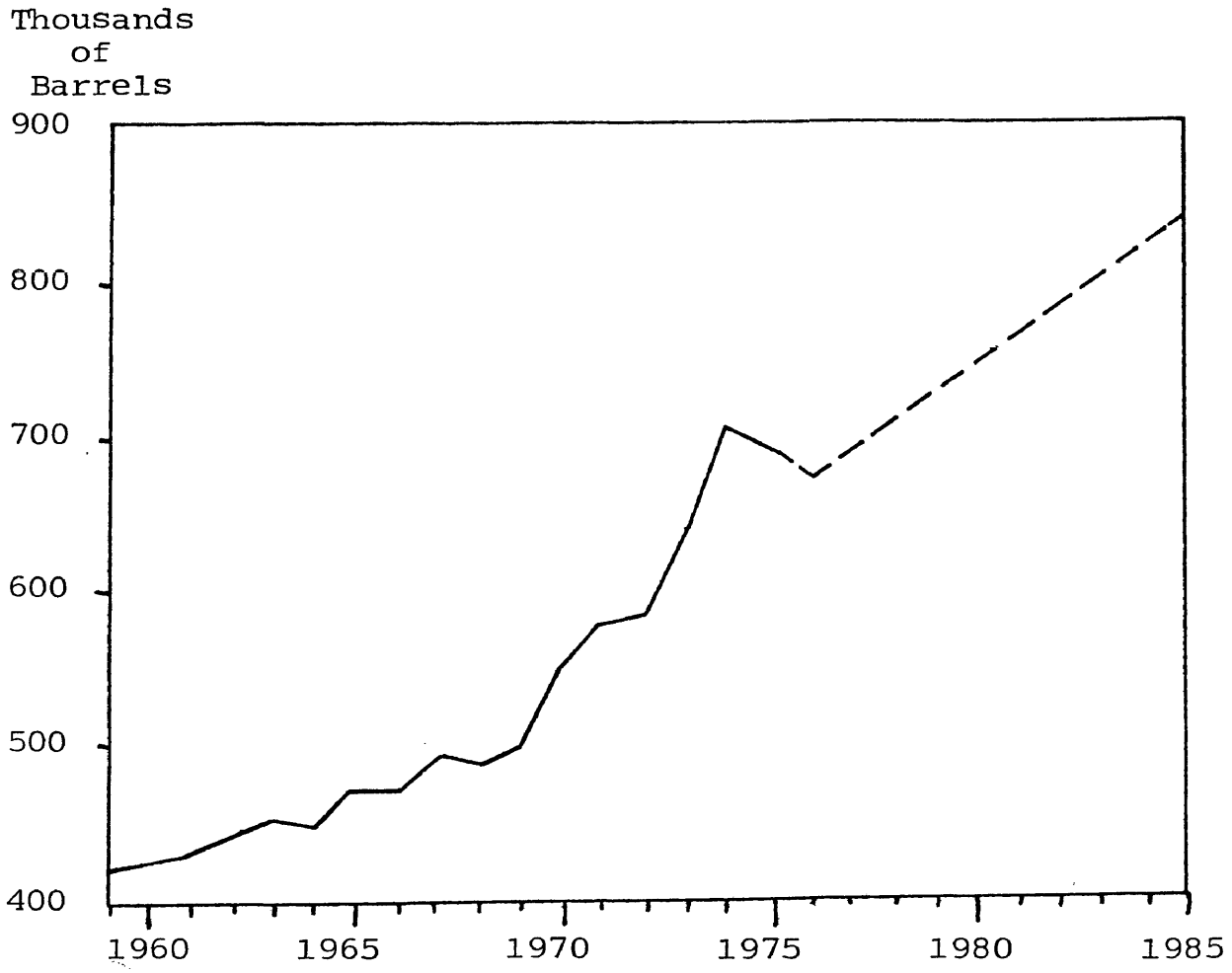

Fig. 7. Annual beer consumption with forecasts through 1985, Montana, 1959-1985.

NOTE: Solid line--historical data, dashed line--forecasts.

companies) in constant dollars,[6] the Consumer Price Index, the Price Index for Malt Beverages, per capita personal income in constant dollars, total per capita beer consumption, and adult per capita beer consumption. Most of these

[6]The advertising expenditures do not include point of purchase and any other non-measured media expenditures (such as newspapers).

models were plagued by multicollinearity[7] and serial correlation problems. In order to overcome these problems, the procedure outlined in Jerome D. Braverman's Probability, Logic and Management Decisions was followed.[8] That is, the redundant independent variables with the lowest correlation coefficients (with the dependent variable) were selectively dropped from the models until the problems were overcome.

The best model (that was not hampered by multicollinearity or serial correlation) employed total beer consumption as the dependent variable and time and adult population as the independent variables. This regression model had an R^2 of 0.962 with significant t-values and a significant F-ratio at the 95 percent confidence level. The estimated equation describing this relationship was

$$Y = \underset{}{-540.1} + \underset{(-3.0)}{0.70(T)} + \underset{(4.0)}{2.4(AP)}, \quad \underset{(5.1)}{}$$

where T is time and AP is adult population. Several other models were also quite good (with significant regression statistics). Four of these will be mentioned for comparison purposes, as shown

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[7]Multicollinearity, or lack of independence between the independent variables, occurs when there is a high R^2 and low t-values. It should be noted that multicollinearity is not as much of a problem in models designed to forecast or predict as it is in models designed to explain demand. For forecasting, a model with a high R^2 is needed, regardless of the t-values.

[8]Jerome D. Braverman, Probability, Logic and Management Decisions (New York: McGraw-Hill Book Company, 1972), pp. 283-309.

below.

(1) $Y = \underset{(-5.3)}{-814.8} + \underset{(4.6)}{2.6}(AP) + \underset{(3.0)}{0.10}(I)$ $\quad R^2 = 0.950$

(2) $Y = \underset{(-1.8)}{-485.2} + \underset{(7.3)}{14.0}(T) + \underset{(2.5)}{1.40}(P)$ $\quad R^2 = 0.943$

(3) $Y = \underset{(3.1)}{450.0} + \underset{(9.1)}{31.8}(T) - \underset{(-0.02)}{0.70}(WP)$ $\quad R^2 = 0.931$

(4) $Y = \underset{(2.4)}{507.4} + \underset{(5.8)}{33.2}(T) - \underset{(-0.3)}{2.6}(YAP)$ $\quad R^2 = 0.932$

where Y = total beer consumption in Montana

T = time

AP = adult population

I = per capita personal income in constant dollars

P = total population

A = total advertising expenditures in constant dollars

WP = wholesale price per case in constant dollars

YAP = 18 to 34 age group

and T = 1 for 1960.

In the third model, the t-value for the wholesale price per case in constant dollars was low (which indicated that the regression coefficient was insignificant). And in the fourth model, the t-value for the 18 to 34 age group was low. In all combinations in which the wholesale price per case or the 18 to 34 age group were among the set of independent variables (or when they were the only independent variables), the regression statistics were not significant (low R^2 or low t-values or both). Apparently the

history of wholesale prices in constant dollars does not significantly affect the level of beer consumption. This suggests that the demand for beer is relatively price inelastic. A study done by Thomas Hogarty and Kenneth Elzinga substantiates this proposition. In their study of September 1971, entitled, "The Demand for Beer," they arrived at a price elasticity for beer of -0.9.[9] Thus, total revenue of the brewers will rise with increases in price and decline with decreases in price. In other words, consumers will continue to purchase relatively the same amount of beer regardless of price changes (up or down) within realistic or tolerable limits, of course. Although it was mentioned in previous sections that the 18 to 34 age group was thought to be the population segment having the greatest effect on the aggregate level of beer consumption, this analysis does not substantiate it. In fact, when total beer consumption was regressed with total population, then with adult population and then with the 18 to 34 age group, the R^2s were 0.720, 0.920 and 0.674, respectively, (with significant regression statistics). Thus, the highest correlation was with adult population and the lowest correlation was with the 18 to 34 age group.

In order to forecast beer consumption, a model was

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[9]Thomas F. Hogarty and Kenneth G. Elzinga, "The Demand for Beer," The Review of Economics and Statistics, May 1972, p. 197.

needed with a high R^2 and with independent variables whose values can be predicted with confidence for several years into the future. The model with the highest R^2 (the one with time and adult population as the independent variables) was used in generating the forecasts. Since projections of adult population levels were not available for this study, they were estimated through a linear regression (with time as the independent variable). With these estimates, the forecasts of total beer consumption in Montana through 1985 along with the estimates at the 95 percent confidence level (the standard error of the estimate was 18.12) are shown in Table 22. The forecasts are also plotted on Figure 7.

Summary

In this chapter, the consumption of beer was analyzed on a seasonal and an annual basis. The seasonal analysis was approached from a monthly and a quarterly respect. By utilizing the method of ratio to moving average, the seasonal component was isolated and then a forecast of consumption for 1976 and 1977 was made with the use of an exponential regression model (see Table 20, page 75). The estimated regression equation describing this relationship was $Y = 46.2(1.0044)^X$ with an R^2 of 0.431.

In analyzing the seasonal variation of the quarterly beer consumption data, a linear regression model

TABLE 22

FORECASTED TOTAL BEER CONSUMPTION, THE PERCENT CHANGE AND THE ESTIMATES AT THE 95 PERCENT CONFIDENCE LEVEL FOR MONTANA IN THOUSANDS OF BARRELS, 1976-1985

Year	Forecast	Percent change	95 Percent confidence interval*	
			Low	High
1976	671	. . . .	635	707
1977	689	2.7%	653	725
1978	708	2.8	672	744
1979	726	2.5	690	762
1980	744	2.5	708	780
1981	763	2.6	727	799
1982	783	2.6	747	819
1983	799	2.0	763	835
1984	820	2.6	784	856
1985	838	2.2	802	874

*The 95 percent confidence interval is calculated based on the standard error of the estimate from the annual model only; it does not include the standard error of the estimate associated with the regression model used in estimating adult population levels.

employing dummy variables was the model of best fit, or $Y = 89.04 + 1.98(X) + 3.73(D_2) + 52.55(D_3) + 47.21(D_4)$ with an R^2 of 0.933. See Figure 6, page 77 and Table 21, page 78 for the forecasts for 1976 and 1977.

The correlation between monthly beer consumption and average monthly temperatures was investigated. The model of best fit indicated that the correlation between these two variables was statistically significant, with an R^2 of 0.632 and valid regression statistics.

For the annual analysis there were several models of good fit but the best model used time and adult

population as the independent variables with an R^2 of 0.962, or Y = -540.1 + 0.70(T) + 2.4(AP), where T is time and AP is adult population. As a result of the annual analysis, it was proposed that the demand for beer is relatively price inelastic. And contrary to the expectations in Chapters II and III, the 18 to 34 age group does not seem to have a great effect on the consumption of beer in Montana. When the three most important population segments (total, adult and 18 to 34) were used as the independent variables in a model employing beer consumption as the dependent variable, the lowest R^2 was with the 18 to 34 age group (at 0.674) and the highest R^2 was with adult population (at 0.920). Furthermore, in all models in which the 18 to 34 age group and/or price were included in the set of independent variables, their t-values were low, which indicated that including these two variables in the model would not significantly change the results. For the forecasts of beer consumption on an annual basis (1976-1985), see Figure 7, page 81 and Table 22, page 86.

CHAPTER V

EVALUATION AND CONCLUSIONS

The purpose of this chapter is to weigh or temper the quantitative forecasts of beer consumption made in Chapter IV with the qualitative factors affecting the industry, and the characteristics of the beer market in Montana (as discussed in Chapters II and III, respectively). In order to facilitate the determination of a revised forecast (on both a seasonal and an annual basis), the qualitative forces impinging the industry are summarized below.

Qualitative Factors

First, it is assumed that the increasing concentration in the brewing industry coupled with changes in the marketing practices of the major brewers is signaling the entrance of the industry into the maturity phase of the product life cycle. Because of this and the expected overcapacity in the industry, competition is expected to intensify; and advertising expenditures are expected to increase rapidly. Intense promotion of beer with modern marketing techniques (especially product and market segmentation) should result in increases in the aggregate level of beer consumption above the expected population

increases; thus per capita consumption should increase. This assumption is further validated when analyzed in light of the next factor.

Second, it is thought that a great potential exists for increasing beer consumption because of the low per capita consumption in the United States as compared to certain European countries. That is, per capita consumption in the United States is approximately 30 percent and 46 percent below the levels in the United Kingdom and West Germany, respectively.[1] Also, women are consuming more beer, ". . . 25% of today's beer volume is consumed by women, as compared with 15% less than 10 years ago."[2] More intelligent and aggressive marketing could stimulate increases in consumption by women and tend to lessen the gap between per capita consumption in the United States and Europe.

Third, although the results of this study indicate that the growth of the 18 to 34 age group in Montana is not as highly correlated with the growth of total in-state beer consumption as expected, and is, in fact, not as highly correlated as the growth of total population and adult population are to beer consumption, it is generally felt within the industry that a slowdown in the growth of this

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[1] "Beverages, Basic Analysis," p. B62.

[2] Ibid., p. B63.

segment (expected to begin in the early 1980s) will tend to slow the trend-line growth of beer consumption.

Fourth, recent estimates of expected increases in nationwide consumption have been revised downward from earlier estimates. Based on large annual increases in consumption in the early 1970s, it was estimated that the annual increases from 1974 to 1980 would average 4.5 percent plus or minus 0.5 percent.[3] This growth did materialize through 1975, however, Montana experienced a 2.2 percent decrease in aggregate consumption in 1975. In 1976, the nationwide growth slowed to 1.2 percent; but growth for 1977 is expected to recover to 3 to 4 percent.[4]

Fifth, consumers' tastes, attitudes and preferences seem to be changing. For example, light beers are becoming much more popular. At present, low calorie beers have a taste that many find disagreeable. However, they will probably become a very important part of the beer market (especially among women and older and overweight drinkers) when the taste is improved. Attitudes are changing in that alcoholic beverages are more socially acceptable; there is not as much of a stigma attached to drinking now as in earlier years. This is manifested in another respect

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[3]"Beer Sales Foaming Higher, But Small Breweries go Dry," Industry Week, 23 October 1972, p. 58.

[4]"Beverages, Current Analysis," Standard & Poor's Industry Surveys, 10 March 1977, p. B51.

in that consumers are thought to be including alcohol in more social occasions than in previous years but consuming smaller amounts per occasion, thus it is thought that there is greater moderation in drinking.[5]

And sixth, the pending legislation in Montana that will, if passed, raise the legal drinking age from eighteen to nineteen could have an effect on aggregate beer consumption. This bill will probably decrease consumption, but there were no quantitative estimates of its impact available. There may be numerous other qualitative factors affecting beer consumption; but for the purposes of this study, the ones mentioned above were assumed to be the most important.

The forecasts of annual beer consumption in Montana made in Chapter IV may be assumed to be reasonable accurate (see Table 22, page 86). The basis for this assumption is that the expected decrease in the size of the 18 to 34 age group and the possible raising of the legal drinking age to nineteen are expected to result in decreased beer consumption; but it is likely that this effect will be more than offset by increases in consumption due to the entrance of the industry into the maturity phase of the product life cycle with the accompanying aggressive market-

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[5]"A Revolution in Drinking Reshapes the Liquor Industry," U.S News and World Report, 21 March 1977, pp. 71-73.

ing techniques (market and product segmentation and differentiation, large increases in advertising outlays, etc.). Also, potential exists for increasing consumption through increased promotion of products designed for women, overweight drinkers, and older drinkers.

The average growth of consumption expected considering all factors is likely to be about 2.2 percent per year for ten years (1976-1985). Consumption is expected to be quite low through 1977 and then to pick up to a quite stable growth of approximately 2.5 percent per year from 1978 to 1985. This is consistent with the assumptions because the really aggressive marketing by the brewers is only in its initial stages at this point in time; and it probably will not be in full force until late 1977 or early 1978 (when the expected overcapacity will begin to put pressures on brewers' margins).

However, the seasonal forecasts, on both a monthly and a quarterly basis, are perhaps too high (see Tables 20 and 21) because they forecast substantial increases in consumption for 1976 and 1977 (7.8 percent and 5.2 percent, respectively, for the monthly model and 7.4 percent and 4.0 percent, respectively for the quarterly model). It is unlikely that the growth in consumption will be this high when considered in light of the qualitative factors facing the industry and the possible changing legal and demographic environments in Montana. Therefore, the

monthly and quarterly forecasts should be lowered by 9.6 percent and 9.0 percent, respectively, for 1976 and 11.9 percent and 10.4 percent, respectively, for 1977 to be in line with the forecasts made with the annual model.[6] Thus, the revised forecasts for the monthly model are shown in Table 23 and those for the quarterly model are shown in Table 24.

TABLE 23

REVISED FORECASTED MONTHLY BEER CONSUMPTION FOR MONTANA IN THOUSANDS OF BARRELS, 1976-1977

Month	1976	1977
January	40.5	41.7
February	41.5	42.7
March	55.6	57.2
April	62.3	64.1
May	65.8	67.7
June	71.7	73.7
July	67.1	69.0
August	71.4	73.5
September	55.0	56.6
October	48.8	50.1
November	43.9	45.2
December	46.5	47.8
Totals	670.1	689.3

[6]The percentage adjustment for the 1977 monthly data, for example, was determined in this manner:

$$\frac{\text{1977 total from Table 20 - 1977 total from Table 22}}{\text{1977 total from Table 20}} =$$

11.9 percent.

TABLE 24

REVISED FORECASTED QUARTERLY BEER CONSUMPTION FOR MONTANA IN THOUSANDS OF BARRELS, 1976-1977

Quarter	1976	1977
1	142.3	147.2
2	191.9	196.0
3	188.8	193.1
4	147.7	152.5
Totals	670.7	688.8

Conclusions

Probably the single most important factor facing the brewing industry is the entrance of the industry into the maturity phase of the product life cycle. This factor coupled with the other qualitative factors confronting the industry (increased concentration, the potential for increased consumption, the slowdown in the growth of the 18 to 34 age group, changing attitudes toward alcoholic beverages, and pending legislation in Montana to raise the legal drinking age) have been used in moderating and substantiating the forecasts of beer consumption, on both a seasonal and an annual basis, made in Chapter IV.

Based on the results of this study, it is likely that the aggregate level of beer consumed in Montana will continue to increase at the annual rates of growth mentioned above barring drastic environmental changes, of course, such as stricter legislation concerning drinking

ages, greatly increased prices, shortages of agricultural commodities (due to disease, drought, etc.), a revision of consumer attitudes favoring abstinence, and so on. For the forseeable future, however, it is unlikely that these types of environmental changes will occur; thus, the consumption of beer in Montana should display annual rates of growth characteristic of the predictions made above.

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