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SPATIAL ADJUSTMENT OF RETAIL ACTIVITY: A SPATIAL ANALYSIS OF SUPERMARKETS IN METROPOLITAN DENVER, 1960-1980

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Introduction

To date, Christaller's central place theory represents the most comprehensive statement on the location of retail and service activity. However, a number of other hypotheses and statements have also been advanced that deal specifically with the spatial behavior and structure of retail activity within an urban area. In two of the earliest statements, factors leading to a clustered spatial pattern of retail activities [15] and those leading to a dispersed spatial pattern [34] were identified. Later, Nelson[29] formulated the interceptor and cumulative attraction location strategies. When applied, the interceptor strategy should lead to a dispersed spatial pattern of retail establishments, and the cumulative attraction strategy should lead to a clustered pattern.

More recently, a number of researchers have studied the intra-urban retail spatial structure. Several emphases among these studies can be identified. One of the emphases involves the analysis of the hierarchical and topological structure of retail and business districts that can be traced back to Proudfoot [32], Lowenstein [26], Garner [11] and Johnston [17]. It is recognized in these studies that "retail and service establishments are grouped spatially according to the special location needs of the business types [41]."

A second emphasis deals with the relation of the number of retail facilities, sales and prices with such socioeconomic factors as the size of population, household income, occupation, and trade intensity. Economists, geographers, and marketing analysts alike have made numerous contributions [4, 6, 7, 13, 21, 22, 23, 24, 30, 40, 44]. The general hypothesis being examined in these studies is that the level and distribution of retail facilities, sales and prices are related to various characteristics of the households that make up the market areas.

Analysis of retail site economics, trade area, and location strategy forms another area of research in retail spatial structure. Significant contributions include Nelson's discussion of selection of retail sites [29], Applebaum's discussion of chain store location strategy and methods of trade area determination [2, 3] and several other discussions in the 1965 proceedings of the American Marketing Association Conference. Empirical analysis of site economics of selected retail and service activities can also be found in a study of the convenience foods stores in metropolitan Denver [20] and an analysis of gasoline service stations [22].

The investigation of the spatial pattern of retail stores within an urban area constitutes another major thrust in retail structure research. Various probability distributions and spatial statistics have been used to describe the spatial pattern

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of retail stores in an attempt to determine the process that generated the spatial pattern. Artle's analysis of the structure of the Stockholms economy [5] was one of the first. Others include Roger's studies of urban dispersion [36, 37, 38, 39], Getis' study of Lansing grocery stores [12], and Dacey's construction of the central cluster process model [8]. In addition, several empirical analyses utilizing various probability models have been conducted. Nelson's interceptor and cumulative attraction strategies, as well as accessibility to households in influencing retail locational patterns, are examined in these studies [19, 20, 21, 22, 25, 40].

These studies have identified and established a number of location factors, principles, processes, or strategies that elucidate various aspects of the urban retail spatial structure. Some of these have been labeled descriptive scales and dichotomies in Simmons' comprehensive analysis of Chicago's changing pattern of retail location [41].

The first factor embodies the different locational strategies and accessibility requirements of the different classes of retail activities. Compatible shopping and specialty goods establishments tend to follow the principle of cumulative attraction by clustering together in space for increased accessibility and the convenience it affords comparison shoppers. Convenience goods activities are inclined to pursue an interceptor location strategy where the establishments tend to spread out in space in order to minimize competition and maximize accessibility.

Closely related to the first factor is the classification of generative, shared, or suscipient retail business generated by retail establishments [29]. Establishments carrying specialty goods have mainly generative business and thus do not require locations with a high degree of accessibility to the market. On the other hand, establishments carrying shopping goods have more shared and suscipient business and therefore require locations with a high degree of accessibility.

The third factor is the rent-advertising ratio of retail establishment as an indication of different locational requirements [29]. Establishments with mainly generative business generally occupy sites with only a moderate degree of accessibility to the market. These sites usually have lower rents, thus allowing the establishments to allocate more of its budget to advertising. The opposite is usually true for establishments that are highly suscipient in nature.

The last factor is the active-unequal competition dichotomy [7]. An active competition strategy entails the deliberate location of an establishment next to its competitor, but not for the benefits of customer convenience and customer interchange. This strategy effectively negates location as a competition advantage and the firms must compete with differences in price, product quality and service. On the other hand, if there is a considerable difference in the market positions of the participants, then the weaker one will generally follow an unequal competition strategy and seek to avoid competing in or near the same locale.

While it is apparent that much knowledge has been acquired on the urban retail structure, a comprehensive review of the recent retailing literature reveals a definite lack of theories or models dealing with the description and prediction of consumer spatial behavior and the spatial pattern of retail activity [9]. More specifically, what seems lacking in previous research is a model with the ability similar to the ecological model used by Hudson in the development of a locational theory of rural settlements [16]. Such a model would deal with the evolution of the spatial pattern of a retail activity within an urban environment. It would address such questions as: How the establishment of a retail activity distributes when that

activity first "invades" an urban area; what adjustments the distribution pattern subsequently experiences as more knowledge of the urban environment and the competitive forces is acquired; and finally, what distribution pattern the establishments will eventually assume.

The two objectives of the present study are (1) to describe changes in the spatial pattern and identify location factors and competitive strategies of supermarkets in the metropolitan Denver area from 1960 to 1980; and (2) to examine the ecological model in describing the evolution of the spatial pattern of the supermarkets. Supermarkets were chosen because, as an institution, they have a longer history than many convenience goods activities. In addition, super-marketing is highly competitive and their operations are sensitive to changes in a wide range of economic and demographic factors.

The three phases of the ecological model (colonization, spread, and competition) originally designed to explain the evolution of the spatial distribution of plants, seem useful in explaining the evolution of the spatial patterns of retail activities. Initially, when a retail activity invades a new urban environment, the unfamiliarity of the general urban environment and the market, coupled with the lack of competition, is likely to lead to an overall spatial pattern that reflects the haphazard approach in site selection. This argument seems particularly appealing for low-order retail and service activities where systematic market potential surveys and site analyses requiring considerable resources are not practical. Thus, it seems arguable that there is a colonization phase, where a retail activity invades a new urban area, that is characterized by a small number of establishments and an overall random spatial pattern.

If a demand is created in the local market for the activity, and growth in population size is experienced by the urban area, more establishments will enter the market. This process is coupled with an improvement in the knowledge of the general urban environment, the market conditions for the retail good and the competitive forces. Thus, the second phase, spread, appears.

In the third phase of the ecological model, competition, the spatial pattern is expected to be a dispersed one. However, the subsequent spatial pattern a retail activity may assume is at least a function of the nature of the retail goods. Convenience goods, such as groceries and gasoline, are purchased frequently and repeatedly. As a result, convenience and accessibility are more important to the consumer than price. Therefore, retailers of this class of goods would seek locations that approximate a spatial monopoly whereby accessibility is maximized and competition is minimized. Consequently, a tendency for these outlets to disperse is expected.

Shopping goods, such as furniture, shoes, and clothing, are purchased occasionally, usually after considerable comparison by the consumer. Retailers of this class of goods generally employ Nelson's cumulative attraction location strategy which results in a tendency for similar establishments to cluster in major retail centers.

Specialty goods, such as automobiles, jewelry, and high quality clothing, are generally purchased even less frequently than shopping goods. The consumer is willing to make a special effort to visit these shops, so retailers of this class of goods are relatively free from locational constraints faced by convenience and shopping goods establishments.

Competition is an important locational factor in the colonization and spread phases, but its greatest impact upon the distribution pattern of a retail activity is

expected in the competition phase. As competition intensifies, the total number of retail establishments should decline or remain relatively stable, even if the urban area continues to grow. This is due to an overexpansion of the activity during the period of spread, and establishments that operate less efficiently should eventually disappear. The competition phase is thus characterized by a decrease in the density of establishments, an increase in the size of operation, and a more dispersed spatial pattern for convenience goods establishments. However, for certain specialty and shopping goods, it is anticipated that there will be clusters of retail outlets in space, with the clusters themselves assuming a dispersed distribution pattern.

Brief History of the Supermarket Industry in Metropolitan Denver

For the purposes of this study, a distinction is made between supermarkets and superettes, or "mom and pop" stores. The Supermarket Institute defines a supermarket as "a large integrated food store offering groceries, meat, dairy, produce and frozen food, operating primarily on a self-service basis and having an annual sales volume of at least one-million dollars [1, p. 34]. Superettes are smaller than supermarkets, carry a limited line of groceries, often lack meat, produce or dairy sections, and have annual sales less than one-million dollars [43, p. 2]. The main distinction between the two lies in annual sales volume, and very few companies willingly share that information. Therefore, supermarkets and superettes are distinguished by the manner in which they are listed in the telephone and city directories and by personal interviews. Most supermarkets are listed as part of a chain operation, and many independents are listed as members, at one time or another, of Associated Grocers, a local wholesaler. Superettes are distinguished from supermarkets mainly by their names. Superettes often carry the word "superette" in their telephone listing or are listed as a specialty or ethnic grocery store.

Prior to the supermarket revolution in the mid-30's, the retail food industry in Denver, as well as in the rest of the U.S., was composed of independent grocers, cooperative groups, and chain stores [1]. The vast majority of the establishments were small-scale operations which served a limited neighborhood trade area. The yellow pages of the 1932 Denver telephone directory listed over 600 grocers and two chain store operations. Safeway, the larger chain, operated 43 stores, and the Serv-U's Chain Stores company operated six stores. The location strategies of independent and chain store grocers reflected the limited mobility of the urban population and relatively small trade areas needed to survive. An examination of the addresses of these 600 grocers indicates they were usually located within a few blocks of each other.

The innovation of the supermarket in the mid-1930's and its acceptance and growth in the following years brought about a tremendous change in the retail food industry. Both independents and chain stores recognized the advantages of larger store size and an increased product line and after World War II, the number of supermarkets greatly increased. More and more independents moved up to the supermarket format, and chains replaced their older stores with supermarkets. Although the number of supermarkets in Denver increased considerably, the number of food retailers actually declined. One 10,000 square-foot supermarket often displaced several grocery stores of the 1920's and 1930's vintage. The increasing mobility of the population allowed a supermarket to draw from a larger trade area, which sharpened the competition between supermarkets. Consequently, accessibility and other locational factors became increasingly important.

In 1960, the beginning of the study period, six supermarket chains and 187 supermarkets were competing in the Denver area. Over the next twenty years both the number of chains and the number of supermarkets declined, despite continuous population growth [Table 1]. The decrease in the number of stores is largely due to the continuation of the 1930's and 1940's trend toward larger stores. During the 1960's and 1970's, this trend produced the "superstores" which generally ranged from 25,000 to 50,000 square feet. These superstores displaced a number of smaller-sized supermarkets. The effect of this trend has been to steadily decrease the total number of supermarkets in the Denver area, while increasing the total store space. Safeway exemplified this trend. In 1968, Safeway operated 29 stores within the limits of the City and County of Denver. Today, only 20 Safeway stores operate within these same boundaries, but the store area has been increased by 50,000 to 60,000 square feet [28, p. 5].

Spatial Analysis of Supermarkets in Metropolitan Denver

The overall study area, an 18.9 mile by 23.6 mile rectangle (446 square miles) covered most of the Metropolitan Denver area. Supermarket locations were plotted at 5-year intervals, beginning with 1960 and ending with 1980. Prior to 1960, the use of telephone and city directories proved unsatisfactory for distinguishing supermarkets from the 1920's and 1930's vintage grocery stores. To further complicate the picture, many of the older supermarket chains were still operating some of these vintage stores along with their modern supermarkets. In too many cases, it could not be reliably determined if these vintage stores had been upgraded to the supermarket format. This was less of a problem in the more recent years.

While the overall study area was initially chosen to provide observation of the location of most of the supermarkets in Metropolitan Denver, the inclusion of much outlying open space in the study area made it inappropriate for specific point pattern analysis selected here. Therefore, an area of 13.93 miles by 15.71 miles (220 square miles), the Statistical Analysis Area, was identified. The size of the new study area [Fig. 1] was substantially less than that of the original area. The size and the position of this area were so chosen in order to avoid the well known density-dependency problem associated with the point pattern in general.¹

The Clark-Evans nearest neighbor measure (R) was employed to describe the spatial distribution of all supermarkets as well as the spatial distribution of selected chains. The spatial association between the stores of the largest chain (Safeway) and the stores of the other chains, as well as the spatial association of the independents with the chain stores were identified by the nearest neighbor spatial association measure (R*) [20]. This measure is designed to determine whether the association between two sets of points is clustering, independent, or avoidance. Not unlike the Clark-Evans measure, R* is also a ratio between the observed average distance (between a point from one set and the nearest point from the other set) and the expected average distance. The expected average distance, r_e is given by $n_1/(2\sqrt{p_2}) + n_2/(2\sqrt{p_1})$, where p_1 and p_2 are the densities of points for each of the two sets, and n_1 and n_2 are the proportions of the points in the two sets ($n_1 + n_2 = 1.0$).

¹ There are several measures one can take to avoid the density-dependency problem. A. Getis and B. Boots, in *Models of Spatial Processes*, suggest the Thiessen polygons and the reciprocal nearest neighbors. The approach used here is a traditional one in that a consistent size rectangle is located well within the entire distribution of points.

Figure 1.: Overall study area and statistical analysis area.

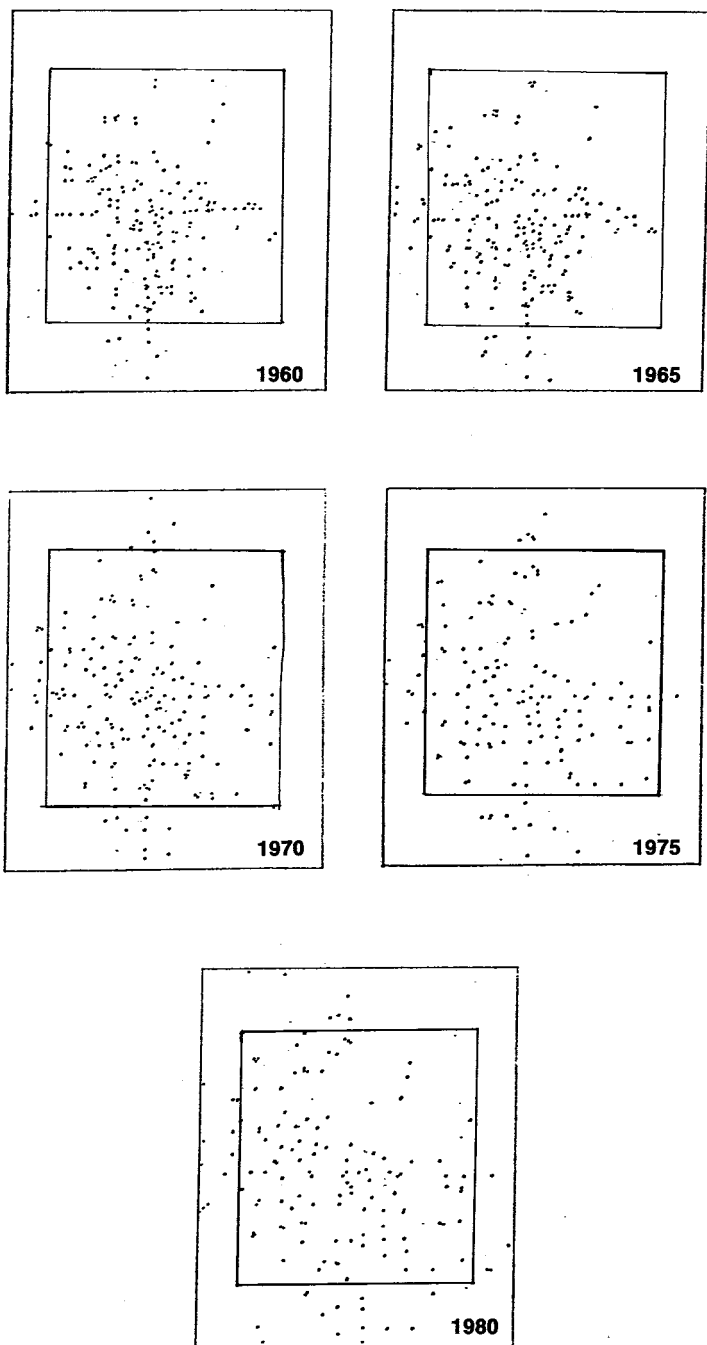


Table 1: Number of Supermarkets in Metropolitan Denver (Overall study area)

Major Supermarkets	1960	1965	1970	1975	1980
Safeway (SW)	49	43	47	50	55
National Tea (NT)	29	26	26	16	-
King Soopers (KS)	10	14	21	27	35
Albertsons (AB)	2	2	6	14	14
Independents	97	105	74	38	42
Total Supermarkets	187	190	174	145	146
Total Chains (Chains = 3 or more stores)	6	6	7	6	3

Table 2: Nearest-Neighbor Statistics (R) (Statistical Analysis Area)

	1960	1965	1970	1975	1980
SW only	N=44 R=1.08 Random	N=39 R=1.05 Random †	N=42 R=.992 Random	N=38 R=1.266 dispersed	N=37 R=1.338 dispersed †
KS only	(- - - - - all were less than 20 - - - - -)				N=35 †† R=1.323 dispersed †
SW, KS, NT	N=82 R=.7618 clustered†	N=74 R=0.677 clustered†	N=77 R=.804 clustered†		
SW, KS, NT, AB				N=74 R=0.788 clustered †	
SW, KS, AB					N=70 R=.817 clustered †
All Supermarkets	N=175 R=0.672 Clustered†	N=172 R=0.682 Clustered†	N=148 R=0.817 Clustered†	N=120 R=0.814 Clustered†	N=107 R=0.882 Clustered†

† : significant at 0.05 level
 ††: for the overall study area (only 20 stores where found in the statistical analysis)

The nearest-neighbor statistics (R), recorded in Table 2, indicate that Denver area supermarkets (all supermarkets) clustered together throughout the twenty-year period with R values ranging from 0.672 for 1960 to 0.882 for 1980. When individual chains were considered, Safeway stores showed a generally random distribution until 1975, whereupon the pattern evolved into one of dispersal.² When all the chain supermarket stores were considered, a tendency towards clustering was also shown for all time periods. The reason that only certain combinations of chains are shown in Table 2 is because not all chains existed for all the five time periods.

² Safeway is the only chain possessing 30 or more stores throughout the study period. Thirty stores were considered the minimum for the application of the statistical techniques to individual chains.

**Table 3: Spatial Association Statistics (R*)
(Statistical Analysis Area)**

	1960	1965	1970	1975	1980
SW vs. KS, NT	N=80 R*=0.781 Aggregated†	N=73 R*=0.582 Aggregated†	N=76 R*=0.691 Aggregated†		
SW vs. KS, NT, AB				N=77 R*=0.701 Aggregated†	
SW vs. KS, AB					N=70 R*=0.641 Aggregated†
Independents vs. chains	N=179 R*=0.807 Aggregated†	N=171 R*=0.848 Aggregated†	N=148 R*=1.03 Independent†	N=120 R*=1.07 Independent†	N=107 R*=0.6504 Aggregated†

†: Significant at 0.05 level

Table 3 records the analysis results of the spatial association of supermarkets. When the distance between the Safeway stores and the nearest stores of other chains was analyzed, the spatial association measures indicated a tendency of spatial aggregation, with $R^*=0.781$ in 1960 and $R^*=0.641$ in 1980. On the other hand, when the distance between chain stores and the nearest independent stores was analyzed, the spatial association measure showed a tendency towards aggregation at first (1960 and 1965), then a tendency towards independence (1970 and 1975), and eventually a tendency towards spatial aggregation (1980).

From the nearest neighbor and the spatial association analyses emerges a reasonably clear picture of the spatial pattern and the location strategy employed by supermarkets in the study area. There exists a tendency for major chains (Safeway) to disperse their stores in order to achieve spatial monopoly and to follow the growth of the urban area. In selecting specific sites, however, there is a tendency among the stores of major chains to cluster together, either as a result of the limited number of desirable sites or the application of the active competition strategy [7]. While the supermarket chains are actively competing with each other in site selections, the independent stores seem to be driven away to avoid head-on competition with the chain stores. In other words, being a weaker firm, the independent store applies the unequal competition strategy by avoiding competition with the "stronger" chain stores in the same locale. The spatial association measures seem to bear this out until 1980, when a spatial aggregation between the independent and chain supermarkets was found. Ideally, one would expect the spatial association of 1980 to be one of spatial avoidance. A possible explanation for such a discrepancy between the expected spatial association and that of the actual involves the event that took place in 1976. When National Tea, a major chain, sold out in 1976, most of the 16 stores were sold to independent operators, and thus possibly disturbing what would have otherwise been a spatial avoidance tendency.

Only one contemporary chain, Safeway, dates back to the 1930's, but given the data sources available, it could not be determined when the chain's stores were upgraded to the supermarket format. Hence, the number and spatial distribution of Safeway supermarkets, as well as other supermarkets of that period remain unknown. It can only be assured that supermarkets appeared in or "colonized"

**Table 4: Frequencies of Clusters in Metropolitan Denver
(Overall study area, stores within 2 blocks of each other)**

	# Of Stores Per Cluster		
	2	3	4
1960	26	5	2
1965	24	4	4
1970	22	2	1
1975	15	3	-
1980	13	4	-

the Denver area during the late 1930's and early 1940's, as this was the trend across the nation [1].

Determination of a "spread" phase is likewise hindered by a lack of adequate data. The nature of many retail food outlets could not be reliably determined because of the large number of pre-1930's grocery stores still serving the market in the late 1950's. Again, given the data source, these stores were largely indistinguishable from supermarkets. Therefore, the determination of a spatial distribution for supermarkets could not be attempted for this period.

The number of supermarket chains increased from four in 1942 to six by 1960, and the number of supermarkets increased from an estimated 74 to 187 during those same years. Such a marked increase in the number of stores suggests that the demand for this new innovation encouraged rapid expansion, or spread. The data for supermarkets from 1960 on are sufficiently accurate to allow statistical analyses. The number of supermarket chains serving the Denver area has declined from seven in 1970 to the present three (Albertson's, King Soopers, Safeway), and the number of stores from 187 to 146. These decreases are consistent with the decreases expected in the competition phase of the ecological model.

The rapid increase in the number of supermarkets since the Second World War and the supermarket decrease evident by the late 1960's suggest that the supermarket industry has adjusted in accordance with the competitive processes of the ecological model. The observed spatial patterns, however, deviate from the one hypothesized for convenience goods: no tendency towards dispersion has emerged among Denver area supermarkets as a group. This discrepancy suggests at least three possibilities: (1) the ecological model is inappropriate for describing the evolution of its spatial distribution, (2) the model is appropriate, but insufficient time has passed to allow the spatial adjustment process to achieve dispersion, or (3) the supermarket should not be categorized as a convenience goods activity. These possibilities will be examined more fully later on.

The competitive process is basic to the ecological model, and it is this process which brings about the decreased density and spatial dispersion among certain plant species [18, 31]. Application of this premise to the analysis of retail spatial structure is not without its problems. The decrease in the total number of supermarkets, for instance, cannot be attributed solely to the competitive process. Store closures are also caused by essentially non-competitive factors. Changes in demographics, such as suburban migration, decline in family income, or encroachment of commercial and industrial development into residential

areas may force a supermarket out of business. Profitable operations occasionally shut down because of expiration of the lease term, or in the case of small or aging stores, the cost to remodel may exceed the projected return on investment. Finally, relocation with a larger facility could theoretically increase the overall market share or better serve a specific trade area. Entire chains may leave a market area despite the overall profitability of their operation. National Tea, for example, sold its Colorado division in order to raise cash to strengthen its eastern division.

The ecological model, to its merit, is relatively simple and straightforward and is conceptually appealing. The deviation of the observed spatial pattern of supermarkets in metropolitan Denver from the pattern predicted by the ecological model does not condemn the model. It is possible that insufficient time has passed to allow the spatial adjustment process to achieve dispersion. In fact, the five maps in Figure 1 do provide a visual impression of a continuous progression towards dispersion. The central area appears to thin out over the twenty year span and supermarkets have generally followed the growth trends in the southeast portion of the city. Nevertheless, eventual dispersion among all supermarkets is not expected and thus the third possibility is seen as most probable.

The clustering of similar convenience goods establishments, as pointed out by Getis [12], Rogers [35], and Lee and Schmidt [22] is largely due to the uneven distribution of population, purchasing power, and other factors in an urban area. An important question has been recently raised in the retail location literature as to the appropriateness of the traditional classification of supermarkets as a convenience goods activity. There is growing evidence that suggests supermarkets no longer fit the description of a convenience goods activity, and consequently, the expected spatial distribution should not be one of dispersal.

Thompson [42] is one of the first challenge the classification of supermarkets as a convenience goods activity. Citing consumer surveys, he argues that price, quality, and aesthetic factors are more important to the shopper than a convenient location and that groceries should be thought of as shopping goods rather than convenience goods. He also cites Holdren's [14] findings that the demand curve for groceries, in the aggregate, was highly elastic, contrary to the relatively inelastic curve theorized for convenience goods. Thompson does acknowledge that supermarkets do compete spatially, but feels "that an assumption of spatial competition had more vitality in the past than it has today [42, p. 80]."

Other studies support Thompson. Consumer surveys conducted by King Soopers in Denver, Albuquerque, and Phoenix indicate consumers are not shopping at the nearest supermarket, but are often driving past one or more competitors to shop at a particular supermarket. Using travel diary data gathered from Tinley Park residents, MacKay [27] found that it is not unusual for consumers to stop at more than one supermarket on a given shopping trip. Many consumers will do the bulk of their weekly shopping at one store and then shop for "specials" at a competitor. This practice, often referred to as "cherry picking" is quite common, and it further illustrates the need to reconsider groceries as convenience goods.

Supermarkets today are not simply places to purchase groceries. Many supermarkets now have pharmacies, delicatessens, optical shops, and film processing services.³ Denver area supermarkets sell tickets for theatres, sporting events, ski

³ King Soopers, for example, handles 51 percent of the film processing in the Metro Denver area [10].

lifts, postage stamps at cost, and bus token and passes at discounts. Most recently, they have become recycling centers for aluminum cans. Furthermore, supermarkets often serve as neighborhood focal points for voter registration drives, public health campaigns, and communication centers (public bulletin boards). This dramatic expansion in the range of goods and scope of services offered by supermarkets, coupled with the changes in consumer preference and habits points out the need to re-evaluate certain traditional assumptions generally associated with supermarkets.

From the data presented here, several observations emerge that suggest a shift has occurred in the importance of certain location factors or principles generally associated with supermarkets. Chain operators do not appear to be as concerned with the avoidance of their competitors as they are with the spatial avoidance of sister stores. The two largest chains, King Soopers and Safeway, each show a dispersed pattern among their own stores, while Denver chains on the whole tend to cluster. Locating a store too close to sister stores could cause more economic damage to the chain than locating too close to a competitor.

The strategy of minimizing competitive hazards appears even less important when individual clusters of supermarkets are considered. The proliferation of clusters of two, three, and even four stores within two blocks of each other in the early 1960's reflects the chain operators' concern with chain visibility (Table 4). Operators were very concerned with chain representation in an area and often built stores to match the competitor's facilities, despite finite market potential [33]. Although the number of supermarket clusters has generally declined, some chains still consider chain visibility an important factor in site selection. The present clusters are not remnants of an outdated location strategy. Quite to the contrary, they represent recent location decisions.

The decision of one or more companies to locate next to an existing supermarket contradicts the interceptor location strategy for convenience goods. Rather than locate a few blocks away at a site that would fulfill the desire for chain visibility and also employ the interceptor strategy, chain stores appear willing to compete head-on. Some factors, such as high land values, scarcity of suitable sites, and zoning laws draw competing chains to neighboring locations. However, the ability to compete side by side can be largely attributed to such factors as increased consumer mobility, increased drawing power of supermarkets offering higher order goods and services, and chain image — all of which act to extend the market area.

Independent supermarkets in metropolitan Denver display a different spatial behavior from the chain supermarkets. The spatial association between the independent and chain stores was one of aggregation for the first two periods, became independent until 1975, and reversed back to one of aggregation in 1980. These independently owned supermarkets are generally older and smaller than the chain stores and lead a more precarious economic existence, especially if located near a major chain store. The independent stores that do find themselves competing with one or more chain stores rarely have the resources to compete effectively or to relocate to a more secure site. The number of independent supermarkets has declined dramatically over the last twenty years and those still operating are concentrated in the older west-central area of Denver. This area has been largely abandoned by the major chains, and in fact, many of the independent stores occupy the shells of former chain stores.

Summary and Conclusions

It has been found that Denver area supermarkets exhibit a clustered spatial distribution throughout the twenty year study period. The major chain stores tend to cluster, but the stores of individual chains tend to disperse. The spatial distribution of Safeway has evolved from a clustered pattern to its present pattern of dispersal. A similar evolution is possible for King Soopers. All chain stores remain spatially aggregated throughout the study period. However, independent supermarkets initially exhibit spatial aggregation with the chain stores but subsequently undergo a spatial adjustment process, but leads back to the early pattern of spatial aggregation.

Since, prior to 1960, supermarkets could not be reliably separated from grocery stores, statistical analysis was not attempted for earlier years. Therefore, the phases of colonization and spread can only be inferred on the basis of historical trends in the supermarket industry. The spatial distribution expected in the competition phase of the ecological model is at least a function of the type of retail goods involved; similar convenience goods are expected to disperse, while similar shopping goods activities are expected to cluster in major retail centers. The discrepancy between the observed and expected distributions, coupled with evidence from previous studies, suggests that this activity should not be considered as a convenience goods activity. As more and more retail activities carry a greater product mix, the definitions of convenience and shopping goods become less meaningful. In turn, the expected spatial behavior for these activities becomes less clear.

Despite these problems, the appealing nature of the ecological model as a framework for analyzing the temporal changes in the spatial pattern or urban retail activities warrants further investigation. Furthermore, the traditional definitions and spatial assumptions associated with convenience and shopping goods activities need to be re-evaluated in order to reflect the diversity in product mix and location strategies evident in today's retail establishments.

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