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Differentials in Supermarket Drawing Power and per Capita Sales by Store Complex and Store Size

by

Bernard Joseph La Londe

Under the Sponsorship of
Programs in Food Marketing Management

Department of Marketing and Transportation Administration

Michigan State University

1961

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DIFFERENTIALS IN SUPERMARKET DRAWING POWER AND PER CAPITA SALES BY STORE COMPLEX AND STORE SIZE

By

Bernard Joseph La Londe

AN ABSTRACT

of a Thesis submitted to the School for Advanced Graduate Studies of Michigan State University in partial fulfillment of the requirement for the degree of

DOCTOR OF PHILOSOPHY

Department of Marketing and Transportation Administration

1961

Bernard Joseph La Londe

ABSTRACT

Since World War II sizable population shifts into the suburbs, along with the advent of large scale retailing, have caused corresponding shifts in the structure of retail distribution.

One of the major problems facing the post war retailer is that of optimal location to serve a shifting market. The multi-unit retailer must solve the additional problem of expanding the store network so that optimal market coverage is attained in any given market area.

The topic of this research is in the general área of retail store location. The specific problem deals with the influence of store size and store complex upon the drawing power and per capita sales of the supermarket.

The study was structured so that store size and store complex were independent variables and drawing power and per capita sales were dependent variables.

The two independent variables selected for study were store size and store complex. Store size was chosen since it represents the closest approximation of product offering within the retail store short of an actual physical inventory. The store size variable was operationally defined as the total square

footage of selling area within the store. The store complex variable reflected the influence of the product offering at the retail cluster. It was operationally defined in terms of 1) number and type of stores surrounding the survey store, 2) traffic arteries, and 3) population and population density. The guiding hypothesis for the research, then, was that the individual consumer is influenced in food purchasing behavior by product offering within the store and product offering at the retail cluster. Specific hypotheses were constructed to test the relationship between the independent and dependent variables.

The dependent variables of drawing power and per capita sales were designed to provide insights for both optimum store network expansion and individual store development. That is, the drawing power variable indicates the appropriate placement of network units for optimum market coverage. The per capita sales measurement provides a framework for analyzing the sales potential of a single unit in the store network.

A total of fifteen supermarkets were selected to provide empirical data for the research. In order to hold price and promotional factors relatively constant, the fifteen stores were selected from the same chain organization and metropolitan area. Customers of the individual survey stores were

asked a series of questions, including a request for their home addresses. These addresses were plotted on a line map of the area and thus provided the basic empirical data for the study. The number of interviews for each survey store were established by using a sales based quota. The quota procedure resulted in a total of 5,300 usable customer interviews for the fifteen survey stores.

The completed customer spotting maps and 1960 Census Tract population data were used in calculating drawing power and per capita sales totals. The data were analyzed statistically using analysis of Variance and Correlation procedures. Appropriate tables and summary analysis of the data and the implication of the data are also presented.

On the basis of the research the following general conclusions can be drawn: (1) Store complex is an important influence in determining the drawing power and per capita sales of the supermarket. (2) Store size is not an important variable in determining the drawing power and per capita sales of the supermarket. (3) There exist distinct and significant patterns of drawing power and per capita sales which can be isolated and quantitatively analyzed as a basis for future location decision.

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The author expresses his deep gratitude and sincere thanks to the above individuals and organizations, as well as all of the individuals whose direct and indirect assistance have made the research possible.

It is with a measure of confidence that the author can state that the experience gleaned from the research will be reflected and magnified both in his own future contributions and the contributions of his students.

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INTRODUCTION

Background of the Problem

During decade 1950-1959, the supermarket[1] grew to a position of dominance in the food distribution field. In 1952, the 16,540 stores classified as supermarkets accounted for approximately 43 per cent of total grocery sales.[2] By 1959, the number of stores had climbed to 32,000 with almost a 70 per cent share of total grocery sales.[3]

The elements of the sizable growth of supermarket share of market and sales volume have originated largely from four sources. First, the chief source of growth was business captured by the supermarket from the smaller and usually less efficient retailer.

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[1]The term "supermarket" is a commonly used trade term denoting a large departmentalized retail store dealing primarily in food. The Super Market Institute states the following: "The original definition of a Super Market was coined by Super Market Merchandising in 1936, and widely accepted everywhere. It described a Super Market then as a retail establishment with a self-service grocery department, and meat, dairy and produce departments--doing a combined volume of at least \$250,000 a year. The minimum sales figure was revised to \$500,000 recently, since the food price index has risen well over 100 per cent, making it logical to double the minimum, at least." ("The True Look of Super Market Industry, 1959." Super Market Merchandising, May, 1960 p. 1 -reprint-.) The formulation is adopted with the \$500,000 minimum sales volume for definitional purposes in this research. It should be noted that this minimum annual sales volume was recently raised to \$1,000,000 by the Super Market Institute.

[2]"Facts in Grocery Distribution," Progressive Grocer, April, 1960, p. F7.

[3]Ibid., p. F7.

The supermarket distinguished itself as one of the leading innovators in internal efficiency of operations during the Post-World War II period. Less efficient food retailers who would not, or could not, follow the lead of the more progressive supermarkets found themselves surrendering sales volume in ever increasing amounts.[4]

A second source of growth was due to population increases and new family formations. The rapidly increasing population of the United States provides a constantly growing base for expanded food sales.

A third growth source, reflecting a constantly increasing standard of living, is found in the changing food preparation and buying habits of the American consumer. A recent report of the United States Department of Labor states:

> Many more foods than formerly are purchased either partially or completely prepared. Fruits and vegetables are canned or frozen. Mixes, particularly those for baking, make cooking far simpler. Even fresh vegetables are more nearly ready to serve; spinach, for example, is washed, stemmed, and neatly packaged. Poultry is cleaned and dressed. More and more frequently hams are being sold ready-cooked. Coffee is already ground and packaged (with the customer's option, however, in many stores, of grinding it on the premises). In addition, foods ready-prepared by a variety of establishments, notably frozen food manufacturers, delicatessen stores,

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[4] Staff Report to the Federal Trade Commission, Economic Inquiry into Food Marketing: Part I Concentration and Integration in Retailing (Washington: U.S. Government Printing Office, 1960), pp. 50-73.

> bakeries, and dairies, make it possible to dine at home with virtually no cooking.[5]

The increased cost that the consumer is willing to pay for partially or completely processed food provides added sales volume for the modern supermarket.

A final source of growth for the supermarket industry was the addition of non-food lines to the product offering with estimates indicating that on an average from seven to ten per cent of total store sales are from non-food products.[6]

However, in the next decade these four sources of growth will not offer equal opportunity for market expansion. Many industry authorities believe that the segment of growth taken from the small food retailer has reached practical limits and that the supermarket share of total food sales will stabilize at about seventy-five per cent of total sales.[7] Thus, one of the prime sources of growth will disappear in the next decade. In contrast, population growth and increasing levels of quality food consumption, as well as non-food products, will probably continue to contribute to the supermarket's growth during the next decade.

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[5] U.S. Department of Labor, How American Buying Habits Change (Washington: U.S. Government Printing Office, 1959), p. 105.

[6] "The Importance of General Merchandise" (The Dillon Study: Part 5), Progressive Grocer, August, 1960, pp. 57-69.

[7] "Facts in Grocery Distribution," op. cit., also: "The True Look of the Super Market Industry," Super Market Merchandising, May, 1960, p. 77.

The Supermarket Industry and the Location Decision

The problem of available location sites for supermarkets is rapidly becoming important in the supermarket industry.[8] The day of widespread availability of prime sites during the early 1950's has disappeared.

The location aspects of supermarket operation have received relatively little attention during the past decade. There are probably several reasons that can be advanced for the lack of interest.

First, in the period of rapid growth, research efforts of the supermarket industry were focused mainly on internal operating efficiency.[9] In a period of rapid and profitable growth, business enterprise typically focuses its efforts on the core of the profit opportunity and either ignores completely or relegates to a position of secondary importance the peripheral efficiency considerations.

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[8] The Supermarket Institute estimates that in 1940 there were 5,659 families per supermarket; by 1950, the total had dropped to 3,014 families per supermarket and, by 1959, had dropped further to 2,310 families per supermarket ("The True Look of the Supermarket Industry, 1959," op. cit.).

[9] "Over the period 1951-1956, when retail food store prices were relatively constant, sales per full-time store employee equivalent increased from $29,700 to $43,000. This is an increase of 46 per cent in sales per cent in sales per employee, a record which, it is believed, cannot be matched by an other kind of major retailing institution." (Theodore H. Beckman, Harold H. Maynard, and William R. Davidson, Principles of Marketing, 6th ed. [New York: Ronald Press, 1957], p. 225.)

The second reason is the orientation of the function responsible for acquiring and developing supermarket locations. Traditionally, in the supermarket industry, this function is performed by the real estate department. The highly complex legal problem of lease arrangements and agreements often requires a specialized legal staff for review of lease contracts and other legal matters. The prime function of the real estate department in most supermarket chains is currently to develop new locations. This function has expanded in importance due to the complexity of larger stores and the more competitive bidding for available sites. The net result of the increasing complexity in store development has been that the real estate manager has become a market analyst, construction superintendent, legal counsel, and property manager. The multiplication of functions without additional staff has caused, in many instances, a superficial treatment or "rule of thumb" treatment of the added functions due to time and background limitation.[10]

A third reason for the lack of emphasis on location analysis stems from a unique attitude toward competition on the part of supermarket chains. In considering market coverage, the supermarket chain is more likely to consider the placement of its own stores in relation to a new site than it is to consider the

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[10] "Chains Reveal Rules-of-Thumb for Choosing Store Locations," Chain Store Age, January, 1960, pp. E33-E38.

location of competitive stores. This attitude is probably based on the belief that a store will capture a certain share of potential business in any market area. That is, the belief that a store will achieve "X" per cent of total available sales in its trading area regardless of the amount of competition in the area. As a result, the problem becomes one of location analysis in relation to the chain's present distribution and store network, and the amount of potential business available becomes a secondary consideration. There is undoubtedly a valid basis for this consideration of "sister" stores.[11] However, considering the fact that there is a limited amount of food dollars in any given area, more intensive coverage from all chains or independents operating in the area will presumably result in a smaller share of the total food dollar for each chain.

A synthesis of the problem-solving analysis in supermarket location is briefly summarized as follows:

Question 1. Where are the available sites suitable for supermarket sites?

Question 2. What is the relationship of the proposed site to our present store and distribution structure?

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[11] The term sister store used here is a frequently used trade term referring to another store of the same chain. The term will be used in similar context throughout the dissertation.

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of supermarkets led to increased land and

[12] Staff Report to the Federal Trade Commission, op. cit., pp. 68-70.

Question 3. What is the relationship of the proposed site to the competitive structure of the market area under consideration?

Question 4. What is the potential sales volume for the proposed site?

Question 5. What are the possibilities of future sales growth in the market area of the proposed site?

Question 6. Can the site be developed within an economically justified framework?

The degree of thoroughness and sophistication employed in the decision process described above varies widely in the supermarket industry.

Recent Trends Affecting Supermarket Location

During the past decade two trends have developed in the supermarket industry which require a re-evaluation of supermarket location analysis procedures. The first is the increasing range of goods offered by the typical supermarket, which in recent years has shown a considerable increase in the average size of store, thus reflecting an increase in product offering.[12] This increasing size of supermarkets led to increased land and

[12] Staff Report to the Federal Trade Commission, op. cit., pp. 68-70.

facility costs, which further points up the importance of proper site selection.[13]

A second trend, not as easily quantified as the first, is the ever increasing range of location types within a city. The competitor in today's market place must consider location alternatives ranging from a store in the central business district to a store located in a sparsely settled suburban area. The move to the suburbs and the increasing amounts of large scale competition have forced the supermarket developer to investigate site development in areas that would not have been considered in 1950.

Both trends have also contributed to a stratification of stores by function and type of market area served.[14] Thus, supermarkets built in 1960 are much larger than those built in 1950 and vary more widely in the types of retail complexes in which they are located.

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[13] According to the Super Market Institute, store equipment and fixtures for a "typical" supermarket of 20,500 square feet cost approximately $250,000 in 1958. Including land and other costs, a total investment of between $400,000 to $500,000 was required: From: "Facts about New Super Markets Opened in 1958," Super Market Institute, Chicago, 1959, p. 10. Also: "What Will It Cost To Open a New Supermarket in 1961?" Chain Store Age, December, 1960, pp. 38-39. The above article estimates that it will cost $640,500 to open a modern 16,000 square feet supermarket (11,000 sq. ft. of selling area).

[14] Bart Jacob Epstein, "The Quincy Food Market: A Study in Marketing Geography" (unpublished doctoral dissertation, Department of Geography, Clark University, 1956), pp. 92-93.

A classification of current location alternatives for the supermarket industry include the following:

1. A store can be built in an area already serviced by one or more supermarkets and meet competition directly. This is becoming an increasingly common situation and has fostered some problems of effective and profitable merchandising.

2. Another choice is to build a store on the outlying fringes of the community and wait for the community to "grow-into" the store. This type of decision raises many questions, some of which are: 1) What size store to build, and 2) What is the rate of growth of the area? Some supermarket chains have pursued this policy of location strategy to the point where they have become shopping center developers.

3. A third location alternative is to seek location where land costs would normally prohibit a supermarket location. An unusual number of apparently successful downtown locations offering no parking facilities and multi-floor shopping have appeared recently.[15]

4. A fourth alternative, although not formally a location problem, is acquisition of an already existing supermarket or chain of supermarkets. From a locational point of view, acquisition is a method of obtaining a site that is already occupied. Chain acquisition has become such a common practice that the government recently investigated the problem.[16]

Also William Applebaum and Saul B. Cohen, "The Dynamics of Store Trading Areas and Market Equilibrium," The Annals of the American Association of Geographers, Vol. 51 (March, 1961), pp. 75-77.

[15] "Retailers Create New Life, Profit Downtown," Food Topics, February 9, 1959, p. 2; also: "In the Shadow of the Empire State," Food Merchandising, May, 1960, p. 62.

[16] Economic Inquiry into Food Marketing," op. cit. See especially Chapters 4 and 5.

The Scope of the Problem

The increasing size of the supermarket and the increasing diversity of location has caused a variety of new problems to develop in the traditional approach to supermarket location analysis. The traditional approach usually revolved around the single variable of distance. That is, in measuring the potential business for a proposed site, a circle is drawn around such a site. The families residing within the circle are then enumerated and their food expenditures estimated. Family enumeration is followed by the application of a fixed percentage figure against the total volume of available business in the area based on historical market share, and a potential store volume is obtained.

The basic error in the traditional procedure appears to be the use of distance as an independent variable. The distance a consumer will travel to get to any point is a function or dependent variable rather than independent variable. For example, a customer desiring to purchase his food requirements would probably be influenced by at least the following factors:[17]

1. Distance to alternative sources of supply.

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[17]The distance the consumer would be willing to travel would probably depend upon the above factors plus many factors which are more subjective and less easily determinable. ("Factors in a Purchase Decision," Convenience Goods Purchasing: Needed Research [Ann Arbor: The Foundation on Human Behavior, 1957], p. 2.)

2. Range of products at alternative sources of supply.
3. Prices and price structure at alternative sources of supply.

The guiding hypothesis of the research is that the distance a customer travels to purchase convenience goods is dependent upon product offering at the retail site. In most metropolitan areas there are probably more than a dozen supply sources for convenience goods within the daily travel sphere of the normal consumer. Given alternative sources the normal urban consumer is presented with several alternative sources for fulfilling his purchase objectives. The hypothesis holds then, that the total product offering at the retail site will influence the customer's choice of alternatives in fulfilling his convenience goods purchasing objectives.

The concept of product offering as it is commonly used in marketing literature can present a very wide range of meaning.[18] When used here, "product offering" refers to the number and variety of available goods and services at the retail site.

Used in the above context, product offering can be viewed from two perspectives. The first perspective is the range of goods and services (product offering) provided within the retail

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[18]Eugene J. Kelley, "The Importance of Convenience in Consumer Purchasing," Journal of Marketing, July, 1958, pp. 23-38.

unit. In the case of the supermarket, the measurement device used to reflect the range of goods and services is the square foot of selling area within the individual retail unit. The square footage measurement reflects in approximate proportion the number and variety offered and probably represents the best measurement short of an actual physical inventory.

The second perspective for viewing product offering is provided by the retail stores making up the shopping area in which the individual store is located. With the rapid growth of the shopping center movement since World War II, the consumer is receiving ever-increasing exposure to the idea of "one-stop" shopping.[19] Empirical evidence suggests that the consumer is willing to travel further to patronize a shopping center than for single purpose trips.[20] It appears that the attraction of any individual store within a shopping area is enhanced by the fact that other stores providing a range of different products or services surround it. Thus, it is postulated that in the case of a shopping center or retail cluster the combination of stores possesses an attraction

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[19] Chain Store Age estimates that there are currently 4,500 shopping centers in operation in the U.S. with an additional 1,000 scheduled to be opened in 1961. ("Centers Open on Target in '60," Chain Store Age, January, 1961, p. E26.)

[20] William L. Garrison, et al., Studies of Highway Development and Geographic Change (Seattle: University of Washington Press, 1959), Chapter 11.

to the consumer that is greater than any of the stores, taken individually, due to a large total product offering.

These two perspectives for viewing product offering provide the independent variables for the study. Store size, measured in square feet of selling area, provides the variable designed to measure the influence of product offering within the individual store. The product offering created by multiple retail units clustered at a geographical point or focus provides the second independent variable for this research. The term store complex is used to identify product offering when it refers to a combination or cluster of stores offering similar and dissimilar products.

Problem Statement

The objective of the study is to investigate empirically the influence of store size and store complex upon customer attraction and per capita sales. Answers are sought for the following questions:

1. What relationship does store size have to the distance traveled by the customer for food purchasing purposes?
2. What relationship does store complex have to the distance traveled by the consumer for food purchasing purposes?
3. What influence does store size have on the per capita sales of a supermarket?

4. What influence does store complex have on the per capita sales of a supermarket?

The research can be termed a pilot inquiry into the problem areas as outlined above. On the basis of the fifteen observations in the study, certain generalizations are presented, and guide lines for further research are established.

General Hypotheses

The major hypothesis is: The variables of store size and store complex are significant variables in influencing the consumer's decision on the distance he will travel to fulfill his food purchasing objectives. The major hypothesis, then, posits that of the range of variables influencing purchase behavior, the two selected are significant in determining the nature of space preferences for the food buying objectives of the consumer.[21]

The specific hypotheses relating to store complex are:

1. As the product offering at a retail complex increases (as measured by number and types of different stores), the drawing power of the supermarket increases.

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[21] David L. Huff proposes an interesting model for the treatment of the full range of variables influencing the consumer purchasing decision. ("A Topological Model of Consumer Space Preference," Occasional Paper No. 11, Bureau of Business Research, University of Washington, Seattle, December, 1959.)

2. A small town relatively isolated from any other city demonstrates drawing power patterns similar to the medium sized shopping center (community).

3. As the product offering at a retail complex increases (as measured by number and types of different stores), per capita sales of the supermarket increase.

The specific hypotheses relating to store size are:

1. As the size of store (as measured by square feet of selling area) increases, drawing power of the supermarket increases.

2. As the size of store (as measured by square feet of selling area) increases, per capita sales of the supermarket increase.

The variables of store size and store complex are regarded as independent variables with the drawing power and per capita sales variables regarded as dependent variables. The research design is structured so that the hypotheses are verified or disproven on the basis of the relationship of the dependent variable to the independent variable.

Method of Investigation[22]

The specific problem is to develop a methodology that permits the measurement of drawing power and per capita sales

[22] A complete outline of methodology can be found in Chapter III, "Research Design."

over a range of store sizes and store complexes. The survey stores selected for study are fifteen in number and range in size from 4,000 to 16,800 square feet of selling area. The same survey stores are used to investigate both the variables of store size and store complex.

In a large urban area, the variety of store complex situations probably range from the isolated retail unit[23] to the central business district.

The entire range of store complex situations are not considered but, rather, a selected portion of the most common types of stores are analyzed. The relevant range is from the Urban Strip store to the store located in the regional shopping center. Selected types within the range are singled out for analysis. For purposes of verification or rejection of the hypotheses, these stores are ranged on the following scale:

	Store Type	No. of Survey Stores
1.	Urban Strip	3
2.	Urban Cluster	3
3.	Small Town	3
4.	Neighborhood Shopping Center	2
5.	Community Shopping Center	2
6.	Regional Shopping Center	2
		15

[23] The isolated retail unit with no other retail stores around it is usually termed a "free-standing location." It is used in this context in this study.

The above ranking is on an ordinal rather than a cardinal basis. That is, it indicates that the Urban Strip type of store is lower on a continuum of store complex than any of the other types, but makes no estimate on how much lower. Similarly, the Urban Cluster store is lower than any of the four stores above it and higher than the Urban Strip type on the store complex continuum.

As outlined above, these stores are ranked on the basis of the product offering provided by the store complex. Hence, the logic of the above scaling would imply that product offering increases over the range from the Urban Strip type to the Regional Shopping Center type.

The majority of the survey stores are located in the metropolitan central city. However, for purposes of comparison and representative store complex structure, a number of the survey stores are located in outlaying areas.

The study included outlets of one large regional supermarket chain. In using one chain for survey purposes the price and non-price aspects of the product offering of the individual store are held constant, with the exception of individual differences in the store manager's ability. If these factors are held constant, it is probable that more reliable and comparable data will result.

The field investigation phase of this research consists of one interview per one hundred dollars in sales per week in each of the survey stores. The interviews were conducted on a Friday and Saturday, which, besides being the largest volume days, are probably the most typical shopping days of the week. The interview replies were recorded on a card designed for this purpose and the customer's address recorded by the interviewer.[24]

The next step in the research procedure is a plot of each customer's home address on a map of the store area. The distance of the customer's home from the supermarket was measured and recorded. From this data, average drawing power (mean average distance traveled) data were calculated and related to the independent variables of store size and store complex.

In order to calculate per capita sales, population estimates were made of a two-mile area surrounding the survey site. Both 1960 Census Tract and Enumeration District data were used to calculate population for this area.

The last phase of this research consists of evaluating the data in light of the hypothesis and presentation of findings.

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[24]There is a commonly used methodology for this step in the research design. See: Bart J. Epstein, "Evaluation of an Established Planned Shopping Center," <u>Economic Geography</u>, January, 1961, pp. 12-21; or: William Applebaum and Richard F. Spears, "How To Measure a Trading Area," <u>Chain Store Age</u>, January, 1951.

Terms and Definitions

Supermarket - A retail establishment with a self-service grocery department and meat, dairy and produce department doing a combined volume of at least $500,000 per year.

Survey Store - The term survey store refers to a store selected for study in this research. There are fifteen such stores divided into six classifications of store types.

Planned Site - A planned site refers to a shopping center which is developed and built according to a prepared plan which provides for a balanced number of retail outlet and consumer conveniences.

Unplanned Site - An unplanned site is a location that is developed in an area with no prior planning or control for the purposes of balance in number and types of retail outlets and customer facilities. In an unplanned area site availability over a given time period provides the basis for the range of goods available.

Store Complex - Store complex refers to the complex of stores surrounding the survey store. When used in references to shopping centers it connotes the complete range of stores within the individual shopping center. When used in reference to unplanned sites, it refers to the retail stores located

within 1/3 mile of the survey site (walking distance). When used in reference to a small town, it refers to all of the retail stores comprising the business district of the town.

Store Type - Store type refers to a particular classification of stores possessing certain measurable location characteristics. The primary characteristic delineating one store type from another is the retail complex in which it is located.

Small Town Store - A small town store is a supermarket located in a town of less than 5,000 population.[25]

Urban Cluster Store - An Urban Cluster store is a supermarket located within walking distance (1/3 mile) of a major business intersection where shopping goods are available for purchase.[26]

Urban Strip Store - An Urban Strip store is located on a major traffic artery in an urban area. The Urban Strip site is surrounded by other convenience type retail stores.[27]

Shopping Center - The term "shopping center" used in this research indicated a center of the controlled or planned variety possessing the following characteristics:

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[25] See page 67 for selection criteria.

[26] See page 67 for selection criteria.

[27] See page 67 for selection criteria.

1) "Land on which the center is situated is owned by a single owner.[28]

2) An integrated assortment of different retail outlets offering a balanced representation of goods and services is featured.[29]

3) "Planning is done in advance of construction. The completed shopping center is designed as an integrated, harmonious unit."[30]

4) Off street parking is provided for customers of the center. Usually the parking ratio exceeds 3:1 except in the case of very small centers.

Regional Shopping Center - A Regional Shopping Center possesses all of the characteristics indicated in the definition of shopping centers. In addition to these requirements, there are in excess of fifty separate retail units within the center which are dominated by a complete full size department store.

Community Shopping Center - A Community Shopping Center possesses all of the characteristics listed under the definition of shopping center. This type of center contains between 16-49

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[28]Eugene J. Kelley, Shopping Centers: Locating Controlled Regional Centers (Saugatuck: The Eno Foundation, 1956), p. 4.

[29]Ibid., p. 4.

[30]Ibid., p. 5.

retail units and is dominated by a large branch department store or departmentalized specialty store.

Neighborhood Shopping Center - A Neighborhood Shopping Center possesses all of the characteristics of the planned shopping center. It is designed to accommodate approximately 15 stores offering a balanced assortment of convenience goods and services and dominated by a supermarket.[31]

Store Size - Store size refers to the total number of square feet of selling area within the supermarket.

Drawing Power - Drawing power is defined as the average main distance traveled by seventy and ninety per cent of the stores' customers. Drawing power is calculated by both seventy and ninety per cent in order to provide a relationship of concentration and dispersion.

Per Capita Sales - Per capita sales is defined as the dollar amount of sales per person (not family) per week within a given geographic area.

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[31]There is no basic agreement on the exact criteria and proper nomenclature for the planned shopping center. Additional insights can be obtained by referring to: Max S. Wehrly, and J. Ross McKeever, Eds., The Community Builders Handbook (Washington: Urban Land Institute, 1954), p. 122; Paul E. Smith, Shopping Centers: Planning and Management (New York: National Retail Dry Goods Ass'n., 1956), pp. 17-18; Gordon H. Steadman, "The Rise of Shopping Centers," Journal of Retailing, XXXI, No. 1 (Spring, 1955), pp. 14-15; Eugene J. Kelley, op. cit., pp. 4-8.

<u>Distance Interval</u>[32] - The term distance interval identifies a specific distance zone in relation to the survey store. The three distance zones used are the 1/2 mile, 1 1/4 mile and 2 mile distance zones. The term denotes the geographic distance extending from the last distance interval line to the one specified. Example: The term 2 mile distance interval indicates that distance between 1 1/4 mile and 2 miles from the survey store. The term 1 1/4 mile distance interval indicates the distance between 1/2 mile and 1 1/4 mile from the survey store. The term 1/2 mile distance interval indicates the area between the survey store site and 1/2 mile.

<u>Quadrant</u>[33] - The area surrounding the survey store is divided into four equal quadrants for purposes of analysis. A verticle line is drawn directly north and south. A horizontal line intersecting at the survey store site is drawn north and south, dividing the area into four equal segments. These segments are labled quadrants 1, 2, 3, 4 and have the following characteristics:

Quadrant No.	Direction	Degrees
1	Northeast	$270^\circ - 360^\circ$
2	Southeast	$181^\circ - 270^\circ$
3	Southwest	$91^\circ - 180^\circ$
4	Northwest	$0^\circ - 90^\circ$

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[32] A graphic presentation of this procedure is presented in Appendix C-4.

[33] A graphic presentation of this procedure is presented in Appendix C-2, and C-4.

Customer Spotting Map - A customer spotting map is a street map on which the residences of the survey store's customers has been identified.

Limitations

The limitations of the study are as follows:

1. The research assumes equal consumer time-distance mobility in all directions. The variable of site accessibility is not explicity integrated into the research. In the selection of the sample, care was taken to select stores where time-distance mobility appeared to approach equality. This factor, to some degree, is self-adjusting in that increasing population density generally results in decreasing time-distance mobility and increased amounts of competition.

2. The research is limited to the supermarket industry, and research results pertain only to this industry. It can provide insights into the entire range of convenience-goods locations problems, but implications for other areas cannot be scientifically justified on the basis of this study.

3. The research is concerned only with the spatial relationships of the customer to the retail site. On the part of the customer, there are social and psychological considerations in his shopping behavior that can affect the extent

of the trading area. On the part of store management, there are considerations of special promotions, store image, etc. that can affect the size of the trading area at any given time.

4. The research design, as presented, is essentially static in nature. That is, it is conducted at one point in time under given market conditions. While this represents a weakness to some extent, in most urban areas, the market place is subject to gradual rather than violent alterations in its basic structure.

Some Possible Contributions of the Study

In January, 1961, at the mid-year meeting of the Supermarket Institute, Mr. Curt Kornblau, Director of Research, made the following statement:

> Nearly two out of every three new supermarkets (62%) are doing less business than expected. . . The difference between actual and estimated sales is quite substantial in many cases, ranging from 54 per cent below forecast to 49 per cent above.
>
> Supermarkets with sales better than expected averaged 13 per cent above the estimate, and supers with sales less than expected averaged 20 per cent below the estimate. All the new supermarkets combined averaged sales 10 per cent less than predicted.[34]

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[34] "A New Dimension: Economics and Marketing Geography," Food Topics, March, 1961, p. 7.

There are probably a variety of reasons for these faulty sales forecasts. Undoubtedly one of the major causes is the heavy reliance placed upon intuition and rules of thumb for site selection in the supermarket industry.[35]

This evidence suggests that the decision to develop the size and number of supermarkets currently being built by some chains is being made on the basis of promotional differentiation rather than economic justification.[36] There is generally a premium rental or price on more developed and desirable locations.

Currently there is some question in the supermarket industry regarding size and number of stores.[37] Annual surveys by Supermarket Merchandising indicate that the average square footage (including basements of new supermarkets opened) has increased from 8,000-9,000 in 1949 to 17,000 in 1958.[38] The question involved in the 50-per cent increase in store size may be restated as: Is store size being decided on an economically justified basis or is it being used in individual situations to overpower a competitor with bigness?

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[35] Ibid., pp. 8-10.

[36] Bob R. Holdren has produced a very interesting study of market structure with implications for economy of scale using the supermarket case as a decision model. (The Structure of a Retail Market [Englewood Cliffs: Prentice-Hall, 1960].)

[37] Interview with Dr. Saul B. Cohen, Boston University, January 18, 1961.

[38] Economic Inquiry into Food Marketing, op. cit., pp. 56-58.

The research, by examining the relationship between store size and customer attraction and per capita sales, should produce some insights into the scale of store decision. Presumably, many market opportunities are ignored because they will not support the volume of the large-scale supermarket currently being built. By varying the scale of store to correspond to the scale of market opportunity a more efficient individual operation results and a more healthy industry situation envolves.

The second variable under study, that of store complex, should provide some insights into the economics of location in various types of store complex situations. There is generally a premium rental or price on more developed and desirable locations. The research, by assessing the relative drawing power and per capita sales of different types of retail clusters, should allow a more informed judgement to be made on the question of the value or rent differentials or property values in relation to anticipated revenues.

A third contribution of this study could be the introduction of a practical methodology leading to greater efficiency of operation for the supermarket industry. Some supermarket chains are very aware of the value and uses of location analysis. But, unfortunately, these chains are so few as to represent exceptions to the normal state of development for location analysis in the supermarket industry. The research

could function as a pilot study for supermarket chains to duplicate and expand to fit their own particular needs and problems.

A fourth contribution of the research could be a new perspective for evaluating growth potential. With the market becoming increasingly saturated in the more densely populated areas, supermarket developers have, in recent years, been faced with the problem of evaluating prospective growth areas for potential market development. This research would provide some indication or guideline for anticipating the level of market opportunity when the marketplace has reached advanced stages of maturity.

A final contribution of this study is the integration of a number of theoretical concepts and practical application developed in other disciplines into the field of marketing. With few exceptions, the pioneering work in retail location analysis has been done in disciplines outside the field of marketing.

Organization of the Study

The introductory chapter, Chapter I, presents the background and rationale for the research. It seeks to set in proper perspective the research problem in relation to the supermarket industry and in relation to the more general field of marketing theory and practice.

The objective of Chapter II is threefold: 1) to present some of the perspectives employed in the theoretical and empirical analysis of consumer space preferences and the trading area, 2) to review some of the operational criteria used to delineate the perimeters of the retail trading area, and 3) to review, in the process of achieving the first two objectives, literature relevant to the area of the research.

In Chapter III, the research design is presented. The primary objective of Chapter III is to construct the design in such a manner that any supermarket with a similar research problem can utilize the design as a methodological base. The concepts and terminology used are operationally defined, and the precise methodology and survey methods are outlined in Chapter III. It provides the operational basis for the empirical portion of the research.

The presentation of findings are found in Chapter IV. The results of the completed research design are tabulated and presented using appropriate tables, charts, and diagrams. The presentation provides the factual basis for the evaluation of hypotheses in the following chapter.

The analysis and conclusions of the research are presented in Chapter V. The research findings are evaluated in terms of the hypotheses presented in Chapter I. Conclusions are presented in Chapter I. Conclusions are presented on the reliability of the hypotheses, the research design, and the findings of this research. Implications for further research and extentions of the study are offered at the conclusion of Chapter V.

CHAPTER II

CONSUMER SPACE PREFERENCES AND THE RETAIL TRADING AREA

Introduction

In recent years much attention has been focused on the changing structure of the metropolitan area. These changes have been presented mainly in terms of shifting population concentrations. However, the impact of such population shifts in turn initiates a whole series of secondary adjustments designed to meet the needs of the changing population concentrations.[1]

One of the most significant adjustments occurs in the retail structure of the community. The retail structure exists to serve the population of the area. Since it serves a definate need, it shifts in response to a change in that need. Many studies have indicated that the retail structure of a community arranges itself functionally so as to best serve the needs of the community and systematic patterns of functional relationships have been empirically established for the retail structure of the community.[2]

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[1]William M. Dobriner, The Suburban Community, G. P. Putnam's Sons (New York), 1958, and Research Monograph No. 2, Metropolitanization of the United States, Urban Land Institute (Washington, D.C.), 1959.

[2]Richard U. Ratcliff, "The Problem of Retail Site Location," University of Michigan (Ann Arbor), Michigan Business Studies, Vol. IX, No. 1, 1939. Also: Malcolm J. Proudfoot, The Major Outlying Business Centers of Chicago, University of Chicago, 1938.

The decentralization of the urban population within the metropolitan area has caused a similar decentralization in the retail structure of the community.[3] Probably the outstanding symptom of decentralization has been the rapid growth of the suburban shopping center. Just as significant, though not as obvious, has been the growth of the retail structure along suburban streets and highways.[4] The decentralization of the retail structure has prompted an increased interest in location and location analysis by the forward thinking retailer.

The retailer, in adjusting to the pressure toward larger scale retailing and the move to the suburbs of great numbers of his customers, has been faced with a great variety of problems.[5] Not the least of these problems has been what type of stores to build and where to build new stores. The suburban market, the suburban customer, and the suburban retail structure was a new and unfamiliar arena of competition for many merchants with traditional roots in the downtown commercial districts.[6]

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[3]Edward F. Staniford, Business Decentralization in Metropolitan Los Angeles (Los Angeles: Bureau of Government Research, University of California, 1960).

[4]E. B. Weiss, Highway Retailing--The Next Great Retail Revolution, (New York: Doyle-Dane-Bernbach, Inc., 1958).

[5]John W. Wingate and Arnold Corbin, Changing Patterns in Retailing (Chicago: R.D. Irwin, Inc., 1956), particularly Parts I, II, and X.

[6]C.T. Jonnassen, Downtown vs. the Suburbs (Columbus: Ohio State University Press, 1955). See Appendix.

During the post-war decentralization of retail business, most firms at one time or another probably faced the following questions:

1. Where can I best locate to serve potential customers without weakening present market position?[7]
2. What type and size store should be built consistent with merchandising policy and long-range planning for market development?[8]
3. Within the framework of the preceding two questions, from where will our customer come? Will the downtown location lose volume to the suburban store?

The above questions are probably more easily resolved for retailers of shopping and speciality goods[9] than for those in convenience or service goods. The retail institutions selling, shopping or specialty goods presumably would make fewer decisions and would be relatively more limited in alternatives due to the nature of these types of retailing.

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[7]A schematic diagram of the J. L. Hudson Co. (Detroit) master decentralization plan is presented, and this question is discussed in: Victor Gruen and Larry Smith, Shopping Towns U.S.A. (New York: Reinhold Publishing, 1960), pp. 35-37.

[8]*Ibid.*, p. 37.

[9]The terms for convenience, shopping, and speciality goods, are used here in the traditional marketing context (Marketing Definitions: A Glossary of Marketing Terms, Chicago: American Marketing Association, 1960).

The retailers of convenience goods are faced with the problem of locating so that they are convenient to their market. They are usually serving small segments of the market and hence must develop discriminating techniques for market delineation. These techniques assume importance as the metropolitan area becomes saturated with convenience stores, leaving smaller and smaller segments of the market open to market development.

The convenience goods retailer is faced with a twofold problem in evaluating a proposed site. He must first evaluate the site on the basis of its profitability as an individual site. He must determine if enough potential sales volume exists at the site to justify its development. A second question is posed by the proposed site's relationship to his present market structure.

Both of these problems probably can be resolved by an analysis of the trading area of the proposed site.[10] Unfortunately, it is more difficult to delineate the trading area for a proposed site than an existing site.

The process of delineating the trading area is, in its simplest form, an attempt to establish perimeters for consumer space preference. These perimeters can be viewed from

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[10] See Appendix A for some commonly used approaches to the delineation of a trading area.

various perspectives, and the objective criteria for establishing them can consist of one or a combination of factors influencing both consumer travel patterns and consumer travel patterns converted into potential store profitability (e.g., per capita sales). The degree of thoroughness and the level of analysis can vary from the simple one-variable distance measurement to a field interview sample of the projected trading area.

The primary purpose of Chapter II is to present some of the perspectives employed in the theoretical and empirical analysis of consumer space preferences and the trading area. A second purpose is to review some of the operational criteria used to delineate the perimeters of the retail trading area. The third purpose is to review, in the process of achieving the first two objectives, some literature relevant to the area of this research.

Some Perspectives for Consumer Space Preferences

The consumer is spatially situated[11] and must satisfy his economic wants within an imperfect market. This imperfection derives from two sources. The first source is geographical in nature. The consumer does not face an equal time-distance

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[11]The term "spatially situated" refers to the fact that the consumer is located at some point in the marketplace and must overcome the "friction of space" to move in any direction from the point of location.

movement rate in every direction. The urban area is crossed by rivers, limited access freeways, industrial developments, etc., all of which influence and limit the consumer's spatial mobility.[12]

A second source of imperfection exists in the consumer's perception of the marketplace. The consumer usually does not possess perfect knowledge of the market and the product offerings of the market place. His knowledge probably ranges from complete certainty to complete uncertainty over the range of goods that he would normally purchase. None the less, the consumer is faced with satisfying his economic wants within a relatively restricted framework. He must satisfy these economic wants over time, which is a limited commodity with many alternative uses.[13] Hence, it can be concluded that the consumer would probably arrange his shopping patterns in such a manner that he will receive an optimum amount of utility for the time and effort expended.

While this is a very convenient generalization and probably true as a generalization, several definitional problems arise. The paramount problem with the above conclusion seems to be the concept of utility. It has been empirically demonstrated that shopping pattern behavior and satisfactions are a function

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[12]Melvin L. Greenhut, "Space and Economic Theory," Regional Science Association, Papers and Proceedings, Vol. V (Chicago, 1959), pp. 268-72.

[13]Frank B. Curran and Joseph T. Stegmaier, "Travel Patterns in 50 Cities," Bulletin 203, Highway Research Board (Washington: National Academy of Sciences--National Research Council, 1959), pp. 111-19.

of factors in addition to distance.[14] Thus, it follows that maximum or optimum utility cannot be measured exclusively in terms of distance. There is also evidence that the consumer views different types of goods in a different perspective as regards the psychological context of shopping behavior.[15] A study in Houston, Columbus, and Seattle also substantiated this fact, indicating that an average of 98.9 per cent of the food purchased during a given period of time was purchased at the suburban shopping center, while only 32.2 per cent of the clothing and 41.9 per cent of the furniture were purchased in the surburban shopping center by the same families.[16] A study conducted in the Washington, D.C. metropolitan area indicated similar results.[17]

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[14] C. T. Jonassen, "Shopper Attitudes" Special Report 11-A, Highway Research Board, (Washington: National Academy of Sciences --National Research Council, 1955), pp. 18-24.

[15] William H. Form and Gregory P. Stone, "The Local Community Clothing Market: A Study of the Social and Social Psychological Contexts of Shopping," Technical Bulletin 262, Michigan State University, Agricultural Experiment Station, East Lansing, Michigan, 1957.

[16] Jonassen, "Shopper Attitudes" Special Report 11-A, *op. cit.*, p. 11.

[17] Alan M. Voorhees, Gordon B. Sharpe, and J. T. Stegmaier, Shopping Habits and Travel Patterns, Technical Bulletin No. 24 (Washington: Urban Land Institute, 1955), pp. 20-24. Also, Gordon B. Sharpe, "Travel to Commercial Centers of the Washington, D.C. Metropolitan Area," Bulletin 79, Highway Research Board, (Washington: National Academy of Sciences-- National Research Council, 1953).

The objective of the retailer should be to locate in such a manner so as to offer consumer utility to the extent that, at a minimum, a threshold level of sales will be attained.[18] The retailer, then, must strike a balance between profitable operation and consumer convenience.[19] One added burden for the retailer is that he is required to make the location decision in what might be termed a competitive vacuum. At best, he can only guess what competitive actions will be taken to counteract his location decision. A competitor by appropriate location strategy can disturb the balance between profitable operation and consumer convenience. This disturbance is often caused by the uninformed competitor who enters a market without regard for the potential business necessary to profitably support more than one competitor. In the case of the inimformed competitor situations might well emerge where both competitors units result in unprofitable operations

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[18] The "threshold" level of sales refers to that level which will provide the minimum amount of sales volume for survival over the long run.

[19] Robert D. Lundy explores the question in relation to gasoline service stations and concluded that "if the criterion of adequacy is to maximize the profits of individual station operators, anything more than approximately 2,000 stations would have been too many in 1946. . . On the other hand, four million or even five million stations might have been necessary to provide gasoline plus maximum convenience for customers." ("How Many Service Stations Are 'Too Many'," Reavis Cox and Wroe Alderson, eds., Theory in Marketing, (Chicago: R. D. Irwin, Inc., 1950), p. 333.

regardless of the thoroughness of the original retailer in choosing his location.[20]

In addition to the pragmatic considerations, one of the conceptual problems in operationally defining a trading area is the diverse meanings of the trading area concept to different disciplines.

The economist often considers the trading area as a "perfect" selling zone with its boundaries determined by plant location and and transport costs. The individuals within the trading area are not subject to promotional or psychological pressures, but react in the best traditions of the "economic man" in their purchase behavior.

The geographer is likely to view the trading area as a complex geographical phenomenon in which the geographical imperfections of the area determine the direction and degree of flow of the inhabitants. Fortunately, this is not completely true in every case; a branch of geography termed marketing geography is making some contributions in integrating the geographic perspectives of the trading area concept with the practical problem of store traffic.[21]

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[20]This particular problem was raised on several occasions during personal interviews with supermarket chain executives. It might be paraphrased as: The best laid plans of mice and men . . . can be upset by a reckless and uninformed competitor.

[21]William Applebaum and Saul B. Cohen, "The Dynamics of Store Trading Area and Marketing Equilibrium," <u>The Annals of the American Association of Geographers</u>, Vol. 51, No. 1, (March, 1961), pp. 73- 101.

A third, somewhat blurred perspective is presented in the marketing literature. This blurred perspective probably results from the common practice of accepting the consumer as "spatially-given" and concentrating on other aspects of demand creation. In most basic marketing texts, the question of consumer space preferences is handled by a presentation of Reilly's Law of Retail Gravitation[22] with some of the proposed alterations and implications of the gravitational approach.[23]

In marketing literature, the individual space preferences of the consumer appear to be implicitly, rather than explicitly, regarded as a function of the product offering. To some degree, increasing suburbanization of the consumer and resulting retail decentralization have focused new attention on the usefulness of the trading area concept. However, much of the renewed interest has been directed toward research in shopping center evaluation and development with little emphasis of individual store trading area.[24]

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[22]The original formulation of Reilly's Law of Retail Gravitation can be found in William J. Reilly, "Method for the Study of Retail Relationships," Bureau of Business Research, Research Monograph No. 4, University of Texas Bulletin No. 2944 (Austin: University of Texas Press, 1929), p. 16

[23]E. Jerome McCarthy, Basic Marketing: A Managerial Approach (Chicago: R. D. Irwin, Inc., 1960), pp. 378-81.

[24]See: Victor Gruen and Larry Smith, Shopping Towns, U.S.A.: The Planning of Shopping Centers (New York: Reinhold Publishing Corporation--Progressive Architecture

In summary, it appears that no coherent direction in the study of spatial aspects of consumer behavior has been developed in the field of marketing since 1929. Advances have been made in several disciplines and by several individual retail firms or groups of firms in a greater understanding of the spatial aspects of consumer behavior. The following section outlines in more detail the various approaches and perspectives for retail spatial behavior and retail trading area delineation.

Some Economic Contributions

Micro-economic theory has been oriented primarily to the economics of the firm and, as such, does not contain a great deal of relevance to the question of consumer space preferences. However, in recent years, certain developments in the field of economics have contributed conceptual insights, both directly and indirectly, to the area of consumer space preferences.

In economic literature, the trading area is generally considered as a sub-problem or derivative of the general location problem.[25] The location problems are generally proposed

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[24]Library, 1960); Eugene J. Kelley, Shopping Centers: Locating Controlled Regional Centers (Saugatuck: The Eno Foundation for Highway Traffic Control, 1956);Paul E. Smith, Shopping Centers: Planning and Management (New York: National Retail Dry Goods Association, 1956); Geoffrey Baker and Bruno Funaro, Shopping Centers: Design and Operation (New York: Reinhold Publishing Corporation--Progressive Architecture Library, 1951).

[25]Walter Isard, Location and Space Economy (New York: Wiley, 1956).

with the following assumptions: 1) location of supply points and location of receiving points are given, 2) transportation costs are fixed, and 3) the amount supplied and the amount demanded are given. The problem then becomes one of solving for the least cost location within a given area or region.[26]

A formulation of the trading area problem presented by Fisher allows for variation in costs and economics of scale at the supplying site.[27] As such, the above cited examples do not represent models of consumer space preferences but, rather, seek to find optimum location and location relationships under given conditions. The consumer is treated as spatially given and his behavior determined exclusively by product price and proximity to the supply site.

Given the following assumptions, a modified model of perfect competition can be constructed.

1. Identical stores with identical product lines (products handled by no other retail outlets).
2. The purchasers have identical tastes and rates of consumption.

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[26] Marcello L. Vidale, "A Graphical Solution of the Transportation Problem," Operations Research, Vol. IV, 1956, pp. 193-203; or Paul A. Samuelson, "Spatial Price Equilibrium and Linear Programming," American Economic Review, 1952, 42, pp. 283-303.

[27] Walter D. Fisher, "Economic Aggregation as a Minimum Distance Problem," Econometrica, Vol. 25, No. 3, p. 363.

3. Equal population and income distribution.

4. Transportation costs (supply) are zero.

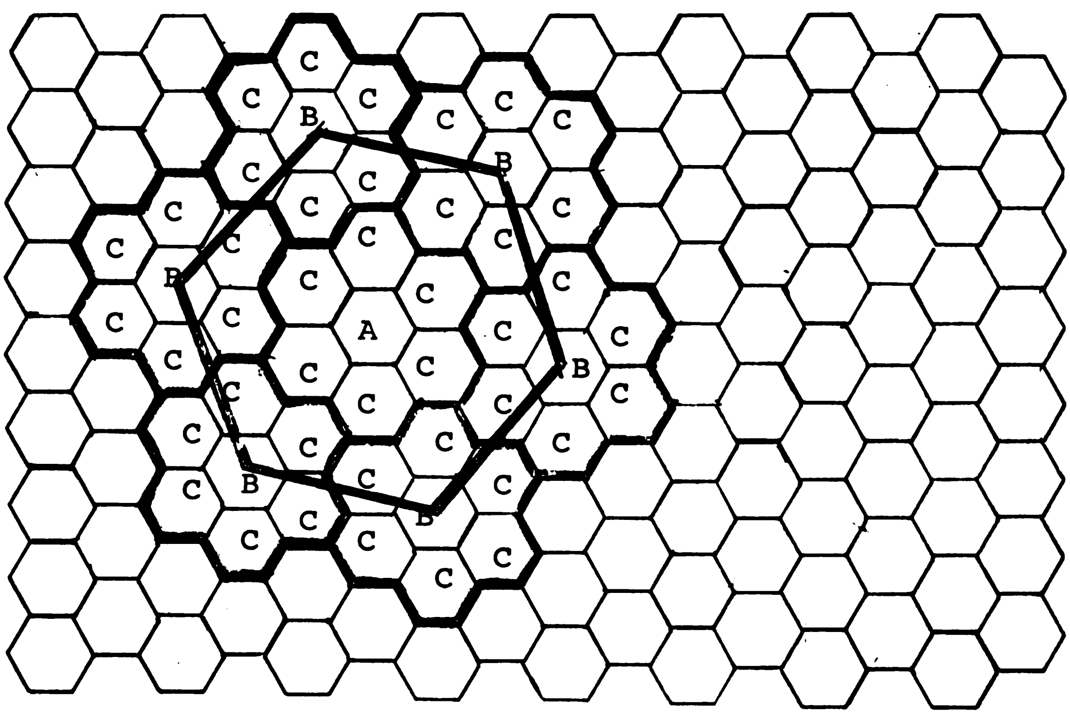
5. Identical time-distance travel mobility in all directions.

6. Identical retail operating cost structure.

An example of the area served by a store in this system is given in Figure 1.

FIGURE I

TRADING AREA UNDER PERFECT COMPETITION[28]



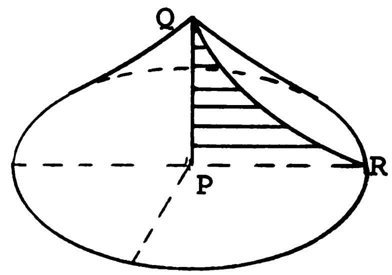
[28]The algebraic proof for this hexagonal shape of the market can be found in: August Losch, The Economics of Location, Trans., 2nd Rev. Ed., Wolfgang F. Stolper (New Haven: Yale University Press, 1954), Ch. X, pp. 109-23.

The economic concept of the "perfect" market is related to the marketing classification of convenience, shopping, and speciality goods. In Figure 1, a series of hexagonal nests are presented. The entire area within the largest hexagon represents the market for specialty goods, and, in an urban area, point A is the central business district. The adjoining "nests" of hexagons could represent shopping goods centers, and point B is either a secondary business district or a community shopping center. Each of the individual hexagons (C) represent convenience goods trading areas with the supply point being the center point of the hexagon. If the above assumptions hold, Figure 1 represents a perfect market from both a marketing and economic point of view.

Losch introduces another concept that has some direct theoretical bearing on the trading area and its use in marketing strategy. Losch termed the diagram, illustrated in Figure 2, a demand cone.[29] The diagram is used by Losch to demonstrate

FIGURE 2

LOSCH'S DEMAND CONE



[29] Ibid., p. 106.

demand intensity for the product (in the case cited, beer) as a function of distance and supply cost. Point QP is the center of the cone and that point at which the brewery is located. At this point, the users pay the established price for a barrel of beer. As the beer is shipped in the direction of R, the buyers must pay established price plus transport cost, which in the case cited, causes the demand intensity (amount purchased) to diminish. Thus, Losch introduces the example of price elasticity of demand in its relation to the trading area.

However, if the brewery instituted a one-price policy throughout its entire market area, the "demand cone" would probably still serve to illustrate the relative degrees of demand intensity. This would be due to the influence of two factors. First, unless it is assumed that the brewery in question is in monopolistic position, the consumer would have alternative sources of supply. If the alternative sources of supply were located in close proximity to the consumer, at some point, he would probably be indifferent to which brewery he patronized. A second, and probably more important, factor is the "friction of space" that the consumer must overcome. Regardless of the price, a consumer would probably not travel over a certain distance to purchase a product that was not a necessity. Viewed in another perspective, the utility of the product to the consumer would probably diminish as the friction of space to be overcome increases.

In summary, then, it seems that Losch's concept of the "demand cone" would hold regardless of the pricing policies of the producer.

Some Consumer Utility Contributions

The consumer utility perspective for consumer space preferences is oriented to the consumer rather than the firm and considers the factors that generate utility and disutility in consumer travel patterns.

An interesting theoretical formulation of this approach is presented by Troxel.[30] Troxel begins by making the assumption that the home is the "primary place of demand expression."[31] With the home as the reference point, the family becomes the basic aggregate unit for travel planning. Elapsed time is selected as the unit of measurement on the following basis:

> Time is a common quantitative relation between the home and non-home alternatives. Using some amount of time to travel beyond the home position, a person or family forgoes something that otherwise is obtainable at home in the same period.[32]

Working with these assumptions, Troxel turns to a graphical presentation of his argument.

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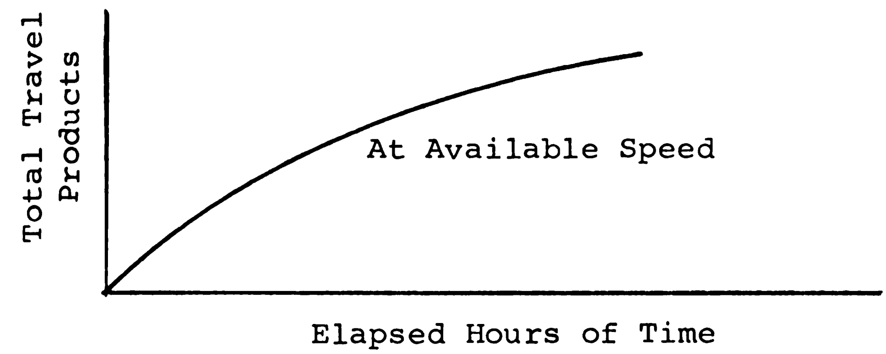
[30] Emery Troxel, Economics of Transport, (Rinehart: New York, 1955), Chapter VII, pp. 144-68.

[31] Ibid., p. 145.

[32] Ibid., p. 150.

FIGURE 3

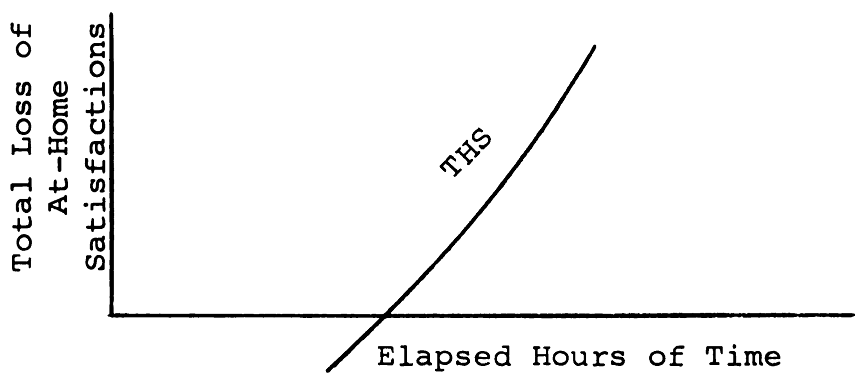
TOTAL TRAVEL PRODUCTS



As Figure 3 indicates, the total travel product increases as time away from home increases. It should be noted, however, that the time away from home increases at a decreasing rate as the hours of elapsed time increase.

FIGURE 4

TOTAL LOSS OF AT-HOME SATISFACTIONS



Next, Troxel (Figure 4) considers the losses of satisfaction and products caused by travel. Time spent traveling could be spent at home or in other pursuits yielding satisfactions or alternative products. The portion below the Y

FIGURE 5

NET TRAVEL PRODUCTS

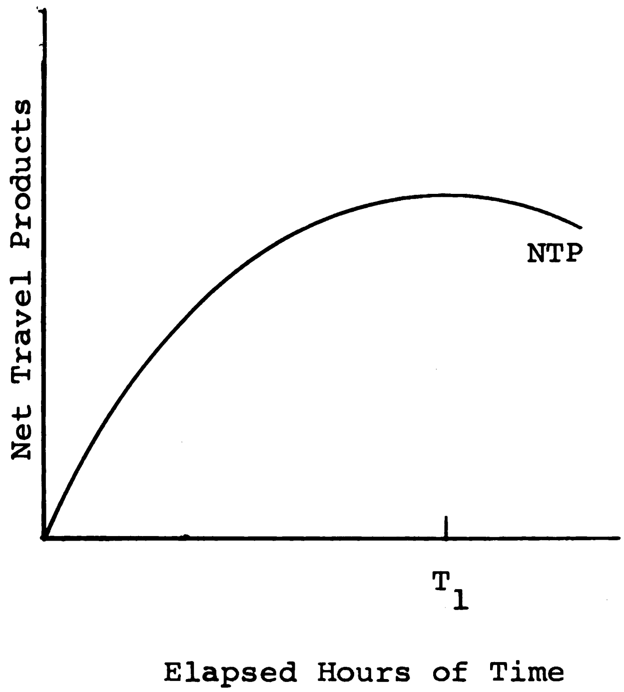
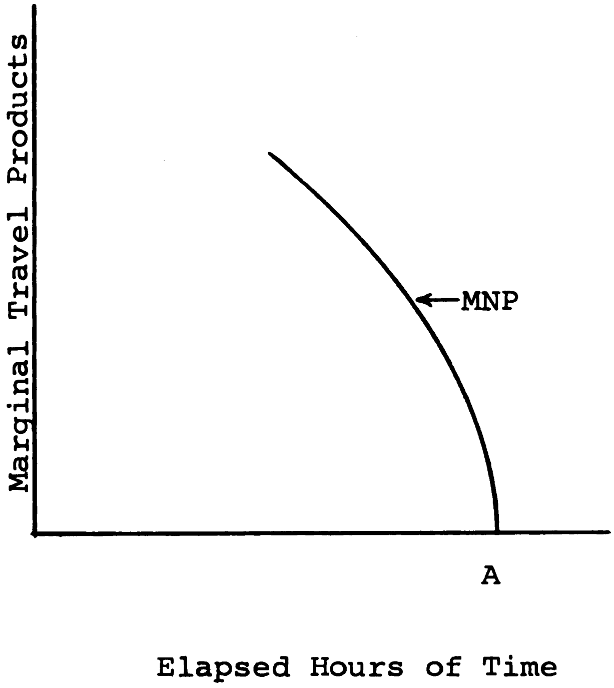


FIGURE 6

MARGINAL NET PRODUCTS



axis recognizes the fact that for some people there is a net loss at being home too much.

If Figures 3 and 4 are combined, a net travel product can be calculated, as in Figure 5.

As indicated in Figure 6, the traveler reaches a point (T_1) where additions to travel result in losses of NTP.

From the slope of the NTP curve (first derivative) a marginal net product curve can be derived. At point A on the curve, it would be necessary to pay the traveler to travel further in order to offset the losses in product satisfaction. Point A corresponds to point T_1 in (Figure 6).

While Troxel's analysis is based upon logic rather than empirical data, it provides an interesting framework for the analysis of consumer space preferences.

Another theoretical contribution has been made by Ide and Baumol, who have apparently developed their ideas in connection with the program of Alderson and Sessions, management consultants. Progress on the theoretical developments has been reported in at least two places.[33]

The Ide and Baumol formulation for determining consumer space preferences begins with a consideration of the probability of a customer finding what he desires to purchase at any given location. An assumption of constant price and promotion is made at the outset. The probability that the consumer will find some mix of items necessary to make his shopping trip successful is established as P (N), where N is the number of varieties sold by the retailer. Thus, a complete probability of success would be P (N) = 1 and complete probability of failure P (N) = 0.

Next, a consideration of shopping costs is introduced. These costs are divided into three segments. The entire cost of shopping is represented by: $c_d D + c_n \sqrt{N} + ci$. The first segment of cost ($c_d D$) represents the cost of the consumer in

[33] W. J. Baumol and E. A. Ide, "Variety in Retailing," Management Science, October, 1956, Vol. III, No. 1, pp. 93-101; and "Basic Report on Consumer Behavior," Alderson and Sessions: Philadelphia (mimeographed).

getting to the store. These costs are assumed to be proportional to distance (D); hence, c_d is a constant. The second segment of cost represents the (cost) difficulty in finding the items after the customer enters the store. If the store carries a great variety of items, the customer must walk further to find the one that he seeks. For a one-story store, it is assumed that the distance walked may be expected to increase proportional to the square root of the number of items ($\sqrt{N}$) carried by the store. For a two-story building, the authors propose a cube root measurement. The third item of cost represents lost opportunity costs (c_i) of other shopping opportunities foregone by consumer. It is possible that this segment of cost (and perhaps c_n) could be negative for those who enjoy shopping. Thus, the three segments of costs are assumed to be: 1) cost of getting to the store, 2) actual costs of shopping, and 3) opportunity costs.

The formulas for the probability of satisfaction and cost are then combined to form a demand function for the consumer. The consumer will shop where his demand function for the formula is positive.

$$f\ (N,D) = wp\ (N) = v\ (c_d C + c_n \sqrt{N} + c_i)$$

In the above formula, w and v are subjective weights assigned by the consumer when evaluates each segment of the formula. It will be noted that the minimum number of items necessary to induce a customer to patronize a given site varies with distance.

A third consumer utility perspective is presented by Huff in a recent paper. In the author's words, the study was undertaken to: "1) identify elements that affect consumer travel making decisions, 2) investigate the connections and relations among these elements, and 3) examine the relative degree of interdependence of each of these elements."[34]

Using the concepts and terminology of the field of social psychology and communications, Huff attempts to build a model indicating basic interactions of the various factors that influence the consumer's space preferences. The model inputs are analyzed using graph theory and matrix algebra.

The advantages of Huff's formulation are its flexible framework for empirical analysis. While, as the author states, in its present form, it is not a predictive device, it might well possess the necessary elements for prediction after further empirical validation.[35]

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[34]David L. Huff, A Topological Model of Consumer Space Preferences, Occasional Paper No. 11, Bureau of Business Research, University of Washington, Seattle, 1959.

[35]Several other presentations of similar types of analysis can be found in: Duane F. Marble, "Transport Inputs at Urban Residential Sites," The Regional Science Association Papers and Proceedings, Vol. V, 1959, pp. 253-66; and William L. Garrison, et. al., op. cit., pp. 181-97.

Some Marketing Contributions

Two distinct orientations appear in marketing literature regarding location and consumer movement. The first, differential advantage,[36] does not formally concern consumer movement but, rather, is concerned with location strategy on the premise of a "spatially given" consumer. It reflects the common bias of marketing literature in assuming a given market and concentrating on optimum policies and strategy to develop the "given" market. In effect, it abstracts from the problem of the ultimate retail outlet and concentrates on the problems of the firm.

Probably one of the most concise summaries of this approach is found in Chamberlin where he states:

> The availability of a commodity at one location rather than another being of consequence to purchasers, we may regard these goods as differentiated spatially and may apply the term "spatially monopoly" to that control over supply which is a seller's by virtue of his location. A retail trader has complete and absolute control over the supple of his "product" when this is taken to include the advantages, to buyers, of his particular location. Other things being equal those who find his place of business most convenient to their homes, their habitual shopping towns, their goings and comings from business or from any other pursuit, will trade with him in preference to accepting more or less imperfect substitutes in the form of identical goods at more distant places. . .[37]

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[36]The term 'differential advantage' was originally used by J. M. Clark in his development of the concept of workable competition. (Studies in the Economics of Overhead Costs, [Chicago: University of Chicago Press, 1923.]).

[37]Edward H. Chamberlin, The Theory of Monopolistic Competition, 7th ed., (Cambridge: Harvard University Press, 1956), pp. 62-63.

The premise that location represents a differential advantage to the firm is more fully developed within a marketing context by Wroe Alderson.[38]

A second distinct marketing orientation to consumer movement originated with "Reilly's Law of Retail Gravitation" in 1929.[39] The term 'comparative advantage.[40] probably best fits Reilly's and his successor's approach to consumer movement. In its original form, "Reilly's Law" stated that:

> Under normal conditions, two cities draw retail trade from a smaller intermediate city or town in direct proportion to some power of the population of these two larger cities and in an inverse proportion to some power of the distance of each of the cities from the smaller intermediate city.[41]

The "law" is applicable in predicting relative trading areas for shopping goods purchases. The two variables involved in the original formulation were population and distance. The

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[38]Wroe Alderson, Marketing Behavior and Executive Action, (Homewood, Illinois: R. D. Irwin, Inc., 1957), pp. 101-29, 337-50.

[39]Reilly, op. cit.

[40]The principle of comparative advantage is, "Generally speaking, each area tends to produce those products for which it has the greatest ratio of advantages or the least ratio of disadvantages as compared with other areas." (Raleigh Barlowe, Land Resource Economics, [New York: Prentice Hall, 1958], p. 224.) For purposes of this research, this definition can be reworded to read: Generally speaking, each buyer will tend to direct his patronage toward those locations which have the greatest ratio of advantage or the least ratio of disadvantage as compared with other areas in fulfilling his purchase objectives.

[41]Reilly, op. cit., p. 16.

variables have been largely replaced or reworked by other contributors to the gravitational approach.[42]

Some authors have sought to extend the range of application by substituting additional variables and rearranging the weighting procedure.[43] Some of the recent contributions are discussed in greater detail in Appendix A.

One methodological consideration that all of the gravitational formulations possess is the consideration of two points and the breaking distance of the trading area between these two points. By assessing the impact of a selected range of variables, the comparative advantage between these two points can presumably be predicted with a "reasonable" degree of certainty.

Definitions and Criteria for Delineation of the Retail Trading Area

The American Marketing Association defines a trading area as:

> A district whose size is usually determined by the boundaries within which it is economical in terms of volume and cost for a marketing unit or group to sell and deliver a good or service.[44]

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[42] Paul D. Converse, "New Laws of Retail Gravitation," Journal of Marketing, October, 1949, pp. 382-83.

[43] Harry J. Casey, Jr., "The Broadening Perspective of Marketing," American Marketing Association (Chicago, 1956), p. 82. See Appendix A for a more detailed consideration of this type.

[44] Marketing Definition: A Glossary of Marketing Terms (American Marketing Association, Chicago, 1960), p. 22.

The above definition is not operational in the sense that it sets no objective criteria for evaluating what are the limits of the trading area in any actual situation. It is significant to note that this definition also contains the bias of the firm in that it does not consider what is "economical" to the consumer but, rather, what is "economical" to the firm.

Cohen and Applebaum offer the following review of operational criteria for the delineation of the trading area:[45]

A. Drawing Power

1. The trading area is "that area from which the community receives approximately 90 per cent of its total retail patronage."[46]
2. "The area of influence from which a shopping center could expect to derive as much as 85 per cent of its total sales volume is defined as the trade area of the center."[47]

B. Per Capita Sales

1. The trading area is "that area which will provide (a general merchandise store) a minimum annual per capita sales of one dollar."[48]

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[45] Applebaum and Cohen, op. cit., p. 3.

[46] Isodore V. Fine, Retail Trade Analysis, University of Wisconsin, Bureau of Business Research and Service, Madison, 1954, p. 11.

[47] Victor Bruen and Larry Smith, Shopping Towns U.S.A., (New York: Reinhold Publishing Company, 1960, p. 278.)

[48] Howard L. Green, Montgomery Ward Co., Correspondence with William Applebaum and Saul B. Cohen, April, 1959.

C. Time

1. "Generally speaking. . . a large majority of customers are willing to travel 12-15 minutes, and a maximum of 25 minutes to reach a regional shopping center."[49]

D. Population

1. "2,000 families would spend $2,000,000 for food annually, or enough to support a large supermarket--if all families were to patronize one store."[50]

All of the above operational criteria have certain weaknesses when applies to all retail units or groups. The weaknesses are discussed at some length in the cited article. The authors conclude with the following statement:

> As a broad definition, the authors suggest that the trading area is the area from which a store gets its business within a given span of time. This does not exclude the reality of overlap. It also emphasizes the "area" in trading area. People must come to a store from a specific area. If other stores offer equal attractions, then the trading area of a given store will be related to the store's distance and convenience of access from the origin and destination of the potential customers."[51]

A further refinement of the trading area concept integrating the factor of demand intensity into the analysis and measurement of trading areas is presented in the following statement:

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[49] Gruen and Smith, op. cit., p. 33.

[50] Max S. Wehrly and J. Ross McKeever, eds., The Community Builders' Handbook, Community Builders' Council of the Urban Land Institute, Washington, D.C., 1954, p. 134.

[51] Applebaum and Cohen, op. cit., p. 6.

> The term primary trading area. . .refers to that portion of the trading area which provides the greatest density of customers in relation to population. This is based upon findings that are tentative and subject to further validation. In metropolitan areas, generally, the primary trading area for supermarkets provides 45 to 75 per cent of the customers, and a ratio of cusomers to population that is at least twice the customer population ratio of adjoining portions of the trading area. The secondary trading area includes 20 to 40 per cent of the customers and the fringe trading area includes 5 to 15 per cent.[52]

It should be noted that the above categories, while offered as experimental or tentative guide lines, are not operational in that too great a degree of overlap exists among the categories.

Relevant to the problem of operation criteria for trading area analysis, a recent study contained the following statement:

> A chain which was open to consideration of a new site must weight two objectives: optimal site selection and optimal net work expansion. The two objectives would not always lead to the same decision. From one viewpoint the site would be evaluated as an independent opportunity in which the sole criteria were objective measures of the potential business for a supermarket at that spot. From the other viewpoint, the chain is attempting to complete the network of stores with which it covers the market as a whole.[53]

In considering the two objectives of optimal site selection and optimal network expansion, the two objective measurements of drawing power and per capita sales provide a useful analytical framework for trading area analysis.

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[52] Saul B. Cohen and William Applebaum, "Evaluating Store Sites and Determining Store Rents," Economic Geography, Vol. XXXVI, No. 1, January, 1960, p. 11.

[53] The Structure of Retail Competition in the Philadelphia Market," Wharton School of Finance and Commerce, University of Pennsylvania, December 31, 1960, p. 51 (mimeographed second draft).

The factor of drawing power indicates the geographical nature of market converage and, hence, is relevant to the problem of optimal network expansion. On the other hand, per capita sales provide a measurement of the quality of any individual site in terms of sales penetration. The two measurements, taken together, provide a framework for decision in site location and development planning.

The problem of application of the drawing power and per capita sales measurements is by no means a simple matter. Probably no two sites are exactly similar, and some judgement must be employed in effectively using these objective measurements. Distinct location profiles could be developed on the basis of past experience if relevant variables could be isolated and integrated into the analysis of a proposed site. An example is the influence of population density or competition on the drawing power and per capita sales of a store in a certain size community. It is entirely possible that, if enough observations were made, a reliable statistical relationship could be formulated.[54]

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[54]This type of analysis (multiple regression procedure) has been formulated in an attempt to explain the number of stores (supermarkets) that a given chain possesses in particular areas on the basis of certain critical independent variables. Ibid., p. 44.

Contributions of the Literature to the Research

In the formulation of a research problem the literature usually contributes both conceptual and methodological insights into the research problem. In this research, several different disciplines contributed both to the conceptual framework and methodological basis for the study.

The hypotheses are constructed using the concept of product offering at the retail store. The concept of product offering from the firm perspective is largely developed in marketing and economic literature. The concept of product offering from the consumer's perspective is developed in the treatment of the principles of consumer utility. The combination of these disciplines provides the conceptual framework for the development of the concept of product offering as it is used in this research. Empirical support for the influence of product offering upon consumer travel patterns is found in the literature of economic geography and highway research and development.

The methodological basis for the research are also drawn from a variety of disciplines and areas of interest. Elements of the store classification procedure are found in supermarket trade literature, real estate and appraisal literature, and economic geography publications. The survey procedure, with some modification, is adopted from store development practice both in the supermarket and shopping center location and analysis literature. The measurement procedures employed in the research are developed specifically for purposes of the research and are not found in the literature.

Since World War II the amount of literature dealing with retail location has increased. However, the content of the literature has been largely unchanged since the turn of the century. The literature presents largely guidelines and checklists for establishing a retail store. Very little empirical evidence is presented to substantiate the sweeping generalizations made by many location analyses. The guidelines and checklists are presented and, if accepted, must be accepted on the basis of the expertness or experience of the writer.

Some original contributions are being made in the area of economic geography. The discipline of economic geography is attempting to integrate the geographical phenomena surrounding the retail site with the performance of the store in its trading area. While this appears to provide insights beyond the traditional approach to retail location analysis, it still suffers from what might be termed a "clinical bias". That is, certain locations are analyzed and after the analysis conclusions are drawn on the basis of the data collected. Generalizations are made after the data is collected, rather than the generalizations providing the guiding hypothesis for the research. Another weakness of the "clinical approach" is that the "diagnosis" depends upon the skill of the "clinician."

If the economic wastes of poor location decisions are to be avoided, retail location analysis must be elevated to the level of rigorous analytical research. The experience of previous location decisions must be quantified and used as a basis or reference point for future location decisions.

CHAPTER III

RESEARCH DESIGN

Introduction

The purpose of this chapter is to structure a research design so that the relationship between store size and store complex as independent variables and drawing power and per capita sales as dependent variable can be investigated.

As a pilot inquiry into the relationship, Chapter Three also has as its purpose a clear and complete presentation of methodology so that the research findings of the study can be either confirmed or invalidated.

The survey stores were selected and the data collected in a large midwestern city. The survey stores were retail units of a chain ranking as one of the largest in the United States measured in terms of both sales and number of stores. At the request of the cooperating chain, the chain or city will not be identified. This, however, in no way adversely influences or affects the generalizations or findings.

This research design is divided into three sections. The first section discusses survey store classification, establishes criteria for classification and discusses the selected survey stores in light of these criteria. The second section discusses the in-store interviewing procedure for obtaining the basic data through customer interviews. The third section

discusses the methods employed in the analysis of the data. Included in this section are descriptions of the basic procedures used to calculate population density, customer attraction and per capita sales.

Survey Stores

Store Classification

Various classification of supermarkets have been presented in supermarket trade literature. Typically the classifications found in the trade literature are used for identification purposes rather than functional classification.

A selected number of classifications are presented in this section in order to provide an industry perspective for the functional store classifications used here.

1) New Small Shopping Center (combined selling area of less than 100,000 square feet)
2) New Large Shopping Center (combined selling area of over 100,000 square feet)
3) Neighborhood
4) Highway
5) Old Large Business Center[1]

Another classification is presented by Bart J. Epstein and was developed in conjunction with his study of the Quincy,

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[1] "Operational Facts About New Supermarkets Opened in 1960", Progressive Grocer, April, 1961, pp. 111-112.

Massachusetts food market. He presents the following nomenclature and definition:

1) Downtown stores: which are situated in or at the edge of the central business district, forming an integral part of the retailing complex of that area.

2) Highway stores: which are isolated from other food stores and located so that almost all business is carborne.

3) Stores located in major outlaying shopping centers: where the large markets are part of a cluster of stores and serve a well defined, restricted area.

4) Stores located in Minor outlaying shopping centers: where the large markets in a small neighborhood cluster has a relatively small trading area.

5) Service stores: which provide a special service that the customer desires. The trading area of these stores depend, to a great extent, upon the distribution of consumers who want this special service.[2]

A third classification of retail types is presented by William Applebaum and Saul Cohen in a recent publication (Table 1). It is noted that Table 1 presents a classification

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[2]Bart J. Epstein,"The Quincy Food Market: A Study in Marketing Geography", unpublished Doctoral Dissertation, Clark University, 1956, pp. 92-93.

of general retail location types rather than a classification referring directly to the supermarket.

All of these lists for store classification presented here suffer the serious short-coming acknowledged in the Cohen and Applebaum classification. That is, they are not quantified classifications hence precision or definition is lacking. The lack of a quantified classification prevents a comparable analysis of distinctive characteristics of location types from being made over time and in different geographical areas.

TABLE 1

CLASSIFICATION OF RETAIL LOCATION TYPES*

A. "Unplanned Business Districts

1. Central Business District

2. CBD String Stores, adjoin the CBD

3. Secondary Business District, serves portions of a central, city or suburb.

4. Secondary String Stores, adjoin secondary business districts.

5. Neighborhood Stores, occur in small clusters or in isolation.

6. Outlaying Highway Stores, occur in strings or in isolation.

*Authors Note: "This is not a quantified classification; therefore, it lacks precision of definition, however, it is a classification which can be readily applied. For an approach to a qualified, functional classification, see Shopping Center Report (preliminary report), Cleveland Regional Planning Commission, Cleveland, Ohio, 1958, p. 26."

B. Planned Shopping Centers

1. CBD Planned Shopping Center, arise through urban renewal.

2. Regional Planned Shopping Center, in strong competition with the CBD.

3. Community Planned Shopping Center, in competition mainly with secondary business districts, or with the CBD in smaller cities.

4. Neighborhood Planned Shopping Center, frequently called neighborhood "strip."

5. Outlaying Planned Shopping Center, draws, in part, upon the passing parade of highway traffic."[3]

Survey Store Classification for This Research

The two general criteria for store classification are:

1) Planned and unplanned retail areas

2) The types of stores surrounding the survey site.[4]

More detailed criteria are used to set up each of the individual classifications. These criteria are presented below and the survey stores are evaluated in terms of these criteria.

It should be noted that the store types presented do not represent all of the possible types of supermarket locations within the urban and suburban area. But rather the six types

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[3] William Applebaum and Saul Cohen, "The Dynamics of Store Trading Areas and Market Equilibrium," The Annals of the American Association of Geographers, Vol. 51, No. 1 (March, 1961) pp. 74-77.

[4] "Surrounding" is defined as 1/3 mile in the case of unplanned centers and the entire planned center in the case of shopping centers.

represent distinctive store types as measured by the established criteria.

A. Urban Strip Store

The criteria for selection of the Urban Strip Store as follows:

1) Located in an unplanned business development.

2) Located in proximity to retail stores selling convenience type merchandise. At least ten stores of this classification with 1/3 mile of the survey store.

3) Located on major traffic artery in urban area.

4) Located in an area where population density is at least 7,500 people per square mile.

B. Urban Cluster Store

The criteria for selection of the Urban Cluster Store are as follows:

1) Located in an unplanned business development.

2) Located in proximity (1/3 mile) to at least one large departmentalized store selling shopping goods.

3) Located on a major traffic artery near intersection with another major traffic artery. The survey store is located within one-mile of this intersection. A traffic light controls traffic at this intersection.

4) Located in an area where population density is at least 7,500 people per square mile.

C. Small Town Store

The criteria for selection of the Small Town Store are as follows:

1) Located in planned shopping development.

2) Located in center with over fifty retail units.

3) Located in center dominated by a large department store.

4) Off street parking provided for at least 5,000 automobiles.

E. Community Shopping Center

The criteria for selection of the Community Shopping Center are as follows:

1) Located in planned shopping development.

2) Located in center with over sixteen and less than fifty retail units.

3) Located in center dominated by medium sized department store or large specialized variety store.

F. Neighborhood Shopping Center

The criteria for selection of the Neighborhood Shopping Center are as follows:

1) Located in planned shopping development.

2) Located in center with over seven and less than sixteen retail units.

3) Located in center dominated by a supermarket and/or a medium sized variety store.

TABLE 2

UNPLANNED SURVEY STORE DATA

Store Type	Date Opened	Date Surveyed	Population per Square Mile[1]
Urban Strip			
Urban Strip-1	10/44	12/60	6,945
Urban Strip-2	6/50	12/60	9,703
Urban Strip-3	1/58	10/59	15,505
Urban Cluster			
Urban Cluster-1	3/52	7/60	8,829
Urban Cluster-2	9/59	9/60	15,403
Urban Cluster-3	8/59	7/60	14,455
Small Town			
Small Town-1	1/41	1/61	3,500[2]
Small Town-2	8/51	12/60	4,000[2]
Small Town-3	5/57	12/60	2,000[2]

[1] Population per square mile within a two-mile radius of the survey store.

[2] Approximate population based upon final 1960 census data.

TABLE 3

PLANNED SURVEY STORE DATA

Type of Center	Date Opened[1]	Date Surveyed	Number of Stores	Dominant Store	Parking Places	Population Density per Square Mile[2]
Regional Shopping Center						
Regional Shopping Center-1	3/54	12/60	Over 50	Large Department Store	Over 5,000	7,107
Regional Shopping Center-2	7/57	3/60	Over 50	Large Department Store	Over 5,000	8,845
Community Shopping Center						
Community Shopping Center-1	8/58	3/60	13	Medium Department Store	1,000	5,308
Community Shopping Center-2	1/59	10/60	11	Medium Department Store	1,150	5,173
Neighborhood Shopping Center						
Neighborhood Shopping Center-1	1/56	12/60	15	Supermarket	1,000	5,736
Neighborhood Shopping Center-2	9/57	12/60	9	Supermarket	750	1,814

[1]Date opened refers to date of opening of survey store.

[2]Population per square mile within a two mile radius of the survey store.

TABLE 4

TYPES OF RETAIL UNITS IN SURVEY PLANNED SHOPPING CENTERS

Type of Store	Community Shopping Center 2	Community Shopping Center 1	Neighborhood Shopping Center 2	Neighborhood Shopping Center 1
Dept. Store - Large				
- Medium	1	1		
- Small			1	1
Variety Store - Large	1	1		
- Medium				1
- Small			1	
Supermarket	2	1	1	1
Drug Store		1	1	1
Men's Clothing	1	2	1	1
Women's Clothing	2	2	1	3
Children's Clothing			1	1
Shoes		2	1	3
Restaurant	1[a]			
Delicatessen				1
Bakery		1		
Finance Company	1			
Jewelry		1		1
Yard Goods and Draperies		1	1	
Paint Store				
Paint				1
	11	13	9	14

[a]Large bakery and restaurant combined.

traffic intersection specified in criteria while Urban Cluster - three is located about one-third of a mile from a major intersection.

Small Town Survey Stores -

The survey stores in the small town category fulfill all of the requirements of the criteria.

Regional Shopping Center -

The two survey stores selected in the Community Shopping Center category fulfill all of the criteria requirements with the exception of number two. Both Community Shopping Center - one and Community Shopping Center - two have less than the minimum number of stores required for the Community Shopping Center. However, the size and nature of the dominent stores in these centers clearly place these centers in the Community Shopping Center category.

Neighborhood Shopping Center -

All of the criteria requirements are satisfied by the two survey stores selected in the Neighborhood Shopping Center category.

Customer Survey Procedures

Customer Interviewing

The customer interviewing portion of the study took place between October, 1959 and January, 1961. However, most of the interviewing (11 out of 15) took place during the last six months of 1960.

Instructions to the interviewers for the actual procedure are presented in Appendix B. The number of interviews per store was set at one interview per one hundred dollars in sales per week. The weekly sales figure was calculated as the average of weekly sales for a period of four weeks prior to the interview date. For example, if weekly sales averaged $25,000 for a period of four weeks prior to the interview date a quota of 250 interviews would be set for the interviewer. In order to obtain 250 usable interviews (addresses) a seven per cent increase over intended quota should be established. This is to insure enough usable interviews considering misstated addresses or addresses that cannot be found on a map of the city. When, after deducting unusable interviews, there remain too many interviews for the quota, the excess interviews are discarded using a table of random numbers.

The customer interviewing procedure adopted for the collection of data is a frequently used technique for location research in the supermarket industry. Prior testing established the validity of the technique for accurately determining the trading area of the supermarket.[5]

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[5]Bart J. Epstein, "Evaluation of an Established Planned Shopping Center" op. cit., pp. 12-21 and William Applebaum and Richard F. Spears, op. cit.

Map Spotting

The map spotting procedure is a mechanical operation and a procedural presentation for this step is found in Appendix B. It consists of plotting the customer's home addresses on a map of the survey area.

There are several possible sources of error in an analysis using comparative map data. First, if the quadrant type of analysis is used as it is used in this research, caution must be exercised so that true north is accurately established and consistantly used in all comparative analysis. Another possible source of error is found in using maps of different mileage scale. In the analysis of the data collected, three different map scales were used. Prior to performing any analysis or drawing any circles, the map scale was checked in order to eliminate errors in analysis or time consuming recalculations of the data.

Measurement Procedures

Drawing Power Measurement

Drawing power was defined as the mean average distance traveled by a fixed percentage of the customers. The question was posed as to what percentage to use in the calculation of drawing power. Experience indicates that it is reasonable to assume that some of the shoppers interviewed are what might be termed "accidental shoppers" in that they are not regular patrons of the store.[6] Ninety per cent of the closest customers to the site are used to calculate the basic drawing power measurement. In order to show a relative measure of concentration, the main average distances were also calculated at the seventy per cent customer level.

The procedure for calculation was as follows:

Using the customer spotting map as a base, a transparent overlay was placed over the survey site (Appendix C-2). The overlay had a series of concentric circles drawn upon it which are one-eighth of a mile apart scaled to the map. It also had a vertical and horizontal axis dividing the overlay into four equal segments or quadrants. The overlay was placed on the map so that the intersection of the horizontal and vertical axis was placed directly over the survey store. The vertical axis was aligned so that it pointed directly north and south.

The customer spottings were then recorded by distance interval and quadrant using a worksheet designed for the purpose (Appendix C-3). The quadrants were totaled in the last column resulting in a customer count for each one-eighth of a mile distance interval.

The main average distance was then calculated using the following formula:

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[6]"Profile of Supermarket Customers" Part 8, Super Value Study, August, 1958, p. S112-13.

$$M_1 = \frac{FM}{N}$$

Where - M_1 = the mean distance

F = number of customers falling within distance interval

M = mid-point of distance interval (e.g. .0675 for 1/8 of) (a mile interval; .1875 for) (1/4 mile interval, etc.)

N = Number of customers

The above calculation was made for all survey stores using data for both the closest seventy and ninety per cent of the customers.

Per Capita Sales Measurement

Per capita sales within an area is an important measurement device for analyzing sales penetration in any given market segment. It introduces into analysis the factors of population and population density not considered in the drawing power measurement.

In order to calculate per capita sales in an area, three types of data must be available. First, the segment of the market must be clearly delineated for analysis so that both population totals and sales may be gathered using a comparable reference point. Secondly, accurate population data must be available to serve as the basis for calculation of per capita sales. Third, sales figures must be available for the market segment in question.

The entire analysis of per capita sales must be accomplished over a relatively short time span so that sales and population refer to the same point in time. Shifting population concentrations and sales patterns cause distortions in final calculation if too great a time span exists between the population estimate and the sales estimate.

The customer interviewing procedure was based upon a quota of one interview per one hundred dollars in sales per week. When the customers addresses are spotted on a map, both a distribution of customers and a distribution of sales results. Thus, if in a one-half square mile area ten customer spottings are made, it can also be said that there is $1,000 per week sales in that area. If the population in the area is 1,000 people, then it can be further stated that per capita sales in the area is one dollar per week or fifty-two dollars annually.

The requirements of distinct market parameters was resolved so that data gathered to provide drawing power information could also be utilized in the per capita sales portion of the analysis. That is, market segments were laid out according to concentric circles drawn from the survey site. The first circle was drawn one-half mile from the store; the second, one and one-quarter miles from the store; and the third, at a distance of two miles from the store. The decision on which distance measurements to use was made after a visual analysis of the spotting maps and a preliminary analysis of the drawing power results. It is believed that these distance increments represent distinct market areas for the survey stores as measured by drawing power and per capita sales.

The quadrants used in the per capita sales measurement were established to coincide with those quadrants used in the drawing power analysis. A graphic presentation of this approach can be found in Appendix C-4.

After the two steps outlined about were completed, the task of accurate population estimation remained. Fortunately, 1960 census data by census tract and enumeration district were available for the survey area. The availability of the data also eliminated the problem of corresponding sales and population estimates. As indicated in Tables 2 and 3, all of the surveys were made within a period of fifteen months. Thirteen of the fifteen survey stores were surveyed in 1960, the year for which census data was most applicable.

Appendix C-5 contains a copy of the worksheet used for population estimates. The general procedure established called for estimation by census tract within the central city and estimation by enumeration district outside the central city. The Census Tract Map was drawn on to a street map of the area and the circles and quadrants were then also drawn on the city street map.

The next step in the procedure was to list population and housing counts by enumeration district or census tract. After the listing was completed, the percentage of each census tract and enumeration district following within a distance interval and quadrant were estimated. The total number of inhabitants in the census tract or enumeration district were then multiplied by the percentage estimate. The results were summed and population by distance interval and quadrant was then available for further analysis.

The following formula was used to calculate per capita sales:

$$S_a = \frac{C_a \times 100}{P_a}$$

Where - S_a = per capita sales in Area A.
C_a = customer spotting in Area A.
P_a = population of Area A.

For example, if a population estimate of 5,500 were made for a survey store at the distance interval of 1/2 mile and there were 65 survey store customers spotted within the 1/2 mile distance interval, the calculation of per capita sales would be as follows:

$$S_a = \frac{65 \times 100}{5,500} = \frac{6,500}{5,500} = 1.08$$

A total per capita sales of $1.08 per person within the 1/2 mile distance interval would result for the hypothetical survey store.

CHAPTER IV

PRESENTATION OF FINDINGS

Introduction

The purpose of this chapter is to present the empirical findings of the study. The chapter is divided into four general parts designed to present the findings in a meaningful and useful context.

The first part presents the purposes, objectives and basic framework for the presentation of findings. The second part, entitled "Drawing Power Measurements," presents findings relarive to the dependent variable of drawing power and its relationship to store complex and store size. The third section presents data relative to the dependent variable of per capita sales and its relationship to store complex and store size. The fourth section presents research findings which are not directly relevant to the research problem, but were discovered in the analysis of the data and believed to be significant.

In order to insure clarity and continuity of presentation, most of the raw data have been appended and can be found in Appendices E-G. The procedure for the analysis of variance can be found in Appendix D.

Utilizing the quota sample set up in Chapter III, a total of 5,300 customer interviews were taken. The classification of survey store customer interviews is presented in Table 5.

At the close of each section the statistical significance of the results are presented. The data are first analyzed using Analysis of Variance and the significance of inter-group comparisons are established using Multiple Range Tests. Where appropriate, Correlation procedures were used to analyze the data. The basic formula and identities for these procedures are presented in Appendix D.

The results of the statistical analyses are presented in terms of levels and significance. The conventions adopted for presentation are the standard conventions for reporting the results of statistical procedures. That is, where results are reported to be significant at the 95 per cent level, the notation indicated that there are five chances out of 100 that the data are the result of chance occurances. In the case of a 90 per cent level of significance this notation indicated that there are but ten chances in 100 that the data are due to chance occurrences. Probability tables with the appropriate degrees of freedom were used to establish the levels of significance for the data.

The 95 per cent level of significance is the minimum level of significance accepted as reliable for the statistical section of the research findings. The 95 per cent level is traditionally the acceptable minimum criterian for research significance.

TABLE 5

NUMBER OF INTERVIEWS AND DATE

OF SURVEY BY SURVEY DATE

Store Type	Number of Interviews	Date of Survey
Urban Strip-1	165	12/60
Urban Strip-2	242	12/60
Urban Strip-3	479	10/59
Total	886	-
Urban Cluster-1	368	7/60
Urban Cluster-2	487	9/60
Urban Cluster-3	564	7/60
Total	1419	-
Small Town-1	106	1/61
Small Town-2	233	12/60
Small Town-3	188	12/60
Total	527	-
Neighborhood Shopping Center-1	211	12/60
Neighborhood Shopping Center-2	345	12/60
Total	556	-
Community Shopping Center-1	262	10/60
Community Shopping Center-2	526	3/60
Total	788	-
Regional Shopping Center-1	576	12/60
Regional Shopping Center-2	548	3/60
Total	1124	-
TOTAL	5300	-

Drawing Power Measurement

Introduction

The definition formulated in the previous chapter for drawing power was the mean average distance traveled to the survey store by seventy and ninety per cent of the store's customers.

Prior to a consideration of drawing power using the above definition, a presentation of customer profiles at the 100 per cent level of patronage provide a basic framework for further analysis. In Table 6, profiles of customers by distance interval are presented by store type. Several distinctive patterns can be immediately seen in Table 6. The amount of customers drawn from under one-half mile declines steadily ranging from a high of 51.4 per cent for the Urban Strip type to a low of 2.4 per cent for the Regional Shopping Center types. The data presented by column is continous with the exception of the Small Town type where there is some deviation by distance interval. In the intermediate distance interval ranges (1-1/2 miles to 2 1/2 miles) the planned centers show relatively strong customer draw while the Urban Strip and Urban Cluster types taper off sharply beyond the one mile distance interval. The only store type drawing customers in significant amounts over 3 1/2 miles are the Regional Shopping Center and Small Town types.

TABLE 6

CUSTOMERS BY DISTANCE INTERVAL
BY STORE TYPE

Distance Interval (Miles)	Unplanned			Planned		
	Urban Strip	Urban Cluster	Small Town	Neighborhood Shopping Center	Community Shopping Center	Regional Shopping Center
1/2	51.4%	46.7%	34.6%	20.1%	16.8%	2.4%
1	30.7	26.8	16.3	29.4	27.3	9.0
1-1/2	6.1	12.6	9.1	19.0	17.6	14.7
2	2.9	5.8	5.8	14.5	12.4	11.2
2-1/2	2.6	2.9	7.7	5.6	7.7	10.8
3	1.5	1.3	4.4	3.1	5.3	9.9
3-1/2	1.3	0.8	5.0	1.9	4.3	8.4
Over 3-1/2	3.5	3.1	17.1	6.4	8.6	33.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

<u>Drawing Power and Store Complex</u>

The empirical findings for the relationship between drawing power and store complex are presented in a series of three tables. All tables are presented at the seventy and ninety per cent levels of customer drawing power in order that the relative concentration and dispersion of customers can be analyzed.

In Table 7 a summary table of drawing power findings by store type is presented. A range of from .38 miles to 1.95 miles appears in a continous series ranging from the Urban Strip type to the Regional Shopping Center type at the seventy per cent level of customer drawing power, at the ninety per cent level of customer drawing power the range shifts upward to .52 miles for Urban Strip type to 2.53 miles for the Regional Shopping Center type. The data are also presented in a continous series with the exception of the Small Town type at the ninety per cent customer drawing power level.

In Table 8 a presentation of drawing power at the seventy and ninety per cent levels by survey store is presented. The purpose of Table 8 is to demonstrate the degree of consistency within each classification of store types.

A comparison of mean[1] and median values at the seventy and ninety per cent level is presented in Table 9. The comparison

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[1]The average mean values are used in the calculation of drawing power at the seventy and ninety per cent levels.

of the mean and median values provides an approximate measure of the symmetry of distribution for the data. Where the mean, median and mode are identical, a perfectly symmetrical distribution is indicated. Where the median exceeds the mean generally the skewness will be positive. Where the mean exceeds the median generally the skewness will be negative.[2] At the seventy per cent level the distribution for data in Table 9 indicate a relatively symmetrical distribution with the exception of the Small Town type stores. However, when the analysis is extended to the ninety per cent level, the data show a definite pattern of negative skewness. The negative skewness is particularly evident in the case of the Small Town type stores.

Drawing Power and Store Size

The research findings for the relationship between drawing power and store site are presented in a series of two tables. Several problems are presented in an analysis of store size and its relationship to drawing power. The first problem concerns the interrelationship between store size and store type. It is a reasonable assumption that a store located in a Regional Shopping Center is larger than a store located in a small town.

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[2]The Pearsonian coefficient of skewness is calculated by:

$$SK = \frac{3\ (\text{mean} - \text{median})}{\text{standard deviation}}$$

If this assumption holds, store size can be influenced by store type. If there exists a relationship between store size and store type, then the analysis of these two factors can best be made with the store type classification rather than over the entire range of store types. It is the purpose of Table 11 to provide some insights into the relationship of store type and store size.

A second problem concerns the time span over which stores are constructed. The average size of stores has been steadily increasing. The period during which a store was built determines to a large extent, its' size. Along with its' size, the period in which it is built also determines to some extent the nature of its' competitive environment. Stores can be expected to decline in productivity as they approach obsolescense. Thus, to remove the influence of these factors an analysis of stores all built in the same year is required. This problem is presented at greater length under "other findings" below.

In Table 10 the stores are ranked by store size in the presentation of drawing power at the seventy and ninety per cent levels. In the table no systematic pattern for the relationship of drawing power to store size emerges. However, when the stores are arrayed by store type (Table 11), there is a relationship within the store type classification for certain of the store types.

TABLE 7

DRAWING POWER AT 70 AND 90 PERCENT

CUSTOMER LEVELS BY STORE TYPE

Store Type	Drawing Power	
	70 Percent	90 Percent
Urban Strip	.38 Miles	.52 Miles
Urban Cluster	.43	.62
Small Town	.79	1.38
Neighborhood Shopping Center	.79	1.05
Community Shopping Center	.87	1.22
Regional Shopping Center	1.95	2.53

TABLE 8

DRAWING POWER AT 70 AND 90 PERCENT CUSTOMER LEVELS BY SURVEY STORE

Survey Store	Drawing Power	
	70 Percent	90 Percent
Urban Strip-1	.32 mi.	.39 mi.
Urban Strip-2	.37	.57
Urban Strip-3	.41	.55
Urban Cluster-1	.43	.62
Urban Cluster-2	.49	.67
Urban Cluster-3	.39	.56
Small Town-1	.54	1.22
Small Town-2	.84	1.44
Small Town-3	.87	1.41
Neighborhood Shopping Center-1	.88	1.24
Neighborhood Shopping Center-2	.74	.97
Community Shopping Center-1	.98	1.34
Community Shopping Center-2	.82	1.17
Regional Shopping Center-1	2.42	3.15
Regional Shopping Center-2	1.57	1.86

TABLE 9

COMPARISON OF MEAN AND MEDIAN VALUES OF DRAWING POWER AT 70 AND 90 PERCENT CUSTOMER LEVELS BY SURVEY STORE

Survey Store	Drawing Power (Miles)			
	70 Percent		90 Percent	
	Mean	Median	Mean	Median
Urban Strip-1	.32	.32	.39	.39
Urban Strip-2	.37	.38	.57	.44
Urban Strip-3	.41	.41	.55	.49
Urban Cluster-1	.43	.41	.62	.50
Urban Cluster-2	.49	.45	.67	.55
Urban Cluster-3	.39	.37	.56	.44
Small Town-1	.54	.41	1.22	.50
Small Town-2	.84	.65	1.44	.88
Small Town-3	.87	.52	1.41	.78
Neighborhood Shopping Center-1	.88	.87	1.24	1.03
Neighborhood Shopping Center-2	.74	.70	.97	.88
Community Shopping Center-1	.98	.97	1.34	1.21
Community Shopping Center-2	.82	.79	1.17	.95
Regional Shopping Center-1	2.42	2.43	3.15	2.94
Regional Shopping Center-2	1.57	1.51	1.86	1.73

TABLE 10

DRAWING POWER AT 70 AND 90 PERCENT CUSTOMER LEVELS BY RANK ORDER OF STORE SIZE

Store Type	Size of Store[1]	Drawing Power (miles) 70%	90%
Small Town-1	4,000	.54	1.22
Urban Strip-1	4,698	.32	.39
Small Town-3	5,455	.87	1.41
Small Town-2	5,673	.84	1.44
Urban Strip-2	9,030	.37	.57
Neighborhood Shopping Center-2	10,004	.74	.97
Neighborhood Shopping Center-1	10,094	.88	1.24
Urban Cluster-1	10,320	.43	.62
Urban Strip-3	10,464	.41	.55
Community Shopping Center-1	10,629	.98	1.34
Urban Cluster-2	10,780	.49	.67
Urban Cluster-3	11,368	.39	.56
Regional Shopping Center-2	11,582	1.57	1.86
Community Shopping Center-2	13,468	.82	1.17
Regional Shopping Center-1	16,800	2.42	3.15

[1]Store size = square feet of selling area within the store.

TABLE 11

DRAWING POWER AT 70 AND 90 PERCENT CUSTOMER LEVELS BY STORE TYPE AND STORE SIZE

Store Type	Size of Store[1]	Drawing Power[2]	
		70%	90%
Urban Strip-1	4,698	.32	.39
Urban Strip-2	9,030	.37	.57
Urban Strip-3	10,464	.41	.55
Urban Cluster-1	10,320	.43	.62
Urban Cluster-2	10,780	.49	.67
Urban Cluster-3	11,368	.39	.56
Small Town-1	4,000	.54	1.22
Small Town-2	5,673	.84	1.44
Small Town-3	5,455	.87	1.41
Neighborhood Shopping Center-1	10,004	.88	1.24
Neighborhood Shopping Center-2	10,094	.74	.97
Community Shopping Center-1	13,468	.98	1.34
Community Shopping Center-2	10,629	.82	1.17
Regional Shopping Center-1	16,800	2.42	3.15
Regional Shopping Center-2	11,582	1.57	1.86

[1]Store size = square feet of selling area within the store.

[2]In miles.

<u>Statistical Significance of Drawing Power Measurement</u>

1. Relationship between drawing power (seventy per cent customer level) and store complex.

The relationship between drawing power and store complex was analyzed both at the seventy and ninety per cent customer levels using Analysis of Variances.[3] The results of this analysis using the seventy per cent drawing power measurement are presented below. The results were highly significant at the 99 per cent level.

Figure 7
ANALYSIS OF VARIANCE - STORE COMPLEX AND DRAWING POWER AT 70 PER CENT CUSTOMER DRAWING POWER LEVEL
(Column = Store Complex)

Source of Variation	DF	SS	Msq	F
Total	14	4.2943		
Between Columns	5	3.8347	.7669	15.0166*
Within	9	.4596	.0511	

(*Reference Point - 95% 3.48; 99% 6.06)

The Multiple Range Tables[4] were then used to examine the differences between store complex and drawing power. On the basis of

[3] See Appendix D-1 for formula and procedure for Analysis of Variance (one-way classification).

[4] See Appendix D-3 for formula and procedure for Multiple Range Test.

the Analysis of Variance, the following differences were established at the 95 per cent level.

A. The Regional Shopping Center type is significantly different in drawing power from all other store types.

B. The Urban Strip Store type is significantly different in drawing power from the Community and Regional Shopping Center types.

2. Relationship between drawing power (90% customer level) and store complex.

Using Analysis of Variance to analyze this relationship, the following results were obtained:

Figure 8
ANALYSIS OF VARIANCE - STORE COMPLEX AND DRAWING POWER AT 90 PER CENT CUSTOMER DRAWING POWER LEVEL
(Column = Store Complex)

Source of Variation	DF	SS	Msq	F
Total	14	6.8706		
Between Columns	5	5.9336	1.1867	11.3996*
Within	9	.9370	.1041	

(*Reference Point - 95% 3.48; 99% 6.06)

These results are significant at the 99 per cent level. Using the Multiple Range Tables to establish the differences within the categories the following results were obtained at the 95 per cent level of significance.

A. The Urban Strip type is significantly different in drawing power from the Small Town type.
B. The Urban Strip type is significantly different in drawing power from the Community Shopping Center type.
C. The Urban Strip type is significantly different in drawing power from the Regional Shopping Center type.
D. The Urban Cluster type is significantly different in drawing power from the Small Town type.
E. The Urban Cluster type is significantly different in drawing power from the Community Shopping Center type.
F. The Urban Cluster type is significantly different in drawing power from the Regional Shopping Center type.

3. Relationship between drawing power (70% customer drawing power level) and store size.

The store size and drawing power variables were correlated for the 70 per cent level of customer drawing power using data from all fifteen survey stores. A coefficient of correlation of $^{+}.575$ was obtained which is significant at the 95 per cent level of significance.[5]

4. Relationship between drawing power (90% customer drawing power level) and store size.

The store size and drawing power variable were correlated for the 90 per cent level of customer drawing power using data from all fifteen survey stores. The resulting coefficient of correlation was $^{+}.444$ which is significant at the 90 per cent level of significance, but not at the 95 per cent level.

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[5]The significance of the coefficient of correlation is established by using Table 11 "Percentile Values of r for n Degrees of Freedom When p equals 0." (Helen M. Walker and Joseph Lev., <u>Statistical Inference</u>. New York: Henry Holt & Company, 1953, p.470).

Per Capita Sales Measurements

Introduction

Per capita sales was defined as the dollar amount of sales per person per week within a given geographic area. This measurement provides a yardstick of productivity for a retail store. Presumably, this measurement would also be responsive to the amount and location of competition. The problem of the influence of competition is discussed at greater length under "Other Findings" below.

The population estimates necessary for the per capita sales figure were made at three distance intervals: 1/2 mile, 1 1/4 miles and 2 miles. These distance intervals were chosen because they are most meaningful considering the clustering of the drawing power data. The statistical significance of the three distance intervals used for per capita sales measurements were established using a two way classification of Analyses of Variance in conjunction with the Multiple Range Tests. The results are presented below in "Statistical Significance of the Per Capita Sales Measurement."

The Analysis of Variance, Multiple Range Tests and Correlation procedures were also used to establish the statistical significance of the relationship between the independent variable of per capita sales. Since Census Tract and Enumeration District Data are not available for the outlaying areas of the Small Town type stores, they are not included in any of the statistical measures of relationship beyond the 1/2 mile distance interval. The population estimations for these outlaying areas were made using the 1960 census (Township) data and the most recent maps of the area. The resulting population estimates are probably as accurate as the remaining data, however, since different estimation procedures were used, these three survey stores were excluded from statistical analysis of the data.

In order to provide a framework for per capita sales figures, Table 12 indicates the percentage of customers coming from each distance interval up to two miles. Except for the Small Town and Regional Shopping Center types, approximately 75 per cent or more of the customers came from within two miles of the store. A special caution must be taken in interpretation of per capita sales for the Regional Shopping Center type where over 65 per cent of the customers are located farther than two miles from the store. As a result, the per capita sales data are only applicable to 35 per cent of the customers of the Regional Shopping Center type.

Per Capita Sales and Store Complex

The research findings establishing the relationship between per capita sales and store complex are presented in two tables (Tables 13-14). Both these tables are constructed so as to show interval and cumulative per capita sales by distance interval.

In Table 13 a summary table of findings by store type is presented. The Small Town type stands out prominently due to its high per capita sales up to and including the two mile distance interval. Another interesting pattern is also shown by the per capita sales of the Urban Cluster and Urban Strip in the 1-1/4 and 2 mile distance intervals. Per capita sales decline rapidly for the Urban Strip and Urban Cluster typed contrasted to the Neighborhood Shopping Center and Community Shopping Center types in the larger distance intervals.

Some overlap between the Neighborhood Shopping Center and Community Shopping Center types is indicated in Table 14. However, with this exception the data shows a systematic distribution with no overlap in any of the other categories at any distance interval.

Per Capita Sales and Store Size

The research findings relating to the relationship between per capita sales and store size are presented in Tables 15-16.

In Table 15 the data are grouped by store size in three categories. There is no systematic relationship between store size and per capita sales indicated in Table 15 with almost complete overlap of data occuring at every distance interval.

The same lack of pattern is shown in Table 16 where the data are arranged by store type and presented for each survey

TABLE 12

PERCENTAGE OF CUSTOMERS BY STORE TYPE

AT 1/2, 1-1/4 AND 2 MILE DISTANCE INTERVALS

Store Type	Distance Interval		
	1/2 Mile Interval	1-1/4 Mile Cumulative	2 Mile Cumulative
Urban Strip	52.0%	85.8%	91.5%
Urban Cluster	46.7	80.3	91.9
Small Town	34.6	56.1	65.8
Neighborhood Shopping Center	20.1	58.2	83.0
Community Shopping Center	16.8	54.9	74.0
Regional Shopping Center	2.4	19.8	37.3

TABLE 13

PER CAPITA SALES BY STORE TYPE AT 1/2, 1-1/4 AND 2 MILE DISTANCE INTERVALS

Survey Store	Per Capita Sales				
	1/2 Mile Interval	1-1/4 Mile		2 Mile	
		Interval	Cumulative	Interval	Cumulative
Urban Strip	$1.55	$ .21	$ .44	$ .02	$ .20
Urban Cluster	1.89	.28	.56	.06	.27
Small Town	2.46	2.64	2.50	1.64	2.32
Neighborhood Shopping Center	1.70	.71	.89	.23	.48
Community Shopping Center	1.58	.62	.76	.20	.44
Regional Shopping Center	.45	.27	.29	.16	.21

TABLE 14

PER CAPITA SALES BY SURVEY STORE AT 1/2, 1-1/4 AND 2 MILE DISTANCE INTERVALS

Survey Store	Per Capita Sales				
	1/2 Mile Interval	1-1/4 Mile		2 Mile	
		Interval	Cumulative	Interval	Cumulative
Urban Strip-1	$1.10	$ .15	$ .34	$ .002	$ .18
Urban Strip-2	1.83	.18	.44	.03	.18
Urban Strip-3	1.73	.27	.44	.03	.22
Urban Cluster-1	1.92	.31	.59	.06	.30
Urban Cluster-2	1.63	.26	.48	.06	.23
Urban Cluster-3	2.10	.28	.62	.05	.29
Small Town-1	1.68	2.13	1.75	.67	1.61
Small Town-2	2.32	2.35	2.33	1.48	2.09
Small Town-3	4.28	3.67	4.12	3.76	4.07
Neighborhood Shopping Cluster-1	2.02	.74	.95	.48	.71
Neighborhood Shopping Cluster-2	1.58	.69	.86	.17	.41
Community Shopping Center-1	1.77	.62	.76	.20	.44
Community Shopping Center-2	1.50	.78	.90	.27	.60
Regional Shopping Center-1	.38	.22	.23	.14	.17
Regional Shopping Center-2	.50	.31	.33	.18	.24

TABLE 15

PER CAPITA SALES AT 1/2, 1-1/4, 2 MILE DISTANCE INTERVALS, BY RANK ORDER OF STORE SIZE

Survey Store	Size of Store	Per Capita Sales				
		1/2 Mile Interval	1-1/4 Mile		2 Mile	
			Interval	Cumulative	Interval	Cumulative
Small Town-1	4,000	$1.68	$2.13	$1.75	$ .67	$1.61
Urban Strip-1	4,698	1.10	.15	.34	.002	.18
Small Town-3	5,455	4.28	3.67	4.12	3.76	4.07
Small Town-2	5,673	2.32	2.35	2.33	1.48	2.09
Urban Strip-2	9,030	1.83	.18	.44	.03	.18
Neighborhood Shopping Center-2	10,004	1.58	.69	.86	.17	.41
Neighborhood Shopping Center-1	10,094	2.02	.74	.95	.48	.71
Urban Cluster-1	10,320	1.92	.31	.59	.06	.30
Urban Strip-3	10,464	1.73	.27	.50	.03	.22
Community Shopping Center-1	10,629	1.77	.40	.55	.14	.28
Urban Cluster-2	10,780	1.63	.26	.48	.06	.23
Urban Cluster-3	11,368	2.10	.28	.62	.05	.29
Regional Shopping Center-2	11,582	.50	.31	.33	.18	.24
Community Shopping Center-2	13,468	1.50	.78	.90	.27	.60
Regional Shopping Center-1	16,800	.38	.22	.23	.14	.17

TABLE 16

PER CAPITA SALES AT 1/2 1-1/4, 2 MILE DISTANCE INTERVALS, BY SURVEY STORE AND STORE SIZE

Survey Store	Size of Store	Per Capita Sales				
		1/2 Mile Interval	1-1/4 Mile		2 Mile	
			Interval	Cumulative	Interval	Cumulative
Urban Strip-1	4,698	$1.10	$ .15	$ .34	$ .002	$ .18
Urban Strip-2	9,030	1.83	.18	.44	.03	.18
Urban Strip-3	10,464	1.73	.27	.50	.03	.22
Urban Cluster-1	10,320	1.92	.31	.59	.06	.30
Urban Cluster-2	10,780	1.63	.26	.48	.06	.23
Urban Cluster-3	11,368	2.10	.28	.62	.05	.29
Small Town-1	4,000	1.68	2.13	1.75	.67	1.61
Small Town-2	5,673	2.32	2.35	2.33	1.48	2.09
Small Town-3	5,455	4.28	3.67	4.12	3.76	4.07
Neighborhood Shopping Center-1	10,094	2.02	.74	.95	.48	.71
Neighborhood Shopping Center-2	10,004	1.58	.69	.86	.17	.41
Community Shopping Center-1	10,629	1.77	.40	.55	.14	.28
Community Shopping Center-2	13,468	1.50	.78	.90	.27	.60
Regional Shopping Center-1	16,800	.38	.22	.23	.14	.17
Regional Shopping Center-2	11,582	.50	.31	.33	.18	.24

store. There is little relationship within the store type classification between store size and per capita sales.

Statistical Significance of Per Capita Sales Measurement

1. Statistical significance of distance intervals of 1/2, 1 1/4 and 2 miles.

In order to establish the relavence of the distance intervals used, the Analysis of Variance and Multiple Range Tests were applied against the per capita sales data using a two way classification problem procedure.[6]

Figure 9
ANALYSIS OF VARIANCE - SIGNIFICANCE
OF PER CAPITA SALES DISTANCE INTERVALS
(Row = Distance Intervals)
(Column = Store Complex)

Source of Variation	DF	SS	Msq	F
Total	14	6.1725		
Row	2	4.6504	2.3252	21.1960*
Columns	4	.6447	.1612	1.4695**
Error	8	.8774	.1097	

(*Reference Point: 95% 4.46; 99% 8.65)
(**Reference Point: 95% 3.84; 99% 7.01)

The Analysis of Variance[6] procedure established the significance of the distance intervals choosen for per capita sales

[6] See Appendix D-2 for formula and procedure for Analysis of Variance (Two-way classification)

analysis at the 99 per cent level of significance. The Multiple Range Test was then applied to the result and the following conclusions were established:

A. The 1/2 mile distance interval is significantly different (95% level) from the 1-1/4 and 2 mile distance interval in per capita sales.
B. The 1-1/4 mile distance interval is significantly different (95% level) from the 2 mile distance interval in per capita sales.

2. Relationship between per capita sales at the 1/2 mile distance interval and store complex.

Using the Analysis of Variance and the Multiple Range Tests, the following results were obtained:

Figure 10
ANALYSIS OF VARIANCE - STORE
COMPLEX AND PER CAPITA SALES AT 1/2 MILE DISTANCE INTERVAL
(Column = Store Complex)

Source of Variation	DF	SS	Msq	F
Total	14	10.9294		
Between Columns	5	6.6928	1.3386	2.844*
Within	9	4.2366	.4707	

(*Reference Point: 90% 2.61; 95% 3.48; 99% 6.06)

The results were significant at the 90% level. The Multiple Range Test established the following relationship at the 95 per cent level.

A. The Regional Shopping Center type is significantly different than the Small Town type in per capita sales at the 1/2 mile distance interval.

3. Relationship between per capita sales at the 1-1/4 mile distance interval and store complex.

The Analysis of Variance disclosed the following significance at the 1-1/4 mile distance interval.

Figure 11
ANALYSIS OF VARIANCE - STORE
COMPLEX AND PER CAPITA SALES AT 1-1/4 MILE DISTANCE INTERVAL
(Column = Store Complex)

Source of Variation	DF	SS	Msq	F
Total	11	.5508		
Between Columns	4	.4642	.1161	9.3629*
Within	7	.0866	.0124	

(*Reference Point: 95% 4.12; 99% 7.85)

The resultant F is significant at the 99 per cent level of significance. The Multiple Range Tests established the following significant (95% level) differences at the 1-1/4 mile distance interval:

A. The Urban Strip type is significantly different in per capita sales from the Community Shopping Center type at the 1-1/4 mile distance interval.
B. The Urban Strip type is significantly different in per capita sales from the Neighborhood Shopping Center type at the 1-1/4 mile distance interval.
C. The Urban Cluster type is significantly different in per capita sales from the Community Shopping Center type at the 1-1/4 mile distance interval.
D. The Urban Cluster type is significantly different in per capita sales from the Neighborhood Shopping Center type at the 1-1/4 mile distance interval.

E. The Regional Shopping Center is significantly different in per capita sales from the Community Shopping Center type at the 1-1/4 mile distance interval.

F. The Regional Shopping Center is significantly different in per capita sales from the Neighborhood Shopping Center type at the 1-1/4 mile distance interval.

4. Relationship between per capita sales at the two mile distance interval and store complex.

The Analysis of Variance disclosed the following significance at the two mile distance interval.

Figure 12
ANALYSIS OF VARIANCE - STORE COMPLEX
AND PER CAPITA SALES AT 2 MILE DISTANCE INTERVAL
(Column = Store Complex)

Source of Variation	DF	SS	Msq	F
Total	11	.2115		
Between Columns	4	.1571	.0393	5.0385*
Within	7	.0544	.0078	

(*Reference Point: 95% 4.12; 99% 7.85)

The resulting F is significant at the 95 per cent level of significance. The Multiple Range Tests indicated the following significant (95% level) variations among the store types:

A. The Urban Strip type is significantly different in per capita sales from the Community Shopping Center type at the 2 mile distance interval.

B. The Urban Cluster type is significantly different in per capita sales from the Community Shopping Center type at the 2 mile distance interval.

5. Relationship between per capita sales (1/2 mile distance interval) and store size.

A test for correlation was made between the store size and per capita sales variables at the 1/2 mile distance interval using data from all fifteen survey stores. The procedure resulted in a Coefficient of Correlation of -.540 which is significant at the 95 per cent level of significance.

6. Relationship between per capita sales (1-1/4 mile distance interval) and store size.

A test for correlation was made between the store size and per capita sales variables using data from twelve stores.[7] A Coefficient of Correlation of +.192 was obtained which is not significant at the 90 or 95 per cent level of significance.

7. Relationship between per capita sales (2 mile distance interval) and store size.

A test for correlation was made between the store size and per capita sales variables using data from twelve survey stores. A Coefficient of Correlation of +.166 was obtained which is not significant at the 90 or 95 per cent level of significance.

Other Findings

Introduction

This selection offers comments and insights into two general types of propositions. In the literature of supermarket location

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[7]Excluding Small Town type stores (3)

analysis several generalizations are found concerning the relationship between density and drawing power. One such generalization states:

> "The denser the population, the larger the size of the trading area, but the greater the per cent of sales that come from close-in. Dense population attract more and larger supermarkets to one focal point, and the effect of a number of supermarkets located side by side is a bigger trading area for each store.[8]

Data are presented that provide insights into the validity of this type of proposition.

A second type of proposition that is investigated in this section is that prompted by discovery of systematic patterns of data. The proposition is not directly relavent to the research problem but it is a significant periphreal area in the problems of store location.

The Influence of Population Density on Drawing Power and Per Capita Sales

In Table 17 the relationship between population density, per capita sales and drawing power is presented. The data are arrayed according to population density at the 1-1/4 mile distance interval are divided into density categories. When the data are arrayed in this manner, there is a definite connection between population density and per capita sales. With the exception

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[8] William Applebaum and Saul B. Cohen, "Store Location Strategy in a Changing Market" Proceedings of the 1961 Midyear Conference (Chicago: Supermarket Institute, 1961), p. 8 (reprint).

of the Regional Shopping Centers an inverse relationship occurs when population density is compared to drawing power at the 70 and 90 per cent level.

However, the relationship must be interpreted with the awareness that there is also a relationship between store type and population density. In Table 18 the relationship is demonstrated by grouping the data in their respective store type classifications.

Influence of Date of Opening Upon Drawing Power and Per Capita Sales

In Table 19 the fifteen survey stores are ranked by date of opening. There appears to be little relationship between date of opening and per capita sales or drawing power in this table. However, when the data are classified by store type (Table 20), there is a relationship within certain of the store type groupings.

Influence of Competition Upon Drawing Power and Per Capita Sales

In Table 21 the number of competitive supermarkets is presented by distance interval. The exact spatial relationship of these supermarkets to the survey store is presented by degree and distance in Appendix G. The influence of competition at the 1/2 mile distance interval is shown in Table 22.

<u>Statistical Significance of Findings</u>

Rank Order Correlations were made for the following relationships:

Relationship	Rxy.
Population Density and Drawing Power (70%)	- .482
Population Density and Drawing Power (90%)	- .579
Population Density and Per Capita Sales	
1/2 mile distance interval	- .271
1-1/4 mile distance interval	- .512
1-1/4 mile cumulative	- .406
2 mile distance interval	- .610
2 mile cumulative	- .400

TABLE 17

POPULATION DENSITY, PER CAPITA SALES AND DRAWING POWER BY SURVEY STORE

Survey Store	Population[1] Density	Per Capita[2] Sales	Drawing Power (Miles) 70%	Drawing Power (Miles) 90%
Small Town-3	479	$4.12	.87	1.41
Small Town-1	802	1.75	.54	1.22
Small Town-2	1,042	2.33	.84	1.44
Neighborhood Shopping Center-1	2,297	.95	.88	1.24
Community Shopping Center-1	4,532	.55	.98	1.34
Neighborhood Shopping Center-2	5,087	.86	.74	.97
Community Shopping Center-2	7,037	.90	.82	1.17
Regional Shopping Center-1	6,858	.23	2.42	3.15
Urban Strip-1	9,280	.34	.32	.39
Urban Strip-2	9,135	.44	.37	.57
Regional Shopping Center-2	9,089	.33	1.57	1.86
Urban Cluster-1	10,271	.59	.43	.62
Urban Cluster-3	15,283	.62	.39	.56
Urban Cluster-2	16,189	.48	.49	.67
Urban Strip-3	16,279	.50	.41	.55

[1]Population per square mile within 1-1/4 mile radius of survey store.

[2]Cumulative per capita sales at 1-1/4 mile distance interval.

TABLE 18

POPULATION DENSITY, PER CAPITA SALES AND DRAWING POWER BY STORE TYPE

Store Type	Population[1] Density	Per Capita[2] Sales	Drawing Power (Miles) 70%	90%
Urban Strip	11,565	$ .44	.38	.52
Urban Cluster	13,915	.56	.43	.62
Small Town	775	2.50	.79	1.38
Neighborhood Shopping Center	3,692	.89	.79	1.05
Community Shopping Center	5,785	.76	.87	1.22
Regional Shopping Center	7,973	.29	1.95	2.53

[1]Population per square mile within 1-1/4 mile radius of survey store.

[2]At 1-1/4 mile comulative distance interval.

TABLE 19

PER CAPITA SALES, DRAWING POWER AND DATE OF OPENING BY SURVEY STORE

Survey Store	Date of Opening	Per Capita Sales[1]	Drawing Power (Miles) 70%	Drawing Power (Miles) 90%
Small Town-1	1/41	$1.61	.54	1.22
Urban Strip-1	10/44	.18	.32	.39
Urban Strip-2	6/50	.18	.37	.57
Small Town-2	8/51	2.09	.84	1.44
Urban Cluster-1	3/52	.30	.43	.62
Regional Shopping Center-1	3/54	.17	2.42	3.15
Neighborhood Shopping Center-2	1/56	.41	.74	.97
Small Town-3	6/57	4.07	.87	1.41
Regional Shopping Center-2	7/57	.24	1.57	1.86
Neighborhood Shopping Center-1	9/57	.71	.88	1.24
Urban Strip-3	1/58	.22	.41	.55
Community Shopping Center-2	8/58	.60	.82	1.17
Community Shopping Center-1	1/59	.28	.98	1.34
Urban Cluster-3	8/59	.29	.39	.56
Urban Cluster-2	9/59	.23	.49	.67

[1]Per capita sales within a two mile radius of the survey store.

TABLE 20

PER CAPITA SALES, DRAWING POWER AND DATE OF OPENING BY STORE TYPE

Survey Store	Date of Opening	Per Capita Sales[1]	Drawing Power (Miles) 70%	90%
Urban Strip-1	10/44	$ .18	.32	.39
Urban Strip-2	6/50	.18	.37	.57
Urban Strip-3	1/58	.22	.41	.55
Urban Cluster-1	3/52	.30	.43	.62
Urban Cluster-2	9/59	.23	.49	.67
Urban Cluster-3	8/59	.29	.39	.56
Small Town-1	1/41	1.61	.54	1.22
Small Town-2	8/51	2.09	.84	1.44
Small Town-3	6/57	4.07	.87	1.41
Neighborhood Shopping Center-1	9/57	.71	.88	1.24
Neighborhood Shopping Center-2	1/56	.41	.74	.97
Community Shopping Center-1	1/59	.28	.98	1.34
Community Shopping Center-2	8/58	.60	.82	1.17
Regional Shopping Center-1	3/54	.17	2.42	3.15
Regional Shopping Center-2	7/57	.24	1.57	1.86

[1] Per capita sales within a two mile radius of the survey store.

TABLE 21

NUMBER OF COMPETITIVE SUPERMARKETS BY DISTANCE INTERVAL AND SURVEY STORE

Survey Store	Distance Interval			
	1/2 Mile	1-1/4 Mile	2 Mile	Total
Urban Strip-1	1	3	6	10
Urban Strip-2	1	6	4	11
Urban Strip-3	0	5	5	10
Urban Cluster-1	2	3	6	11
Urban Cluster-2	2	1	12	15
Urban Cluster-3	0	4	6	10
Small Town-1	1	0	0	1
Small Town-2	1	0	0	1
Small Town-3	0	0	0	0
Neighborhood Shopping Center-1	0	3	1	4
Neighborhood Shopping Center-2	1	3	2	6
Community Shopping Center-1	1	0	5	6
Community Shopping Center-2	2	2	6	10
Regional Shopping Center-1	1	0	7	8
Regional Shopping Center-2	0	2	5	7

Note: Does not include "sister" stores - see Appendix G for this information.

TABLE 22

NUMBER OF COMPETITIVE SUPERMARKETS, PER CAPITA SALES AND DRAWING POWER AT 1/2 MILE DISTANCE INTERVAL BY SURVEY STORE

Survey Store	Number of Competitive Supermarkets	Per Capita Sales at 1/2 Mile	Drawing Power (Miles) 70%	Drawing Power (Miles) 90%
Urban Strip-1	1	$1.10	.32	.39
Urban Strip-2	1	1.83	.37	.57
Urban Strip-3	0	1.89	.41	.55
Urban Cluster-1	2	1.92	.43	.62
Urban Cluster-2	2	1.63	.49	.67
Urban Cluster-3	0	1.89	.39	.56
Small Town-1	1	1.68	.54	1.22
Small Town-2	1	2.32	.84	1.44
Small Town-3	0	4.28	.87	1.41
Neighborhood Shopping Center-1	0	2.02	.88	1.24
Neighborhood Shopping Center-2	1	1.58	.74	.97
Community Shopping Center-1	1	1.77	.98	1.34
Community Shopping Center-2	2	1.50	.82	1.17
Regional Shopping Center-1	1	.38	2.42	3.15
Regional Shopping Center-2	0	.50	1.57	1.86

CHAPTER V

SUMMARY AND CONCLUSIONS

Introduction

The purpose of Chapter V is to present the summary and conclusions of the research findings. The chapter is divided into three sections. The first section evaluates the hypotheses presented in Chapter I in relation to the research findings. The second section relates these findings to the practical problems of the supermarket location decision. The implications of the findings are discussed within the typical problem solving framework of the supermarket chain operator. Section three presents possible extentions of the research. Significant problem areas not directly relevant to the research, as well as further refinements of the research are also presented and discussed.

Evaluation of Hypothesis

Store Complex Hypotheses

1. As the product offering at a retail complex increases (as measured by number and types of different stores) the drawing power of the supermarket increases.

On the basis of Table 7 and Figure 8 and 9, the hypothesis is judged to be valid. In Table 7 a series of data are presented indicating an increase in drawing power by levels of store complex.

Table 8 offers additional support for the validity of the hypothesis by indicating the degree of consistency within each category of store type. The deviation in pattern shown by the Small Town type at the 90 per cent customer level (Table 7) can be explained by a comparison of mean and median values for the Small Town type store (Table 9).

From the characteristics of the data in Table 7 and 8, three relatively homogeneous categories of drawing levels emerge. The Urban Strip and Urban Cluster types represent the first category; the Small Town, Neighborhood Shopping Center and Community Shopping Center types represent the second category; and, the Regional Shopping Center type stands alone as a third category.

2. A small town relatively isolated from any other city demonstrates drawing power patterns similar to the medium sized shopping center (community).

In the course of gathering basic data it was noted that the small towns selected for study had approximately the same number of retail businesses in their central business district as the large community shopping center (40-50 retail business units). Since the small town business area functions as a nucleated business district, it was hypothesized that the small town would demonstrate drawing power characteristics similar to the medium sized shopping center.

On the basis of Table 7 and 8, hypothesis number two is judged to be a valid hypothesis.

3. <u>As the product offering at a retail complex increases (as measured by number and types of different stores) per capita sales of the supermarket increase</u>.

Per capita sales were calculated at three distance intervals, one-half, one and one-quarter and two miles. The distnace categories used were subjected to analysis which indicated that the differences between distance intervals were highly significant (Figure 10).

The hypothesis as stated is invalid at every distance interval.

Both Table 13 and 14 present data which by inspection indicates that hypothesis number three would not hold. These tables (13-14) do, however, present a systematic pattern of data by distance interval. Per capita sales rise at every distance interval up to the Small Town type and then fall; with the Neighborhood Shopping Center being lower than the Small Town type; the Community Shopping Center lower in per capita sales than the Neighborhood Shopping Center; and, the Regional Shopping Center being sharply lower from the Community Shopping Center level.

It is also significant to note in Tables 13 and 14 the variation in per capita sales at the 1-1/4 and 2 mile distance intervals. The wide deviation between the Small Town and other store types can probably be explained by the lack of competition in the small towns (Table 21). The deviation between the smaller shopping centers and the urban stores is more difficult to justify on the basis of competition and are probably due to the degree of store complex.

Store Size Hypotheses

1. As the size of store (as measured by square feet of selling area) increases, per capita sales of the supermarket increase.

The data relevant to the above hypothesis are presented in Tables 10 and 11. When the store size and drawing power variables were correlated for the 70 per cent level of customer drawing power, a coefficient of correlation of $^{+}$.575 was obtained. The coefficient of correlation is significant at the 95 per cent level of significance. When the store size and drawing power variables were correlated for the 90 per cent level of customer drawing power a coefficient of correlation of $^{+}$.444 was obtained. The coefficient of correlation for the 90 per cent level of customer drawing power is significant at the 90 per cent level of significance, but not at the 95 per cent level.

The store size hypothesis is judged as invalid on the basis of the distribution of data in Tables 10 and 11, and the low coefficients obtained in the Correlation procedures. In Table 11 the data are classified and presented by store type. There are some indications that size of store has an influence upon drawing power within the store type classification, but further observations would be necessary to test this observation.

2. <u>As the size of store (as measured by square feet of selling area) increases, per capita sales of the supermarket increase</u>.

The above hypothesis refers to per capita sales within a two mile radius of the survey store. The importance and influence of the per capita sales data are more effectively interpreted if the data are analyzed in reference to Table 12, which presents the percentage of customers living within a 2 mile radius of the survey stores.

Data relevant to the hypothesis are presented in Tables 15 and 16. The variables of store size and per capita sales were correlated for the 1/2 mile, 1 1/4 miles and 2 mile distance intervals. The resulting coefficients of correlation were: -.540, $^{+}$,192 and $^{+}$.166, for the 1/2 mile, 1 1/4 miles and 2 mile distance intervals, respectively. The coefficient of -.540 is significant at the 95 per cent level of significance. The coefficients of $^{+}$.196 and $^{+}$.166 are not significant.

The above hypothesis is judged to be invalid on the basis of the distribution of the data presented in Tables 15 and 16 and the low coefficients of correlation obtained in the Correlation procedures.

Conclusions

The conclusions section is divided into two sections. The first section contains conclusions based upon the statistical findings contained in Chapter IV. The criterion of a 95 per cent level of confidence was established as the criterion of reliability for the conclusions. The second part of this section presents conclusions that emerge from the statistical and analytical treatment of the data.

Statistical Findings

1. The relationship between drawing power (70 per cent customer level) and store complex is significant.
2. The Regional Shopping Center type is significantly different in drawing power (70 per cent customer level) from all other store types.
3. The Urban Strip type is significantly different in drawing power (70 per cent customer level) from the Community and Regional Shopping Center types.
4. The relationship between drawing power (90 per cent customer level) and store complex is significant.
5. The Urban Strip type is significantly different in drawing power (90 per cent customer level) from the Small Town type.
6. The Urban Strip type is significantly different in drawing power (90 per cent customer level) from the Community Shopping Center type.

7. The Urban Strip is significantly different in drawing power (90 per cent customer level) from the Regional Shopping Center type.
8. The Urban Cluster type is significantly different in drawing power (90 per cent customer level) from the Small Town type.
9. The Urban Cluster type is significantly different (90 per cent customer level) from the Community Shopping Center type.
10. The Urban Cluster type is significantly different in drawing power (90 per cent customer level) from the Regional Shopping Center type.
11. There is a significant relationship between drawing power (70 per cent customer level) and store size.
12. There is no signficant relationship between drawing power (90 per cent customer level) and store size.
13. The 1/2 mile distance interval is significantly different from the 1 1/4 and 2 mile distance interval in per capita sales.
14. The 1 1/4 mile distance interval is significantly different from the 2 mile distance interval.
15. There is no significant relationship between per capita sales at the 1/2 mile distance interval and store complex.

16. The Regional Shopping Center type is significantly different than the Small Town type in per capita sales at the 1/2 mile distance interval.
17. There is a significant relationship between per capita sales at the 1-1/4 mile distance interval and store complex.
18. The Urban Strip type is significantly different in per capita sales from the Community Shopping Center at the 1-1/4 distance interval.
19. The Urban Strip type is significantly different in per capita sales from the Neighborhood Shopping Center type at the 1-1/4 mile distance interval.
20. The Urban Cluster type is significantly different in per capita sales from the Community Shopping Center type at the 1-1/4 mile distance interval.
21. The Urban Cluster type is significantly different in per capita sales from the Neighborhood Shopping Center type at the 1-1/4 mile distance.
22. The Regional Shopping Center type is significantly different in per capita sales from the Community Shopping Center type at the 1-1/4 mile distance interval.
23. The Regional Shopping Center is significantly different in per capita sales from the Neighborhood Shopping Center type at the 1-1/4 mile distance interval.

24. The Urban Strip type is significantly different in per capita sales from the Community Shopping Center type at the 2 mile distance interval.
25. The Urban Cluster type is significantly different in per capita sales from the Community Shopping Center type at the 2 mile distance interval.
26. There is a significant negative relationship between store size and per capita sales at the 1/2 mile distance interval.

Analytical Conclusions

Store Complex and Drawing Power

Store Complex exerts a relatively significant influence upon drawing power, both at the 70 and 90 per cent drawing power level (Table 7). As the level of product offering at the retail site increases, the drawing power increases. However, the drawing power findings indicate that the increases in drawing power are not proportionate to the level of product offering at the retail site, but rather the data cluster into three general classifications.

The first classification consists of the Urban Strip and Urban Cluster types. The second classification includes the Small Town, Neighborhood Shopping Center and Community Shopping Center types. The Regional Shopping Center type stands alone as the third category. The classification of drawing power by individual survey store further substantiates the classification

(Table 8). From these data the fact is deduced that there exists distinct levels of drawing power attraction clustered around different levels of store complex. These data are arrayed as follows to indicate the distinctive characteristics of drawing power by the above outlined classifications.

TABLE 23

RANGE OF DRAWING POWER---GENERAL CLASSIFICATION
BY STORE TYPE

Classification	Drawing Power 70 Per Cent	 90 Per Cent
1	.38 - .43 miles	.56 - .62 miles
2	.79 - .87 miles	1.05 -1.38 miles
3	1.95 miles	2.53 miles

If this type of classification is applied to the individual survey stores, the following array of data results:

TABLE 24

RANGE OF DRAWING POWER---GENERAL CLASSIFICATION
BY SURVEY STORE

Classification	Drawing Power 70 Per Cent	 90 Per Cent
1	.32 - .49 miles	.39 - .67 miles
2	.54 - .98 miles	.97 -1.44 miles
3	1.57 -2.42 miles	1.86 -3.15 miles

Thus, two general types of conclusions can be drawn on the basis of the findings regarding the relationship between store complex and drawing power.

1. As store complex increases, drawing power increases, but not proportionate to the level of product offering at the retail site.
2. There are distinct drawing power characteristics that tend to cluster at certain levels of store complex.

Store Size and Drawing Power

The independent variables of store size and store complex are related to some degree. That is, large supermarkets are built in a large shopping center and small stores are more likely to be found in a small town. When the findings are presented by rank order of store size (Table 10) there is no apparent relationship between store size and drawing power.

To remove the possible distortion caused by the interrelationship of store size and store complex, the data are also presented by individual survey stores arrayed according to store type (Table 11). It would seem that by comparing store size and drawing power within the individual store type classifications a more accurate reflection of the influence of store size upon drawing power might be obtained, since the store type variable would be held constant. However, when the data are

presented in this manner it again fails to indicate any systematic relationship between store size and drawing power.

Thus, the conclusion must be drawn that on the basis of the findings there exists no systematic and reliable connection between store size and drawing power.

Store Type and Per Capita Sales

Per capita sales estimates were made at the 1/2, 1-1/4 and 2 mile distance intervals from the survey store (Appendix C-4, E). Per capita sales outside a 2 mile radius from the survey store were not calculated since the major segment of customers for all store types with the exception of the Regional Shopping Center type were located within two miles of the survey store.

In this regard, several special cautions should be exercised in the interpretation of per capita sales data. First, the Regional Shopping Center type draws over 65 per cent of its customers from beyond the 2 mile distance interval. Hence, when per capita sales data are presented for the Regional Shopping Center type, it is relevant only to the 35 per cent of the customers of this store type. Another factor that should be noted is the lack of competition for the Small Town type stores (Table 22). The factor probably contributed to an unusually high per capita sales figure throughout the entire area under consideration.

At the 1/2 mile distance interval, store complex has little effect upon per capita sales except in the case of the Regional

Shopping Center. There is a negative relationship between store complex and per capita sales when the total for the Regional Shopping Center type is contrasted to the remaining five types at the 1/2 mile distance interval (Table 13). The convenience nature of the products sold by the supermarket probably accounts for the lack of variation in the data at the 1/2 mile distance interval. The low per capita sales of the Regional Shopping Center at the 1/2 mile distance interval is probably due to the fact that the typical consumer prefers not to become involved with the problems of large parking lots and heavy traffic if the sole objective of his shopping trip is for food purchasing.

At the 1-1/4 mile distance interval a more distinct pattern of per capita sales emerges (Table 13). The influence of store complex upon per capita sales also becomes more evident. The data cluster in three general classifications at the 1-1/4 mile distance interval. The first classification includes the Urban Strip, Urban Cluster and Regional Shopping Center types. The second category includes the Community and Neighborhood Shopping Center types. In the third category the Small Town type stands alone in per capita sales characteristics. The array and range of data at the 1-1/4 mile interval by store type are presented in Table 25. A similar presentation of data using per capita sales by individual survey store is presented in Table 26.

TABLE 25

RANGE OF PER CAPITA SALES AT 1-1/4 MILE DISTANCE INTERVAL--GENERAL CLASSIFICATION BY STORE TYPE

Classification	Range of per Capita Sales by Store Type
1	$.21 - .28
2	.62 - .71
3	2.64

TABLE 26

RANGE OF PER CAPITA SALES AT 1-1/4 MILE DISTANCE INTERVAL--GENERAL CLASSIFICATION BY SURVEY STORE

Classification	Range of per Capita Sales by Survey Store
1	$ .15 - .31
2	.62 - .78
3	2.13 - 3.67

The distribution of per capita sales at the 1-1/4 mile distance interval indicates that store complex begins to influence per capita sales somewhere between 1/2 and 1-1/4 miles from the store. The negative relationship between the variables found in the Regional Shopping Center at the 1/2 mile distance interval continues to exert an influence at the 1-1/4 mile distance interval when contrasted with the per capita sales levels of the Neighborhood and Community Shopping Center types.

The consistency of these data is found both in store type (Table 13) and when classified by individual survey store (Table 14).

The relationship between store complex and per capita sales becomes even more apparent at the 2 mile distance interval (Table 13). Again, the data clusters around certain levels of store complex making possible distinct classifications. However, due to the fact that per capita sales for the Regional Shopping Center remain at a relatively high level, the classifications formulated for the 1-1/4 mile distance interval must be realligned. The general classification at the two mile distance interval is as follows: 1) Urban Strip and Urban Cluster; 2) Neighborhood, Community and Regional Shopping Center; and 3) Small Town. The range of per capita sales at the 2 mile distance interval using these classifications is presented in Table 27.

TABLE 27

RANGE OF PER CAPITA SALES AT 2 MILE DISTANCE INTERVAL--
GENERAL CLASSIFICATION BY SURVEY STORE

Classification	Range of per Capita Sales by Store Type
1	$.02 - $ .06
2	.16 - .23
3	1.64

A similar distribution of data using the same classifications, but using the range of the individual survey stores within the general classification, is presented in Table 28.

TABLE 28

RANGE OF PER CAPITA SALES AT 2 MILE DISTANCE INTERVAL--GENERAL CLASSIFICATION BY SURVEY STORE

Classification	Range of Per Capita Sales by Store Type
1	$ .002 - $ .06
2	.14 - .48
3	.67 - 3.76

It should be noted that both the high value for the range in classifications 2 and the low value for the range in classification 2 show a wide deviation from the mean value of the distribution (Table 14).

The distribution of per capita sales at the 2 mile distance interval indicates that the influence of store complex on per capita sales becomes greater as the distance from the survey store increases.

In summary the following conclusions are drawn from these findings:

1. All store types, with the exception of the Regional Shopping Center type, achieve relatively similar per capita sales in the 1/2 mile distance interval.

2. The congestion created by the number of stores and large parking areas provided by the Regional Shopping Center type effect a negative influence upon per capita sales in the 1/2 mile distance interval.
3. Per capita sales for the Small Town type are higher than other store types at all levels due to the fact that the consumer has a limited range of alternatives (stores) with which to fulfill food purchasing objectives.
4. Per capita sales for the Urban Strip and Urban Cluster types drop more rapidly than for the Community and Neighborhood Shopping Center types at the 1-1/4 and 2 mile distance interval.
5. The influence of store complex on per capita sales becomes more prominent at the 1-1/4 and 2 mile distance intervals.

Store Size and Per Capita Sales

As was indicated in the above section on store size and drawing power, there is probably a relationship between store size and store complex. If the data are arrayed by rank order of store size (Table 15) there appears to be a negative relationship between store size and per capita sales at the 1/2 mile distance interval. Correlation of the series indicates a coefficient of correlation of -.540 which is significant at the 95 per cent level of confidence. Correlation between store size and per capita sales at the 1-1/4 and 2 mile distance intervals produce coefficient of correlations of +.192 and +.166 respectively. Neither of these coefficients are significant at the 90 or 95 per cent level of significance.

These same findings are presented by store type and store size in Table 16 in order to minimize distortions due to the relationship between store size and store type. There is no distinct pattern of store size influence even when this relationship is presented by store type classification.

In summary it is concluded that on the basis of these findings there is no systematic and reliable connection between store size and per capita sales.

Implication of Findings for Location Policy

Introduction

The supermarket chain operator faces two types of problems when seeking to formulate effective policy and strategy for market development. They are:

1) The problem of optimal network expansion where the objective is to construct a network of stores that will provide optimum sales and profit in any given market territory.
2) The problem of developing individual distribution points

where the objective is to develop a profitable individual distribution unit.

These two problems are closely related and the development of any individual location must be evaluated both on its profitability as an individual site and on its contribution to network expansion. For any given location decision, both the objective of optimal network expansion and individual store profitability should be achieved. However, in the competitive market place location strategy might dictate that the objective of individual store profitability be subordinated to the objective of optimal network expansion. That is, it is realistic to assume that some individual locations are developed with the prospect of future profitability and/or present market representation rather than immediate profitability.[1]

The factor of uncertain competitive adjustments to the location decision add a demension of strategy to the supermarket chain operator's location policy. The twin objectives of optimal network expansion and individual store profitability must be sought in an uncertain competitive environment. The degree of freedom of competitive reactions to the location decision is almost unlimited. A practical limitation is provided by the fact that all competitors presumably formulate location policy in order to insure survival in the marketplace.

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[1]"The Structure of Retail Competition in the Philadelphia Market," op. cit., p. 51.

If all competitors in the market place were aware of the economics[1] involved in the location decision, a more orderly and efficient competitive environment than currently exists in most metropolitan areas would result. That is, in almost every large city there are areas that are overstored and have too many supermarkets servicing the population of the area to allow a reasonable return on investment for the stores in the area. This type of situation would not develope if all supermarket operators sought to achieve the objectives of optimal network expansion and individual store profitability within an economically justified framework.

It is necessary that all competitors be aware of the economics of location development. One reckless competitor committed to expansion at any cost can disturb the economic structure of the market for all of the competitors in the market place.

In summary it appears that one of the most pressing problems facing the supermarket industry is an awareness of the economics involved in the location decision.

Store Complex and Location Policy

The concept of store type can be useful in developing sound location policy in several ways. The conclusion that a store placed in a certain retail complex will perform differently both

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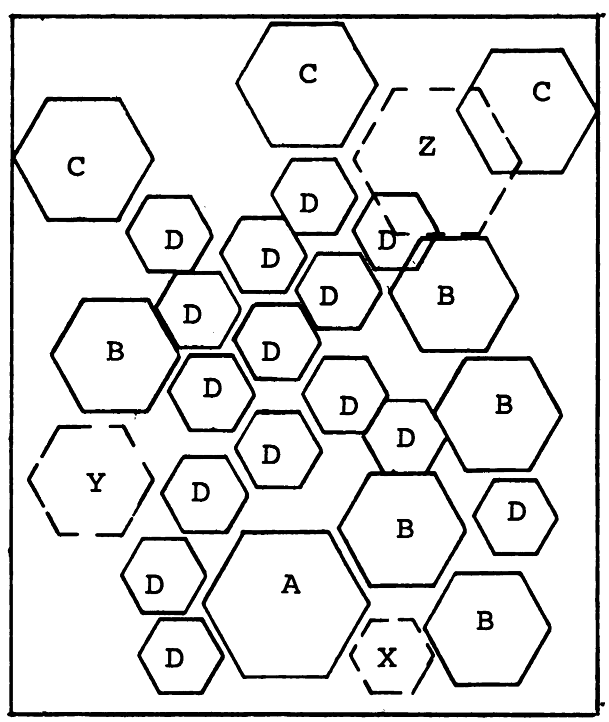
[1]The term "economics" as it is used here refers to the concept of return on investment.

in drawing power and per capita sales than when placed in another form of retail complex has some obvious and significant implications for optimal network expansion. The supermarket chain either consciously or unconsciously has a great variety of store types within any metropolitan area. If these types are isolated and analyzed and their drawing power characteristics determined an optimum network of distribution points can be established and maintained by adding or closing individual distribution points.

Regarding the location decision to build a new store the implication of this research would be to build a store in the store complex situation that would match the geographical limits

FIGURE 13

HYPOTHETICAL DISTRIBUTION NETWORK



Store Type

A = Regional Shopping Center
B = Community and Neighborhood Shopping Center
C = Small Town
D = Urban Strip and Cluster
X, Y, Z = Proposed Sites

of market opportunity. In Figure 14 a network of stores for a hypothetical city is outlined. The size of the hexagons corresponds to relative drawing power of store types. Points X, Y, and Z represent proposed additions to the network.

Proposed store "X" is located on a major traffic artery in an urban area. The proposed store type is on Urban Strip and it appears that given this segment of undeveloped market opportunity that the development of this location would contribute to the network as a whole. Proposed store "Y" is located on the fringe of town in a new Neighborhood Shopping Center. As illustrated this location would also contribute to optimum network expansion. Proposed location "Z" is located in a new Regional Shopping Center. The drawing power of the Regional Shopping Center would cause a store at this point seriously to compete with other segments of the network and hence a store developed at this point would be detrimental to optimum network expansion.

The hypothetical analysis above assumes that there is sufficient potential available for market development and that competition is evenly distributed throughout the market area.

Since it has been established that different store types have different patterns of per capita sales, this concept may also be useful in estimating sales volume for a proposed site. If enough observations were made for a given store type, the following procedure might produce valid results in estimating sales volume for a proposed site.

TABLE 29

PROCEDURE FOR CALCULTION ON ESTIMATED WEEKLY SALES FOR PROPOSED SITE

Distance Interval	Population	Per Capita Sales	Total Sales
1/2	10,000	$1.55	$15,500.00
1-1/4	20,000	.21	4,200.00
2	50,000	.02	1,000.00
		Sales under 2 miles	$22,700.00
		Sales over 2 miles	2,110.00
		Total Weekly Sales	$24,810.00

The basic formula used for the estimation procedure outlined above is:

$$\text{Total Weekly Sales} = (P_a \times PCS_a) + (P_b \times PCS_b) + (P_c \times PCS_c) + (TS_x)$$

Where: P_a = Population within 1/2 mile of survey store.

PCS_a = Per capita sales figure for Urban Strip type 1/2 mile distance interval.

P_b = Population in 1 1/4 mile distance interval

PCS_b = Per capita sales figure for Urban Strip type at 1 1/4 mile distance interval.

P_c = Population in 2 mile distance interval.

PCS_c = Per capita sales figure for Urban Strip type at 2 mile distance interval.

TS_x = Total sales over two miles--The total is calculated in Table 30 by the following:

$$TS_x = \frac{91.5\%}{8.5\%} + \frac{\$22,700}{X}$$

Where: 91.5% = Per cent of customers from under 2 miles.

8.5% = Per cent of customers from over 2 miles.

\$22,700 = Weekly sales within 2 miles of survey store

X = Weekly sales over 2 miles from survey store.

The degree of accuracy of the procedure would be influenced by several factors. First, it seems to be a generally accepted fact that a supermarket's average weekly sales will decline over time.[2] Estimating sales on the basis of currently operating supermarkets might then produce a disproportionately low sales estimate. The factor of declining weekly sales could be adjusted for in the formula quite easily, if the rate of sales decline were a constant.

A second factor influencing the usefulness of the per capita sales measurement for estimating sales volume for proposed sites would be the amount and degree of competition. If further research can accurately establish the influence of competition upon per capita sales, then the factor of competition could also be

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[2]This gradual decline in weekly sales was proposed as a common phenomena by a number of supermarket chain real estate executives interviewed by the author.

incorporated into a formula for estimating sales volume of proposed sites.

Store Size and Location Policy

There is no connection between store size and drawing power or per capita sales for the survey stores analyzed in this research. In general, the larger a store the greater investment required in facilities. As the amount of investment in the location increases, a larger amount of sales are required to maintain a constant return on investment.

The increasing return on investment would presumably lead the developer to use a minimum size of store criterion in his development policy. Both a more profitable total network and more profitable individual locations would result from a minimum store size criteria in development policy.

On the basis of these research findings it would seem difficult to justify the increasing size of store on the basis of performance. There are probably promotional factor and long range planning factors that enter into store size decisions. However, it would seem that the size of store decision should be critically evaluated by supermarket management in its' relation to profitable network and site development.

The Dynamics of Location Policy and Strategy

The establishment and maintenance of an optimal network of distribution points is a continous challenge due to a number of dynamic factors in the marketplace. When the decision is made to develop an individual location, the site becomes a fixed target for competitive adjustments. Due to the fixed nature of the costs incurred in developing a site an error, once made, is likely to develop into a situation where the supermarket chain continues to pay both in terms of profits and poor market representation for a number of years.

The huge shifts of population to the suburbs along with an increasing number of competitors cause a constant shift in the structure of optimal network. The alert developer must constantly reassess his market structure both in terms of profitability and in terms of how well his market is being served.

The concept of store type and the implications of the store size variable provide some insights into a possible framework for planning and evaluating the distribution structure of the modern large scale supermarket chain. The conclusions, while drawn on the basis of a limited number of observations, provide a methodology and approach to the problem of evaluating both the objective of optimal network expansion and individual store profitability.

Suggested Areas for Further Research

There are a very limited number of publications dealing with location research. The researcher working in this field is handicapped to some extent by the lack of established methodology and the lack of comparative data. With the increasing emphasis upon mass merchandising and large scale retailing some of the traditional competitive silence on location procedures and study should be breached.

Three broad areas for further research are suggested. It is believed that a significant research contribution could be made in broadening the concept of store type. Six selected levels of store complex were chosen for this research. As noted above the levels of store complex range on a continuum from the free standing store to the Regional Shopping Center. A research study designed to isolate and classify additional store types would provide the supermarket industry with additional tools for intelligent and efficient market development. Research devoted to exploring in depth the various classifications of store profitability type would also prove of value in evaluating individual store profitability.

A second area suggested for further research is research regarding the influence of the store size variable. The store size variable is not established as significant in this research. However, within the store type classifications there is some indication that this variable is important. Further observations using a greater number and range of store size might contribute valuable additional insights into the economic justification of the large supermarket.

A third broad area of inquiry is the study of the competitive environment of the supermarket industry. More specifically, what is the influence of competition upon the drawing power and per capita sales of the supermarkets? Several vague generalization or rules-of-thumb are accepted in the supermarket industry regarding competition. There are some indications based on the present study that these rules would not stand the rigor of close observation. As the marketplace becomes more saturated and over storing becomes a more common situation the necessity of an answer to the question of competitive influence becomes imperative.

If a contribution to more efficient competition is to be made by increased amounts of location research, several prerequisites are necessary. First, the firms must stand ready to provide their retail units as laboratories for the collection of data. They must further be ready to share the results of their research through an independent research institute of integrity with competitor and non-competitor alike. The researcher must publish clear and concise methodology and results so that his research might be duplicated and his results validated.

Lastly, the contributions of many desciplines must be integrated into the study of the retail structure of the market. The related and unrelated disciplines of marketing, transportation and traffic, economics, economic geography and others have theoretical and empirical insights to offer the location researcher.

APPENDIX A

Delineating Retail Trading Areas in Urban Areas

Delineating Retail Trading Areas in Urban Areas

Purpose

The purpose of this appendix is to present several methods for delineating retail trading areas in urban areas. The presentation of these techniques is divided into "procedure" and "evaluation". The procedure section gives a brief outline of how these techniques are employed, while the evaluation section points up the advantages and disadvantages of the different approaches.

This appendix presents techniques designed to delineate the trading areas of single sites or distinct clusters of stores (shopping center). Other techniques are available for delineating large retail trading areas such as the trading area of an entire city. Some of the techniques presented here can be used in both situations, but they are presented here within the framework of single-site or cluster analysis.

A comparative study of the effectiveness of various techniques for delineating the trading area of an entire community has been done by Isodore V. Fine.[1] In the study, Fine uses seven techniques for delineating the trading area of a community including:

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[1] Isodore V. Fine, Retail Trade Area Measurement Techniques as Applied to Fort Atkinson, Baraboo and West Bend, unpublished doctoral dissertation, Columbia University, 1953.

1. Law of retail gravitation.

2. Automobile license plate analysis.

3. Bank check clearance analysis.

4. Credit record analysis.

5. Newspaper circulation analysis.

6. Retailer determined delineation.

7. Consumer interviews.

He establishes the consumer-interview technique as the most accurate delineation and measure deviation from this model. He concludes that automobile license plate analysis is the second most accurate form of community trade area delineation.

Reilly's "Law of Retail Gravitation" was also first conceived as a method of establishing trading areas for large areas such as towns or cities. However, since its first formulation, it has undergone alterations which some authors claim has extended its usefulness to single-site and cluster locations. The envolvement of these procedures and current applications will be discussed in the second part of this appendix.

Introduction

The delineation of retail trading areas is undertaken for many different purposes. These purposes range from a projected rejuvenation of the central business district to providing a framework for projecting sales volume of a proposed store. The available techniques for delineation also vary widely in sophistication, accuracy, and cost. The existence of alternative techniques requires that the objective of the practical delineation problem be clearly defined so the most effective techniques may be employed in the research.

In a business environment, the clinical approach to the research problem is often applied to trading area analysis. That is, in contrast to the scientific method, the data is collected, and the problems, relationships, and influences are deduced from the data without benefit of prior hypotheses. There are certain disadvantages to the clinical approach in business research with one of the main weaknesses being its heavy dependence upon the skill (or lack of skill) of the diagnostician.

There are two basic approaches to the delineation of retail trading areas: 1) the empirical approach, 2) the gravitational approach.

The first of the two approaches, the empirical approach, depends upon primary data and, hence, is generally a more costly process. Depending, however, on the degree of accuracy required, it can often yield the best results at the lowest net cost. Other techniques might yield results at lower cost, however, these results might not possess the degree of accuracy specified by the research problem. The gravitational approach generally relies upon secondary data and, for this reason, is often less costly in application.

This appendix is devoted to a consideration of the two approaches outlined above.

The Empirical Approach

The empirical approach, as mentioned above, relies upon primary data. The data may be collected at the store site (or proposed store site) or they may be collected through field interviewing of the estimated trading area. Following are some common procedures for both methods of empirical analysis.

Site Survey

1. Customer Interview[2]

Procedure - Normally, the customer interviewing takes place within the store after the customer has completed his purchase. In the case of a self-service store, the customer is interviewed as he leaves the check-out stand. In the case of a personal-service type store, the customer in interviewed either while his purchase is being wrapped or after he has completed his purchase and is leaving the store.

The interviewing is done randomly with a quota sample or a stratified sample can be established. The type of sampling would depend upon the purposes of the interview, if any, in addition to delineating the trading area.

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[2] The customer-interview procedure was used in this research. A copy of instructions to the interviewers follows in Appendix B.

If the interviewing period covers extended periods of time or more than one interviewer is employed, caution should be taken so as not to interview a customer more than once.

In the case of a quota sample, a five to seven per cent allowance should be made to compensate for customers who have given non-existent addresses and recording errors. If the quota is exceeded, the excess customer interviews can be eliminated, using a table of random numbers.

Evaluation - The principal advantage of the customer-interview procedure is its flexibility. In addition to the customer address, a whole range of other information can be obtained. Information such as: size of purchase, types of purchase, reasons for purchases, shopping habits, competitive data, etc. A properly designed project can probe for useful attitudes, opinions and habits as well as provide the necessary data for delineating the trading area.[3]

The main disadvantage of this procedure is its expense. Costs are incurred both for the interviewing and the spotting of customers' homes on a map of the area. The costs involved depend

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[3]For examples of this technique see: Bart J. Epstein, "Evaluation of an Established Planned Shopping Center," Economic Geography, January, 1961, pp. 12-21; William Applebaum and Richard F. Spears, "How to Measure A Trading Area," Chain Store Age, January, 1951, pp. 149-154, and Bart J. Epstein and Howard J. Green, "Store Location Analysis," Marketing Research in Action, Studies in Business Policy, No. 84, National Industrial Conference Board, Inc., 1957, pp. 85-87.

upon the experience of the interviewers and individuals doing the map work as well as the size of the store and dispersion of customers. However, using a quota sample of one interview per one hundred dollars of sales per week, as used in this research, would result in costs of between seventy-five and one hundred and fifty dollars per store.

2. Automobile License Plate Analysis

Procedure - Prior to the actual recording of customer license plates all employees' plates are recorded. Owner and employee automobiles have a small influence on individual stores, but in the case of shopping centers, they could provide enough influence to cause some distortion of data.

In this procedure, a recorder is placed at every entrance to the parking lot. His job is to record all license plates entering the center or lot. In the case of a store with no off street parkings, this task becomes more difficult. Normally, the procedure when collecting data involving on-street parking is to analyze the parking situation and establish a parking zone for the store or cluster of stores under study. After the zone is established it is checked at short intervals (no longer than 10 minutes apart) and all new licenses are recorded. In both cases commerical vehicles are excluded from the sample or census.

The next step is to obtain the addresses of the car owners from the state license plate bureau. (It should be noted that the list of names and addresses obtained can also be used for mail questionnaire purposes.) These addresses are then plotted on a map and the trading area of the site delineated.

Evaluation - The license plate check assumes that the automobile is in the area for shopping purposes. The assumption seems entirely logical in the case of a shopping center or store parking lot. However, in the case of on-street parking, it is difficult to attribute the automobiles presence to any single store, or even group of stores. In the case of an off-street parking situation, area analysis rather than site analysis would provide the most accurate delineation.

The outstanding advantage of the automobile license plate analysis is that the desired information can be obtained in a relatively short period of time. An added advantage is that license plate data can also be obtained for a competitive location and with it a competitive trading area can be delineated.

One outstanding disadvantage of the automobile license plate analysis can be its expense. Many state motor vehicle departments charge a fee on a per name basis for this information. For example, in Michigan there is a charge of fifty cents per license. If a license plate check of a Regional Shopping Center were made, it could cost three to five thousand dollars to obtain the names and addresses for the recorded license plates. In other states the individual has access to the records or can hire a firm specializing in clerical recording service at a reasonable fee.

Another disadvantage of automobile license plate analysis is that unless followed up with a mail questionnaire, nothing can be deduced about the size of purchase or place of purchase.

3. Prize Contests

Procedure - The technique of delineating trading areas using prize contests is a fairly simple procedure. Usuallly a list of prizes is established appealing to a fairly wide range of customers. The rules for the contest are established. In some cases the customer is required to make a guess or estimate of something, and in other cases the customer has only to register to be eligible. He is given a slip of paper inside the store, or is offered the opportunity of clipping it out of a newspaper or circular and bringing it to the store. The coupon, when completely filled out, has the customer's name, address and phone number, along with any of the other procedural data required by the contest.

The addresses on these coupons are recorded and plotted on a map of the area and the trading area is delineated.

Evaluation - The chief advantage of the prize contest approach to trading area delineation is that the trading area can be delineated while at the same time store traffic is being increased. While this in a sense is an advantage, it is also a disadvantage in that the promotional aspects of the contest might distort normal shopping patterns hence, distort the actual trading area under normal circumstances.

Another problem generally associated with the prize contest type of approach is that it is difficult to select a list of prizes that will appeal to all age groups and sexes. If the prize list appeals to one segment of the potential customers more than another segment, a distorted trading area may result.

4. Check Cashing and Clearing

Procedure - Payroll check and personal check used in payment for merchandise provide another source of customer addresses. These addresses are recorded over a period of time. If payroll check constitutes a significant part of total checks taken in, then the recording period is established over the entire payroll cycle. In a factory area the payroll cycle would probably be one week in a largely white collar area it would probably be either a two week or monthly payroll cycle.

Evaluation - The credit record approach also has the advantage of being a simple and inexpensive method of tentatively delineating the trading area. On the other hand, it also possesses a similar weakness to credit record analysis in that the use of checking accounts is not uniform throughout every area. The use of a checking account is influenced by the individuals' age, marital status, occupation, etc.

Area Survey

1. Home Interviewing

Procedure - The home interview is generally used in connection with the analysis of a proposed site rather than an existing location. Its purpose is usually to determine present shopping habits and willingness to change under certain circumstances.

A probability sample can be effectively employed if the proper lists of data are available.[4] After the sample is drawn, field interviews are made regarding shopping habits, attitudes, etc. Upon completion of the data collection phase, the data are proportionately expanded to cover the entire area and estimates of potential business are made.[5]

Evaluation - The home interviewing approach to retail trading area delineation is undoubtedly the most accurate and useful form of analysis. It provides the researcher with both a geographic and per capita sales projection for a proposed site. It is also useful in attacking specific problems for existing sites, such as shrinking sales volume in certain areas.

The major disadvantage of the home interviewing approach is its costs. However, when a site is being considered for

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[4] "Sampling Methods for a Small Household Survey" Public Health Monograph No. 40, U.S. Department of Health, Education and Welfare (Washington: U.S. Government Printing Office, 1956).

[5] For a graphic example of this type of procedure see: Richard L. Nelson, The Selection of Retail Locations (New York: F. W. Dodge Corporation, 1958) pp. 160-163.

development, the survey cost as per cent of total development cost might be relatively small in the long run.

2. Telephone Interview

Procedure - Using properly trained personnel it is possible to obtain useful results through telephone interviewing.

Using the cross index phone directory available in most larger cities the same sampling procedure used in the home interviewing is established. Then, instead of an actual visit, the names selected for the sample are contacted by telephone. The telephone interviewers use a standard interview guide to insure comparability of data and records all responses as they are made.

After the telephone interviewing portion is complete the remaining procedure is the same as in (1) above.

Evaluation - Telephone interviewing is more economical than field interviewing because it eliminates costly call-backs and can be done as time permits by personnel with less training than the field interviewing personnel would require.

The major problem in telephone interviewing is the ease with which the person being interviewed can terminate the interview. Refusal to answer any questions would presumably be higher by telephone than by personal interviewing, also an experienced field interviewer can be more flexible on turn-downs and more objective in evaluating the quality of a response.

<u>The Gravitational Approach</u> - The gravitational approach is based upon the concept of comparative advantages which states that customers direct their patronage to the retail site where the maximum utility returns per dollar and time unit may be obtained. Implicit in the presentation of a retail gravitational model is some level of consumer knowledge of what is available in the marketplace at alternative supply points.[6]

<u>The Development of Reilly's Law of Retail Gravitation</u>[7] - The original formulation of the "law" of Retail Gravitation was made by William J. Reilly and was stated as, "under normal conditions two cities draw retail trade from a smaller intermediate city or town in direct proportion to some power of the population of these two large cities and in an inverse proportion to some power of the distance of each of the cities from the smaller intermediate city.[8]

The formula presented in the original formulation was:

$$\frac{Ba}{Bb} = \left(\frac{Pa}{Pb}\right)^N \left(\frac{Db}{Da}\right)^N$$

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[6]For a general discussion of gravity models in regional analysis see: Walter Isard (ed.), <u>Methods of Regional Analysis</u> (New York: John Wiley, 1960)

[7]It is more literally correct to term "Reilly's Law" "Reilly's Principle" of retail gravitation since by his own definition it does not cover all possible situations (<u>Reilly, op. cit</u>., p. 16)

[8]William J. Reilly, <u>op. cit</u>., p. 16.

Where - Ba = the business which City A draws from intermediate Town T.
Bb = the business which City B draws from intermediate Town T.
Pa = Population of City A.
Pb = Population of City B.
Da = Distance of City A from Intermediate Town T.
Db = Distance of City B from Intermediate Town T.[9]

A simplified version of this law was developed by P. D. Converse.[10]

$$\text{Breaking Point between A and B, miles from B} = \frac{\text{Distance between A and B}}{1 + \dfrac{\text{Population of Town A}}{\text{Population of Town B}}}$$

Thus, the formula presented by Reilly is used to determine where the trade of an intermediate town will go between two completing cities. The Converse formulation by assuming Ba = Bb in the Reilly formula is used to determine the breaking point for trade flow between two towns.[11]

Another application was developed by Converse in order to determine waht percentage of trade was kept within a city. Formulations up until this point include only the factors of population and distance and are only applicable in the case of

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[9] Ibid., p. 48.

[10] Paul D. Converse, Harvey W. Huegy and Robert V. Mitchell, Elements of Marketing, 6th Edition, (New York: Prentice-Hall, 1958) p. 30 (First Present in 2nd Edition, 1935, p. 792).

[11] P. D. Converse, Retail Trade Areas in Illinois (Urbana, Business Study No. 4, University of Illinois, 1946) p. 30-31.

shopping goods. The formulation by Converse is intended to predict the amount of fashion goods business that should be retained in any town. Mathematically, the formula is stated as:[12]

$$\frac{Ba}{Bb} = \left(\frac{Pa}{Hb}\right)\left(\frac{4}{d}\right)^2$$

Where - Ba = Proportion of trade going to the outside town.
Bb = Proportion of trade retined by the home town.
Pa = Population of the outside town
Hb = Population the home town
d = Distance to the outside town
4 = Inertia factor

The inertia factor was calculated from Mr. Converse's research of Illinois trading areas and trade flows. While population and distance are the basic variables in these formulations, Converse offers the following alternatives:

"The attraction of a shopping district may be measured by the population of the town, the volume of sales, or the square footage in fashion goods stores. The time and expense factor may be represented by car or bus fare and time when public carriers are used."[13]

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[12] Paul D. Converse, "A New Application of the law of Retail Gravitation," Opinion and Comment, August, 1947 and Paul D. Converse, "New Laws of Retail Gravitation," Journal of Marketing, Vol. XIV, No. 3 (Oct. 1949) pp. 382-383.

[13] Paul D. Converse, Harvey W. Huegy and Robert V. Mitchell, op. cit., p. 29.

In a recent article, Jung attempts to show how Reilly's Law does not properly predict trade flow in Columbia, Missouri.[14] In his original publication, however, Mr. Reilly makes the following statement which seems to negate Jung's exception.

> "In other words, every city presents an individual case with its characteristic differences, and the retail trade territory of any given city is the resultant of a highly complicated inter-relationship of a large number of factors rather than the resultant of the influence of one or two or three or four factors.[15]

Stating the quote above as his reason, Reilly then proposes a "provisional list rather than an arbitrary classification" of factors that may influence the retail trade territory of any given city.[16] They are:

TABLE 30

OUTLINE OF FACTORS INFLUENCING RETAIL TRADING AREAS

1. Lines of Transportation
   - A. Public Highways
   - B. Railroads and railraod rates--including special rates to commuters
   - C. Electric Lines--regular and special rates

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[14] Allen F. Jung, "Is Reilly's Law of Retail Gravitation Always True?" Journal of Marketing, October, 1959. pp. 62-63.

[15] William J. Reilly, op. cit., p. 21.

[16] Ibid., p. 21.

D. Bus lines--regular and special rates
E. Waterways--regular and special rates
F. Express and parcel post rates--regular and special
G. Air lines

2. Lines of Communication

A. Circulation of the daily newspaper
(1) Number of papers distributed
(2) Geographical territory covered
(3) Classes of people reached

B. Telephone and telegraph lines and rates

3. The Class of Consumer in the Territory Surrounding the Market

4. Density of Population in the Territory Surrounding the Market

5. Proximity of the Market to a Larger City Market

6. The Business Attractions of the City

A. The nature of the leading stores of the city

(1) The kinds of goods and selections of goods offered by stores in the market
(2) The delivery, credit, and other services offered by these stores
(3) The general reputation of these stores as style-goods centers

B. The extent to which the city offers storage and a market for the sale and redistribution of goods produced in the surrounding territory

C. The banking facilities of the city

7. The Social and Amusement Attractions of the City

A. Theaters
B. Educational institutions and facilities
C. Musical attractions
D. Athletic events
E. Church, society, or fraternal gatherings
F. Fairs and expositions

8. The Nature of the Competition Offered by Smaller Cities and Towns in the Surrounding Territory

    A. The kinds of goods and selections of goods offered by stores in smaller locations.
    B. The general attitude of these surrounding cities and towns toward the larger city.

9. The Population of the City

10. The Distance Which Prospective Customers Must Travel in Order to Reach the Market, and the Psychology of Distance Prevailing in That Part of the Country

11. The Topographical and Climatic Conditions Peculiar to the City and its Surrounding Territory

12. The Kind of Leadership Offered by the Owners of Managers of Various Business Interests of the City.[17]

Reilly's Law and Shopping Centers[18]- In 1953, James W. Rouse, President of the Moss-Rouse Company presented the possibility of the application of Reilly's law to planned shopping centers.[19] The Rouse contribution is noteworthy in that it is perhaps the earliest attempt to adapt Reilly's law to a retail cluster within a large urban area.

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[17]Source: Ibid., pp. 21-22.

[18]In 1951, Baker and Funaro made the following comment: "when measuring the pulls of a large Regional Center, Reilly's law may be applied just as aptly as it has been to downtown shopping centers." They did not elaborate or give example but from what followed this comment, the reader is lead to assume that the original formula can be applied rather than an adaption of the original formula. (Geoffrey Baker and Bruno Funaro, Shopping Centers: Design and Operation (New York: Reinhold, "Progressive Architecture Library," 1951), p. 18.

[19]James W. Rouse, "Estimating Productivity for Planned Regional Shopping Centers" News and Trends in City Development - Urban Land Insititute. (November, 1953) pp. 1-5.

Rouse suggested that by substituting retail presentation of shopping goods in square foot area for size of city and converting distance to driving time distance the principle of retail gravitation could be applied in urban areas.[20] He restates the principle as:

"Retail Shopping Centers and districts in a metropolitan area attract trade from the neighborhoods and communities comprising the area in direct proportion to the shopping goods presentation at the district or center and in inverse proportion to the square of the driving time - distances between the ratail districts and centers and neighborhoods and communities."[21]

The technique presented is also proposed as useful in determining the level of shopping goods sales for a proposed center. The conversion of the basic principle into this conclusion is vaguely presented by the author with little substantive comment.

In a later article Mr. Leon W. Ellwood, moving from Mr. Rouse's article, restates the principle as:

"The principle retail districts within a metropolitan trading area attract trade from the residential sections of the area approximately in direct proportion to the size of the retail districts and in inverse proportion to the square of the driving

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[20] Ibid., p. 3.

[21] Ibid., p. 4.

time distance from each residential section to the retail districts."[22]

This presentation also suffers from vagueness in that "size of the retail districts" is not precisely defined.

Basically, the Ellwood formulation differs from the Rouse formulation in that potential sales or per capita sales must be calculated. Then a modification of Reilly's Law is:

$$\frac{\text{Distance from A to B}}{1 + \sqrt{\dfrac{\text{Size A}}{\text{Size B}}}}$$ [23]

applied to calculate relative "pulling" power between competing centers and the proposed center. The buying power within the pulling range of the proposed site is then calculated. Certain adjustments are made to this calculation in order to delete from consideration those stores and services that will not be included in the center. After the deletion adjustment has been made the remainder represents the potential volume of the proposed centers. Using the Ellwood formulation an optimum, relative size of proposed shopping center, is obtained.

A third somewhat similar approach was presented by Harry J.

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[22] Leon W. Ellwood, "Estimating Potential Volume of Proposed Shopping Centers," The Appraisal Journal, Vol. XXII, No. 4 (October, 1954), pp. 581-589.

[23] Ibid., p. 584.

Casey, Jr. a few years later.[24] The following mathematical formula summarizes his approach:

$$\text{Bia} = \frac{\frac{\text{Fa}}{(\text{Dia})^2}}{\frac{\text{Fa}}{(\text{Dia})^2} \; \frac{\text{Fb}}{(\text{Dib})^2} \; \frac{\text{Fc}}{(\text{Dic})^2} \; \frac{\text{Fd}}{(\text{Did})^2} \; \frac{\text{Fe}}{(\text{Die})^2} \; \text{etc.}} \times \text{Bl}$$

Where - Bl = Buying Power of Neighborhood 1
Bia = Purchases made by residents of Neighborhood 1 in the shopping Center A
Fa, Fb, Fc, etc. = the square feet of retail space in the shopping centers A, B, C, etc.
Dia, Dib, Dic, etc. = driving time distances between neighborhood 1 and other retail centers.

The three adaptations of the Principle of Retail Gravitation outlined above have several things in common. First, all three methods are applicable to the retail complex commonly known as the shopping center. Secondly while most adaptations of Reilly's "law" have been concerned with calculating proposed sales volume or proposed size reflected by sales volume. A third factor and probably a weakness is that in every case, little, if any, solid empirical research is offered in support of the validity of the individual formulations.

In summary, the gravitational approach to trading area delineation was originally developed to measure retail trade flows between towns of different sizes. In recent years new applications of the gravitational approach have been developed

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[24] Harry J. Casey, Jr., op. cit., p. 82.

which have application for delineation of the trading area of shopping centers. There are at least two additional areas of research in which contributions to the development of a reliable gravitational model can be made. Further empirical research is necessary to validate the reliability of the application of gravitational models to shopping center analysis. In the three gravitational applications cited in this section, hypothetical data is used for illustration and no evidence of raliability is presented. A second opportunity for contribution is the extention of the application of valid formula to other types of retail store complexes in addition to shopping centers.

APPENDIX B

INSTRUCTIONS FOR CUSTOMER SPOTTING

Appendix B contains the instructions for customer spotting given to store interviewers. These instructions were provided through the generous cooperation of Professor Saul B. Cohen, Department of Geography, Boston University, Boston, Massachusetts.

Instructions for Customer Spotting

Introduction

Customer spotting is a method of getting customer addresses and other related information to aid in store location.

Procedure

The following pages give an explanation of the procedure to be used to accomplish the tasks.

Listed below is a brief summary of the information found on each page.

Page 2 and 3	- Customer Interviewing Procedure. An explanation of how to interview, what to ask, and hours of interview.
Page 4	- Copy of the Questionnaire.
Page 5	- An explanation of the questionnaire.

Customer Interviewing Procedure

Position

Stand back of the checkout booths where you can observe the customers, the total amount of their purchases, can encounter customers as they leave the checkout booth or are standing waiting for their order to be packed. Try to stand in a position that will not block the normal flow of traffic.

Pre-Interview Data

While the customer is getting her order checked out, the following information can be entered on the interview card:

Time, Sex, Departments Patronized and Sales Amount.

Interview

The checkout procedure is not to be interrupted and the customer is not to be approached until the cashier has completed the cash transaction.

Be courteous and smile as you approach the customer.

Your conversation with each customer will be as follows:

"Good morning. We are making a little survey for this store. Would you mind telling me whether you walked or drove to this store today?" (Fill in column headed Transportation on the interview card.)

"How often do you shop at this store?" (Fill in column marked How Often on the interview card.)

"How long have you traded at this store?" (Fill in column marked How Long on the interview card.)

"And what is your home address, please?" (Fill in column marked <u>Address</u> on the interview card.)

"Thank you!"

If the customer makes inquiry concerning the purpose of the interview, you may say:

"We are trying to see if our store is conveniently located near the homes of our customers."

<u>Reply to Customer's Inquiry Regarding Purpose of Interview</u>

(NOTE: Not for solicitations of any kind.)
(NOTE: <u>Do not</u> record or ask for names.)

A tactful manner on your part will easily secure 99% of the interviews for you.

Never insist on an answer or subject a customer to "pressure." A refusal or misunderstanding on the part of any customer can be dismissed easily by merely saying, "Well, thank you just the same."

<u>CUSTOMER ADDRESS IS THE SINGLE MOST IMPORTANT ITEM ON THE SURVEY FORM</u>. LATER EACH ADDRESS WILL BE MARKED ON A MAP AND THE <u>EXACT</u> ADDRESS IS VITAL TO THIS OPERATION. ALWAYS ASK LOCAL CUSTOMERS FOR STREET <u>AND</u> NUMBER. ASCERTAIN WHETHER THE ADDRES IS A STREET, AVENUE, ROAD, PLACE, ETC. IF A CUSTOMER GIVES ONLY AN RFD ZONE, BE SURE TO ASK FOR THE STREET NAME ALSO. REPEAT ALL ADDRESSES AS THEY ARE GIVEN. FOR OUT-OF-TOWN CUSTOMERS, THE NAME OF THE TOWN WILL BE SUFFICIENT UNLESS YOU ARE INSTRUCTED OTHERWISE.

Do not "pick" customer, but take them as they come so that we will have a representative sample. Be <u>especially sure</u> that customers with small orders are not missed.

Slow business--few checkouts working--try to get every customer.

Steady business--some checkouts working--4 consecutive interviews per checkout booth. Start at first open booth and rotate booths to cover all open booths before coming back to first open booth.

Fast business--all checkouts working steadily--same as Steady Business above.

Hours of Interview

Friday - 10:00 A.M. - 1:00 P.M. - 2:00 P.M. to 7:00 P.M. - Total day - 8 hours

Number of Interviewers

One interviewer, if store volume is under $20,000 per week.

Two interviewers, if store volume is over $20,000 per week.

STORE INTERVIEW FORM

BRANCH ____________________ DATE ____________

STORE ____________________

Time		Sex	Department	Sales Amount
9	3	F	All	
10	4	M	GM	
11	5	Ch (under 15)	GP	$
12	6	Couple	MP	
1	7	Multiple	G	
2	8		M	
			P	

CUSTOMER-ADDRESS ____

Transportation	How Often per Week	How Long
A	-1	1st time
W	1	-3M
B	2	3 - 6M
T	3	6M - 1 yr.
	4	1 yr.- 2 yrs.
	5	2 yrs.- 5 yrs.
	6	5-plus yrs.
	6+	Since opening
	1st Time	

EXPLANATION OF QUESTIONNAIRE

Branch	-Branch territory where survey is being conducted.
Store	-To include name and address.
Date	-Date that interview takes place.
Time	-Time of interview. Circle the hour nearest time of interview.
Sex	-Sex refers to all persons in the shopping party, not only to the person who is interviewed.
Department	-Observe what the customer buys and mark the department(s) shopped. Watch the flags on the cash register to record meats, groceries and produce.
Sales Amount	-Cash register total sales. Record the sales figure in the space provided.
Address	-Address of the customer interviewed. Get the complete address--Street, Avenue, Road, Place, Rural Route, etc. Don't accept names of apartments, but insist upon full address.
Transportation	-Record the method of getting to the store--auto, taxi, streetcar, bus, etc., are all important.
How Often Week	-Record the number of times the customer visits <u>this store</u> in a normal week's time.
How Long	-Record the length of time that the customer has been shopping in <u>this</u> store.

<u>Note</u>: Carefully encircle each applicable item on the form. Also be sure to write each address legibly.

APPENDIX C

FORMS' WORKSHEETS AND MEASUREMENT DEVICES USED IN RESEARCH PROCEDURE

Appendix C presents copies of the forms, worksheets and measurement devices developed for this research. The appendix is divided into five subsections.

C - 1 <u>Store Survey Data</u> - The store survey form was designed to record the basic data necessary for analysis of the survey store. The site map was drawn to reflect the mix of stores with 1/3 mile of the site for unplanned sites and the entire shopping center plan for planned sites. The area map was constructed by mounting a three mile diameter section of a street map on the sheet and spotting competition by color code on this map.

C - 2 <u>Customer Spotting Overlay</u> - In its original form, Appendix C-2 was drawn on a transparent plastic overlay and scaled to the customer spotting map.

C - 3 <u>Customer Spotting Record</u>

C - 4 <u>Basic Procedure for Population Estimates</u> - The graphic presentation illustrated in Appendix C-4 was originally drawn directly on to a detailed street map of the area. The Census Tract and/or Enumeration Districts were then also outlined on the map and the population and housing percentage estimated by tract or district were recorded on Appendix C-5.

C - 5 <u>Population Estimate Form</u>

No.________________

Date________________

Time________________

STORE SURVEY DATA

I. CITY and SITE DATA

ADDRESS______________________________

CITY_________________________________ SIZE________________

NEAREST CROSS STREETS STREET WIDTH

STREET	WIDTH

II. STORE DATA

STORE NO.____________________________ TYPE________________

STORE SIZE

SELLING AREA______________________

STORAGE AND WORK__________________

SUB TOTAL_________________________

BASEMENT__________________________

TOTAL_____________________________

SPECIAL DEPARTMENTS --

DATE OPENED____________ DATE REMODELED__________ DATE SURVEYED_____

III. WEEKLY SALES ORDER NUMBER OF INTERVIEWS

FIRST WEEK________________

SECOND WEEK________________ AVERAGE SALES= $\left(\dfrac{\text{Total Sales}}{4}\right)$

THIRD WEEK________________

FOURTH WEEK________________ NO. OF INTERVIEWS= $\left(\dfrac{\text{Average Sales}}{100}\right)$

TOTAL________________

IV. COMPETITION

	NAME	LOCATION	ESTIMATED SIZE	PARKING	REMARKS
1.					
2.					
3.					
4.					
5.					

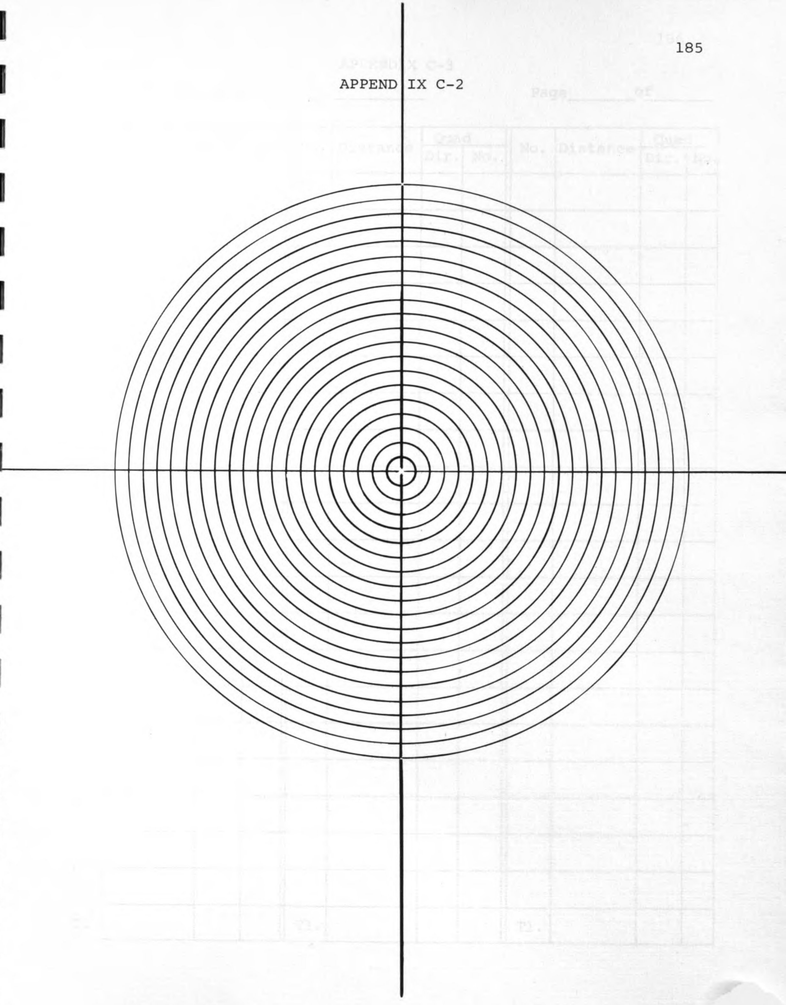
V. STORE COMPLEX

NUMBER	TYPE	LOCATION	ESTIMATED SIZE	PARKING

VI. SITE MAP

VII. AREA MAP

APPENDIX C-2

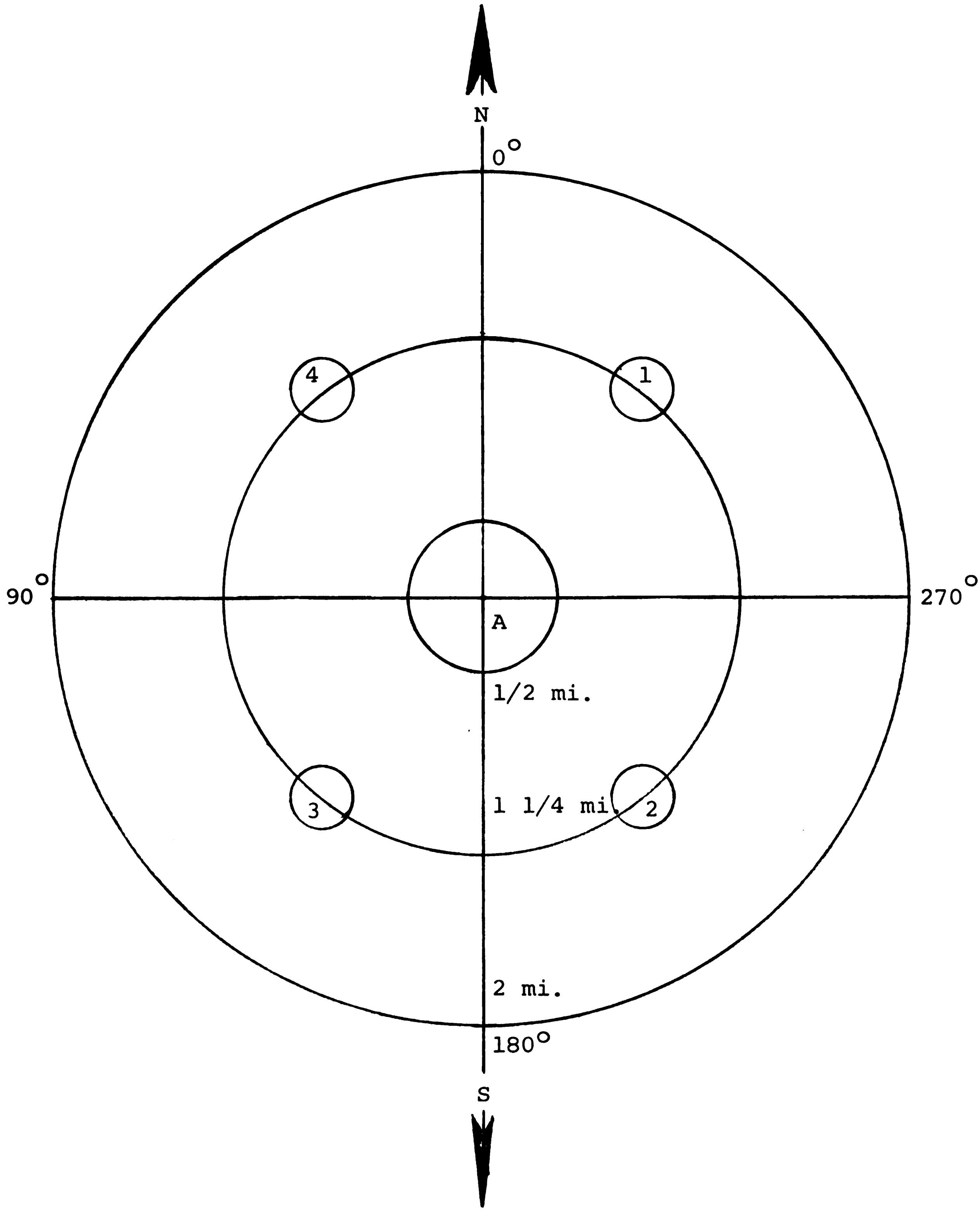


APPENDIX C-3

Store No.__________________ Page________of________

No.	Distance	Quad		No.	Distance	Quad		No.	Distance	Quad	
		Dir.	No.			Dir.	No.			Dir.	No.
Tl.				Tl.				Tl.			

APPENDIX C-4



= Quadrant

A = Survey Store Site

APPENDIX C-5

Store No. ________________ Page________ of________

__________ Mile Zone

Census Tract	E.D. Quad	Total P & H		Percentage	Corrected P & H	
		Pop.	Housing		Pop.	Housing

APPENDIX D

STATISTICAL PROCEDURES

Appendix D describes the statistical procedures, formula and identities used in the application of the Analysis of Variance and Multiple Range Tests to the data collected for this research.

D-1 Analysis of Variance
(Single Classification Problem)

D-2 Analysis of Variance
(Two-way Classification Problem)

D-3 Multiple Range Tests

APPENDIX D-1

ANALYSIS OF VARIANCE
(Single Classification Problem)

1. The fundamental identity for a one way classification is; TSS = Between SS + Within SS, where, SS represents sum of squares.

2. Let χ_i represent the i^{th} observation. The formulae are:

$$\text{Between SS} = n_1(\bar{A} - \bar{X})^2 + n_2(\bar{B} - \bar{X})^2 \;.\;.\;.\;.\; n_m(\bar{Z} - \bar{X})^2$$

$$= \frac{A_i^{\,2}}{n_1} + \frac{B_i^{\,2}}{n_2} \;.\;.\;.\;.\; \frac{Z^2}{n_m}$$

$$\text{Total SS} = \Sigma(\chi_i - \bar{X})^2 = \Sigma\chi_i^{\,2} - \frac{(\Sigma\chi_i)^2}{N}$$

$$\text{Within SS} = \text{Total SS} - \text{Between SS}$$

Where χ_i = i^{th} observation

$\bar{X}$ = average of all observations

n_1 = number of observations in first column

n_2 = number of observations in second column

n_m = number of observations in m^{th} column

$\bar{A}$ = average of first column

$\bar{B}$ = average of second column

$\bar{Z}$ = average of Z^{th} column

A = sum of first column

B = sum of second column

Z = sum of Z^{th} column

N = total number of observations

3. The degrees of freedom are computed as follows:

   Total = N - 1

   Between = Number of columns - 1

   Within = Total degrees of freedom - Between DF

4. The mean square column is computed using the ratio $\frac{SS}{DF}$ for the between and within categories.

5. The F value is computed by the ratio of $\frac{\text{Between Mean Square}}{\text{Within Mean Square}}$

APPENDIX D-2

ANALYSIS OF VARIANCE

(Two-Way Classification)

1. The fundamental identity for a two-way classification is; TSS = Row SS + Column SS + Error SS, where, SS represents sum of the squares.

2. Let χ_i represent the i^{th} observation. The formulae are:

$$\text{Total SS} = \Sigma\chi_i^2 - \frac{(\Sigma\chi_i)^2}{N}$$

$$\text{Row SS} = \frac{\Sigma R_i^2}{n_i} - \frac{(\Sigma\chi_i)^2}{N}$$

$$\text{Column SS} = \frac{\Sigma C_i^2}{n_{R_c}} - \frac{(\Sigma\chi_i)^2}{N}$$

$$\text{Error SS} = \text{Total SS} - \text{Row SS} - \text{Column SS}$$

where:

χ_i = the i^{th} observation

R_i = sum of the i^{th} row

C_i = sum of the i^{th} column

n_c = number of columns

n_R = number of rows

N = total number of observations

3. The degrees of freedom are computed as follows:

   Total = N - 1

   Row = number of rows - 1

   Column = number of columns - 1

   Error = total DF - Row DF - Column DF

4. The mean square column is computed using the ratio $\frac{SS}{DF}$ for each category.

5. The F value is computed by the ratios,

$$\frac{\text{Row Mean Square}}{\text{Error Mean Square}}, \quad \frac{\text{Column Mean Square}}{\text{Error Mean Square}}.$$

APPENDIX D-3

MULTIPLE RANGE TEST

When it is ascertained from the Analysis of Variance that there is a significant difference in the data, a device termed the Multiple Range Test[1] is utilized for establishing these significant differences between the individual columns.

Using specially constructed "Significant Studentized Ranges for the 5% level[2] the values for the number of items to be compared are found. This table is entered to the degrees of freedom of the error term (within a single classification). The values found in this table are multiplied by a constant $\sqrt{\frac{EMS}{SE}}$, where EMS = error (within) mean square; SE = $\frac{1}{k-1}$ $(\Sigma n - \frac{\Sigma n^2}{\Sigma n})$; where K = number of classes and n = number of observations per class.

The above computed value ($\sqrt{\frac{EMS}{SE}} \cdot \frac{\text{Table}}{\text{Value}}$) is then tested against the average of the classes.

If $\bar{A}$, $\bar{B}$ . . . . $\bar{F}$ represents the average of each class and $\bar{A}$ plus the computed value is less than $\bar{B}$ it can be stated that they are significantly different. All possible combinations are tested in this manner and the significance or lack of significance between classes established.

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[1]David B. Duncan, "Multiple Range and Multiple F Tests," Biometrics, Vol. 11, 1955, pp. 1-42.

[2]*Ibid.*, pp. 3-4.

APPENDIX E

EMPIRICAL DATA

SURVEY STORE POPULATION ESTIMATES

BY QUADRANT AND DISTANCE INTERVAL

Appendix E presents the population estimates upon which per capita sales are based by survey store. These data are presented both by quadrant and distance interval by individual survey store.

APPENDIX E

SURVEY STORE POPULATION ESTIMATES BY QUADRANT AND DISTANCE INTERVAL

Survey Store	Distance Interval	Quadrant 1	2	3	4	Total
Urban Strip-1	1/2 mile	2537	1953	1953	2962	9405
	1-1/4 mile	12854	8174	4367	10753	36148
	2 mile	18988	5354	5167	12216	41725
Urban Strip-2	1/2 mile	1275	2278	2094	1471	7118
	1-1/4 mile	9647	9797	13160	5118	37722
	2 mile	18235	16218	26937	15697	77087
Urban Strip-3	1/2 mile	4160	4241	2315	2151	12867
	1-1/4 mile	14841	22834	19506	9863	67044
	2 mile	29799	29625	31024	24489	114937
Urban Cluster-1	1/2 mile	1442	1901	2443	2850	8636
	1-1/4 mile	11600	8774	11778	9627	41779
	2 mile	15592	19886	18499	6554	60536
Urban Cluster-2	1/2 mile	2924	2205	3247	4103	12479
	1-1/4 mile	21618	15969	11000	18403	66990
	2 mile	36600	28135	19757	29595	114087
Urban Cluster-3	1/2 mile	4886	3980	2320	2948	14134
	1-1/4 mile	15537	20310	15300	9738	60885
	2 mile	14419	41734	30485	19994	106632
Small Town-1	1/2 mile	832	400	1032	1063	3327
	1-1/4 mile	75	86	129	320	610
	2 mile	172	127	126	178	598
Small Town-2	1/2 mile	992	992	992	991	3967
	1-1/4 mile	158	339	337	316	1148
	2 mile	299	637	637	449	2022
Small Town-3	1/2 mile	439	200	438	676	1753
	1-1/4 mile	150	150	100	200	600
	2 mile	100	100	75	150	425

APPENDIX E. Continued

Survey Store	Distance Interval	Quadrant				Total
		1	2	3	4	
Neighborhood	1/2 mile	408	273	536	619	1836
Shopping	1-1/4 mile	1293	1685	3168	3292	9438
Center-1	2 mile	1472	5447	2615	1988	11522
Neighborhood	1/2 mile	118	1788	771	2001	4678
Shopping	1-1/4 mile	2049	4878	6796	6569	20292
Center-2	2 mile	17375	10964	7523	11243	47105
Community	1/2 mile	755	982	439	306	2482
Shopping	1-1/4 mile	5715	7489	5090	1472	19766
Center-2	2 mile	5037	16547	13342	7838	42764
Community	1/2 mile	1486	1746	1091	1614	5937
Shopping	1-1/4 mile	5941	6325	8388	7951	28605
Center-2	2 mile	6124	10883	8174	6983	32164
Regional	1/2 mile	431	1257	891	76	2655
Shopping	1-1/4 mile	8816	7807	11746	2638	31007
Center-1	2 mile	14711	19153	19274	2513	55651
Regional	1/2 mile	530	732	623	1496	3381
Shopping	1-1/4 mile	6381	9434	14441	10978	41234
Center-2	2 mile	14142	16832	19718	15841	66533

APPENDIX F

EMPIRICAL DATA

SURVEY STORE CUSTOMERS BY DISTANCE TRAVELED TO SURVEY STORE AND QUADRANT

Appendix F presents summary results of the customer spotting maps. A distance interval of one-eighth of a mile was established for measurement purposes. When the distance is specified as .125 miles the customers' home was located between 0 - .125 miles from the survey store. The tables in Appendix F are arranged so that at least 95 percent of the survey store customers are identified by distance traveled with only five percent or less of store customers in the "over" classification.

APPENDIX F-1

EMPIRICAL DATA - SURVEY STORE CUSTOMER BY DISTANCE TRAVELED TO SURVEY STORE AND QUADRANT (URBAN STRIP)

Distance Interval (Miles)	Urban Strip-1				Urban Strip-2				Urban Strip-3			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
.125	4	1	2	3	2	3	5	4	3	3	2	3
.250	9	3	10	11	4	5	13	14	17	15	22	16
.375	6	7	5	10	9	1	12	11	23	27	10	9
.500	9	5	8	10	10	6	18	13	24	28	3	17
.625	4	7	5	6	4	5	3	8	23	27	1	20
.750	2	8	5	10	6	3	4	5	13	23	5	7
.875	-	-	2	1	-	2	2	4	7	21	10	6
1.000	1	2	-	-	-	3	-	-	-	2	5	-
1.125				-	1	3	1	4	-	-	3	-
1.250				1	2	3	2	2	1	3	2	1
1.375					2	2	1	1	7	-	1	4
1.500						1	2	1	2	1	-	-
1.625						1	-	-	1	1	1	2
1.750					1	1	-	2	-	1	-	3
1.875						2	1		-	-	-	1
2.000				1		1	1		3	1	-	1
2.125				1	1	1			-	1	1	2
2.250						1			1	1	-	-
2.375					3				-	3	1	1
2.500		1			1			1	-	1		1
2.625							1	1		1		
2.750						1	1					1
2.875					1			1				
3.000									4			1
3.125												
3.250												1
3.375			1					1				
3.500	1		1						4			1
> 3.5 miles	-	2	-		2	5	1	1	10	-	5	6
Total	36	36	39	54	50	50	68	74	143	160	72	104

APPENDIX F-2

EMPIRICAL DATA - SURVEY STORE CUSTOMERS BY DISTANCE TRAVELED TO SURVEY STORE AND QUADRANT (URBAN CLUSTER)

Distance Interval (Miles)	Urban Cluster-1				Urban Cluster-2				Urban Cluster-3			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
.125		1	3	5	3	4	-	3	7	5	5	2
.250	4	1	3	28	13	21	7	9	23	20	16	17
.375	5	10	10	46	17	26	12	13	21	29	34	27
.500	6	5	13	26	17	27	12	19	13	35	22	21
.625	2	8	12	17	12	6	8	13	16	9	12	12
.750	1	10	13	10	16	1	14	11	9	16	1	14
.875	2	4	6	6	4	4	7	16	14	6	4	7
1.000	-	5	7	5	1	4	2	9	9	10	1	6
1.125	-	3	3	2	2	11	9	6	2	3	1	1
1.250	2	1	10	1	2	5	4	10	1	5	1	8
1.375	-	3	5	-	-	1	3	9	-	2	-	5
1.500	1	3	6	-	1	2	9	17	1	6	4	3
1.625	-	1	1	-	-	2	2	2	2	9	-	-
1.750	2	2	2	1	-	3	3	2	3	3	2	2
1.875		2	1	-	1	1	3	8	4	1	-	1
2.000		3	2	1	-	1	-	2	2	3	-	2
2.125		1	2		-	-	-	-	2	1	-	3
2.250		1	2		2	2	1	1	2	6	-	1
2.375		1	1			-	-		-	2	1	-
2.500	1	2	2	1		-	1		-	2		-
2.625	1			1				1		2		1
2.750	1			-				1		2		
2.875	1	1		1					1	2	1	
3.000		1			1							
3.125								1	1			
3.250			1									
2.375			1	1				1	1			
3.500		1	1					1			2	1
> 3.5 miles	-	6	-	4	-	-	10	11	6	1	2	2
Total	29	76	107	156	92	121	107	167	139	180	109	136

APPENDIX F-3

EMPIRICAL DATA - SURVEY STORE CUSTOMERS BY DISTANCE TRAVELED TO SURVEY STORE AND QUADRANT (SMALL TOWN)

Distance Interval (Miles)	Small Town-1				Small Town-2				Small Town-3			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
.125	1	4	2	-	3	1	2	2	1	-	2	2
.250	1	1	6	2	3	2	5	7	6	-	1	6
.375	4		6	6	5	3	5	11	5	1	6	5
.500	1		6	8	6	3	4	8	4	4	6	15
.675	2		-	6	2	-	3	4	1	3		7
.750			-	1	8	1	4	-	-	1		7
.875			1	5	2	-	2	9	1	2		3
1.000			1	2	-	-	4	2	-	1		
1.125		1	-	-	-	1	1	3	3	1		
1.250			1	1	-	-	2	1	2	1		
1.375	1				2	-	2	4	1		2	1
1.500					1	1	1	3	1			
1.625					1	2	-	-	1			2
1.750				1	2	2	-	3			1	
1.875					1	1	-	-			1	1
2.000		1	1		-	1	1	2		3		2
2.125					2	1	1	-				2
2.250					2	1	-	1		5	2	-
2.375					0	1	1	1		7		1
2.500					1	2	-	2		4	1	2
2.625		1	1			-	1	1				2
2.750						1	3	-			3	
2.875					1		1	-				
3.000		2	1		2			2			1	
3.125						1	1	-		1		
3.250						3		2				3
3.375							1	1		2		
3.500	1	1			1		2	2				6

APPENDIX F-3. Continued

Distance Interval (Miles)	Small Town				Small Town-2				Small Town-3			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
3.625	1	1	-	-	1	-	1	1				
3.750	2	1	-			-	1			2		1
3.875		2	2			1	-			1	1	
4.000	1			1		-	-					
4.125				1	1	-	-	2	3	2	1	1
4.250		2			1	1	1		3	3	1	1
4.375				1	1							2
4.500			1								1	
4.625							1					
4.750					1		2	3			1	
4.875							1	1				
5.000			1				2					
5.125			1		1		-					
5.250							2					1
5.375		1					1			3	1	
5.500			1				-					
5.625		1					2	1				
5.750						1						
5.875			1									
6.000		1										
Over 6 miles	1	2	-		1	2	3	5	-	-	2	2
Total	16	22	33	35	52	33	64	84	32	47	34	75

APPENDIX F-4

EMPIRICAL DATA - SURVEY STORE CUSTOMERS BY DISTANCE TRAVELED TO SURVEY STORE AND QUADRANT (NEIGHBORHOOD SHOPPING CENTER)

Distance Interval (Miles)	Neighborhood Shopping Center-1				Neighborhood Shopping Center-2			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
.125	3	-	-	1	-	1	-	-
.250	5	1	-	5	-	13	2	4
.375	6	-	-	1	3	15	1	5
.500	11	2	-	2	1	10	-	19
.625	4	1	1	3	-	9	6	12
.750	1	2	5	4	-	21	7	4
.875	1	3	2	10	1	4	12	5
1.000	3	6	-	9	2	2	15	7
1.125	1	5	-	5	3	1	7	1
1.250	2	1	-	1	6	2	6	7
1.375	3	4	3	10	6	1	6	3
1.500	2	1	-	3	4	2	4	5
1.625	-	2	1	5	2	4	11	1
1.750	3	2	4	4	2	4	9	4
1.875	-	1	1	3	3	-	-	1
2.000	1	2	-	-	3	2	2	1
2.125	-	1	-	-	3	3	2	1
2.250	1	1	-	-	3	3	-	2
2.375	1	-	1	2	1	-	3	4
2.500	1	-	-	1		-	1	2
2.725				2	-	2	3	1
2.750				1	1		-	
2.875							4	
3.000	1	1					1	
3.125	1	-		2			-	1
3.250	1	-		4			2	
3.375	1	1					1	1
3.500	1	-						
3.625	2		1					1
3.750	1	1					2	
3.875		1						
4.000								

APPENDIX F-4. Continued

Distance Interval (Miles)	Neighborhood Shopping Center-1				Neighborhood Shopping Center-2			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
4.125								
4.250								
4.375		1		1			1	
4.500								
4.672								
4.750								
4.875				4				
5.000				3				
Over 5 miles	1	-	-	8	1	-		-
Total	58	40	19	94	45	100	108	92

APPENDIX F-5

EMPIRICAL DATA - SURVEY STORE CUSTOMERS BY DISTANCE TRAVELED TO SURVEY STORE AND QUADRANT (COMMUNITY SHOPPING CENTER)

Distance Interval (Miles)	Community Shopping Center-1				Community Shopping Center-2			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
.125	2	1	-	-	1	-	-	1
.250	3	4	2	3	13	3	8	5
.375	3	4	4	3	4	5	8	4
.500	4	5	6	-	2	16	11	8
.625	1	3	4	-	13	12	11	10
.750	2	3	2	-	6	10	11	12
.875	8	5	3	-	3	10	12	9
1.000	6	11	4	-	2	12	26	5
1.125	5	3	4	-	-	15	17	2
1.250	3	5	7	-	2	6	15	2
1.375	5	10	6	-	2	3	9	4
1.500	1	5	1	-	1	1	3	2
1.625	2	6	3	1	-	3	6	4
1.750	1	4	1	-	1	2	10	2
1.875	3	2	1	1	-	3	5	4
2.000	3	4	-	2	1	7	5	8
2.125	4	1	2	2	1	1	3	3
2.250	1	2	-	1	-	7	-	1
2.375	2	1	-	1	-	4	3	2
2.500	2	3	3	2	2	2	4	1
2.625	1	-	-	-	-	1	3	1
2.750	2	1	-	-	-	1	3	2
2.875	4	1	1	-	-	6	4	3
3.000	2	-	1	-	-	-	3	2
3.125	3	-	-	-	-	1	1	3
3.250	1	-	2	-	-	1	3	1
3.375	1	-	-	-	-	2	2	5
3.500	1	1	-	-	-	1	-	5
3.625						1		2
3.750		1				1		1
3.875			2				1	
4.000	3						1	

APPENDIX F-5. Continued

Distance Interval (Miles)	Community Shopping Center-1				Community Shopping Center-2			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
4.125							2	1
4.250					2	1	3	1
4.375						1	1	2
4.500								1
4.625	1	1					1	2
4.750								1
4.875	1						1	
5.000		2				1		1
5.125	2							
5.250		1			1			
5.375	1					1		
5.500	1	1						
5.625								
5.750		2				1		
5.875	1	1						1
6.000		2				1		
Over 6 miles	3	2	-	-		3	1	2
Total	89	98	59	16	57	146	197	126

APPENDIX F-6

EMPIRICAL DATA - SURVEY STORE CUSTOMERS BY DISTANCE TRAVELED TO SURVEY STORE AND QUADRANT (REGIONAL SHOPPING CENTER)

Distance Interval (Miles)	Regional Shopping Center-1				Regional Shopping Center-2			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
.125	-	-	-	-	-	-	-	-
.250	-	-	-	-	-	-	-	2
.375	1	3	-	-	2	1	2	1
.500	3	1	1	1	3	-	3	3
.625	2	-	2	-	2	1	3	5
.750	1	-	3	1	3	1	11	4
.875	7	1	5	-	4	3	6	7
1.000	1	2	3	1	4	12	7	1
1.125	5	7	7	4	4	16	8	3
1.250	4	3	6	4	3	12	9	-
1.375	2	4	6	4	2	11	6	-
1.500	1	3	3	2	6	11	5	2
1.625	2	5	2	4	6	17	7	2
1.750	-	5	2	3	4	11	3	-
1.875	-	6	3	4	2	2	5	1
2.000	2	7	6	1	1	5	8	1
2.125	3	4	7	1	2	6	12	-
2.250	4	8	3	1	1	4	9	1
2.375	1	5	2	1	2	8	13	-
2.500	4	3	5	-	2	4	7	-
2.625	1	2	4	2	2	4	12	
2.750	2	2	6	5	-	5	6	
2.875	2	4	7	5	1	11	5	
3.000	-	5	8	4	1	5	6	
3.125	4	-	6	1	3	1	5	
3.250	3	6	2	3	1	2	6	
3.375	3	5	3	4	2	3	10	
3.500	2	4	3	4	-	1	8	
3.625	3	4	2	1	-	1	2	-
3.750	1	2	4	4	-	2	2	-
3.875	3	5	3	2	1	1	8	-
4.000	3	6	6	1	1	-	5	-
4.125	1	10	3	-	1	2	4	1
4.250	1	2	3	-	2	2	4	1
4.375	-	5	2	2	-	1	1	

APPENDIX F-6. Continued

Distance Interval (Miles)	Regional Shopping Center-1				Regional Shopping Center-2			
	Quad 1	Quad 2	Quad 3	Quad 4	Quad 1	Quad 2	Quad 3	Quad 4
4.500	-	2	1	-	1	2	2	
4.625	3	1	2	1	2	-	4	1
4.750	1	5	3	1	-	1	2	
4.875	2	1	-	1	-		3	
5.000	1	4	1	2	1		2	
5.125	2	3	1	1	-		4	
5.250		-	-	-	2		2	
5.375		6	2	2	2		1	
5.500		5	1	-			1	
5.625		3	1	1			-	
5.750		2	-	3			4	1
5.875		4	3	2			3	
6.000		1	3	1	1	4	2	
6.125	2	4	-	1	2		4	1
6.250		2	1	1			1	
6.375		3	1	1			2	
6.500		1	1	2			1	1
6.625		-	-	2			1	
6.750		1	-	2			2	
6.875		1	2	2			2	
7.000		3	-	-			-	
7.125		2	2	-			2	
7.250		-	-	1				
7.375		2	1	3				1
7.500		4	-	1				
7.625		1	-				1	
7.750		2	-					
7.875		2	1	1				
8.000		2	1	1				
Over 8 miles	6	18	7	8	-	-	2	
Total	89	214	162	111	79	173	256	40

APPENDIX G

EMPIRICAL DATA

LOCATION OF COMPETITIVE SUPERMARKETS BY SURVEY STORE

The locations of competitive supermarkets are presented in Appendix G. The competitive stores are identified by distance and degree using the intersection of the N-S and E-W quadrant lines as the reference point. Identification - letters (i.e. A, B, C, D, etc.) indicates competitive chain organizations. That is, all of the stores labeled "A" belong to the same chain of supermarkets operating in the survey area. The letter "X" denotes a sister store of the survey store.

APPENDIX G

LOCATION OF COMPETITIVE SUPERMARKETS BY SURVEY STORE

Survey Store	Distance (Miles)	Degree	Chain Identi- fication
Urban Strip-1	.40	105°	D
	.70	140	A
	1.00	35	B
	1.13	210	C
	1.50	269	B
	1.50	310	A
	1.50	342	D
	1.63	271	A
	1.88	302	B
	2.00	7	C
Urban Strip-2	.45	272°	C
	.55	287	A
	.63	142	D
	.90	190	A
	1.05	21	C
	1.14	88	C
	1.25	220	B
	1.30	250	D
	1.60	330	C
	1.70	128	B
	1.70	321	A
	1.80	310	X
Urban Strip-3	.70	57°	B
	.80	66	A
	.80	302	B
	.93	298	A
	1.15	252	A
	1.20	262	B
	1.45	17	A
	1.55	16	X
	1.67	79	X
	1.70	139	X
	1.70	309	X
	1.75	64	A

APPENDIX G. Continued

Survey Store	Distance (Miles)	Degree	Chain Identi-fication
Urban Strip-3 (Continued)	1.80	149°	A
	2.00	154	C
	2.00	260	A
Urban Cluster-1	.05	270°	C
	.38	268	A
	.88	9	B
	.88	90	C
	1.17	268	C
	1.25	7	X
	1.38	230	A
	1.63	225	C
	1.65	183	D
	1.90	121	C
	2.00	235	B
	2.00	302	D
Urban Cluster-2	.25	273°	D
	.40	81	A
	1.23	40	A
	1.40	255	C
	1.50	248	D
	1.55	157	A
	1.65	287	A
	1.60	279	C
	1.65	253	B
	1.75	204	A
	1.75	330	A
	1.80	208	C
	1.85	225	C
	1.90	210	X
	2.00	185	D
	2.00	302	A
Urban Cluster-3	.75	162°	A
	.75	272	A
	.80	150	B
	1.25	182	B
	1.30	300	B
	1.50	178	A

APPENDIX G. Continued

Survey Store	Distance (Miles)	Degree	Chain Identi-fication
Urban Cluster-3 (Continued)	1.60	75°	X
	1.65	145	X
	1.65	80	A
	1.75	208	A
	2.00	110	B
	2.00	112	A
Small Town-1	.15	90°	A
Small Town-2	.20	90°	A
Small Town-3	-	-	
Neighborhood Shopping Center-1	1.05	0°	D
	1.20	58	A
	1.22	60	B
	2.00	237	C
Neighborhood Shopping Center-2	.20	270°	D
	1.20	37	B
	1.25	314	B
	1.25	212	A
	1.40	40	D
	1.50	46	A
Community Shopping Center-1	.25	270°	A
	1.55	122	B
	1.55	132	X
	1.58	270	B
	1.65	230	D
	1.60	186	D
	2.00	83	C
Community Shopping Center-2	.20	268°	A
	.40	260	D
	.60	255	B
	1.25	215	D
	1.50	56	C
	1.65	131	B
	1.90	297	A

APPENDIX G. Continued

Survey Store	Distance (Miles)	Degree	Chain Identi-fication
Community Shopping Center-2	1.95	242°	C
(Continued)	2.00	241	A
	2.00	298	B
Regional Shopping Center-1	.45	200°	B
	1.25	185	X
	1.30	195	C
	1.35	202	A
	1.40	305	C
	1.42	296	A
	1.42	151	C
	1.75	222	C
	2.00	262	D
Regional Shopping Center-2	.80	280°	D
	1.05	78	B
	1.40	340	B
	1.45	274	B
	1.65	190	B
	1.75	135	C
	1.75	150	A

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