INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA

UMI®
800-521-0800
UNIVERSITY OF CALIFORNIA  
Santa Barbara

SAN DIEGO STATE UNIVERSITY

The Economic and Spatial Dynamics of U.S. 
Metropolitan Retailing: 1977-1997

A Dissertation submitted in partial satisfaction 
of the requirements for the degree of

Doctor of Philosophy

in

Geography

by

Scott Thomas Munroe

Committee in charge:

Professor Arthur Getis, Chairperson
Professor Serge Rey
Professor Richard Church
Professor Helen Couclelis

August 1999
The dissertation of Scott Thomas Munroe is approved

Houck

Richard Z. Church

Kajsa B
d

Committee Chairperson

August 1999
ACKNOWLEDGEMENTS

It is with deep appreciation that I thank the members of my committee for their efforts in the preparation of this research and contributions to my development as a scholar. The unique nature of our geography program put extra burdens on all faculty involved but offered myself as a student the unique opportunity to learn from the best of two separate institutions. I am grateful for the efforts of my committee and others who afforded me this educational opportunity.

Professor Arthur Getis provided me with the inspiration to first gain an interest in this research problem and then see it through to completion. At all points in between he has provided rewarding advice and guidance on the both the general and technical aspects of the research. Outside of this research, he has patiently guided my education and broadened my interests in the field of regional science.

I am also indebted to Professors Serge Rey, Rick Church and Helen Couclelis for their help with this dissertation and my education. Their varied perspectives on the research problem were of immense benefit in assuring its completeness. The influence of their different interests has also helped me to accrue a wealth of knowledge and skills that I enjoy using in applied research on a daily basis.

I also must thank all the faculty and staff of the geography departments of both institutions for their work on my and others’ behalf. In particular, Yumiko Tsuneyoshi of San Diego State has made sure I made it over all the hurdles posed by the program requirements and logistics.

Finally, I would like to thank my family who made this all possible in the first place and then provided the support I needed to achieve success in this and all other endeavors. Thank you!
VITA

March 18, 1969 -- Born -- Pasadena, California

1991 -- B.A. -- Economics -- University of California, Irvine

1993 -- M.A. -- Geography -- California State University, Long Beach

1991-93 -- Teaching Assistant -- Department of Geography, California State University, Long Beach

1993-97 -- Teaching Assistant -- Department of Geography, Department of Geography, San Diego State University

PUBLICATIONS

Munroe, Scott and Zainul Nurani (1999) Multi-facility retail location problems *Business Geographics* 7(5)


Munroe, Scott (1993) The Effects of Jobs/Housing Balancing on Commuting Patterns in Orange County, California Master’s Thesis, California State University, Long Beach

FIELDS OF STUDY

Major Field: Regional Science

Spatial Analysis -- Professor Arthur Getis

Urban Modeling -- Professors Arthur Getis and Serge Rey

Location Modeling -- Professor Richard Church

Urban Structure -- Professor Arthur Getis and Helen Couclelis
ABSTRACT

The Economic and Spatial Dynamics of U.S. Metropolitan Retailing: 1977-1997

by

Scott Thomas Munroe

The spatial structure of 20th century metropolitan retailing in the United States has been characterized by two distinct trends. The first was the migration of retail activities from central city to suburban areas. These activities subsequently agglomerated into the regional malls that characterized suburban shopping in the decades following World War II. A more recent trend, however, has emerged. Innovative new value or big-box retailers have taken over the metropolis transforming the retail pattern from one of agglomeration to dispersion. In this research we detail the nature of this retail revolution.

Through an examination of eight sample retail sectors in the San Diego MSA we characterize this change as non-homogeneous. The nature of retail dynamics brought about by the emergence of value retailers is unique from sector to sector. Shopping oriented sectors have seen the greatest degree of change as big-box format stores negate the importance of comparison shopping. Affinities between unique retail types have changed as well as value retailers spatial align themselves with one another in search of prominence and suitable sites.

The possible mechanisms for this change are investigated through a supply and demand model of retail structure. In our model the cost structures of firms and preferences of consumers interact to shape retail structure. We consider both substitutable and complementary spatial relationships between retail outlets. Model simulations suggest that changes in firm structure, particularly an increased ability to realize scale economies, are the most likely cause for the observed change. Retail dynamics that necessitates change in consumer behavior can occur even in the presence of static consumer preferences.

Empirical research of firm costs and consumer preferences support these model results. Consumers indicate no significant change in their preferences for different retail types even in the presence of retail structural and behavioral change. Analysis of firm costs indicate that they continue to realize greater scale benefits through expansion of their outlets. Alterations in spatial affinities between firms are due
primarily to unique site requirements and the exposure associated with locations nearby other prominent retailers.

Keywords: retail structure, retail dynamics, urban modeling, point pattern analysis, catastrophe modeling
TABLE OF CONTENTS

ACKNOWLEDGEMENTS iii

VITA iv

ABSTRACT v

TABLE OF CONTENTS vii

LIST OF FIGURES x

LIST OF TABLES xiii

CHAPTER

1. Introduction 1
   Background to the Study
   The Problem
   The Organization of the Study
   Detecting Change
   Exploring Mechanisms for Observed Dynamics
   Validating the Mechanisms
   Synthesizing the Results
   Limitations of the Research

2. Literature Review 16
   Introduction
   The Structure of Metropolitan Retailing
   Central Place Theory
   Relaxing the Assumptions
   The Limits of Central Place Studies
   Pattern Analyses
   Bid-Rent Theory and the Principal of Minimum
   Differentiation
   The Integration of Structural Factors
   The Process of Structural Change
   Modeling Retail Structural Change

vii
Central Place Dynamics
Spatial Competition and Location Modeling
Catastrophe Theory
   Consumer Utility Maximization
   Supply and Demand
   Modeling Changes in the Size and Relative Location of Outlets
Empirical Analyses of Retail Change
The Process of Change
   External Forces
   Internal Forces
Conclusions

3. Intrasectoral Dynamics and Competitive Impacts
   Introduction
   Methodology
      Data
      Analysis of Relative Location Dynamics
      Analysis of Competitive Impacts
   Findings
      Supermarkets
      Drug Stores
      Stationers and Office Supply Dealers
      Book Stores
      Sporting Goods Dealers
      Home Electronics Dealers
      Traditional Department Stores
      Furniture Stores
   Summary

4. Comparative and Intersectoral Dynamics
   Introduction
   Comparative Sectoral Dynamics and Competitive Impacts
      Dynamics within the convenience goods oriented sectors
      Dynamics within the shopping goods oriented sectors
      Dynamics within the intermediate shopping/convenience oriented sectors
   Intersectoral Dynamics
   Summary
5. Modeling Change
   Introduction
   Methodology
   The Model
   Simulation Procedures
   Numerical Experiments
   Locational Problems
   Results of Numerical Experiments
   Mathematical Background
   Numerical Results
   Results of Locational Problems
   Individual Parameters
   Simultaneous Parameter Shifts
   Summary

6. Mechanisms of Change
   Introduction
   Firm Cost Structures
   Locational Costs
   Consumer Preferences
   Summary

7. Conclusions
   Overview of Research
   Summary of Findings
   Structural Dynamics
   Modeling Structural Change
   The Forces of Change
   Directions for Future Research

BIBLIOGRAPHY

APPENDIX
   A. Survey Dialogue
   B. Survey Form
## LIST OF FIGURES

1-1. Trends in the market share of different size retail establishments 6  
2-1. Shopping utility and optimum retail establishment size 43  
2-2. Discontinuous change in the optimum size of retail establishments resulting from continuous change in the cost of travel 44  
2-3. Supply and demand modeling approach to analyzing retail dynamics 47  
3-1. The average spacing of supermarkets 81  
3-2. The clustering of supermarkets 82  
3-3. Competitive impacts of discount supermarkets upon conventional supermarkets 85  
3-4. The locations of supermarkets 87  
3-5. The average spacing of drug stores 94  
3-6. The clustering of drug stores 95  
3-7. Competitive impacts of discount drug stores upon conventional, drug stores 98  
3-8. The locations of drug stores 100  
3-9. The average spacing of stationers/office supply dealers 106  
3-10. The clustering of stationers/office supply dealers 107  
3-11. Competitive impacts of office supply superstores upon conventional stationers/office supply dealers 110  
3-12. The locations of stationers/office supply dealers 111  
3-13. The average spacing of book stores 118
3-14. The clustering of book stores


3-16. The locations of book stores

3-17. The average spacing of sporting goods dealers

3-18. The clustering of sporting goods dealers

3-19. Competitive impacts of sporting goods superstores upon conventional sporting goods dealers

3-20. The locations of sporting goods dealers

3-21. The average spacing of home electronics dealers

3-22. The clustering of home electronics dealers

3-23. Competitive impacts of home electronics superstores upon conventional home electronics stores

3-24. The locations of home electronics dealers

3-25. The average spacing of traditional department stores

3-26. The clustering of traditional department stores

3-27. The locations of traditional department stores

3-28. The average spacing of furniture stores

3-29. The clustering of furniture stores

3-30. The locations of furniture stores

4-1. Comparative plots of nearest neighbor statistics for the sample sectors over time
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-2</td>
<td>Comparative plots of k-function measures for the sample sectors over time</td>
<td>185</td>
</tr>
<tr>
<td>4-3</td>
<td>Location of the 25 mi.² subregion</td>
<td>198</td>
</tr>
<tr>
<td>4-4</td>
<td>The locations of sampled sector stores within the detailed study region</td>
<td>200</td>
</tr>
<tr>
<td>5-1</td>
<td>The artificial study region used for the locational problems</td>
<td>226</td>
</tr>
<tr>
<td>5-2</td>
<td>The nature of $W^*$ under changing $\alpha$ and $\beta$</td>
<td>231</td>
</tr>
<tr>
<td>5-3</td>
<td>Variation in the values of the locational measures through the study region</td>
<td>248</td>
</tr>
<tr>
<td>6-1</td>
<td>Changes in the parameters describing the cost structure of retail establishments</td>
<td>267</td>
</tr>
<tr>
<td>6-2</td>
<td>The relationship between GLA and rent per square foot</td>
<td>272</td>
</tr>
<tr>
<td>6-3</td>
<td>Changes in the parameters describing the rent structure of retail establishments</td>
<td>278</td>
</tr>
<tr>
<td>6-4</td>
<td>Changes in consumer preferences for the four store attributes</td>
<td>291</td>
</tr>
</tbody>
</table>
LIST OF TABLES

3-1. Changes in the number and spacing of supermarkets 80
3-2. Changes in the number and spacing of drug stores 93
3-3. Changes in the number and spacing of stationers/office supply dealers 105
3-4. Changes in the number and spacing of book stores 117
3-5. Changes in the number and spacing of sporting goods dealers 129
3-6. Changes in the number and spacing of home electronics dealers 142
3-7. Changes in the number and spacing of traditional department stores 155
3-8. Changes in the number and spacing of furniture stores 166
5-1. Model parameters and allowed ranges 220
5-2. Location problem parameters, allowed ranges, base settings, and pseudocode 239
6-1. Establishment sales per employee by employment size class 261
6-2. Percent change in establishment sales per employee by employment size class 263
6-3. Changes in the parameters describing the cost structure of retail establishments 266
6-4. Average GLA and real rent per square foot for the different center types over the study period 271
6-5. Changes in the parameters describing the rent structure of retail establishments. 277
6-6. Cross tabulations of survey responses 284
6-7. Changes in consumer preferences for the four store attributes
CHAPTER 1: Introduction

Background to the Study

Following World War II the United States experienced a dramatic shift in its urban geography as suburban areas swelled with the new residences of its affluent population. In response to this migration of demand from central to more peripheral metropolitan locations, retailers shifted and expanded their activities to the burgeoning suburbs. As the suburbs began to stabilize and retailing became an established suburban activity, the retail pattern further evolved as the benefits of agglomeration were realized through locations in regional malls. These malls became the focal point of suburban retail activities and, following rapid growth in their numbers during the 1960s and 70s, the spatial pattern of metropolitan retailing settled into an equilibrium with little change in the prosperous 1980s.

While the 1960s to 1980s were marked by retail suburbanization and later agglomeration, two distinct trends in the spatial pattern of retail activities, there was relatively little innovation in the types of retail establishments found\(^1\). The two trends involved primarily the same types of retailers found before the spatial changes began. Recent innovations, however, suggest that the suburban equilibrium reached by these
retail types has ended. Many commentators have noted the profound changes currently sweeping the retail marketplace. Germeroth (1992), Morganosky (1993), Schwanke (1993) and Siegel (1996), among others, have recognized the growth of innovative new retailers who offer the same quality and name brands of more traditional retailers at significantly reduced prices. These value retailers have adopted a multitude of different store formats yet they may be considered together as a single group because they distinguish themselves from more traditional retailers by realizing profits from the sale of large volumes at margins. To achieve this end, these new retailers operate large establishments which tend to be part of a larger chain organization, allowing them to capitalize on scale economies.

Value retailing involves a number of distinct store types and formats. Warehouse clubs (such as CostCo, Sam’s Club), factory outlets (Nike, Liz Claibourne), category killers (Sports Authority, Home Depot, Circuit City), discount clothing department stores (Ross, Marshalls; sometimes referred to as off-price apparel retailers), and discount department stores (WalMart, Kmart, Target) represent the bulk of the formats. In this study we investigate, particularly, category killers and, incidentally, the department stores. It is these value retail formats which compete most directly with traditional retailers. We are interested in how the growth of these formats have altered the spatial distribution of retail activities within specific retail sectors. For example, how has the growth of home electronics superstores
impacted the spatial pattern of all home electronics dealers? This necessarily ignores
the fact that competition exists between sectors. The growth of home electronics
superstores, for example, has come at the expense of not just traditional home
electronics dealers but also department and furniture stores, many of which have
electronics departments. This simplifying focus is necessary due to the
overwhelming complexity of potential intersectors' competitive linkages. As shown
in the research, however, there is still much that is learned from examining the
problem on a sectoral basis.

We focus our attention particularly on the category killer format for two
reasons. In the first case, they are the most pervasive value retail format. Popular
accounts speak volumes of the category killer phenomenon:

Superstores have gone from zero to $550 billion in annual sales, or fully one-
third of the nation's retail revenue, in 10 years flat. In fiscal year 1996, Home
Depot, the leading home-improvement superstore chain, showed a record
$938 million profit on $19.5 billion in sales, a 28 percent improvement over
the previous year's record profits; Staples, a $106 million profit on $4 billion
in sales, or a 44 percent improvement. Borders, the No. 2 bookseller in the
nation, has been opening new superstores at the rate of one every nine days;
Barnes & Noble, the leading bookseller, one every four or five days; Staples,
two a week. For Home Depot, nearly three a week. (Panek 1997, p. 66)

Category killers have been the biggest growth phenomenon in retailing in
North America and Europe over the last 15 years. (Wileman and Jary 1997,
p. 77)

Surprisingly, little attention has been focused upon them by the geographic
community. The spatial significance of category killer growth is practically unknown
but surely great. To quote Panek (1997, p. 67) further, "they don't just give the
local competition a run for its money -- they eliminate it by design." Secondly, the
growth of superstores, on the surface, not only seems uniform but is typically treated
as just that:

The retail formula has been fairly consistent. Focus on a product category
that is still dominated by a fragmented group of small-scale independents
and/or is served poorly by large generalist retailers (department stores,
hypermartks). Aim to offer the widest possible range, minimise out-of-
stocks, and under-cut the independents and generalists by 10-25% on price.
Open large out-of-town/edge-of-town ('power strips', in the USA)
warehouse-type stores with huge parking lots that draw consumers from a
large drive-time catchment area of half an hour or more. Aim for a dominant
(20%+) share in the catchment area. Become the low cost operator, through
a combination of low rents, low cost shop-fits, tight staffing, economies of
scale (labour and overhead) at store and chain level, buying muscle, and high
asset productivity (space and stock turn). (Wileman and Jary 1997, p. 77)

The supermarket structure has served as a model for retailers in such
specialty lines as Toys "R" Us in toys, Levitz in furniture, and Herman's in
sporting goods. (Michman and Greco 1995, p. 73-74)

But while category killers may be seen as an application of identical formats to the
selling of different product lines, this study demonstrates that the spatial significance
of their growth varies highly between sectors, but that these variations are in part due
to the nature of the goods sold. In effect, we demonstrate that the traditional
dichotomy between shopping and convenience goods, which has long been
recognized as an important determinant of retail spatial structure (cf. Getis and Getis
1968), affects the spatial implications of category killer growth.
Growth in value retailing activities suggests that the mall dominated equilibrium has been broken and the retail system is shifting, at the least, to a pattern of relatively fewer, but larger establishments. Evidence of this is provided in Figure 1-1 which shows shifts in the market shares of establishments of different sizes\textsuperscript{2} between 1972 and 1992.\textsuperscript{3} Of interest is the increasing market share of the largest retail establishments coupled with the decreasing share of the smallest. In terms of sales, shown in part (b), establishments with one hundred or more employees in 1992 had greater market share than those with nine or fewer (25.74 versus 21.77 percent). This contrasts sharply with the situation just 10 years prior when the sales share of the smallest firms was 70 percent greater than that of the largest (27.75 versus 16.32 percent). This is particularly striking when one considers how few in number the large establishments are compared with the small as evidenced in part (a). During the twenty year period shown, the number of establishments with 9 or fewer employees decreased by 2.53 percent while the number of those with 100 or more increased 173 percent suggesting a dramatic upward shift in the hierarchy of retail establishments. Additionally, this shift occurred rather suddenly following little change into the mid 1980s.

The trend observed in Figure 1-1 implies a shift towards larger establishments. The data utilized cover SIC Major Groups 52-59, all retail trade as defined by the census, and thus mask likely greater variations between sectors.
Figure 1-1. Trends in the market share of different size retail establishments.

(a) Percent of total establishments by establishment size class

(b) Percent of total sales by establishment size class
Additionally, the data cover both metropolitan and nonmetropolitan retailing while
the changes have largely been a metropolitan phenomenon. Because of the
categorical and geographic aggregation within the data it is difficult to generalize to
any great extent on the degree and temporal nature of change, but it is clear that the
retail system has entered a transformational stage. Since innovation has not occurred
uniformly across the retail industry the observed changes are likely more pronounced
in the more innovative sectors.

This economic trend itself implies a shift in the spatial pattern of retailing.
Increases in the size of establishments suggest an upward shift in the metropolitan
retail hierarchy as fewer establishments are required to serve the population.
Furthermore, initial observations suggest additional modifications to the spatial
pattern of metropolitan retailing. Clustering of the new establishments has been
noted but relatively little overlap in the offerings of individual establishments within a
cluster exists; a pattern quite distinct from that of the mall dominated period. They
further take on new locations, as opposed to establishing themselves among the
existing stock of retail floorspace. Additionally, locational patterns vary across
unique retail sectors which have experienced different levels of innovation and prefer
different types of locations. It is the purpose of this study to investigate the spatial
significance of this commercial revolution in detail.
The Problem

This study is concerned with the spatial structure of retailing within urban areas. It is the dynamic nature of this structure, however, which is the focus here. Thus, this research seeks to identify those changes which have occurred in the spatial structure of metropolitan United States retail firms and markets in the last twenty years and to determine the mechanisms responsible for these changes.

Locational dynamics, shifts in the spatial positioning of retail establishments with respect to other outlets is the main structural element to be addressed in this research. The first goal of this study is to describe the nature of these dynamics. The research will focus on how metropolitan retail structure has been altered by the growth of new retail types. The second goal is to determine the mechanisms responsible for the observed dynamics. These are functions of consumer and firm characteristics reflecting preferences, spatial and aspatial cost structures.

The Organization of the Study

Following this introductory chapter we discuss the relevant literature in chapter 2. This review traces the development of retail research from a geographic perspective examining theoretical and empirical inquiries into retail spatial structure as well as models of retail location and change. Little attention has been focused on the value revolution by the geographic community and the reader will surely note the
relative dearth of discussion accordingly. It is, however, evident from our introductory discussion that change is sweeping the retail marketplace. That very little effort has been directed at examining the nature of the changes occurring in metropolitan retail structure or the forces behind it likely reflects not a lack of interest, but rather the recentness of change. It is hoped that the geography of the value retail revolution will become a much researched topic.

The current research seeks to describe recent retail dynamics in terms of changes in the relative locations of retail establishments and the competitive impacts of value retailers. It further seeks to explore and confirm the mechanisms responsible for the dynamics. It thus has three main components -- each of which builds on that which precedes it. The first involves an empirical analysis which identifies those changes which have occurred in the structure of metropolitan retailing since 1977. Once the exact nature of the changes have been detailed a theoretical modeling approach is utilized to explore the mechanisms responsible. The final component empirically confirms these mechanisms. The details of these three components are discussed at length in their respective research chapters. A broad sketch of the procedures are provided here, however, to initiate the reader.

*Detecting Change*

The San Diego MSA (conterminous with San Diego County) is utilized as the
study region in the exploration of locational dynamics. This region was chosen in part as a matter of convenience to facilitate the collection of data but also because observation of retailing in the region suggests it has been quite dynamic. Data concerning the locations of San Diego stores in 8 sample retail sectors were obtained for the years 1977, 1982, 1987, 1992, and 1997 through inventories of telephone directories published for the study region. The sample sectors; supermarkets, drug stores, stationers/office supply dealers, book stores, sporting goods dealers, department stores, home electronics dealers, and furniture stores, provide a respectable cross section of stores offering both shopping and convenience goods.

Structural change due to the growth of value retailing activities necessarily results in some spatial alteration to the pattern of retail outlets. If there are fewer, but larger establishments serving the same population and area it would imply, at the least, that the average distance between outlets has increased. A multitude of other spatial alterations are possible, however, owing to the actions of the establishments locating in order to enhance their competitive position in the market and the complementary and/or substitutable nature of the goods sold at the outlets. In chapter 3, for each sector, in each year, we detail the number of establishments operating, the ratio of population to stores, and several statistics describing the characteristics of each sector's spatial distribution. Emphasis is placed on location with respect to competing establishments. We further explore the competitive
impacts of value retailers upon traditional stores through a series of hypothesis tests.

The nature of the observed dynamics are further discussed in chapter 4 in relation to the nature of the goods sold within the different sectors. We use the shopping versus convenience goods dichotomy in order to draw generalizations concerning retail change. In particular we compare the dynamics of the different sample sectors and relate these to consumer shopping behavior in an effort to explore the role of comparison shopping in light of the category killer approach towards one stop shopping. In chapter 4 we also explore changes in spatial affinities between sectors. Using a smaller area within the study region we explore the positioning of retail firms in general, and value retailers in particular, with respect to establishments in other sectors. We trace the evolution of retailing within this smaller area from 1977, before the appearance of superstores, to 1997, when these superstores clearly dominate the landscape. The potential for multi-purpose shopping within the new retail landscape is further explored.

*Exploring Mechanisms for Observed Dynamics*

Following our account of the structural and spatial changes that have occurred in the urban retailing system we examine possible mechanisms for them in chapter 5. This section of the research is necessarily exploratory in nature. The approach is theoretical as simulations will be run on a model which generates supply
and demand equilibrium retail configurations. The method utilizes the basic framework originally developed by Harris and Wilson (1978) and subsequently extended by Fotheringham and Knudsen (1986). The critical difference is the incorporation of a more flexible competing destinations model which can encapsulate complementary and substitutable relationships between retail outlets.

The simulations are based on a number of parameter variations in the model. These parameters describe various consumer and retailer characteristics and linkages between similar and dissimilar firms as they relate to multi-purpose and comparison shopping. The differential effects changing perceptions of the importance of: 1, having a wide selection and variety of similar goods in close proximity to one another and 2, being able to accomplish different shopping needs in a single trip have on the spatial structure of the retailing system are explored. The simulations operate upon a hypothetical region populated by consumers and served by numerous retail establishments. Simulation procedures are based around sequentially changing the value of a single parameter while holding the values of all other parameters constant.

*Validating the Mechanisms*

Through the manipulation of parameter values and residential characteristics the simulations of chapter 5 provide a basis for the exploration of possible mechanisms leading to the changes discussed in chapters 3 and 4. Those parameter
shifts which lead to changes in the model, analogous to the changes identified in the earlier section, are empirically explored in chapter 6. Data which provide evidence of these real world parameter shifts were gathered from a variety of sources including The Census of Retail Trade, a shopping center industry study published annually by the Urban Land Institute, and a survey of consumers.

We identify shifts in the efficiency of operating retail establishments, scale and agglomeration economies, and retail rents through a combination of econometric models calibrated on the data obtained from the retail census and shopping center industry study. The results of our consumer survey are tabulated to evaluate changes in consumers' changing perceptions of the utility associated with the scale and relative location of retail outlets. These varied sources and procedures provide the information necessary to confirm changes in those conditions theoretically identified as potential mechanisms for the observed locational dynamics.

Synthesizing the Results

In the final section of the research report, chapter 7, we highlight the major research findings synthesizing the results of our inquiry into the dynamics of the retail revolution. We then provide guidance for future research into the structure of metropolitan retailing and urban land use.
The growth in value retailing activities implies that urban retailing is entering a new era and that a third post war trend is occurring. This research confirms this and explains the mechanisms responsible for it. In so doing, it develops a more flexible and general framework by which more detailed retail dynamics may be explored. A further outgrowth of this framework is the introduction of a new production constrained spatial interaction model by which retail interactions may be modeled that consider varying levels of substitutability and complementarity between establishments. This has been a dominant theme in the spatial interaction literature in recent years.

Limitations of the Research

Retail activities have long been recognized as a catalyst for the development of other metropolitan land uses. The spatial patterns of land use exhibited in metropolitan areas today owe much to the suburbanization of retail activities and the subsequent development of regional malls which typified the post war period. The structural change currently occurring in metropolitan retailing likely has far reaching implications for other types of urban land uses. By identifying and explaining this structural change, this research provides a stepping stone by which future urban evolution may be investigated. The research is not, however, without its limitations.

A complex mix of influences acts to shape the retail environment. Consumer
preferences and needs are in a constant state of change and the retail system must
continually adjust itself to serve consumer demand. Rapid changes in technology act
to alter the very way in which retailers can serve their consumers. Value retailers
could never have achieved the success they enjoy today without, for example, the
information technologies to manage their significant inventories or the automobile to
attract consumers from sizable areas. This research attempts to incorporate as many
of these varied influences as possible. It is believed that the most significant of these
are included, but by no means are all factors affecting retail structural change isolated
(nor can they be). In the subsequent chapter we discuss the literature of relevance to
the study and develop our thinking of the factors affecting this most recent change in
metropolitan retailing.

1 Several innovations were experienced during this period when many of the retail types which form
the basis of this study first emerged. These innovations, however, failed to make significant inroads
on the already established retail types at the time and thus were of minor consequence to the
patterns of metropolitan retailing.

2 Number of employees is taken as the measure of size for this research. This is not ideal owing to
different rates of use of full-time versus part-time employees, and a likely non-linear correlation
between employees and floorspace which may further vary by retail activity. The nature of these
data, however, which involve a complete census, and are available at the most complete sectoral and
geographic scales, make them the best choice despite these limitations.

3 Similar data for 1997 were not available at the time of the study. The only 1997 Census of Retail
Trade data available at the time of the study are utilized in chapter 6.
CHAPTER 2: Literature Review

Introduction

The structure of retailing in a capitalist system reflects the individual decisions of firms on what types of retail establishments to operate and where to locate them. By *structure*, we mean the types, sizes and locational patterns of establishments, while *system* refers to the spatial unit the structural elements serve. Retail systems have been analyzed from the national to city level but the focus in this study is on metropolitan areas, nearly continuous regions of urban and suburban land uses. It is in these areas where the majority of the U.S. population resides and functions and, arguably, where most retail innovation originates. The individual decision making process and sheer numbers of establishments required to serve the needs of a metropolitan population would suggest that metropolitan retail structure could take on a multitude of forms. Structural regularities do exist, however, at many scales and across cultural boundaries. This results from consistent motivations guiding decision making processes.

The study of retail geography has enjoyed a rich and diverse history in its search for these regularities and their determinants. It was inquiries into retail
structure which formed the initial thrust of quantitative research within human
geography. Interest in central place theory and the pattern of economic activity it
theorized provided impetus for the examination of retail structure. As new theories
and techniques were developed retail structure remained an important area for
application. After nearly one half a century of focused inquiry, the literature on the
geography of retailing is both voluminous and encompassing.

For the purposes of this research we organize the relevant retail literature
according to a structural or process orientation. Structural studies have sought to
describe and rationalize empirical retail spatial distributions. Process studies are
more concerned with the dynamics of this structure. We discuss the relevant works
as they relate to the problem of concern in this research.

The Structure of Metropolitan Retailing

The purpose of individual retail establishments, and the network they
together form, is to provide consumers the opportunity to shop for and purchase
needed goods. Retail operators, in pursuit of profits, attempt to provide consumers
with an efficient network of shopping opportunities. Most structural inquiries have,
therefore, proceeded from the notion that retail patterns reflect an attempt to provide
an efficient distribution of shopping opportunities. Locational factors relating to how
well the store’s location fits with the consumers travel patterns (generally taken as
how close the store is to the consumer's home or workplace), how proximate the store is to other stores selling similar merchandise (as it fosters comparison shopping), and how proximate the store is to other stores selling other types of merchandise (as it fosters multi-purpose shopping) affect how efficiently a store can service the needs of its consumers.

These factors are empirically quantifiable but the way in which they affect consumer behavior operates through consumer perceptions of their value. Additionally, their effects can vary radically between individual consumers. Because retail stores rely upon the business of many individual consumers, structural inquiries have largely avoided these confounding problems by treating consumer behavior in the aggregate. Nonetheless, the theorization of retail structure is complicated due to these various consumer desires and other influences relating to governmental regulation and zoning as well as the differing objectives of individual firms.

In this section we trace the various approaches towards examining retail structure according to their treatment of these various locational influences. Structural studies are static in nature - attempting to describe and explain retail structure at points in time. The theoretical base they lay for explicating retail arrangements is, however, crucial to understanding the process of change in a retail system.
Central Place Theory

The 1933 central place theory of Christaller (1966) and related 1941 work of Losch (1954) provided the foundation from which early research on the spatial structure of retailing developed. As originally conceived, central place theory was concerned with the spatial structure of settlements and their functioning as retail and service centers. The theory posits that, given certain assumptions regarding the nature of how goods and services are provisioned and how consumers behave to obtain them, the most efficient system for their provision is a hierarchical network of centers which will vary regularly in frequency, location and product/service offerings. The distribution of centers reflects the wider spatial distribution of consumers they serve. Centers which offer a large number of tertiary activities are relatively few in number and widely spaced but as one moves down the hierarchy centers become increasingly less diverse, more common and less distant.

While important differences in the theoretical underpinnings and findings of the separate contributions of Christaller and Losch exist they are taken together as pioneering efforts to explain observed patterns in market provision. Subsequent research focused initially on detecting the patterns posited by central place theory at a variety of geographic scales (Brush 1953; Berry 1963, 1967, 1973; Berry and Garrison 1958; Carruthers 1961; Davies 1967; Smith 1968; Thorpe 1968). The major contribution of these studies was that the basic hierarchical structure of market
centers was present not only at large scales, but also at smaller scales such as within metropolitan areas. The hierarchy of settlements (hamlets, villages, towns, and cities) serving rural areas described by Christaller manifest themselves within the urban context, as shown by Berry and Garrison (1959), as a hierarchy of retail clusters (street corner, neighborhood, community, and regional). More recent research (Morrill 1987) has confirmed the continued presence of an intrametropolitan retail hierarchy and demonstrated the endurance of some of the original ideas embodied in the theory. Most current research concerning central place theory tends to be theoretical in nature (cf. Church and Bell 1990). The rigid behavioral assumptions, and static nature of central place theory have greatly limited its use for anything more than simple rationalization of retail structure.

Relaxing the Assumptions

In its original form, central place theory considered the nature of the provision of a particular good to be constant throughout the hierarchy. If for example, clothing was a good available at all centers throughout the hierarchy, clothing stores would be uniform in nature and consumers would travel to the nearest one for clothing purchases. In higher levels of the hierarchy, other types of goods and stores would be available but the presence of, for example, a shoe store near a clothing store in a higher level center would not affect a consumer’s propensity to
choose where to shop for clothing. In reality, however, multi-purpose shopping is an important means by which to reduce the costs of shopping. A consumer would be more likely to visit a clothing store near a shoe store because she or he would also be able to purchase shoes in the same trip. This results in an increase in the spatial extent of the market area for clothing stores located in those centers which also offer shoes, contradicting the market area and nearest center patronage conjectures of traditional central place theory.

Issues regarding the postulates of consumer behavior associated with the above scenario have been well addressed in the literature. Halperin (1988) provides an excellent review of these issues, while Saey (1973) diagrams the results in terms of alterations to the spatial pattern of market areas. In a series of papers, Rushton (1969, 1971, 1972) addresses the relaxation of nearest center patronage and other assumptions. He shows that under the alternative behavioral postulate that consumers are willing to travel further to larger centers a hierarchy remains but the functions found in different levels of this hierarchy differ from the Christallerian system (Rushton 1971). Additionally, it has been shown that a non-uniform population distribution may alter the spatial extent of market areas and pattern of centers but a hierarchy of centers remains (Rushton 1972, Berry and Parr 1988). Similar results have been shown in the case where purchasing power varies geographically (Beavon 1977).
These and other studies have attempted to make central place theory more realistic by relaxing its rigid assumptions. The focus has been on aspects of the retail and service centers comprising a system: their locations, functional complexity, market areas and frequency of occurrence. The center may represent anything from an urban area to a shopping district and, analogously, the system may range from a nation to a city. Given what tertiary activities are present in the system, the questions have been: where will the centers be located and what bundle of activities will be found in each? In the Christallerian system a bundle is generally interpreted as the types of activities found in a center. Each activity is assumed to have a constant range which is the maximum distance consumers travel in order to purchase the goods or services of that activity. Because consumers travel to the nearest center offering a particular activity, and these centers are distributed evenly with respect to the population, demand for each activity is the same at all centers. In the more realistic central place systems which allow for non nearest center patronage, however, a bundle must also include the quantities of these activities because demand for a particular activity varies by level in the hierarchy (Berry and Parr 1988). Since, in keeping with the previous example, consumers are willing to travel further to shop for clothes in centers which also offer shoes, demand for clothing is greater in higher level than lower level centers. Higher order centers thus must have more clothing stores, larger stores or some combination. The system becomes increasingly
complex when we consider that this process feeds back upon itself attracting more
demand as expansion of an activity in a center leads to the realization of economies
of scale, thus lowering prices, and greater opportunity for comparison shopping.
Additionally, this process is occurring in different hierarchical levels and for activities
which complement each other to varying degrees.

The Limits of Central Place Studies

Central place theory and the studies utilizing this framework have been very
important to the understanding of retail patterns. It provides theoretical reasoning
into why different types of activities are present in different frequencies, why these
activities tend to agglomerate into centers and why a hierarchy of retail centers
exists. But despite the construction of behavioral postulates more consistent with
observed reality, the relaxation of other rigid assumptions, and allowing for system
dynamics, the use of central place theory as a framework for the study of retail
patterns is limited. The theory is concerned with the size and spatial distribution of
central places as centers of tertiary activities. Analysis of the functions within centers
is limited to the sectors represented and their respective share of center activity.
Little attention is focused upon the structure of these sectors in terms of the
establishments comprising them. Clearly, however, this is an important component
of retail structure. A few, large establishments represent a very different reality to
consumers than many small establishments. In the one case, economies of scale prevail resulting in lower prices. In the other, localized economies of agglomeration are realized by consumers as comparison shopping is enhanced. Additionally, relationships exist between the establishments comprising activities in terms of how they complement each other (as in the clothing and shoe example) or compete with one another. Changes in consumer preferences and the cost and organizational structure of the individual establishments and firms operating them further add a dynamic element.

Issues such as these have not been adequately addressed in the central place literature. Getis and Getis (1968) proposed that research should be directed at understanding spatial affinities, the propensity for certain types of retail establishments to locate near one another. While recognized in central-place theory, it was Nelson (1958) who clarified the benefits firms receive from such clustering. A voluminous amount of research has developed in the area of multipurpose shopping (reviewed by Thill and Thomas 1987) expounding on the benefits to both establishments and consumers that firm agglomeration entails. Research on particular retail linkages, however, has been scarce, with most inquiry being undertaken privately by shopping center developers. Additionally, no work on linkage dynamics appears to have been undertaken. From a consumer’s standpoint the linkages should not necessarily change but they do become dynamic in response
to changes in the types and organization of retailers. For example, grocery and drug stores are known to complement each other to such a degree that they often locate near one another. Now, however, supermarkets are increasingly offering drug store goods. Not only does this change their affinity for one another but also that of other retailers who thrived from the consumers moving between such stores. While central-place theory was concerned with differentiation between centers there clearly exists differentiation between establishments as well. And, given increases in store sizes, it is clear that a hierarchy of establishments has developed which may or may not be tied to the hierarchy of the centers.

*Pattern Analyses*

While central place studies have traditionally focused on centers and the activities found within them, another line of research has focused explicitly on establishments. The approach in these studies has involved the application of spatial statistics to store distributions. Comparison of store point patterns to theoretical distributions was seen as a convenient means to describe and classify locational regularities in store spatial distributions.

Most of the work in this area has been predominantly descriptive (Artle 1959, Clark 1969, Rogers 1965, 1969) with emphasis placed on classifying store patterns on a continuum from clustered to random to dispersed. Clustered patterns
demonstrate linkages between competing firms. Comparison shopping opportunities are enhanced through store clustering which presents a superior, more efficient opportunity to consumers. In effect, consumers are willing to go to more trouble (travel farther) in order to capitalize on comparison shopping opportunities. Stores located in clusters thereby draw from a larger market than stores which are not so located. Individual store revenues are higher among clustered than dispersed stores in accordance with Nelson's (1958) theory of cumulative attraction. At the other extreme, dispersed store patterns reflect a tendency for stores to avoid each other. Competitive effects are seen to be high as store's compete for, rather than mutually attract, consumers. Random patterns indicate no distinct locational preferences towards these two extremes.

The main contribution of these studies is evidence that shopping goods oriented retailers tend to cluster, while convenience goods selling stores prefer dispersion. The ability to compare the goods sold by different retailers on such aspects as price and quality is important to consumers when purchasing relatively expensive and infrequently consumed shopping goods. For convenience goods, which are relatively inexpensive and frequently consumed, consumers possess a high degree of knowledge regarding products and the retail opportunities where they can be purchased. Comparison shopping is not important and thus clustering would not increase the extent of the market area from which an individual store would draw its

26
customers. These findings are in general agreement with central place theory. The theory posits that high-order (shopping goods) retailers are located in relatively fewer, and thereby more distant retail centers, with low-order (convenience goods) stores being more commonly distributed among many, nearer, retail centers. No distinction was made in the theory, however, regarding the number of stores which would occupy these centers.

Similar spatial analytic methods have been suggested and utilized to examine spatial affinities between stores in different retail sectors (Getis 1967, Getis and Getis 1968). A store’s proximity to other types of retail stores has long been recognized as an important element in its location since it fosters multi-purpose consumer trip making (Nelson 1958, Boyce 1960, O’Kelly 1983). The importance of these affinities vary highly between stores in different sectors, however. Casual and spatially significant relationships between stores were identified by Getis and Getis (1968). These were most important among stores selling shopping goods. Evidence is strong that affinities do exist as they allow retail proprietors to capitalize on consumer preferences towards multi-purpose and comparison shopping.

Other researchers have used pattern analysis of retail locations in a temporal framework to examine retail structural dynamics. This research is discussed together with other process oriented studies in a subsequent section.
Bid-Rent Theory and the Principal of Minimum Differentiation

Two alternative theoretical explanations for the often observed clustering of similar stores can be derived from the bid-rent theory attributed to von Thunen (1826) and Hotelling’s (1929) principal of minimum differentiation. The foundations of these two normative models are entirely different yet they both postulate similar spatial arrangements for the same reason - access to the market.

Bid-rent theory, in its original form, was not at all concerned with the location of retail activities. Rather, the arrangement of different agricultural land uses surrounding the market in which agricultural products were sold and distributed was the focus. Because the production and transport costs of different agricultural products vary, their producers are willing to bid different prices for land according to its accessibility to the market to which the goods must be transported. Market accessibility is thus the key determinant of spatial variation in land uses. Applied to the retail setting by such researchers as Firey (1947), Getis (1961), Garner (1966) and Scott (1970), the theory holds that different retail activities are willing to bid for retail sites according to the varying degrees of access to consumers they provide. Store types which generate high per areal unit sales assume the most central, accessible sites (Getis 1961) because they are willing to bid the highest for such accessible locations (Garner 1966). Stores which generate less sales per areal unit assume less accessible locations because their bid-rent functions are lower. Similar
types of stores thus locate nearby one another because they have similar bid-rent functions. Agglomerative tendencies result from regular preferences towards access to consumers and not because stores have particular affinities for one another.

The principal of minimum differentiation varies considerably from bid-rent theory in that its concern is on competition for sites between similar, rather than dissimilar, stores. Hotelling's (1929) work was concerned with more than just retail location (primarily pricing strategies) but his examination of the problem in terms of ice-cream vendors seeking strategic locations along a beach front has made it a classic in the retail location literature. Essentially, given simplifying assumptions, Hotelling demonstrated that two firms seeking to maximize access to their market reach an equilibrium locational configuration which places them adjacent to one another. Clustering results, in a different manner but for the same reason, as it does according to bid-rent theory - firms seek to be as accessible as possible to their market. Because consumers patronize the nearest firm, adjacent firm locations place each nearest to as many consumers as possible.

Under more realistic assumptions regarding consumer behavior and the number of firms operating in the market, this clustered solution has been shown not to obtain (Lerner and Singer 1937, Eaton and Lipsey 1975, 1979, Okabe and Suzuki 1987). Only through the incorporation of agglomeration economies due to consumer desires towards comparison and multi-purpose shopping has the theory's clustered
outcome been vindicated (c.f. Thill and Thomas 1987). So though the original model of Hotelling (1929) would suggest firm clustering results simply out of desires to maximize access to consumers, the present consensus would appear to be that such clustering is more attributable to retail operators attempting to provide consumers with greater opportunity to compare product offerings between similar firms and fulfill multiple shopping needs among dissimilar firms. We discuss the methods utilized to reach such conclusions more fully in the spatial competition section under “The Process of Structural Change”.

The Integration of Structural Factors

The spatial structure of retailing reflects a mixed bag of influences. The empirical evidence continually points towards the clustering of similar store types, particularly those selling shopping goods. Dispersion, or even repulsion, is more common among sellers of convenience goods. Due to its concern with the distribution of retail functions, as opposed to stores, central place theory, the cornerstone of much retail geographic research, can provide only incidental theoretical justification for such patterns. Clustering of high order, shopping goods sellers into relatively few retail centers versus the relative dispersion of low order, convenience goods selling stores is consistent with the spatial pattern theorized in the theory. Within the tenets of the theory, however, such a pattern is based on differing
thresholds (the population necessary to support its sale) for goods which begs the
question of how the population surrounding a center could support multiple stores.
The theory is clearly not detailed enough to deal with such questions.

Under bid-rent theory, adjacent retail sites have similar levels of accessibility.
Since firms are willing to bid for such sites according to their accessibility, and
similar firms have similar bid-rent functions, adjacent sites become occupied by
similar store types. Clustering of similar stores is therefore coincidental - no spatial
linkages exist between firms. And while the principal of minimization would suggest
such a clustered pattern could result for different, but similarly coincidental, reasons,
further research has demonstrated that such a pattern is only viable in more realistic
situations when benefits accrue to firms because of inter-firm linkages.

This leads us back to the work of Nelson (1958) and the theory of cumulative
attraction:

a given number of stores dealing in the same merchandise will do more
business if they are located adjacent, or in proximity to each other than if they
are widely scattered (Nelson 1958, p. 58)

Under this theory individual stores are more attractive to consumers if their location
enhances comparison shopping opportunities. Nelson's contributions also extend to
multi-purpose shopping through his rule of retail compatibility. While the specifics
of this rule may be too mathematically stringent, the idea behind it holds considerable
credence:
two compatible businesses in close proximity will show an increase in business volume directly proportionate to the incidence of customer interchange between them, inversely proportional to the ratio of business volume of the larger store to that of the smaller store and directly proportionate to the sum of the ratios of purposeful purchasing to total purchasing in each of the two stores. (Nelson 1958, p. 66)

Compatible business are those which sell related merchandise or services. Through his compatibility tables, Nelson attempted to define how certain store types ‘fit’ with one another. If we are to assume that market forces act to create locational arrangements based upon compatibility, the affinities between stores such as those measured by Getis and Getis (1968) demonstrate their importance. Of course, compatibility and affinities vary highly between different types of stores. As generalized by Getis and Getis (1998), affinities appear to be highest among sellers of shopping oriented goods.

It is important to note the role of affinities within the shaping of the value retail revolution. Value retailers seek to capture as much of each consumer’s dollar as possible by eliminating the need to comparison shop. To quote Wileman and Jary (1997, p. 77-78), “Consumers are drawn to category killers on the basis of price and range authority. They know that they are unlikely to find a cheaper store, that the store is likely to carry what they want, and that what they want is likely to be in stock.” By negating the importance of comparison shopping, value retailers reduce the benefits associated with clustering nearby similar firms. But because these
benefits vary according to the shopping versus convenience goods orientation of different retail types clustering tendencies should vary accordingly. Additionally, the locational groupings of value retailers, either haphazard or in planned 'power centers', do not on the surface demonstrate obvious linkages between firms such as one would expect if they were to capitalize on consumer desires towards multipurpose shopping (a typical grouping might, for example, include such diverse super store types as building supplies/home improvement, pets, and office supplies). Inter-firm affinities, therefore, would appear to have been altered but the degree to which this is true must be investigated in detail.

The Process of Structural Change

Structural studies have sought to first, describe the spatial structure of retailing and second, to explain this structure through the various theories previously discussed. In most cases theory came first with subsequent research being directed at empirically detecting the patterns these theories posited. Process oriented studies have added a dynamic element to this body of research as they have sought to investigate change within the spatial structure of retailing. Unfortunately, the theoretical and empirical studies of structural change are not strongly linked together. The theoretical work in this area is much more advanced than the empirical with little effort having been directed at empirically validating theoretically
hypothesized mechanisms for structural dynamics. It is one of the hopes of this study that these two research directives be more closely integrated.

In this section we discuss the various approaches used to theoretically investigate structural dynamics. Emphasis is placed on the particular models and methods used to explore such change. We then discuss empirical studies of retail change in terms of the methods used and the processes inferred. The section concludes with a discussion of the various mechanisms identified in these research endeavors as drivers of retail change. This discussion includes thoughts on some recent developments in retail analysis which have come from what has been termed a political-economy perspective.

*Modeling Retail Structural Change*

The vast majority of theoretical work regarding the geography of retail dynamics has involved methods to model such change. Some of the earlier work in this area stemmed from the overwhelming interest in central place theory. This research was primarily devoted to the issue of hierarchical shifts in the provision of certain classes of goods. Subsequent and most recent research has been more concerned with individual retail establishments and their locations. Spatial competition modeling, for example, has grown from the pioneering work of Hotelling (1929) on the competitive positioning of firms. Research in this area has
not been necessarily dynamic in nature, yet its focus on process and the framework it
sets forth for examining shifts in the spatial positioning of retailers make it useful for
dynamic inquiries. We discuss it here in connection with more general location
modeling. Most of our attention is focused on catastrophe modeling and the
rigorous research framework for modeling retail dynamics that has evolved from this
area of research. It is the principles of this modeling method which we justify as
being most relevant to this study and which we subsequently extend to the analysis of
the recent retail dynamics of concern.

Central Place Dynamics

While relaxation of the behavioral assumptions has made central place theory
more realistic, it suffers from another serious shortcoming. As originally formulated,
the theory is static while clearly retailing is a dynamic industry. Berry and Parr
(1988) identify three types of change which may occur in a central place system. The
first is the pattern by which the system itself develops. This may be top-down as in
Vance (1970) or bottom-up as suggested by Parr (1978). In the top-down approach,
the system is originally comprised of a single or limited number of centers but
subsequent growth in the system leads to the migration of lower order activities into
a larger number of subordinate centers. Bottom-up development occurs when
diversification in tertiary activities leads to the polarization of higher order activities
and an initial system of equal, small centers evolves into a hierarchy. Both utilize a
center level of analysis. The second type of change concerns the transfer of activities
between levels of the hierarchy. Theoretical work on the causes of change of this
type focus on shifts in demand for activities (Berry and Parr 1988) while the results
of these shifts are generally analyzed in terms of their impacts on the populations of
centers (Mulligan 1980). The third type of change deals with changes in the
frequency or number of levels in the hierarchy as detailed in Parr (1980, 1981). It is
related to the first in this way but deals with modification to an existing system as
opposed to the evolution of a new system. This type of change has been addressed
in terms of shifts in the demand for a bundle of activities, unlike the second type of
change. The focus is on the center, its functions and frequency of occurrence.

The work of White (1974, 1977, 1978) represents another approach to the
study of central place dynamics. His concern is the pattern of clustering of economic
sectors into centers in a simulated system. Using a model encapsulating supply and
demand relationships in such a system he is able to show that clustering of sectors
occurs in accordance with consumer preferences towards such a pattern. In so doing
he supports the basic tenet of central place theory, that activities will cluster, under
more realistic postulates of consumer behavior than that assumed in the original
theory (Mulligan 1984). This and related work by Allen and Sanglier (1979, 1981)
provide a framework which allows for the simulation of modifications to a central
place system in response to changes in consumer behavior and sector operating costs.

While central place studies have traditionally focused on centers and the activities found there, other lines of research have focused explicitly on establishments. Their evolution has also been motivated by other factors, which make them superior to central place theory if dynamics in a retail system are the focus of investigation. Whereas central place theory was primarily concerned with description and a static account of the state of a retail system, these alternative approaches have been more concerned with process and thus have a built-in dynamic component. The main limitations of these studies is their theoretical nature, which has generally come at the expense of empiricism that validates their claims. Nonetheless, they do provide important insights into why retail systems are structured as they are and the processes underlying this structure.

Spatial Competition and Location Modeling

Studies on the locational behavior of individual establishments have been motivated by two desires. The first is to understand why establishments have previously located such as they have and the second is to choose where to locate new establishments. That the latter objective is being addressed would seem to indicate a very high level of development in the literature concerning the former. And while
this is true, a large number of questions remain. The primary reason for this appears to be the complexity of the situations and intractability of the mathematical formulations utilized.

Spatial competition is concerned with understanding the interrelationships between the location and price and cost levels of establishments and those of their competitors. Location modeling utilizes these findings to choose locations for establishments. Location modeling is able to avoid intractable mathematical problems in many cases by formulating the problem in terms of a network where there is a fixed number of potential solutions and the goal becomes to choose the best or nearly best one. The problem then boils down to a computationally burdensome, but tractable, endeavor. Spatial competition, however, is more concerned with process and thus needs to focus on continuous space so that the interrelationships may be understood as location varies. As a result of the complexity of the problem, the system must be greatly simplified in terms of either geography, by studying the problem in one-dimensional space for example, or in terms of the modeled relationships.

The spatial competition literature has provided several insights into the rationale behind the locations of individual retail establishments. In general, the research has supported the ideas of central place theory while focusing on the establishment. Webber (1972) and Eaton and Lipsey (1979), for example, provide
theoretical justification for the often observed clustering pattern of establishments through, respectively, reduction of risk and localization economies much in agreement with Nelson (1958). Carruthers (1981) further shows how such agglomerative tendencies lead to a hierarchy of centers comprised of individual establishments. Economides (1993) and Mulligan and Fik (1994, 1995), however, show that clustering does not occur when multi-purpose and comparison shopping are insignificant concerns of consumers. Thill (1992) has addressed the issue of rising incidences of establishments being operated by multi-establishment firms. His finding, quite remarkable but in agreement with Teitz (1968), is that the pattern of establishments in an independent establishment market is remarkably similar to that in a market where establishments are members of chains. These studies did not, however, investigate the effects a preference for multi-purpose or comparison shopping would have had on the pattern. O’Kelly (1983) has demonstrated the importance of multi-purpose shopping in explaining actual consumer behavior, a topic well developed in the literature. The difficulty in incorporating preferences for this type of behavior in spatial competition models is added complexity. The same holds for comparison shopping.

As noted previously, another important element for consideration is the size of retail establishments. Spatial competition modeling has traditionally not considered this issue, preferring instead to treat establishments as equal units in this
area. But this is an important issue because it has the potential to affect price levels and the consumer's perception of selection. The location modeling literature has offered a more explicit treatment of this variable, although with only limited success. Simultaneously solving for location and size, as noted by O'Kelly (1987), is a difficult problem. The usual approach, in accordance with the central place dynamics literature, has been to consider them sequentially. Goodchild (1978), for example, first solves for locations then determines the optimal sizes of the facilities. In reality, optimal size and location are interdependent but methods to simultaneously solve for both have not yet been devised.

Catastrophe Theory

Perhaps the most promising area of research into the dynamics of the establishments comprising a retail system is that which developed out of a paper by Poston and Wilson (1977). Catastrophe theory was adapted to the retail setting to describe how a system may shift abruptly between different equilibrium configurations, such as from a pattern of corner grocery stores to supermarkets, or from dispersed suburban retailing to concentrations in regional malls. While it was developed to model discontinuities in retail dynamics, its real benefit is a more realistic treatment of consumer behavior than is found in the spatial competition or location modeling literature. It accomplishes this by incorporating models which are
used in other settings to model consumer spatial behavior. The downside to this added complexity is an inability to mathematically derive optimal solutions or retail configurations in the more realistic models. The approach to investigating retail dynamics using catastrophe theory has thus been to simulate changes in the parameters describing the system in an effort to gain insight into how the system may react. The framework which has evolved is not unlike that of White (1974, 1977, 1978) but interest is on the establishment whereas White considers centers. Three separate approaches may be identified. These are discussed in what follows.

**Consumer utility maximization** Poston and Wilson (1977) argue that the utility associated with a shopping trip has two components. The first component \( u_1 \) relates positively to the size \( W \) of a retail outlet since larger establishments offer a better variety from which the consumer can choose. This positive relationship is assumed to be logistic as size benefits only accrue up to a certain level. The second component \( u_2 \) is negatively related to size. Since the larger the retail establishments, the fewer and far between they will be located and thus the greater the distance consumers will have to travel to patronize them. This disutility is assumed linearly related to size. The total utility \( U \) associated with shopping at a particular retail situation is thus given by

\[
U = u_1 + u_2 \quad .
\]  

(2-1)
Figure 2-1 shows these two components and the associated total utility where \( W^* \) is the utility maximizing size of retail outlets.

As the cost of travel (\( \beta \)) decreases, so to does the disutility associated with traveling. This would be shown by an increase in the slope (becomes less negative) of \( u_2 \). The shape of \( U \) changes accordingly and it is shown that \( W^* \) increases with ever decreasing travel cost. Smooth, continuous changes in \( \beta \) do not, however, necessarily lead to continuous changes in \( W^* \). Instead, at some point, \( W^* \) jumps abruptly, or catastrophically (Figure 2-2) as in the fold catastrophe described by Thom (1975). This form of dynamic analysis was subsequently applied to describe the situation in which a retail system suddenly moves from a pattern of corner stores to supermarkets (Wilson and Oulton 1983). Implicit was the assumption that consumer preferences dictate retail structure.

**Supply and demand** Extending Poston and Wilson’s work, Harris and Wilson (1978) utilized a retail interaction model as the basis for modeling retail size discontinuities or catastrophes of the type discussed above. Assume the profit (\( \Pi \)) earned by retail outlet \( j \) is given by:

\[
\Pi_j = S_j - C_j
\]

(2-2)

where \( S_j \) is the revenue earned and \( C_j \) the costs incurred by the outlet. \( S_j \) thus
Figure 2-1. Shopping utility and optimum retail establishment size
Figure 2-2. Discontinuous change in the optimum size of retail establishments resulting from continuous change in the cost of travel.
represents demand at j, and $C_j$, supply. Revenue is modeled using a production constrained spatial interaction model of the Huff (1964) and Lakshmanan and Hansen (1965) type but with an exponential distance deterrence term. This is given by

$$S_{ij} = \frac{P_i E_i W_j^\alpha \exp(\beta c_{ij})}{\sum_j W_j^\alpha \exp(\beta c_{ij})},$$

(2-3)

where $S_{ij}$ is the flow of expenditures from residential zone i to outlet j, $P_i$ is the population of zone i, $E_i$ is the per capita expenditure of zone i residents, $W_j$ is the size of retail outlet j, $c_{ij}$ the cost of overcoming the physical separation of i and j, and $\alpha$ and $\beta$ are parameters representing, respectively, consumer scale economies and the friction of distance. Total revenue at outlet j is then found by summing across all origins,

$$S_j = \sum_i S_{ij} .$$

(2-4)

Cost is a linear function of outlet size,

$$C_{ij} = \delta W_j ,$$

(2-5)

where $\delta$ is the efficiency of operating retail outlets. It is assumed that when profits are positive ($S_j > C_j$) an outlet expands ($\Delta W_j > 0$) and when negative ($S_j < C_j$), contracts ($\Delta W_j < 0$), such that an equilibrium outlet size ($W_j^\ast$) is reached when profits are zero ($S_j = C_j$).
Because of the interrelated nature of the components and the complexity of the model numerical experiments are utilized to find equilibrium points through changing values of the three parameters. In general, decreasing values of $\beta$ and $\delta$, and increasing values of $\alpha$, tend to increase $W_j^*$. In this basic model discontinuous change of the type discussed by Poston and Wilson (1977) is possible when $\alpha > 1$. Figure 2-3 diagrams the basic framework for the instance where $C_j$ is decreasing over time. Equilibrium points are circled for three values of $C_j$ and the concordant equilibrium establishment sizes labeled. The change from $W_j^{*1}$ to $W_j^{*2}$ is discontinuous since there can be no other equilibrium points between those two circled as $C_j$ descends gradually from $C_j^1$ to $C_j^2$. Continuous change between $W_j^{*2}$ and $W_j^{*3}$ is possible, however, because additional equilibrium points exist on the segment $S_j$ between $C_j^2$ and $C_j^3$. $W_j^*$ is an unstable equilibrium size because forces at this point tend to move $W_j$ away from it.

A great deal of work on this dynamic model and some minor variations has been completed (Beaumont et al 1981a, 1981b, Clarke et al 1985, Clarke and Wilson 1983, 1985, Wilson 1978, 1981a, 1981b). Particular attention has been focused on the equilibrium points and their stability (Chudzynska and Stodkowski 1984, Clarke 1981, Rijk and Vorst 1983a, 1983b) and proving that additional types of catastrophic behavior are possible (Kaashoek and Vorst 1984). Some experiments in varying the
Figure 2-3. Supply and demand modeling approach to analyzing retail dynamics
input population characteristics have also been explored (Harris et al 1982).

This line of research provided a firm foundation for studying retail dynamics and in particular discontinuous change. Its primary deficiency, however, is that the dynamics explored are not explicitly spatial -- this also holds for the utility maximizing approach outlined previously as well. Rather, focus is on changes in equilibrium retail size. If it is assumed that there is some fixed total quantity of retail floorspace necessary to support the shopping needs of some population, then increases in the average size of establishments necessitate that there be fewer of them. That is, if \( T \) represents the total retail floorspace in a region, \( N_t \) the number of establishments at time \( t \), and \( W_t^* \) the equilibrium establishment size at time \( t \),

\[
T = N_t W_t^* .
\]  
(2-6)

If at some later time \( t' \), shifts in one or more of the model parameters create a situation such that

\[
W_{t'}^* > W_t^* ,
\]  
(2-7)

then necessarily

\[
N_{t'} < N_t ,
\]  
(2-8)

to satisfy the constraint

\[
T = N_{t'} W_{t'}^* .
\]  
(2-9)

Spatial changes in the arrangement of establishments are then implied since a lesser number of establishments must be distributed through the same size region. A
change in the location of an outlet thus results only because of a change in average facility size. An establishment may not change its relative location independent of a change in its size.

Modeling Changes in the Size and Relative Location of Outlets In a series of papers Fotheringham (1985) and Fotheringham and Knudsen (1984, 1985, 1986) extend the Harris/Wilson framework through the use of Fotheringham’s (1983, 1984) competing destinations (CD) model. The CD model is a modified spatial interaction model which has a variable that quantifies the relative location of each outlet to all other outlets. This variable takes the form

\[ A_j = \sum_k \frac{W_k}{c_{jk}} \quad j \neq k \quad , \quad (2-10) \]

where \( W_k \) is the size of each retail outlet other than \( j \) and \( c_{jk} \) is a measure of the physical separation of \( j \) and \( k \).

Their approach was basically to modify the demand and cost equations in accordance with the theory of the CD model. The disaggregate demand equation given in (3) thus becomes

\[ S_{ij} = \frac{P_i E_i W_j^\alpha A_j^\epsilon \exp(\beta c_{ij})}{\sum_j W_j^\alpha A_j^\epsilon \exp(\beta c_{ij})} \quad , \quad (2-11) \]

where all variables and parameters are as previously defined except \( \epsilon \) which is
discussed shortly. The cost equation (5) is expanded to

\[ C_j = \delta_1 W_j^{\sigma_1} + \delta_2 A_j^{\sigma_2} \]

(2-12)

where \( \delta_1 \) is a measure of the overall efficiency of running retail outlets, \( \sigma_1 \) is a measure of producer scale economies (not originally included in the Harris/Wilson model), \( \delta_2 \) is a measure of retail rent gradients, and \( \sigma_2 \) is a measure of producer agglomeration economies.

Numerical experiments show that two forms of discontinuous change are possible in the model: first, in the size of retail establishments, as in the Harris/Wilson and Poston/Wilson frameworks; and second, in the relative location of outlets. It is shown that the retail system can move suddenly from a pattern of clustered outlets to one of dispersed outlets and vice versa independent of the size of outlets. This second type of discontinuity, it is argued, is analogous to the movement of retail outlets from the central city to the suburbs (clustered to dispersed pattern) and then, later, the clustering of suburban outlets into regional malls (dispersed to clustered pattern).

These results are noteworthy but not particularly surprising because the \( A_j \) term operates similarly to the \( W_j \) term. The model only focuses on one type of retail establishment (although the particular type is not specified) which means that high values, for example, of \( A_j \) are analogous to high values of \( W_j \). A high value of \( A_j \)
implies the presence of many establishments in close proximity to one another, which
the consumer would view as a large variety of goods relatively in the same location.
This consumer view is nearly identical to that of a single large facility offering a large
variety of goods. As discussed previously, however, there are important distinctions
that should be made between a location with few large establishments and one with
several small outlets.

Lo (1991, 1992) points out that in interaction modeling it is important to
account for the differential effects of locational and economic substitutability and
complementarity. Substitutability is the degree to which different destinations (in this
case retail outlets) can substitute for one another. In retailing, levels of
substitutability are affected by the types of goods offered at outlets (economic
substitutability) and the relative location of these outlets with respect to one another
(locational substitutability). Two competing clothing stores are good economic
substitutes and if located close to one another are also good locational substitutes.
Complementarity is best viewed as a type of urbanization economy realized by
consumers and defined by example. Clothing outlets and shoe stores have a high
degree of economic complementarity because consumers are likely to need the
services of both at the same time. If they are located in close proximity to one
another they also complement one another locationally.

Complementarity is never detrimental to outlets. A shoe store located next to
a clothing store will perform at least as well but most likely better than an identical shoe store which is located next to nothing that complements it. This is because of consumers' preferences towards multi-purpose shopping. Substitutability, on the other hand, can be either beneficial or detrimental to an outlet. In the case of comparison shopping, two clothing stores located next to one another may each benefit from this arrangement because consumers view their adjacency as a benefit to the variety and selection they will have to choose from and thus are more likely to patronize them. Conversely, if consumers were to travel to that location for clothing anyway, two stores means that consumer purchasing power will be split among them.

Retail dynamics analyzed using the CD model as formulated above are only applicable to situations of perfect substitutability and completely ignore complementary effects. The CD model can only recognize one sector and thus all establishments must be considered perfect substitutes. The importance of modeling multiple sectors has been recognized (Beaumont et al 1981a), but work in this area is lacking. Whether substitutability is beneficial or detrimental depends on the parameter $\varepsilon$. A negative $\varepsilon$ implies detrimental effects as outlets compete and steal business from one another. A positive $\varepsilon$ means firms are enjoying agglomerative effects and benefiting from their close proximity. A more complex model is required if one is to analyze changes in the relative location of outlets in different sectors with varying levels of substitutability and/or complementarity. A model of
this type is outlined in a subsequent section. This model will be utilized to extend the Harris/Wilson and Fotheringham/Knudsen framework to explore more complex retail dynamics.

Empirical Analyses of Retail Change

The empirical analysis of retail structure enjoys a long tradition going back at least to the work of Proudfoot (1937). Empirical studies of retail dynamics, however, are relatively few in number.

One reason for the absence of literature on retail change is that much of the past work by retail geographers has been concerned with cross-sectional studies of retail patterns, or alternatively with hierarchical studies of shopping centres. This preoccupation with the identification and description of the retail hierarchy is not so remarkable considering its close relationship with the development of central-place theory. (Shaw 1978, p. 1)

Shaw is referring to the works of Berry and Garrison (1958), Berry (1963, 1967) and the many others which these stimulated. As discussed previously, these studies, which embodied what was later referred to as an “essentially pattern recognition approach to the geography of commercial structure” (Davies 1992, p. 220) were largely descriptive and static accounts of the hierarchical structure of retailing. Dynamic analyses of retail structure have largely been in those theoretical traditions discussed previously.

Little effort has been directed at empirically validating these theoretical
approaches. Wilson and Oulton (1983) and Fotheringham and Knudsen (1986) provide rare exceptions. In connection with Wilson's theoretical contributions, Wilson and Oulton provide some evidence of the rapid change experienced in the size dynamics of food retailing as it made the transition from a corner shop to supermarket organizational structure. Their approach is simple enough. Data on the average size of stores for a sample area in the UK were gathered and then plotted against time. Their analysis showed that in fact there had been a rapid (sudden) growth in the size of food retailers between 1956 and 1980. Similarly, Fotheringham and Knudsen explored dynamics in the relative location of clothing retailers in a sample area between 1955 and 1984. Their results showed two marked trends. The first was a period in which there was some store dispersion due to a sudden failing of downtown stores. The second was an overall trend towards a clustered pattern resulting from the concentration of stores into suburban malls. These two trends are analogous to the two thus far identified trends in metropolitan retailing discussed in the introduction. These authors only looked at relative location with respect to other clothing retailers and did not consider other types of retailing as this approach was in accordance with the theoretical work they were seeking to develop.

Fotheringham and Knudsen (1986) empirically explore changes in retail patterns through a nearest neighbor technique first applied to such problems by Getis (1964). In demonstrating the utility of two techniques for studying retail spatial
dynamics Getis provides evidence that changes in the pattern of grocery stores is closely linked to changes in population patterns. This supports the first post war trend of retail stores following their demand to the suburbs. Similar frameworks using probability models have been adopted by such researchers as Artle (1965), Rogers (1965) and Lee (1974) to study the spatial patterns of establishments. Their general result is that retail firms exhibit agglomerative tendencies over time. This has been seen as the process described by Nelson (1958) where an establishment locates initially to intercept consumers traveling to other opportunities only to later become part of an agglomeration as new establishments locate around it in response to consumer propensities for comparison or multi-purpose shopping. Shaw (1978) has also used this framework to study long term change in the patterns of establishments in a retail system while relating this change mostly to population processes.

The works of Simmons (1964, 1966) provide perhaps the most empirically comprehensive treatments of locational dynamics. Simmons studies retail and population change in the Chicago and Toronto regions. He attempts to show a causal link between retail and population change through regression models where the number of establishments of a particular retail type in a zone are estimated as a function of the characteristics of the population in each. While a novel approach, several problems with his framework exist (which he does acknowledge to a degree). Recent developments in spatial econometrics and interaction modeling could allow
this framework to be extended so that retail change in a particular zone could be a spatially weighted function of population change in surrounding zones. The approach would still be inadequate for the purposes of this research, however, because retail change is assumed to be a function of a much more diverse set of factors than population characteristics.

More recent research has documented changes in the economic and spatial structure of retailing in Germany (Kulke 1992) and the UK (Gaylor 1989). The findings of these studies suggest that the increasing mobility of consumers, coupled with less stringent planning restrictions have fostered the decentralization and growth in size of retail establishments and centers -- an argument which has also been made for the US (Handy 1993). Little in the way of direct causation, however, is proven. Most discussion of new retailing trends has been of a casual nature (Brown 1990, Morganosky 1993, Mutter 1993, Schwanke 1993, Siegal 1996) while simply acknowledging that change is occurring. Given the age of previous in-depth inquiries and the widely cited change currently underway, it is apparent that a systematic, empirical inquiry into the dynamics of current U.S. metropolitan retailing is sorely needed and that this change must be causally linked to the mechanisms driving it.
The process of change

Previous empirical studies have provided continued evidence of change in retail systems while theoretical work has given insight into why change may occur. Unfortunately, little effort has been directed at combining these two approaches to examine retail dynamics. Several of those engaged in catastrophe modeling, for example, have recognized that it is crucial to empirically validate the mechanisms explored theoretically but have not done this themselves (Wilson and Oulton 1983, Dendrinos and Mullally 1985, Fotheringham and Knudsen 1986). The clearest way of doing so would be to compare calibrated parameter values for the models across different time periods. This would necessitate, however, that data be available for the same study area for these time periods because of problems with the spatial transferability of calibrated models (cf. Fotheringham and Webber 1980, Fik 1988). Clearly, data of this type do not exist and accordingly a study utilizing them has not been done.

Agergard, et. al (1970) view the process of retail change in terms of internal and external forces. Internal forces include those controls which can be directly manipulated by the retailer: price levels, merchandise mix, choice of locations. External forces indirectly affect retailer operations: the competitive environment, population size, location, and characteristics, and transport alternatives. Simmons’ (1964) controlling and modifying forces and Scott’s (1970) supply and demand
factors represent similar approaches towards conceptualizing the process of retail change. Within the Agergard, et al framework retailers manipulate the internal factors under the constraints imposed by the external forces. We borrow this conceptualization to further detail the underlying forces driving the process of retail structural change.

External Forces

Those indirect factors described by Agergard et al (1970) as external to the firm have undoubtedly received the most attention as drivers of retail change. The marketing literature on retail change typically focuses on such factors under the assumption that change is driven by consumer preferences and conditions. Brown (1987a, b) reviews the various models of retail evolution under this assumption. Increasing levels of value-consciousness, it has been argued, are driving the most recent changes observed in US retailing (Germeroth 1992, Morganosky 1993, Michman and Greco 1995).

Early work on structural change grew out of the interest in central place theory and its focus on retail location with respect to the distribution of consumers. Berry's (1963) study into the causes of retail decline and commercial blight, for example, drew a direct connection between retail change and movements of the population. Similar connections between retail and population change were made by
Simmons (1964, 1966). The decentralization of retail activities in response to the suburbanization of the population as detailed by such researchers as Getis (1964) and Dawson (1974) represent similarly driven examinations of retail locational change.

Changes in population characteristics and the technologies available to them have been further drawn upon to explain retail change. Examples include the growth of convenience stores and food/drug combination stores in response to increasing numbers of married women entering the workforce (Rogers 1984) and increases in the ownership of automobiles and refrigerators fostering the development of supermarkets (McNair and May 1976). While most such studies have been non-geographic, arising instead out of the marketing disciplines, the spatial strategies of retailers as detailed by such researchers as Laulajainen (1987) and Graff (1998) reflect retailers awareness of population dynamics and their target consumers.

Increased segmentation of the population and continually expanding geodemographic knowledge (Goss 1995, O'Malley et al. 1995) promise continued change in retailers and store locations. Perhaps increases in shopper mobility, especially due to the availability of automobiles, has been the most persistent theme in the analysis of retail locational change (Vance 1962, Bouchard 1973, Handy 1993).

Competitor locations also greatly affect locational structure and change. A process of attraction can occur around shopping goods oriented retailers as competitors are drawn into proximate locations. Convenience goods sellers can
effectively preclude entry into their market through their choice of locations. Of course, the predatory tactics of some firms (Brown 1994), with their willingness to take short run losses in the hope of attaining a long run monopoly, can lead to short run clustering of convenience goods oriented retailers. Most work in this area has been case or firm specific with the work of Laulajainen (1987) being the most comprehensive. Generalizations of such tendencies are best described by Nelson (1958) and Getis and Getis (1968). Little to no work has addressed the issue of how changes in these relationships affect the process of structural change. Inter-firm relationships, due in part to their complexity, have almost exclusively been examined from a static, structural perspective. The tenets of spatial interaction modeling (Fotheringham and O’Kelly 1987), which conceptualizes consumer shopping movements in terms of the locations of competing retail establishments, speak to the importance of competitive location.

Internal Forces

The effects of internal factors, such as a firm’s ability to control pricing and its cost structure, have received considerable attention in recent years. Most work in this area has come from a political-economy perspective (Wrigley and Lowe 1996) with its focus on retailing as part of the greater flow of capital. In their seminal piece, Ducatel and Blomley (1990) adopt a Marxist perspective in outlining how
linkages between suppliers, retailers, and consumers act to affect the structure of retailing by manipulating both the production and consumption of consumer goods. While they identify several crucial elements affected by such relations two are particularly relevant to the purposes of this study - the issue of retail scale and store location.

The scale of retail operations is identified by Ducatel and Blomley as a key factor in the transformation of retail capital. Keeping in mind the Marxist perspective of their arguments:

As they grow, retail capitalists gain further competitive strength through economies of scale in their operations, which do not accrue to management-intensive petty bourgeois retailers. Thus, retail capital has penetrated and restructured this sphere, driving out independent retailers through strategies such as direct price and quality competition, and through the ability to develop large stores in prime sites which operate at a higher turnover and require a larger staff than small-scale, owner-operator retailers can support. (Ducatel and Blomley 1990, p. 219)

Two separate issues regarding scale may be identified. First, the overall size of the retail organization allows the retailer to manipulate the price and quality of goods produced for sale. Scale provides retailers with increased leverage over their suppliers to better purchasing relations (Foord, et al. 1996) and reduce distribution costs (Wrigley 1987). As these cost savings may be partially passed on to consumers in order to increase the retailers market share, larger retailers gain competitive advantage over smaller competitors and these advantages build with ever increasing
retail size. Most attention in this area has been focused on this issue - the size of the retail organization and the resulting power this then allows it to wield. The second issue, that of the size of the outlets operated by the retailer, has received less attention but is equally important. This issue is intertwined with location.

The increased scale of retail outlets allows firms to centralize retail opportunities into fewer locations. Increased turnover in stock and reduced distribution costs through just-in-time delivery schedules and elimination or reduction of retailer operated warehouses result with the burden of travel becoming increasingly shifted to the consumer (Ducatel and Blomley 1990). This, however, neglects the principal issue of consumer response to such a shift. The success of such formats as category killers within the U.S. suggests that consumers willingly accept this burden. Of course, they will only do so if they receive something in exchange for such an increase in travel costs. New retailers must initially compete with smaller competitors for consumer dollars. That consumers are bypassing these traditional retailers in favor of the larger superstores while at the same time subjecting themselves to greater travel burden implies that benefits are being received. This is the shortcoming of current research under the political-economy moniker. It focuses too much on retailers with consumers being treated merely as pawns. Little attention is focused upon what these retailers provide consumers. This is not to say that they are ignored - only that the relation between consumers and
retailers is portrayed too heavily in terms of retail power. We agree that the structure of retailing is intimately entwined amongst its vertical relations but we stress that retailers are completely dependent upon consumers and that any power they attempt to wield must, at least perceptually, benefit the consumer.

Conclusions

The long held belief that the three most important elements to successful retailing are location, location, location (Ghosh 1990) points to the significant role geography can play in the study of retail distribution. In this chapter we have attempted to summarize the various contributions that have been made through the geographical study of retail structure. Perhaps the most dominant theme in this literature is agglomeration. The empirical evidence continually points to retail clustering and a large portion of the theoretical work has sought to explain it.

From central place theory it can be inferred that such a pattern can arise as an efficient means by which to serve a dispersed population of consumers. The hierarchical structure of retail centers, and the grouping of similar functions, result from regularities in the threshold population sizes needed to support these functions. Such coincidental factors driving retail outlets into close proximity with one another are separately justified through bid-rent theory and the principle of minimum differentiation where retailers seek to maximize their accessibility to consumers. The
best explanation for such patterning, however, is the simplest. Nelson’s (1929) theory of cumulative attraction and rule of retail compatibility provide theoretical justification for the oft observed clustering of similar outlets and compatible stores. Though no studies exist attempting empirical comparisons of these varying theories, the interest in multi-purpose and comparison shopping (cf. O’Kelly 1983, Thill and Thomas 1987) would seem to justify this conclusion. And while most studies in retail geography have been concerned with such structural issues, much research has also addressed the process of change within retail spatial structure. Early empirical work in this area generally tied such dynamics to population process or the evolution of a retailing system. The theoretical work, on the other hand, has identified a much richer set of potential mechanisms for retail change. Unfortunately, this theory has received little empirical attention.

In this study, we investigate retail change from both an empirical and theoretical point of view. After identifying recent retail locational dynamics we theoretically explore their possible mechanisms and empirically verify the drivers of this change. We adopt the general idea that “the aggregate choices of consumers shape the overall pattern of retail activity” (Craig et al. 1984, p. 12) without denying the importance of vertical relations stressed by those under the political-economy banner. That power relations shape the way in which retailers organize distribution is undeniable. However, their constructed distribution still must operate in a world
where the consumer possesses the free will to choose those retail opportunities
which best serve her needs. There clearly are structural elements we do not address
here, in particular, the political environment (planning, zoning, etc.). It is felt that
these are unnecessary given the establishment level of inquiry. Given the competition
for tax dollars among communities (Lloyd 1991) few regulatory barriers exist
regarding retail location as such activities are actively promoted.
CHAPTER 3: Intrasectoral Dynamics and Competitive Impacts

Introduction

The utility associated with a shopping trip has two components (Poston and Wilson 1977). Shopping satisfies both consumptive and recreational needs generating positive utility for consumers. Stores with larger selections, lower prices, and better service offer more utility to their customers because they can better satisfy their needs. Having to travel to shop, however, creates disutility as the trip itself requires expenditures of both time and money. Closer, more convenient shopping destinations minimize this disutility. In deciding where to shop, consumers seek the optimal balance between these positive and negative components of shopping utility. They are willing to, for example, suffer greater inconvenience by traveling to a supermarket rather than a corner grocer in order to realize price savings and a greater selection.

The big box, value retailing revolution has involved retail operators pushing the tradeoff between these two utility components to new levels. Through large format stores, they are able to offer a larger selection of goods at lower prices than their more traditional competitors. But by gathering the total amount of retail

66
floorspace into fewer locations it becomes necessary for consumers, on average, to travel farther in order to satisfy their shopping needs. The success of this format proves that a large number of consumers are willing to accept this travel burden in exchange for the extra utility associated with the big box value platform.

The utility earned from a shopping trip is also affected by consumer desires towards comparison and multipurpose shopping. The attractiveness of a particular retail store is thus also influenced by its proximity to other retail outlets. Clustering of similar stores enhances comparison shopping while multipurpose trips are fostered when dissimilar stores locate nearby one another. The success of the traditional mall testifies to the importance of these relationships.

These relationships are continually being realized but also changing due to the nature of new store formats. For example, small furniture stores benefit from clustering due to a consumer desire to comparison shop. Large furniture stores, which already feature a large selection, receive much less benefits and may actually suffer due to price competition if they locate proximate to one another. Change in retail store formats, therefore, can alter the nature of the benefits received by stores when they locate nearby other stores.

In the next three chapters we detail the nature of the locational dynamics resulting from the value retailing revolution in light of the factors discussed above. This chapter continues with a discussion of the specific data and methodology.
utilized followed by an examination of dynamics and competitive impacts within each sector. The nature of these dynamics are then generalized and compared in the next chapter. The third of these chapters discusses intersectoral dynamics.

Methodology

Spatial dynamics, or changes in the positioning of retail outlets with respect to one another, are relatively simple to identify and quantify with the appropriate data. The existence of the many confounding influences operating in the urban marketplace, however, make it difficult to determine how significant these changes may be. In addition to the forces we wish to investigate, the patterning of retail outlets is affected by shifts in the population distribution, the number of outlets operating, and a host of other factors of less severe influence. In what follows we describe the data and means utilized to control for these influences in order to investigate shifts in relative positioning.

Data

Data concerning the locations of 8 different retail types operating in the urban portions of San Diego County in the years 1977, 82, 87, 92, and 97 were obtained from the Pacific Bell Yellow Pages. This source, published in multiple volumes, provided continuous coverage of the entire metropolitan area for the duration of the
study period. Listings are provided as a courtesy to all establishments with phone service. Fees are charged only for expanded advertising and exclusion from the local directory is done only upon request. These policies remained consistent throughout the study period and help assure the thoroughness of listings.

The limitation of this data source is that only business type and location, and not size or sales figures, may be obtained. Data are available from other commercial sources which include this additional information, however, these data are not as thorough in their coverage and the extent of coverage declines moving into the earlier years of the study period. Government sources will not provide such detailed information as employment or sales figures for individual establishments due to confidentiality restrictions. Data on firm location and type are available but the yellow pages are a more readily accessible source and do provide the degree of reliability required.

Business listings were obtained using the yellow pages business categories most closely corresponding with the sample establishment types. In some instances, data exclusions and more detailed classifications were made where the Yellow Page categories differed from the sample description. These are as follows:

- Book stores - Adult book stores and spiritual/religion oriented book stores were excluded from the locational study. Only general line stores were included.
- Supermarkets - Supermarket listings were obtained from the “Grocers” section of the Yellow Pages. Grocers included a much larger variety of store types.
• Drug stores - Yellow page listings were obtained from the “pharmacy” category. Listings for such pharmacy locations as discount department stores, or medical offices were excluded. Corner drug stores were further excluded so that emphasis could be placed on the impacts of super-discount drug stores upon conventional, large format drug stores.

• Stationers/office supply dealers - Yellow page listing were obtained from both the “stationers” and “office supply dealers” categories. Many listings for specialty office suppliers were excluded to focus only upon general line stores.

• Department stores - Listings for traditional, discount, membership, and discount clothing oriented department stores were extracted. Those for variety stores were excluded.

• Sporting goods stores - Only general line stores were included.

• Furniture stores - All furniture stores were included.

• Home electronics - Listings were obtained from the “television and radio dealers” section.

Once constructed, the listings were cross checked with published white pages directories for the region. This involved verifying the nonexistence or disappearance of outlets in those years in which no yellow page listing appeared. For example, if the yellow pages showed listings for an establishment only in 1987 and 1992, white pages were consulted to verify that the establishment did not yet exist in 1982 and was no longer operating in 1997. The results of this verification procedure proved that the primary source was highly reliable as less than 100 of the thousands of listings showed any discrepancy. These discrepancies were most likely due to slightly different publishing dates for the yellow and white pages, and the listings were thus not altered.
Analysis of Relative Location Dynamics

Analysis and interpretation of changes in the point patterns for each store type is accomplished through two techniques. The first is nearest neighbor analysis which provides a detailed account of first order clustering tendencies by reporting the average distance to each stores nearest neighbor of the same type. The value of this statistic is reported for each store type in each of the study years to track changes in the stores' relative positioning with respect to each other. In order to distinguish between locational changes due to shifts in the population and number of outlets serving this population, upper and lower bounds were established for the expected value of the nearest neighbor statistic. Given changes in the number of stores and the amount of land available for these stores to locate from one period to the next, the bounds establish a range in which the statistic should fall in the latter period if the relative spacing present in the former period is maintained. It can be shown that if the same relative spacing is to be maintained then

$$d_1 = d_0 \sqrt{\frac{A_1n_0}{A_0n_1}},$$  \hspace{1cm} (3-1)

where, at times 0 and 1, $d$ is the nearest neighbor statistic, $A$ the amount of land available to locate, and $n$ the number of establishments. The number of stores at each time is known, however, the amount of land available for these stores to locate is not. Since the interest in this formulation is only on the ratio of land available at
two times, assumptions can be made to define the extremes: first, the amount of land available is the same in the two periods and the ratio is thus equal to 1; or second, the land available at one time is directly proportional to the size of the population at that time and, thus, the ratio for available land at one time versus a later time is the same as the ratio for the population sizes at those two times.³

Based on this formulation and since the population \((P)\) has increased continuously throughout the study period we expect

\[ \bar{d}_0 \sqrt{\frac{n_0}{n_1}} \leq \bar{d}_1 \leq \bar{d}_0 \sqrt{\frac{P_1 n_0}{P_0 n_1}} \tag{3-2} \]

if the same relative spacing present at time 0 is maintained at time 1. If the new value falls outside this range a notable change can be seen to have occurred since the prior time. This provides a consistent benchmark against which to gauge the degree of change from one period to the next. This is more effective than testing against a CSR hypothesis as the boundaries and area of the study region are difficult to define and appropriate boundary correction procedures can not be utilized.⁴

A second technique, based on k-function, or second-order, analysis is also utilized to describe the point patterns. This technique compliments nearest neighbor analysis by providing a more overall pattern description. Additionally, modifications made by Getis (1984) allowing for analysis of weighted point patterns, provide a means by which the pattern of retail stores may be directly compared with the
population distribution. Thus, it is possible to control for growth and spatial shifts in
the population through the study period without making assumptions regarding the
influence this population growth may have had on the availability of retail locations
as was the case for the nearest neighbor analysis.

To provide a baseline distribution against which retail patterns can be
compared, census tract population totals for each of the study years are required.
Population totals were obtained at the census tract level from the 1980 and 1990
Censuses of Population and Housing. The 1980 tract geography and population
totals were then reconfigured to match the 1990 geography. For each tract a yearly
growth rate \( r_i \) was computed from

\[
POP90_i = POP80_i (1 + r_i)^{10}
\]  

(3-3)

where \( POP90_i \) and \( POP80_i \) are, respectively, the 1990 and 1980 population totals for
each tract \( i \), and \( t \) is the number of years separating the two times from which
population totals were available. The compound growth assumption inherent in this
formulation allows for momentum to build in the tracts’ growth rates. Tract
population estimates for each of the study years were then obtained by utilizing the
appropriate value of \( t \). To assure that the sum of these estimates were equal to
county population estimates obtained from the Census Bureau’s “Current Population
Reports” series, the growth rates, \( r_i \), were ratio adjusted as necessary to obtain
appropriate estimates.
K-functions for each store type and weighted k-functions for the population were computed for each of the study years. No boundary corrections were made. Two subsequent analyses were then done for each store type. The first involved generating curves for each year which quantify the difference between the store and population k-function values at .25 mile increments up to a distance of 5 miles:

\[ L(d) - L^*(d) \quad ; \quad d = .25, .50, ... , 5.00 \quad , \quad \text{ (3-4)} \]

where \( L(d) \) and \( L^*(d) \) are, respectively, the heights of the store and population k-functions at specified distances \( d \). The individual curves allow store clustering or dispersion within the overall pattern of the population to be identified. At each distance, a value near 0 indicates that the stores are equally dispersed among the population. Values greater than 0 indicate the stores are clustered within the population and values below 0 dispersed. Curves for the individual years are directly comparable since the population effect upon store patterns has been removed. This allows shifts in the degree of clustering of stores within specified distances of one another to be identified.

The second analysis focuses on changes between certain distances or within bands. This allows us to determine specific regularities in spacing. K-functions are cumulative in nature and the value of the function at a specified distance is influenced by its values at lesser distances. Subtracting the k-function value at one distance from the value at a longer distance gives us a measure of clustering/dispersion.
tendencies between the two distances. The quotient of this measure for stores to that for the population then provides a statistic describing store patterns amongst the population pattern. We calculate this ratio, going up by distances of .25 miles to a maximum of 1, to identify very close clustering or dispersion tendencies. This may formally be expressed as:

$$\frac{\Delta L(d)}{\Delta L^*(d)} = \frac{L(d) - L(d-25)}{L^*(d) - L^*(d-25)} ;$$

$$d = .25, .50, .75, 1.00 .$$  

(3-5)

The expectation of this ratio, if the stores are spaced evenly with respect to the population between certain distances, is 1. Values above one indicate clustering, while those below 1 are indicative of dispersion. Since control has been made for population dynamics, the curves for each year are directly comparable.

Analysis of Competitive Impacts

The structure of the data permit us to identify which stores present at one time were no longer operating at later times. Within each sample sector, we thus compute the total failure rate, \( \rho \), of conventional stores between two periods.\(^5\) We also subset the conventional stores into groups within specified distances of value retailers within the sector and compute their failure rates, \( p_d \). Testing the hypothesis, \( H_0: p_d = \rho \), then allows us to identify if failure rates vary significantly by proximity to
superstore competition\(^6\). Where \(p_d > \rho\), competitive effects hold and value oriented retailers are displacing conventional stores. Comparison of \(p_1, p_2, \ldots, p_0\) allows the spatial extent of these competitive effects to be determined. If \(p_d < \rho\), there are localization effects implying that conventional stores benefit from proximity to big box retailers most likely due to cumulative attraction effects.

Depending upon how early big boxes appeared within a sector it is possible to further investigate short versus long term failure rates. If, for example, value retailers were first recorded within a sector in 1992 it is possible to examine the short term failure rates of conventional stores from 1987 to 1992 and the long term rates from 1987 to 1997. If new value oriented stores were recorded in 1997 it becomes possible to investigate further short term failure rates from 1992 to 1997. It thus is possible to investigate the temporal, as well as spatial, dynamics of big box impacts.

Competitive impacts are detailed for six of the eight sample retail sectors. The furniture sector has not been subject to the value retail revolution and thus no competitive impacts may be investigated. It's lack of dynamism with respect to structure, however, provides an important benchmark to evaluate the locational dynamics of other sectors against. Although especially dynamic in its structure, the department store sector differs from the other sectors in a way which makes competitive impacts impossible to adequately determine. The revolution which struck the other sectors involved new stores which differed primarily from
conventionals in that they offered the same goods but with a larger selection and lower prices. The alternative formats which have intruded into the department store sector differ in many respects from traditional department stores including the types, quality, prices, and ranges of goods sold. Because the different value department store formats (discount, discount clothing oriented) compete only partially and in varying degrees with traditional department stores, competitive impacts for them are not detailed.

Findings

Using the discussed methodology sectoral dynamics are investigated within each of the eight sample retail sectors. We discuss the dynamics and competitive impacts within each sample sector individually. Generalities and comparisons of the dynamics of the individual sectors are discussed in chapter 4 together with an analysis of intersectoral dynamics.

Supermarkets

Traditional supermarkets, which have dominated the grocery landscape for several decades, represent something of a big box pioneer. With their large selection and value pricing, the revolutionary formats currently sweeping other retail sectors have largely copied the format supermarkets have used to dominate grocery
retailing. But despite the long history of big box formatting within the grocery industry, the latest revolution has involved even larger stores, with even lower prices - through the adoption of warehouse style stores. This is not an entirely new idea but it has found more success now than in earlier periods. The renewed value-consciousness of consumers coupled with the experience of the established supermarket chains who operate these stores has made them a successful entrant into the retail grocery trade.

Even prior to the arrival of these warehouse, or “super discount” format stores, the supermarket pattern exhibited dynamism. In the initial year of the study period the pattern could be described as one of dispersion and market respect. There were few stores within .25 miles of one another and more than half the stores did not have a neighbor within 1 mile (Figure 3-1b). The pattern indicates a general reluctance on the part of chains to compete head to head with each other for local markets. Much the same was true in 1982, however, the pattern began to show the first signs of change.

While the population increased approximately 16 percent from 1977 to 1982 the number of supermarkets positioned to serve this population increased only around 6 percent. This slight growth involved new stores not only in growing areas but also in established, but not rapidly growing markets. As purveyors of convenience goods, grocers receive little benefit from clustering. This latter
positioning was thus an early sign of attempts to overtake and compete head to head in markets - a strategy not at all prevalent in 1977. Supporting this suggestion of predatory behavior, the average nearest neighbor distance decreased more than would be expected given changes in the population size and number of stores (Table 3-1 and Figures 3-1a, b). Figure 3-2a further supports this contention as the stores became slightly more clustered with respect to the population moving from 1977 to 1982. This clustering tendency was most prevalent within a distance of 1/4 mile as shown in Figure 3-2b.

The period from 1982 to 1987 was especially dynamic for the industry. Population continued to increase at a steady rate growing 15 percent in the period. Supermarket growth was more tremendous (59 percent) as the chains sought to make up for the population growth that was largely ignored in the early period and position themselves as the dominant players in both emerging and existing markets. The result was a dramatic shift to a much more clustered pattern. The average nearest neighbor distance fell much more than expected and by 1987 more than twice as many stores were within .5 miles of one another than was the case in 1982. The increase in clustering was not accounted for by increased population densities. The supermarket growth also expanded the spatial extent of the clusters. The 1977 and 1982 patterns demonstrated clustering in regions of stores within 1 mile of one another. By 1987 more stores were within 2 miles of one another than the
Table 3-1. Changes in the number and spacing of supermarkets.

<table>
<thead>
<tr>
<th>year</th>
<th>n</th>
<th>p</th>
<th>p/n</th>
<th>d</th>
<th>d_u</th>
<th>d_l</th>
<th>percent difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>above d_u</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>below d_l</td>
</tr>
<tr>
<td>1977</td>
<td>78</td>
<td>1,696,084</td>
<td>21,745</td>
<td>1.44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>83</td>
<td>1,972,354</td>
<td>23,763</td>
<td>1.31</td>
<td>1.48</td>
<td>1.39</td>
<td>6</td>
</tr>
<tr>
<td>1987</td>
<td>132</td>
<td>2,275,309</td>
<td>17,237</td>
<td>.76</td>
<td>1.13</td>
<td>1.05</td>
<td>27</td>
</tr>
<tr>
<td>1992</td>
<td>146</td>
<td>2,601,055</td>
<td>17,815</td>
<td>.77</td>
<td>.78</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>152</td>
<td>2,672,850</td>
<td>17,585</td>
<td>.77</td>
<td>.76</td>
<td>.75</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 3-1. The average spacing of supermarkets.

(a) Average distance to nearest neighbor: empirical and expected values.

(b) Cumulative frequency of nearest neighbor distances.
Figure 3-2. The clustering of supermarkets.

(a) Difference between store and population k-function values.

(b) Ratio of change in store versus population k-function values.
population distribution would warrant.

By 1992 the pattern had largely stabilized. While the population increased another 14 percent and the number of stores 11 percent, there was little change in the statistics describing the pattern. The clustered pattern continued in a stable fashion into 1992 and the introduction of alternative formats such as food/drug combination stores and super discount, warehouse style supermarkets did little to change the availability of conventional stores in local markets. Whereas the change from 1982 to 1987 suggested predatory tactics there is little evidence that these were successful in driving individual stores out of many markets. From 1987 to 92 there is continued evidence of this strategy as more stores moved into locations within .25 miles of existing stores. This strategy was still not explained by increases in population densities.

By 1997 population growth had stabilized and growth from 1992 was under 3 percent. The number of stores increased by a similar 4 percent. There was little change in the patterning although evidence of marginal predatory success is present. The nearest neighbor statistic increased slightly more than would be expected and the k-function measures indicate that the store distribution is slightly more in line with that of the population. The degree of clustering within .25 mile distance bands is between 1982 and 87 levels.

These slight changes in the overall supermarket distribution from 1992 to
1997 are partially explained by growth in warehouse style stores. The first of these "super discount" supermarkets opened between 1982 and 1987 in a rapidly growing area at the fringes of the urban area. Despite this being an area of increasing demand, the single supermarket located within 1/2 mile of the new store closed. The next closest store, located within 2 miles, continued to operate through 1992 but had closed its doors by 1997. In fact, all supermarkets within 5 miles had ceased operations by 1997 (Figure 3-3c) but several other new stores did enter the marketplace. Despite the apparent impact of this first store, as shown in Figure 3-3a, none of these statistics differ significantly from the total failure rates.

Between 1987 and 1992 no additional super discount supermarkets opened. The 1992 to 1997 period, however, saw the number of stores increase by 12. As evident in Figure 3-3b, this had a profound and immediate impact on nearby competitors. Despite a low overall failure rate in the industry of 26 percent for the period, 8 of 13 supermarkets within 1/2 mile of the openings failed as did 10 of the 22 within 1 mile. The associated failure statistics of 62 and 46 percent, respectively, differ significantly from the overall rate at the .05 level. It is clear that these new format stores have profoundly impacted their traditional supermarket competition.

The predatory tactics common from 1982 on resulted initially in a very clustered supermarket distribution. Few supermarkets were driven out of established markets by the entrance of other supermarkets. The arrival of the super discount
Figure 3-3. Competitive impacts of discount supermarkets upon conventional supermarkets.

(a) Short term (1982 - 87)

(b) Short term (1992 - 97)

(c) Long term (1982 - 97)
format, however, gave credence to these tactics. With their competitive advantage they have been able to successfully drive their more conventional competitors out of business. And the spatial extent of this competitiveness extends out several miles despite most supermarket travel patterns involving very short trips. As these stores represent less than 10 percent of the total number of supermarkets in the area, these effects have been limited to the few markets they have entered.

The statistical trends noted above are clearly born out in the maps of Figure 3-4. Also of note is the generally large separation between the super discount supermarkets. Only two chains operate in the area and, with two exceptions involving 4 of the 13 stores, they appear to respect each others locations. While the number of these stores is still growing it appears that their distribution will be far more dispersed than that of conventional supermarkets. Although not shown on the maps, their locations are not oriented towards specific demographic segments. Still, these stores do not have the mass appeal of conventional supermarkets as a result of their being merely a more radical extension of the big box, supermarket format. Though they have experienced notable growth, and displaced many supermarkets, there is little evidence that they have or will dramatically alter the spatial pattern of grocery retailing.
Figure 3-4. The locations of supermarkets.

(a) 1977
Supermarkets

- conventional (117)
- food/drug (14)
- super discount (1)

1987 Persons per Sq. Mile

- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500
(d) 1992

Supermarkets
conventional (123)
food/drug (22)
super discount (1)

1992 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500
Drug Stores

As with the grocery industry, drug stores represent somewhat of an unusual case compared with the other sample retail sectors. Much as value retailers are replacing conventional stores in many sectors today, drug stores and supermarkets replaced most corner pharmacies and grocers long ago. To a certain degree, the big boxes of today have simply reproduced the format pioneered by the drug store and supermarket industries. The big boxes we consider traditional drug stores today notwithstanding, this sector has experienced intrusion by retailers of larger size and lower prices as part of the current retail revolution. To date, the region only has two of these “super discount” drug stores, the first of which opened between 1987 and 1992 and the second between 1992 and 1997.

Long before their arrival, the 1977 drug store pattern was one of extremes. The average distance separating stores was over 1.25 miles (Table 3-2 and Figure 3-5a) yet nearly 1/3 of the stores were within .5 miles of one another (Figure 3-5b) and extreme clustering tendencies are prevalent (Figure 3-6). This clearly was a time of transition in the locational patterning as the large average degree of separation between stores indicates a general tendency to serve distinct geographic markets while the clustering would indicate predatory behavior by some stores.

Growth in the number of stores moving into 1982 was slightly greater than population growth (21 versus 16 percent) and there was a greater than expected
Table 3-2. Changes in the number and spacing of drug stores.

<table>
<thead>
<tr>
<th>year</th>
<th>n</th>
<th>p</th>
<th>p/n</th>
<th>d</th>
<th>d_u</th>
<th>d_l</th>
<th>percent difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>above d_u</td>
<td>below d_l</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>67</td>
<td>1,696,084</td>
<td>25,315</td>
<td>1.30</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>1982</td>
<td>81</td>
<td>1,972,354</td>
<td>24,350</td>
<td>1.13</td>
<td>1.25</td>
<td>1.18</td>
<td>3</td>
</tr>
<tr>
<td>1987</td>
<td>95</td>
<td>2,275,309</td>
<td>23,951</td>
<td>1.01</td>
<td>1.12</td>
<td>1.04</td>
<td>4</td>
</tr>
<tr>
<td>1992</td>
<td>114</td>
<td>2,601,055</td>
<td>22,816</td>
<td>1.03</td>
<td>.99</td>
<td>.93</td>
<td>4</td>
</tr>
<tr>
<td>1997</td>
<td>118</td>
<td>2,672,850</td>
<td>22,651</td>
<td>1.08</td>
<td>1.02</td>
<td>1.01</td>
<td>6</td>
</tr>
</tbody>
</table>
Figure 3-5. The average spacing of drug stores.

(a) Average distance to nearest neighbor: empirical and expected values.

(b) Cumulative frequency of nearest neighbor distances.
Figure 3-6. The clustering of drug stores.

(a) Difference between store and population k-function values.

(b) Ratio of change in store versus population k-function values.
decrease in the nearest neighbor statistic. Tight clustering within the population distribution is decreased, however, as demonstrated by the k-function measures for .25 mile distance bands. The 1982 pattern indicates that the few instances of predatory locational tactics present in 1977 were damaging to some of the stores involved. Sharing of market subareas is more the norm in 1982 with less severe degrees of the market competition present in 1977.

The same shifts in patterning evident in the 1977-82 period continued into 1987 but were less severe in magnitude suggesting the approach of a locational equilibrium. The pattern remained relatively stable moving into 1992 but with a slight reversal of earlier trends. Within the overall changes in the population size and distribution clustering increased slightly in .25 mile distance bands. This was accompanied by a minor increase in average nearest neighbor distances despite an expected decrease. This same trend continued into 1997 but the overall change in pattern was insignificant. Overall, the drug store pattern from 1987 on can be described as stable, and those changes which were noted are slight enough to attribute to adjustment in light of population dynamics.

Despite the evidence of predatory tactics early in the study period, most drug stores today enjoy a comfortable degree of spacing from their competitors. While other big box retailers have adopted locational strategies to attack their conventional competitors, the single chain operating large format stores in the drug industry would
appear to have taken a more conservative approach. The first of their two stores opened in a location nearly two miles away from another drug store and the second nearly a mile away from any competition.

Their openings also do not appear to have had any significant effect on surrounding drug stores (Figure 3-7). Failure rates among drug stores is low, with about 16 and 24 percent of 1987 stores no longer operating at the same locations in, respectively, 1992 and 1997. Approximately 12 percent of the stores operating in 1992 were no longer doing so in 1997. For the first super-store which opened, its two nearest conventional competitors, both located within 2 miles of the big box store, continued to operate in 1997. Conversely, in the short run, the failure rate among competitors within 5 miles of this store (including the two survivors) is nearly 50 percent higher than the total failure rate. This difference, however, is not highly significant. Of the stores still operating in 1992, all continued to operate in 1997 and no new stores entered this market. For the later opening store, half of the stores operating within 1 mile of it were not continuing their operations in 1997. This high failure rate is not highly significant but does indicate that there are competitive impacts. Failure rates among stores located farther than 1 mile are near, and not significantly different from, the total failure rate.

Overall, there is very weak evidence that the “super discount drug store” format is a successful replacement for what are considered conventional drug stores.
Figure 3-7. Competitive impacts of discount drug stores upon conventional drug stores.

(a) Short term (1987 - 92)

(b) Short term (1992 - 97)

(c) Long term (1987 - 97)
The drug store pattern remained consistently dispersed throughout the study period as evidenced by the locational measures and the patterns shown in Figure 3-8. This is primarily due to an early big box orientation and the super discount stores taking the current revolution to an unnecessary level.

Stationers and Office Supply Dealers

Of the sample sectors, the conventional purveyors of stationary and office supply products have been the hardest hit by the value retailing revolution. Following the initial arrival of office supply superstores between 1987 and 1992 the industry experienced a dramatic spatial redistribution. Prior to their arrival, however, the locational nature of the industry was not static.

Early in the study period the pattern of stationers and office supply dealers was one of tight clustering within dispersed areas. Typically, several outlets located within close proximity of one another, but these clusters of outlets were well dispersed with respect to one another. This is due to an orientation towards the commercial districts found in pockets throughout the study area. The 1977 to 1982 period saw the number of stores increase 32 percent compared with a 16 percent growth in the population (Table 3-3). The average distance separating stores fell more than expected (Figure 3-9) but the degree of tight clustering decreased slightly when adjusted for the population distribution (Figure 3-10). Stores retained the
Figure 3-8. The locations of drug stores.

(a) 1977
Drug Stores
conventional (81)

1982 Persons per Sq. Mile

- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

Miles
Drug Stores

- conventional (116)
- super discount (2)

1997 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500
<table>
<thead>
<tr>
<th>year</th>
<th>n</th>
<th>p</th>
<th>p/n</th>
<th>d</th>
<th>d_u</th>
<th>d_l</th>
<th>percent difference above d_u</th>
<th>below d_l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>76</td>
<td>1,696,084</td>
<td>22,317</td>
<td>.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>100</td>
<td>1,972,354</td>
<td>19,724</td>
<td>.60</td>
<td>.78</td>
<td>.74</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>1987</td>
<td>132</td>
<td>2,275,309</td>
<td>17,237</td>
<td>.73</td>
<td>.56</td>
<td>.52</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>1992</td>
<td>116</td>
<td>2,601,055</td>
<td>22,423</td>
<td>.71</td>
<td>.83</td>
<td>.78</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>1997</td>
<td>71</td>
<td>2,672,850</td>
<td>37,646</td>
<td>1.16</td>
<td>.91</td>
<td>.90</td>
<td></td>
<td>27</td>
</tr>
</tbody>
</table>

Table 3-3. Changes in the number and spacing of stationers and office supply dealers.
Figure 3-9. The average spacing of stationers/office supply dealers.

(a) Average distance to nearest neighbor: empirical and expected values.

(b) Cumulative frequency of nearest neighbor distances.
Figure 3-10. The clustering of stationers/office supply dealers.

(a) Difference between store and population k-function values.

(b) Ratio of change in store versus population k-function values.
same general pattern as was prevalent in 1977 but the size of the store clusters increased while the density within these clusters decreased. Moving into 1987 a dramatic shift occurred involving more dispersion in the pattern despite the number of outlets growing faster than the population. While the store clusters retained their prominence, new stores were increasingly choosing locations in newly opened tracts of land far from existing outlets.

From 1987 to 1992 the population continued to increase, however, the total number of stores decreased due to the coming of the first 3 big box office supply dealers in the area. The statistics describing the locational pattern were stable with only insignificant change. By 1997, 18 additional big boxes had opened which more than halved the number of conventional dealers able to operate in the area. The effects in the patterning were dramatic. The formerly prominent clusters became dominated by big boxes. Some of the smaller outlets survived within the clusters but most found success in more dispersed, and isolated, areas. The reduction in the importance of the clusters is borne out by the descriptive statistics. Prior to the arrival of the big box outlets more than 50 percent of the stores were within .5 miles of one another. By 1997, less than 25 percent still had neighbors within this distance. The nearest neighbor distance rose 63 percent from 1992 to 1997 and the degree of clustering indicated by the k-function measures decreased by a large measure.

The first three office supply superstores all opened in areas already heavily
saturated with conventional sellers. The effects of these openings were immediate and dramatic. The only conventional store located within 1/2 mile of a superstore failed, 6 of 9 located within 1 mile and 11 of 21 within 2 miles also failed. While overall nearly 44 percent of the 1987 stores no longer operated in 1992, these three local rates are all above this (Figure 3-11). By 1997, the remaining 3 stores within 1 mile ceased operation as did 9 of the remaining 10 within 2 miles. This patterning is clearly evident in Figure 3-12.

The failure rates among stores within 1/2 mile are most significant in the short term while those between 1/2 and 2 miles are more significant in the long run (Figure 3-11). The competition brought on by the arrival of the superstores was overwhelming nearly immediately for the proximate stores while slightly more distant, and therefore protected, stores were able to survive a few years longer. Eventually, however, as the superstores presence and market areas expanded, even these stores were overcome. From 1992 to 1997 failure rates were nearly even across the board suggesting superstore saturation within the San Diego market. Local failure rates are nowhere significantly different from the total failure rate but they do, however, suggest localized competitive impacts. Only the locations of 3 of the conventional stores operating in 1992 were farther than 5 miles from a superstore by 1997, and despite their distance only 1 continues operation today. Clearly, though competitive impacts were at first confined to areas proximate to the first
Figure 3-11. Competitive impacts of office supply superstores upon conventional stationers/office supply dealers.

(a) Short term (1987 - 92)

(b) Short term (1992 - 97)

(c) Long term (1987 - 97)
Figure 3-12. The locations of stationers and office supply dealers.

(a) 1977

Stationers and Office Supply Dealers
conventional (76)
1977 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500
(b) 1982

Stationers and Office Supply Dealers
conventional (100)
1982 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

0 5 10
Miles
(d) 1992

Stationers and Office Supply Dealers
conventional (113)
super store (3)

1992 Persons per Sq. Mile
7500 or more
6000 to 7500
4500 to 6000
3000 to 4500
1500 to 3000
0 to 1500

0 5 10 Miles
superstores, the market today is dominated by the big box dealers. The conventional stores still operating today survive primarily in locations relatively distant from superstores or where demand is sufficiently high to support multiple formats and stores.

**Book Stores**

The book store industry in the San Diego region has traditionally featured clusters of independent operators. From 1977 to 1982 this pattern persisted but with some shifts in the prominence of individual clusters. The total number of stores increased only 8 percent but greater growth was realized in dispersed, suburban clusters with some loss of stores in more centralized book districts. Little change was realized in the average nearest neighbor distance as it rose only slightly more than expected (Table 3-4 and Figure 3-13a). As demonstrated in Figure 3-13b, the proportion of stores within 1/2 mile of one another fell further indicating the growth of more dispersed suburban clusters. This is further shown in Figure 3-14a where the degree of clustering within the population falls markedly. Figure 3-14b shows this to mostly be a factor at distances only up to 1/2 mile with a still clustered pattern.

The 1982 pattern continued largely unchanged into 1987 with continued shifts in the dominance of individual clusters but insignificant change in the overall
Table 3-4. Changes in the number and spacing of book stores.

<table>
<thead>
<tr>
<th>year</th>
<th>n</th>
<th>p</th>
<th>p/n</th>
<th>d</th>
<th>d_s</th>
<th>d_l</th>
<th>percent difference above d_s</th>
<th>below d_l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>121</td>
<td>1,696,084</td>
<td>14,017</td>
<td>.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>128</td>
<td>1,972,354</td>
<td>15,409</td>
<td>.66</td>
<td>.64</td>
<td>.60</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>150</td>
<td>2,275,309</td>
<td>15,169</td>
<td>.62</td>
<td>.66</td>
<td>.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>193</td>
<td>2,601,055</td>
<td>13,477</td>
<td>.45</td>
<td>.58</td>
<td>.55</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>127</td>
<td>2,672,850</td>
<td>21,046</td>
<td>.67</td>
<td>.57</td>
<td>.56</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>
Figure 3-13. The average spacing of book stores.

(a) Average distance to nearest neighbor: empirical and expected values.

(b) Cumulative frequency of nearest neighbor distances.
Figure 3-14. The clustering of book stores.

(a) Difference between store and population k-function values.

(b) Ratio of change in store versus population k-function values.
structure of book store locations. The number of stores increased at roughly the same pace as the population and the locations chosen by new stores were primarily in areas to serve population expansion. Book store growth from 1987 to 1992 was more than twice that for the population (29 versus 14 percent) and included the arrival of 3 new big box stores. This growth was primarily in under served markets between clusters. This pattern narrowed the distance to previously isolated stores causing the nearest neighbor statistic to fall 18 percent more than expected.

By 1997, the number of big box book outlets had quadrupled and their was a 39 percent decrease in the number of conventional stores. Unlike the former pattern of tight clustering, most superstore locations were isolated from one another but often in close proximity to conventional book stores. The number of stores comprising book districts fell sharply but decline was also evident in isolated locations and in areas nearby superstores. The result was an increase in the average distance separating stores above that expected due to dynamics in the population size and number of stores. The degree of clustering at distances greater than .5 miles was reduced but remained stable at lesser distances. This indicates that the core of book districts survived largely intact while the stores on the fringes accounted for most of the decline in numbers.

The locations chosen by the big boxes involved malls, diversified retail districts and centers, and value centers. Of the first three stores, two located nearby
regional malls while the third chose a location along a diversified strip retail district. Surprisingly, the failure rate of conventional stores was lowest among those stores located nearby the new big box retailers (Figure 3-15a). Of the three stores located within one half mile of new book superstores, all survived into 1992 and two were still operating in 1997 (Figure 3-15c). This, despite that, of the conventional stores present in 1987, 42 and 74 percent, respectively, were no longer operating at the same location in 1992 and 1997. These sample failure rates are not significantly different from the overall rate, however, due primarily to the small number of stores located in such close proximity to the book superstores. This pattern can be seen in Figure 3-16.

The failure rates of conventional stores as a function of superstore proximity present an interesting pattern. In the short term from 1987 to 1992, the failure rates of conventional stores located within 5 miles of a superstore were generally lower than those located more distant. This is particularly true of stores located between 1 and 5 miles of a superstore. That more proximate stores had lower failure rates might suggest that while superstores are intended to serve all book buying and shopping needs they also provide surrounding stores with benefits through customer cast off or interception. The long distance at which these agglomerative benefits seem to extend, however, indicates the pattern is more a function of the vitality of the large scale shopping areas in which the superstores located. Only the long term
Figure 3-15. Competitive impacts of book superstores upon conventional book stores.

(a) Short term (1987 - 92)

(b) Short term (1992 - 97)

(c) Long term (1987 - 97)
Figure 3-16. The locations of book stores.

(a) 1977

Book Stores
conventional (121)
1977 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500
Book Stores
conventional (128)
1982 Persons per Sq. Mile

- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

0 5 10
Miles
(c) 1987

Book Stores
conventional (150)
1987 Persons per Sq. Mile

≥ 7500 or more
6000 to 7500
4500 to 6000
3000 to 4500
1500 to 3000
0 to 1500

0 5 10
Miles

125
Book Stores
conventional (115)
super stores (12)

1997 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

Miles
rate at a distance of 2 miles is near significant. Furthermore, the short term rates from 1992 to 1997, as shown in Figure 3-15b are near the overall rate at all distances.

The results indicate that, early on, conventional book stores benefited from proximity to book superstores. It is difficult to believe, however, that these proximity benefits could extend such great distances. The diversion in the pattern in the .5 to 1 mile distance band also runs counter to an agglomerative hypothesis. The process indicated is most likely due to coincidence. The superstores, with greater resources and experience, chose better locations than the average conventional bookstore. Those small stores which survived through the recession plaguing the 1987 - 1992 period were in better locations which just happened to be relatively proximate to the superstores\textsuperscript{10}. As the economy stabilized in the 1992 to 1997 period the failure rates were near even with respect to location. Thus, despite strong evidence for agglomerative benefits, the effects of superstores likely are not spatially discriminatory but much more broad.

\textit{Sporting Goods Dealers}

The locational pattern of sporting goods stores has been remarkably stable over time with nearest neighbor distances consistently remaining at just under 1 mile (Table 3-5 and Figure 3-17a). As demonstrated in Figure 3-17b, nearly 50 percent of
Table 3-5. Changes in the number and spacing of sporting goods dealers.

<table>
<thead>
<tr>
<th>Year</th>
<th>n</th>
<th>p</th>
<th>p/n</th>
<th>d</th>
<th>d_a</th>
<th>d_l</th>
<th>Percent difference above d_a</th>
<th>below d_l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>77</td>
<td>1,696,084</td>
<td>22,027</td>
<td>.97</td>
<td>.95</td>
<td>.90</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>1982</td>
<td>91</td>
<td>1,972,354</td>
<td>21,674</td>
<td>.93</td>
<td>.95</td>
<td>.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>104</td>
<td>2,275,309</td>
<td>21,878</td>
<td>.74</td>
<td>.94</td>
<td>.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>106</td>
<td>2,601,055</td>
<td>24,538</td>
<td>.82</td>
<td>.78</td>
<td>.73</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1997</td>
<td>91</td>
<td>2,672,850</td>
<td>29,372</td>
<td>.87</td>
<td>.89</td>
<td>.88</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 3-17. The average spacing of sporting goods dealers.

(a) Average distance to nearest neighbor: empirical and expected values.

(b) Cumulative frequency of nearest neighbor distances.
all stores have been within 1/2 mile of a competitor throughout the study period. This clustering of stores (Figure 3-18) has been associated with recreation oriented areas such as coastal strips and the retail district adjacent to the San Diego Sports Arena. Outside these clusters the pattern has remained one of random dispersion. Locational shifts have been minor with a slight, but not highly significant, decrease in the average distance separating stores from 1982 to 1987. From 1977 to 1987 the industry generally grew in proportion to the population and its locations reflected those of the population.

Store growth from 1987 to 1992 was below that of the population (2 versus 14 percent) and it was during this period that the first superstore had appeared. This was accompanied by an insignificant rise in the average nearest neighbor distance but no change in clustering tendencies. By 1997 there were 8 big box sporting goods dealers and the number of conventional stores fell from 105 to 83. This resulted in an increase in the distances separating stores near that which was expected.

The only conventional store within 1/2 mile of the first superstore had discontinued operations by 1992 as did 2 of the 3 within 1 mile of its location (Figure 3-19a). During the period, however, overall failure rates were 45 percent and these local failures are not significantly different from the overall figure. While nearly 3/4 of the 1987 stores were not operating in the same location in 1997 (Figure 3-19c), the store which survived into 1992 within 1 mile of the first superstore continued to
Figure 3-18. The clustering of sporting goods dealers.

(a) Difference between store and population k-function values.

(b) Ratio of change in store versus population k-function values.
Figure 3-19. Competitive impacts of sporting goods superstores upon conventional sporting goods dealers.

(a) Short term (1987 - 92)

(b) Short term (1992 - 97)

(c) Long term (1987 - 97)

133
operate through 1997. Though none of the long term proportions differ significantly from the overall rate, those stores within 2 miles of the original sports superstore survived better than those located farther away. This indication of agglomerative benefits is more evident in the 1992 to 1997 short term period.

With the opening of 7 additional sports superstores between 1992 and 1997 emerged an interesting pattern. While the overall failure rates during the period was 59 percent, it was only 20 among stores located within 1/2 mile of a superstore, but 81 percent among those at distances between 1 and 2 miles. (Figure 3-19b). These differences are significant at the .10 level. It is also evident in Figures 3-20 that many conventional stores moved to or opened in locations nearby but not immediately adjacent to the superstores.

This indicates that comparison shopping between superstores and conventional sports retailers is important and that conventional stores are benefiting more from the cast off or interception of superstore customers rather than from traditional agglomerative benefits. The superstores may have significant drawing power but it would appear that customers often end up shopping their nearby, more traditional competition either through interception of these customers on the way to the superstore or through cast off after the customers found themselves unsatisfied by the superstore. The agglomerative trend indicates that the big box stores do not well serve their purpose as one-stop sporting goods destinations. It is also
Figure 3-20. The locations of sporting goods dealers.

(a) 1977
(b) 1982

Sporting Goods Dealers
conventional (91)
1982 Persons per Sq. Mile

- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

0 5 10
Miles
Sporting Goods Dealers

conventional (104)

1987 Persons per Sq. Mile

- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

Miles
(d) 1992

Sporting Goods Dealers
- conventional (105)
- super store (1)

1992 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

Miles
(e) 1997

Sporting Goods Dealers
- conventional (84)
- super store (8)

1997 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

0 5 10
Miles
noteworthy because the big box revolution has been characterized as homogeneous across sectors. Clearly however, the impacts of, for example, sporting goods versus office supply superstores are entirely polar though they represent similar approaches to the same retail problem.

*Home Electronics Dealers*

The home electronics sector provides the longest case study in competitive impacts available among the sample retailers. It is also somewhat of an unusual case, however, in that the industry has experienced a great deal of dynamism in its structure independent of the value retail revolution. Rapid changes in the accessibility and range of goods available to consumers has traditionally marked the industry. In the past, costs were high and the range of goods limited. Neighborhood television, radio, and appliance repair/sales stores dominated the landscape. As the technology used in these devices became more pervasive and lower in price the accordant increase in demand greatly expanded the range of goods available to the market. Additionally, repairing old or broken devices became the exception when replacement costs fell to reasonable levels. This had the effect of wiping out most repair/sales stores who could not stock the wide selection now available and who suffered from accelerating decreases in demand for their repair services.

In 1977, home electronics repair/sales stores were still the dominant type of
establishment but were well on their way out. Reflecting this dynamic, the sector experienced a continual decline in the number of establishments comprising it throughout the study period (Table 3-6). Their continued decline has resulted in a gradual increase in the average distance separating stores (Figure 3-21a). This process has been generally smooth resulting in little change in relative spacing patterns but a continued increase in the distance separating stores. This is borne out in Figure 3-21b where a smooth decrease in the number of stores within given distances of competitors is evidenced and in Figures 22a and b where no appreciable change in the k-function measures is evident through 1992.

This increasing average separation notwithstanding, the pattern has always been one of concentration. As purveyors of relatively high ticket shopping goods, home electronics dealers have long clustered near one another to facilitate comparison shopping. And despite decreases in the number of establishments and growth in the population these establishments serve, the nature of this relative positioning has remained remarkably stable. Only in the most recent year of the study has the pattern diverged from its consistent past. This has primarily resulted from the dominance of value retailers in this sector.

Only between 1982 to 1987 was the increase in nearest neighbor distances much above that expected. It was also during this period that the first big box home electronics stores appeared in the region with two super stores and a single
Table 3-6. Changes in the number and spacing of home electronics dealers.

<table>
<thead>
<tr>
<th>year</th>
<th>n</th>
<th>p</th>
<th>p/n</th>
<th>d</th>
<th>d_u</th>
<th>d_l</th>
<th>percent difference above d_u</th>
<th>below d_l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>220</td>
<td>1,696,084</td>
<td>7,709</td>
<td>.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>188</td>
<td>1,972,354</td>
<td>10,491</td>
<td>.54</td>
<td>.50</td>
<td>.47</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>1987</td>
<td>120</td>
<td>2,275,309</td>
<td>18,961</td>
<td>.87</td>
<td>.73</td>
<td>.67</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>1992</td>
<td>118</td>
<td>2,601,055</td>
<td>22,043</td>
<td>.93</td>
<td>.94</td>
<td>.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>88</td>
<td>2,672,850</td>
<td>30,373</td>
<td>1.01</td>
<td>1.09</td>
<td>1.07</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>
Figure 3-21. The average spacing of home electronics dealers.

(a) Average distance to nearest neighbor: empirical and expected values.

(b) Cumulative frequency of nearest neighbor distances.
Figure 3-22. The clustering of home electronics dealers.

(a) Difference between store and population k-function values.

(b) Ratio of change in store versus population k-function values.
warehouse style mega store. These stores were not as revolutionary in this sector as in others due to many local proprietors already adopting similar format stores. These new chain stores, however, did still represent a lower price, larger selection alternative and were much more aggressive in their marketing. While the overall failure rates during the period was 66 percent it was 90 percent among those stores located within .5 miles of the new category killer format electronics houses (Figure 3-23a). The differences in these rates is nearly significant at the .10 level.

The short term from 1987 to 1992 brought 20 new superstores and an additional megastore. Failure rates were again highest among immediately adjacent competitors The region was saturated with superstores by 1992, however, so immediate proximity was no longer a large factor. During the 1992 to 1997 period one of the superstore chains failed but the region still gained a net of 3 superstores and a single additional megastore. Failure patterns were similar to the earlier short term periods but less significant owing to the increased saturation.

The long term patterns reinforce the short term findings regarding the competitive impacts of the value formats. The lone surviving store within 1/2 mile of a super store in 1987 had failed by 1992, and of the 2 survivors between 1/2 and 1 mile, 1 ceased operations by 1992 with the other doing the same by 1997. There was no marked difference between the overall failure rate of 1987 stores and those within 1 or 2 miles of a superstore in 1992. By 1997, however, the local failure rates of
Figure 3-23. Competitive impacts of home electronics superstores upon conventional home electronic stores

(a) Short term (1982 - 87)

(b) Short term (1987 - 92)

(c) Short term (1992 - 97)
these stores did differ noticeably from the overall rates and were near significant at the .20 level. The results indicate that the early superstores had dramatic impacts upon their most proximate competition almost immediately and generally impacted stores up to 2 miles away within 10 years. The later stores had less spatially specific impacts as a result of industry saturation and the near ubiquitous nature of big box home electronics stores.

Overall, the impacts on conventional stores brought on by the value retail revolution was tremendous. The number of conventional stores fell from 188 in 1982 to 60 in 1997. The rise in average distance was as expected but the stores also became more dispersed relative to the population. The degree of clustering which continues to exist, is in relatively fewer districts than was the case earlier in the study period. This can be seen in Figure 3-24. Clustering of superstores is evident but this is due in large part to the predatory tactics of a single chain which continued to expand into locations proximate to those of competing chains through 1997. Most surviving conventional stores enjoyed relatively isolated markets by 1997 although with some clustering tendencies in prominent retail districts.

*Traditional Department Stores*

The pattern of traditional department stores shows two distinct phases. The study period involves only the last remaining years of the first and likely only the
Figure 3-24. The locations of home electronics dealers.

(a) 1977
Home Electronics Dealers
- conventional (60)
- super store (25)
- mega store (3)

1997 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500
beginning of the second. From 1977 to 1987 the pattern was marked by the (increasing) dominance of the regional mall. The later period, from 1987 on, saw a quick downturn in the demand for traditional department store retailing and mall oriented shopping. This transition between periods was quite rapid but not overnight. Its causes are many fold but primarily involve economic downturn and the accompanying value retailing revolution. Because of the chosen study dates, 1987 marks the transition point but it was during the recession and value retailing growth of the later portions of the 1987 to 1992 period in which the turnaround in mall dominance actually commenced.

Both the population and number of department stores operating in the region increased 34 percent from 1977 to 1987 (Table 3-7). Despite a long history of mall retailing in the San Diego area 4 new malls opened during this period. This was a 50 percent increase which brought the region's total number of malls to 12 by 1986. Even well established malls grew during the period as all but 2 of the last remaining department stores in independent locations closed or moved into malls.11 By 1987, a full 80 percent of the traditional department stores operating in the region enjoyed mall locations.

Due to the increasing preference for mall locations, the average distance separating stores declined more than expected during this period. This increase in clustering tendencies was very smooth as demonstrated in Figures 25 and 26. No
Table 3-7. Changes in the number and spacing of traditional department stores.

<table>
<thead>
<tr>
<th>year</th>
<th>n</th>
<th>p</th>
<th>p/n</th>
<th>d</th>
<th>d₀</th>
<th>d₁</th>
<th>percent difference above d₀</th>
<th>below d₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>41</td>
<td>1,696,084</td>
<td>41,368</td>
<td>.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>50</td>
<td>1,972,354</td>
<td>39,447</td>
<td>.72</td>
<td>.79</td>
<td>.75</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>1987</td>
<td>55</td>
<td>2,275,309</td>
<td>41,369</td>
<td>.56</td>
<td>.74</td>
<td>.68</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>1992</td>
<td>48</td>
<td>2,601,055</td>
<td>54,189</td>
<td>.44</td>
<td>.64</td>
<td>.60</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>1997</td>
<td>39</td>
<td>2,672,850</td>
<td>68,535</td>
<td>.14</td>
<td>.50</td>
<td>.49</td>
<td></td>
<td>71</td>
</tr>
</tbody>
</table>
Figure 3-25. The average spacing of traditional department stores.

(a) Average distance to nearest neighbor: empirical and expected values.

(b) Cumulative frequency of nearest neighbor distances.
Figure 3-26. The clustering of traditional department stores.

(a) Difference between store and population k-function values.

(b) Ratio of change in store versus population k-function values.
abrupt changes occurred but rather the pattern gradually adjusted from independent to mall locations.

The recession of the early 1990s and competition from alternative format stores deeply impacted the success of the department store chains in the 1987 to 1992 period. Consolidation and failures in the industry resulted in a net loss of 7 stores in the region - all in independent locations (Figure 3-27). There was an additional failure of 1 of 2 stores located in a deteriorating mall but an additional mall added a new store. By 1997, due to even greater competition, an additional 11 stores ceased to exist. 2 of these were in independent locations, 1 was the store left remaining in the previously mentioned deteriorating mall, 2 resulted in the failing of the traditional format of an additional mall, and the remaining 6 were from 4 other malls - 2 stores each in 2 malls, and 1 store each in the remaining 2.

Despite this quite revolutionary swing in shopping preferences impacting department stores heavily, the statistics describing their locational pattern continued along the paths set forth in the earlier phase. But while the paths were the same the rates of change were accelerated. The increases in clustering, and decreases in average distances, from 1987 to 1992 and 1992 to 1997 are greater than was the case in the earlier periods. As seen in Table 3-7, the average distance separating stores fell 71 percent more than expected from 1992 to 1997. Thus, the department stores best able to survive the value retail revolution were those in mall locations.
Figure 3-27. The locations of traditional department stores.

(a) 1977

Number of Traditional Department Stores
1 (17)
2 (5)
3 (2)
4 (2)

1977 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500
The pattern of store failures heavily favored those in independent locations or smaller malls.

Most of the closed department stores became the outlets of big box and value retailers. This was in part due to the reformatting of formerly traditional malls. Of the two failed malls, one became a value center and the other is planned to become the same. The 2 malls which each lost 2 stores were also somewhat realigned with the former department stores becoming in one case a discount department store, in another a specialty retail outlet operated by a department store chain, and in the 2 other cases specialty value retailers. These changes were accompanied by overall changes in each mall’s store mix to reflect more of a value orientation. They remain, however, hybrids of traditional and value-oriented malls.

The department stores which were best able to survive the downturn in their demand did so by facilitating comparison shopping by consumers. Where previously higher demand levels were able to support traditional malls in close proximity to one another, adjustment has led to the reformatting of some while strengthening the traditional orientation of others. For example, there were two pairs of malls within 2 miles of one another. In each case one of the pair increased the number of department stores anchoring it between 1987 and 1997, while the other of the pair reformatted, after losing department anchors, into a hybrid center with a distinct value orientation in its anchors.
Furniture Stores

Furniture retailers have traditionally been drawn into close proximity with one another in response to consumer desires for comparison shopping. The clustered pattern has involved multiple orientations including along strips, among diversified retail districts, and in dedicated furniture centers. This pattern has been generally stable over time but with gradual shifts in the preeminence of individual clusters. As demand for furniture is highest in those areas in which there is new home construction these shifts have largely followed population growth towards the urban periphery. This pattern notwithstanding, a large proportion of furniture purchases are luxury as opposed to necessity related. The fortunes and success of furniture retailers have thus been closely tied with the economic well being of an area and the state of the national economy.

Throughout the study period there was a gradual decline in the number of furniture stores relative to the total population size (Table 3-8). Despite this increase in the population/store ratio, the relative positioning of stores with respect to one another has been generally stable. From 1977 to 1987, as seen in Figure 3-28a, the average distance separating stores decreased slightly, but not highly significantly. This indicates a weak, but increasing tendency towards clustering. During this period between 80 and 85 percent of all stores had at least one competitor within 1/2 mile of their locations (Figure 3-28b).
Table 3.8. Changes in the number and spacing of furniture stores.

<table>
<thead>
<tr>
<th>Year</th>
<th>n</th>
<th>P</th>
<th>p/n</th>
<th>d</th>
<th>d_P</th>
<th>d_P %</th>
<th>( d_{d_P} )</th>
<th>( d_{d_P} % )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>299</td>
<td>1,696,084</td>
<td>5.673</td>
<td>.31</td>
<td>.31</td>
<td>.47</td>
<td>.30</td>
<td>.32</td>
</tr>
<tr>
<td>1982</td>
<td>277</td>
<td>1,972,354</td>
<td>7.120</td>
<td>.29</td>
<td>.29</td>
<td>.30</td>
<td>.32</td>
<td>.34</td>
</tr>
<tr>
<td>1987</td>
<td>286</td>
<td>2,275,309</td>
<td>7.956</td>
<td>.25</td>
<td>.25</td>
<td>.29</td>
<td>.31</td>
<td>.31</td>
</tr>
<tr>
<td>1992</td>
<td>315</td>
<td>2,601,055</td>
<td>8.257</td>
<td>.24</td>
<td>.24</td>
<td>.25</td>
<td>.25</td>
<td>.28</td>
</tr>
<tr>
<td>1997</td>
<td>260</td>
<td>2,672,850</td>
<td>10.280</td>
<td>.28</td>
<td>.28</td>
<td>.34</td>
<td>.34</td>
<td>.34</td>
</tr>
</tbody>
</table>
Figure 3-28. The average spacing of furniture stores.

(a) Average distance to nearest neighbor: empirical and expected values.

(b) Cumulative frequency of nearest neighbor distances.
Unlike all the other sample retail sectors, the San Diego furniture sector has not seen widespread intrusion by value retail operators. Nonetheless, it experienced its most dramatic shifts in locational tendencies during the value retailing revolution. This is most likely due to the downward swing in economic conditions which helped foster the revolution but more directly impacted the success of existing furniture retailers. From 1987 to 1992, despite an increase in the number of stores, there was a slight increase in the average distance separating these stores. This was due in large part to the opening of new stores in dispersed locations around new population growth centers. Still, the pattern remained highly clustered (Figure 3-29a) with some evidence that this clustering tendency was increasing (Figure 3-29b) despite the increase in average distance.

The 1992 to 1997 period witnessed the failure of many stores and despite continued population growth in the area there were 17 percent fewer stores operating in 1997 than in 1992. The recession had a deep impact on many retailers who did not have the resources to withstand the sharp decrease in demand brought on by the poor economic conditions. The decrease in average distance separating stores indicates that failures were highest among those stores not located in clusters. Comparison shopping became an even more important consideration for the value conscious consumer and those furniture stores located in clusters were best able to cope with the poor economic conditions. This is supported by Figure 3-29a where
Figure 3-29. The clustering of furniture stores.

(a) Difference between store and population k-function values.

(b) Ratio of change in store versus population k-function values.
the large increase in clustering tendencies is noted. Figure 3-29b indicates that the increase in clustering involves very short distances of under .25 miles.

So though not an industry revolutionized by the appearance of value retailers, furniture selling has still experienced dynamism as a result of the same economic phenomenon that fostered the revolution in the first place. Still, relative to most of the other sample sectors, the locational pattern of furniture retailing was remarkably stable during the study period (Figure 3-30). Despite overall increased clustering tendencies during this period a few stores found success locating in isolated positions in which there was rapid residential growth. This trend reached its peak during the 1987 to 1992 period and was reflected in a significant increase in the nearest neighbor statistic.

With decreased population growth in the 1992 to 1997 period, these outlying pioneer stores began to fail - reinforcing the long term trend towards an extremely clustered pattern. The decrease in the nearest neighbor statistic bears this out as does the abrupt rise in the k-function measures. Whereas in 1992 there was an abundance of dispersed furniture options, by 1997 the pattern was highly organized into furniture districts and corridors and the long term trend towards clustering reached its apogee.
Figure 3-30. The locations of furniture stores.

(a) 1977

Furniture Stores
conventional (299)
1977 Persons per Sq. Mile

- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

Miles
(d) 1992

Furniture Stores
conventional (315)
1992 Persons per Sq. Mile
- 7500 or more
- 6000 to 7500
- 4500 to 6000
- 3000 to 4500
- 1500 to 3000
- 0 to 1500

0 5 10 Miles
Summary

The previous discussions have clearly demonstrated the pervasive nature of intrasectoral dynamics. Changes within sectors have been greatly influenced by the coming of value retailers. The department store sector has experienced the greatest intrusion by value formats and has also been the most dynamic. The furniture sector, in comparison, has remained relatively stable from a structural perspective and therefore has experienced little change in the locational configuration of its stores.

The entrance of value retailers into the other sample sectors has occurred in various degrees and the dynamism of locational change has varied accordingly. The nature of these dynamics, independent of the degree of intrusion, however, varies considerably. The locational patterning of stationers/office supply dealers and home electronics stores has clearly shifted away from clustering to one of greater dispersion - the expected pattern. Value retailers in the book and sporting goods sectors, conversely, have attracted clusters of smaller, conventional stores. And, different again, the supermarket and drug store sectors have seen value retailers displace other stores but overall merely fit into, rather than alter, the preexisting pattern. It is clear that dynamics can vary dramatically across sectors and therefore, the value revolution is not a uniform movement.

In the next chapter we rationalize these differences and take the analysis a step further by investigating intersectoral dynamics or changes in the positioning of stores.
relative to the locations of stores in different sectors.

1 Most notable, perhaps, is the economic vitality of individual markets and the metropolitan region as a whole. Economic swings in an area will have an impact upon the firms operating within it which may lead to contraction or expansion of a particular sector. Because these economic conditions manifest themselves by altering the number of outlets comprising a sector we make no attempt to control for them directly.

2 The average distance between neighbors, $d$, in a region at time $t$ can be represented as

$$d = k \sqrt{\frac{A}{n}}$$

where $A_r$ is the area of the study region, $n_r$ the number of points in the region, and $k$ a constant representing the degree of dispersion or clustering in the pattern (see Earickson and Harlin 1994, p. 250 or Boots and Getis 1988, p. 37 for representative values of $k$ and an explanation of this formulation). If at a later time, $t^*$, the values of $A$ and/or $n$ have changed, the average nearest neighbor distance which maintains the same relative spacing in the pattern described by $k$ can be found by solving the above equation for $k$ and substituting into the original formulation:

$$k = d \sqrt{\frac{n_r}{A_r}} \Rightarrow d_{*,*} = k \sqrt{\frac{A_{*,*}}{n_{*,*}}} = d \sqrt{\frac{n_r A_{*,*}}{n_{*,*} A_r}}$$

3 Assuming equal overall population densities.

4 Testing against CSR is further compounded by the requirement that only those tracts of land suitable or available for retail land uses be included. The study region would thus be discontinuous and different from one time period to the next.

5 A store “failure” can also refer to a relocation. Such relocations were not, however, tracked. Only the appearance or disappearance of a retailer at a particular location is known.

6 Formally, we test the hypothesis that $x = \rho n$ where $x$ is the number of failures among the $n$ stores located within distance $d$ of a big box competitor and $\rho$ is the overall rate of store failures in the study area. $x$ is then distributed binomial with an expectation of $\rho n$ failures from among $n$ stores.

7 To quote Michman and Greco (1995, pp. 74-75), “The supermarket structure has served as a model for retailers in such specialty lines as Toys ‘R’ Us in toys, Levitz in furniture, and Herman’s in sporting goods.”

8 Predatory tactics within different retail sectors have been extensively noted (c.f. Brown 1994), the supermarket sector included (West and von Hohenbalken 1984).

9 There is a tendency to avoid the most affluent areas, however, as demonstrated by their absence along the coastal strip.

10 As Sibley (1972) suggests, the locations of small, private shops are often not driven by profit maximization and in many circumstances the rational for their location is one of chance.

11 Of the two freestanding department stores outside malls in 1997, only one is in an independent location with the other being adjacent to, but outside, a regional mall.

12 The Levitz chain, which some consider a big box operator, had stores in place before the first study year. By the time the value retail revolution hit, this chain was in decay and their stores are not considered as value retailers.
CHAPTER 4: Comparative and Intersectoral Dynamics

Introduction

The products sold at retail establishments may be classified, according to consumer buying behavior, as either convenience or shopping goods. The distinction between the two is best exemplified using the following definitions put forth by the American Marketing Association (1958):

- Convenience goods - those consumers' goods which the customer purchases frequently, immediately, and with the minimum of effort.
- Shopping goods - those consumers' goods which the customer in the process of selection and purchase characteristically compares on such bases as suitability, quality, price, and style.¹

The same item may be a convenience or shopping good to different consumers. Generally, however, a majority of consumers exhibit shopping behavior which leads it to be considered as one or the other.

Stores may sell both types of goods but they generally have an orientation towards one or the other. For example, supermarkets and drug stores are oriented towards convenience food stuffs and personal care sundries but may also carry a selection of shopping oriented housewares. Department stores sell primarily shopping oriented goods such as clothing and housewares but also carry more
convenience oriented clothing such as undergarments (which often are sold at supermarkets and drug stores).

Since consumer shopping behavior is used to distinguish between the two types of goods, and store locations must accommodate this behavior, there are regular locational preferences associated with the convenience or shopping goods orientation of stores. These locational preferences concern a store’s location with respect to both similar (in the same sector) and dissimilar (in other sectors) outlets.

Purveyors of shopping oriented goods stand to benefit the most from clustering nearby similar merchants. While clustered stores do compete with one another for the same customer it has long been recognized that together they are able to attract more customers than the combined net of each if located independently (Nelson’s 1958 “Law of Cumulative Attraction”). In effect, they are able to expand the spatial extent of their market areas to encompass a larger population because consumers are willing to travel farther for the greater attraction associated with the ability to comparison shop.

Convenience goods sellers, conversely, do not generally benefit from clustering because the availability of comparable stores nearby their location is not important to their prospective customers. By definition, convenience goods are not comparison shopped. Because there is no expansion of their market areas, clustering results simply in sharing of the same customer base and lower revenues.
Locational relationships between firms are important and have significantly affected retail distributions (O’Kelly 1983). Borrowing terminology from Getis and Getis (1968), we refer to these locational relationships as spatial affinities. Evidence for them abound in both convenience and shopping goods oriented sectors. Supermarkets and drug stores, which often assume proximate positions in the same shopping centers, assist convenience shopping. Regional malls demonstrate affinities between department stores and other shopping goods providers. Affinities between stores can be specific to, or extend across, shopping and convenience orientations. By fostering multipurpose trips, convenience goods sellers increase the attractiveness of their offerings through locations nearby other, but dissimilar, convenience sellers. They also stand to benefit from locations nearby shopping oriented stores by taking advantage of those stores’ drawing power. The same holds true for shopping oriented goods. In general, however, convenience oriented stores fit better with other convenience stores, and shopping stores fit best with other shopping stores. This pattern has worked best with shopping patterns that favor multipurpose trips directed towards either weekday convenience or weekend shopping needs.

In the remainder of this chapter we investigate these affinities with respect to value retail revolution. The discussion is broken into three major sections. In the next section we generalize the nature of the sectoral dynamics and the competitive impacts of the new value retailers in light of the sample stores’ shopping or
convenience orientations. We then discuss intersectoral dynamics and changes in the relative positioning of outlets from the sample sectors with respect to one another in a subsequent section. The final section summarizes and synthesizes these results.

**Comparative Sectoral Dynamics and Competitive Impacts**

Of the eight sample retail sectors furniture, department, and home electronics stores represent shopping goods oriented retailers. Furniture is a large ticket item which is purchased infrequently and for which tastes are highly varied. The offerings of department stores today are focused towards clothing/accessories and housewares (including linens). Home electronics can represent a significant expenditure and there is a great variability in their quality, features, and prices. Additionally, as focus pieces in the home, style considerations can also be important. Comparison shopping to achieve price, feature, and style goals for the products sold by these three retail store types is of significant importance to most consumers.

Sporting goods dealers, book stores, and stationers/office supply dealers are not easily classified as shopping or convenience oriented. For book stores many consumers know prior to a shopping trip exactly what book or magazine is to be purchased. A large number of other consumers, however, are simply looking for reading material and the opportunity to shop for a suitable purchase is important. Sporting goods and office supply dealers are not as easily classified for similar
reasons but also because of the diverse nature of the goods sold. Shopping for a
tennis racquet or laser printer is much more important than shopping for tennis balls
or a ream of paper. The orientation of these three store types represents the middle
ground between shopping and convenience.

Supermarkets and drug stores are purveyors of convenience goods. The food
and miscellaneous products sold by supermarkets are frequently purchased items of
individually small cost. The same is true of the personal care and other miscellaneous
sundries sold by drug stores. Consumers have a high degree of awareness regarding
product alternatives and the selection of such merchandise varies little between
different stores in the same sector. Purchasing behavior at these stores generally
involves a priori formulation of exactly what will be bought and is done with minimal
effort.

Because individual goods are categorized according to consumer shopping
behavior, and this behavior can vary among individual consumers, the treatment of
shopping versus convenience orientations has been treated as non-discrete with the
nature of a particular good falling along a continuum (c.f. Holton 1958). Clearly,
with the diversity of the goods sold by stores in the different sample sectors, the
shopping versus convenience orientation of stores can be viewed in a similar manner.

The relative spacing of stores in different sectors reflects this
shopping/convenience continuum. Figure 4-1 shows, for each sample sector, the
Figure 4.1. Comparative plots of nearest neighbor statistics for the sample retail sectors over time.
average distance separating nearest neighbors. Supermarkets and drug stores, the most convenience oriented store types among the sectors, exhibited the widest average spacing in 1977, long before the value retailing revolution. The k-function measures\(^5\) shown in Figures 4-2a and b show similarly that supermarkets and drug stores exhibited the least amount of clustering in the first study year.\(^6\)

At the other extreme, furniture, home electronics, and department stores represent the most shopping goods oriented retailers. Furniture and electronics retailers exhibited the closest spacing in 1977, and department stores the greatest degree of clustering within .25 mile. Despite the high degree of clustering, many department stores still existed in independent locations in 1977 and the nearest neighbor statistic is thus only average relative to those for the other sectors. Electronics stores show only an average amount of clustering in 1977 despite the low nearest neighbor value, indicating that the locational pattern was one of pairing or clustering of only a few stores. Furniture stores not only have the lowest nearest neighbor value but also a high degree of clustering as evidenced by the k-function measures. This demonstrates that the clusters typically involved several stores. So while these sectors are similar in their shopping goods orientations and their general locational strategies, the exact nature of the locational positioning varies in the extent of clustering and proportion of stores involved.

More near the center of the shopping/convenience dichotomy lie
Figure 4-2. Comparative plots of k-function measures for the sample sectors

(a) within .25 mile
stationary/office supply, book, and sporting goods stores. Though more towards the convenience side, stationers/office suppliers exhibited a very clustered pattern in 1977, and a modest degree of distance separating stores due to a locational alignment with business and office districts. Book stores exhibited a degree of clustering rivaling that of department stores in .25 mile bands. Their clustering tendency within a distance of 1 mile was even greater than that of department stores. The reason was the dominance of book districts within the San Diego study area. While these involved general line stores, many featured specialty offerings and the districts presented a unique experience to the book buying public. The locational pattern of sporting goods dealers was more in line with expectation based on their intermediate convenience/shopping orientation. The average distance to the nearest neighbor of each was just under 1 mile and the degree of clustering was only moderate compared with the other sectors. Some large scale retail districts had a distinct sporting goods character but these were within a generally dispersed locational pattern.

**Dynamics within the convenience goods oriented sectors**

There had been some dramatic changes in the locational arrangement of convenience goods oriented stores by 1997. Based on the k-function measures shown in Figure 4-1, supermarkets had increased and drug stores decreased their
locational concentration. The greater magnitude of change in .25 versus 1 mile
distance bands indicates this shift in locational positioning primarily involved stores in
very close proximity to one another. These changes are linked to predatory
locational behavior on the part of some firms in each sector as discussed in the
previous chapter.

By 1997, there was approximately 1 discount supermarket for every 10
conventional. Of the 13 discounts operating in 1997, 12 had opened in 1992 or later.
The other, which opened between 1982 and 87, did so in a relatively isolated location
and thus had no significant impact on its competitors. The later opening stores,
however, greatly impacted the conventional within 1/2 mile of their locations.
Impacts on stores at greater distances were less decisive but there is evidence which
suggests that the conventional located between 1 and 2 miles from the discounters
benefited from their presence. This is most likely due to the failure of their
competitors located nearer the value operators. The results of these competitive
impacts was a slight decrease in the degree of supermarket clustering in .25 mile
zones as shown in Figure 4-1. Little change was evident in the degree of clustering
at greater distances or in the nearest neighbor statistic.

The drug store sector saw less intrusion with only 2 value retail stores
operating in the region by 1997 compared with 116 conventional. Much like the
first discount supermarket, the first of these super discount drug stores opened in a
relatively isolated location and therefore had no competitive impacts. The second
was more proximate to conventional competitors and there is some evidence that it
negatively impacted those within 1 mile of its location. Due to the few value
oriented stores in this sector, however, no alterations in the spatial pattern were
noted as a result of the value revolution.

Any previously noted shifts notwithstanding, supermarkets and drug stores,
as the most convenience oriented goods sellers, remained the least clustered sectors
throughout the period. Spatial dynamics within these sectors were much more
greatly affected by predatory locational tactics prior to 1987 than the intrusion of
value retailers after. Still, among supermarkets, the revolution did reverse the trend
towards increased tight clustering due to the competitive advantage of super
discount formats. Because of the supermarkets’ convenience orientation,
competitive impacts, and thus spatial dynamics, were limited to those areas very
proximate the discounters. Drug stores, which saw less intrusion by value retailers,
experienced little dynamism as a result of the revolution.

**Dynamics within the shopping goods oriented sectors**

Furniture and department stores, two of the most shopping oriented retail
sectors, both increased the degree of clustering evident in the initial study year. By
1997 they ranked as the 2 most concentrated sectors and had the shortest nearest
neighbor values. While the locational pattern of furniture stores remained relatively stable throughout the period, demonstrating significant change only after significant pressure from the poor economic times of the early 1990s, department stores increased their clustering, and decreased the average distance between themselves, at a significant and near consistent rate throughout the period. Furniture has also been the most stable from a structural perspective, with little change in store types⁷, while department stores have experienced increased competition from a diverse set of new format department stores⁸. The increases in clustering have thus been a response to different pressures which increased the competitiveness of the marketplace and encouraged these store types to foster shopping through locations nearby competing stores.

Home electronics dealers, generally shopping oriented goods sellers, exhibited locational behavior quite different from the other two heavily shopping oriented store types. While its level of locational clustering in the initial study year was below that of furniture and department stores, the average distance separating stores was near that of furniture and much less than that of department stores. Change in these locational descriptors over the course of the study period, however, was opposite to those for furniture and department stores as the degree of clustering decreased and the average separation between stores increased. By 1997, the degree of clustering (or lack thereof) was nearly as low as that for supermarkets and drug
stores, particularly in short .25 mile distance bands, and the average distance between stores was greater than that for supermarkets and near that for drug stores. The reason was the tremendous growth, and success, of big box format home electronics dealers.

This value retail format greatly reduced the need to comparison shop between stores by gathering an enormous selection of merchandise under one roof and offering it at prices which were unlikely to be beat by competitors. Smaller, traditional dealers could not compete on selection or price and competing big format stores carried nearly identical merchandise with low price guarantees. Comparison shopping between stores was nearly negated in importance. The competitive impacts upon conventional stores levied by these retail giants were great as the number of conventional stores serving the study area fell throughout the study period. Nearly 1 in 3 home electronics stores were big boxes by 1997. These impacts did not demonstrate any spatial significance, however, but were geographically broad. This suggests that their competitive advantage was so great that consumer preferences generally overcame any geographic restrictions and proximity to electronics stores was secondary to the value and selection offered by these stores. Only among those conventional stores located more than 5 miles from a superstore in 1992 was any significant resistance to their competitiveness demonstrated.
Dynamics within the intermediate shopping/convenience oriented sectors

The intrusion of big box format stores into the stationary/office supply sector resulted in impacts to conventional stores similar to those seen in the home electronics sector. The pattern of these retailers had traditionally been one of clusters within commercial districts. From 1977 to 1992, in response to the continued dispersion of commercial activities and other factors, there was a gradual decrease in the degree of store clustering and an itinerant increase in the nearest neighbor statistic. After 1992, this rate of change was much more severe as value retailers took over markets and drove traditional competitors out of business. By 1997, nearly 30 percent of outlets were superstores, and only in the home electronics sector was the value/conventional ratio higher. Despite early spatial concentration, the value revolution brought the average distance separating office supply stores to a level greater than that in any other sector and the degree of clustering in .25 mile bands down to a level nearly as low as that for supermarkets and drug stores. The decrease in clustering in 1 mile bands was less severe, however, as remnants of the commercial land use orientation remained for both traditional and big box format stores.

Entry of the superstore format into the home electronics and stationary/office supply sectors resulted in similar spatial outcomes. Interestingly, however, office supplies are a much more convenience oriented good than home electronics. Some
of the more high end merchandise carried by the office supply superstores, such as furniture and computer equipment, represent shopping goods. The majority of their stock, however, is comprised of much cheaper and more frequently purchased convenience oriented goods such as paper products. The success of office supply superstores demonstrates that consumers are willing to forfeit the convenience of neighborhood stationers in order to realize the larger selection and lower prices offered by the superstore format even for convenience goods. The competitive advantage of the superstore format in the home electronics and office supply sectors transcended the distinction between shopping and convenience goods. In other sectors, however, adaptation of similar big box formats had dramatically different results.

Much like office suppliers, sporting goods dealers sell a mix of merchandise that is both convenience and shopping oriented in nature. The relative spacing between these stores remained relatively constant, and average (for the sample sectors) for the entire study period. An increase in tight clustering was noted between 1982 and 1992 but clustering at longer distances remained unchanged in this period. Between 1992 and 1997 seven new sporting goods superstores opened bringing the region's total to eight. This was met with a 20 percent decrease in the number of conventional stores. Surprisingly, a dominant feature of the locational patterning of the conventional stores was that new stores took up locations not
adjacent to, but surrounding, the superstores and those already in such locations survived better than those more isolated. This resulted in a sharp increase in the degree of clustering of stores within 1 mile of one another. In contrast to the big box stores in the home electronics and office supply sectors -- which took over markets and created an environment not conducive to the survival of smaller competitors -- sporting goods superstores have created markets for competitors who appear to thrive in close proximity to superstore competition. So while evidence from these other sectors suggests that value retail impacts transcend shopping and convenience goods orientations, it is clear from the case of sporting goods dealers that the effects of the revolution are not necessarily uniform across sectors.

In part due to a previously unique locational structure, the spatial dynamics of book stores are not similar to any of the other sectors. Following a dramatic decrease in the degree of clustering which typified the sector in 1977, the pattern stabilized after 1982. There was a relatively sharp decrease in the amount of clustering in .25 mile distance bands from 1987 to 1992 due to weakening of the region's multiple book districts, however, outside these districts little change was noted. This decrease brought the degree of clustering to a level just below that of sporting goods dealers where it remained into 1997. Clustering within 1 mile distance bands decreased from 1992 to 1997 to a level similar to that of sporting goods dealers and office supply stores. This decrease was also met with a sharp
increase in the nearest neighbor statistic which took it from a level near that of shopping oriented department stores to one more in line with convenience oriented supermarkets. Compared with supermarkets, however, the distribution of book stores remained much more clustered -- particularly in .25 mile distance bands.

By 1997 nearly 10 percent of the book selling establishments in the region were superstores. The first 3, which opened between 1987 and 1992, had no significant impact on their proximate conventional competitors but failure rates among those stores located between 2 and 5 miles from the superstores were significantly lower than the regional figure while that for stores between 5 and 10 miles was significantly higher. This is felt to be more a function of the vitality of the large scale shopping districts in which the superstores located rather than competitive impacts.  

Long term impacts from these initial stores were significant at no distances and the 9 additional superstores which opened between 1992 and 1997 also had no spatially significant impacts on smaller competitors. On a regional scale, however, impacts are evident as the number of conventional stores fell nearly 45 percent from 1992 to 1997. The lack of spatial variation in these impacts would suggest that the drawing power of superstores in the book sector is much greater than that in other sectors. This may be influenced to a degree by a tendency to locate in, or adjacent to, regional malls. Such locations allow them to benefit from the combined drawing power of all stores and in particular the mall anchors.
In general, it is the shopping goods oriented sectors which have experienced the greatest change in locational patterns as a result of the value retail revolution. Broader generalizations are, however, difficult to make. The locational patterns of the present are closely associated with the patterns of the past. The locational form of the value retail industry today reflects this. The unique competitive situations of some sectors, such as sporting goods, further demonstrate that it can be difficult to associate uniform change across the retail industry. So while regularities in the dynamics experienced within the various sample sectors can be attributable to shopping versus convenience orientations, it is clear that the value retail revolution has not affected the industry in a wholly consistent manner.

Intersectoral Dynamics

With the dramatic changes brought about by the value retail revolution it is important to determine what changes have occurred in spatial affinities between dissimilar establishments. With 8 sample sectors, however, there are 28 separate intersectoral linkages to examine -- too many for any great detail. We therefore take a less formal, but more hands on, approach towards examining such dynamics. This begins with the selection of a square 25 mi.² subregion as shown in Figure 4-3. This area includes the metropolitan downtown, and several other retail clusters including two regional malls. Population dynamics were minimal in this area throughout the
Figure 4-3. Location of the 25 mi.$^2$ subregion.
study period which helps negate the influence of external forces.

Figure 4-4a shows the distribution of stores and the different retail clusters in 1977. The first cluster is based around Morena Blvd. and is a specialized corridor of furniture stores. Inexpensive warehouse property and proximity to two major freeways fostered the development of this informal\textsuperscript{11} cluster. The nearby sports arena district served primarily the needs of local neighborhoods. This diversified retail cluster featured all the 1977 stores types with the exception of no traditional department or office supply stores. The unusually high number of sporting goods stores capitalized on traffic to the many sporting engagements held at the nearby arena as well as the sporting flavor of the area. The downtown area featured a large number and diversity of stores to serve the needs of both its residential and daytime work populations. Book, sport, office supply, and drug stores dominated the mix. Other store types were represented including a free standing department store. A cluster of home electronics stores east of downtown is also noted. The University Ave. strip was a diversified retail cluster not unlike the Sports Arena district but with the inclusion of a free-standing department store. A number of furniture and home electronics stores also assumed complementary positions along the strip. Mission Valley Center is one of the region's older regional malls and was fully developed by 1977 with four department store anchors and a typical mix of other retailers. Fashion Valley Center, another regional mall, was more upscale and recently
Figure 4-4. The locations of sampled sector stores within the detailed study region.

(a) 1977

1977 Stores by Type (n)

- Book stores (36)
- Supermarkets (3)
- Drug stores (large format) (5)
- Stationers and office supply dealers (9)
- Traditional dept. stores (10)
- Membership dept. stores (2)
- Sporting goods dealers (10)
- Furniture stores (34)
- Home electronics dealers (21)
(b) 1982

1982 Stores by Type (n)

- book stores (29)
- supermarkets (4)
- drug stores (large format) (3)
- stationers and office supply dealers (12)
- traditional dept. stores (12)
- membership dept. stores (1)
- sporting goods dealers (12)
- furniture stores (35)
- home electronics dealers (18)
1992 Stores by Type (n)

- book stores (39)
- book superstores (1)
- supermarkets (7)
- drug stores (large format) (7)
- stationers and office supply dealers (10)
- office supply superstores (1)
- traditional dept. stores (13)
- discount clothing dept. stores (5)
- discount dept. stores (1)
- sporting goods dealers (15)
- furniture stores (36)
- home electronics dealers (7)
- home electronics superstores (4)
### 1997 Stores by Type (n)

<table>
<thead>
<tr>
<th>Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>book stores</td>
<td>19</td>
</tr>
<tr>
<td>book superstores</td>
<td>2</td>
</tr>
<tr>
<td>supermarkets</td>
<td>8</td>
</tr>
<tr>
<td>discount supermarkets</td>
<td>1</td>
</tr>
<tr>
<td>drug stores (large format)</td>
<td>7</td>
</tr>
<tr>
<td>stationers and office supply dealers</td>
<td>3</td>
</tr>
<tr>
<td>office supply superstores</td>
<td>5</td>
</tr>
<tr>
<td>traditional dept. stores</td>
<td>10</td>
</tr>
<tr>
<td>discount clothing dept. stores</td>
<td>7</td>
</tr>
<tr>
<td>discount dept. stores</td>
<td>2</td>
</tr>
<tr>
<td>sporting goods dealers</td>
<td>7</td>
</tr>
<tr>
<td>sporting goods superstores</td>
<td>1</td>
</tr>
<tr>
<td>furniture stores</td>
<td>24</td>
</tr>
<tr>
<td>home electronics dealers</td>
<td>2</td>
</tr>
<tr>
<td>home electronics superstores</td>
<td>4</td>
</tr>
</tbody>
</table>
developed than Mission Valley Center just to its east. It too was anchored by four department stores but had a less diverse mix of additional tenants due to a greater orientation towards clothing stores. The intersection of two major freeways allowed these two malls to survive in close proximity to one another.

By 1982, as shown in Figure 4-4b, there had been some relatively dramatic changes despite this period being less than revolutionary. Several other store types had moved into the Morena District — most notably home electronics stores. These complemented furniture stores nicely and affinities between the two store types were noted in 1977 in other retail clusters. The Sports Arena area remained fairly unchanged in mix but did add an additional supermarket despite little change in the population base served by the cluster. The number of home electronics stores did not change but the pattern became more clustered and an additional furniture store opened in the area. The most notable change in the downtown area was the loss of 3 of the 4 home electronics stores clustered just east of the area. The apparent loss of book stores in the area was actually a shift in orientation from general line to adult. University Ave. lost its membership department store and several home electronics stores but otherwise retained its diverse store mix. The only change within Mission Valley Center was the loss of its drug store which was typical for the period as this convenience oriented store type never fit well within the regional shopping mall setting. Fashion Valley grew considerably with the addition of 2 more department
store anchors. Also added was a sporting goods store, a home electronics store and an additional book store reflecting an increasingly diversified image for the primarily clothing oriented regional mall.

The first seeds of change from the value retail revolution were in place by 1987 (Figure 4-4c). This was not apparent along Morena Blvd. which continued to thrive as a specialty retail district with the addition of several new furniture stores. This area did, however, lose two of its three home electronics stores. This may be due in part to the opening of two electronics superstores -- one by the nearby Sports Arena and the other farther south next to the freeway. With the addition of the electronics superstore in the Sports Arena District there was a 75 percent reduction in the number of conventional electronics stores but a new store opened outside the district itself. The membership department store closed but was soon reopened as a discount department store. It was flanked by a new discount clothing oriented department store. The three value retailers operating in the district became the anchors for what was rapidly becoming a value-oriented center (a do-it-yourself warehouse later opened in the center as well). Downtown added a new mall which catered largely to tourists. This was anchored by three traditional, and a single discount clothing oriented, department stores. The free-standing downtown department store discontinued operations. The area was also all but abandoned by electronics merchants with only a single store located outside the heart of the
downtown continuing to operate under increasing pressure from the superstores located in other adjacent retail clusters. The independently located department store near University Ave. closed its doors under the increasing competition wrought by the newly opened downtown mall and two additional malls in the area. Electronics stores along University also failed but furniture stores retained a strong presence despite continued expansion of the Morena District. The only major change for the two regional malls was the opening of two discount clothing oriented department stores adjacent to one another but freestanding between the two malls.

The value retail revolution was in full swing by 1992 as shown in Figure 4-4d. The warehouse style floorspace which made the Morena Blvd. area popular with furniture stores also attracted an office supply superstore. Additional furniture stores also joined this specialty cluster. The Sports Arena area became the focus of most value retailing activities within this subregion. Joining the already present value-oriented department store types and electronics superstore were another discount clothing department store, two additional big-box electronics dealers, and a book superstore. While the area remained heavily diversified and populated with traditional retailers the value retailers had a significant presence in the area. The pattern of these stores was centered predominantly around one strip shopping center in 1987. By 1992, however, the four more recently opened value retailers assumed locations in other shopping centers within the district. Two (one of the new
electronics superstores and the new discount clothing oriented department store) were adjacent to one another in the same shopping center. The book and other home electronics superstore took on locations independent of any other value retailers. In the two malls, downtown area, and along University Ave. little change was noted.

Between 1992 and 1997 the revolution escalated. Figure 4-4e shows the large number of value retailers operating in the study subregion. Morena Blvd. continued as a furniture district but its position weakened with the growth of other districts outside this smaller sample area. The office supply superstore continued to operate along this strip but another had opened in the Sports Arena district. Also taking a position within this value cluster was another discount clothing oriented department store. This was in the same shopping center already housing discount and discount clothing oriented department stores. This same shopping center also added a new home electronics superstore to match the existing store. One of the home electronics stores present in 1992, however, ceased operations by 1997 (the entire chain failed and not just this unit). Taken together, the Sports Arena area became a major value retailing center. The arrangement of stores, however, does not foster foot shopping like a traditional mall. Complementary relationships between stores are thus not clearly defined.

The downtown area witnessed a major loss of sample stores but actually became more vibrant. This involved the development of several upscale residential
buildings which attracted a young affluent population who could now live and work downtown. A typically suburban supermarket opened in response to this influx but one of the department stores in the downtown mall did fail (this mall was dependent upon tourist dollars as well as its market population). A office supply superstore also opened in the downtown area. This led to the failure of all but one conventional office supply outlet. The University Ave. area continued largely unchanged but with some loss of furniture stores as demand continued to shift to more peripheral areas of the county.

The greatest change occurred in the Mission Valley area - home to the two regional malls. While these two malls were able to thrive in close proximity to one another in earlier years the recession of the early 1990s and accompanying value retail revolution led to a significant downturn in demand for mall oriented retailing. Fashion Valley Mall continued to house a total of 6 department stores but these were not all the same stores operating in 1992. The mall received a considerable facelift and a renewed orientation towards high end clothing. The loss of 2 book stores, and its sporting goods dealer reflected this renewed orientation. Mission Valley Center underwent even more significant change. Two of its four department stores were closed and reopened as different types of retailers (one of which was a prominent value retailer in a non-sample sector). The mall received considerable upgrades and was reformatted into a hybrid value center. Two discount clothing oriented
department stores also opened in the mall. Of these, one was of the pair located just west of the mall in 1992, the other was completely new. An office supply superstore also opened adjacent to the mall property. Two value center also opened in the area surrounding the mall (and another was under construction as of the study date). One of these housed a book superstore and super discount supermarket. The other a discount department store, discount clothing department store, sporting goods superstore, and office supply superstore.

Unlike the Sports Arena area, where existing retail floorspace was utilized by value retailers, the two new centers in Mission Valley were purpose built as value centers. It is interesting to note, therefore, how the individual value retailers aligned themselves with one another. In the larger center are housed three stores which are big box formats of typical mall shopping goods stores (the two discount department store types and the sporting goods dealer). This alignment is similar to that of the traditional mall with the shopping goods oriented stores complementing each other. There is also some overlap in the merchandising between the discount department store and the two others so that they serve as marginal substitutes. The layout of the shopping center, however, is such that the foot traffic which drives traditional malls is not encouraged. Additionally, the office supply superstore does not mesh with the other three stores in any conceivable way. The other center, which houses a discount supermarket and a book superstore, is more oriented towards foot traffic but again
these two value retailers do not complement each other to any great degree.

We see that spatial affinities between value retailers in these sectors are
strong enough to lead to distinct value agglomerations. The evolution of structure in
this subregion has led to value retailers assuming proximate positions in diversified
shopping districts and in purpose built value centers. There is little to suggest,
however, that the benefits received through such locational arrangements are great.

Summary

Dynamics have been great within all sectors intruded by value retailers but,
with the exception of furniture retailing, it is within those sectors concerned with the
selling of shopping goods that the locational pattern has been most altered by the
introduction of value retail formats. It is for shopping goods that the large selection
and low prices of big box format stores provides significant advantages to
consumers. Still, dynamics within any one sector are greatly influenced by the
individual players within it. The changes experienced within the sectors are as
unique as the companies comprising them. So while the value retail revolution has
been treated as a single trend sweeping across the retail industry as a whole, it is
clear that the adoption of similar format stores in different sectors does not
necessarily result in the same outcomes.

The value retail stores benefit from the appeal associated with the clusters of

211
new, prominent value retailers but the linkages between them are minimal. The linkages that do exist are likely indirect. They receive favorable exposure by locating nearby other destination retailers but do not complement each other directly nor particularly foster multipurpose shopping. Additionally, though competing stores in some sectors locate near one another, these distances are not short enough to enhance comparison shopping possibilities. In particular, office supply and home electronics superstores assume locations in which they compete for largely the same geographic markets. Comparison shopping between stores, however, would require motorized travel between them. Additionally, they are competing for largely different sources of demand since home electronics stores cater to households and office supply superstores to small businesses. The only instance in which affinities between stores appear to be more traditional in nature is among discount clothing oriented department stores who are more likely to occupy locations which foster comparison shopping between competing stores. These linkages extend to other shopping goods stores as evidenced by their locations nearby traditional and discount department stores. Clearly, however, they are not as dependent upon these links (as traditional department stores have become) since they occupy a diverse set of different locational types including those which do not place them adjacent to other department store formats. Discount department stores also differ from their traditional counterparts in that they do not locate together such as in malls. This is
most likely due to a more convenience orientation but it is important to note that it is very early in the value retail revolution and locational preferences may change. In the formative stages of mall building, traditional department stores were reluctant to position themselves so closely to their competitors. It was only through the success of these locations, achieved over time, that the benefits of clustering were realized. This may or may not occur with the discount department store format. Clearly, the benefits are already being realized among discount clothing department stores.\textsuperscript{12}

\footnotesize
\begin{enumerate}
\item A third category was also offered as part of this classification scheme: Specialty goods - those consumers’ goods on which a significant group of buyers are habitually willing to make a special purchasing effort. Specialty goods are thought of as combining behavioral elements distinguishing both convenience and shopping goods. Consumers are willing to expend more than a minimum of effort to obtain them yet they have a predetermined idea of what they will purchase and thus do not need to comparison shop. This category, based on the original work in this area by Copeland (1923), is often omitted by scholars and the format of such classification schemes is still debated (c.f. Greenberg and Bellenger, 1974). For classification purposes here, we treat goods only as having a convenience or shopping orientation.
\item Perhaps the most visible of such a relationship is that between supermarkets and drug stores.
\item Drug stores in shopping malls, for example.
\item Regional malls with their clustering of shopping oriented goods retailers and clothing stores in supermarket and/or drug store anchored convenience shopping centers represent two typical examples.
\item The k-function measure again, is \( L(d) - L^*(d) \), where for each year \( L(d) \) is the k-function value for a particular store type and \( L^*(d) \) the weighted k-function for the tract level population at distance \( d \).
\item We do see, however, that there is a much greater degree of clustering among drug stores within .25 mile of one another than supermarkets. This was attributed previously to predatory behavior.
\item The furniture sector was actually one of the first to feature big box format stores such as the prominent Levitz chain. However, little structural change has occurred since the initial study year.
\item Not to mention other non-department retail types including the category killer format stores which essentially compete with single departments. The impacts of these stores have greatly changed the format and departmental offerings of department stores (cf. Chapter 1 in Michman and Greco, 1995).
\item Sporting goods superstores differ from other value retailers in that the majority of their sales come from a single department (shoes). The success of general line conventional stores located nearby
\end{enumerate}

213
superstores in this sector may thus reflect inadequacies in the offerings of the superstores’ other departments due to less attention being directed towards these departments by management.

10 As discussed in the previous chapter.

11 Unlike other furniture store clusters in the San Diego region which were specifically developed as furniture centers and strips, the Morena District has grown from the individual decisions of numerous operators.

12 The study of Getis and Getis (1968) indicated that, at that time, clothing stores demonstrated the strongest spatial affinities for one another. That only the clothing oriented value retailers demonstrate any affinity for another presently could indicate that it is only in this sector where affinities remain strong enough to result in clustering or because the affinities are so great this is the first value sector to realize them.
Chapter 5: Modeling Change

Introduction

The structural form of retailing at any point in time reflects a myriad of interrelated factors concerning the preferences of consumers, the travel costs they must endure to shop, and the cost structures of retail outlets. In this chapter we investigate the role of these factors in the changing structure of metropolitan retailing. We noted in the previous chapters that there had been a rapid increase in the size of retail establishments comprising most of the sample retail sectors and that, furthermore, the large, big-box format stores tended to cluster together but that these clusters rarely involve multiple stores in the same sector.

Through a simulation approach we explore potential mechanisms for this observed structural change. The approach we adopt is theoretical using, as its foundation, a model which encapsulates supply and demand relationships in a hypothetical retail system. In the next section of the chapter, we detail the model and simulation procedures. Section 3 concerns the mathematical nature of the model and results obtained through numerical experiments. In the fourth, the model is utilized to examine equilibrium retail configurations within the simulated system with

215
reference to the observed structural changes. We summarize our results in a final section.

Methodology

The methods and approach used here build on the work which has grown out of the Harris/Wilson and Fotheringham/Knudsen frameworks discussed in Chapter 2. We introduce a more generalized and flexible modeling framework through which additional mechanisms of retail dynamics may be explored. As discussed previously, the Harris/Wilson line of research focused solely on size dynamics with an implied spatial outcome. The Fotheringham/Knudsen line incorporated relative location but only between identical firms. The model to be utilized here can explore those size and location dynamics emphasized by Harris/Wilson and Fotheringham/Knudsen while also incorporating more complex dynamics such as those caused by linkages between similar and dissimilar firms.

The Model

Our methods utilize the basic framework originally developed by Harris and Wilson (1978) and subsequently extended by Fotheringham and Knudsen (1986). The critical difference is the incorporation of a more flexible competing destinations model which can encapsulate complementary and substitutable relationships between
retail outlets. This is somewhat related to the work of Fik (1988) and Fik and Mulligan (1990) who recognized the competing destinations model as a special case of a more generalized interaction framework.

From Harris and Wilson (1978), the profit earned by a retail firm is given by:

\[
\Pi_j = S_j - C_j ,
\]

where \( S_j \) is the revenue earned by the establishment and \( C_j \) the cost of operating it. Revenue is modeled using a production constrained spatial interaction model which generates estimates of the quantity of expenditures flowing from residential zones \( i \) to retail outlets \( j \). The interaction model to be utilized in these simulations was derived in order to build into the competing destinations approach the notions of complementarity and substitutability discussed at length by Lo (1991, 1992). It should be noted that this model should have application in spatial interaction modeling in general though it is not to be applied to any empirical data here. The general form of the model is as follows:

\[
S_{ij} = \frac{P_i E_i W_j^a Z_j^b V_j^c e_{ij}^\alpha}{\sum_j W_j^a Z_j^b V_j^c e_{ij}^\alpha} ,
\]

where \( S_{ij} \) is the flow of expenditures from zone \( i \) to outlet \( j \), \( P_i \) is the population of zone \( i \), \( E_i \) is the per capita expenditure of zone \( i \) residents, \( W_j \) is the size of retail outlet \( j \), \( Z_j \) is a measure of outlet \( j \)'s location relative to all other substitutable outlets, \( V_j \) a measure of the relative location of outlet \( j \) to all other complementing outlets,
and $c_{ij}$ is a measure of the cost of overcoming the physical separation of $i$ and $j$.

Greek symbols are parameters representing: $\alpha$, consumer scale economies; $\gamma$, consumer localization economies; $\lambda$, consumer urbanization economies; and $\beta$, the non-linear, deterring effect of having to travel to shop. and $\alpha$, $\gamma$, $\lambda$, $\beta$ are parameters.

The relative location of outlet $j$ to all other substitutable outlets is given by:

$$Z_j = \sum_{k} \frac{W_k}{c_{jk}} \quad j \neq k \quad (5-3)$$

where $W_k$ is the size of outlet $k$ and $c_{jk}$ a measure of the cost of overcoming the physical separation of outlets $j$ and $k$. $j$ and $k$ are taken from the same set of outlets selling identical goods. The relative location of outlet $j$ to other complementing outlets is given by:

$$V_j = \sum_{l} \frac{W_l}{c_{jl}} \quad (5-4)$$

where $W$ and $c$ are measures of size and cost, respectively. These refer to a set of complementing outlets. This set is distinct from the set of substituting outlets.

Revenue for each $j$ is then found by summing across all origins $i$, such that,

$$S_j = \sum_{i} S_{ij} \quad (5-5)$$

Costs are assumed to be a function of the size of the outlet and its location relative to other outlets (irrespective of type) such that,
\[ C_j = \delta_1 W_j^{\sigma_1} + \delta_2 (Z_j + V_j)^{\sigma_2} \]

where \( \delta_1 \) is the per unit cost of operating retail outlets, \( \sigma_1 \) are retailer scale economies, \( \delta_2 \) are retail rent gradients, and \( \sigma_2 \) are retailer agglomeration economies. All other variables are as previously defined.

The assumption inherent in this formulation of retail supply is that management or owner's compensation is directly related to sales volume. The goal of retail operators is thus to manipulate the size and location of their store to increase sales up to the point where they equal costs and profits are zero. The values of the various parameters in the model dictate the actions necessary to achieve such an end. A number of restrictions on the relative values each parameter can take, based on theoretical considerations, are introduced. These are summarized in Table 5-1 and discussed below.

\( \alpha \) is like an elasticity associated with the utility consumers receive from the size of a retail outlet. It serves to dictate how consumer preferences vary in proportion to retail size. Values for \( \alpha \) greater than 1 indicate that consumers preferences for larger facilities increase at a rate greater than that of size itself. In other words, one facility which is twice as large as another is more than twice as attractive as the smaller. \( \alpha = 1 \), indicates that increases in preferences are proportional to increases in size. When \( 0 < \alpha < 1 \), larger facilities are preferred but the degree of preference is less than the degree of difference in size. \( \alpha \leq 0 \) is not
Table 5-1. Model parameters and allowed ranges

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>consumer preferences for larger facilities</td>
<td>$0 &lt; \alpha &lt; 2.5$</td>
</tr>
<tr>
<td>$\beta$</td>
<td>travel costs</td>
<td>$-2.5 \leq \beta \leq 0$</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>consumer preferences for comparison shopping</td>
<td>$-2.5 \leq \gamma \leq 2.5$</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>consumer preferences for multi-purpose shopping</td>
<td>$-2.5 \leq \lambda \leq 2.5$</td>
</tr>
<tr>
<td>$\delta_1$</td>
<td>per unit operating costs</td>
<td>$0 &lt; \delta_1$</td>
</tr>
<tr>
<td>$\sigma_1$</td>
<td>scale economies</td>
<td>$0 &lt; \sigma_1 \leq 1$</td>
</tr>
<tr>
<td>$\delta_2$</td>
<td>rent gradients</td>
<td>$0 \leq \delta_2$</td>
</tr>
<tr>
<td>$\sigma_2$</td>
<td>agglomeration economies</td>
<td>$0 &lt; \sigma_2 \leq 1$</td>
</tr>
</tbody>
</table>
allowed because this would indicate either no consumer preferences for different sized establishments, or preferences for smaller facilities. This would result in establishments seeking an impossible size of 0. Intuition suggests further, that $\alpha$ would not be much greater than 1. A value of 2 for example, indicates that consumer preferences for a large facility relative to a small facility are 200 percent greater than the difference in the two facilities’ sizes. To err on the side of caution, we allow $\alpha$ to assume values as large as 2.5.

Consumer preferences for multi-purpose and comparison shopping are related through $\gamma$ and $\lambda$, respectively. The relative location measures, $Z_i$ and $V_j$, which these variables parameterize, increase the more a store’s location facilitates such shopping behavior. In this respect, restrictions and interpretation of values for these parameters are identical to those for $\alpha$ with 0 and 1 being critical values. Unlike the case for $\alpha$, however, $\gamma$ or $\lambda = 0$ is a realistic situation indicating that consumers have no preferences for locations which facilitate shopping between stores. In fact, $\gamma$ or $\lambda < 0$ is theoretically possible in the sense that congestion may induce consumers to shop more isolated facilities. We therefore allow $-2.5 \leq \gamma, \lambda \leq 2.5$. These limits are chosen based on the reasoning of the previous paragraph. The limits are arbitrary but reasonable.

$\beta$ portrays the relative cost of having to travel to patronize shopping facilities. Because this is a cost, $\beta$ is restricted to be less than 0. The more negative $\beta$, the
greater the cost and thus greater consumer preferences for nearby facilities.

Allowing \(-2.5 \leq \beta < 0\) covers the general range reported for \(\beta\) in empirical studies (Fotheringham and Knudsen 1984) and is intuitively reasonable.

In the cost equation, \(\delta_1\) measures the costs of operating facilities per unit of size. We only restrict \(\delta_1 > 0\). \(\sigma_1\) is a measure of scale economies with \(\sigma_1 < 1\) indicating that operating costs increase at a rate less than that of size. We restrict this parameter as \(0 < \sigma_1 \leq 2.5\). Because locations which are proximate to other facilities generally cost more (for example, mall versus free-standing locations), retail rent gradients act through \(\delta_2\) which is restricted as \(\delta_2 \geq 0\). Agglomeration economies are related by \(\sigma_2\). \(\sigma_2 = 1\) is a critical value for this parameter. When \(\sigma_2 < 1\) the costs of clustering increase less than proportionally to the degree of clustering (because parking facilities may be shared, for example). The opposite is true when \(\sigma_2 > 1\). In line with earlier arguments, \(\sigma_2\) is logically restricted to \(0 < \sigma_2 \leq 2.5\).

**Simulation Procedures**

With the form of the model and the parameter restrictions discussed above, we utilize two different simulation procedures for investigating potential mechanisms for the observed dynamics. The first procedure is based around numerical experiments utilized to understand mathematical relationships within the model while the second utilizes a locational problem solving approach to investigate the behavior
of an individual store, in terms of its size and location, under changing conditions concerning consumer preferences and firm cost structures.

An important distinction between these two procedures is that the former assumes what has been termed a constant backcloth (Fotheringham and Knudsen 1985), while the latter utilizes a changing backcloth. Under the constant backcloth assumption, changing values for one store (\(W, Z, V,\) or \(c_i\)) does not change those for the others. This is useful for examining mathematical relationships in which system effects upon one store, independent of effects upon others, are of interest. In reality, however, shifting one store affects the relative location of itself and all others in the system. This changing backcloth is critical for investigating optimal locations in the simulated system.

Numerical Experiments

Numerical simulation of the system is necessary because of the highly complex nature of the mathematical formulation. For the numerical experiments we are interested in how an outlet's optimal size (\(W^*\)) or relative location (\(Z^*\) or \(V^*\)) changes due to parameter shifts given the objective of achieving zero profits. In these numerical experiments, the focus is not upon the actual values of \(W^*, Z^*,\) and \(V^*\) but rather the relative magnitude of change in their values given the magnitude of change in the parameters which govern their values.
The numerical experiments are based around simultaneous sequential change in two parameters. Given the eight individual parameters, there are obviously a large number of potential combinations which could be investigated. There are, however, only a few parameter combinations which are of interest and which we therefore focus our attention. In general, we isolate the size and locational factors from each other to understand how each operate independently. That is, when examining size dynamics, we set the parameters describing relative location factors such that relative location is of no consequence. The opposite is then true when investigating relative location changes. In the locational problems we treat size and location simultaneously, but for the numerical experiments, we are concerned solely with trying to understand model behavior at its simplest level. The particular relationships of interest are detailed in the results section.

Locational Problems

For the locational problems a hypothetical retail system was developed comprised of 121 residential zones of equal population and purchasing power arranged in an 11 x 11 square pattern. Retail demand within the system is served by 4 (substituting) retail outlets with 10 additional outlets acting as their complements (these do not serve the demand). These complementing units were randomly located through the region and are all of equal size ($W_1 = 2 \forall i$). Locations for the
substituting retail outlets are chosen from a discrete set of 100 possible sites arranged in a square 10 x 10 pattern at the vertices of the residential zones. Distances throughout the region are computed using the Euclidean metric.

Figure 5-1 shows the derived region and the locations of the relative supply and demand elements. It was found that when all outlets $j$ are of equal size and using parameter settings such that relative location factors play no role ($\gamma = \lambda = \delta_2 = 0$, $\sigma_2 = 1$), no scale economies exist for consumers or firms ($\alpha = \sigma_1 = 1$), total system revenue equals total system costs ($\Sigma_i[\delta_i W_i] = \Sigma_i[\Pi_i E_i])$, and travel costs are very restrictive ($\beta = -2.5$), only two stable equilibrium configurations for the four $j$ existed -- both of which were mirror images of one another. One of these equilibrium configurations is shown in Figure 5-1.

The equilibrium solution shown and parameter settings resulting in it are treated as the base, or starting, point for all the locational problems. The locational problems proceed by introducing parameter shifts into the model and allowing the western most equilibrium location for $j$ (the location at 3, 6) choose a new size and location from among the discrete set of possible locations if such change would allow it to increase sales while maintaining a non negative profit level. The possible sizes it can choose range from 1 to 10 in single unit increments. The sizes of the three other substituting, and ten other complementing, outlets are fixed at 2. Because the choices are discrete it would appear to be impossible to detect smooth continuous
Figure 5-1. The artificial study region used for the locational problems.

- Residential Zones $i$
- Possible Locations for $j$
- Location maximizing value of $Z_j$
- Location maximizing value of $V_j$
- Equilibrium Locations of $j$
- Complementing Stores
change in $W^*$, $Z^*$, or $V^*$ but, as will be shown, certain small parameter shifts result in dramatic changes which skip combinations in the discrete set of possible sizes and locations.

**Results of Numerical Experiments**

We begin our discussion of results by examining the mathematical nature of the model equations. The functional form is detailed and the problem as addressed by previous researchers is recast in terms of an asymptotic analysis. Following that discussion, the results of the numerical experiments are considered.

**Mathematical Background**

As discussed previously, we treat size and locational factors independent of one another in this numerical analysis. For example, when investigating the behavior of $W^*$, some parameters are set so that $Z_j$ and $V_j$ play no role in the model. The effect of this is to set asymptotic values which $W^*$ and $Z^*$ or $V^*$ can approach under circumstances where size and relative location, respectively, are exceedingly important determinants in the allocation of demand.

When focusing on the behavior of $W^*$, we set $\gamma = \lambda = \delta_2 = 0$ so that the revenue and cost equations become:
\[ S_j = \sum_i \frac{P_i E_i \alpha \epsilon_i^\beta}{\sum_j W_j^\alpha c_i^\beta}, \quad (5-7) \]

which are slightly modified versions of the equations used by Harris and Wilson (1978).² The maximum or asymptotic value \( W^* \) can approach in such a formulation is determined by the values of \( \delta_1 \) and \( \sigma_1 \) in light of the total amount of demand available in the system (\( \Sigma_i [P_i E_i] \)). This asymptote \( \Omega \), can be found from the following equation:

\[ \Omega = \left( \frac{1}{\delta_1} \sum_i E_i P_i \right)^{\sigma_1}, \quad (5-9) \]

In the presence of extreme consumer preferences for large scale facilities, and minimal travel restrictions, \( \Omega \) is that value of \( W^* \) which allows the subject facility to capture all demand. \( W^* \) can never be greater than \( \Omega \), because this would result in the operating costs of the subject facility exceeding the total demand present in the system.

Similarly, when interested in the behavior of \( Z^* \) or \( V^* \), \( \alpha \) and \( \delta_1 \) are set equal to 0, resulting in the revenue and cost equations breaking down into the following forms:
\[ S_j = \frac{\sum_i P_i E_i Z_j^i V_j^i c_j^s}{\sum_j Z_j^i V_j^i c_j^s} \quad , \] (5-10)

and

\[ C_j = \delta_2 (Z_j + V_j)^{e_2} \quad . \] (5-11)

This creates asymptotic values for \( Z^* \) and \( V^* \) which are related, respectively, through the following equations:

\[ Z = \left( \frac{1}{\delta_2} \sum_i E_i P_i \right)^{\frac{1}{\sigma_2}} - V_j \quad , \] (5-12)

and

\[ V = \left( \frac{1}{\delta_2} \sum_i E_i P_i \right)^{\frac{1}{\sigma_2}} - Z_j \quad , \] (5-13)

where \( Z \) and \( V \) are the respective asymptotes. Just as was the case for \( \mathcal{W}^* \), the maximum values \( Z^* \) and \( V^* \) can attain are fixed through the parameters governing the cost structure of the outlet (\( \delta_2 \) and \( \sigma_2 \)) and the total amount of demand present in the system.

This is an important recognition because it characterizes the problem as investigated by Harris and Wilson (1978) and Fotheringham and Knudsen (1984, 1985, 1986) as one in which size and locational behavior may be understood by investigating how \( \mathcal{W}^* \), \( Z^* \), and \( V^* \) approach their asymptotes. It also eliminates the
need to numerically investigate the roles of the parameters in the cost equation because these merely act to set the asymptotes. However, as will be discussed later, the setting of these asymptotes is crucial for understanding rapid system change.

Numerical Results

We begin by investigating the mechanisms responsible for rapid increases in establishment size. The mathematical results presented above, and our framework which eliminates the influence of relative location, leaves $\alpha$ and $\beta$ as the parameters of exclusive interest. These parameters, we may recall are associated, respectively, with consumer preferences towards larger scale facilities and the deterring effects of having to travel to shop. Though the effects of shifting $\alpha$ and $\beta$ upon $W^*$ have been extensively investigated (cf. Fotheringham and Knudsen 1984) we revisit their role here in light of our characterization of understanding the problem in terms of the asymptote $\Omega$.

Realizing again our restricted ranges for the values of the parameters, Figure 5-2 shows the behavior of $W^*$ under increasing $\alpha$ for six representative values of $\beta$. Initially we set $\sigma_1 = 1$ indicating no scale economies. The resulting asymptote for $W^*, \Omega$, is 100 in this situation.$^3$ The value of $W^*$ under varying $\alpha$ and $\beta$ with $\sigma_1 = 1$ are shown in Figure 5-2a. Significant scale economies were subsequently introduced through $\sigma_1 = .5$. The results of this change are shown in Figure 5-2b.
Figure 5-2. The nature of $W^*$ under changing $\alpha$ and $\beta$.

(a) $\sigma_1 = 1$
(b) $\sigma_1 = .5$
The basic results clearly fit expectation. The greater the preferences for larger scale facilities (larger $\alpha$) the greater the equilibrium facility size. The less costly travel (lower the absolute value of $\beta$) the less the value $\alpha$ need obtain for $W^*$ to reach its maximum value ($\Omega = 100$). Several specific attributes are also of note.

First is the logistic relationship between $\alpha$ and $W^*$ and how the logistic curve is stretched horizontally by increasingly negative $\beta$. Due to the logistic relationship, even slight changes in $\alpha$ can lead to quite rapid change in $W^*$. The range in which $\alpha$ must be changing for rapid increases in $W^*$ to occur, however, is dictated by $\beta$. Of course, if both $\alpha$ and $\beta$ are simultaneously increasing, exceedingly rapid change in $W^*$ is possible. We must note also, as demonstrated in Figure 5-2a, that when no scale economies exist for firms the range of values for $W^*$ is narrow (from about 25 to 100) compared with the situation shown in Figure 5-2b when significant scale economies are present. Setting $\sigma_1 = .5$ raises $\Omega$ to 10,000 but when consumer scales are relatively unimportant and travel costs high, $W^*$ is only around 625. Thus scale economies not only raise the asymptote for $W^*$ but also expand the range of values $W^*$ takes over various settings of $\alpha$ and $\beta$. Additionally, introducing scale economies, forces $W^*$ towards $\Omega$ earlier than when no such scales are present. Therefore, there is a much greater likelihood for rapid change in $W^*$ when scale economies exist.
This is an important finding for it indicates that rapid change in outlet size is possible without any change in consumer preferences. \( W^* \) can increase rapidly due solely to a firms greater ability to reap scale economies. So though such a dynamic in system structure leads to changes in consumer behavior (as they patronize larger facilities) no change in consumer utility or preferences need accompany such a dramatic change. In essence, the cost structure of firms drive what opportunities are available to consumers. One would, of course, suspect that firm characteristics and cost structures are important but these findings suggest that they are omnipotent. Consumer preferences take a secondary role in explaining size dynamics.

The relative location measures, \( Z_j \) and \( V_j \), operate in the model similarly to \( W_j \). An important difference, however, is that their respective parameters, \( \gamma \) and \( \lambda \), are, unlike \( \alpha \) on \( W_j \), not precluded from assuming negative values. Each could theoretically take on any positive or negative value but it is likely that these would be near 0. Positive values would indicate there are consumer agglomeration economies associated with comparison or multi-purpose shopping. Negative values, conversely, would indicate diseconomies for consumers resulting most likely from congestion costs. If \( \gamma \) is negative but \( \delta_2 \) and \( \sigma_2 \) positive (as they are assumed to be) then firms will attempt to distance themselves from their competitors because there are extra costs but no sales benefit to locations proximate to them. The same holds true for negative \( \lambda \) but with firms distancing themselves from other types of outlets.
If $\gamma$ and $\lambda$ simultaneously have different signs indicating, for example, consumer propensities to comparison but not multi-purpose shop, behavior in a real environment will be interesting as firms locate so as to balance the benefits of proximity to some types of stores against the costs of doing so (from assumed rent gradients) while retaining a degree of separation from other types of stores (whose proximity decreases their attractiveness while increasing their costs). In the numerical experiments such behavior is not possible to investigate because of the constant backcloth assumption. This controlling assumption would allow firms to alter $Z_j$ and $V_j$ independent of one another. In reality, a change in location will change both. We could, however, simulate the behavior of optimal values of $Z_j$ and $V_j$ under varying parameter values. There is no direct need for such experiments because $Z_j$ and $V_j$ operate almost identically to $W_j$ in both the revenue and cost equations. We do, however, note two important differences.

First, the rent gradient and agglomeration economy parameters ($\delta_2$ and $\sigma_2$ respectively) act upon the additive combination of $Z_j$ and $V_j$, whereas their counterpart parameters $\delta_1$ and $\sigma_1$ act upon $W_j$ directly. This implies that shifts in $\delta_2$ or $\sigma_2$ will alter costs more dramatically than will similar magnitude shifts in $\delta_1$ or $\sigma_1$. Changes in consumer preferences in comparison or multi-purpose shopping (as governed by $\gamma$ and $\lambda$ respectively) will further not result in as dramatic a change in $Z^*$ or $V^*$ as will a similar magnitude change in consumer preferences ($\alpha$) change $W^*$. 

235
Change in $Z_j$ or $V_j$ affect costs more than revenue when compared with similar change in $W_j$. On the consumer side, therefore, the system is more responsive to shifts in $\alpha$ than $\gamma$ or $\lambda$, while on the firm side, shifts in $\delta_2$ or $\sigma_2$ affect things more greatly than do similar shifts in $\delta_1$ or $\sigma_1$.

Second, because $\gamma$ and $\lambda$ are not restricted to positive values as is the case for $\alpha$ we might not be able to assume system behavior from the simulations involving varying $\alpha$. Negative or zero values for $\gamma$ and $\lambda$ will result in firms attempting to find locations which will set $Z^*$ and $V^*$ as close to 0 as possible due to the role of $Z_j$ and $V_j$ in the cost equation. We earlier limited $\delta_2$ to be non negative in value because it is well known that firms pay for more proximate locations. If rent gradients exist, as $\delta_2 > 0$ would suggest, it would seem there is no reason for a firm who receives no benefit from proximate locations ($\gamma, \lambda \leq 0$) to pay extra for the privilege of a location nearby other facilities. If, however, other firms are centrally located to the population the firm intends to serve, the costs of locations proximate to other facilities must be endured in order to maximize customer accessibility. Under the constant backcloth assumption, in which variable values can change independent of one another, it is impossible to simulate this tradeoff. Instead, it must be examined through the locational problems.

So we are left with the situation where numerical analysis of $Z^*$ and $V^*$ is unnecessary. The behavior of these optimal location measures under changing $\gamma$ or $\lambda$. 236
and \( \beta \) is identical to that of \( W^* \) under changing \( \alpha \) and \( \beta \) with the caveat that shifts in \( Z^* \) and \( V^* \) are somewhat slower than those in \( W^* \) because of the additive nature of \( Z_j \) and \( V_j \) in the cost equation. In general, small shifts \( \gamma \) and \( \lambda \) can lead to rapid locational change if \( \gamma \) and \( \lambda \) are near the critical values dictated by \( \beta \). This is even more true in the presence of agglomeration economies \( (\sigma_2 < 1) \) and it should be noted that, just as was the case for size dynamics, shifts in firm costs can lead to much more rapid change than can shifts in consumer preferences for establishments with different relative locations. The locational structure of retailing is thus more influenced by firm costs than consumer preferences.

**Results of Locational Problems**

As informative as they are, the above discussion highlights the limitation of the numerical analysis approach generally used to examine retail dynamics using this catastrophe framework. It should be clear from this discussion that the constant backcloth assumption is too limiting because several of the more interesting scenarios can not be investigated when location is not explicitly treated. Allowing firms to alter one locational characteristic independent of others is limiting from a modeling point of view but even more restrictive from a theoretical standpoint because it ignores the interconnectedness of spatial attributes. For the locational problems we do not have to deal with the constant backcloth assumption and its accordant
limitations.

The downside to this is an inability to isolate and examine the effects of individual parameters on a continuum. The complexity of the mathematical formulation precludes us from analytically solving for optimal size and location. We are forced to solve the locational problems by offering up a discrete set of size and locational combinations from which firms can choose. We may then note general changes in size and location as a result of parameter shifts but with a necessary lack of precision. This is particularly troublesome when the focus is on identifying not just change, but rate of change. Extensive experiments with the locational model, however, have shown that it is possible to infer the rapidity of dynamics in a general sense, despite the discrete formulation.

We recall from the introductory discussion that the locational problems involve finding the optimal size and location for a single store. This store serves a population evenly distributed among 121 zones, has 3 substitutes, and 10 complements. These 13 stores are all 2 units in size. The base parameter settings, restricted ranges, and pseudo code outlining the simulation procedures for these locational problems are provided in Table 5-2. The value of $\delta_1 = 1512.5$ was set so that total system revenue and cost are equal when all stores are of the same size and the other base parameter settings are used. In what follows we first discuss the results of individual parameter shifts and then simultaneous shifts as well.
Table 5-2. Location problem parameters, allowed ranges, base settings and pseudocode.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Range</th>
<th>Base Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>consumer preferences for larger facilities</td>
<td>$0 &lt; \alpha &lt; 2.5$</td>
<td>0</td>
</tr>
<tr>
<td>$\beta$</td>
<td>travel costs</td>
<td>$-2.5 \leq \beta \leq 0$</td>
<td>-2.5</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>consumer preferences for comparison shopping</td>
<td>$-2.5 \leq \gamma \leq 2.5$</td>
<td>0</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>consumer preferences for multi-purpose shopping</td>
<td>$-2.5 \leq \lambda \leq 2.5$</td>
<td>0</td>
</tr>
<tr>
<td>$\delta_1$</td>
<td>per unit operating costs</td>
<td>$0 &lt; \delta_1$</td>
<td>1512.5</td>
</tr>
<tr>
<td>$\sigma_1$</td>
<td>scale economies</td>
<td>$0 &lt; \sigma_1 \leq 1$</td>
<td>1</td>
</tr>
<tr>
<td>$\delta_2$</td>
<td>rent gradients</td>
<td>$0 \leq \delta_2$</td>
<td>0</td>
</tr>
<tr>
<td>$\sigma_2$</td>
<td>agglomeration economies</td>
<td>$0 &lt; \sigma_2 \leq 1$</td>
<td>1</td>
</tr>
</tbody>
</table>

Pseudocode:

(1) $t = 0$
    all parameters at base setting
(2) Choose single $P$ from \{$\alpha$, $\beta$, $\lambda$, $\gamma$, $\delta_1$, $\sigma_1$, $\delta_2$, $\sigma_2$\}
(3) if: $P = \alpha$, $\beta$, $\gamma$, $\lambda$, $\sigma_1$, or $\sigma_2 \Rightarrow l = .1$
     else: $\delta_1$ or $\sigma_2 \Rightarrow l = 151.25$
(4) Solve for $W_i^*$, $x_i^*$, and $y_i^*$ through complete enumeration of all possible combinations
     of $W$, $x$, and $y$ where $W \in \{1, 2, ..., 10\}$; $x \in \{1, 2, ..., 10\}$; $y \in \{1, 2, ..., 10\}$
(5) Record $W_i^*$, $x_i^*$, and $y_i^*$ (note - if $t = 0 \Rightarrow W_i^* = 2$, $x_i^* = 3$, and $y_i^* = 6$
(6) if: $P_t = \max$ or $\min P \Rightarrow$ STOP
     else: $P_{t+1} = P_t \pm 1$, go to (4)
Individual Parameters

In examining the roles of individual parameter shifts we vary one parameter throughout its range (when there are upper and lower bounds on the range) with the remaining parameters set at their base values. For $\delta_1$ and $\delta_2$, which have open ended ranges, their values are changed in equal increments until their value equals zero or system stability ensues. The results of these parameter shifts are discussed in what follows.

The range for $\alpha$ allows for highly varied consumer preferences for facility size. The simulation results indicate that the equilibrium location for the store, however, is chosen no matter the value of $\alpha$. Only when $\alpha = 0$, is a size different from the equilibrium size chosen (in this case the minimum size of $W_1 = 1$ is optimal). As was discussed for the numerical experiments, this suggests that consumer preferences associated with retail scale has little effect on the state of the retail system.

Much as was the case for $\alpha$, $\beta$ has little impact upon the optimal size or location for the facility. Only when $\beta > -1$ (indicating minimal travel restrictions) does the facility assume a location different from the equilibrium point. In these instances, the facility assumes a more central location to take advantage of consumer willingness to travel significant distances. As travel costs are increased towards $-1$
the facility gradually moves towards the equilibrium location. In all instances, the optimal facility size is the same as the other substituting outlets ($W_j = 2 \forall j$). Again, this behavior points to the relative lack of importance consumer conditions have in explaining structure.

When $\gamma$ is in the negative portion of its range the optimal location for the facility is stable and near the equilibrium location (one spot south of it). Compared with the equilibrium location, this particular optima provides similar access to the distribution of demand but a slightly lower value for $Z_i$. Values of $\gamma$ near 0 result in the equilibrium location while as $\gamma$ becomes increasingly positive (indicating greater consumer preferences for comparison shopping) the optimal location proceeds gradually towards that location which maximizes the value of $Z_i$. We must be careful to note that the values of $Z_j$ are much greater than those for $W_j$. The equilibrium solution is, therefore, much more sensitive to shifts in $\gamma$ than it is to those in $\alpha$. Given this, it is most likely that in practice the value of $\gamma$ would be much nearer to zero than would the value of $\alpha$. Since the solution is relatively stable when $\gamma$ is near 0 this implies that, again, consumer preferences do not play a highly significant role in explaining system structure. The optimal facility size was 2 for all values of $\gamma$ suggesting little connection between size and location.

The situation for $\lambda$ is much the same as it is for $\gamma$ but, because there are more complementing than substituting outlets (10 versus 4), the values of $V_j$ are greater
than those for $Z_t$. This has the effect of magnifying the effects of shifts in $\lambda$ compared with similar magnitude change in $\gamma$. The argument made above regarding the comparative roles of $\gamma$ and $\alpha$ holds for $\lambda$ as well with the results not differing between $\gamma$ and $\lambda$ except those due solely to the different spatial distributions and numbers of substituting and complementing outlets. For example, the facility settles at that location maximizing the value of $Z_t$ once $\gamma > 1.7$, but it settles at the location maximizing $V_t$ for less severe, or earlier encountered, values of $\lambda$ (when $\lambda > .5$) because the marginal contribution of $V_t$ is much greater than that of $Z_t$.

The procedure for varying $\delta_t$ involved decreasing its value from the base setting in increments equal to 10 percent of its base value. As its value was decreased, the optimum facility size grew gradually reaching a preset maximum of 10 when costs were 40 percent those used as the base setting. At the same time, the facility moved gradually towards a more centralized location. So while there were no severe consumer preferences for larger scale facilities, and travel costs were very restrictive, the facility did what might be expected to result from increasing consumer preferences for larger facilities and decreasing travel costs, simply as a result of decreasing operating costs. This suggests the more significant importance of firm versus consumer characteristics in explaining retail structure.

The effects of introducing greater firm scale economies by reducing the value of $\sigma_t$ was nearly identical to the situation above where operating costs were
increased. $\sigma_1 < .7$ results in the largest, most central facility possible despite no change in consumer preferences for the attributes of such a facility. Even minor increases in a firm's ability to realize scale economies rapidly increases its size and centralizes its location.

The introduction of rent gradients through increases in $\delta_2$ up to the base setting for $\delta_1$ results in a locational solution identical to the introduction of consumer dispreferences for comparison or multi-purpose shopping but for different reasons. When $\gamma$ or $\lambda > 0$ the firm attempts to distance itself from competitors who can compete for the same business and cost it business through congestion while maintaining as central a facility as possible to attract the distributed demand. Even without such factors, rent gradients force the facility to pay more for locations which don't offer it any benefits in terms of drawing customers. It therefore attempts to find a location that does not have an expensive locational cost but which is fairly central to its demand.

Even the presence of agglomeration economies through $\sigma_2 < 1$ does not change the locational outcome which results from the introduction of rent gradients. Taking $\delta_2$ and $\sigma_2$ together, it is clear that the need to balance proximity to customers while avoiding other facilities that exist in those locations that offer good proximity to the customer base decreases the sensitivity of the model to changes in the locational cost structure of firms. So unlike the situation where we are concerned
with facility size there is no dramatic difference between the effects of parameter
shifts in the revenue and cost sides of the equation.

The locational problems suggest, just as the numerical experiments did, that
rapid changes in facility size are much more likely to result from changes in the cost
structures of firms than they are from shifting consumer preferences for different
sized facilities or a change in travel restrictions upon consumer behavior. In
particular, greater operating efficiency and an increased ability to realize scale
economies lead firms to choose larger facilities which are more centrally located to a
larger population. Decreasing travel costs and an increased preference for such
facilities should logically lead to the same structural change but, as was noted, shifts
of this nature that resulted from such changes in consumer conditions were very
modest. For facility size, at least, the firm seems to control structure for its own
benefit and major structural changes alter consumer behavior only to fit the pattern
the firms prescribe as opposed to increasing consumer utility.

Increasing consumer preferences for facilities which are proximate to other
facilities drive firms into clustered patterns. Rent gradients are never negative, which
might suggest that this is the only situation which could result in such clustering.
Even with agglomeration economies, locational rent can not decrease with greater
proximity. It can, however, in the presence of severe agglomeration economies, not
increase too rapidly. In the previous locational problems, though, there was no
benefit associated with such proximate locations so when rent gradients existed, firms avoided clustering. It may be possible to, in the presence of consumer preferences for comparison and multi-purpose shopping, create a situation in which firms cluster despite the fact that this increases their costs. Such issues are addressed in the subsequent subsection which deals with multiple parameter variations and resulting locational and size optima.

*Simultaneous Parameter Shifts*

In light of the general characteristics of the retail revolution outlined at the beginning of the chapter, we are particularly concerned with finding those simultaneous parameter shifts which lead to: 1) rapid increases in establishment size, 2) firms clustering with outlets in different sectors, and 3) firms avoiding locations nearby other stores in the same sector. In terms of the variables in the model, we wish to identify the most likely parameter shifts which simultaneously result in rapid increases in $W^*$, decreases in $Z^*$, and increases in $V^*$.

From the analysis of the effects of individual parameters in both the numerical experiments and locational problems it is clear that rapid increase in $W^*$ most likely results from decreasing $\delta_1$ and/or $\sigma_1$. Mechanisms for changes in the locational pattern, as described by $Z^*$ and $V^*$, are less easy to pinpoint. The empirical evidence
suggests the values of these two variables are changing in different directions, with
$Z^*$ decreasing and $V^*$ increasing. The interconnectedness of the two in the cost
equation would seem to suggest that such opposing dynamics could not occur as a
result of change in rent gradients and agglomeration economies but rather need be
tied to shifts in $\gamma$ and $\lambda$.

In the analysis of individual parameter influences, $\gamma$ and $\lambda$ had expected
effects on the optimal location approaching and receding away from those locations
that maximized the values of $Z$ and $V$ as consumer preferences for comparison and
multi-purpose shopping changed. As we should recall, however, the base parameter
settings on which this behavior was based set $\delta_2 = 0$, implying there were no
locationaly variable costs or rent gradients. In the presence of such rent gradients
the costs of more proximate relative locations can outstrip the benefits (in terms of
an establishments ability to attract customers). The effects of $\gamma$ and $\lambda$, then, are the
same as discussed previously but location would not be as sensitive to their shifts in
the presence of rent gradients. It was therefore necessary to introduce rent gradients
into the model through $\delta_2 > 0$ while retaining the remaining base settings. It was
found, somewhat surprisingly, that the equilibrium solution was still optimal even
when rent costs were greater than operating costs ($\delta_2[Z_+V]^{a2} > \delta_1W_j^{a1}$). In
practice, the locationally variable part of a firms cost can be quite significant but it is
highly unlikely that, for a retailer, they would be greater than its operating costs.
Nevertheless, for future locational problems, $\delta_1$ and $\delta_2$ were set so that in the equilibrium solution both the locational and operating costs contributed equally to total costs. No scale or agglomeration economies, however, were introduced ($\sigma_1 = \sigma_2 = 1$). Using these settings, parameter values were shifted in order to create an optimal solution in which the subject establishment dramatically increased its size and moved to a location which was proximate to complementing outlets but relatively distant from its substituting competitors.

The first task in this endeavor was to identify possible locations in which $V_1$ was high relative to $Z_1$. Figure 5-3 shows variations in the values of $Z_1$ and $V_1$ over the created study region plus combinations of the two. In Figure 5-3a, we note that $Z_1$ generally increases towards the middle of the region where the three other substituting outlets are located. Spatial variation in the value of $V_1$ is similar but with notable spikes at those locations very near complementing outlets. We also note how pronounced is that location in which $V_1$ is maximized (as shown in Figure 5-1). Furthermore, the values of $V_1$ tend to be much higher than those of $Z_1$. In Figure 5-3c, we show variation in the additive combination of $Z_1$ and $V_1$ noting the similarity in this pattern to that of $V_1$ alone. It is this combination which affects the firms locational cost. Figure 5-3d shows the ratio of $V_1$ to $Z_1$. Again, the locational component of the most noted structural dynamic is that firms have clustered with dissimilar firms avoiding competitors (or potential substitutes). This is indicative of
Figure 5-3. Variation in the values of the locational measures in the study region.

(a) $Z_j$
(b) $V_j$
(e) $V_j + Z_j$
(d) $V_j / Z_j$
those locations in which $V_1$ is high relative to $Z_1$. Three such locations stand out in figure 5-3d as high values for the ratio. The two most pronounced are peripheral locations in which $V_1$ was relatively high but $Z_1$ was low (as was the general case all along the periphery). The third is the location in which $V_1$ was at its highest. This location is also high for $Z_1$ but the overpowering value of $V_1$ there still inflates the ratio.

With these locations noted, the task is to find those parameter shifts which will lead our subject facility to choose one of these locations. The extreme situation where there are great consumer dislikes for comparison shopping ($\gamma = -2.5$) but great preferences for multi-purpose shopping ($\lambda = 2.5$) was initially solved for (with all base settings as set previously or as otherwise noted). Under these extreme conditions the optimal firm location was at that location which maximized the value of $V_1$. This location did not provide the best tradeoff between $V_1$ and $Z_1$, but it was central to the population. Also of note was an optimal facility size of 1 compared with the other competing outlets preset size of 2. Under the enormous locational cost of this location, the optimal choice for a facility is to minimize its operational costs through a small size.

While the parameter settings used are theoretically sound, there is no real reason to suspect that $\gamma < 0$. A general indifference or slight preference ($g \approx 0$) for comparison shopping is much more likely. $\gamma$ was therefore increased incrementally to

252
determine if the noted solution still obtained. And while this location had a high ratio between \( V_1 \) and \( Z_1 \) it also had a high value for each. Increasing \( \gamma \) up to its maximum therefore had no effect on the solution to the locational problem.

The excellent accessibility of this central location overrode the importance of avoiding locational costs despite their large contribution to total costs. In order to decrease the importance of accessibility, \( \beta \) was subsequently increased incrementally upward from its preset minimum of -2.5 while \( \gamma \) and \( \lambda \) were reset to 0 and 2.5, respectively. The optimal location remained where \( V_1 \) was maximized until \( \beta > -1 \) at which point the optimal location shifted to the most pronounced peak in Figure 5-3d which was that location in which \( V_1 \) was at its greatest relative to \( Z_1 \). Thus, only when travel costs are relatively unimportant to consumers, are the full effects of consumer preferences towards comparison and/or multi-purpose shopping reflected in the structure of the retail system. The most surprising element of this solution was that, despite no great consumer preferences for larger facilities \( (\alpha = 1) \), the optimal size of the facility was 6, or three times that of its other competitors. In effect, the firm radically grew in size to attract consumers to its peripheral location from greater distances. This solution further held when \( \lambda \) was decreased to just above 1 and \( \gamma \) was increased to just above 0.
Summary

The results from the locational problems involving multiple parameter shifts suggest that if travel costs are relatively low, slight preferences towards multipurpose shopping and a general indifference to comparison shopping can lead to a pattern where clusters of large, dissimilar firms dominate. Travel costs do not have to change, however, for this solution to obtain. Any preferences for patterns which facilitate shopping can be met through large facilities rather than clusters of similar stores. Furthermore, though we found through the numerical analysis and single parameter location models that decreasing operational costs and an increased ability to realize scale economies are the most likely candidates for rapid increases in firm size, the nature of size and location are so intertwined that changes in locational preferences and costs alone can result in radical size changes. It should be noted, however, that this was the case only for the peripheral, and not central, solution. But by referring back to the maps showing the locations of big box format stores in chapter 3 we can clearly see the avoidance of central locations by these new value retailers.

We are left with a mix but greatly narrowed down set of potential mechanisms for observed structural changes. Firm cost structures, independent of location, can greatly affect the optimal size of facilities with little regard to the preferences of consumers. That is, even when consumers have no great preference
for large facilities, such large facilities can dominate the landscape simply because they are a more efficient means of retailing to their operators. This is noteworthy because it demonstrates that structural form may be more firm than consumer driven even though the purpose of the structure is to serve the needs of consumers. We do note, however, that in more complex situations, as examined through the multi parameter locational problems, large size shifts are possible through changes in consumer preferences for attributes that have nothing to do with retail scale.

Locational and size characteristics are far from independent and shifts in the preferences for different locational attributes can radically alter structure in terms of both facility location and size. In the next chapter we empirically explore these mechanisms in order to conclude what the actual mechanisms for the retail revolution have been.

1 We define a stable equilibrium as a configuration in which no individual outlet can assume a location that would better its sales. Any configuration in which the four outlets are arranged symmetrically with respect to the center is an equilibrium where sales, costs, and profits are equal for all j. None of these, except the two discussed, however, proved stable.

2 The distinction between the Harris and Wilson (1978) equations and those used here are the power function form of distance deterrence used in the revenue equation and the addition of scale economies to the cost function through \( \sigma_1 \).

3 In this example \( \delta_1 = 121, \sigma_1 = 1 \) (no scale economies), and total system demand equals 12,100.

4 Empirical proof of this is provided in the next chapter.

5 When \( \gamma \) is negative, \( Z_j \) has a similar effect as the distance deterrence term if the substituting facilities are centrally located. Thus, negative \( \gamma \) is very similar to highly restrictive travel costs which as was noted for \( \beta \), drive the facility towards its equilibrium solution.
CHAPTER 6: Mechanisms of Change

Introduction

A balance between the cost structures of firms and preferences of consumers acts to determine the retail configuration that best serves the needs and conditions of any particular point in time. The connection between changes in the parameters which define these structures/ preferences and dynamics in the retail environment are logical. For example, if consumers prefer the larger selection and lower prices offered by bigger retail establishments, and retailers can operate such establishments without enduring prohibitive costs in doing so, the retail system will offer such opportunities. Similarly, if consumers demonstrate few preferences for stores whose locations facilitate multi-purpose or comparison shopping but retailers pay a premium for such locations, retailers will not arrange their stores in an agglomerated pattern.

Connections between conditions and structure, such as these, are clear cut individually. In reality, however, the structure of the retail environment does not allow conditions to change independently. If firms increase their size to better serve consumer preferences for large selections and lower prices, they must do a greater
volume of business to make up for the increase in costs. But because retail demand is finite, larger stores means fewer stores, and fewer stores means the distance between consumers and retail opportunities must, on average, increase. This give and take relationship between different conditions complicates our understanding of the mechanisms responsible for retail dynamism.

The numerical analysis and simulations of the previous chapter modeled the complexity of this interconnectedness to provide a theoretical base for explaining the recent structural change in retailing. In so doing, we were able to identify the probable mechanisms for the value retail revolution. In this chapter, we empirically verify these mechanisms. The discussion is organized into three sections. In the first, changes in the cost structure of firms are investigated. The second section focuses on the costs of locational significance to firms as they agglomerate or disperse throughout the market they serve. The changing preferences of consumers are examined in the third section. A final concluding section ties these three distinct research endeavors together.

**Firm Cost Structures**

In the previous chapter it was found that the types of change noted in the U.S. retail system were, from a theoretical standpoint, most likely due to shifts in the cost structure of retailers. In particular, the operating costs of retailers were
identified as being the most directly related to retail size. Smaller facilities require less maintenance, employees, and managers as well as use fewer resources such as electricity and other utilities. In general, then, operating costs increase with the scale of operations. If costs per areal unit fall, retailers should increase their size.

Economies associated with the scale of operations further imply that retailers can increase the scale of their establishments with a less than proportionate increase in their costs. Diseconomies can exist instead, however, if costs increase more rapidly than scale. In the numerical and locational experiments of the previous chapter the cost equation 5-5 explicitly accounted for this potentially nonlinear relationship between scale and costs through the parameter $\sigma_1$. When $\sigma_1 < 1$ economies of scale prevail. Conversely, if $\sigma_1 > 1$ diseconomies exist. If $\sigma_1 = 1$ there are no economies and costs increase in direct proportion to size. Thus, as demonstrated previously here and by others (Poston and Wilson 1977; Harris and Wilson 1978) the value of this parameter plays a critical role in determining what the optimal facility size is for a retailer.

What remains is to determine the nature of the mathematical relationship between operating costs and establishment size and how this relationship has changed over the last 20 years. Taking the relevant portion of equation 5-5 as

$$C_o = \delta_1 W_j^{\sigma_1}$$

(6-1)
provides us with an equation relating operating costs \( (C_o) \) to establishment size \( (W_i) \) where \( \delta_1 \), again, is the per areal unit operating cost and \( \sigma_1 \) measures scale dis/economies. With suitable statistics for \( C_o \) and \( W_i \), \( \delta_1 \) and \( \sigma_1 \) can be estimated and compared for each year in the study period. Size is generally associated with square footage or some similar metric but number of employees serves equally as well. Quality data concerning U.S. retail employment size are published every five years in the Census of Retail Trade. This statistical resource also provides retail sales figures. While quite a different measure than operating costs, sales is used in its place in this analysis. Its use could be justified based on it being generally proportional to costs alone. More importantly, however, when compared with employment statistics it provides a measure of how the efficiency of retail operations varies with the size of the operation. This requires a different interpretation of the scale economies parameter \( \sigma_1 \), however. Were costs used for \( C_o \), the interpretation of \( \sigma_1 \) would be as discussed in the previous paragraph. Using sales, however, \( \sigma_1 > 1 \) indicates scale economies, diseconomies would be suggested by \( \sigma_1 < 1 \), and \( \sigma_1 = 1 \) indicates neither exist. Thus, costs increasing slower than size is analogous to sales increasing more rapidly than size.

Data were obtained on sales and employment levels for firms classed according to their employment size from the 1977 to 1992 publications of the Census
of Retail Trade (U.S. Census Bureau, 1977; 1982; 1987; 1992). Similar data for 1997 were obtained from an advance publication from the U.S. Census Bureau (1997). While 1977-1992 data are classed according to the employment size of establishments this classification was not yet available for 1997.\textsuperscript{1} Only data classed by “kinds of business” were available. This classification did, however, provide a similar range of employment sizes between the classes. This classification could not be used for previous years to provide exact uniformity in the data because of the Census Bureau’s switch from the Standard Industrial Classification (SIC) system used in 1992 and earlier years to the North American Industrial Classification system (NAICS) used in 1997.

We begin the analysis by investigating temporal changes in efficiency, where efficiency is measured as real sales per employee (Table 6-1).\textsuperscript{2} This statistic is taken as a gauge of efficiency as it measures the ability of establishments to generate sales for a given amount of (labor) input. This measure must, however, be taken with some caution.

The sales statistics reflect overall retail demand. Employment levels will not exactly mirror demand levels since a certain number of employees are required no matter the quantity of sales being generated.\textsuperscript{3} Changes in sales per employee thus indicate general changes in sales levels in addition to an establishment’s ability to service varying sales levels with a certain number of employees. The limitation in
Table 6-1. Establishment sales per employee by employment size class.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>87.4</td>
<td>66.4</td>
<td>54.5</td>
<td>78.7</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>64.3</td>
<td>53.4</td>
<td>50.3</td>
<td>55.9</td>
<td>--</td>
</tr>
<tr>
<td>3 to 4</td>
<td>59.5</td>
<td>53.3</td>
<td>48.4</td>
<td>48.7</td>
<td>--</td>
</tr>
<tr>
<td>5 to 6</td>
<td>54.3</td>
<td>49.9</td>
<td>47.0</td>
<td>47.2</td>
<td>--</td>
</tr>
<tr>
<td>7 to 9</td>
<td>50.5</td>
<td>44.8</td>
<td>43.6</td>
<td>43.1</td>
<td>--</td>
</tr>
<tr>
<td>10 to 14</td>
<td>48.0</td>
<td>40.7</td>
<td>40.3</td>
<td>38.9</td>
<td>--</td>
</tr>
<tr>
<td>15 to 19</td>
<td>50.5</td>
<td>39.8</td>
<td>38.1</td>
<td>35.1</td>
<td>--</td>
</tr>
<tr>
<td>20 to 49</td>
<td>55.4</td>
<td>41.9</td>
<td>39.2</td>
<td>36.0</td>
<td>--</td>
</tr>
<tr>
<td>50 to 99</td>
<td>61.2</td>
<td>49.2</td>
<td>48.4</td>
<td>46.7</td>
<td>--</td>
</tr>
<tr>
<td>100 or more</td>
<td>50.6</td>
<td>44.9</td>
<td>52.5</td>
<td>55.4</td>
<td>--</td>
</tr>
<tr>
<td>all establishments</td>
<td>54.8</td>
<td>45.6</td>
<td>45.2</td>
<td>44.7</td>
<td>65.2</td>
</tr>
</tbody>
</table>

* establishments with payroll that operated entire year only
** data for employment size classes unavailable until 3rd quarter, 2000
this is that the changes noted reflect shifting consumer demand between the different sized retail establishments as well as efficiency gains or losses. In Table 6-2 we thus investigate these changes on a percentage basis noting that shifts of only a few percentage points are suspect.

The data suggest some startling trends. Based on this measure the retail industry as a whole became less efficient from 1977 to 1992. Real sales per employee dropped from nearly $55,000 in 1977 to under $45,000 in 1992. The majority of this change occurred between 1977 and 1982 with a less than 1 percent change from 1982 to 1992. The changes in efficiency were not uniform across the different establishment size classes, however. It was in the middle establishment size classes (7 to 99 employees) that the greatest downward shifts in per employee sales were experienced. The smaller sized establishments (less than 6 employees) realized an increase in efficiency between 1987 and 1992. For firms with 3 to 6 employees this increase was minor. Establishments with 2 employees realized an increase of over 11 percent and single employee units realized an increase greater than 44 percent. This efficiency change for single employee units works out to roughly an 8 percent per annum increase. The only size class that recorded an efficiency increase from 1982 to 1992 was the largest. Sales per employee for establishments with greater than 100 employees increased nearly 17 percent from 1982 to 1987 and then almost 6 percent in the following 5 years.
Table 6-2. Percent change in establishment sales per employee by employment size class.

<table>
<thead>
<tr>
<th>Employees per Establishment*</th>
<th>1982</th>
<th>1987</th>
<th>1992</th>
<th>1997**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(24.0)</td>
<td>(17.8)</td>
<td>44.4</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>(16.9)</td>
<td>(5.9)</td>
<td>11.3</td>
<td>--</td>
</tr>
<tr>
<td>3 to 4</td>
<td>(10.4)</td>
<td>(9.2)</td>
<td>.8</td>
<td>--</td>
</tr>
<tr>
<td>5 to 6</td>
<td>(8.2)</td>
<td>(5.8)</td>
<td>.6</td>
<td>--</td>
</tr>
<tr>
<td>7 to 9</td>
<td>(11.2)</td>
<td>(2.9)</td>
<td>(1.0)</td>
<td>--</td>
</tr>
<tr>
<td>10 to 14</td>
<td>(15.3)</td>
<td>(.9)</td>
<td>(3.5)</td>
<td>--</td>
</tr>
<tr>
<td>15 to 19</td>
<td>(21.2)</td>
<td>(4.3)</td>
<td>(7.9)</td>
<td>--</td>
</tr>
<tr>
<td>20 to 49</td>
<td>(24.3)</td>
<td>(6.5)</td>
<td>(8.2)</td>
<td>--</td>
</tr>
<tr>
<td>50 to 99</td>
<td>(19.5)</td>
<td>(1.7)</td>
<td>(3.4)</td>
<td>--</td>
</tr>
<tr>
<td>100 or more</td>
<td>(11.1)</td>
<td>16.7</td>
<td>5.7</td>
<td>--</td>
</tr>
<tr>
<td>all establishments</td>
<td>(16.7)</td>
<td>(.9)</td>
<td>(1.2)</td>
<td>45.9</td>
</tr>
</tbody>
</table>

* establishments with payroll that operated entire year only
** data for employment size classes unavailable until 3rd quarter, 2000
Due to the lack of data classed by employment size in 1997 it is not possible to carry these class analyses to the most current year. We do note, however, the remarkable increase in sales per employee for the industry as a whole. The 1992 to 1997 period marked the only time during the study period that sales per employee increased for retail industry as a whole. This increase was very notable as the statistic increased nearly 46 percent during this period. Only single employee units from 1987 to 1992 experienced any similar level of increased efficiency.

There are two explanations for this major change. 1992 approximately marks a major turn in the health of the U.S. economy. It was during this time that the recession of the late 1980s/early 1990s was ending and the boom of the mid to late 1990s beginning. This was met with a major upswing in retail sales. During the 1992 to 1997 period, total real retail sales increased over 13 percent. Adjusting for population growth, this amounted to a 10.5 percent increase in per capita retail spending. Given the cautionary notes discussed earlier we must note that this retail growth affected the measured increase in retail efficiency. Despite this increase in retail sales, however, retail employment fell nearly 18 percent during the same period. Clearly the second, and more significant, explanation is that retailers have become much more efficient in their operations.

To better understand this efficiency increase the parameters $\delta_1$ and $\sigma_1$ from equation 6-1 were estimated for each of the years 1977, 1982, ..., 1997. In order to
estimate the parameters using linear regression, Equation 6-1 was log transformed into:

\[ \ln(C_0) = \ln(\delta_1) + \sigma_1 \ln(W_i) \]  

(6-2)

For each of the classes from the Census of Retail Trade, as discussed previously, the average sales per establishment was calculated and used as \( C_0 \). \( W_i \) was calculated as the average number of employees per establishment. Based on the Census defined classes, this provided 10 observations for each of the years 1977 to 1992 and 11 observations for 1997. Although not a large number of observations, the data set is built on the population of retail establishments in the U.S.\(^6\) The individual significance of the parameters is not an issue since the theory embodied in this analysis dictates the cost function. All parameter estimates were, however, significant at the .001 level.

The calibrated parameters are listed in Table 6-3 and changes in the values of \( \delta_1 \) and \( \sigma_1 \) charted in Figure 6-1a and b, respectively. The behavior of these two parameters details why the efficiency changes noted earlier occurred. The role of \( \delta_1 \) is to measure marginal changes in efficiency independent of the size of the retail establishment. This marginal change can, of course, be dependent on the size of the establishment if, for example, an increase of 10 employees for a firm that only has 10 employees changes sales in a different magnitude than would a 10 employee increase

265
Table 6-3. Changes in the parameters describing the cost structure of retail establishments.

<table>
<thead>
<tr>
<th>Year</th>
<th>$\delta_1$</th>
<th>$\sigma_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>66,703</td>
<td>.9364</td>
</tr>
<tr>
<td>1982</td>
<td>55,662</td>
<td>.9368</td>
</tr>
<tr>
<td>1987</td>
<td>47,893</td>
<td>.9821</td>
</tr>
<tr>
<td>1992</td>
<td>55,398</td>
<td>.9331</td>
</tr>
<tr>
<td>1997</td>
<td>55,302</td>
<td>1.0276</td>
</tr>
</tbody>
</table>
Figure 6-1. Changes in the parameters describing the cost structure of retail establishments.

(a) $\delta_1$

(b) $\sigma_1$
for a firm with 100 employees. This is a function of scale economies as dictated by $\sigma_1$. If the value of $\sigma_1 < 1$, the magnitude will be larger for the smaller firm. The opposite holds true when $\sigma_1 < 1$. $\sigma_1 = 1$ is thus a critical point and so is delineated in Figure 6-1a.

From 1977 to 1987, change in $\delta_1$ was downward indicating that all establishments needed more employees to serve the same level of sales over time. During this period $\sigma_1$ increased in value but remained less than 1. This temporal trend indicates that larger establishments would require less of an increase, over time, in the number of employees needed to service a given sales level. Because $\sigma_1 < 1$, however, increasing the size of the establishment at any particular point in time would result in a less than proportionate increase in sales. Thus, smaller facilities would realize the best proportional increase in sales by increasing their size.

The 1987 to 1992 period saw a reversal of the trends evident in the preceding 10 year period as $\delta_1$ increased and $\sigma_1$ decreased. This indicates that firms, on average, could generate more real sales per employee in 1992 than in 1987. Because $\sigma_1$ remained less than 1 the marginal sales benefits of increasing size were still best realized by smaller establishments. And, since $\sigma_1$ was lower in 1992 than at any other time during the study period, this was more true in 1992 than previously.

The marginal advantage of increasing facility size switched to larger retailers.
between 1992 and 1997 as $\sigma_1$ increased to a value greater than 1. At the same time, the value of $\delta_1$ decreased only slightly (less than 1/10th of a percent). This radical change indicates an enormous advantage for larger retail establishments. Prior to this period, when $\sigma_1 < 1$, the marginal benefit of increasing size decreased as firms grew larger. Now, the more an establishment grows, the greater the marginal increase in sales per employee it attains.

The numerical and simulation experiments of the preceding chapter suggest that the rapid increase noted in the size of retailers is most attributable to retailers’ increasing ability to capitalize on economies of scale. The realization of these economies between 1992 and 1997 corresponds with the rapid growth of big box retailing. $\sigma_1 > 1$ further implies that firms will only get larger. Evidence for this continues to mount.\(^7\)

**Locational Costs**

Data used to measure change in locational costs were obtained from the Urban Land Institute’s Dollars and Cents of Shopping Centers. The 1978, 81, 84, 87, 90, 93, 95, and 97 editions of the study were utilized in this research to most closely fit the study period.\(^8\) The study is based on a survey given to U.S. shopping center operators. Survey questions concern tenant, operating, and center
characteristics. Survey data are reported based on shopping center type:

1. neighborhood - 30,000 to 100,000 square feet of GLA
2. community - 100,000 to 450,000 GLA
3. regional - 300,000 to 850,000 GLA and one or two major anchors
4. super-regional - 600,000 to 1,500,000 GLA and three or more major anchors

Of concern here are statistics concerning gross leasable area (GLA) and rent charges per square foot for each of the center types. Table 6-4 presents these statistics for each year the study was published. All rent figures are reported in 1977 dollars. The average rent per square foot was calculated by weighting each class of shopping centers in each year by the number of shopping centers upon which the data were based. Of general note is the gradual increase in this statistic from 1981 to 1995. If costs reflect sales levels, this suggests a rising importance of locations within shopping centers during this period. The downturn in this value from 1995 to 1997 may imply this no longer is as true. This is perhaps due to the increase of big-box, one-stop retail formats.

Of particular note is the relationship between the size of the centers and the amount they are able to charge for rent. In each time period a positive relationship exists between GLA and rent per square foot for community to super regional centers. Neighborhood centers, however, average higher rent charges than the larger community centers. In Figure 6-2 we generalize this relationship by combining years and computing the weighted average of GLA and rent/sq. ft. Clearly evident is this
Table 6-4. Average GLA and real rent per square foot for the different center types.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighborhood</td>
<td>53,911</td>
<td>59,304</td>
<td>62,525</td>
<td>62,683</td>
<td>64,760</td>
<td>56,785</td>
<td>60,299</td>
<td>60,150</td>
</tr>
<tr>
<td>Community</td>
<td>162,262</td>
<td>147,008</td>
<td>146,774</td>
<td>145,523</td>
<td>150,529</td>
<td>146,604</td>
<td>156,543</td>
<td>148,782</td>
</tr>
<tr>
<td>Regional</td>
<td>261,203</td>
<td>230,011</td>
<td>252,615</td>
<td>254,736</td>
<td>266,475</td>
<td>236,192</td>
<td>246,718</td>
<td>235,262</td>
</tr>
<tr>
<td>Super Regional</td>
<td>366,018</td>
<td>352,661</td>
<td>329,214</td>
<td>360,796</td>
<td>370,930</td>
<td>358,287</td>
<td>346,370</td>
<td>352,459</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rent per Square Foot* (1977 dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighborhood</td>
</tr>
<tr>
<td>Community</td>
</tr>
<tr>
<td>Regional</td>
</tr>
<tr>
<td>Super Regional</td>
</tr>
<tr>
<td>weighted average</td>
</tr>
</tbody>
</table>

* Source: Dollars and Cents of Shopping Centers, Urban Land Institute 1978, 81, 84, 87, 90, 93, 95, 97
Figure 6-2. The relationship between GLA and rent per square foot.
trend for centers over approximately 150,000 GLA. Smaller centers go against this
grain leading to the distinctive U shape in the curve. This is due to a difference in
orientation between neighborhood and other centers. Smaller centers serve
convenience needs while the larger are more shopping oriented. Though it facilitates
multi-purpose trips, convenience is hampered as convenience oriented centers grow
larger. Shopping oriented centers, on the other hand, benefit directly through larger
sizes because it increases the variety and selection of merchandise from which
shoppers have to choose. 100,000 to 150,000 GLA is a critical level for centers
depending on their orientation as reflected in this association between rent charges
and shopping center size.

The variation between GLA and rent charges clearly points to the existence
of rent gradients associated with proximity to other retailers. Additionally, there may
be agglomeration economies due to non-linearities in this relationship between size
and rent. When using shopping center size as a measure of proximity to other
retailers, rent gradients mean that a change in size is met with a proportional change
in rent. Agglomeration economies manifest themselves when the marginal change in
rent associated with a unit change in size varies with the size of the shopping center.
The cost equation in the numerical and simulation experiments of the previous
chapter (Eq. 5-5) was explicitly formulated to capture these two forces through the
parameters $\delta_2$ and $\sigma_2$ which quantified, respectively, rent gradients and agglomeration
economies. We take the relevant portion of this cost equation as:

\[ C_L = \delta_2 (Z_j + V_j)^a \]  \hspace{1cm} (6-3)

where \( C_L \) measures locational costs, \( Z_j \) proximity to substitutable outlets, and \( V_j \) proximity to complementary outlets. No distinction need be made here between substitutable and complementary outlets. Rather, we take a measure of proximity to all retail outlets, \( A_j \), which may be considered as:

\[ A_j = Z_j + V_j \]  \hspace{1cm} (6-4)

The equation describing locational costs can therefore be simplified to:

\[ C_L = \delta_2 A_j^a \]  \hspace{1cm} (6-5)

For our purposes \( A_j \) is taken as GLA since an establishment's proximity to other stores is directly related to the number of retailers within the same shopping center and therefore the size of the shopping center itself. It should be noted that \( C_L \) does not measure total rental charges but rather a premium paid in rent attributable to the quality of the location. Basic rent charges are built in to Equation 6-1 since they will vary with the size of the retail outlet. \( C_L \) is that charge attributable solely to locational factors. This manifests itself in a premium paid on a square footage basis but is not a function of the square feet leased. We must, therefore, measure \( C_L \) as rent per square foot rather than total rent paid.

A problem with the functional specification of Equation 6-4 is that it can not
adequately describe the U-shaped pattern evident in Figure 6-2. Earlier arguments suggest that the equation is applicable to convenience and shopping oriented centers separately where convenience centers reside at the lower, and shopping centers the upper, ends of the GLA scale. Convenience centers exhibit a negative slope and shopping centers a positive slope. Combining these two center types in the same data set results in the distinctive U-shape. We therefore exclude neighborhood centers, which are convenience oriented in nature, for calibration of the parameters in Equation 6-4. Since our interest is in how locational costs have changed over time we focus only upon this narrower range of the data for shopping oriented centers. Neighborhood centers are thus excluded from this part of the analysis.

The ULI data described above are further classified according to four major geographic regions covering the U.S. For each year statistics are provided for the four center types in each of these regions. Between the community, regional, and super-regional centers there are 12 observations available for each year (each observation is a combination of a particular center type and geographic region). There are, however, differences in the number of shopping centers used by ULI to provide statistics for the average center type in each geographic region. Observations were therefore weighted by expanding the observations in the data set in proportion to the number of stores in the shopping centers used to construct each. This procedure acts to create a data set structured around the individual
establishments that are the concern in this research. The only negative effect that could result from this procedure is an artificial increase in the significance of statistical tests using the data. No such tests are, however, needed for the calibrated parameters.

With these data, \( \delta_2 \) and \( \sigma_2 \) are estimated for each year using linear regression after log transforming equation 6-5 into:\(^{10}\)

\[
\ln(C_L) = \ln(\delta_2) + \sigma_2 \ln(A_j) \tag{6-6}
\]

Interpretation of \( \delta_2 \) and \( \sigma_2 \) is similar to that of \( \delta_1 \) and \( \sigma_1 \) in the previous section. GLA is reported in thousands of square feet so a thousand square foot increase in GLA will result in a \( \delta_2 \) increase in the rent charged per square foot. \( \sigma_2 \) functions to adjust this increase according to how large the center is. When \( \sigma_2 < 1 \), rent charges increase less than proportionately to the change in GLA. That is, a center that is 10 percent larger than another will demand less than 10 percent more in rent per square foot if \( \sigma_2 < 1 \). The opposite holds true if \( \sigma_2 > 1 \).

Table 6-5 reports the calibrated parameter values. Changes in the values of \( \delta_2 \) and \( \sigma_2 \), over time, are charted in Figures 6-3a and b, respectively. As is to be suspected based on Table 6-4 and Figure 6-2, it is always more costly to locate in larger centers. The positive value of \( \delta_2 \) in all periods confirms this. The varying magnitude of this parameter might suggest that the importance of this can change
Table 6-5. Changes in the parameters describing the rent structure of retail establishments.

<table>
<thead>
<tr>
<th>Year</th>
<th>$\delta_2$</th>
<th>$\sigma_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>.0658</td>
<td>.7378</td>
</tr>
<tr>
<td>1981</td>
<td>.0171</td>
<td>.9879</td>
</tr>
<tr>
<td>1984</td>
<td>.0066</td>
<td>1.1665</td>
</tr>
<tr>
<td>1987</td>
<td>.0301</td>
<td>.8947</td>
</tr>
<tr>
<td>1990</td>
<td>.0286</td>
<td>.9032</td>
</tr>
<tr>
<td>1993</td>
<td>.0077</td>
<td>1.1807</td>
</tr>
<tr>
<td>1995</td>
<td>.0076</td>
<td>1.1768</td>
</tr>
<tr>
<td>1997</td>
<td>.0329</td>
<td>.8971</td>
</tr>
</tbody>
</table>
Figure 6-3. Changes in the parameters describing the rent structure of retail establishments.

(a) $\delta_2$

(b) $\sigma_2$
dramatically from period to period. It is important to note though that \( \delta_2 \) acts in concert with \( \sigma_2 \). When one is relatively large the other is relatively small so as to balance each other out. The value of \( \sigma_2 \) above and below 1 is, however, critical.

Consumers rarely exhibit a dispreference for facilities that foster multi-purpose or comparison shopping.\(^{11}\) Larger shopping centers are preferred, all else equal, over smaller centers. The greater the clustering of stores the greater the sales of each. When \( \sigma_2 < 1 \) the cost of agglomerating is less than proportional to the degree of agglomeration. The more stores cluster, the greater their appeal to consumers, but the less premium they have to pay for this benefit. This is a strong agglomerative force. When \( \sigma_2 > 1 \) it is not necessarily a degglomerative force because consumers still prefer this pattern. Because costs increase more than proportionally than the degree of agglomeration, however, there will be less motivation to cluster together.

The observed changes in \( \sigma_2 \) indicate that this motivation to cluster has varied greatly throughout the study period. In the early to mid 1990s \( \sigma_2 \) increased to a level greater than 1. This would indicate that agglomerative forces would not be strong as costs would increase more rapidly than the degree of clustering. This coincided with major growth in value retail activities, but the tendency for individual stores to locate on their own. Thus, high agglomerative costs created a preference for a non
clustered locational pattern among these emerging retailers.

The later development, as discussed in Chapter 3, has been for these big-box stores to cluster together -- particularly in power centers. There is, however, little to suggest that there is much to gain from this agglomeration. The arrangement of retailers within these clusters, with generally freestanding units and few pedestrian linkages, does not promote shopping between stores. As also noted in earlier chapters, the retail types found agglomerating in these centers do not seem to complement one another to any significant degree. The exposure and prominence retailers gain through such locations are the only real benefit.

If the costs of agglomerating increase less than proportionally to the degree of agglomeration, any small benefit from clustering may be enough to justify these higher costs. Referring back to Figure 6-3b, we note that the value of $\sigma_2$ decreased to a level less than 1 sometime after 1995. This indicates that, in this most recent period, retailers have been able to cluster into larger agglomerations while paying a premium less significant then in years prior. Additionally, we note that rent charges increased in regional and super regional centers from 1990 to 1995. From 1995 to 1997, however, costs decreased. This latest trend is the reason many value oriented retailers have been drawn to traditional malls to such a degree as to transform many into true value centers.
Consumer Preferences

The value retail revolution has demanded changes in consumer behavior. In Chapter 3 we documented the decrease in the number of retail establishment serving consumers. This alone means consumers must travel farther, on average, to shop. Additionally, we noted the distinct change in the patterning of retailers implying the locational behavior of consumers has further been altered. But, the theoretical work of the previous chapter suggests that changes in consumer preferences were not a likely cause for the retailing change witnessed.

Behavior can change independent of preferences. In choosing where to shop, consumers trade off numerous factors including the proximity of stores, the prices and selection they offer, and how their locations inhibit or foster comparison and multi-purpose shopping. If preferences have not changed, the retail revolution has allowed retailers to decrease proximity and locational benefits only by offering a better selection and lower prices. The retail change witnessed may thus be due to a change in the cost structure of retailers alone. In the previous two sections we noted that this cost structure has been changed. Furthermore, the changes we noted empirically are in general agreement with the theoretical work determined to be the most likely cause of retail structural change. What is left is to determine what role, if any, consumer preferences have had in this revolution.

In our model, there are four parameters associated with consumer
preferences for different store attributes:

\[ \alpha \] - facility size (has a larger selection and/or lower prices)
\[ \gamma \] - proximity to other types of stores (fosters multi-purpose shopping)
\[ \lambda \] - proximity to similar stores (fosters comparison shopping)
\[ \beta \] - proximity to origin of shopping trip (little time money cost to get to)

A survey was designed to evaluate if preferences for these store attributes has changed. The survey was given by phone to a random sample of San Diego County households. Calls were made until a total of 100 responses were obtained. A copy of the survey dialogue and questions are attached in the appendix.

The survey is structured around four sets of questions. Each set is concerned with one of the individual preferences described above. Two questions comprise each set. The first question asks about a particular preference in the present and the second asks about the same preference in the past. Respondents were instructed to use their own judgment of what “past” means in order to avoid focusing on a particular period so that they could think in broad terms about changes in their shopping preferences. A sample question not dealing with shopping was given prior to the actual questions. This allowed respondents to consider how they would answer the second question in each set when answering the first. Thus, when thinking about a current preference, they were already thinking about this preference in the past. In this way, respondents were prevented from overstating the importance of a current preference if the nature of that preference had changed. The survey thus
promoted respondents to indicate that their preferences had changed. This is important because it is the lack of change that is significant to this research effort.

Cross tabulations of the survey results are presented in Table 6-6. It is clear that, as all the questions concerned generally positive store characteristics, most respondents agreed that they preferred to shop at stores with such attributes in the present and past. Still, 47 percent of respondents did disagree with at least one statement. For question sets 1, 2, and 4 few respondents indicated a neutral stance (didn’t agree or disagree). For set 3, however, most responses were neutral indicating little concern for comparison shopping. The off-diagonal responses in set 3 are also very meager indicating that very little change has occurred in how they feel about comparison shopping opportunities. This is even more true for set 2 where only 28 percent of respondents indicated their preferences for stores located nearby other types of stores changed in any way. Preferences for facilities with a larger selection and lower prices changed the most with 47 percent of respondents indicating some change had occurred.

That little to no change in preferences has occurred is further demonstrated by the grouping of responses in the upper left and lower right regions of each cross tabulation. Few respondents indicated a preference for something in the past and a dispreference for it in the present or vice-versa. Respondents generally indicated they felt much the same about all preferences in the past and present. The two
Table 6-6. Cross tabulations of survey responses.

(a) Set 1: Prefer to shop at stores with a larger selection and lower prices

<table>
<thead>
<tr>
<th>response</th>
<th>definitely agree</th>
<th>somewhat agree</th>
<th>don't agree or disagree</th>
<th>somewhat disagree</th>
<th>definitely disagree</th>
<th>Σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>definitely agree</td>
<td>.39</td>
<td>.06</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.45</td>
</tr>
<tr>
<td>somewhat agree</td>
<td>.17</td>
<td>.11</td>
<td>.02</td>
<td>.02</td>
<td>.00</td>
<td>.32</td>
</tr>
<tr>
<td>don't agree or disagree</td>
<td>.03</td>
<td>.00</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
<td>.04</td>
</tr>
<tr>
<td>somewhat disagree</td>
<td>.00</td>
<td>.12</td>
<td>.02</td>
<td>.01</td>
<td>.00</td>
<td>.15</td>
</tr>
<tr>
<td>definitely disagree</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.03</td>
<td>.01</td>
<td>.04</td>
</tr>
<tr>
<td>Σ</td>
<td>.59</td>
<td>.29</td>
<td>.05</td>
<td>.06</td>
<td>.01</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Σ denotes the sum of the row.
(b) Set 2: Prefer to shop at stores located close to other types of stores

<table>
<thead>
<tr>
<th>response</th>
<th>definitely agree</th>
<th>somewhat agree</th>
<th>don't agree or disagree</th>
<th>somewhat disagree</th>
<th>definitely disagree</th>
<th>Σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>definitely agree</td>
<td>.34</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.35</td>
</tr>
<tr>
<td>somewhat agree</td>
<td>.12</td>
<td>.29</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
<td>.42</td>
</tr>
<tr>
<td>don't agree or disagree</td>
<td>.00</td>
<td>.05</td>
<td>.04</td>
<td>.00</td>
<td>.00</td>
<td>.09</td>
</tr>
<tr>
<td>somewhat disagree</td>
<td>.00</td>
<td>.06</td>
<td>.00</td>
<td>.01</td>
<td>.00</td>
<td>.07</td>
</tr>
<tr>
<td>definitely disagree</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.03</td>
<td>.04</td>
<td>.07</td>
</tr>
<tr>
<td>Σ</td>
<td>.46</td>
<td>.41</td>
<td>.05</td>
<td>.04</td>
<td>.04</td>
<td>1.00</td>
</tr>
</tbody>
</table>
(c) Set 3: Prefer to shop at stores located close to other similar stores

<table>
<thead>
<tr>
<th>response</th>
<th>definitely agree</th>
<th>somewhat agree</th>
<th>don't agree or disagree</th>
<th>somewhat disagree</th>
<th>definitely disagree</th>
<th>Σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>definitely agree</td>
<td>.19</td>
<td>.01</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.22</td>
</tr>
<tr>
<td>somewhat agree</td>
<td>.04</td>
<td>.14</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.18</td>
</tr>
<tr>
<td>don't agree or disagree</td>
<td>.00</td>
<td>.03</td>
<td>.19</td>
<td>.03</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>somewhat disagree</td>
<td>.00</td>
<td>.05</td>
<td>.05</td>
<td>.04</td>
<td>.00</td>
<td>.14</td>
</tr>
<tr>
<td>definitely disagree</td>
<td>.00</td>
<td>.00</td>
<td>.05</td>
<td>.06</td>
<td>.10</td>
<td>.21</td>
</tr>
<tr>
<td>Σ</td>
<td>.23</td>
<td>.23</td>
<td>.31</td>
<td>.13</td>
<td>.10</td>
<td>1.00</td>
</tr>
</tbody>
</table>
(d) Set 4: Prefer to shop at stores close to home or work

<table>
<thead>
<tr>
<th>response</th>
<th>definitely agree</th>
<th>somewhat agree</th>
<th>don't agree or disagree</th>
<th>somewhat disagree</th>
<th>definitely disagree</th>
<th>Σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>definitely agree</td>
<td>.39</td>
<td>.05</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.44</td>
</tr>
<tr>
<td>somewhat agree</td>
<td>.06</td>
<td>.12</td>
<td>.04</td>
<td>.03</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>don't agree or disagree</td>
<td>.04</td>
<td>.04</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.08</td>
</tr>
<tr>
<td>somewhat disagree</td>
<td>.04</td>
<td>.08</td>
<td>.00</td>
<td>.08</td>
<td>.00</td>
<td>.20</td>
</tr>
<tr>
<td>definitely disagree</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.01</td>
<td>.02</td>
<td>.03</td>
</tr>
<tr>
<td>Σ</td>
<td>.53</td>
<td>.29</td>
<td>.04</td>
<td>.12</td>
<td>.02</td>
<td>1.00</td>
</tr>
</tbody>
</table>
greatest instances of changing preferences regarded store selection/prices and proximity. In both cases, 12 percent of respondents who indicated they did not prefer these characteristics in the past did prefer them now. Only 2 percent preferred stores with large selections and low prices in the past but not the present and only 3 percent preferred close stores in the past but not now. There were few such reversals in preferences regarding stores located close to other stores. 6 percent of respondents did not prefer stores located close to other types of stores in the past but did prefer them now. A similar 5 percent felt this way about stores located nearby similar stores. No respondents indicated either was important in the past but not the present.

These results clearly indicate that little change in consumer preferences has occurred. We add more statistical rigor to this by scoring responses and then testing differences in response to the questions in each set. Responses to each statement were scored as follows:

- definitely agree (strong preference) 2
- somewhat agree (mild preference) 1
- don’t agree or disagree (no preference) 0
- somewhat disagree (mild dispreference) -1
- definitely agree (strong dispreference) -2

Subtracting the score for the question regarding the past from the score for the present provides a mathematical representation of how a respondents preferences have changed for each of the four store attributes. For example, if a respondent
indicated they definitely agreed they preferred stores with a larger selection and lower prices now but somewhat disagreed that they preferred them in the past the difference would be scored as $2 - (-1) = 3$. Positive scores thus indicate an increased preference, zero scores no change in preference, and negative scores a decreased preference with the absolute value of the score relating the magnitude of the change. The potential range of difference scores is from -4 to 4.

Table 6-7 reports the proportion of respondents whose responses indicated the specified degrees of change in their preferences. The distribution of responses is better visualized in Figure 6-4. It is clear from the figure and table that little change in preferences has occurred. The distribution for all four store attributes is centered on zero -- no change. This is particularly true for preferences concerning locations which foster multi-purpose shopping or are close to home or work. Nearly three fourths and two thirds of respondents indicated that no change in their preferences for these two store attributes, respectively, had changed. The distributions for changes in preferences for stores with lower prices/larger selections and that foster comparison shopping are much flatter. Less than half of respondents answered the survey questions in such a manner as to indicate that no change in preferences for these two store attributes had changed. The median score for changes in preferences for three of the four store attributes, however, was 0.

Though centered on no change, preferences for stores with larger selections
Table 6-7. Changes in consumer preferences for the four store attributes.

<table>
<thead>
<tr>
<th>Quantified Change in Preference</th>
<th>Interpretation of Change in Preference</th>
<th>Proportion of Respondents Indicating Specified Degree of Change in Store Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Large Selection / Low Prices</td>
</tr>
<tr>
<td>4</td>
<td>very large increase</td>
<td>.00</td>
</tr>
<tr>
<td>3</td>
<td>large increase</td>
<td>.03</td>
</tr>
<tr>
<td>2</td>
<td>moderate increase</td>
<td>.16</td>
</tr>
<tr>
<td>1</td>
<td>small increase</td>
<td>.18</td>
</tr>
<tr>
<td>0</td>
<td>no change</td>
<td>.42</td>
</tr>
<tr>
<td>-1</td>
<td>small decrease</td>
<td>.11</td>
</tr>
<tr>
<td>-2</td>
<td>moderate decrease</td>
<td>.04</td>
</tr>
<tr>
<td>-3</td>
<td>large decrease</td>
<td>.06</td>
</tr>
<tr>
<td>-4</td>
<td>very large decrease</td>
<td>.00</td>
</tr>
</tbody>
</table>

Median degree of change 0 0 -1 0
Mean degree of change .22 -.30 -.55 -.30
Significance of change (1-tail) .44 .31 .33 .35
Figure 6-4. Changes in consumer preferences for the four store attributes.
and lower prices is the second most changed preference. The distribution features a strong skew to the right indicating more respondents had an increased rather than decreased preference for this store attribute. 37 percent indicated an increased preference for this attribute compared with 21 percent indicating a decreased preference. The vast majority of change, however, is only small to moderate.

Changes in preference for facilities which fostered multi-purpose shopping have a slight left skew as 26 percent of respondents indicated that preferences for such facilities had decreased. Nearly 80 percent of those that did report a decreased preference indicated this change is only small. The remaining 20 percent indicated it is only moderate. Only 2 percent indicated that their preference for such an attribute had increased but all such increases are small. With 72 percent of respondents indicating no change, preferences for this attribute are the least changed.

Respondents indicated that their preferences for stores that facilitated comparison shopping were the most changed. The median degree of change for this preference was -1 -- a small decrease. 52 percent of respondents indicated that preferences for this attribute had decreased to some degree compared with 14 percent who indicated it had increased. Slightly more than a third indicated no change. What change there was, however, was only slight. The difference in responses to the two questions in this set did not suggest anyone had a very large change in preferences and less than 10 percent indicated a large change. Over 75
percent of responses were spread between a small increase, no change, or a small
decrease with 15 percent indicating a moderate change.

Only 6 percent of respondents indicated that their preferences for stores
located close to their home or work had increased while three times as many
indicated they had decreased. Nearly two thirds, however, indicated no change in
this preference. No large or very large changes were detected with over three
fourths of responses being between a small increase, no change, or a small decrease.
Only 14 percent indicated a moderate change with most of these being towards a
decreased preference.

One-tail t-tests on the mean degree of change were used to determine the
significance level of the noted changes. The mean was calculated as the average
difference between responses to the two questions in each of the four sets using the
above scoring. These mean scores are reported in Table 6-7. The absolute values of
all mean scores are between 0 and 1 indicating that, on average, the changes in
preferences for respondents were somewhere between a small and zero change. The
one-tail significance of these mean scores are reported below the means in Table 6-7.
Though some change in preferences are noted, and the degree of change varies
between the different store attributes, none of these changes differ from 0 at any
reasonable level of significance.

We are left to conclude that consumers have not changed their preferences
for any of the store attributes to any significant degree. It is interesting to note, however, that what little changes in preferences are noted are for the characteristics of the retail structure that is emerging. Consumers indicate an increased, but not significant, preference for facilities with larger selections and lower prices -- the single most distinguishing characteristic of value retailers and the growth in the size of establishments noted in the empirical analysis. They also indicate a slight, but again not significant, decrease in preferences for stores located so as to facilitate comparison or multi-purpose shopping between stores. The change in retail structure to a pattern in which stores are increasingly in independent locations or in clusters that do not function in a unified manner would reflect such a change in preferences. The slight, non significant, decrease in preferences for stores located close to respondents' homes or workplaces is in further agreement to the pattern of fewer, more dispersed retail opportunities also marking the value retail revolution. That none of these changes is near significant, however, indicates they are not the cause for the changes in retailing noted. The fact that the small changes demonstrated support the new structure of retailing suggests that consumers tended to report changes in their preferences that reflect changes in their shopping behavior. It is clear, however, that it is not changes in preferences that have caused this behavioral shift.
Summary

The ability to realize scale economies was demonstrated, in Chapter 6, to be one of the primary mechanisms responsible for the growth in size of retail establishments. The analysis here, demonstrating the attainment of scale economies, supports the contention that retail structural change has been due largely to shifts in the cost structure of retail outlets. Prior to 1992, a growth in firm size was met with an increase in costs that was more than proportional to the growth in size. Between 1992 and 1997, this situation changed as retailers were able to grow their stores more rapidly than costs would increase. And, while it is not the purpose of this research to determine why cost structures have changed, the ability to realize economies of scale is most likely due to the increased adoption of technologies by retailers. The use of inventory control, automated check-out, and merchandise return systems, for example, help retailers control their operations as they grow to large proportions. Furthermore, it is likely that establishments must be of a certain size before the use of these technologies can be justified.

The locational patterning of value retailers first leaned towards independent, freestanding locations. The more recent dynamic has involved these retailers clustering together into purpose built value or power centers or simply clustering in existing shopping districts. This is an interesting development because, while firms are clustered in close proximity to one another, the layout of the clusters does not
promote shopping between stores. Thus, while the clustering might suggest a locational pattern that promotes multi-purpose or comparison shopping, the arrangement of stores within the clusters does not foster such consumer behavior. Stores are close to one another but there is little to help consumers move between them. In addition, the types of stores in the clusters suggest that few linkages between them exist. The results of the analysis in this chapter indicate that such patterning is more expensive as well. However, the extra costs associated with such locations have fallen in the later parts of this decade when the clustering pattern became pervasive. This indicates that the relatively minor benefits, such as exposure and prominence, that value retailers receive from agglomeration are enough to justify a clustered pattern.

These two findings indicate that there has been enough change in firm costs alone to explain the recent dynamics. It was also these cost structures that were found, in a theoretical sense, to be most responsible for the observed dynamics. The alterations to retail structure, however, have necessitated that consumers adopt their behavior to suit the new retailing. This behavior can change independent of consumer preferences because consumers trade off between different store attributes. While the value retailing revolution has changed consumer behavior, the analysis of changes in consumer preferences indicates that preferences have not been significantly altered. Value retailers have achieved success, and altered the structure
of metropolitan retailing, within the constraints of static consumer preferences.

1 Due to processing needs, Census of Retail Trade reports are issued incrementally following the Census year. The 1997 edition of the specific report used for the years 1977-1992, "Establishment and Firm Size," is not due for release until the 3rd Quarter of 2000.

2 All sales figures were adjusted to 1977 dollars based on the Consumer Price Index (CPI) average for the relevant year.

3 A minimum level of employment must be maintained independent of sales levels. Most notably, employees engaged in activities not directly related to sales such as maintenance and management.


5 Following calibration, \( \delta_1 \) was computed by taking the exponential of the intercept term.

6 All establishments with payroll and that operated the entire year are included.

7 For example, the Home Depot, a big-box format pioneer, has increased the size of the new stores it open by an average of 4 percent each year during the 1990s.

8 This survey of shopping center operators was conducted every three years until 1993. Commencing in 1995, the study became a semiannual publication.

9 All rent figures were adjusted to 1977 dollars based on the Consumer Price Index (CPI) average for the relevant year.

10 Following calibration, \( \delta_1 \) was computed by taking the exponential of the intercept term.

11 This is proven in the subsequent section.
CHAPTER 7: Conclusions

Overview of Research

This study utilized a three stage research process to understand the structural change in retailing that has occurred as a result of the value retail revolution. The first stage of this research, discussed in chapters 3 and 4, detailed the nature of this structural change. Structure was examined in terms of the characteristics of retail establishments and the locations in which they chose to locate. The second stage focused on exploring possible mechanisms for the observed structural dynamics as covered in chapter 5. Attention was focused on a set of parameters describing the preferences of consumers and cost structures of retail outlets. These costs were both operational and locational in nature. In chapter 6, the third and final research stage validated these mechanisms using a diverse set of methods used to examine changes in consumer preferences and firm costs.

In this concluding chapter, we highlight the major findings of the research. In the next section we build our conclusions as we examine the three separate research components individually. The final section of the chapter then provides guidance for future work in this particularly dynamic area of research.
Summary of Findings

The approach to examining the nature of the value retailing revolution involved a cumulative research process. We first detailed the characteristics of retail change by examining the growth of value retail activities, evaluating their competitive impacts upon traditional retailers, and then tracing the evolution of spatial structure resulting from their emergence. We highlight the findings of this research below under the heading Structural Dynamics. Following this discussion, the section Modeling Structural Change, provides an overview of the mechanisms that were identified as being the most likely candidates for causing the structural dynamics. The findings regarding empirical evidence for these mechanisms are then discussed under the heading The Forces of Change.

Structural Dynamics

In the analysis of eight sample retail sectors a diverse set of structural changes were noted. These were due in part to varying degrees of intrusion by value retailers into the sample sectors. The department store sector has been the most dynamic sector and also has seen the greatest intrusion by value retailers. The once mall dominated pattern of traditional department stores has been broken by the spread of discount and discount clothing oriented department stores. Where the former avoid both mall locations and each other, the latter have replaced traditional
department store retailers as the anchors of malls. In so doing, the very nature of some malls has been changed as they have reformatted into hybrid and value oriented centers. The decline of the traditional department store has been accompanied by the decline of the traditional mall. Consolidation in the San Diego study region has been the norm since 1987 as department store chains have failed and mall anchors lost. This has polarized mall activity into fewer traditional centers which have sought to increase their attractiveness to compete in the value retail marketplace. Those that have not been the foci of this polarization continue to decline while others have had to reformat all together into value oriented retail centers.

The furniture sector is the antithesis of the department store sector. The furniture sector has not witnessed the large scale intrusion of chain operated big-box stores. Whereas the Levitz chain was an early big-box pioneer in retailing, this furniture giant remains on the edge of solvency today and its once dominating format no longer succeeds in the marketplace of the 1990s. As the most shopping oriented of the sample retail sectors, it is interesting to note the relative lack of dynamism with regards to furniture store size. Big-box format stores enhance shopping opportunities by offering consumers a selection of merchandise not possible in traditional stores. Furniture, however, is so shopping oriented that big-box format stores still do not offer enough shopping opportunity. Instead, this consumer predilection has led to unparalleled levels of agglomeration among furniture retailers.
Enormous districts of furniture stores have grown through the study period to serve
different regions within the metropolis. Big-box retailing can offer advantages over
individual furniture stores but not over the clusters that have evolved.

Change in the remaining six sample sectors has occurred in various degrees
with the level of change being related to varying levels of value retail intrusion.
Excluding furniture and department stores, dynamics have been greatest in the more
shopping oriented sectors. In the early years of the study period, home electronics
dealers, like furniture stores, clustered together to enhance consumer shopping
opportunities. This sector saw the earliest intrusion of value retailers. Not only have
these eliminated a majority of the traditional home electronics dealers but they have
also greatly altered the locational pattern of stores. By gathering a huge selection of
merchandise and offering it with low price guarantees, big-box home electronics
stores have negated the need for consumers to comparison shop. Clustering of firms
is no longer of significance and the locational pattern has evolved to reflect this.
Some agglomeration between the value retailers in this sector is noted but this is due
to predatory tactics on the part of a single chain.

Stationers/office supply dealers, book stores, home electronics dealers, and
sporting goods dealers represent the middle ground between shopping and
convenience oriented. Despite similar orientations and levels of intrusion by value
retailers, dynamics within these sectors are as varied as the individual stores
comprising them. Value retailers have altered the locational pattern of
stationers/office supply dealers from one of concentration to dispersion. Traditional
retailers of office supply products have survived only in locations isolated from big-
box stores or in areas where demand is sufficient to support both value and
traditional retailers side by side. In most cases, however, value retailers have
eliminated their smaller competitors at rates directly related to the proximity of these
traditional stores to the big-box competition. In the book and sporting goods
sectors, conversely, traditional retailers located close to value retailers have thrived
but for different reasons. Among sellers of books, stores located in the same general
area as value retailers have survived the onslaught of big-box stores by simply being
positioned in the same thriving areas which value retailers chose for their store
locations. This pattern exists among sporting goods dealers as well but the evidence
suggests that traditional retailers are benefiting from the drawing power of sporting
goods giants. By either intercepting customers headed for big-box stores or
satisfying their needs after the value retailer could not, traditional sporting goods
stores have thrived in locations nearby big-box stores.

The most convenience oriented sample sectors, supermarkets and drug
stores, have seen the least intrusion by value retailers and the least significant
dynamism. Already dynamic and highly competitive sectors, the pattern of
supermarkets and drug stores experienced the greatest degree of locational change
before value retailers emerged in their sectors. Additionally, it could be argued that these sectors saw the earliest intrusion of value retailers as what are considered traditional supermarkets and drug stores were big-box pioneers in decades prior to the time covered by this study. This notwithstanding, recent years have seen the emergence of even larger, more discount oriented players in the food and drug business. Their arrival, however, caused far fewer changes than the predatory tactics of traditional stores did prior. Overall, the relatively few value retail oriented stores in these two convenience oriented sectors have merely fit into, rather than alter, the pattern of stores.

How the value retail stores in different sectors have chosen to position themselves with respect to each other has also been quite extraordinary. Intersectoral dynamics, resulting from spatial affinities, have evolved along with the retail revolution. Early value retailers assumed locations that were freestanding and independent of one another. As one-stop shopping destinations, there is little justification for paying the premiums associated with locations that integrate them into shopping centers with other retailers. In light of this, the last five years of the study witnessed a remarkable change as value retailers clustered together in both existing retail districts and purpose built value oriented centers. Seemingly unrelated value retailers have grouped themselves together to such a degree that clustering rather than dispersion of big-box stores is the norm. Examination of these clusters,
however, indicates that relationships between these retailers are weak. Even in the
purpose built centers, the layout of stores does not foster pedestrian movement
between the different establishments as they are separated by parking lots and drive-
ways. The benefits they receive are indirect. Exposure, prominence, and the
availability of suitable space are the main benefits provided by such locations. Still,
this is enough to lead to the overwhelming clustering tendencies noted.

The only instance in which affinities between stores appear to be more
traditional in nature is among discount clothing oriented department stores who are
more likely to occupy locations which foster comparison shopping between
competing stores. These linkages extend to other shopping goods stores as
evidenced by their locations nearby traditional and discount department stores.
Clearly, however, they are not as dependent upon these links (as traditional
department stores have become) since they occupy a diverse set of different
locational types including free standing locations. In some cases, however, their clustering has created opportunities for shoppers much in line with traditional malls.
In one such instance, these retailers have assumed the role of anchors in a value
centers that once served as traditional shopping malls. With the exception of
discount clothing oriented stores, however, value retailers have displayed a marked
tendency to seek locations away from big-box stores in the same sectors. Clustering
of big-box stores is great but rarely do these clusters include multiple stores in the
same retail sector.

While the value retail revolution has been treated as a single trend sweeping across the retail industry as a whole, it is clear that the nature of the dynamics experienced in individual sectors are as unique as the sectors themselves. The adoption of similar format stores in different sectors does not result in the same outcome. In general, the nature of the dynamics in any one sector are related to the shopping versus convenience orientation of the goods sold by each sector’s retailers. Shopping oriented sectors have been more greatly affected than convenience oriented sectors. Excluding the furniture sector, more value retailers have entered the shopping goods oriented sectors and the locational dynamics in these sectors have been the greatest dynamism accordingly. The value retail revolution, so characterized by the emergence of big-box format stores has demonstrated a distinct locational regularity as well -- the clustering together of dissimilar big-box stores.

Modeling Structural Change

With the value retail revolution characterized by the growth in the size of individual establishments and the clustering together of dissimilar big-box stores, the model of chapter 5 allowed us to investigate what mechanisms might be responsible for this dramatic shift in retail structure. By expanding the model developed by Harris and Wilson (1978) and extended by Fotheringham and Knudsen (1986), we
were able to investigate a much richer set of retail dynamics than previous research. Recasting the problem of rapid change in retail structure to one in which the variables describing this structure are examined in terms of their asymptotic values allowed us to better understand how changes in consumer preferences and firm costs can alter retail structure.

Examination of the structural influences of the individual parameters describing these preferences and costs pointed towards the most likely mechanisms responsible for the individual characteristics of the observed dynamics. In general, consumer preferences have a secondary role to firm costs. Though retail structure must adapt to the needs of consumers it can take on many forms while serving the same set of consumer preferences. The tradeoffs between the selection, price level, proximity, and relative location of retail outlets allow firms to mimic these characteristics and still serve consumer needs under fixed preferences. Behavior can change independent of preferences because of these tradeoffs. The numerical experiments and locational problems indicate that firms, more than consumers, dictate the structure of metropolitan retailing.

The ability of retailers to realize scale economies is much more likely to increase the size of facilities than is an increase in consumer preferences for larger facilities. This is particularly true when the cost of travel is low, as is typical in the U.S. metropolitan system. Consumers are always willing to make a tradeoff between
the price and selection of a store and that store's proximity to them. Changes in their
willingness to make this tradeoff are far less significant to retail structure, however,
than are firm's abilities to offer them stores with larger selections and lower prices.

Locational dynamics similarly point to the importance firm costs play in
shaping retail structure. Firms can assume locations that facilitate comparison or
multi-purpose shopping but must pay a premium to do so. Rent structures have
evolved to reflect that such locations are favorable to consumers. Changes in these
rent structures, however, are much more likely to alter locational behavior than are
alterations to consumer preferences for different types of relative store locations.
Intuition suggests that consumers always prefer stores that facilitate their ability to
comparison or multi-purpose shop. Whether or not these preferences increase or
decrease in importance, however, is secondary to the premium stores must pay to
facilitate them. The numerical experiments and locational problems demonstrate the
omnipotence of retailers. So long as their offerings fit within the constraints imposed
by consumer preferences, they can adapt locational behavior to best suit their needs.

While these point towards the most likely determinants of the individual
characteristics of retail structure, these characteristics are highly intertwined. For
example, changes in the size of retail establishments will affect their locations.
Because the retail floorspace needed to serve a finite population is fixed, increasing
the size of establishments will mean that less establishments are required. If there are
less establishments, they will necessarily be more widely spaced with respect to each
other and the population they serve. Additionally, desires to comparison shop can be
negated by large stores with diverse selections and low prices.

In light of these interdependencies, it is important to examine how parameters
describing consumer preferences and firm costs interact simultaneously. Locational
problems involving multiple parameters shifts point towards the most likely causes
for a change in retail structure to a pattern where clusters of large, dissimilar firms
dominate. If travel costs are relatively low, slight preferences towards multi-purpose
shopping and a general indifference to comparison shopping can lead to such a
pattern. Locational and size characteristics are not independent and changes in
locational preferences and costs alone can result in radical size changes. Similarly,
though we found through the numerical analysis and single parameter location
models that decreasing operational costs and an increased ability to realize scale
economies are the most likely candidates for rapid increases in firm size, changes in
locational preferences and costs alone can result in radical size changes.

Though these simulations pointed towards the complexity of retail structure
they provided a narrowed down set of possible reasons for the observed structural
changes. They demonstrate that structural form is more firm than consumer driven.
Abilities to realize scale economies are more likely to lead to increases in store size
than are increasing consumer preferences for large stores. If firms are able to assume
positions which foster multi-purpose or comparison shopping without paying too high a premium to do so this will cause a greater degree of store clustering than will a similar change in consumer preferences for such facilities. These findings force us to remember that the purpose of retail structure is not just to serve the needs of consumers but also to generate profit for retail operators. So while “the consumer is king” it is clear that he is susceptible to the whims of his court.

The Forces of Change

The modeling endeavors suggested the important link between firm costs and retail structure. Tradeoffs between the various economic and spatial characteristics associated with consumer preferences allow stores to assume a myriad of size and locational attributes and still fulfill their needs. Stores seek to balance this fulfillment with their own profit minded objectives. The results of the model simulations indicate that changes in the way firms meet this objective are more likely to result in the retail structural dynamics observed than are changes in how consumer needs are fulfilled.

The analysis of Census of Retail Trade data indicated the attainment of scale economies by firms between 1992 and 1997. We must note that, because these data are aggregated, this does not mean that all retailers realized these economies in this period. Nor does it mean that no retailers realized them prior. It does indicate that
their realization was much greater in 1997 than at any prior time in the study period. Before scale economies became pervasive, a growth in establishment size led to a more than proportional increase in costs for most firms. When most firms became able to increase their size and pay a shrinking per unit cost in exchange it became an incentive to increase firm size. This ability to realize scale economies was shown in the numerical simulations to be the most likely mechanism responsible for rapid size increases.

A decreasing penalty for increasing size first manifest itself between 1987 and 1992 and sometime after 1992 this penalty became a reward as scale economies were attained. This corresponds with the emergence of the value retail revolution which gained steam through the late 1980s and early 1990s before reaching a feverish pace of growth in the mid to late 1990s. The pace of growth has not subsided as the U.S. heads towards the millennium and based on the cost structure of firms in 1997 this growth is not likely to stop.

Value retailers have typically been characterized by their large size but it is evident from this research that they also have some distinct locational regularities as well. Their locational pattern at first indicated a preference for freestanding, independent locations. It the 1990s, however, they began to agglomerate into distinct clusters. But while they grouped themselves together there is little to suggest they gain traditional agglomerative advantages from doing so. The clusters
are not integrated to facilitate shopping between stores and the types of stores found in the clusters do not complement one another in any perceptible way. In many cases, the clustered retailers' target markets are even very different. For example, office supply superstores go after the dollars of small businesses while neighboring home electronics superstores seek the business of household based consumers.

Through the locational simulations we demonstrated that such clustering could occur for many reasons. Though consumer preferences for such agglomerations could lead them to cluster it was the ability of firms to agglomerate and not pay a large premium for doing so which was the most likely cause. Even if consumers only have slight preferences for such a pattern firms will cluster if they don't have to pay too much for the right. The analysis based on shopping center rent data indicates that the extra costs associated with such locations have fallen in the later parts of the 1990s. The costs have decreased enough that the relatively minor benefits, such as exposure and prominence, that value retailers receive from agglomeration are enough to justify a clustered pattern.

The changes in the cost structures of firms that were found to best explain the dynamics associated with the value retail revolution have manifest themselves in the Census and ULI data. It was shown that consumer preferences did not have to change favorably towards the characteristics of this new retail structure in order for it to exist. Alterations in the way firms assume costs are alone enough to lead to the
profound changes which have occurred. Consumer behavior can adapt to this change without consumers having to change the nature of their preferences.

The analysis of changes in consumer preferences indicates that, in fact, consumers have not altered their preferences. Consumers report no significant change in their preferences for facilities with larger selections/lower prices, that are closer to their home or work, or that promote multi-purpose or comparison shopping. They have changed their behavior -- the success of superstores attests to this -- without changing their preferences. What small changes are noted, however, do lean towards the characteristics of the new retail structure. Value retailers have altered the structure of retailing working within the constraints of static consumer preferences.

Directions for Further Research

Value retailing has been characterized as a single homogeneous trend sweeping across the metropolitan United States. The big-box, and in particular, category killer format has proven a successful means to sell almost every type of retail good. In addition to those sectors addressed in this research, big-box stores have come to dominate the selling of such diverse products as pet supplies, shoes, linens, home improvement/building materials, and toys. Each year it seems an additional sector becomes subjected to the invasion of superstores. But while it is
easy to view the homogeneity in this trend the results of this research indicate the
great heterogeneity that actually exists between sectors.

In this research we sought generalizations of this trend and were successful in
identifying the regularities and explaining their causes. It was necessary, however, to
also address the differences observed between the sample sectors. This was done by
examining the sectors in terms of their orientations towards the selling of shopping
versus convenience goods. It is clear that superstores foster comparison shopping
and as such the more shopping oriented sectors have been the most affected by the
value retail revolution. And while this rationalization holds in a very general sense
there are inconsistencies. The most obvious is the furniture sector. Based on this
shopping-convenience dichotomy this most shopping oriented of the sample store
types would be expected to have been heavily affected by the entrance of
superstores. In fact, however, it was the least. We rationalized this by arguing that
the furniture sector is too shopping oriented and thus superstores can not provide the
same level opportunity to comparison shop as clusters of multiple establishments.
The patterning of stores clearly bears this out.

Additionally, stores within the middle range of the shopping to convenience
goods dichotomy displayed similar levels of superstore intrusion but the effects of
this differed substantially between them. So while it is clear that understanding the
effects of the value retailing revolution upon a sector can be aided by examining its
shopping versus convenience orientation, there is still much variation which this can
not explain. This additional variation may be due solely to the individual attributes of
the firms in each sector. Due to the pervasiveness of chain operators, each sector is
dominated by only two or three firms. Whatever the case, it is clear that more
research is needed to explain differences in the value retail revolution between
sectors.

This research is national in scope but draws many of its conclusions using
empirical research conducted solely in the San Diego MSA. In particular, the
empirical analysis of structural dynamics and the query of consumer preferences were
confined to this study area. An important question is just how well San Diego
represents the rest of the United States. In general, San Diego and the rest of
Southern California tend to be culturally progressive. Not only is it the home to
many retail innovations (such as warehouse clubs) but many retailers target the area
early in their expansion efforts because it is an important market in both an economic
and image sense. In light of the still evolving nature of the value retail revolution,
studying the San Diego market allows us to be at the forefront of change. A few
caveats about the region bear mentioning however.

Though shopping primarily serves consumptive needs it also has a
recreational component. Regional malls are an attraction to weekend and evening
shoppers. The growing addition of food venues and entertainment activities to these
centers bears this out. The San Diego area may be seen as atypical in this respect
due to the prevalence of alternative recreational opportunities. Climate controlled
regional malls likely represent a greater attraction to a Minneapolis resident than a
Southern Californian. The decline of the mall and growth of freestanding big box
stores, however, is a phenomenon which has affected all parts of the country.
Perhaps the greatest dynamism has been experienced in places like San Diego but it
is far from limited to it.

San Diego is unique from other places additionally because its influence as a
shopping destination extends across the U.S. border. The border crossing between
San Diego and Tijuana, Mexico is the busiest in the world with many Mexican
citizens crossing the border to enjoy the shopping opportunities of the San Diego
area. This, however, is confined largely to the area immediately adjacent to the
border itself. Additionally, many of the big box stores of prevalence in this research
have pioneered the Mexican market with stores just across the border from San
Diego negating transborder effects within San Diego. The influence of Mexican
money upon San Diego retailing is not substantial.

All regions have their idiosyncrasies but we feel San Diego to be
representative of national change. This notwithstanding, an important area for future
research on is regional variations in retail change. The retail types characterizing the
value retail revolution have populated the entire nation. Their prevalence does,
however, vary due to the different expansion patterns of firms and variations in regional preferences (c.f. Graff 1998). The 1997 Census of Retail Trade will be one fruitful source for determining variations in these retail dynamics.

Another area where additional research is needed is determining the social impacts of this retail structural change. We have assumed throughout this research that consumer behavior has changed because of the observed structural dynamics. We have argued that consumers must travel further, on average, because stores are fewer and farther between. Additionally, comparison shopping opportunities have been greatly reduced by the replacement of many traditional stores by superstores. The nature of this change must be detailed if the full impacts are to be known.

In a sense, the value retail revolution has transferred transport costs from retailers to consumers. Consumers must travel longer distances while retailers need to transport goods to fewer stores. It has been argued that consumers will assume this greater travel burden in exchange for the greater selection and lower prices offered by big-box retailers. Perhaps this transfer was successful because the small increase in costs to millions of individual consumers is less tangible than a large decrease in costs to just a few retailers. In response to this transfer, however, it is likely that consumers have responded by also shopping less often. The buying of goods in bulk at supermarkets and warehouse clubs points to this. But for more shopping oriented goods such as electronics or clothing this is a less feasible
alternative. Much attention has been focused on the transfer of costs from retailers to producers (cf. Ducatel and Blomley 1990) but more attention clearly needs to be addressed at the consumer side of this structural revolution.

While this research addresses the fundamental questions arising from the value retail revolution there clearly are details remaining to be addressed. The identification and explanation of structural change in this research is but one element in a more complex urban dynamic. Retail activities have long been recognized as a catalyst for the development of other metropolitan land uses. The spatial patterns of land use exhibited in metropolitan areas today owe much to the suburbanization of retail activities and subsequent development of regional malls which typified the post war period. The structural change resulting from the value retail revolution likely has far reaching implications for other types of urban land uses.

At a larger scale, retailing is but one function in an increasingly complex world economy. The search for scale efficiencies has led to the exportation of American retailing to foreign lands and greater international linkages between the producers, sellers, and consumers of goods. Simultaneously, new means of selling, such as e-commerce, create alternative means for consumers to obtain the necessities and luxuries of life. This research has shown the dynamism within the U.S. retail industry but it is an equally important task for future researchers to further understand the dynamic role of retailing in the world economy.
BIBLIOGRAPHY


Berry, B.J.L. (1963) Commercial structure and commercial blight Research Paper No. 85 Department of Geography, University of Chicago


Berry, B.J.L. (1973) Growth Centers in the American Urban System Cambridge, MA: Ballinger

Berry, B.J.L. and W.L. Garrison (1958) A note on central place theory and the range of a good *Economic Geography* 34:304-311


319
Environment and Planning A 16:185-200

Church, R.L. and T.L. Bell (1990) Unpacking central place geometry 1: single level theoretical k systems Geographical Analysis 22:95-115

Clarke, G.P., M. Clarke and A.G. Wilson (1985) Multiple bifurcation effects with a logistic attractiveness function in the supply side of a service system Sistemi Urbani 7:43-76


Copeland, M.T. (1923) Relation of consumer’s buying habits to marketing methods Harvard Business Review 1:282-289


Garner, B.J. (1966) *The Internal Structure of Retail Nucleations* Northwestern University Studies in Geography, Number 12, Evanston IL: Northwestern University


Germeroth, E.A. (1992) They won't shop till they drop *Bobbin* 34:64-68


322


Greenberg, B. and D. Bellenger (1974) The classification of consumer goods: an empirical study Research Monograph No. 56, School of Business Administration, Georgia State University, Atlanta


323


Lerner, A.P. and H.W. Singer (1937) Some notes on duopoly and spatial competition *Journal of Political Economy* 45:


324


326


Saey, P. (1973) Three fallacies in the literature on central place theory Tijdschrift voor Economische en Sociale Geografie 64:181-194


Simmons, J.W. (1964) The Changing Pattern of Retail Location Research Paper #92, Department of Geography, The University of Chicago


Thom, R. (1975) *Structural Stability and Morphogenesis* Reading, MA: Benjamin


von Thunen, J.H. (1826) *Der Isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie, I. Teil* Hamburg:Perthes

Webber, M.J. (1972) *Impact of Uncertainty on Location* Cambridge, MA: MIT


Wilson, A.G. (1981b) Some new sources of instability and oscillation in dynamic models of shopping centres and other urban structures *Sistemi Urbani* 3:391-401


APPENDIX

A) Survey Dialogue
B) Survey Form
Survey Dialogue

Good evening, my name is _____________. I am a researcher in the Department of Geography at San Diego State University. How are you?

I am conducting a brief survey in order to better understand recent changes in the retail environment and would like to include your responses. The survey is completely anonymous and should only take approximately 3 minutes. Once we are done nothing further will be asked of you. Would you like to participate?

No thank you for your time anyway  End

Yes let me provide you with some background information and instructions

In recent years the nature of retailing in the United States has changed dramatically. This has involved the growth of large format, or ‘big-box’ stores. Compared with smaller retailers these big-box stores offer both advantages and disadvantages to consumers. The advantages include a larger selection and lower prices. The disadvantages include a need to travel farther and longer to shop. Your participation will help to determine how consumers trade off between these advantages and disadvantages as well some other related factors.

I am going to read you four sets of statements. I ask that you indicate the extent to which you agree or disagree with each statement I read.

In each set, the first statement will refer to the present and the second to the past. What “past” means is up to you. For example if the first statement is “I prefer Bugs Bunny cartoons”, the second statement will be “I have always preferred Bugs Bunny cartoons”. Please consider this when indicating your responses.

Let’s begin.
Survey Form

Set 1
a) I prefer to shop at stores which have a large selection and low prices.  
   1. definitely agree  
   2. somewhat agree  
   3. don't agree or disagree  
   4. somewhat disagree  
   5. definitely disagree  

b) I have always preferred to shop at stores which have a large selection and low prices.  
   1. definitely agree  
   2. somewhat agree  
   3. don't agree or disagree  
   4. somewhat disagree  
   5. definitely disagree

Set 2
a) I prefer to shop at stores located close to other types of stores because it fosters multi-purpose shopping.  
   1. definitely agree  
   2. somewhat agree  
   3. don't agree or disagree  
   4. somewhat disagree  
   5. definitely disagree  

b) I have always preferred to shop at stores located close to other types of stores because it fosters multi-purpose shopping.  
   1. definitely agree  
   2. somewhat agree  
   3. don't agree or disagree  
   4. somewhat disagree  
   5. definitely disagree

Set 3
a) I prefer to shop at stores located close to the other similar stores because it fosters comparison shopping.  
   1. definitely agree  
   2. somewhat agree  
   3. don't agree or disagree  
   4. somewhat disagree  
   5. definitely disagree  

b) I have always preferred to shop at stores located close to the other similar stores because it fosters comparison shopping.  
   1. definitely agree  
   2. somewhat agree  
   3. don't agree or disagree  
   4. somewhat disagree  
   5. definitely disagree

Set 4
a) I prefer to shop at stores that I do not have to travel long distances to get to.  
   1. definitely agree  
   2. somewhat agree  
   3. don't agree or disagree  
   4. somewhat disagree  
   5. definitely disagree  

b) I have always preferred to shop at stores that I do not have to travel long distances to get to.  
   1. definitely agree  
   2. somewhat agree  
   3. don't agree or disagree  
   4. somewhat disagree  
   5. definitely disagree