



Urban consumer attitudes toward farm supply cooperatives
by Glenn Richard Barth

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY in Agricultural Economics
Montana State University
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Abstract:

Farm supply cooperatives have secured a substantial share of the farm petroleum products market, both nationally and in Montana-western North Dakota. Yet, in spite of the successful penetration of the farm market the refinery operated by the Farmers Union Central Exchange at Laurel, Montana is being operated at less than the optimum volume. A virtually untapped market for Co-op gasoline exists in rapidly growing urban centers, but gasoline consumers in these centers have demonstrated little interest in patronizing cooperatives.

The purpose of the study was to identify and measure the attitudes of urban consumers toward farm supply cooperatives as sources of gasoline. It is hoped that the resulting information about urban attitudes will provide Cooperative managers with a better basis for planning sales expansion, educational efforts, and changes in cooperative policies and practices.

Urban gasoline consumers in Bismarck, North Dakota; and Billings and Missoula, Montana were found to have a generally unfavorable attitude toward farm supply cooperatives, considering them a type of cut rate gas station selling primarily to farmers. In contrast to their major competitors, cooperatives were thought to sell poor quality gasoline in unattractive surroundings and to be poor community citizens. Little outright hostility to cooperatives was found, but cooperatives have failed to interest urban residents in cooperative buying and the merits of the cooperative movement.

These research findings suggest that farm supply cooperatives should be able to win a substantial amount of urban business if they are willing and able to change unfavorable consumer attitudes through education and physical improvements. Such a public relations drive to court the urban consumer will demand a high level of cooperation between local and regional cooperatives and the abandoning of such traditional features as the strong rural flavor of most cooperatives. An alternative course of action would be the formation of a Separate organization geared to urban needs and in no way identified with the present farm supply cooperatives.

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Agricultural Economics

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August, 1966

ACKNOWLEDGMENTS

Association with Dr. John L. Fischer, who originally served as graduate committee chairman, and with Dr. Layton S. Thompson who replaced him as chairman, has been a source of pleasure and inspiration. Dr. Fischer provided counsel, advice, and encouragement in planning and conducting this research. Dr. Thompson was most helpful in the task of organizing and presenting the results. Dr. Jack R. Davidson and Dr. Lloyd C. Rixe also provided invaluable assistance. Other members of the staff of Montana State University contributed much by their suggestions and advice on clarifying the problem, analyzing the data, and organizing the report.

In addition to those individuals who have contributed directly, this study could not have been completed without the assistance of others whose activities were of a sustaining and supporting nature. Among these are the Directors of the Farmers Union Central Exchange, the members of the Research Committee of the Central Exchange Foundation, and other management personnel of the Farmers Union Central Exchange too numerous to mention. It is hoped that the conclusions will be of some service to them in the future conduct of their business.

A special word of thanks is due my wife and children for the patience with which they have endured many inconveniences.

Notwithstanding the substantial contributions made by others, any errors or omissions in this study are the responsibility of the author alone.

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ABSTRACT

Farm supply cooperatives have secured a substantial share of the farm petroleum products market, both nationally and in Montana-western North Dakota. Yet, in spite of the successful penetration of the farm market the refinery operated by the Farmers Union Central Exchange at Laurel, Montana is being operated at less than the optimum volume. A virtually untapped market for Co-op gasoline exists in rapidly growing urban centers, but gasoline consumers in these centers have demonstrated little interest in patronizing cooperatives.

The purpose of the study was to identify and measure the attitudes of urban consumers toward farm supply cooperatives as sources of gasoline. It is hoped that the resulting information about urban attitudes will provide cooperative managers with a better basis for planning sales expansion, educational efforts, and changes in cooperative policies and practices.

Urban gasoline consumers in Bismarck, North Dakota; and Billings and Missoula, Montana were found to have a generally unfavorable attitude toward farm supply cooperatives, considering them a type of cut rate gas station selling primarily to farmers. In contrast to their major competitors, cooperatives were thought to sell poor quality gasoline in unattractive surroundings and to be poor community citizens. Little outright hostility to cooperatives was found, but cooperatives have failed to interest urban residents in cooperative buying and the merits of the cooperative movement.

These research findings suggest that farm supply cooperatives should be able to win a substantial amount of urban business if they are willing and able to change unfavorable consumer attitudes through education and physical improvements. Such a public relations drive to court the urban consumer will demand a high level of cooperation between local and regional cooperatives and the abandoning of such traditional features as the strong rural flavor of most cooperatives. An alternative course of action would be the formation of a separate organization geared to urban needs and in no way identified with the present farm supply cooperatives.

INTRODUCTION

General Background

Cooperatives today are a solidly established part of the American business scene. Mutual insurance companies, mutual investment funds, cooperative wholesale houses, federal credit unions, federal building and loan associations, the Railway Express Agency, the news wire services, and many other types of organizations are cooperatives in practice if not in name and serve all segments of our society. Electricity, telephone service, and credit are provided cooperatively to the agricultural sector of the economy. Marketing cooperatives, through which many farmers sell their products and supply cooperatives through which they buy their feed, fertilizer, seed, gasoline, and other necessary supplies are also important.

Figure 1 compares growth of Gross National Product, sales by farm supply cooperatives, and total cash expenditures by farmers for supplies and equipment from 1950 to 1960. Although the rate of increase in cooperative sales has been less than the rate of growth of Gross National Product during the same time period, it can be seen to be well ahead of all sales of farm supplies and equipment.

Similar data are provided in index number form in Table I. Farm supply cooperative sales started the 1950-1960 period at 81.1 percent of their ten-year average and rose to 115.9 percent of this average, an increase of 42.9 percent, at the end of the period. As a comparison, total cash expenditures by farmers began at 101.3 percent of their ten-year average but increased to only 106.6 percent, a 5.0 percent rise. The

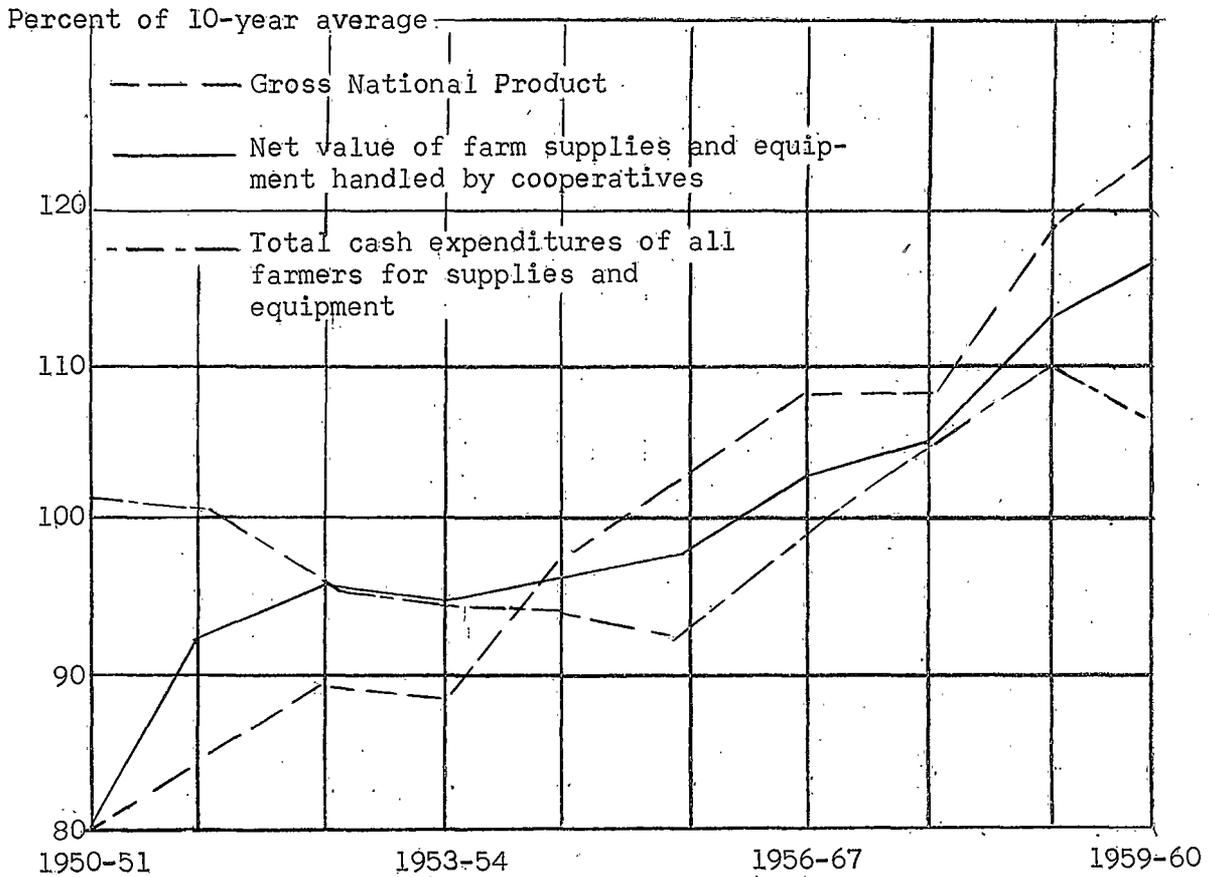


Figure 1. Growth trends of supplies and equipment handled cooperatively, cash expenditures of all farmers for supplies and equipment, and Gross National Product, 1950-60.*a/

*Source: United States Department of Agriculture, Trends in Growth of Farmer Cooperatives 1950-1960, General Report 110, Farmer Cooperative Service.

a/ Cooperative data are for fiscal years. Other data are for calendar years.

TABLE I

COMPARISON OF ANNUAL INDEXES FOR NET VALUES OF FARM SUPPLIES AND EQUIPMENT OBTAINED THROUGH COOPERATIVES AND FOR CASH EXPENDITURES OF ALL FARMERS FOR FARM SUPPLIES AND EQUIPMENT 1950-1960*

Period	Annual Indexes for Farm Supplies and Equipment		
	Index of cooperative supply value <u>a/</u>	Index of cash expenditures of all farmers <u>a/</u>	Difference <u>b/</u>
1950-51	81.1	101.3	-20.2
1951-52	92.4	100.6	- 8.2
1952-53	96.9	96.4	+ 0.5
1953-54	95.2	94.4	+ 0.8
1954-55	97.3	95.2	+ 2.1
1955-56	98.5	93.9	+ 4.6
1956-67	103.3	97.4	+ 5.9
1957-58	105.3	104.0	+ 1.3
1958-59	114.1	110.2	+ 3.9
1959-60	115.9	106.6	+ 9.3
10-year average	100.00	100.00	—

*Source: United States Department of Agriculture, Trends in Growth of Farmer Cooperatives 1950-1960, General Report 110, Farmer Cooperative Service.

a/ Cooperative indexes are based on net business volumes for associations with fiscal years ending between July 1 and June 30. Net volume figures are adjusted for duplications arising from intercooperative business. Indexes for all farmers are based on cash expenditures of all farmers for farm supplies and equipment in calendar years. Comparison of the 1950-51 index for cooperatives is made with the 1951 index for all farmers. For example, 81.1, the cooperative index for 1950-51, and 101.3, the 1951 index for all farmers, are compared.

b/ Index of cooperative supply volume less index of cash expenditures of all farmers for supplies and equipment.

conclusion that farm supply cooperatives in the United States have been able to gain an increasing share of the farm supply market seems incapable. Montana's growth in cooperative sales brought the cooperative share of the state farm supply market to 14.4 percent in 1963. (Table II shows Montana and U.S. total cooperative sales as percentages of their respective markets.) All supply cooperative sales represented 22.2 percent of the national market in 1963. The rapid growth of Montana supply cooperatives during the past few years is partially explained by their smaller initial market share.

The situation in sales of petroleum products during 1963 was somewhat different. As shown in Table III, Montana's cooperatives controlled a larger share of their petroleum products market, 47.4 percent, than did all U.S. cooperatives combined, 43.2 percent. With more than a 47 percent share of the petroleum products market, Montana supply cooperatives have achieved a market penetration held by few firms in any industry.

In addition to this already large market share, other forces may be barriers to further large scale expansion of cooperative sales of petroleum products to Montana farmers. Discussions with interested people repeatedly brought forth two such barriers. The most frequently mentioned was political or ideological in nature. Many cooperatives in Montana are closely associated with the Educational and Cooperative Union of America, commonly known as the Farmers Union. The Farmers Union Grain Terminal Association and the Farmers Union Central Exchange are two examples. Many farmers in Montana and adjoining states are strongly opposed to the

TABLE II

1963 SALES OF ALL FARM SUPPLIES--NET OF INTERCO-OP SALES

United States Total <u>a/</u>	\$12,189,873,000
Cooperative Total <u>b/</u>	2,704,400,000
Cooperative Market Share	22.2%
Montana Total <u>a/</u>	179,571,000
Cooperative Total <u>b/</u>	25,812,000
Cooperative Market Share	14.4%

TABLE III

1963 SALES OF PETROLEUM FUEL AND OIL TO FARMERS

United States Total <u>a/</u>	\$1,469,036,000
Cooperative Total <u>b/</u>	634,246,000
Cooperative Market Share	43.2%
Montana Total <u>a/</u>	26,315,000
Cooperative Total <u>b/</u>	12,467,000
Cooperative Market Share	47.4%

a/ Farmer Cooperative Service, U.S.D.A., Estimated Cash Expenditures for Production Supplies and Equipment by Farm Operators, Service Report No. 76, November 1965.

b/ Farmer Cooperative Service, U.S.D.A., Highlights of Farmer Cooperatives in Montana 1962-63, State Information Series.

political views and actions of the Farmers Union. Therefore, opposition to the Farmers Union could be expected to transfer to any cooperative having Farmers Union in its title, and finally to any cooperative, with resulting effects on cooperative sales.

The second reason is that cooperative buying does not appear to benefit the large farmer to the same degree that it does the small

TABLE IV

NUMBER OF FARMS, ALL LAND IN FARMS AND
AVERAGE SIZE OF FARM, 1950-1963*

Year	Number of Farms	All Land in Farms	Average Size of Farm
	Thous.	Thous. Acres	Acres
1950	37.2	65,000	1,747
1951	36.8	65,200	1,772
1952	36.4	65,500	1,799
1953	35.9	65,800	1,833
1954	35.4	66,100	1,867
1955	34.8	66,100	1,899
1956	34.2	66,200	1,936
1957	33.6	66,300	1,973
1958	33.0	66,500	2,015
1959	32.4	66,600	2,056
1960	32.0	66,700	2,084
1961	31.6	66,800	2,114
1962	31.2	66,800	2,141
1963	30.8	66,700	2,166

*Source: Montana State Department of Agriculture, Montana Agricultural Statistics, Statistical Reporting Service, Volume 10, Helena, Montana, 1964.

operator. Table IV shows Montana farm size to be rapidly increasing. One operator of a large farm in north central Montana reported spending \$2,500 on petroleum products each year. He stated that he could buy at prices comparable to those charged by the cooperative in his community, and get better service as well. It seems likely that many other Montana farmers who are not now cooperative members may buy sufficiently large quantities of petroleum products to be able to bargain effectively with their local suppliers.

The principal supplier of petroleum products to farm supply cooperatives in Montana and western North Dakota is the Farmers Union Central Exchange refinery at Laurel, Montana. Whether by direct shipment from the refinery or by trading product with other refiners, the sales of the farm supply cooperatives approximate the volume of product processed by this refinery. Refinery executives report that at the present time the quantity of product produced is substantially below the capacity of the refinery. As shown in Table V, operating the refinery at a volume close to its theoretical capacity would result in savings that could be passed on to the cooperative's members.

TABLE V
REFINERY COSTS AT SELECTED LEVELS OF OPERATION*

% of Capacity	Cost per Barrel
62%	\$3.166
65	3.129
69	3.103
77	3.051
81	3.029
85	3.008
92	2.973

*Source: Information provided by the Farmers Union Central Exchange, Laurel, Montana.

Since farm supply cooperatives in this region find themselves caught between ideological and economic restraints to a rapid increase in sales to their traditional farmer members on one hand, and an inefficient level of operations of their refinery on the other, they would benefit by opening

a new market. One source of new patrons may be found in the region's growing urban areas. By 1975 it is estimated that 69 percent of Montana's population will live in urban areas (over 2,500 population).¹ North Dakota, part of which is included in this study, is expected to have 48 percent of its population in urban areas. On the other hand, small towns (2500 population and less) are expected to lose 87 percent of their population.

In most larger communities in Montana and western North Dakota, however, urban residents have shown little interest in patronizing farm supply cooperatives. Perhaps this lack of interest is due in part to mistaken ideas about the nature of cooperatives as seen through urban eyes. As an example of such erroneous ideas, Bell² found that urban cooperatives members come largely from middle and upper middle income groups, whereas he found the popular image of the cooperative member to be distinctly low income.

Research Objectives

The primary purpose of this research is to study and identify the attitudes of urban users of gasoline in this region (Montana-western North Dakota). It is hoped that identifying the present composite image³

¹John R. Burchard and Russel B. Adams, Projected Urban Growth in the Upper Midwest 1960-1975, Upper Midwest Economic Study, 1964, p. 12.

²Martin L. Bell, "A Revised Concept of the Consumers Co-op," Journal of Marketing, January, 1961.

³"Attitude implies an evaluation of an object or concept, whereas image is concerned with description alone." Marketing Research, Boyd & Westfall, p. 323.

of farm supply cooperatives in the minds of urban gasoline buyers; and identifying their attitudes toward patronizing cooperatives will provide cooperative managers with better tools for planning sales expansion, educational efforts, or changes in their cooperative policies and practices.

The identification of consumer attitudes with sufficient accuracy to be the basis of management decisions is more difficult than the gathering of the types of economic or consumer data which are readily available and quantifiable. Attitudes are so much a part of a person that they may not be recognized by the holder, and if recognized may not be willingly revealed. If attitudes can be determined accurately the problem of quantification for comparison purposes remains. These aspects of attitudinal measurement are discussed in greater detail in the following chapter.

Research Methodology

The study was based on an "area probability" or "cluster" random sample of heads of households who were gasoline buyers in Bismarck, North Dakota; Billings, Montana; and Missoula, Montana. Eighty interviews were conducted in each city. Instead of the customary questionnaire, data was recorded by the subject on Spectro-Fan Cards provided by the Cooperative Extension Service of Montana State University. When properly used, these cards encourage more spontaneous and unguarded responses, resulting in increased validity. They also permit a more rapid compilation of the data than is possible with the printed forms usually employed.

The study was limited to only three cities so that it could be done in sufficient depth to arrive at useful conclusions, and to eliminate as many as possible of the variables that make generalizations impossible. These three cities are among the largest and fastest growing in the area and show promise of continued rapid growth.⁴ Thus they represent the type of cities which will be among the more important markets for consumer products in this region in future years. These cities are spaced quite evenly from the western to the eastern boundaries of the study area.

The research was further limited to a study of urban consumer attitudes toward ten different qualities or attributes of supply cooperatives. The principal consideration in choosing these was a three-step process using Montana State University students as subjects. Other interesting attributes of cooperatives could have been studied, but those selected were the ones judged most important and most amenable to corrective action if unfavorable attitudes toward cooperatives were found.

⁴Burchard and Adams, Loc. Cit.

CHAPTER II

Attitude Measurement

An attitude study of gasoline users in several cities implies a need for some technique of measurement so that intercity comparisons can be made, and so that some quantitative conclusions can be reached. A large number of unquantifiable impressions or feelings would be difficult to evaluate or to use. If people are asked whether they like daytime television programs they might answer: "Sometimes"; "yes"; "They're terrible". These comments indicate something about attitudes toward daytime television, but if they are to be used to measure attitudes they must be put in at least two categories, "favorable", and "unfavorable". Some answers like, "they could be better", are hard to classify in either category.

Another major difficulty in attitude measurement is that attitudes are subjective. No one can see, weigh, or otherwise measure them. Direct questioning of respondents about their attitudes is often ineffective because even the respondent himself may not be aware of his attitudes or cannot articulate them.¹ Other respondents are aware and articulate but are unwilling to express an unpopular view or one they consider unworthy.

A number of scaling techniques have been developed to overcome these basic problems of communication. The word "scaling" is used because most such measuring devices involve some type of numbered scale. For instance, the respondent may be asked to indicate his acceptance of some

¹Chester R. Wassan, The Strategy of Marketing Research, Appleton-Century-Crofts, New York, p. 132.

product on a scale from one to seven, or to indicate the extent of his agreement with a statement on a scale from one to five. Four standard attitude scales, the Thurstone, Guttman, Likert and Semantic Differential were considered for use in this research.

The Thurstone Scale

The Thurstone, or method of equal-appearing intervals, is based on the assumption that even though people cannot assign cardinal or quantitative measurements to their own attitudes they can tell the difference between the attitude represented by two different statements and can identify items that are approximately halfway between the two.² Each item is assigned a scale value and this scale value indicates the strength of attitude of an agreement response to the item. The scaling procedure finds these scale values after a series of rather complex steps. Thurstone scales are not widely used in marketing research, probably because after the time consuming task of preparing them the results produced are no better than those resulting from simpler methods.

The Guttman Scale

The Guttman scale consists of a relatively small set of homogenous items that are supposedly unidimensional.³ A unidimensional scale

²Boyd and Westfall, Marketing Research, Richard D. Irwin, Inc., Homewood, Illinois, 1964.

³United States Department of Agriculture, Attitudinal Research Relating to Farmers' Use of Short Term Credits, ERS-25, Farm Economics Division, Economic Research Service, Washington, D.C., 1961.

measures only one variable. In practice, the researcher asks the subject his opinion on a series of questions so arranged that if he answers "yes" to the first question he can be expected to answer "yes" to the following questions. If he answers "no" to the first question and "yes" to the second, he can be expected to answer "yes" to the remainder, etc. Then follows a process of sorting or scaling to assure that the questions are arranged in the prescribed order described above. Any deviations from this order are considered "errors" and detract from the reliability score of the test.

Certain problems are reported in using the Guttman scale for analysis of attitudes. A sample of at least 100 respondents is needed for any scale to be constructed. If two different groups are to be compared, a sample of 100 of each is needed. Constructing a set of statements that will satisfy the requirements of a scale is not easy.

The Likert Scale

Likert scales, like Thurstone scales, involve a list of statements related to the attitude in question. Instead of checking only those statements with which they, however, respondents also indicate the extent of agreement or disagreement. For instance, the extent of agreement may be indicated by choosing one of the following:

1. agree very strongly
2. agree fairly strongly
3. agree
4. undecided
5. disagree
6. disagree fairly strongly
7. disagree very strongly
8. don't know

Each degree of agreement is given a numerical score and the respondent's total score is computed by summing these scores from all statements. The statements to be evaluated are of the nature: 1. automobiles are too expensive; 2. winter is too short; 3. Montana is cold. All should be statements of opinion, not of fact.

Likert scales are developed in the same way as Thurstone scales but are considered more discriminating and reliable because of the larger range of responses typically given in Likert scales.⁴ However, they are also somewhat difficult to prepare. The preparation of long lists of statements and the ratings of these statements by a number of judges (20 or more)⁵ is more easily adapted to the classroom than to field operations.

The Semantic Differential Scale

The Semantic Differential attitude scale, described in great detail by Osgood,⁶ was chosen as the basis of this study for several reasons. First, the Semantic Differential is frequently used in marketing research and appears to be the choice of practitioners in this field, perhaps because it permits the development of descriptive profiles, such as those shown in Chapter IV, that facilitate comparisons of competitive

⁴Boyd and Westfall, loc. cit.

⁵Fred N. Kerlinger, Foundations of Behavioral Research, Holt, Rinehart, and Winston, Inc., New York, 1964.

⁶Osgood, Suci, Tannenbaum, The Measurement of Meaning, University of Illinois Press, Urbana, 1957.

items. Second, according to Mindak,⁷ "It is a quick, efficient means of getting in readily quantifiable form and for large samples not only the direction but also the intensity of opinions and attitudes toward a concept...be it brand, product, or company." Third, and least important, in comparison with the other attitude scales described above it is easily prepared and readily adapted to research in the field.

Although people see things differently, they act in their daily lives as though they believe some common core of verbal meaning exists. They talk to one another through shared meanings of words and usually communicate effectively. Accepting the assumption of common or shared meanings, Osgood developed the Semantic Differential method to measure the meanings of various concepts.

The Semantic Differential method can be defined as essentially a combination of controlled association and scaling procedures. In developing and using the Semantic Differential, Osgood provided the subject with a concept to be differentiated and a set of bipolar adjectival scales against which to do it. The subject's only task was to indicate for each item--by pairing a concept with a seven-point scale--the direction of his association and its intensity.

Osgood began by postulating a semantic space, a region of some unknown dimensionality and Euclidian in character. Each semantic scale, defined by a pair of polar (opposite-in-meaning) adjectives, is assumed to represent a straight line function that passes through the origin of

⁷William A. Mindak, "Fitting the Semantic Differential to the Marketing Problem," Journal of Marketing, April, 1961.

this space, and a sample of such scales than represents a multidimensional space. If through research the general meanings of the dimensions have been determined, then the meaning of each point in the space would be some combination of the meanings of the dimensions. That is, Osgood says that when a subject judges (differentiates) a concept against a series of scales each judgment represents a selection among a set of given alternatives and serves to localize the concept as a point in the semantic space.

	Father		
Happy	_____X_____	Sad	
Hard	X_____	Soft	
Slow	_____X_____	Fast	

The point in space which serves as an operational definition of meaning has two essential properties--direction from the origin, and distance from the origin. Osgood identifies these properties with the quality and intensity of meaning, respectively. For instance, in the example above, the concept Father is judged to be two units of intensity, counting from the middle of the scale, in the direction of the quality sad, three units in the direction of hard, and at the origin as regards slow and fast.

The three most significant dimensions Osgood found were named Evaluative, Potency, and Activity. Evaluative is interpreted as "goodness," potency as "strength," and activity as "motion and action". Through research, Osgood found that adjective pairs like good-bad, bitter-sweet, large-small, and clean-dirty fall into clusters. The most

important cluster seems to consist of adjectives that are Evaluative, such as good-bad and pleasant-unpleasant. A second cluster is made up of adjectives that seem to share strength or potency ideas such as strong-weak, or rugged-delicate. Examples of the third factor, activity, are fast-slow and hot-cold.

In describing the construction and administration of the Semantic Differential, Osgood says, "although we often refer to the Semantic Differential as if it were a 'test' having some definite set of items and a specific score, this is not the case. To the contrary, it is a very general way of getting at a certain type of information, a highly generalized technique of measurement which must be adapted to the requirements of each research problem to which it is applied. There are no standard concepts and no standard scales; rather, the concepts and scales used in a particular study depend upon the purposes of the research." The adjectives chosen for use in this study are all thought to be Evaluative in a gasoline buying context.

Although the Semantic Differential was developed as a tool for measuring the meaning of words, it is readily adapted to the measurement of attitudes. Again quoting Osgood,

One of the significant by-products of our work in experimental semantics, we believe, has been a new approach and rationale for attitude measurement. It has been feasible to identify 'attitude' as one of the major dimensions of meaning-in-general and thus to extend the measurement procedures of the Semantic Differential to an important area of social psychology. Despite a plethora of definitions of 'attitude' in contemporary social science, some consensus and agreement is evident, particularly with respect to the major properties that attitudes are learned and implicit--they are inferred states of the organism that are presumably acquired in much

the same manner that other such internal learned activity is acquired. Further, they are predispositions to respond, but are distinguished from other such states of readiness in that they predispose toward an evaluative response.

Kerlinger⁸ describes attitudes as an integral part of personality, along with such other parts as intelligence and aptitude. He says

Personality measurements are mostly measurements of traits. A Trait is an enduring characteristic of the individual to respond in a certain manner in all situations. If one is dominant, one exhibits dominant behavior in most situations. If one is anxious, anxious behavior permeates most of one's activities. An attitude, on the other hand, is a predisposition to think, feel, perceive, and behave toward a cognitive object. One has an attitude toward something "out there". A trait has subjective reference; an attitude has objective reference. One who has a hostile attitude toward foreigners may be hostile only to foreigners, but one who has the trait hostility is hostile toward everyone (at least partially).

"It is apparent that the Semantic Differential may be used as a generalized attitude scale," writes Osgood. "If we are careful to select as our evaluative scales those which maintain high and pure loading on the evaluative factor regardless of the concept class being judged, it is probable that high correlations with standard attitude measuring instruments would be obtained regularly." For this reason, adjectives found to be highly evaluative by Osgood were used whenever consistent with the objectives of this research.

The theoretical usefulness of consumer attitude surveys in economic prediction is to provide data for predicting consumer behavior. Analysis

⁸Kerlinger, loc. cit.

⁹Stephen Paranka, "Marketing Predictions from Consumer Attitudinal Data," Journal of Marketing, July, 1960.

of the past accuracy of such surveys shows that they do not always indicate the purchases consumers will make in the future.⁹

Osgood agrees and calls the frequent failure to predict consumer behavior one of the most common criticisms of attitude scales. But he says, "Like most such arguments, this one is overdone. Most proponents of attitude measurement have agreed that attitude scores indicate only a disposition toward certain classes of behaviors, broadly defined, and that what overt response actually occurs in a real-life situation depends also upon the context provided by that situation." Downey¹⁰ supports the predictive value of attitude scales and reports that cooperative members having a strong sense of cooperative awareness and a favorable attitude toward cooperation buy a far larger percentage of their farm supplies from cooperatives than do those members showing definite anti-cooperative feelings. It seems probable therefore, that favorable consumer attitudes toward cooperatives would facilitate their successful entry into the urban gasoline market and that unfavorable attitudes would hinder this entry.

⁹Stephen Paranka, "Marketing Predictions from Consumer Attitudinal Data," Journal of Marketing, July, 1960.

¹⁰Downey, Kohls, Wilson, "Purchasing Behavior of Cooperative Members," Purdue University Research Bulletin No. 797.

CHAPTER III

Research Design

The Sample

Three cities, Missoula, Billings, and Bismarck were used as sites for taking the 240 interviews used in this attitude study. Missoula at the western end of Montana, had a 1960 population of 34,200. It is the site of the University of Montana and the principal trade center for a large, but sparsely populated area. The principal industrial activity is tied to the lumber industry. Its probable 1975 population is estimated at 50,900.¹

Billings, the second largest city in Montana, had a 1960 urban area population of 57,500 and a probable 1975 population of 90,100. It is located in south central Montana and is becoming a major wholesale and retail center, as well as an oil refining center.

Bismarck, the capital of North Dakota, with its neighboring city of Mandan, had a 1960 population of 40,100. The combined population in 1975 is estimated at 52,700. Bismarck's economy depends heavily upon state and federal offices and upon retail and service facilities serving a large farming area.

To make more efficient use of interviewer time, an area probability or "cluster" sampling method was used to select subjects to be interviewed in each city. After obtaining maps of all three cities, each block

¹John R. Burchard and Russell B. Adams, loc. cit.

shown was numbered. A sample of 50 blocks was chosen using a table of random numbers. These blocks were then numbered from 1 to 50 in the order they were selected.

Interviewers attempted to obtain data from the first five heads of households found by starting on the northeast corner of the block and going clockwise. If there were no northeast corner, the interviewer was instructed to use the north. Each residence was taken in order and two call-backs were made to obtain interviews in the event the heads of households were not available the first time. In case of a refusal to cooperate the household was to be skipped. Because people living on the same block may be similar in many ways, some reliability was probably lost by this method. But, by limiting the number of interviews on any one block to a maximum of five, this loss was expected to be slight.

It was expected that some of the interviews would, upon examination, turn out to be unusable for one reason or another. To avoid the necessity of returning to the various cities and continuing the interviews on the preselected blocks to replace the unusable interviews, several extra interviews were obtained in each city. Then, even though some interviews were unusable there would be at least the planned sample available from each city.

The Interview

The interview was designed to permit the use of Spectro-Fan Cards, Figure 2, developed by the Cooperative Extension Service of Montana State University. Instructions for the use of the cards are shown in Appendix D. After gaining admission to the home, the interviewer first explained

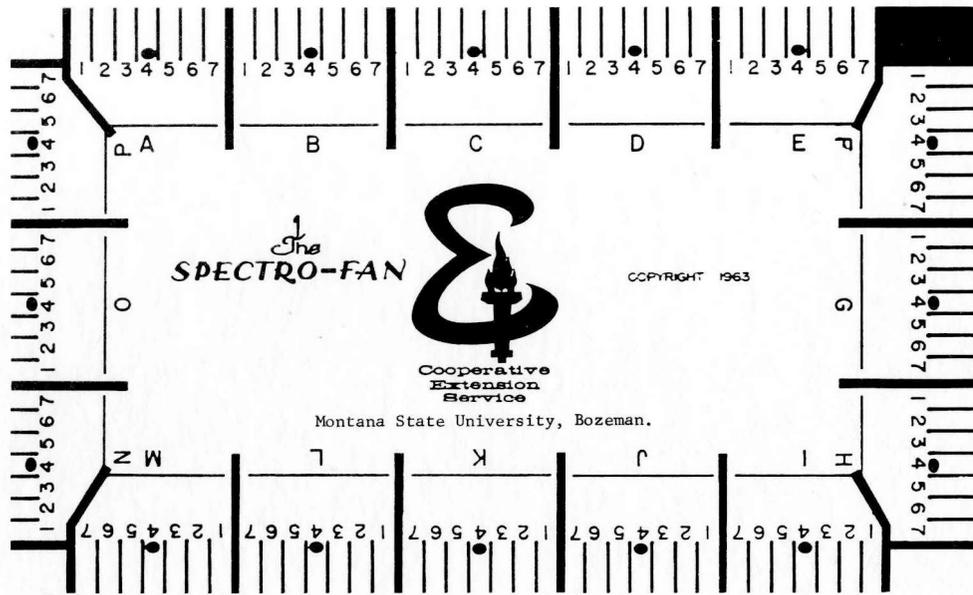


Figure 2. Sample Spectro-Fan Card.

the purpose of the interview and the use of the cards. To eliminate interviewer bias, interviewers were told only that the study was about attitudes toward gasoline stations and oil companies, not that it was primarily concerned with attitudes toward cooperatives.

The interview required that the subject rate six real or fictitious companies. Each subject was given a pack of six Spectro-Fan cards, each of which had printed on it a different company name or trademark. The interviewer then read each of the pairs of descriptive adjectives listed below to the subject who rated the company whose trademark was before him from one to seven by filling in the proper space on the card. This procedure was repeated for each of the six companies with ratings for each being given on the appropriately labeled card. The trademark labels were expected to be useful not only for later sorting purposes, but also for holding the subject's attention on one company at a time, thus reducing confusion.

The companies rated consisted of two well-known major oil companies in this region--Enco and Conoco--which were included as controls; the subject's "Favorite" which was included to serve as a model of what urban consumers actually accept in the stations they patronize rather than what they may say they want; a composite "Cut Rate" company for comparison purposes; and two cooperatives--the Farmers Union Co-op Oil Company and a hypothetical "Consumer's Cooperative Association". This last was included to test the attitude toward the word cooperative with and without the addition of the Farmers Union name. It was expected that the Favorite would sometimes coincide with Enco, Conoco, or the Farmers Union

Co-op. But, because the research was concerned with attitudes, not buying patterns, no count was made of these coincidences.

The company names and the descriptions of them supplied to the interviewers for reading to subjects were:

ENCO

Enco is the trademark of the Humble Oil and Refining Company. Please give us your impression of this company, its service stations, and its products.

CONSUMERS COOPERATIVE
ASSOCIATION

Cooperatives selling gasoline and other automotive products are found in most cities in this area. Please rate them, their service stations, and products.

CONOCO

Conoco is the trademark of the Continental Oil Company. Please give us your impression of this company, its service stations, and products.

FARMERS UNION
CO-OP
OIL COMPANY

Cooperatives selling gasoline and other automotive products are found in most cities in this area. Please rate them, their service stations, and products.

YOUR FAVORITE
GAS
STATION

Most drivers have a favorite service station where they prefer to trade. The name of your favorite station is _____ . Please rate it, its parent company and products.

CUT RATE
DISCOUNT GAS
GAS COMPANY

Each city has several cut rate service stations selling gasoline. Please rate those in your city on the following characteristics:

The six companies were kept in the same order for all interviews rather than following the common practice of rotation to avoid order bias. Rotation was thought likely to confuse the interviewers and to be a temptation for them to disregard instructions. In addition, it was thought that by keeping them in a set order the consumer cooperative could be introduced before the Farmers Union name appeared, thus better indicating consumer attitudes toward the Farmers Union name. It was also possible to begin each interview with Enco, a well-known company, to ease the respondent into the interview process.

The interviewer was instructed to ask the respondent to write the name of his favorite station on the "Favorite" card to help the respondent fix one particular firm or outlet in his mind.

The Questionnaire

The pairs of descriptive words and phrases used were developed in three steps. First, an informal, open ended, sentence completion questionnaire, shown in Appendix A, was administered to 43 Montana State University students in advertising and management classes. No attempt at random selection was made. Then, in early autumn 1965, a second questionnaire, Appendix B, was given to 19 Montana State University students. These preliminary studies were used to discover some of the more common attitudes toward service stations and cooperatives, the words or phrases, with which these attitudes are usually expressed, and to suggest hypotheses about urban attitudes. The major conclusions drawn from these very limited and informal studies were:

- A. Although some students believed that they could save money on gasoline by patronizing cooperatives, many were dubious about the quality of co-op gas.
- B. Most of these students took the quality of major brands for granted and chose their source of supply principally on the basis of appearance and cleanliness.
- C. They seemed not to identify personally with cooperatives because they considered cooperatives to be farm organizations, and most of them were not farmers.

When the results of the informal studies were analyzed and interpreted the basis for a third preliminary student study was available. This third study consisted of a semantic differential test of student attitudes toward five different companies selling petroleum products.

These five were the Farmers Union Cooperative, Enco, Conoco, a "Favorite," and a "Cut Rate." Each of these was evaluated by 58 Montana State University students in terms of a list of 23 pairs of descriptive words and phrases drawn from Osgood's tested examples, comments made by students in the first test, and the purposes of the study. This test was conducted using the customary printed questionnaire shown in Appendix C instead of Spectro-Fan Cards.

Using the two major oil companies--Enco and Conoco--as controls, the answers given by the 14 students (25 percent of sample) whose total scores were most favorable to the cooperative were compared with the 14 who gave the cooperative the lowest score. The pairs of adjectives which were least discriminating between these extreme groups were dropped. Several other pairs were dropped because they summarized images as "good" or "bad" without detailing the reasons for this judgment. After this item analysis, the ten adjectival pairs chosen for use in the final consumer survey were:

Rather weak gas	1 2 3 4 5 6 7	Powerful gas
Somewhat old, dirty gas	1 2 3 4 5 6 7	Really fresh, clean gas
Messy station	1 2 3 4 5 6 7	Neat station
Ugly	1 2 3 4 5 6 7	Attractive
For farmers	1 2 3 4 5 6 7	For city people
Inconvenient	1 2 3 4 5 6 7	Convenient
No savings	1 2 3 4 5 6 7	Big savings
Dishonest	1 2 3 4 5 6 7	Honest
Unfair to competitors	1 2 3 4 5 6 7	Fair to competitors
Doesn't pay fair share of taxes	1 2 3 4 5 6 7	Pays fair share of taxes

Each end of the scale was meant to convey an opposite meaning, one clearly favorable--the other unfavorable. However, the pairs are not all extreme opposites such as love--hate would be. Mindak reports a reluctance on the part of many people to choose extreme positions and a tendency to cluster their answers in the neutral center. This was confirmed by some reluctance on the part of the first student sample to make harsh or critical statements about any firm. A number of them used expressions such as, "all right in their place," or "all right if you're a farmer." These expressions seemed to register indifference or mild disapproval.

Numbers from one to seven were used to indicate to the respondent equally spaced differences in attitude. This was done because later statistical analysis was planned on the assumption that the intervals between numbers were equal. It was believed that the use of words such as "some," "a lot," or "very," would be much less likely to result in equal intervals. The numbers on the final questionnaire all ran from one on the left to seven on the right to avoid confusion when using the Spectro-Fan Cards.

In addition to helping in the selection of appropriate descriptive words and phrases, the results of the third preliminary study led to the following hypotheses:

Hypotheses

Urban gasoline buyers have a less favorable attitude toward farm supply cooperatives than toward well-known major oil companies. This is because:

1. Cooperative gasoline is considered to be inferior to that sold by the majors.

2. Cooperative service stations are thought to be less neat, attractive, and convenient than those selling major brands.
3. Cooperatives are thought to be in business to serve farmers rather than urban residents.
4. Cooperative savings are not believed to be substantial.
5. Cooperatives are considered less honest and more unfair to competitors than the majors.
6. Cooperatives are not thought to pay their fair share of taxes.
7. Popular identification of cooperatives with the Farmers Union repels non-farmers.

Pilot Study

The fourth preliminary test was a pilot study using the same instructions, descriptive words and phrases, and Spectro-Fan Cards planned for the field survey. Seventy-two students were the subjects. The results confirmed the hypothesis that the students tested had a generally less favorable opinion of cooperatives than of the major oil companies. It also indicated that cooperatives fall far short of equaling the image of the favorite stations. Out of a total possible score of 5040 points, the total company scores were:

Favorite	3902	77.2%
Conoco	3633	72.1%
Enco	3367	66.8%
Cut Rate	2807	56.9%
Consumers Cooperative	2704	53.6%
Farmers Union Cooperative	2568	50.9%

CHAPTER IV

Preliminary Analysis

Interview Results

The interviewing of selected consumers was carried out during the last two weeks of December, 1965 and the first two weeks of January, 1966. Most interviews were conducted on weekends and evenings so that heads of households could be reached. The field interviewers reported very few refusals of cooperation, although they did report some confusion on the part of the subjects as to the purpose of the interviews. In order to avoid introducing a bias the interviewers themselves were not told the real purpose, only that attitudes toward gasoline sellers were being studied.

When the 240 interviews had been completed and the Spectro-Fan Cards were examined, it was found that a few complete interviews and parts of other interviews were unusable. Some cards were improperly marked while others were not marked at all. An effort had been made to train interviewers carefully, both through personal instruction in their home cities just prior to the interview period and through written instructions (see Appendix E), but in these few cases interviewers were unable to get the cards properly filled out. An example of such failures were a few interviews with only one comment, "no preference". Quite a number of subjects were reported to have had trouble with the hypothetical Consumer Cooperative, saying that they didn't know any such firm and refusing to say what they thought such a company would be like if it existed. Since no

difficulties of this type were encountered when using university students for the pilot study, it seems that the age of the subjects may play a part in their ability or willingness to visualize an unreal company.

Mean Scores

The removal of the unusable interviews and partial interviews from the data resulted in unequal sample sizes as between cities and between scales. To return the unequal interview data to a comparable basis, mean scores were computed for use in subsequent analysis. These mean scores for each scale and each company for all cities combined are shown in Table VI, which also shows the number of usable interviews included in the data. Tables VII, VIII and IX show the same information for each city individually. The composite data by cities is summarized in Table X.

Inasmuch as the original purpose of the study was to determine the composite urban attitude toward farm supply cooperatives (which for all practical purposes means cooperatives affiliated with the Farmers Union in this area) the use of means rather than the scores given by individuals should not involve the loss of essential information. However, important information would have been lost if distribution of scores given any company had been greatly different from what is considered "normal"; for instance a greatly skewed distribution or a bimodal distribution. Table XI and Figure 3 show the distribution of Farmers Union Co-op scores and Table XII and Figure 4 show the distribution of the combined scores given Enco and Conoco, the two control companies. It can be seen from these examples that extreme values are few. For reasons that will

TABLE VI
ALL CITIES' MEAN SCORES

SCALE	ENCO	CONOCO	FARMERS UNION CO-OP	CONSUMERS CO-OP	CUT RATE	FAVORITE
	N=238	N=238	N=238	N=219	N=238	N=230
A	4.76	4.97	4.07	3.96	3.41	5.31
B	4.92	5.05	4.28	4.04	3.63	5.57
C	5.51	5.14	4.11	4.17	4.22	5.81
D	5.46	5.22	4.02	4.01	4.21	5.63
E	4.50	4.71	3.28	3.51	4.55	4.76
F	5.27	5.41	3.80	4.00	4.30	5.85
G	4.31	4.26	4.04	4.39	4.37	4.51
H	5.41	5.13	4.52	4.45	4.27	5.74
I	5.11	4.94	3.85	4.06	3.78	5.47
J	4.82	4.80	3.64	3.85	4.22	5.07
COMPOSITE MEAN	5.01	4.97	3.96	4.02	4.10	5.38

TABLE VII

MISSOULA MEAN SCORES

SCALE	ENCO	CONOCO	FARMERS UNION CO-OP	CONSUMERS CO-OP	CUT RATE	FAVORITE
	N=80	N=80	N=80	N=79	N=80	N=76
A	4.56	5.23	4.06	4.09	3.75	5.30
B	4.74	5.19	4.23	4.23	3.66	5.71
C	5.51	5.55	3.91	4.14	3.94	5.78
D	5.33	5.61	3.86	4.04	3.93	5.64
E	4.63	4.78	3.34	3.34	3.45	4.72
F	5.19	5.78	3.89	4.47	4.15	6.03
G	3.93	3.94	4.16	4.57	4.23	4.30
H	5.19	5.00	4.49	4.66	4.34	5.88
I	4.69	4.90	3.95	3.99	3.80	5.34
J	4.64	4.60	3.66	3.92	4.46	5.40
COMPOSITE MEAN	4.84	5.06	3.95	4.15	4.06	5.40

TABLE VIII

BISMARCK MEAN SCORES

SCALE	ENCO	GONOCO	FARMERS UNION CO-OP	CONSUMERS CO-OP	CUT RATE	FAVORITE
	N=78	N=78	N=78	N=60	N=78	N=77
A	4.96	4.44	4.37	3.93	3.24	5.12
B	4.88	4.72	4.40	3.80	3.91	5.36
C	5.51	4.24	4.47	4.53	4.86	5.88
D	5.37	4.64	4.42	4.23	4.83	5.68
E	4.63	4.67	3.03	3.55	5.03	4.68
F	5.61	4.71	3.82	3.75	4.51	6.03
G	3.97	4.15	3.81	3.80	4.58	4.66
H	5.65	5.10	4.56	4.20	4.31	6.00
I	5.33	4.94	3.64	4.12	3.91	5.61
J	4.88	4.96	3.53	3.77	4.20	4.68
COMPOSITE MEAN	5.08	4.66	4.01	3.97	4.34	5.37

TABLE IX

BILLINGS MEAN SCORES

SCALE	ENCO	CONOCO	FARMERS UNION CO-OP	CONSUMERS CO-OP	CUT RATE	FAVORITE
	N=80	N=80	N=80	N=70	N=80	N=77
A	4.76	5.25	3.79	3.86	3.24	5.52
B	5.15	5.24	4.21	4.08	3.33	5.64
C	5.50	5.64	3.94	3.85	3.86	5.78
D	5.69	5.41	3.79	3.76	3.86	5.62
E	4.25	4.69	3.46	3.65	4.28	4.88
F	5.01	5.73	3.69	3.79	4.25	5.49
G	5.03	4.70	4.15	4.03	4.31	4.56
H	5.65	5.28	4.51	4.59	4.15	5.34
I	5.31	4.98	3.96	4.08	3.63	5.47
J	4.93	4.84	3.73	3.85	4.00	5.26
COMPOSITE MEAN	5.13	5.18	3.92	3.95	3.89	5.36

TABLE X

ALL COMPANY MEANS BY CITY

CITY	ENCO	CONOCO	FARMERS UNION CO-OP	CONSUMERS CO-OP	CUT RATE	FAVORITE
MISSOULA	4.84	5.06	3.95	4.15	4.06	5.40
BILLINGS	5.13	5.18	3.92	3.95	3.89	5.36
BISMARCK	5.08	4.66	4.01	3.97	4.34	5.37
COMPOSITE COMPANY MEAN	5.01	4.97	3.96	4.02	4.10	5.38

TABLE XI

DISTRIBUTION OF FARMERS UNION CO-OP
INDIVIDUAL SCORES

SCORE	NUMBER
1.0 - 1.4	3
1.5 - 1.9	1
2.0 - 2.4	8
2.5 - 2.9	11
3.0 - 3.4	23
3.5 - 3.9	45
4.0 - 4.4	68
4.5 - 4.9	29
5.0 - 5.4	17
5.5 - 5.9	10
6.0 - 6.4	6
6.5 - 6.9	4
7.0 -	1

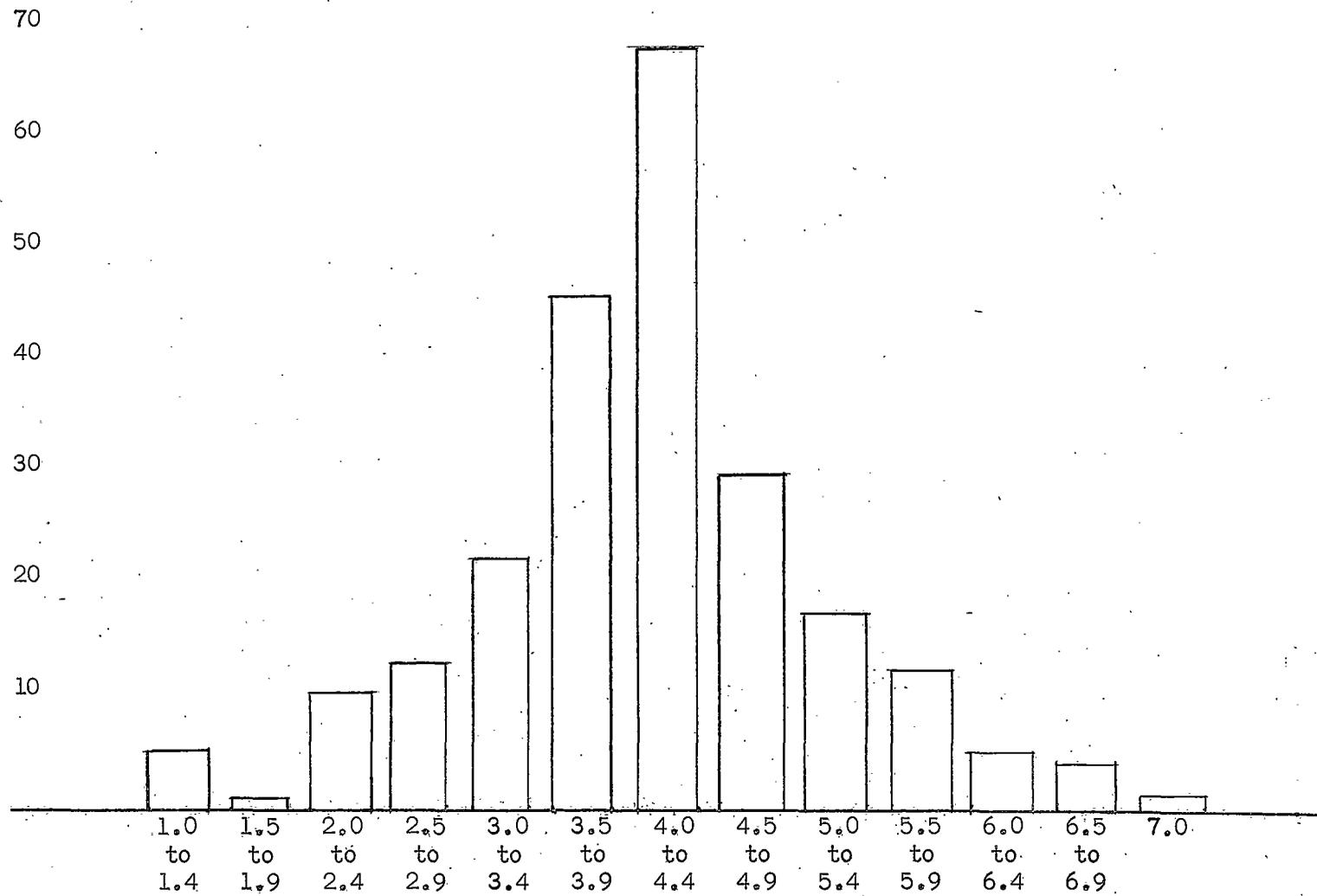


Figure 3. Distribution of Farmers Union Individual Scores.

TABLE XII

DISTRIBUTION OF COMBINED CONOCO AND
ENCO INDIVIDUAL SCORES

SCORE	NUMBER
1.0 - 1.4	0
1.5 - 1.9	0
2.0 - 2.4	0
2.5 - 2.9	0
3.0 - 3.4	1
3.5 - 3.9	4
4.0 - 4.4	45
4.5 - 4.9	64
5.0 - 5.4	51
5.5 - 5.9	48
6.0 - 6.4	21
6.5 - 6.9	4

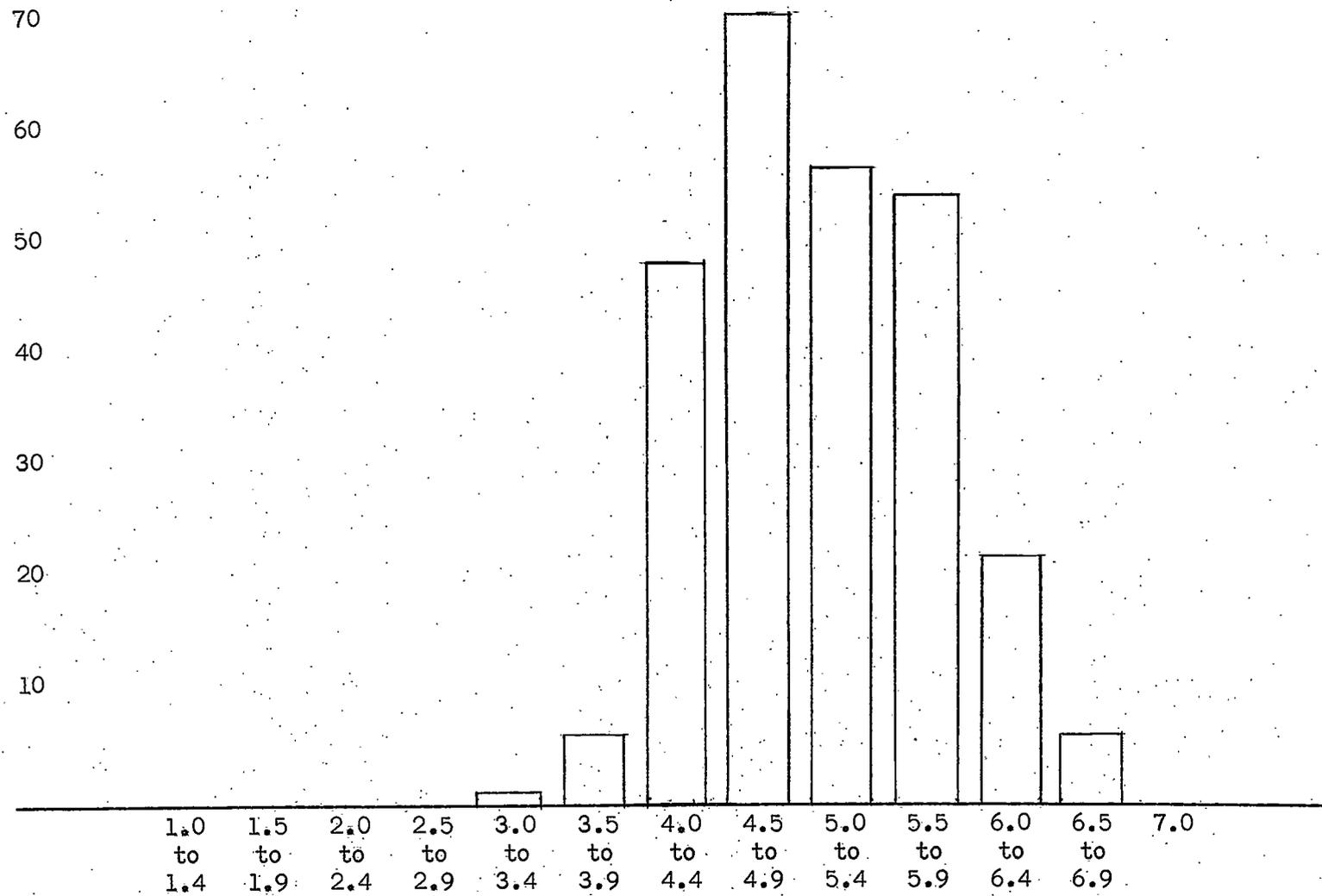


Figure 4. Distribution of Conoco and Enco Individual Scores.

be explained in detail in the following chapter, such statistical measures of spread as the standard deviation are not appropriate for this data.

It can be seen in Table VI that the Farmers Union Co-op was given an overall score of 3.96 by the consumers interviewed. Since 4.0 is the middle of the seven point scale this might be interpreted as an average score. However, such an interpretation would not be justified since Encó and Conoco scored 5.01 and 4.97 respectively. It is the difference between company scores that shows the relative success of each company in presenting itself to the urban public and the Farmers Union Cooperative can be seen to have a substantially lower rating than these two major companies.

The value of absolute scores is further weakened by an effect of the subjects' personalities. It was apparent when working with the data cards that while one person would mark all six companies quite low, another would mark all six high. In general, subjects seemed to use the scale values from three to six most heavily. These observations suggest the possibility that different subjects see the scale values in somewhat different terms and also raise a question about the length of scale intervals as perceived by each individual. A general feeling of caution in this regard seems warranted in spite of Osgood's¹ evidence that although scale intervals do vary the variation is not sufficiently great to rule out the assumption of "approximate equality". Approximate equality would seem adequate for forming general impressions as to urban consumer attitudes, but somewhat weak for rigorous statistical analysis.

¹Osgood, loc. cit.

It is interesting to compare the 4.57 overall mean score of all subjects interviewed with those of students, mentioned in Chapter III, who avoided making critical comments about organizations or groups of people during the first, preliminary, stage of this study. Furthermore, in the more formal pilot study which followed, a second group of students gave the six companies studied an overall score of 4.41. This observed kindness in rating would appear to support the use of scores relative to some control group rather than the use of absolute scores when appraising consumer attitudes.

Company Profiles

A summary of findings as to relative consumer attitudes toward the Farmers Union Cooperative compared with the five other real or hypothetical companies studied is shown pictorially in the "profiles" presented in Figures 5, 6 and 7. These profiles, although drawn with continuous lines, do not represent continuous mathematical functions. They are intended only to help the reader visualize the inter-company relationships found to exist.

Figure 5 shows the Farmers Union Cooperative with its two real competitors, Enco and Conoco. It can be seen that both Enco and Conoco have higher absolute scores on every scale than the Farmers Union Cooperative. This tends to support the first six hypotheses presented on page 32. Appropriate statistical evaluation of this apparent support will be reported in the following chapter.

Figure 6 compares the Farmers Union Cooperative with the hypothetical Consumers Cooperative and the Cut Rate company. Inspection

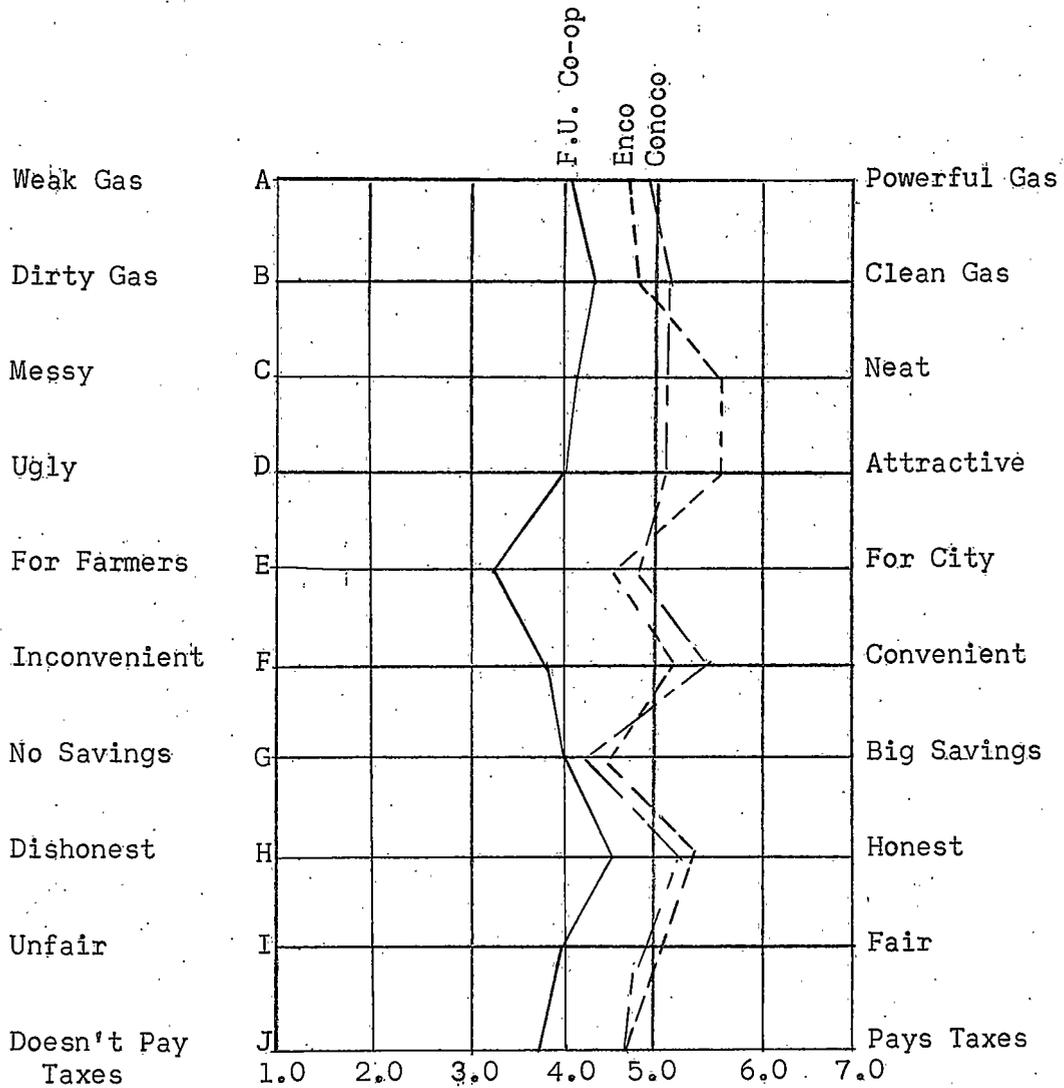


Figure 5. All Cities--Total Sample--Profile.

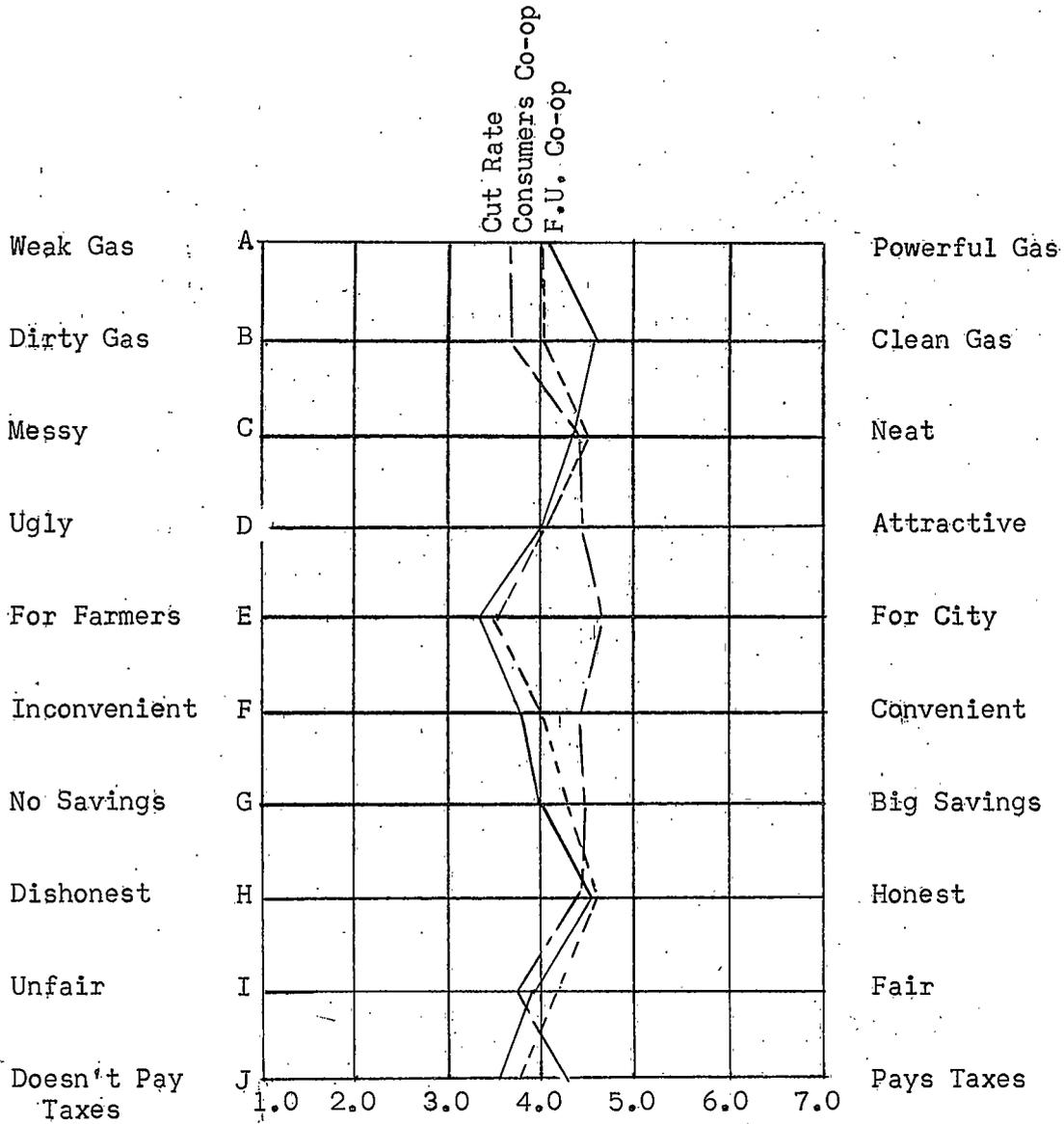


Figure 6. All Cities--Total Sample--Profile

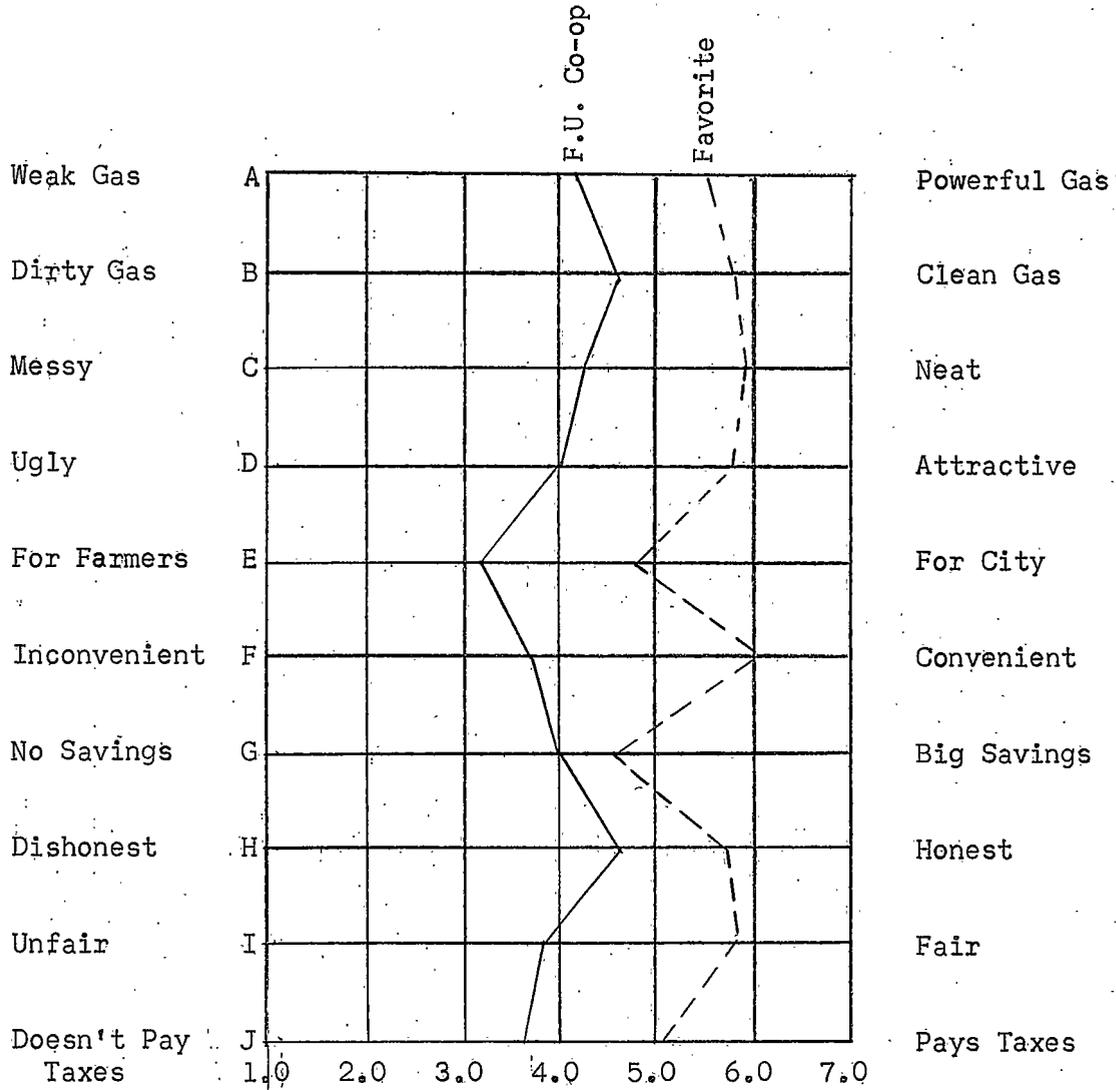


Figure 7. All Cities--Total Sample--Profile

suggests that the seventh hypothesis, i.e., that the Farmers Union name contributes to a poor urban attitude, should not be accepted, because both cooperatives have very similar scores on most scales. However, it does not show that the Farmers Union name has no effect on results, or, on the other hand, if "Farmers Union" and "cooperative" are so closely identified in urban minds as to be indistinguishable.

In summary, the first two profiles show that:

1. Urban gasoline users consider co-op gas to be weaker and dirtier than that sold by rival companies;
2. Co-op service stations are thought to be less neat, attractive and convenient than those of their rivals;
3. Cooperatives are considered more for farmers than for city people;
4. There are no substantial savings thought likely to result from using co-op gas;
5. Cooperatives are considered less honest and more unfair to competitors than their rivals;
6. It is believed that they do not pay their share of taxes.

There is no evidence that cooperative identification with the Farmers Union repels non-farmers. Overall, urban gasoline consumers do have an unfavorable attitude toward cooperatives, both those associated with the Farmers Union name, and those not associated with it.

Figure 7 shows the Farmers Union Cooperative compared with the subject's favorite stations. Probably the most interesting feature of this profile is the relatively low score given the "Favorite" on the

savings scale. The people interviewed did not consider their favorite station an especially good place to save money, but thought it sold a good quality of product in clean, neat, attractive surroundings. It was also considered honest and fair to competitors. This, then is the model of the sort of gasoline station with which these people liked to trade. It could also serve as a model for the cooperatives to follow in planning their own approach to the urban market.

CHAPTER V

Statistical Analysis

In the preceding chapter it was shown by descriptive methods that urban gasoline consumers have a less favorable attitude toward the Farmers Union Cooperative than toward the two major gasoline companies used as controls. The statistical significance of these attitude differences can be measured mathematically by standard procedures. That is, the probability of obtaining the same results from repeated experiments can be estimated.

The assumptions underlying the usual statistical analysis specify the form of the distribution of data and usually deal with normal or bell-shaped distributions. Such a curve has a mean and a variance, is symmetric about its mean, and is continuous with an infinite range. While discrete sampling data such as that obtained during this research departs from normality by having a finite range and being discontinuous, this departure in the case of a carefully selected random sample is small in comparison with sampling variation and accordingly will have little effect upon inference based on samples. Quantities such as the mean are called parameters when they characterize populations and statistics when they characterize samples. It is assumed that parameters have been estimated by using data obtained from an unchanging scale of measurement.

Nonparametric Statistics

Semantic Differential scale intervals have been shown by Osgood to be only approximately equal, so the use of parametric statistics in this

study might be inappropriate and could therefore lead to erroneous conclusions. This difficulty can be avoided by the use of nonparametric statistics. Nonparametric statistics are distribution free. That is, they are not dependent upon any particular parent distribution and so can be used with a number of different distributions.

A major disadvantage of nonparametric procedures is that if the form of the parent population is known to be reasonably close to a distribution for which there is a standard theory, or if the data can be transformed so that is the case, then nonparametric procedures do not extract as much information from the data as would parametric procedures. If all an investigator's experiments result in data such that the null hypothesis is true, i.e., there is no difference between the means of two or more distributions, then the nonparametric procedures are as good as any others since the investigator sets the error rate. However, if the null hypothesis is false, then the usual problem is to detect differences among means. Nonparametric procedures are not as good as classical procedures for this purpose, provided the assumptions about the parent distribution are valid.¹ On balance, it would appear that, because of the unequal interval size discussed above, nonparametric statistics are preferable in this case.

¹Steele and Torrie, Principles and Procedures of Statistics, McGraw, Hill, New York.

A parallel statistical analysis, using the parametric analysis of variance method, is presented in Appendix F to show the amount of information lost by the use of nonparametric procedures in this study.

Friedman's nonparametric complete block design was used to test the hypotheses presented on Page 32. Steele and Torrie list the following steps in the use of Friedman's method:

1. Rank the treatments within each block from lowest to highest;
2. Obtain the sum of the ranks for each treatment;
3. Test the null hypothesis of no difference among population means for treatments by the following equation:

$$X^2 = \frac{12}{BT(T+1)} \sum R_i^2 - 3B(T+1)$$

Where: 12 and 3 are constants not dependent on the size of the sample

B = the number of blocks (scales)

T = the number of treatments (companies)

$\sum R_i$ = the sum of the ranks in each treatment.

This test criterion measures the homogeneity of the treatment sums and is distributed approximately as chi-square.

The remainder of this chapter is devoted to testing the hypotheses presented on page 32. The analysis is limited to comparison involving the Farmers Union Cooperative. Other comparisons, while interesting, would not contribute directly to the purpose of this research and so have been omitted.

First Hypothesis

The first hypothesis, that cooperative gasoline is considered inferior to that sold by the majors, can be tested by combining scales A and B, both of which refer to aspects of product quality. The combined scores are shown in Table XIII followed by the computations necessary to test this hypothesis.

TABLE XIII

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR COMPANY
MEAN SCORES ON SCALES A AND B, PRODUCT QUALITY.

		ENCO	CONOCO	F.U. CO-OP
Bismarck	A	4.96	4.44	4.37
Rank		3	2	1
Bismarck	B	4.88	4.72	4.40
Rank		3	2	1
Billings	A	4.76	5.25	3.79
Rank		2	3	1
Billings	B	5.15	5.24	4.21
Rank		2	3	1
Missoula	A	4.56	5.23	4.06
Rank		3	2	1
Missoula	B	4.74	5.19	4.23
Rank		2	3	1

$$\sum R_i \quad 15 \quad 15 \quad 6$$

$$\begin{aligned} X^2 &= \frac{12}{ET(T+1)} \sum R_i^2 - 3B(T+1) \\ &= \frac{12}{18(4)} (225 + 225 + 36) - 18(4) \\ &= \frac{486}{6} - 72 \end{aligned}$$

= 9.00 with 2 d.f.; $\chi^2 .05 (2 \text{ d.f.}) = 5.99$

Therefore, reject the null hypothesis of no difference between company means and accept the hypothesis as stated.

Thus, the hypothesis that cooperative gasoline is considered to be inferior to that sold by the majors is supported at the 95 percent level by the nonparametric statistics used. Conoco's "the hottest brand going" and Enco's "put a tiger in your tank", campaigns would seem to have been successful in convincing consumers that these companies sell superior gasolines. The writer has found during informal discussions that most gasoline users are willing to agree that all gas is pretty much the same, all made from the same crude, in the same refineries, and pumped through the same pipelines. But, this intellectual assent to equal quality does not carry through to the more basic emotional responses which reflect their attitudes. It is as though they were saying, "Yes, I know gasoline is all the same, but I don't trust the cooperative product."

Second Hypothesis

The second hypothesis, that cooperative service stations are thought to be less neat, attractive and convenient than those selling major brands can be tested by combining scales C, D, and F, which refer to these qualities.

TABLE XIV

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR
COMPANY MEAN SCORES ON SCALES C, D, AND F,
STATION APPEARANCE AND CONVENIENCE

		ENCO	CONOCO	F.U. CO_OP
Bismarck Rank	C	5.51 3	4.24 1	4.47 2
Bismarck Rank	D	5.37 3	4.64 2	4.42 1
Bismarck Rank	F	5.61 3	4.71 2	3.82 1
Billings Rank	C	5.50 2	5.64 3	3.94 1
Billings Rank	D	5.69 3	5.41 2	3.79 1
Billings Rank	F	5.01 2	5.73 3	3.69 1
Missoula Rank	C	5.51 2	5.55 3	3.91 1
Missoula Rank	D	5.31 2	5.61 3	3.86 1
Missoula Rank	F	5.19 2	5.78 3	3.89 1

$$\sum R_i \quad \quad \quad 22 \quad \quad \quad 22 \quad \quad \quad 10$$

$$\begin{aligned}
 X^2 &= \frac{12}{BT(T+1)} \sum R_i^2 - 3B(T+1) \\
 &= \frac{12}{27(4)} (484 + 484 + 100) - 27(4) \\
 &= \frac{1068}{9} - 108 \\
 &= 10.66 \text{ with 2 d.f.}; \quad X^2_{.01}(2 \text{ d.f.}) = 9.21
 \end{aligned}$$

Therefore, reject the null hypothesis of no difference between company means and accept the hypothesis as stated.

This data supports at the 99 percent level, the hypothesis that cooperative service stations are thought by urban consumers to be less neat, attractive, and convenient than those selling major brands. It can be seen that many cooperatives are housed in unattractive buildings, some have unpaved driveways, others have piles of old tires or oil drums near the gasoline service area. The best of them are clean and neat, but even these give the excessively utilitarian impression of a newly constructed suburban fire hall. It appears that urban consumers are aware of this appearance and adversely influenced by it.

Each local cooperative is a separate corporate entity with only products and suggestions coming from the regional supply organization. Therefore, each local cooperative is free to follow its own individual predilections as to style and appearance. Major oil companies, on the other hand, control their local outlets very closely, thereby guaranteeing uniformity of appearance and cleanliness from city to city. This results in a continuity that makes identification by the traveler easier.

Third Hypothesis

The third hypothesis, that cooperatives are considered to be in business to serve farmers rather than city dwellers, can be tested using scale E alone. The data is shown in Table XV.

TABLE XV

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR COMPANY
MEAN SCORES ON SCALE E, FARM IDENTIFICATION

	ENCO	CONOCO	F.U. CO-OP
Bismarck Rank	4.63 2	4.67 3	3.03 1
Billings Rank	4.25 2	4.69 3	3.46 1
Missoula Rank	4.63 2	4.78 3	3.34 1

$$\sum R_i \quad \quad \quad 6 \quad \quad \quad 9 \quad \quad \quad 3$$

$$X^2 = \frac{12}{BT(T + 1)} \sum R_i^2 - 3B(T + 1)$$

$$= \frac{12}{9(4)} (36 + 81 + 9) - 9(4)$$

$$= \frac{126}{3} - 36$$

$$= 6.00 \text{ with 2 d.f.}; X^2_{.05}(2 \text{ d.f.}) = 5.99$$

Therefore, reject the null hypothesis of no difference between company means and accept the hypothesis as stated.

It can be seen that the data supports, at the 95 percent level, the hypothesis that cooperatives are thought to be in business to serve farm farmers rather than city dwellers. This conclusion is hardly surprising since most supply cooperatives are affiliated with one or another of the national farm organizations and since so many have the word "farmers" in their name.

control some 47 percent of the sales of petroleum products to farmers in Montana. Their ability to obtain this substantial market share would seem to be based on successfully serving their farmer members. It therefore appears likely that the unfavorable urban evaluation of cooperative savings is based upon lack of information rather than objective fact.

Fifth Hypothesis

The fifth hypothesis, that cooperatives are considered less honest and more unfair to competitors than the majors, can be tested by combining scales H and I.

TABLE XVII

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR COMPANY
MEAN SCORES ON SCALES H AND I, HONESTY AND FAIRNESS

		ENCO	CONOCO	F.U. CO-OP
Bismarck	H	5.65	5.10	4.56
Rank		3	2	1
Bismarck	I	5.33	4.94	3.64
Rank		3	2	1
Billings	H	5.65	5.28	4.51
Rank		3	2	1
Billings	I	5.31	4.98	3.96
Rank		3	2	1
Missoula	H	5.19	5.00	4.49
Rank		3	2	1
Missoula	I	4.69	4.90	3.95
Rank		2	3	1
ΣR_i		17	13	6

$$\begin{aligned}x^2 &= \frac{12}{BT(T+1)} \sum R_i^2 - 3B(T+1) \\&= \frac{12}{18(4)} (238 + 169 + 36) - 18(4) \\&= \frac{494}{6} - 72 \\&= 10.33 \text{ with d.f.}; \quad X^2_{.01} (2 \text{ d.f.}) = 9.21\end{aligned}$$

Therefore, reject the null hypothesis of no difference between company means and accept the hypothesis as stated.

Thus, the hypothesis that cooperatives are considered less honest and more unfair to competitors than the majors is supported at the 99 percent level. Perhaps this is the most damaging conclusion to be reached in this report. Urban consumers do not trust cooperatives. It seems unlikely that any substantial number of new members can be attracted to the cooperatives while this attitude prevails. A feeling of trust and confidence would seem to be absolutely essential to growth. Possibly, respondents did not distrust cooperatives because of any known facts, but rather because of a general aura of doubt and uncertainty surrounding them. If consumer attitudes on any of the scales could be improved, a corresponding improvement in all scales including those relating to honesty and fairness might result.

Sixth Hypothesis

The sixth hypothesis, that cooperatives are not thought to pay their fair share of taxes can be tested using scale J.

TABLE XVIII

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR COMPANY
MEAN SCORES ON SCALE J, PAYING FAIR SHARE OF TAXES

	ENCO	CONOCO	F.U. CO-OP
Bismarck	4.88	4.96	3.53
Rank	2	3	1
Billings	4.93	4.84	3.73
Rank	3	2	1
Missoula	4.64	4.60	3.66
Rank	3	2	1

$$\sum R_i \quad \quad \quad 8 \quad \quad \quad 7 \quad \quad \quad 3$$

$$X^2 = \frac{12}{BT(T + 1)} \sum R_i^2 - 3B(T + 1)$$

$$= \frac{12}{9(4)} (64 + 49 + 9) - 9(4)$$

$$= \frac{122}{3} - 36$$

$$= 4.67 \text{ with 2 d.f.}; \quad X^2_{.05} (2 \text{ d.f.}) = 5.99$$

$$\quad \quad \quad X^2_{.10} (2 \text{ d.f.}) = 4.61$$

Although the difference between company means is not significant at the 95 percent confidence level, there is a statistical difference at the 90 percent level.

The hypothesis that cooperatives are not thought to pay their fair share of taxes is supported at the 90 percent level. This finding should not be neglected because it is not "significant" at the customary 95

percent level. Any business firm which is even 90 percent confident that its potential customers consider it to be evading taxes should be interested in correcting that impression. It would appear that cooperatives have failed to get the message of their differentness across to the urban public. Their opponents, on the other hand, have successfully told the story of "the investor owned, taxpaying business".

Seventh Hypothesis

The seventh hypothesis, that popular identification of cooperatives with the Farmers Union name repels non-farmers, can be tested by comparing the mean scores of the Farmers Union Co-op with the Consumers Cooperative. For further comparison purposes the cut Rate scores are also included in the computations shown in Table XIX.

TABLE XIX

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR OVERALL
COMPANY MEAN SCORES--ALL SCALES COMBINED

		F.U. CO-OP	CONSUMERS CO-OP	CUT RATE
Scale Rank	A	4.07 3	3.96 2	3.41 1
Scale Rank	B	4.28 4	4.04 3	3.63 1
Scale Rank	C	4.11 1	4.17 2	4.22 3
Scale Rank	D	4.02 2	4.01 1	4.21 3
Scale Rank	E	3.28 1	3.51 2	4.55 3
Scale Rank	F	3.80 1	4.00 2	4.30 3
Scale Rank	G	4.04 1	4.39 3	4.37 2
Scale Rank	H	4.52 3	4.45 2	4.27 1
Scale Rank	I	3.85 2	4.06 3	3.78 1
Scale Rank	J	3.64 1	3.85 2	4.22 3
ΣR_i		18	21	21

$$\begin{aligned} X^2 &= \frac{12}{BT(T+1)} \sum R_i^2 - 3B(T+1) \\ &= \frac{12}{30(4)} (324 + 441 + 441) - 30(4) \\ &= \frac{1206}{10} - 120 \\ &= 62 \text{ d.f.}; \quad X^2_{.05} (2 \text{ d.f.}) = 5.99 \end{aligned}$$

Therefore, accept the null hypothesis of no difference between company means, and reject the stated hypothesis.

The seventh hypothesis is not supported by the data. Urban consumers do not consider the two cooperatives named to be substantially different. Had there been a significantly lower score given the Farmers Union Co-op as was expected, the explanation would have been simple. But, the negative result actually obtained is open to two possible interpretations: either the Farmers Union name makes no difference, or cooperatives in this area are so closely identified with the Farmers Union that urban gasoline consumers make no distinction between them.

An incident that occurred early in the research planning period may help to answer this question. During the preliminary study of university students one question in the sentence completion part of the questionnaire was: The Farmers Union is a _____.

Several students filled in the word co-op. This suggests that the second explanation that people do not distinguish between them, is the more likely. It also seems probable that the belief that cooperatives are intended primarily to serve farmers supports this explanation. In any event, there is no evidence that the association of cooperatives with the

Farmers Union attracts urban gasoline consumers while there is evidence (from the third hypothesis) that cooperatives are associated with farmers rather than city people. While the whole Farmers Union name has not been proven to be damaging to the urban attitude toward cooperatives it seems likely that further research would show that the word "farmers" did nothing to attract urban gasoline consumers.

The similarity between the scores of the two cooperatives and the Cut Rate station is instructive. It can be seen in the profile, Figure 6, Chapter IV, that the greatest difference between the Cut Rate and the cooperatives occurred on scale E--that of urban versus rural identification. The statistical significance of this difference is computed below:

TABLE XX

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR COMPANY
MEAN SCORES ON SCALE E, FARM IDENTIFICATION

	F.U. CO-OP	CONSUMERS CO-OP	CUT RATE
Bismarck Rank	3.03 1	3.55 2	5.03 3
Billings Rank	3.46 1	3.65 2	4.28 3
Missoula Rank	3.34 1.5	3.34 1.5	4.35 3

$$\sum R_i \quad 3.5 \quad 5.5 \quad 9$$

$$X^2 = \frac{12}{BT(T+1)} \sum R_i^2 - 3B(T+1)$$

$$= \frac{12}{9(4)} (12.25 + 30.25 + 81) - 9(4)$$

$$= \frac{125.50}{3} - 36$$

$$= 5.17 \text{ with 2 d.f.}; \quad \chi^2_{.05} (2 \text{ d.f.}) = 5.99$$
$$\chi^2_{.10} (2 \text{ d.f.}) = 4.61$$

Although the difference between company means is not significant at the 95 percent level, there is a statistical difference at the 90 percent level. This shows that cooperatives do have a more rural, and the Cut Rate a more urban identification in urban minds.

General Hypothesis

To test the general hypothesis that urban gasoline consumers have a less favorable attitude toward the Farmers Union Co-op than toward the two major oil companies all scales are used. The data is shown in Table XXI.

TABLE XXI

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR
COMPANY MEAN SCORES--ALL SCALES COMBINED

		ENCO	CONOCO	F.U. CO-OP
Scale Rank	A	4.76 2	4.97 3	4.07 1
Scale Rank	B	4.92 2	5.05 3	4.28 1
Scale Rank	C	5.51 3	5.14 2	4.11 1
Scale Rank	D	5.46 3	5.22 2	4.02 1
Scale Rank	E	4.50 2	4.71 3	3.28 1
Scale Rank	F	5.27 2	5.41 3	3.80 1
Scale Rank	G	4.31 3	4.26 2	4.04 1
Scale Rank	H	5.40 3	5.13 2	4.52 1
Scale Rank	I	5.11 3	4.94 2	3.85 1
Scale Rank	J	4.82 3	4.80 2	3.64 1

$\sum R_i$ 26 24 10

$$\begin{aligned}
 X^2 &= \frac{12}{BT(T+1)} \sum R_i^2 - 3B(T+1) \\
 &= \frac{12}{30(4)} (676 + 576 + 100) - 30(4) \\
 &= \frac{1352}{10} - 120 \\
 &= 15.2 \text{ with 2 d.f.}; \quad X^2_{.01} (2 \text{ d.f.}) = 9.21
 \end{aligned}$$

Therefore, reject the null hypothesis that the company means are the same and accept the stated hypothesis.

Overall, the total attitude toward the Farmers Union Co-op rates a substantially lower score than the attitude toward Conoco or Enco. This, of course, would be expected inasmuch as all the scales individually gave the same results.

City Differences

One further comparison of interest to this study can be made by testing the mean scores obtained by the Farmers Union Co-op in each of the three cities where the study took place. The data is presented in Table XXII.

TABLE XXII

FRIEDMAN'S NONPARAMETRIC COMPLETE BLOCK DESIGN FOR
FARMERS UNION CO-OP MEAN SCORES BY CITY

		BISMARCK	BILLINGS	MISSOULA
Scale Rank	A	4.37 3	3.79 1	4.06 2
Scale Rank	B	4.40 3	4.21 1	4.23 2
Scale Rank	C	4.47 3	3.94 2	3.91 1
Scale Rank	D	4.42 3	3.79 1	3.86 2
Scale Rank	E	3.03 1	3.46 3	3.34 2
Scale Rank	F	3.82 2	3.69 1	3.89 3
Scale Rank	G	3.81 1	4.15 2	4.16 3
Scale Rank	H	4.56 3	4.51 2	4.49 1
Scale Rank	I	3.64 1	3.96 3	3.95 2
Scale Rank	J	3.53 1	3.73 3	3.66 2

ΣR_i 21 19 20

$$X^2 = \frac{12}{BT(T+1)} \Sigma R_i^2 - 3B(T+1)$$

$$= \frac{12}{30(4)} (441 + 361 + 400)$$

$$= \frac{1202}{10} - 120$$

$$= 120.2 \text{ with 2 d.f.}; \quad X^2_{.01} (2 \text{ d.f.}) = 9.21$$

Therefore accept the null hypothesis that there is no difference between city means.

The results of this computation show no evidence of a difference in attitude toward the Farmers Union Co-op in the three cities studied.

No statistical analysis of the scores given the Favorite station is presented because on every scale the Favorite station received a higher score than either Enco or Conoco. Therefore, on every scale where the Farmers Union Co-op scored significantly lower than these two majors it also scored significantly lower than the Favorite.

Although nonparametric statistics do not provide a means separation test for use in determining the distribution responsible for a statistically significant difference, in the examples above this step is easily accomplished by inspection. If the nature of the research had required that several more companies be compared, or if the relative position of the Farmers Union Co-op had not been so markedly different from the two control companies, this inspection method probably would not have been successful.

For this reason, analysis of variance is used to test the same hypotheses in Appendix F. Essentially the same results are obtained with one method as with the other, but analysis of variance does provide a means separation test. A researcher is therefore faced with a choice between making a somewhat questionable assumption about equality of scale intervals and using analysis of variance; or accepting the lack of a means separation test and using a nonparametric method.

CHAPTER VI

Summary and Recommendation

Summary

Farm supply cooperatives have gained a substantial share of the farm petroleum products market; 47 percent in Montana and 43 percent nationally. The economic logic of the refining industry calls for increased sales to permit additional savings resulting from the economics of optimum utilization of plant facilities. One virtually untapped market for cooperative gasoline is in the rapidly growing urban centers. This research was conducted to measure the attitudes of urban gasoline consumers in this region toward the Farmers Union Cooperative-- a typical name for the local cooperative organizations affiliated with the Farmers Union Central Exchange.

A random sample of 80 gasoline consumers was drawn in each of three of the larger cities of the region; Billings, Montana; Missoula, Montana; and Bismarck, North Dakota. This sample was asked to participate in a Semantic Differential test of their attitudes toward the Farmers Union Cooperative, Enco, Conoco, a fictitious Consumers Cooperative and their Favorite gas station. The results of these interviews were analyzed using appropriate nonparametric methods and using analysis of variance. The results of both methods were similar, with the analysis of variance producing somewhat higher confidence levels at the risk of making a dubious assumption. It was concluded that in this case nonparametric methods were adequate and were safer to use.

To summarize the findings as to urban attitudes; it can be said that urban gasoline consumers consider the Farmers Union Cooperative to be similar to a cut rate company, but selling primarily to farmers. Both cooperatives and cut rate stations are considered to be sellers of sub-standard gasoline in comparatively unattractive surroundings. In contrast with its major competitors the cooperative is considered a poor citizen, it is suspected of dishonesty and of failing to pay its fair share of taxes. It appears that while members and supporters of the "cooperative movement" have been telling one another of the role of cooperation as a self-help tool for progress, they have largely failed to reach people outside their own group with this message.

Since there was no statistically significant difference between scores given the Farmers Union Cooperative in each of the three cities studied, it would appear that this unfavorable attitude is widespread rather than localized. Further research to determine if small town and non-farm rural residents hold the same attitudes would be instructive.

It is only fair to point out that cooperatives in this area have made no noteworthy effort to win supporters among urban families. This neglect, coupled with some readily observable deficiencies in appearance and house-keeping have probably contributed heavily to the unfavorable urban attitude toward cooperatives. Farm supply cooperatives may also have been the victims of newspaper advertisements and other attacks aimed principally at rural electric cooperatives. Whatever the cause of present unfavorable attitudes may have been, they exist today as a

barrier to increased sales of gasoline to urban residents and thereby prevent potential production economics and increased member savings.

Recommendations

Although action recommendations contain as much art as science, it may be appropriate to suggest some changes in cooperative practice based on the foregoing research. It seems cooperatives should be able to obtain a substantial amount of urban business if their members decide to develop this market because nothing in the research data suggests that potential consumers are so anti-cooperative in attitude that they cannot be won over.

The first problem to be overcome is within the cooperatives themselves. While the decision to expand the cooperative sphere of operations would probably be made first at the regional supply cooperative level, it can be carried out only with the help of the local level. Local cooperatives are usually small and democratically controlled organizations with final authority in the hands of their members. It is entirely possible that the members of some local cooperatives may be quite unwilling to make the kinds of changes necessary if urban patrons are to be effectively solicited.

Several changes would be called for if the regional cooperatives were able to win local support for a stepped up educational effort directed at urban gasoline buyers. The first of them, requiring the fewest changes in management practices, would be to work toward a high degree of uniformity and beauty in buildings and signs. The service stations operated by

most gasoline companies are readily recognizable, sometimes at a great distance. The best of them are bright, shiny and modern. They are conveniently located on main highways and open at the hours desired by urban customers. If they hope to attract urban consumers, the cooperatives should do no less.

It seems unlikely that the general public will patronize the cooperatives until they are invited to do so and made to feel at home. Therefore the public should be told that "co-ops are for everyone" not just farmers. This change in emphasis should be accompanied by an educational effort aimed at informing potential members about cooperatives and countering the frequent attacks made upon them.

If "co-ops are for everyone" it would seem desirable to take the further step of dropping the farm identification found in so many cooperative names and also to drop the Farmers Union name where it occurs. In spite of the inconclusive results in this part of the research, it seems unlikely that the Farmers Union name would attract urban residents to a cooperative. A third and more drastic step would be to drop the use of the word "cooperative" in any new service station built to appeal to urban residents. As mentioned at the beginning of this report many organizations that are cooperatives in fact do not use the word in their names. Operation of these stations would increase the efficiency of refinery operations with resulting benefits to farm cooperative members, even if they were corporations wholly owned by a cooperative.

If these changes, which admittedly call for a major change in direction and demand a high level of cooperation between cooperatives, are

accompanied by a well-planned and well-financed educational program there is no reason to believe that cooperatives cannot capture a much larger share of the urban gasoline market.

Suggestions for Further Research.

Further research is needed to clarify the relationships between "farmer" and "cooperative" as well as to help in the selection of alternative names, should the use of both of these words be discontinued by cooperative organizations. The semantic differential would be a suitable instrument for such research. It seems probable that fewer preliminary tests would be needed when choosing descriptive pairs of adjectives in the future. Since consumers in the cities included in this study were found to hold very similar attitudes toward gasoline sellers, interviewing efficiency could be improved by concentrating research in a single city.

APPENDIX

APPENDIX A

This is the first preliminary questionnaire used in the summer of 1965 to determine general student attitudes toward gasoline and cooperatives. The sentence completion questions were intended to be completely nondirective so that students would feel free to comment in any way they chose. The discussion questions were intended to let the students go into detail on some points if they wished. No detailed analysis was made of the answers. They were used only to suggest hypotheses.

NAME _____

AGE _____

HOME ADDRESS _____

OCCUPATION OF HEAD OF FAMILY _____

Sentence Completion

1. I usually buy my gasoline
2. To me the most important thing in buying gas is
3. Trade unions are
4. Gasoline quality is
5. Conoco gas is
6. The Republican party is
7. When people buy gas they ought to
8. Co-op gas is
9. The station where I buy my gas is
10. Cooperatives are
11. A saving of four cents a gallon is
12. Farmers buy gas
13. A well-known brand of gas is usually

14. Farmers are
15. People in town buy gas
16. The Farmers Union
17. I never stop at a gas station where
18. Cooperatives don't
19. The Democratic Party is
20. Rest room facilities
21. Texaco gas is
22. When buying gas it doesn't really matter to me if
23. Phillips gas is
24. The last brand of gas I bought was
25. All gas stations are
26. Discount gas is
27. People join a co-op because

Discussion Questions

1. Why do you buy gas from your favorite station?
2. Why don't you buy gas from the Farmers Union Cooperative station?

3. What do your parents think about co-ops?

4. What do you think of the Farmers Union?

APPENDIX B

This is the second preliminary questionnaire. It was used in early autumn of 1965 to narrow down the ideas gained from the first questionnaire. Because it is nondirective the answers cover a very wide range and would therefore be difficult to handle quantitatively.

Age _____

Home Address _____

Occupation of head of family _____

1. To me the most important thing in buying gas is
2. When people buy gas they ought to
3. I never stop at a gas station where
4. Restroom facilities
5. When buying gas it doesn't really matter to me if
6. Gasoline quality is
7. I think that credit cards
8. I buy most of my gas
9. The station where I buy most of my gas is always
10. The brand of gas I buy
11. The restroom is
12. The place where I buy my gas always looks
13. I could save money by buying my gas
14. The reason I trade with my favorite station is

15. People who buy gas at cooperatives are

16. Co-op gas is

17. Cooperatives are

18. All gas stations are

19. Co-ops don't

20. I would buy co-op gas if

21. Co-op gas stations

22. The Farmers Union is

APPENDIX C

In an effort to design a questionnaire that would be amenable to quantification the Semantic Differential method was chosen. This questionnaire was given to 54 students during Autumn, 1965. A sample page of the questionnaire follows. Similar pages for Enco, Cut Rate, Favorite, and Farmers Union Co-op were used, but are omitted here in the interest of brevity.

INSTRUCTIONS

Montana state University wants to know how you feel about certain companies selling gasoline. Please indicate on the descriptive scales provided in the following pages your feelings on the basis of what these companies mean to you. On each page of this booklet you will find the name of a different company and beneath it a number of pairs of descriptive words. Please rate the company named at the top of the page on each of these pairs in order.

Here is how you use these words and scales.

If you feel that the company named at the top of the page is very well described by the words at one end of the scale you should show your feelings as follows:

Hot ⑦ 6 5 4 3 2 1 Cold

or

Hot 7 6 5 4 3 2 ① Cold

If you feel that the company named is quite well described by the words at one end of the scale you should show your feelings as follows:

Hot 7 ⑥ 5 4 3 2 1 Cold

or

Hot 7 6 5 4 3 ② 1 Cold

If you feel that the company is only slightly described by the words at one end of the scale you should show your feelings as follows:

Hot 7 6 ⑤ 4 3 2 1 Cold

or

Hot 7 6 5 4 ③ 2 1 Cold

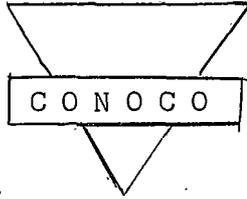
In other words, the stronger your feelings one way or the other the farther you go toward one end of the scale or the other.

If you consider the company to be neutral on the scale, or both ends of the scale seem equally associated with the company, or if the scale has nothing to do with the company you should circle the number in the middle:

Hot 7 6 5 ④ 3 2 1 Cold

Please Remember: Mark every scale for every company. Do not omit any. Never circle more than one number on a single scale.

Sometimes you may feel that you've had the same item before on the test. This will not be the case, so do not look back and forth through the items. Do not try to remember how you checked similar items earlier in the test. Make each item a separate and independent judgment. Work at fairly high speed and do not worry or puzzle over individual items. It is your first impressions, the immediate "feelings" about the items that we want. On the other hand, please do not be careless, because we want your true impressions.



Conoco is the trademark of the Continental Oil Company. Please give us your impression of this company, its service stations, and products.

										CODE
Rather weak gas	1	2	3	4	5	6	7	Powerful gas		_____
Really fresh gas	7	6	5	4	3	2	1	Somewhat stale gas		_____
Sometimes dirty gas	1	2	3	4	5	6	7	Always clean gas		_____
Good gas	7	6	5	4	3	2	1	Bad gas		_____
Gas that damages my car	1	2	3	4	5	6	7	Safe gas for my car		_____
Very fast service	7	6	5	4	3	2	1	Sort of slow service		_____
Somewhat messy station	1	2	3	4	5	6	7	Neat appearing station		_____
Quite modern	7	6	5	4	3	2	1	A little old fashioned		_____
Ugly	1	2	3	4	5	6	7	Attractive		_____
Usually courteous	7	6	5	4	3	2	1	Often rude		_____
For farmers	1	2	3	4	5	6	7	For city people		_____
Convenient	7	6	5	4	3	2	1	Inconvenient		_____
Sometimes unreliable	1	2	3	4	5	6	7	Always reliable		_____
Friendly	7	6	5	4	3	2	1	A little unfriendly		_____
Bad service	1	2	3	4	5	6	7	Good service		_____
Big savings	7	6	5	4	3	2	1	No savings		_____
Dishonest	1	2	3	4	5	6	7	Honest		_____
A good place to buy	7	6	5	4	3	2	1	A poor place to buy		_____

Unfair to competitors	1	2	3	4	5	6	7	Fair to competitors	_____
Pays fair share to taxes	7	6	5	4	3	2	1	Doesn't pay fair share of taxes	_____
Foreign philosophy	1	2	3	4	5	6	7	American philosophy	_____
Interesting	7	6	5	4	3	2	1	Boring	_____
Not very important	1	2	3	4	5	6	7	Very important	_____

APPENDIX D

Notes on Use of the Spectro-Fan Card¹

Purpose

The attitudes, values, expectancies, and needs of every individual predispose, prejudice, and to a large extent, determine how he or she will react to every situation, either individually or as a member of a group.

For those who wish to accomplish things through and with others, therefore, knowledge of these forces, their effects on behavior and some skill in measuring and working with them represent basic tools.

The Spectro-Fan Card, as a survey instrument, was designed to accomplish the following limited group process functions.

1. To provide a response schedule with a very high degree of anonymity. This aids materially in:
 - a. Getting responses from all members of the group
 - b. Overcoming the priority and prestige factors
 - c. Separating personality from idea in group discussion
 - d. Making it easier for a person to change his opinion without losing face.
2. To provide response possibilities with a minimum of writing, thus reducing the biases caused by differences in literary skill.
3. To provide for more rapid hand sorting of stratified data.
4. To provide for rapid tabulation of results. Fairly accurate approximations of the range of responses, the mean, variance, and shape of the frequency distribution curve for each question can be made visually by an individual or group.

¹These instructions were provided by the Cooperative Extension Service, Montana State University, Bozeman, Montana.

5. To provide for rapid feedback in visual form to group leaders or to a group.
6. To facilitate the study of relationships between various data items.
7. To stimulate group discussion and achieve a greater and more positive sense of individual involvement.

Some suggestions on the use of Spectro-Fan Cards

1. Be sure to recognize a number of limitations inherent in this type of survey schedule. Here are a few:
 - a. It looks complicated to some people.
 - b. It is extremely important that respondents understand for each question how responses are to be communicated, i.e., how the attitudes, feelings, etc., are expressed on the sliding 1 to 7 scale, which end of the 1 to 7 continuum is high, and which is low, etc. Persons who feel indifferent about a particular question or choose not to respond should leave it blank.
 - c. Make clear how responses are to be marked; i.e., by filling in, completely, the space above one number to the extreme edge of the card. Don't simply make a check mark or an "x" in the space. Don't circle the number. With a pen or pencil fill in the space completely and firmly.
 - d. In case of an error, simply tear a notch out of the edge of the card taking with it the erroneous mark; be sure you leave the space of the number needed for your corrected response.
2. If the responses are to be anonymous, be sure to emphasize this point--then be sure and keep your word.
3. Type of questions--some limitations:
 - a. The easiest responses to employ are those which can normally be expressed on a continuum similar to the base of a normal bell-shaped distribution curve. The opposite extremes are at the 1 and 7 positions respectively, and the black dot on the card above the 4 is simply to help locate the midpoint.
 - b. This schedule makes it easy to survey opinions regarding deviations from the status quo or any described situation. For example: A response of "4" in Question A might be interpreted to convey "satisfied with situation as is"--while responses on

the 3, 2, and 1 end might be used to convey degrees of a need for "less"--while a 5, 6, or 7 might be indicating a need for "more" than at present.

- c. Values: Negative or positive responses can easily be elicited either for ideas or words. I am for (don't care "4"), or against a certain proposal.
- d. Many ways can be thought up to stratify the data according to the demands of the situation. For example: Age--code age groups into the seven categories, or use different colored cards for age categories. Sex--use different colored cards for male and females; or, simply have one sex mark an "x" in the extreme top left-hand corner of the card. Years of experience--may either code this or use 1 to 7 to convey up to one year, 2, 3, 4, 5, 6, or 7 or more years respectively. Be sure to include all possible responses. Hours per day you spend reading--your impression of your relative rank in your organizational hierarchy (7 = top dog, 4 = middle, 1 = low man on the totem pole). It is usually best to define the geographic area to be included in such a question. Choose stratification questions which will be most helpful in interpreting, or will give greater meaning to the responses for your other questions.
- e. If objective responses are wanted, it is very important not to prejudice or foreshadow the desired response by the wording of the question. Even the repeated use of the "1" end of the continuum to represent the negative or lesser values can reduce the attractiveness of that "less desirable" end of the scale.
- f. Questions to which almost every respondent gives about the same answer seldom provide much new information--are frequently not worth asking. Try to design questions which will most efficiently reveal the real and significant differences.
- g. Some attitudes can best be obtained by indirect means. For example: Instead of asking "what is your attitude toward Negroes?" (1) antagonistic or negative, or very favorable--positive (7). Use several specific, indirect, but indicative questions, such as: "If you were going on a vacation and taking a companion, which would you be inclined to choose?" (4) = no choice whatsoever, (3, 2, or 1) tend toward choosing a white companion, (5, 6, 7) tend toward choosing a Negro companion; or, another example: "If you were moving into a city whose population were one-half colored and the other half white, where would you most likely choose to live? (1) In an all-colored community; (2) In a predominately colored community; (3) In a section with a few colored people; (4) Race would not affect my choice of area at all; (5) In a

section with a few white people; (6) In a mostly white area;
(7) In an all-white area.

- h. Almost always there are a few responses which seem incredible to someone else. The first conclusion usually jumped to is that this respondent certainly didn't know how to use the card. It is usually well, therefore, to include somewhere among the early questions, one or a combination of two or more questions which serve also as a check on the respondent's proper understanding of the continuum and its use. Sometimes one self-evident response is used solely for this purpose, but usually a person's understanding of the use of the card can be deducted from other responses.
- i. Avoid ambiguity in your questions as much as possible. This requires considerable effort. Questions are almost always improved by a trial run or by trying them out on several people similar in background and experience to the intended respondents.
- j. When opinions, attitudes, or values are sought, off-the-cuff responses are best and the questions most frequently are read or stated once or twice with little or no interpretive discussion. This type of survey should move along fairly rapid. If considered judgments are wanted, then prepared lists of questions are usually more appropriate.

How to Fan the Stack of Cards

1. In order to expose the peripherally located information on all the cards in a deck simultaneously it is necessary to fan them out evenly.
2. First, make sure all cards are stacked face up and in the same position.
3. To expose the data along the right edge of the cards, hold the deck loosely and tap this edge on a desk or flat surface to even the cards.
4. Grip the left margin of the stack between the thumb and forefinger of the left hand (thumb on the face of the top card and forefinger on the bottom card underneath). Grip the right margin of the stack in the same manner with the right hand.
5. While gripping the stack firmly with the left hand and very loosely with the right, bend both edges of the card stack downward. Now while holding the stack bent, reverse your grip (grip firmly with the right hand and loosely with the left) and bend both edges

upward. By repeating this procedure several times, the stack becomes fanned in such a way as to expose the right hand margin of each card.

6. Edges of the deck of cards nearest to and farthest from the operator remain relatively straight during the fanning process. By tapping one of these edges on a desk or flat surface the alignment of the exposed edges is improved.
7. It may be necessary to practice this fanning technique for a few minutes so that one may expose any desired margin at will and keep the stack relatively straight in the process.

Some Limitations and Potential Problems Related to the Use of the Spectro-Fan Technique

Notwithstanding certain advantages, the Spectro-Fan Technique is subject also to certain limitations and certain problems. Some of these are:

1. The technique, as a survey schedule, is extremely limited. It is limited to such responses as can be expressed by the marking of a location along a continuum.
2. The division of the continuum into discreet classes, in this case seven, imposes limitations in both expression and analysis, even though there are also certain advantages in both the discreet classes and the basic seven divisions.
3. As with most other opinionaires, polls, and tests, a wide variety of factors can have significant effects upon the responses obtained. Insofar as the design of the instrument may structure bias into the data, efforts to achieve significance through statistical means may tend only to sanctify sin.
4. The lack of sophistication in the Spectro-Fan and Multi-Scan Techniques may foster excessive generalization. Because these are primarily scanning devices and designed for approximating certain statistics and immediate feedback, there may be a greater tendency to over generalize--to draw more conclusions than the facts justify or will support.
5. Some skill and experience in manually fanning the deck of cards is essential to take full advantage of the peripheral location of the data, reduce error, and facilitate rapid communication.

6. Obviously, the statistical results obtained visually are only approximations and subject to considerable error depending on both the size of the sample, which is limited by the number of cards that can be managed in the hands, and upon experience.
7. There is always the potential of a communications failure in giving instructions to the one who marks a response on the card. Occasionally, someone has difficulty with the concept of a continuum, or misunderstands the coding intended; or, occasionally someone gets values reversed on the one to seven scale. A clear explanation on how the cards are to be marked and whether or not the respondents are to remain anonymous is essential.

APPENDIX E

The following instructions were explained to interviewers during meetings with them in Billings, Bismarck and Missoula. The interviewers then participated as subjects in a sample interview. A set of instructions was left with each interviewer.

Instructions

1. Begin interviewing on block number one shown on the city map. Then take the following blocks in numerical order.
2. Start on the northeast corner of each block and interview the first five families going in a clockwise direction. If the block doesn't have a northeast corner use the north.
3. Interview only the person who heads the household. If two unmarried adults live together either will do.
4. If the head of the household doesn't buy gasoline, go on to the next family.
5. When conducting the interview:
 - a. Ask for the head of the family
 - b. Identify yourself.
 - c. Ask if he buys gas. If he does not, thank him and go on.
 - d. If he buys gas request his help.
 - e. When you get inside explain the use of the cards.

Cards

1. Each card is for a different company.
2. The company name is on the card.
3. Question (a), (b), etc., are to be answered in the corresponding sections of the card.
4. For each pair of words the negative or weaker word is given first and corresponds to the one end of the scale. The positive or stronger word is second and corresponds to the seven end of the scale.

5. Tell the interviewee to decide which word of the pair best describes his feelings toward the company and how strong these feelings are. If very strong he will mark one or seven, if weaker six or two, if still weaker five or three. If he is neutral, doesn't know, or thinks the question doesn't apply to the company at all he should mark four.
6. Watch to see that he marks every section clearly.
7. Keep moving after you see that he is doing it right. There should not be time enough to puzzle over answers. Answers should be spontaneous but not careless.
8. When he has finished all six cards have him put his name and address on the back of one of them. If he won't give his name, you get the address on your way out. This is important because we will want to check back on most of these people for additional information.
9. Make at least three attempts to interview the right person if he is not available the first time. If you cannot complete the interview in three attempts, go on to the next family.
10. Each city should send us 80 completed interviews with an explanation of any problems encountered and how these were solved.

Administering the Interview

Ask the interviewee to take each card in the stack in order without looking to see what is underneath. As he prepares to fill in each card read the description (of Enco) below to him.

ENCO

Enco is the trademark of the Humble Oil and Refining Company. Please give us your impression of this company, its service stations, and its products.

CONSUMERS COOPERATIVE
ASSOCIATION

Cooperatives selling gasoline and other automotive products are found in most cities in this area. Please rate them, their service stations, and products.

CONOCO

Conoco is the trademark of the Continental Oil Company. Please give us your impression of this company, its service stations, and products.

FARMERS UNION
CO-OP
OIL COMPANY

Cooperatives selling gasoline and other automotive products are found in most cities in this area. Please rate them, their service stations, and products.

CUT RATE
DISCOUNT GAS
GAS COMPANY

Each city has several cut rate service stations selling gasoline. Please rate those in your city on the following characteristics:

YOUR FAVORITE
GAS STATION

Most drivers have a favorite service station where they prefer to trade. The name of your favorite station is _____. Please rate it, its parent company and products.

When you have read the name and description of the first company read each of the following pairs of adjectives. He will rate the company according to these traits in the corresponding letter section of the card.

- | | |
|------------------------------------|--------------------------|
| A. Rather weak gas | Powerful gas |
| B. Somewhat old, dirty gas | Really fresh, clean gas |
| C. Messy Station | Neat Station |
| D. Ugly | Attractive |
| E. For Farmers | For City People |
| F. Inconvenient | Convenient |
| G. No Savings | Big Savings |
| H. Dishonest | Honest |
| I. Unfair to competitors | Fair to Competitors |
| J. Doesn't pay fair share of taxes | Pays fair share of taxes |

When the first card is completed go on to the second and repeat the entire process of reading name and description first, then the pairs of adjectives. Be sure the cards are all used in the order given.

APPENDIX F

Analysis of Variance

The same data analyzed by nonparametric procedures in Chapter VI can be subjected to parametric analysis of variance methods. If Osgood's conclusions about the approximate equality of scale intervals is accepted as applying to the data of this study, there is no reason why analysis of variance cannot produce results that are meaningful in the context of business decision making.

In each section of the appendix, the relevant data is presented in tabular form, the analysis of variance computations follow, and Duncan's New Multiple Range means separation test is then applied if needed. Using Duncan's test, means that are not significantly different show the same underlining.

In the case of most hypotheses tested here, this use of analysis of variance permits the original hypothesis to be accepted at the 99 percent level rather than at the 95 percent level reached using nonparametric procedures. The use of Duncan's New Multiple Range means separation test permits attaching a mathematical value to what was a matter of inspection and judgment using the nonparametric methods. The final outcome of the study would be the same using either method. It would seem that a business-man who was 95 percent confident his potential customers considered his product inferior would not ask to be 99 percent confident of the negative attitude before he took action to correct this opinion. In any case, whether the gain in information obtained by using analysis of variance is

adequate to justify the theoretically questionable assumption of equal scale intervals is a question of judgment outside the purposes of this study.

TABLE I
COMPOSITE COMPANY SCORES BY CITY

Scale	ENCO			CONOCO			FARMERS UNION COOPERATIVE			CONSUMERS CO-OP			CUT RATE			FAVORITE		
	Bismarck	Billings	Missoula	Bismarck	Billings	Missoula	Bismarck	Billings	Missoula	Bismarck	Billings	Missoula	Bismarck	Billings	Missoula	Bismarck	Billings	Missoula
A	4.96	4.76	4.56	4.44	5.25	5.23	4.37	3.79	4.06	3.93	3.86	3.75	3.24	3.24	3.75	5.12	5.52	5.30
B	4.88	5.15	4.74	4.72	5.24	5.19	4.40	4.21	4.23	3.80	4.08	4.23	3.91	3.33	3.66	5.36	5.64	5.71
C	5.51	5.50	5.51	4.24	5.64	5.55	4.47	3.94	3.91	4.53	3.85	4.14	4.86	3.86	3.94	5.88	5.78	5.78
D	5.37	5.69	5.33	4.64	5.41	5.61	4.43	3.79	3.34	4.23	3.76	4.04	4.83	3.86	3.93	5.68	5.62	5.64
E	4.63	4.25	4.63	4.67	4.69	4.78	3.03	3.46	3.34	3.55	3.65	3.84	5.03	5.28	4.35	4.68	4.88	4.72
F	5.61	5.01	5.10	4.71	5.73	5.78	3.82	3.69	3.89	3.75	3.79	4.47	4.51	4.25	4.15	6.03	5.49	6.03
G	3.79	5.02	3.93	4.15	4.70	3.94	3.81	4.15	4.16	3.80	4.03	4.57	4.58	4.31	4.23	4.66	4.56	4.30
H	5.65	5.65	5.19	5.10	5.28	5.00	4.56	4.51	4.49	4.20	4.59	4.66	4.31	4.15	4.34	6.00	5.34	5.88
I	5.33	5.31	4.69	4.94	4.98	4.90	3.64	3.96	3.95	4.12	4.08	3.99	3.91	3.63	3.80	5.61	5.47	5.34
J	4.88	4.93	4.64	4.96	4.84	4.60	3.53	3.73	3.66	3.77	3.85	3.92	4.20	4.00	4.46	4.68	5.26	5.28
City																		
Sum	50.79	51.28	48.41	46.57	51.76	50.58	40.05	39.23	39.51	39.68	39.54	41.45	43.88	38.91	40.61	53.70	53.56	53.98
X	5.08	5.13	4.84	4.66	5.18	5.06	4.01	3.92	3.95	3.97	3.95	4.15	4.34	3.89	4.06	5.37	5.36	5.40
Sum of Squares Observations:																		
	260.43	264.69	236.81	217.73	269.12	258.51	162.77	154.60	157.32	158.23	156.97	173.11	190.86	152.74	165.63	291.13	288.13	294.21
Company Sum	150.48				148.91			118.78			120.67			122.90				161.24

Grand Total Sum of Observations = 882.98
 Grand Total Sum of Observations Squared = 667,296.0804
 Grand Total Sum of Observations Squared/180 = 3762.75
 Grand Total Sum of Squared Observations = 3852.29
 Sum of Company Sums Squared/30 = 3819.70
 Sum of City Sums Squared/10 = 3823.02

$$\text{Within Company Sum of Squares} = \sum \left[\frac{(\sum X_i)^2}{S} \right] - \frac{\sum (\sum \sum X_{ij})^2}{RS} = 3823.02 - 3819.70 = 3.32$$

$$\text{Total Sum of Squares} = \sum \sum \sum X_{ijk}^2 - \frac{(\sum \sum \sum X_{ijk})^2}{TRS} = 3852.29 - 3762.75 = 89.54$$

$$\text{Within Company/City Sum of Squares} = \sum \sum \sum X_{ijk}^2 - \frac{\sum (\sum X_i)^2}{S} = 3852.29 - 3823.02 = 29.27$$

$$\text{Between Company Sum of Squares} = \sum \left[\frac{(\sum \sum X_{ij})^2}{RS} \right] - \frac{(\sum \sum \sum X_{ijk})^2}{TRS} = 3819.70 - 3762.75 = 56.95$$

Analysis of Variance

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	5	56.95	11.390	41.11 hi.sig.
Within Companies	12	3.32	.277	1.53 n.s.
Within Company/City	162	29.27	.181	
Total	179	89.54		

Tabulated value of F for 5, 12 d.f. = 6.07 at 99 percent level.

Tabulated value of F for 12, 162 d.f. = 1.94 for 95 percent level.

Reject the null hypothesis that company means are equal. Accept the null hypothesis that city means within companies are equal.

Duncan's New Multiple Range Test to see which company means differ significantly from which others.

$$\bar{S}_X = \sqrt{\frac{S^2}{r}} = \sqrt{\frac{.181}{10}} = .13$$

1 Percent Protection Level, 100 d.f.

Value of P	2	3	4	5	6
SSR	3.71	3.86	3.98	4.06	4.11
(SSR) \bar{S}_X	.4823	.5018	.5174	.5278	.5343
F.U. Co-op	3.949	4.022	4.096	4.036	5.016
Consumers Co-op					5.374
Cut Rate					
Conoco					
Enco					
Favorite					

The means fall into two distinct groups. Farmers Union Cooperative, Consumers Cooperative and Cut Rate are different at the 99 percent level from Conoco, Enco and Favorite.

This is the total image of each company.

TABLE II

SCALE A

	ENCO	CONOCO	FARMERS UNION COOPERATIVE	CON CONSUMERS COOPERATIVE	CUT RATE	FAVORITE
Bismarck	4.96	4.44	4.37	3.93	3.24	5.12
Billings	4.76	5.25	3.78	3.86	3.24	5.52
Missoula	4.56	5.23	4.06	4.09	3.75	5.30
$\sum X$	14.28	14.92	12.22	11.88	10.23	15.94
$\frac{\sum X}{r}$	4.76	4.97	4.07	3.96	3.41	5.31
$\sum X^2$	68.05	74.63	49.94	47.07	35.88	84.77
$\frac{1}{r}(\sum X_{ij})^2$	67.97	74.20	48.77	47.04	34.88	84.69
$\sum X^2 - \frac{1}{r}(\sum X_{ij})^2$	.08	.43	.17	.03	.18	.08
S^2	.04	.22	.09	.02	.09	.04

Total Sum of Squares = $\sum X^2 - \frac{(\sum X_{ij})^2}{Tr} = 359.52 - 350.86 = 8.66$

Company Sum of Squares = $\frac{\sum (\sum X_{ij})^2}{r} - \frac{(\sum X_{ij})^2}{Tr} = 358.55 - 350.86 = 7.69$

Error Sum of Squares = $\sum X^2_{ij} - \frac{(\sum X_{ij})^2}{r} = 359.52 - 358.55 = .97$

Analysis of Variance

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies T-1	5	7.69	1.54	19.25
Within Companies T(r-1)	12	.97	.08	
Total rT-1	17	8.66		

Tabulated F .01 (5, 12 d.f.) = 6.07

Therefore, reject the null hypothesis of no difference between company means.

Duncan's New Multiple Range Test

$\bar{S}X = \sqrt{\frac{S^2}{r}} = \bar{S}X \sqrt{\frac{.08}{3}} = .026666 = .17$

5 Percent Protection Level

Value of P	2	3	4	5	6	
SSR	3.08	3.23	3.33	3.36	3.40	
(SSR) $\bar{S}\bar{X}$	.52	.55	.57	.57	.58
Cut Rate	Consumers Co-op	F.U. Co-op	Enco	Conoco	Favorite	
	3.41	3.96	4.07	4.76	4.97	5.31

1 Percent Protection Level

Value of P	2	3	4	5	6	
SSR	4.32	4.55	4.68	4.76	4.85	
(SSR) $\bar{S}\bar{X}$	.7344	.7735	.7956	.8092	.8228
Cut Rate	Consumers Co-op	F.U. Co-op	Enco	Conoco	Favorite	
	3.41	3.96	4.07	4.76	4.97	5.31

TABLE III

SCALE B

	FARMERS					
	ENCO	CONOCO	FARMERS UNION COOPERATIVE	CONSUMERS COOPERATIVE	CUT RATE	FAVORITE
Bismarck=	4.88	4.72	4.40	3.80	3.91	5.36
Billings	5.15	5.24	4.21	4.08	3.33	5.64
Missoula	4.74	5.19	4.23	4.23	3.66	5.71
$\sum X_{ij}$	14.28	14.92	12.22	11.88	10.23	15.94
$\sum X_{ij}/r$	4.92	5.05	4.28	4.04	3.63	5.57/82.88
$\sum X^2_{ij}$	72.80	76.67	54.98	48.98	39.77	93.14
$1/r(\sum X_{ij})^2$	72.71	76.50	54.95	48.88	39.60	93.07
$\sum X^2_{ij} - 1/r(\sum X_{ij})^2$	.09	.17	.03	.10	.17	.07
s^2	.05	.09	.02	.05	.09	.04

Total Sum of Squares = 386.34 - 377.94 = 8.40

Company Sum of Squares = 385.71 - 377.94 = 7.77

Error Sum of Squares = 386.34 - 385.71 = .63

Analysis of Variance					
Source of Variance		Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	T-1	5	7.77	1.55	31.00
Within Companies	T(r-1)	12	.63	.05	
Total	rT-1	17	8.40		

Tabulate F .01 (5, 12 d.f.) = 6.07

Therefore, reject the null hypothesis of no difference between company means.

Duncan's New Multiple Range Test:

$$s\bar{X} = \sqrt{\frac{s^2}{r}} = \sqrt{\frac{.05}{3}} = \sqrt{.0167} = .13 \quad 12 \text{ d.f.}$$

5 Percent Protection Level						
Value of P	2	3	4	5	6	
SSR	3.08	3.23	3.33	3.36	3.40	
(SSR) $s\bar{X}$	.37	.42	.43	.44	.44	
Cut Rate	Consumers Co-op	F.U. Co-op	Enco	Conoco	Favorite	
3.63	4.04	4.28	4.92	5.05	5.57	

1 Percent Protection Level						
Value of P	2	3	4	5	6	
SSR	4.32	4.55	4.68	4.76	4.84	
(SSR) $s\bar{X}$	.56	.59	.61	.62	.63	
Cut Rate	Consumers Co-op	F.U. Co-op	Enco	Conoco	Favorite	
3.63	4.04	4.28	4.92	5.05	5.57	

TABLE IV

SCALE C

	FARMERS					
	ENCO	CONOCO	UNION COOPERATIVE	CONSUMERS COOPERATIVE	CUTE RATE	FAVORITE
Bismarck	5.51	4.24	4.47	4.53	4.86	5.88
Billings	5.50	5.64	3.94	3.85	3.86	5.78
Missoula	5.51	5.55	3.91	4.14	3.94	5.78
$\sum X_{ij}$	16.52	15.43	12.32	12.52	12.66	17.44
$\sum X_{ij}/r$	5.51	5.14	4.11	4.17	4.22	5.81
$\sum X_{ij}^2$	90.97	80.59	50.79	52.48	54.04	101.39
$1/r(\sum X_{ij})^2$	90.97	79.36	50.59	52.25	53.42	101.38
$\sum X_{ij}^2 - 1/r(\sum X_{ij})^2$	.0	.23	.20	.23	.62	.01
s^2	0	.12	.10	.12	.31	.01

Total Sum of Squares = 430.26 - 419.43 = 10.83

Company Sum of Squares = 427.97 - 419.43 = 8.54

Error Sum of Squares = 430.26 - 427.97 = 2.29

Analysis of Variance				
Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	I-1 5	8.54	1.71	9.00
Within Companies	I(r-1) 12	2.29	.19	
Total	rI-1 17	10.83		

Tabulate F .01 (5, 12 d.f.) = 6.07

Therefore, reject the null hypothesis of no difference between company means.

Duncan's New Multiple Range Test:

$$s\bar{X} = \sqrt{\frac{s^2}{r}} = \sqrt{\frac{.19}{3}} = \sqrt{.0633} = .25$$

5 Percent Protection Level						
Value of P	2	3	4	5	6	
SSR	3.08	3.23	3.33	3.36	3.40	
(SSR) \bar{S}_X	.77	.81	.83	.84	.85	
F.U. Co-op	Consumers	Co-op	Cut Rate	Conoco	Enco	Favorite
4.11	4.17	4.22		5.14	5.51	5.81

1 Percent Protection Level						
Value of P	2	3	4	5	6	
SSR	4.32	4.55	4.68	4.76	4.84	
(SSR) \bar{S}_X	1.08	1.14	1.17	1.19	1.21	
F.U. Co-op	Consumers	Co-op	Cut Rate	Conoco	Enco	Favorite
4.11	4.17	4.22		5.14	5.51	5.81

TABLE V

SCALE D

	FARMERS					
	ENCO	CONOCO	UNION COOPERATIVE	CONSUMERS COOPERATIVE	CUT RATE	FAVORITE
Bismarck	5.37	4.64	4.42	4.23	4.83	5.68
Billings	5.69	5.41	3.79	3.76	3.86	5.62
Missoula	5.33	5.61	3.86	4.04	3.93	5.64
$\sum X$	16.39	15.66	12.07	12.03	12.62	16.94
$\sum X/r$	5.46	5.22	4.02	4.01	4.21	5.65
$\sum X^2$	89.62	82.27	48.40	48.35	53.67	95.66
$1/r(\sum X)^2$	89.54	81.74	48.56	48.24	53.08	95.65
$\sum X^2 - 1/r(\sum X)^2$	.08	.53	.24	.11	.59	.01
S^2	.04	.27	.12	.06	.30	.01

Total Sum of Squares = 418.37 - 408.59 = 9.78

Company Sum of Squares = 416.81 - 408.59 = 8.22

Error Sum of Squares = 418.37 - 416.81 = 1.56

Analysis of Variance				
Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	T-1	8.22	1.64	11.69
Within Companies	T(r-1)	.97	.08	
Total	rT-1	8.66		

Tabulated F .01 (5, 12 d.f.) = 6.07

Therefore, reject the null hypothesis of no difference between company means.

Duncan's New Multiple Range Test:

$$s\bar{X} = \sqrt{\frac{s^2}{r}} = \sqrt{\frac{.13}{3}} = \sqrt{.0433} = .21$$

5 Percent Protection Level

Value of P	2	3	4	5	6
SSR	3.08	3.23	3.33	3.36	3.40
(SSR) $\bar{S}\bar{X}$	.65	.68	.70	.71	.71
Consumers Co-op	F.U. Co-op	Cut Rate	Conoco	Enco	Favorite
4.01	4.02	4.21	5.22	5.46	5.65

1 Percent Protection Level

Value of P	2	3	4	5	6
SSR	4.32	4.55	4.68	4.76	4.84
(SSR) $\bar{S}\bar{X}$	.91	.96	.98	1.00	1.02
Consumers Co-op	F.U. Co-op	Cut Rate	Conoco	Enco	Favorite
4.01	4.02	4.21	5.22	5.46	5.65

TABLE VI

SCALE E

	FARMERS					
	ENCO	CONOCO	FARMERS UNION COOPERATIVE	CONSUMERS COOPERATIVE	CUT RATE	FAVORITE
Bismarck	4.63	4.67	3.03	3.55	5.03	4.68
Billings	4.25	4.69	3.46	3.65	4.28	4.88
Missoula	4.63	4.78	3.34	3.34	4.35	4.72
ΣX	13.51	14.14	9.83	10.54	13.66	14.28
$\Sigma X/r$	4.50	4.71	3.28	3.51	4.55	4.76
ΣX^2	60.94	66.65	32.31	37.08	62.54	68.00
$(\Sigma X)^2/r$	60.84	66.64	32.21	37.02	62.19	67.97
$\Sigma X^2 - (\Sigma X)^2/r$	.10	.01	.10	.05	.35	.03
s^2	.05	.01	.05	.03	.18	.02

Total Sum of Squares = 327.52 - 320.55 = 6.97

Company Sum of Squares = 326.88 - 320.55 = 6.33

Error Sum of Squares = 327.52 - 326.88 = .64

Analysis of Variance					
Source of Variance		degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	T-1	5	6.33	1.27	25.40
Within Companies	T(r-1)	12	.64	.05	
Total	rT-1	17	6.97		

Tabulated F .01 (5,12 d.f.) = 6.07

Therefore, reject the null hypothesis of no difference between company means.

Duncan's New Multiple Range Test:

$$\bar{S}\bar{X} = \sqrt{\frac{S^2}{r}} = \sqrt{\frac{105}{3}} = \sqrt{.0167} = .13$$

5 Percent Protection Level

Value of P	2	3	4	5	6						
SSR	3.08	3.23	3.33	3.36	3.40						
(SSR) $\bar{S}\bar{X}$	.37	.42	.43	.44	.44					
F.U. Co-op	3.28	Consumers Co-op	3.51	Enco	4.50	Cut Rate	4.56	Conoco	4.71	Favorite	4.76

1 Percent Protection Level

Value of P	2	3	4	5	6
SSR	4.32	4.55	4.68	4.76	4.84
(SSR) $\bar{S}\bar{X}$	.56	.59	.61	.62	.63

TABLE VII
SCALE
SCALE F

	FARMERS					
	ENCO	CONOCO	UNION COOPERATIVE	CONSUMERS COOPERATIVE	CUT RATE	FAVORITE
Bismarck	5.61	4.71	3.82	3.75	4.51	6.03
Billings	5.01	5.73	3.69	3.79	4.25	5.49
Missoula	5.19	5.78	3.89	4.47	4.15	6.03
ΣX	15.81	16.22	11.40	12.01	12.31	17.55
$\Sigma X/r$	5.27	5.41	3.80	4.00	4.30	5.85
ΣX^2	83.51	88.43	43.34	48.41	55.63	102.86
$(\Sigma X)^2/r$	83.31	87.69	43.32	48.08	55.55	102.66

$\Sigma X^2 - (\Sigma X)^2 / r$	.20	.74	.02	.33	.08	.20
S^2	.10	.37	.01	.17	.04	.10

Total Sum of Squares = 422.18 - 409.93 = 12.25
 Company Sum of Squares = 420.61 - 409.93 = 10.68
 Error Sum of Squares = 422.18 - 420.61 = 1.57

Analysis of Variance				
Source of Variance	degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	T-1 5	10.68	2.14	16.46
Within Companies	T(r-1) 12	1.57	.13	
Total	rT-1 17	12.25		

Tabulated F .01 (5, 12 d.f.) = 6.07

Therefore, reject the null hypothesis of no difference between company means.

Duncan's New Multiple Range Test:

$$\bar{S}_X = \sqrt{\frac{S^2}{r}} = \sqrt{\frac{.13}{3}} = \sqrt{.0433} = .21$$

5 Percent Protection Level

Value of P	2	3	4	5	6
SSR	3.08	3.23	3.33	3.36	3.40
(SSE) \bar{S}_X	.65	.68	.70	.71	.71
F.U. Co-op	3.80	4.00	4.30	5.27	5.85
Consumers Co-op				5.41	
Cut Rate					
Enco					
Conoco					
Favorite					

1 Percent Protection Level

Value of P	2	3	4	5	6
SSR	4.32	4.55	4.68	4.76	4.84
(SSR) \bar{S}_X	.91	.96	.98	1.0	1.02
F.U. Co-op	3.80	4.00	4.30	5.27	5.85
Consumers Co-op				5.41	
Cut Rate					
Enco					
Conoco					
Favorite					

TABLE VIII

SCALE G

	FARMERS					
	ENCO	CONOCO	UNION COOPERATIVE	CONSUMERS COOPERATIVE	CUT RATE	FAVORITE
Bismarck	3.97	4.15	3.81	3.80	4.58	4.66
Billings	5.03	4.70	4.15	4.03	4.31	4.56
Missoula	3.93	3.94	4.16	4.57	4.23	4.30
ΣX	12.93	12.79	12.12	12.40	13.12	13.52
$\Sigma X/r$	4.31	4.26	4.04	4.13	4.37	4.51
ΣX^2	56.51	54.84	49.04	51.55	57.45	61.00
$(\Sigma X)^2/r$	55.72	54.52	48.96	51.25	57.37	60.93
$\Sigma X^2 - (\Sigma X)^2/r$	.79	.32	.08	.30	.08	.07
S^2	.40	.16	.04	.15	.04	.04

Total Sum of Squares = $330.39 - 328.36 = 2.03$

Company Sum of Squares = $328.75 - 328.36 = .39$

Error Sum of Squares = $330.39 - 328.75 = 1.64$

Analysis of Variance				
Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	T-1 5	.39	.08	<1
Within Companies	T(r-1) 12	1.64	.14	
Total	rT-1 17	2.03		

For $F < 1$ accept the null hypothesis of no difference between company means. Therefore, no means separation test is indicated.

TABLE IX

SCALE H

	FARMERS UNION CONSUMERS CUT FAVORITE					
	ENCO	CONOCO	COOPERATIVE	COOPERATIVE	RATE	
Bismarck	5.65	5.10	4.56	4.20	4.31	6.00
Billings	5.65	5.28	4.51	4.59	4.15	5.34
Missoula	5.19	5.00	4.49	4.66	4.34	5.88
ΣX	16.49	15.38	13.56	13.45	12.80	17.22
$\Sigma X/r$	5.50	5.13	4.52	4.48	4.27	5.74
ΣX^2	90.78	78.89	61.29	60.41	54.63	99.09
$(\Sigma X)^2/r$	90.64	78.84	61.29	60.30	54.61	98.84
$\Sigma X^2 - (\Sigma X)^2/r$	.14	.105	0	.12	.02	.25
S^2	.07	.03	0	.06	.01	.13

Total Sum of Squares = 445.10 - 439.06 = 6.04

Company Sum of Squares = 444.52 - 439.06 = 5.46

Error Sum of Squares = 445.10 - 444.52 = .58

Analysis of Variance

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	T-1	5.46	1.09	21.80
Within Companies	T(r-1)	.58	.05	
Total	rT-1	6.04		

Duncan's New Multiple Range Test

$$S\bar{X} = \sqrt{\frac{S^2}{r}} = \sqrt{\frac{.05}{3}} = \sqrt{.0617} = .13$$

5 Percent Protection Level

Value of P	2	3	4	5	6
SSR	3.08	3.23	3.33	3.36	3.40
$(SSR)S\bar{X}$	.37	.42	.43	.44	.44
Cut Rate	Consumers Co-op	F.U. Co-op	Conoco	Enco	Favorite
4.27	4.28	4.52	5.13	5.50	5.74

1 Percent Protection Level

Value of P	2	3	4	5	6	
SSR	4.32	4.55	4.68	4.76	4.84	
$(SSR)\bar{S}\bar{X}$	.56	.59	.61	.62	.63
Cut Rate	Consumers	Co-op	F.U. Co-op	Conoco	Enco	Favorite
4.27	4.48		4.52	5.13	5.50	5.74

TABLE X

SCALE I

	FARMERS					
	ENCO	CONOCO	UNION COOPERATIVE	CONSUMERS COOPERATIVE	CUT RATE	FAVORITE
Bismarck	5.33	4.94	3.64	4.12	3.91	5.61
Billings	5.31	4.98	3.96	4.08	3.63	5.47
Missoula	4.69	4.90	3.95	3.99	3.80	5.35
ΣX	15.33	14.82	11.55	12.19	11.34	16.42
$\Sigma X/r$	5.11	4.94	3.85	4.06	3.78	5.47
ΣX^2	78.60	73.21	44.53	49.54	42.91	89.91
$(\Sigma X)^2/r$	78.33	73.21	44.46	49.53	42.86	89.97
$\Sigma X^2 - (\Sigma X)^2/r$	.27	0	.07	.01	.05	.04
s^2	.14	0	.04	.01	.03	.02

Total Sum of Squares = $378.70 - 370.37 = 8.33$

Company Sum of Squares = $378.26 - 370.37 = 7.89$

Error Sum of Squares = $378.70 - 378.26 = .44$

Analysis of Variance				
Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	T-1	7.89	1.58	39.50
Within Companies	T(r-1)	.44	.04	
Total	rT-1	8.33		

Tabulated F .01 (5, 12 d.f.) = 6.07

Therefore, reject the null hypothesis of no difference between company means.

Duncan's New Multiple Range Test:

$$\bar{S}\bar{X} = \sqrt{\frac{S^2}{r}} = \sqrt{\frac{.04}{3}} = \sqrt{.0133} = .11$$

5 Percent Protection Level

Value of P	2	3	4	5	6
SSR	3.08	3.23	3.33	3.36	3.40
(SSR) $\bar{S}\bar{X}$	.34	.36	.37	.37	.37
Cut Rate	F.U. Co-op	Consumers Co-op	Conoco	Enco	Favorite
3.78	3.85	4.06	4.94	5.11	5.47

1 Percent Protection Level

Value of P	2	3	4	5	6
SSR	4.32	4.55	4.68	4.76	4.84
(SSR) $\bar{S}\bar{X}$	.48	.50	.51	.52	.53
Cut Rate	F.U. Co-op	Consumers Co-op	Conoco	Enco	Favorite
3.78	3.85	4.06	4.94	5.11	5.47

TABLE XI
SCALE J

	FARMERS					
	ENCO	CONOCO	UNION COOPERATIVE	CONSUMERS COOPERATIVE	CUT RATE	FAVORITE
Bismarck	4.88	4.96	3.53	3.77	4.20	4.60
Billings	4.93	4.84	3.73	3.85	4.00	5.26
Missoula	4.64	4.60	3.66	3.92	4.46	5.28
ΣX	14.45	14.40	10.92	11.54	12.66	16.22
$\Sigma X/r$	4.82	4.80	3.64	3.85	4.22	5.07
ΣX^2	69.65	69.19	39.77	44.40	53.53	77.45
$(\Sigma X)^2/r$	69.60	69.12	39.74	44.39	53.42	77.21
$\Sigma X^2 - (\Sigma X)^2/r$	.05	.07	.03	.01	.11	.24
S^2	.03	.04	.02	.01	.06	.12

Total Sum of Squares = 353.99 - 348.39 = 5.60

Company Sum of Squares = 353.48 - 348.39 = 5.09

Error Sum of Squares = 353.99 - 353.48 = .51

Analysis of Variance					
		Degrees of Freedom	Sum of Squares	Mean Square	F
Between Companies	T-1	5	5.09	1.02	25.50
Within Companies	T(r-1)	12	.51	.04	
Total	rT-1	17	5.60		

Tabulated F .01 (5, 12 d.f.) = 6.07

Therefore, reject the null hypothesis of no difference between company means.

Duncan's New Multiple Range Test:

$$\bar{sX} = \sqrt{\frac{S^2}{r}} = \sqrt{\frac{.04}{3}} = \sqrt{.0133} = .11$$

5 Percent Protection Level						
Value of P	2	3	4	5	6	
SSR	3.08	3.23	3.33	3.36	3.40	
(SSR) \bar{sX}	.34	.36	.37	.37	.37	
F.U. Co-op	Consumers Co-op	Cut Rate	Conoco	Enco	Favorite	
3.64	3.85	4.22	4.80	4.82	5.07	

1 Percent Protection Level						
Value of P	2	3	4	5	6	
SSR	4.32	4.55	4.68	4.76	4.84	
(SSR) \bar{sX}	.48	.50	.51	.52	.53	
F.U. Co-op	Consumers Co-op	Cut Rate	Conoco	Enco	Favorite	
3.64	3.85	4.22	4.80	4.82	5.07	

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