

An Empirical Mega-Analysis of Retail Locations: Value Platforms, Real-Estate Maturity,
and Deployment Decisions

by

Lawrence Joseph

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Graduate Supervisory Committee:

Michael Kuby, Chair
Breandán Ó hUallacháin
Richard Matthews
Ajith Kumar

ARIZONA STATE UNIVERSITY

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ABSTRACT

The objective of this dissertation is to empirically analyze the results of the retail location decision making process and how chain networks evolve given their value platform. It employs one of the largest cross-sectional databases of retailers ever assembled, including 50 US retail chains and over 70,000 store locations. Three closely related articles, which develop new theory explaining location deployment and behaviors of retailers, are presented. The first article, “Regionalism in US Retailing,” presents a comprehensive spatial analysis of the domestic patterns of retailers. Geographic Information Systems (GIS) and statistics examine the degree to which the chains are deployed regionally versus nationally. Regional bias is found to be associated with store counts, small market deployment, and the location of the founding store, but not the age of the chain. Chains that started in smaller markets deploy more stores in other small markets and *vice versa* for chains that started in larger markets. The second article, “The Location Types of US Retailers,” is an inductive analysis of the types of locations chosen by the retailers. Retail locations are classified into types using cluster analysis on situational and trade area data at the geographical scale of the individual stores. A total of twelve distinct location types were identified. A second cluster analysis groups together the chains with the most similar location profiles. Retailers within the same retail business often chose similar types of locations and were placed in the same clusters. Retailers generally restrict their deployment to one of three overall strategies including metropolitan, large retail areas, or market size variety. The third article, “Modeling Retail Chain Expansion and Maturity through Wave Analysis: Theory and Application to

Walmart and Target,” presents a theory of retail chain expansion and maturity whereby retailers expand in waves with alternating periods of faster and slower growth. Walmart diffused gradually from Arkansas and Target grew from the coasts inward. They were similar, however, in that after expanding into an area they reached a point of saturation and opened fewer stores, then moved on to other areas, only to revisit the earlier areas for new stores.

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1. Introduction

1.1 Background

The objective of retailing in a capitalistic economic system is to supply items that consumers demand, with profit maximization being part and parcel. Retailing is a complex business, however, especially given its dynamic structure. As consumer needs and preferences evolve, they have become increasingly differentiated. For example, differences in income, family or household structure, employment, age, areas of in- or out-migration, proximity to recreational activities, and more affect consumer demand and the preference for store types (Vias 2004; Carpenter and Moore 2006; Gonzalez-Benito et al. 2007). Also, the evolution of markets, technology, and the overall economy affect where and how people shop. In addition, many retailers are publically traded companies, and stock prices generally rise when retailers are opening new stores (Serpken and Tigert 2006).

Given the pressure to grow, and the increasing differentiation among consumers, the retail marketplace experienced a proliferation of different types of chain stores selling different types of merchandise diffusing over space. Each retailer has a unique value platform (see Table 1.1 for definition of this and other key terms). The value platform encapsulates all aspects of the consumer experience with the retailer. In the early twentieth century, department stores were abundant, and many were in central business districts (CBDs), accessible to mass transportation systems (Padilla and Eastlick 2009). The advent of the automobile and population shifts to lower density neighborhoods led to retailers moving from the CBDs to suburban shopping centers and malls in the 1960s

(Craig et al. 1984). Discount department stores like Target and Walmart spread across the US during the 1970s and 1980s (Joseph 2010). These two chains provide an example of competitors with different value platforms (Walmart with its everyday low prices vs. Target as an upscale discounter). In the 1990s, category killers became a dominant participant in the retail landscape, often choosing to locate with other category killers and a larger anchor tenant in power centers. Their growth is attributed to price advantages due to the economies of scale and relationships with vendors, as well as offering a better customer experience because of merchandise mix, ease of parking, service, and the opportunity for multi-purpose shopping in power centers, as well as other factors (Hernandez et al. 2004). Other formats were also quickly developing from small niche retailers to large warehouse chains like Costco. In the 2000s, e-commerce became increasingly competitive with traditional brick and mortar stores (Brynjolfsson et al. 2009). Although the previous discussion only highlights a few relevant but influential changes to the structure of retailing, the types and locations of contemporary retail stores are a result of this evolution.

With each new store, a retailer had to support the decision on why it was in its best interest to deploy at a particular site at a particular moment in time. Most retailers open new stores to grow or protect sales or market share. Ideally, the decision maker that is accountable for real estate deployment within the retail organization approves locations that are consistent with its value platform. For example, chains like Toys “R” Us may target areas near households with discretionary income and the presence of children. Depending on the value platform, there are a discrete amount of potential locations for

deployment that can support the sales thresholds of the stores. Rational behavior suggests that a retailer that desires to grow, and is in a financial position to do so, will continue to open new stores in sites that best fit its value platform if they can generate an acceptable level of profitability. Over the life of the business, these individual decisions form a chain network, or a distribution of stores over space. Geographers are renowned for studying distributions of market centers and retail stores, with considerations given to size and type of products offered. Depending on the type of retailer involved, the opportunities for growing the business through new store deployment may be affected by the general laws of retail geography, such as establishing a limit on how many stores of a certain type can be situated in a region, or whether a trade area can support the deployment of a particular type of store.

Table 1.1. Retail Terms

Term	Meaning
Category Killer	A specialist that offers a focused line of merchandise but with a vast assortment and generally low prices, thus differentiating itself from the competition and making it challenging for the presence of multiple competitors in the marketplace (e.g. Best Buy).
Power Center	Three or more big-box retailers with shared parking lot and typically ancillary smaller commercial services (Hernandez et al. 2004).
General Merchandiser	A retailer that does not offer a focused line with few complementary products but instead offers a variety of product lines.
Big-Box Store	A very large retail store, say over 10,000 square feet, such as a general merchandise retailer like Walmart or a specialist such as PetSmart. <i>Note: category killer and general merchandiser are mutually exclusive categories, but either can also be a big-box store.</i>
Intratype Competitor	Competition between the same type of retailer selling similar products, say those with the same SIC code (e.g. between Petco and PetSmart).
Intercategory Competitor	Competition between specialists (category killers) and general mass merchandisers (e.g. between PetSmart and Walmart).
Omni-Channel	A type of retailing that provides a seamless approach to the consumer experience through all various shopping channels (e.g. brick and mortar, e-commerce, mobile, etc.)
Value Platform	The entire shopping experience that a consumer receives from the purchase and consumption of a good or service according to Thrall (2002). Includes items such as situation of store location, personnel, service, display of goods, etc.

1.2 Classical Retail Geography

The retail geography literature is rich in tradition. Influential contributions in the twentieth century helped shape theories concerning the spatial relationships between markets, stores, competitors, and customers. Much of this research can be ultimately be tracked back to Reilly (1931) and Huff (1963, 1964) with their efforts to develop methods for delineating trade areas using spatial interaction models, and to Christaller (1933), Lösch (1954), Berry and Garrison (1958), and Berry (1963) for the development and advancement of central place theory and the classification of markets. Applebaum (1966) demonstrated applied methods for determining trade areas and forecasting sales at particular sites. Location-allocation models were applied to identify optimal site locations for multi-store deployment (Goodchild 1984). Berry identified hierarchies of retail centers. Reilly and Huff demonstrated how markets or retail space of greater size could attract sales from greater distances. Retailers could also sell higher-order goods in these larger cities and retail centers because there is the necessary threshold of population needed to offer such items, which is also supported by central place theory.

Christaller (1933) developed central place theory, which is a spatially organized hierarchical system of market centers based on the marketing principle where the maximum amount of demand is supplied by a minimum number of central places. The friction of distance determines the range, which is the maximum distance consumers are willing to travel for a good. In order for the producer to make a profit, the threshold (the minimum level of demand needed for the producer to be profitable) must be smaller than the range. With demand evenly spread out over an isotropic plane, a uniform lattice of

market centers serves identical non-overlapping hexagonal areas equal to threshold size. There is continuum of goods and services ranging from low order with a small threshold and small range (e.g. groceries) to high order with a large threshold and large range (e.g. furniture). There are more market centers with lower order goods than higher order, although goods of different orders may cluster in the same central place because higher order centers include all lesser order goods.

Lösch (1954) followed with a different version of central place theory that allowed for specialization of market centers. Unlike the rigid hierarchy of Christaller, centers of the same size could now produce quite different combinations of goods. With the assumption that firms are free to enter the market and maximize profit, equilibrium is established as new firms continue to enter the market to capture excess profits until the entry of a new firm causes all firms to experience a loss. In Lösch's version, the total distance between production points is minimized in order to maximize consumer welfare. The maximum amount of purchases can be made locally because the largest number of production locations coincide, which follows the *principle of least effort*. Berry and Garrison (1958) found that larger cities were more likely to get closer to equilibrium than smaller cities.

Retail gravity models, developed by Reilly (1931) and Huff (1963, 1964), include many of the same components as central place theory. In attempting to identify the breaking points between the retail pull of two differently sized cities, Reilly (1931) found that as the population of a city increased, trade from outside the city increased at about a similar rate. He also identified a distance-decay parameter of around two, meaning that

trade decreased at a rate nearly twice as fast as distance increased. According to Huff (1963, 1964), customers were willing to travel much farther for higher-order goods. The Huff Model allows for customizing the distance-decay parameter, in which the analyst can consider the different types of trading and retail areas and products. For example, Young (1975) found that large regional shopping centers attracted customers from nearly twice the drive time as smaller neighborhood shopping centers in Philadelphia. Drezner and Drezner (2002) found that distance-decay lowers as the time spent shopping increases. For further reading, Cooper and Nakanishi (1988) provide a good review of parameter calibration techniques for gravity models.

There has been considerable research that has focused on the spatial organization of retailers and competitors. Hotelling (1929) inspired the research on spatial and pricing competition. There have been studies suggesting that competitors intentionally cluster together in space (Brown 1989; Miller et al. 1999; Oppewal and Holyoake 2004). Agglomeration—the bundling of retail activities—extends the size of trade areas because of the opportunities for multipurpose and comparison shopping (Cox 1959; O’Kelly 1981; Ghosh and McLafferty 1987; Berman and Evans 1998; Mittelstaedt and Stassen 1990; Oppewal and Holyoake 2004; Reimers and Clulow 2004; Leszczyc et al. 2004). Stores selling similar types of merchandise may cluster together because it reduces consumer search (Ghosh 1986; West 1992). Customers are more likely to find desired products and services as well (Brown 1989). From the macro-scale perspective, many chains diffuse methodically through space and time (Jones 1981). Regional concentration has been

connected to the distances from chain headquarters or distribution centers (Doyle and Cook 1980; Laulajainen 1987; Graff 1998; Zhu and Singh 2009).

1.3 Research Agenda

The classical studies have been the inspiration for the continued advancement and sophistication of methods that still incorporate the basic principles of these early models. Given all of the changes to the structure of retailing, however, additional coverage is needed concerning how the evolution of the decision making process by retailers is affected by retail type. Furthermore, the retail landscape has experienced dramatic growth and diffusion of chain stores. From 1983 to 1993, retail space per capita almost tripled in the United States (Sternquist 1997). With only a limited number of locations that can be profitable for a particular type of store, an expanding retailer has only a certain amount of opportunities for organic growth until it can no longer sustain the addition of new stores in a familiar way without cannibalizing its existing stores. This dissertation refers to this stage of a retailer's evolution as real-estate maturity. The US has been over-stored for a long time leading to growth in international markets and the development of new concept stores. There is a dearth of research that accounts for how retailers affect the level of real-estate maturity in regards to their value platform and business practices. The literature is also underdeveloped concerning how retail strategies and spatial competition are affected by real-estate maturity. Given that the structure of the chain network and the level of maturity are the manifestation of all those individual decisions, retailers need to be studied more specifically along the lines of internal and external factors that affect overall

deployment strategies and the associated levels of consistency of locations chosen. To that end, three distinct articles are presented to address decision making in this changing retail landscape. In fact, these articles comprise a mega-analysis of US domestic retail locations of the largest chains to identify any systematic patterns of major retailers as they move beyond the stage of maturity including analyzing them among types of retailers and value platforms, and competitors at various scales including the national level, trade-area level, and deployment over time, as well as the size of markets and retail areas.

In addition to addressing three related aspects of the overall research question of how do major chain store retailers arrange their stores in the US, the three articles leverage one of the largest cross-sectional databases of retailers ever assembled, including 50 US retail chains and over 70,000 store locations, obtained in 2009. The first article, “Regionalism in US Retailing,” presents a comprehensive spatial analysis of the domestic patterns of major US retail chains. Geographic Information Systems (GIS) and statistics examine the degree to which 50 of the largest chains are deployed regionally versus nationally. We investigate whether factors such as the age of the chain, store count, or the size of the markets in which stores are located (or founded) are related to the level of regional concentration.

In the second article, “The Location Types of US Retailers,” we present the results of an inductive analysis of the types of locations chosen by US retailers. We empirically develop a classification of retail location types using cluster analysis on situational and trade area data at the geographical scale of the individual stores. These data are then

applied to each of the studied chains to create a domestic location profile for each retailer. Based on the results of the first cluster analysis, a second cluster analysis then groups together the chains with the most similar location profiles. We also test whether value platform or category of retailer is related to the type of market or retail area most common for deployment.

In the final article, “Modeling Retail Chain Expansion and Maturity through Wave Analysis: Theory and Application to Walmart and Target,” we study retail store deployment through the analysis of waves. Based on concepts originally developed in coastal geomorphology and adapted to medical geography, we present a theory of retail chain expansion and maturity whereby retailers expand in waves with alternating periods of faster and slower growth.

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2. Regionalism in US Retailing

2.1. Introduction

Retailing trends are dynamic: many well-known US retailers such as Office Max and PetSmart did not exist 30 years ago, and Walmart, the largest retailer in the world, with sales exceeding those of the next five largest US retailers (Fortune 2008), was merely a regional chain at that time. Now there is a Walmart store within five miles of more than half of all Americans and over two thirds of all other retail stores (Basker 2007).

Numerous studies have looked at the spatial patterns and diffusion processes of major retailers, but these studies have mostly been limited to a small number of particular chains and competitors (Graff 1998; Karande and Lombard 2005; Jia 2008; Joseph 2010). However, with so many national retailers vying for customers by deploying networks of stores numbering from the low hundreds to nearly 10,000, there is a need for a more comprehensive spatial analysis of the deployment of major US retail chains.

For retailers, especially publicly traded companies, continual growth is paramount. Retail companies cannot always deploy stores in their historical regions if they want to continue growing (Jones 1981). If they do continue to expand in familiar markets, however, new stores may cannibalize the trade areas of existing stores within the chain as markets become oversaturated. The result of this trend is that many large retailers have a network of stores in a number of different markets. Joseph (2010) suggested that a retail company reaches domestic real-estate maturity when it can no longer open new stores in traditional or desired markets without significant cannibalization of existing stores. Following this line of thinking, the level of regional concentration of a retail chain may

be related to its stage in the real-estate maturity process.

This article uses Geographic Information Systems (GIS) and statistics to examine the degree to which 50 of the largest US domestic retail chains are deployed regionally versus nationally. Metrics such as spatial mean center, standard distance, and standard distance ellipse are employed to analyze the locations of these chains. Regional concentration is also evaluated using the Herfindahl-Hirschman Index (HHI), measuring the concentration of stores across major US regions. We investigate whether factors such as the age of the chain, store count, or the size of the markets in which stores (or the first store) are located are correlated with the level of regional concentration as indicated by the chain's standard distance and HHI values. Retail types are discussed both collectively and individually as the processes may vary depending on type of retailer and the associated locational requirements.

2.2. Relevant Literature

This study builds on research that has focused on the process of retail contagion, or diffusion of retail stores over space. Much of this literature attempted to identify the underlying processes behind how and why retail chain networks evolve. The locations of retail stores have been explained by factors including the distances from chain headquarters or distribution centers. Regional concentration near such locations can be advantageous because of economies of scale, lower distribution costs, and higher customer awareness (Doyle and Cook 1980; Graff 1998). Expansion may be constrained by warehouse locations (Laulajainen 1987). Further, companies that start in smaller

towns may hesitate to open stores in large markets and *vice versa* (Jones and Simmons 1987). Another important growth strategy for retailers is the acquisition of other chain store retailers, which may lead to having locations in a variety of markets (Laulajainen 1987). Still, many chains diffuse methodically through space and time (Jones 1981).

A number of studies have focused on particular retailers or groups of competitors. Zhu and Singh (2009) found that headquarters location was a determinant of Walmart, Target, and Kmart store locations. Walmart did not initially saturate markets because most of its early stores were located in isolated smaller towns in the Southeast. Walmart eventually expanded to urban markets, although the locations were not far removed from distribution centers, and supercenters were clustered near food distribution centers (Graff 1998). Jia (2008) noted that Walmart was much more likely to open new stores near distribution centers than Kmart. Notwithstanding, Graff (2006) observed a concentration of standard and Super Kmart stores near their old headquarters in Michigan. Shields and Kures (2007) also identified distance to distribution centers as a factor determining which stores Kmart closed. Target has focused its store deployment in particular larger markets with its standard and supercenter formats (Graff 2006). Joseph (2010) found that although Target and Walmart now have the most similar patterns of any time in their history (dating back to 1962), they had quite dissimilar expansion strategies, with open date and distance to first store being strongly correlated for Walmart but not Target. Much of Target's early growth was the result of acquiring properties from other chains such as Fedmart and Gemco, especially in the Western US. As Walmart saturated markets farther from its Arkansas headquarters, eventually it revisited markets closer to

home for domestic new store expansion, thus reaching a point of domestic real-estate maturity (Joseph 2010).

In summation, various theories have been postulated for how retail chains grow. Most studies have noted methodical diffusion processes due to factors such as distance to headquarters or distribution centers. However, not all chains follow these patterns and that may be related to retail type or chain heritage. Taking a static snapshot of a dynamic process, the data and methods for this article are unique in terms of the broad scope of the study and the combination of the studied variables.

2.3. Data and Methods

2.3.1 Data

This article is based on all the stores in the contiguous lower 48 US states of 50 leading domestic retailers. This includes discount department stores such as Walmart and Target, “category killers” such as Office Max or Best Buy, as well as other retail types such as rental stores. The retailers are grouped according to type of retailer, based on the North American Industry Classification System (NAICS). Although there are variations in specific merchandise mix between retailers within a type, there are enough similarities that they can be considered as competitors. The general criteria for inclusion in this study were based on three factors: 1) rank of sales according to the 2008 Fortune 1000 list; 2) average store size of at least 2,500 square feet; and 3) at least 100 store locations. We omit smaller stores that do not involve the same level of risk as larger stores. We also excluded grocery stores because the regional chains greatly outnumber the nationally

deployed chains. Only a few of the chains had franchises (i.e. Aarons, Pet Supplies Plus, Rent-A-Center), while the vast majority had company-owned stores.

The 70,796 stores of these 50 retailers range in size from 2,500 to over 150,000 square feet, with as few as 111 locations for Nordstrom to a high of 8,577 for Dollar General. We limited the study to the standard, and in some cases supercenter, formats of the chains. The locational data were obtained from company websites and Environmental Systems Research Institute (ESRI), geocoded, and checked against store locator results for at least ten markets for each retailer.

2.3.2 Methods

The objective is to measure the level of regional clustering of 50 large US retailers and identify the factors associated with the clustering in order to understand the systematic processes behind retail contagion and future proliferation of retail stores in the US. First, we investigate whether chains that start in small markets tend to continue to locate more often in other smaller markets. A chain that seeks small market locations would, in theory, be able to maintain a high level of regional clustering because there may be opportunities for expansion in a larger number of markets. These chains could accumulate thousands of stores in desired locations before reaching a point of domestic real-estate maturity. Conversely, chains with stores only in larger markets may run out of options near the historical region sooner and need to turn to large markets in other parts of the country for expansion, even after just opening a few hundred stores.

The first store location of each retailer is assigned to one of four categories based on 2010 market size, according to the US Census (Table 2.1). Each store location is also assigned to one of five categories. (There is an additional division of store location markets because the number of store locations being studied far outnumbers the amount of studied chains.) Non-metro refers to locations that were not classified as metropolitan or micropolitan by the US Census Bureau. Cross-tabulating the two creates a 4x5 contingency table tested with the chi-square statistic.

Table 2.1. Store Count by Market Type and First Store Market

<u>FIRST STORE MARKET</u>	<u>STORE LOCATION MARKET</u>
Metropolitan 7 million +	Metropolitan 7 million +
Metropolitan 1-7 million	Metropolitan 1-7 million
Metropolitan <1 million	Metropolitan <1 million
Micropolitan or Non-metro	Micropolitan 50,000-200,000
	Micropolitan <50,000 or Non-metro

The second step is to empirically analyze the patterns of studied retailers using spatial statistics for different types of retailers according to the NAICS. This includes identifying the spatial mean center (SMC) of each retailer, which is calculated as the mean of the eastings (longitude) and northings (latitude) (Lee and Wong 2000). A SMC is calculated and plotted for each retailer and compared with the SMCs for the national population, national income, and a point file of over 7,000 shopping centers, which was obtained from ESRI for the lower 48 states. The population and income SMCs were based on the centroids of 2010 US counties.

To analyze the degree to which stores are clustered or dispersed around the mean center, we calculate the standard distance (SD) in miles for each retail chain and for the 7,000+ shopping centers. In spatial statistics, *standard distance* is the equivalent of standard deviation (Lee and Wong 2000). Retailers with greater regional clustering will generally have lower SD values. To supplement the discussion, we also generate the standard distance ellipse (SDE) for the chains to capture any directional bias of the retail store locations. The components of a SDE are the angle of rotation, and the deviation along the major and minor axes (Lee and Wong 2000; Myint 2008).

The level of regional clustering is also evaluated by the Herfindahl-Hirschman Index (HHI), which has been frequently used to study the number of firms in an industry. It calculated as:

$$HHI = \sum_{i=1}^N S_i^2 \quad (1)$$

where S is the percentage share of a retailer's lower 48 stores in region *i*. A HHI value of 25 percent indicates an equal distribution of stores across all regions (Figure 2.1).



Figure 2.1. Map of US Census Regions

The final step is to identify the factors that affect regional concentration. With two measures of regional concentration as dependent variables, HHI and SD, we hypothesize that retailers with greater regional concentration may be related to factors including age of the chain, store count of the chain (in studied area), distribution of stores in smaller markets, or the market size of the first store. We test these hypotheses using ordinary least-squares (OLS) regression (Table 2.2). The expected signs for HHI and SD are inverse of each other because high values of HHI and low values of SD indicated regional concentration. We check for multicollinearity using Pearson correlation coefficients. The following discussion of hypotheses and rationales focuses on SD as the dependent variable, with the opposite applying to the HHI model.

We expect that chains with a higher share of stores in smaller markets have smaller standard distances. This is based on the assumption that retailers are more likely to

saturate a region with stores if they are open to deployment opportunities in a variety of market sizes, including small markets, which are of course far more numerous. Given the familiarity of a region, and the costs of warehousing (logistics) and advertising, it would seem more likely that chains would methodically diffuse over space by giving preference to new locations that are closer to the home base, as long as additional opportunities continue to be available. This process may also be related to whether the chain originated in a large or small market, as previously discussed. The other independent variables, including the age of the chain (years since founding) and total number of stores in the chain, are hypothesized to lead to higher standard distances. Older chains have had more time and possibly more pressure to grow their networks through expansion. Chains with more store locations may have reached a point of saturation in their traditional markets and thus had to explore new markets for store deployment, which would have increased the standard distance.

Table 2.2. Regression Variables and Hypotheses

<i>Independent Variable</i>	<i>Shorthand</i>	<i>Hypothesis (HHI Model)</i>	<i>Hypothesis (SD Model)</i>
Years since founded	AGE	-	+
Store count in studied area	STORES	-	+
Percent of stores not in metropolitan areas	SMALL	+	-
Population of first store market	POP_FIRST	-	+

2.4. Results and Discussion

This section presents the results for different types of retailers as well as the collective findings for all retailers. For particular retail types, the focus is on why some types and chains are more clustered or dispersed than others. For the collective set of all 50 retailers, the focus is on testing hypotheses that could be driving regional concentration and choice of market size.

2.4.1 Implications of Retail Chain Heritage

The first test is whether the size of the market in which retail stores are located is associated with the market size of the first store. The highest numbers of chains were founded and have stores in metropolitan areas with populations between one and seven million (Table 2.3). With a chi-square statistic of 3893 and 12 degrees of freedom, the p value is significant at the 0.01 level. The location of retail stores, with respect to market size, is significantly associated with the market size of the first store of the retailer.

Specific examples are discussed in Section 4.2.

Table 2.4 reveals greater detail based on the percentage of stores for each individual size of market given the market size of the first store location. Regardless of the original store location, the chains consistently deploy about one third of their stores in metropolitan areas with populations under one million. Chains founded in the largest metropolitan areas are more likely to have stores in large markets (14%) than chains founded in the smallest markets (4%), while chains founded in the smallest markets are more likely to have stores in the smallest of markets (21%) compared to chains founded

in the largest markets (4%). Although this bias is detected in the table, most retailers have the majority of their stores in medium sizes to larger markets.

Table 2.3. Store Count by Market Size and First Store Market

FIRST STORE MARKET	STORES BY MARKET				
	Metropolitan 7 million +	Metropolitan 1-7 million	Metropolitan <1 million	Micropolitan 50,000- 200,000	Micropolitan <50,000 or Non- Metro
Metropolitan 7 million +	627	1942	1459	224	188
Metropolitan 1-7 million	2959	13425	9939	1983	2077
Metropolitan <1 million	1094	7792	7327	1756	2756
Micropolitan or Non Metro	556	4357	5494	1688	3153

2.4.2 Empirical Observations

Each studied group of retailers is analyzed in terms of the national deployment patterns of its largest chains and the level and direction of regional clustering. Due to space limitations, maps are only shown for a few selected types.

Table 2.4. Store Count by Market Size and First Store Market

FIRST STORE MARKET	STORES BY MARKET					TOTAL
	Metropolitan 7 million +	Metropolitan 1-7 million	Metropolitan <1 million	Micropolitan 50,000- 200,000	Micropolitan <50,000 or Non- Metro	
Metropolitan 7 million +	14%	44%	33%	5%	4%	100%
Metropolitan 1-7 million	10%	44%	33%	7%	7%	100%
Metropolitan <1 million	5%	38%	35%	8%	13%	100%
Micropolitan or Non Metro	4%	29%	36%	11%	21%	100%

2.4.2.1 Discount Department Stores

Figure 2.2 illustrates the spatial mean centers (SMCs) and standard deviational ellipses (SDEs) of Walmart, Target, and Kmart, and Meijer—a large regional supercenter chain in the Midwest—as well as of the 7,000+ shopping centers. The shopping center SDE is largest, suggesting that the studied discount department stores all have some regional bias. Based on its SDE, Walmart has greater regional bias than Target. Walmart’s SMC location is the result of its ubiquitous presence in markets of various sizes in the Southeast, while Target has a strong presence in California, which pulls its SMC farthest west. Target has the most similar spatial patterns to those of the national shopping centers. Kmart’s SMC is in Illinois while the others are in Missouri, a result of Kmart closing many of its Sunbelt stores where Walmart is strong.

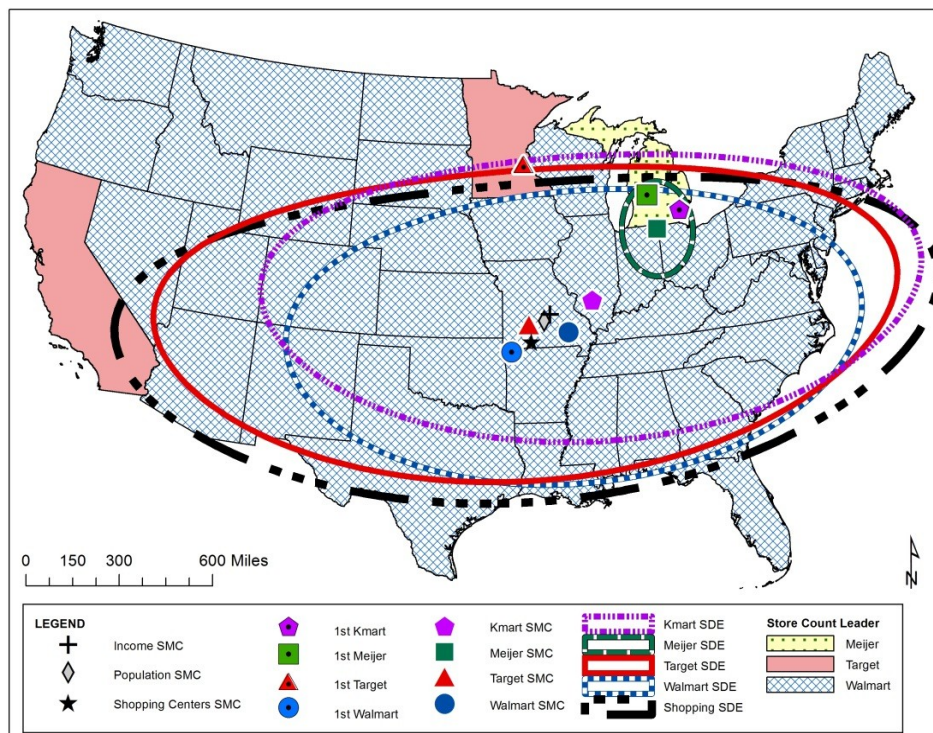


Figure 2.2. Regional Clustering of Discount Department Store Chains

Table 2.5. Studied Discount Department Stores

Retailer	Year Founded	Store Count	Percent Stores in Micro/Non	Regional HH Index	Std. Distance	Distance from SMC of		
						Pop	Inc	Retail
Kmart	1962	1326	21.8%	27.1%	434.6	169	144	238
Target	1962	1734	4.6%	27.3%	402.8	51	75	55
Walmart	1962	3724	38.6%	33.4%	389.3	87	83	124
Meijer	1934	187	11.2%	91.1%	49.5	469	442	545

Walmart has more stores than Target, Kmart, and Meijer combined (Table 2.5). It has more stores in each state except Minnesota, where Target was founded and is currently headquartered, California, where Target opened some of its earlier stores by acquiring properties from other chains, and Michigan, the home of Meijer (Figure 2.2). These chains tend to have more stores in the areas closest to their first store locations, especially Walmart near its first store in Rogers, Arkansas. With nearly half of its stores in the South, Walmart has high regional concentration, denoted by its HHI (Table 2.5). It also has the highest level of deployment in smaller markets (nearly 39 percent); markets Target has mostly avoided to this point. Kmart still has many stores in the Midwest, near its first location in Garden City, Michigan, and current headquarters in Illinois. The oldest studied discount department store, Meijer, is also the most regionally concentrated, which goes against our age-concentration hypothesis.

2.4.2.2 Category Killers

In this section we summarize the findings for category killers, or retailers that focus on a particular type of merchandise. Due to space limitations we include maps for only home improvement and office supply. Data are listed in Table 2.6.

There are two major home improvement chains, Home Depot and Lowe's, with national coverage and one particularly strong regional chain, Menards—each with different approaches to real estate deployment. Home Depot has 2,013 stores in the study area compared to 1,682 for Lowe's, but there is a greater dispersion of Lowe's stores between central Pennsylvania and eastern Texas. Home improvement provides another example where the hypothesis that chains that open their first stores in small markets tend to grow more often in other small markets seems to hold. Home Depot started in large market Atlanta and has 9 percent of its stores in micropolitan or non-metro markets, while Lowe's started in the smaller market of North Wilkesboro, North Carolina and has 18 percent small market penetration.

Table 2.6. Studied Category Killers

Retailer	Type of Retailer (NAICS)	Year Founded	Store Count	Percent Stores in Micro/Non	Regional HH Index	Std. Distance	Distance from SMC of		
							Pop.	Inc.	Retail
Home Depot	Home Centers	1979	2013	9.5%	27.8%	413.0	29	41	77
Lowe's		1921	1682	18.3%	33.2%	425.4	160	150	198
Menards		1972	250	24.0%	99.2%	113.9	272	251	344
Office Depot	Office Supplies and Stationery	1986	1119	5.1%	39.2%	405.3	207	234	131
Office Max		1988	912	8.0%	28.9%	378.2	90	108	94
Staples		1986	1663	12.5%	26.6%	457.2	174	151	240
Petco	Pet Supplies Stores	1965	1053	5.2%	26.1%	398.8	127	143	124
PetSmart		1987	1075	2.1%	28.4%	396.9	49	76	31
Pet Supplies Plus		1988	228	7.5%	44.9%	229.3	537	512	605
Big 5 Sporting Goods	Sporting Goods	1955	385	8.1%	94.0%	197.3	1346	1362	1313
Dick's Sporting Goods		1948	418	3.3%	27.9%	419.7	358	336	421
Sports Authority		1987	472	1.9%	29.1%	371.6	184	206	147
Barnes & Noble	Book Stores	1917	705	1.4%	26.3%	413.5	11	16	90
Books-A-Million		1917	224	13.8%	82.2%	186.2	501	494	515
Borders		1962	493	2.8%	25.3%	440.9	17	22	93
Advance Auto Parts	Automotive Parts and Accessories	1932	3326	21.7%	47.2%	244.4	475	460	512
Auto Zone		1979	4233	18.2%	31.6%	403.5	84	108	33
O'Reilly Auto Parts		1957	3438	23.4%	35.0%	324.4	394	415	349
Hobby Lobby	Hobby, Toy, and Game	1972	447	9.8%	40.6%	224.3	80	97	64
Michaels		1973	961	4.0%	26.6%	410.2	14	31	83
Jo-Ann Fabric & Craft	Sewing, Needlework, and Piece Goods	1943	768	11.7%	25.9%	431.4	103	85	176
Burlington Coat Factory	Family Clothing	1972	427	0.9%	27.0%	439.3	170	152	224
Marshalls		1956	734	3.1%	27.2%	448.7	156	140	207
Ross		1957	950	4.5%	46.3%	369.1	472	498	408
TJ Maxx		1977	912	5.6%	27.3%	458.5	226	205	285
Bed Bath & Beyond	All Other Miscellaneous	1971	904	4.8%	26.8%	432.2	94	78	152
Best Buy	Household Appliance	1966	1092	4.0%	27.4%	416.4	17	18	91
Toys "R" Us	Hobby, Toy, and Game	1957	584	0.9%	26.5%	443.8	102	86	158
Tractor Supply	Nursery, Garden Center, and Farm Supply	1938	855	40.4%	39.6%	304.7	300	282	349

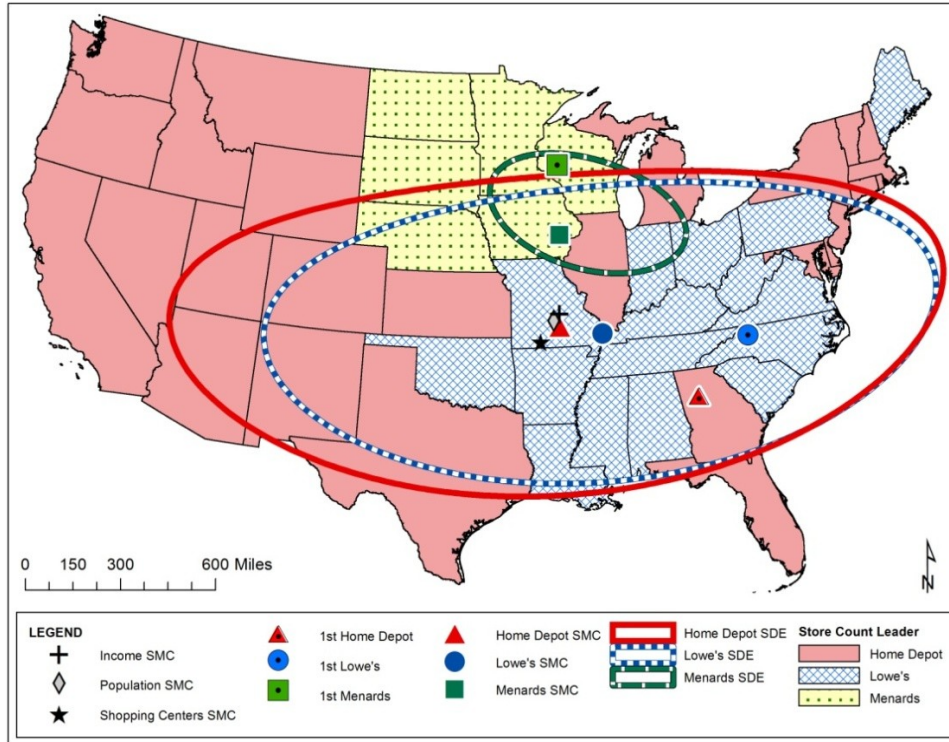


Figure 2.3. Regional Clustering of Home Improvement Chains

Similar to Walmart, Lowe’s has deployed stores in many smaller markets with a threshold size large enough to support a store. With many regularly spaced towns of adequate size in the Southeast, Lowe’s has a bias towards its roots in North Carolina (Figure 2.3). Lowe’s has the highest store count in most southeastern states except Georgia and Florida. These two states are more urban than others in the region, and Home Depot originated and is currently headquartered in Georgia. Home Depot’s deployment patterns are less *regionally* concentrated than Lowe’s as denoted by its lower HHI value (27.8% versus 32.2%) and more in line with national retail patterns, with greater store penetration in the West. Menards is a formidable regional competitor in the

upper Midwest. With its roots in the smaller metropolitan area of Eau Claire, Wisconsin, the chain has deployed nearly a quarter of its stores in smaller markets.

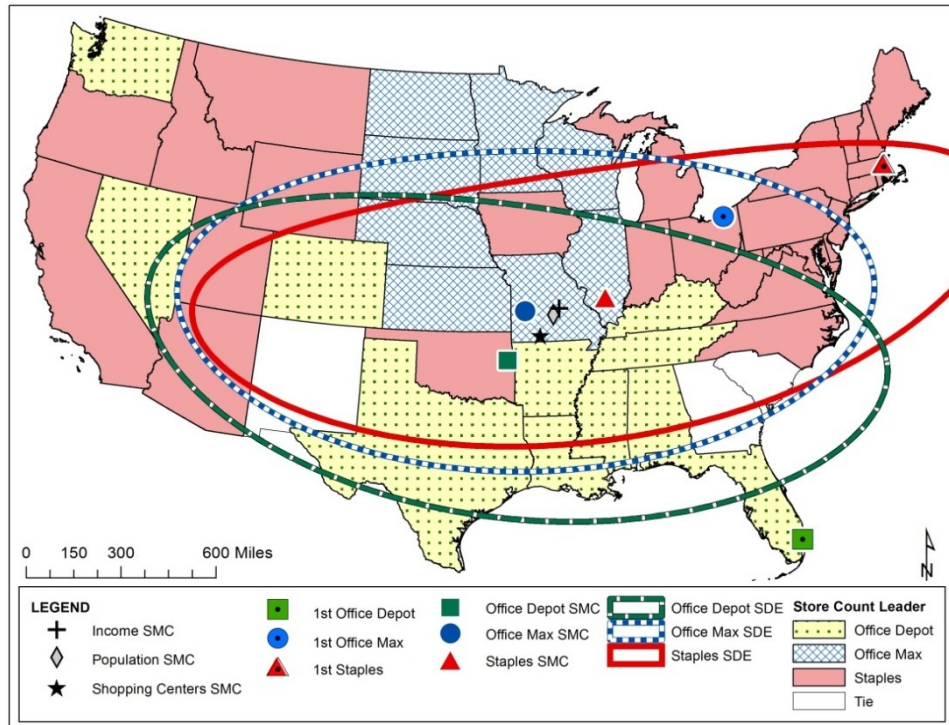


Figure 2.4. Regional Clustering of Office Supply Stores

The largest office-supply chains—Office Depot, Office Max, and Staples—have distinct regional patterns (Figure 2.4). Staples has a relatively large SD (457 miles) and low HHI (26 percent). To say that Staples lacks any regional concentration is somewhat misleading because it has a clustering of stores in the markets on opposite ends of the country, particularly the Northeast, near its first store, and California. Office Max has its highest concentration of stores in the Midwest, near its first store, and thus a lower SD (378 miles). Office Depot, founded in Florida, has a strong presence in the Sunbelt.

California, Texas, and Florida alone account for nearly 40 percent of its stores, leading to the directional tilt of the Office Depot SDE and its high HHI (39 percent). By comparison, just 24 percent of Office Max stores are located in the same three states. While Staples has over 500 more stores than either of its competitors, there are still 22 states where Staples does not have the highest store count. These regional concentrations may be partially related to the relative youth of the chains. All three chains were founded between 1986 and 1988. These chains are all leaders in store count in their home regions.

The largest auto parts chains—Advance Auto Parts, Auto Zone, and O’Reilly Auto Parts—have nearly 11,000 store locations combined and have been in existence for at least 30 years with Advance Auto Parts dating back to 1932. Despite its age, Advance Auto Parts is not necessarily mature from a real-estate perspective as it is still regionally concentrated in the East, with a standard distance of 244 miles, and HHI over 47 percent. It started in the smaller metropolitan area of Roanoke, Virginia and has nearly 22 percent of its stores in smaller markets. O’Reilly Auto Parts, which dates back to 1957, remains heavily saturated in Texas. Although the recent acquisition of CSK Auto for \$542 million provided O’Reilly with 1,342 new stores in 22 states giving it a much greater presence in the Midwest and West (Lamiman 2010). Still, its HHI value is 35 percent. The chain started in a smaller metropolitan area—Springfield, Missouri—and has more than 23 percent of its stores in small markets. Auto Zone has nearly 800 more stores than its next largest competitor, but only leads in fourteen states indicating the regional focus of its rivals. It also has the lowest percentage of small market stores of the three chains. Still, its 18 percent is high, having opened its first store in the small town of Forrest City,

Arkansas. Auto Zone's SDE is most consistent with national patterns but still is somewhat biased towards the South (HHI=32 percent) with minimal coverage of the upper Midwest, where O'Reilly Auto Parts now has a strong presence. Collectively, these chains all have a southern bias with SMCs farther south than the retail, population, and income SMCs. In addition to small market deployment, this regional concentration may be because of lower sales thresholds associated with smaller stores or more fix-it-yourself customers in the poorer South.

The following discussion highlights some noteworthy findings from the list of category killers. Barnes & Noble is more nationally dispersed than many of the other studied retailers. It has large market roots and little presence in small markets. Its largest brick and mortar competitor, Books-A-Million, has demonstrated a willingness to deploy in smaller markets (over 13 percent) and has remained regionally concentrated. It opened its first store in the smaller metropolitan area of Florence, Alabama. The deployment of sporting goods stores is highly regional. Dick's Sporting Goods has regional concentration near its historical base with nearly a quarter of its stores in New York, Ohio, and Pennsylvania. Big 5 has remained a regional chain in the West, often deploying in smaller markets. Family clothing chains—Burlington Coat Factory, Marshalls, and TJ Maxx—have an eastern bias with SMCs in Illinois. They each opened their first stores in the Northeast. Ross, founded in California, is by far the leading chain in western and many southern states. All four chains were founded in large markets and have mostly avoided small market locations. Hobby retailer Jo-Ann Fabric & Craft has greater focus in the northern states than Michaels, near its first store and headquarters in

Northeast Ohio. Michaels' focus has been on larger markets: only 4 percent deployment in smaller markets. Bed Bath & Beyond and Toys "R" Us also have a slight eastern bias. Both opened their first store in the East and are currently headquartered in New Jersey. They also opened their first stores in larger markets and have mostly avoided smaller markets. The last statement holds true for Best Buy as well. Tractor Supply, which started in Minot, North Dakota, a micropolitan market, has its HHI and small market deployment at about 40 percent. Lastly, pet supply retailers—PetSmart, Petco, and Pet Supplies Plus—started in larger markets and have generally avoided deployment in small markets.

2.4.2.3 Other Studied Retail Types

The remaining analysis includes retail types that do not specialize in a particular focused line of merchandise, summarized in Table 2.7. We start by focusing on chains that attract lower income consumers. With multiple thousands of locations, these chains also provide numerous employment and shopping opportunities for small towns and economically challenged areas, especially in the South. We conclude this section by discussing warehouse chains and department stores.

Dollar stores are growing in consumer popularity in recent times due to the economic challenges and consumers trading down (Brookman 2010). These chains continue to deploy stores aggressively even though the largest three—Dollar General, Dollar Tree, and Family Dollar—already have nearly 19,000 stores combined. Despite high store counts, there remains strong regional bias with low SD and high HHI, indicating opportunities for additional expansion and increased spatial competition. This also may

indicate a retail category that can heavily saturate an area with stores because of smaller store sizes and possibly lower rents and sales thresholds. Plus, the distance customers are willing to travel may be lower given that these chains offer low-order goods. Dollar General and Family Dollar alone have over 15,000 locations and many of these stores are in the Southeast. Dollar General has only penetrated 35 states, and Family Dollar does not have a store in California. Dollar General clearly has the most stores in the Southeast and lower Midwest while Family Dollar has the lead in the states surrounding the periphery of Dollar General's presence where it has yet to deploy (Figure 2.5). These chains also have high deployment in smaller markets, with nearly forty percent of Dollar General stores. Dollar General's first store was in small town Scottsville, Kentucky. Dollar Tree is the only large dollar store with national coverage, giving the chain a market share advantage in the West. 99 Cents Only Stores is a regional chain, rivaling Dollar Tree in California. The chain started in Los Angeles and has yet to deploy a store in a smaller market. The regional bias of these chains is also related to the locations of the first stores, with the three largest chains sharing a heritage in the Southeast.

Table 2.7. Other Studied Retailers

Retailer	Type of Retailer (NAICS)	Year Founded	Store Count	Percent Stores in Micro/Non	Regional HH Index	Std. Distance	Distance from SMC of		
							Pop	Inc	Retail
99 Cents Only Stores	All Other General Merchandise Stores (Value)	1982	268	0.0%	82.5%	327.2	1332	1352	1287
Dollar General		1955	8577	39.4%	49.9%	221.7	289	279	315
Dollar Tree		1986	3600	19.5%	29.9%	429.3	110	92	168
Family Dollar		1959	6592	27.7%	38.6%	292.1	288	273	328
Big Lots!		1982	1382	16.1%	31.1%	415.0	71	88	64
Aaron's	Consumer Electronics and Appliances Rental	1955	1666	28.9%	38.5%	386.2	157	158	168
Rent-A-Center	Warehouse Clubs and Supercenters	1973	3153	22.3%	31.1%	410.3	213	197	261
BJ's Wholesale Club		1984	188	7.4%	50.2%	197.3	868	847	923
Costco		1983	400	2.5%	36.7%	320.0	505	523	473
Sam's Club		1983	597	4.5%	32.5%	360.8	108	106	135
Belk		Department Stores	1888	302	35.4%	99.3%	170.5	542	534
Dillard's	Department Stores	1938	307	5.9%	52.4%	311.4	250	271	185
JCPenney		1902	1089	27.9%	28.8%	401.7	30	14	105
Kohl's		1962	1067	6.1%	26.4%	431.3	70	43	148
Macy's		1858	715	1.4%	26.2%	405.8	58	69	99
Nordstrom		1901	111	0.0%	32.3%	315.4	381	400	344
Sears		1925	1463	21.7%	28.0%	432.3	68	49	135

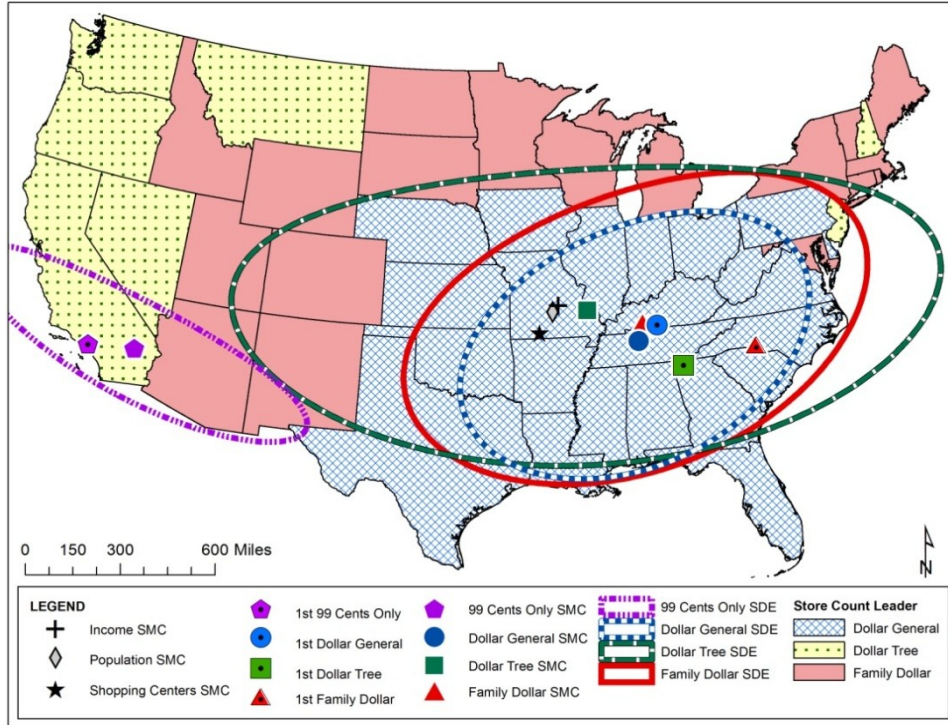


Figure 2.5. Regional Clustering of Dollar Store Chains

Rental chains, Aaron’s and Rent-A-Center, also have a bias towards the Southeast, as does Big Lots, a value-oriented general merchandise retailer. Aaron’s has 28.9 percent of its stores in smaller markets and an HHI of 38.5 percent, while Rent-A-Center is lower on both metrics with 22.3 percent small market deployment and a 31.1 percent HHI. Big Lots has a slight southern bias and an HHI of 31 percent.

Warehouse chains have strong regional bias, related to historical base of the retailers. Costco has the strongest presence in the West; Sam’s Club is most prevalent in the rest of the US, except for the Northeast where BJ’s has strong market share. The lowest HHI belongs to Sam’s Club (32.5 percent). The SMCs of the competitors are separated by at least 600 miles and they have fairly low SDs, all less than 360 miles. With these chains

starting in metropolitan areas, deployment in smaller markets has been minimal. These chains were founded in the early 1980s and have relatively low store counts. With room for expansion, warehouse chains provide a good example of a retail type that is relatively young from a real-estate deployment perspective.

The largest department store chains—JCPenney, Kohl's, Macy's, and Sears—have relatively similar dispersed national coverage, high store counts, SMCs close to the national retail, income, and population SMCs, high SD over 400 miles, and low HHI values under 29 percent. Macy's and Nordstrom, with roots in New York and Seattle respectively, have all but avoided any deployment in small markets. JCPenney, however, with its first store in small town Kemmerer, Wyoming, has more than a quarter of its stores in small markets. The number of markets of any size near Kemmerer is limited so JCPenney had to grow in other areas of the country. Belk and Dillard's have a regional focus towards the South. Belk dates back to 1888 and has ample room for chain expansion while Sears, dating back to 1925, has a mature domestic network. Age does not seem to effect the national dispersion of department stores.

2.4.3 Factors Affecting Regional Clustering

The final analysis seeks to identify factors that explain the level of domestic regional concentration of retail stores, based on HHI and SD values. HHI and SD are strongly, yet not perfectly correlated (Table 2.8). The number of stores (STORES) and percentage in smaller markets (SMALL) are strongly correlated, consistent with the previous discussion that retail chains with high store counts would rely on small market

deployment. Another noteworthy correlation is between SMALL and the population of the market of the first store (POP_FIRST), as expected given the analysis in 4.1. There is some variation in how the other variables are correlated with HHI and SD values respectively. While SMALL is significantly associated with HHI and SD, STORES is only weakly correlated with HHI and is nearly perfectly uncorrelated with SD.

Table 2.8. Correlation Matrix

	<i>HHI</i>	<i>SD</i>	<i>AGE</i>	<i>STORES</i>	<i>SMALL</i>	<i>POP_FIRST</i>
HHI	1.000					
SD	-0.847	1.000				
AGE	0.184	-0.167	1.000			
STORES	-0.150	0.190	-0.960	1.000		
SMALL	0.228	-0.275	0.207	0.587	1.000	
POP_FIRST	-0.530	0.199	0.170	-0.263	-0.415	1.000

Despite evidence of some correlation between the independent variables and HHI and SD, nothing was strongly correlated. This may be a result of varying deployment strategies of different retail types. Figure 2.6 illustrates the relationship between standard distance and store count. The relationship is positive for most retail types (i.e. category killers with R^2 of 0.47). When considering all chains collectively, however, three retail types in particular disrupt the overall trend including auto parts, value (dollar), and rental stores. This may be a result of a variety of factors including smaller store sizes, cheaper rents, and the associated lower sales thresholds. Still, there are only two blatant examples of chains with a very high store count and low SD, Dollar General and Family Dollar. Standard distances may increase for these chains as they continue to move towards real-

estate maturity. For other chains, maturity seems to occur closer to the one thousand store mark, although there are variations for different chains depending on value platforms and business practices.

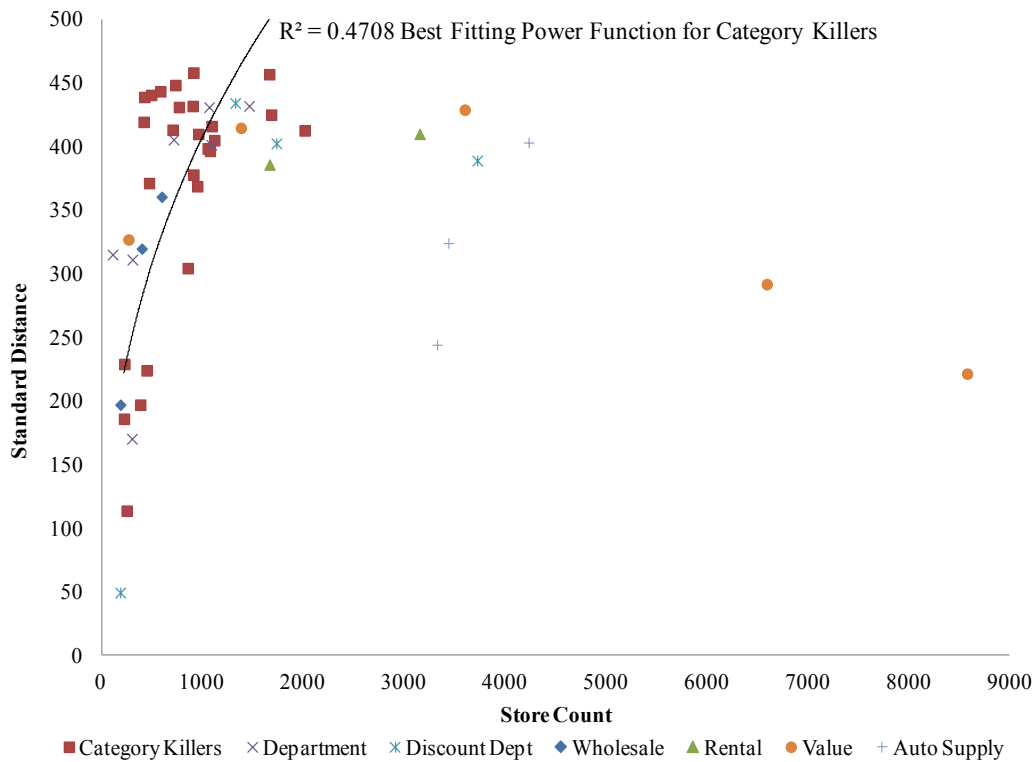


Figure 2.6. Standard Distance and Store Count

Removing auto parts, value (dollar), and rental chains, the remaining 41 retailers are placed into two OLS regression models with HHI and SD as the dependent variable in each model (Table 2.9). The independent variables include years since founded (AGE), store count (STORES), percent of stores not in metropolitan areas (SMALL), and the population of the metropolitan or micropolitan area of the first store (POP_FIRST).

Removing auto parts, dollar, and rental chains reduces the correlation between STORES

and SMALL and SMALL and POP_FIRST respectively. In regards to multicollinearity, none of the correlation coefficients exceed the critical level of 0.7 (Clark and Hosking 1986).

With an inverse relationship between HHI and SD, the signs are consistent for both models. There are two variables that are significant in both (STORES and SMALL), with the hypothesized direction of the signs. Generally, opening more stores leads to lower levels of regional concentration and deploying in small markets leads to higher levels of regional concentration. The statistical significance of SMALL is important because the removed chains had thousands of store locations in smaller markets and high regional concentration.

Table 2.9. Regression Results

MODEL 1: DEPENDENT VARIABLE (HHI)			MODEL 2: DEPENDENT VARIABLE (SD)		
R ² : 0.446 n=41			R ² : 0.488 n=41		
	<i>Coefficients</i>	<i>P-value</i>		<i>Coefficients</i>	<i>P-value</i>
Intercept	0.456071	0.00000	Intercept	292.9449	0.00000
AGE	-0.000282	0.78120	AGE	0.351887	0.45124
STORES	-0.000208	0.00000	STORES	0.112776	0.00000
SMALL	1.261622	0.00017	SMALL	-554.2552	0.00097
POP_FIRST	0.000000	0.85574	POP_FIRST	0.000001	0.81927

The hypothesis for AGE was that older chains would have had time to expand. Notwithstanding, no statistically significant relationship is found. Business practices vary and age is not statistically associated with regionalism. While some of the newer chains such as PetSmart and Staples have high standard distances, older chains like Belk still

have low SDs. Long-time regional chains may at some point decide to shift their real estate aspirations to a national scale. Also recall that Kmart, Target, and Walmart all opened their first stores in 1962 but are at different levels of real-estate maturity.

Finally, POP_FIRST was not statistically significant. This is in part because of its relationship to SMALL. By removing SMALL from both models, POP_FIRST becomes statistically significant, in accordance with the hypotheses. The explanatory power of the models, however, is considerably reduced.

2.5. Concluding Remarks

This broad analysis examines the location patterns of major US retailers, individually and collectively. Despite the dramatic proliferation of chains to near or full national coverage, there are still strong regional biases of some of the largest retailers. Much of this regional bias was confirmed to be associated with store counts and small market deployment.

Where the chain had its roots (heritage) was found to be influential as well, but not the age of the chain. Most chains saturated the markets near their first store locations. Also, chains that started in smaller markets tended to be more willing to deploy more stores in other small markets and *vice versa* for chains that started in larger markets. The greatest levels of regionalism were noted for most auto parts, warehouse, and value (dollar) chains and well-known national retailers like Walmart, Lowe's, and Office Depot. The common thread is that these chains either have high numbers of small market stores or they have not yet reached real-estate maturity and have room to build their networks and substantially increase their store counts.

Opportunities for extension of this research include identifying the general processes of how chains spread over space and the influence of associated factors such as minimum trade area populations (thresholds). This article could also be adapted as a longitudinal study, focusing on how spatial mean centers and store distributions change over time. Studying diffusion along with the open dates of the stores, or when the companies became publically traded, can lead to additional opportunities for modeling. An investigation of when to anticipate alterations in chain strategy (e.g. international expansion, new store formats, sizing of stores) would also be beneficial. Finally, competitors can be studied based on their level of spatial competition juxtaposed to their current stage of real-estate maturity.

The diffusion of retail chains across space is a dynamic process. Notwithstanding the general trends that affect regional concentration, individual business practices do impact deployment strategies. For instance, the distribution system can be a limiting factor on chain expansion leading to opening a new store in the “next market over” with an adequate threshold for some retailers. For mature chains with a developed national distribution system, however, attempting to identify areas for domestic growth becomes increasingly challenging with every new store. It is inevitable that retailers eventually must find opportunities for new stores in areas that may not be familiar. Although this may be publicly promoted by a retailer as a new and exciting shift in strategy, these are merely adjectives to mask the reality of real-estate maturity. This is noted by the depletion of opportunities in desired options, an unwillingness to continually cannibalize existing stores, or in some cases desperation to satisfy investors with new store growth.

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3. The Location Types of US Retailers

3.1 Introduction

Every year, most large US retail chains make dozens, if not hundreds, of locational decisions to open new stores or close existing ones. Locational decisions have internal and external impacts. The internal impacts are on the opportunities for new store growth and how to operate the stores within the framework of the locational diversity of the chain, while the external impacts are on communities, real-estate developers, co-tenants, competitors, and other stakeholders. While each location is evaluated individually in great detail, certain retailers tend to favor certain types of locations based on factors such as retail type (category killer, mass merchandiser, etc.), region, store count, store size, and urbanization. For example, according to its company website (corporate.familydollar.com), discount chain Family Dollar prefers 7,000 to 10,000 square foot stores in neighborhood or convenience shopping centers or free-standing buildings that are near low-to-middle income segments of the population in its existing regions.

Location types matter to retailers. Thrall (2002) used the term “value platform” to encapsulate the entire shopping experience that a consumer receives from the purchase and consumption of a good or service. The value platform includes factors such as personnel, service, and display of goods, as well as the situational aspects of store location. The type of location is not only part of the shopping experience, but has an effect on numerous other components of the business. For instance, retailers must decide how to present each store to the market, and whether they can be consistent across their

chain networks in building the brand in regards to product assortment, marketing, and other factors. Large chains, whether in store count or total square footage, need to appeal to many segments of the population in order to keep adding new store locations and thus they cannot always deploy stores in their most desired retail areas. Consider that Walmart, which has traditionally located in smaller towns or suburban areas, is attracting attention for its increasing presence in urban areas (D'Innocenzio and Beck 2011). One can find a retailer such as Staples (office supply) in the urban core, suburbs, and small towns situated in power centers, lifestyle centers, grocery-anchored neighborhood centers, super-regional centers, malls, stand-alone locations, or on the ground floor of skyscrapers. Retailers that can succeed in more diverse location types have more flexibility for expansion but may face a greater challenge of maintaining consistency. In this article, we attempt to establish the theoretical basis for locational decisions and the associated level of consistency of location types.

Before we can evaluate the types and diversity of locations for large retail chains, we first need to develop a typology of retail locations. There is no comprehensive typology of retail locations in the academic literature. Further, aside from studies on a few particular chains such as Walmart (Zhu and Singh 2009) and others (Karande and Lombard 2005), there is minimal formal knowledge of the types of locations chosen by major U.S. retailers. The International Council of Shopping Centers (ICSC 1999) provides a classification of retail centers into categories such as neighborhood, power, or lifestyle centers, to name a few. Their classification system, however, is based on the characteristics of the retail property itself, not on the surrounding area. The suitability of

a retail location is determined not only by the site or center itself but also by situational factors, including proximity of other retailers off-site, accessibility, and characteristics of the customer base in the trade area. Furthermore, the ICSC classification system covers only retail centers, not stand-alone store locations, which may comprise a large percentage of the stores of some chains.

This article presents the results of an inductive analysis of the types of locations chosen by U.S. retailers using one of the largest cross-sectional databases of retailers ever assembled. With fifty of the largest retail chains, and over 70,000 store locations, we present two distinct cluster analyses. First, situational and trade area data at the geographical scale of the store are used to categorize the store locations into empirical groupings of retail locations types. Based on the clustering of individual stores, a second cluster analysis groups together the retailers with the most similar location profiles. Finally, the chains and categories of chains are analyzed based on factors that explain their location profiles.

3.2 Relevant Literature

Chain store retailing is complex because every store trade area will have various customer types. Consumer demographics affect the demand for products and responses to promotions. Furthermore, stores are in a number of different types of sites, situations, and competitive environments. In this treatment, we consider location types as encompassing both the site itself and the situational aspects including trade area demographics. As such, there may be considerable diversity among the location types chosen by retailers and

overall by categories of retailers. The following literature review is presented to address the factors behind this diversity and the resultant effects on the choice of why retailers choose particular location types. We also discuss how the structure of retailing is continually evolving based on consumer preferences, macroeconomic factors, technological innovations, and their impacts on store deployment.

3.2.1 Customer Types

There has been an exhaustive amount of research suggesting that not all consumers have the same shopping behaviors nor do they all react similarly to promotions (Stone 1954; Lumpkin, Hawes, and Darden 1986; Hortman et al. 1990; Burt and Gabbott 1995; Johnson-Hillery, Kany, and Tuan 1997; Theodoridis and Chatzipanagiotou 2009).

Consumers develop attitudes towards products based on their needs, which are linked to demographic and lifestyle factors (Myers 1970). Most of the research has focused on the effects of specific socioeconomic factors such as age, household size, and income.

Household dynamics affect the patronage decisions of many shoppers. Elderly shoppers with smaller household sizes have been found to be more price-conscious, more caring about their relationships with the staff, and less sensitive to location (Hortman et al. 1990; Burt and Gabbott 1995). Conversely, younger adults are highly responsive to convenience factors because they may be time-poor, especially those with growing families (Hortman et al. 1990). An interesting spatial dynamic is that younger adults tend to gravitate towards urban areas, especially for job opportunities (Garasky 2002). These younger consumers are also noted for their high levels of brand consciousness (Morton

2002; Noble, Haytko, and Phillips 2009) and brand loyalty (Noble, Haytko, and Phillips 2009). Gable et al. (2008) found that college-aged women perceived discount stores to have more convenient locations, lower prices, and a wider variety of products whereas category killers (specialty retailers such as Best Buy in the electronics category) were perceived to have better service and deeper product lines, especially of well-known brands. Younger adult shoppers listed their most preferred retailers as Walmart, Target, and Best Buy, and preferred specialty stores more than older cohorts (Carpenter and Moore 2005). Given the connection between urbanization, youth, and brand awareness, it would seem that urban markets would have more stores in prime locations that feature brands whereas areas with older residents may have stores featuring more private labels.

Research on shopping behavior has consistently found that lower-income households have greater price sensitivity (Hoch et al. 1995; Kalyanam and Putler 1997; Baltas and Argouslidis 2007). Carpenter and Moore (2006) found income and education were negatively associated with supercenter shopping while customer service was important to specialty shoppers. Shoppers list price as the most important reason for visiting Walmart (Arnold, Handelman, and Tigert 1998). Carpenter and Moore (2006) also found household size was positively associated with supercenter and warehouse club shopping and that African Americans preferred supercenters more than Caucasians. Gonzalez-Benito, Bustos-Reyes, and Munoz-Gallego (2007) stressed, however, that failing to account for spatial convenience can overestimate the preference for store formats by various geo-demographic groups. Along those lines, retailers with low prices can perform

well in less-convenient locations with cheaper real estate costs given that consumers are willing to drive farther distances for the price savings (Grewal et al. 2012).

3.2.2 Location Types

Most research on customers has not accounted for their spatial proximity to the stores. Obviously, this research would not exist if every consumer had the same needs and motivations. This quickly becomes spatial when you consider that similar lifestyles tend to cluster in the same neighborhoods. The following discussions highlight more of the spatial factors relating to the stores and their trade areas.

Many classical studies in retail geography have dealt with the classification of retail centers or markets. They are concerned with the type, size, and number of stores as well as the size of the trade area and location within the market. Various typologies have emerged including shopping malls, neighborhood centers, regional centers, specialty centers, and factory outlets. Retail centers tend to locate near one another and other stand-alone retail because of agglomeration and zoning. Guy (1998) referred to unplanned clusters of centers as *retail areas*. Few studies have attempted to classify retail centers or areas based primarily on the populations served. Berry (1963) conducted a landmark study of retail centers (actually retail areas) in Chicago and found hierarchies of business ribbons along major highways, in planned centers, and in either high or low income areas. Brown (1991) took a view against hierarchies and instead identified four main variations in shopping centers including planned or unplanned clusters, linear retail along highways, and isolated retail. Vias (2004) used cluster analysis to identify five types of

non-metro US counties that experienced similar structural changes in retailing from 1988 to 1999. Hardin and Carr (2006) attempted to identify distinct retail types in order to determine appropriate rental rates based on site and trade area attributes.

There have also been studies comparing the locational differences of competing retailers. For example, Zhu and Singh (2009) examined the geographic differentiation of mass merchandisers Walmart, Target, and Kmart. They found Walmart stores located near areas with larger household sizes, lower retail wages, lower incomes, and higher percentages of vehicle ownership. Conversely, Target stores were closer to areas of greater income, higher educational attainment, and more overall population. Kmart stores were somewhere in the middle of the income continuum. These results are not surprising given their value platform differences. As chains like Walmart and Target continue to expand their store counts past the point of real estate maturity, there may be less geographic differentiation between them in the future given that the traditionally chosen locations types have already been populated with stores (Joseph and Kuby 2013).

Some chains have gravitated towards deployment in large retail areas. A general consensus in the literature is that agglomeration—the bundling of retail activities—extends the size of trade areas because of the opportunities for multipurpose and comparison shopping (Cox 1959; O’Kelly 1983; Berman and Evans 1998; Oppewal and Holyoake 2004; Reimers and Clulow 2004). Consumers have proven to be willing to travel longer distances for multipurpose shopping (Ghosh and McLafferty 1987). Further, the risk of not finding desired products and services is reduced (Brown 1989). Price-conscious shoppers benefit from visiting multiple competitors (Mittelstaedt and Stassen

1990). Karande and Lombard (2005) found that office supply stores (Office Depot, Office Max, Staples) and home improvement stores (Home Depot, Lowe's) in three southeastern markets located near each other when the demographics were attractive. The agglomeration occurred mostly in areas of high income or density, young median ages, high retail expenditures, or high home ownership.

3.2.3 Contemporary Trends in Retailing

Location strategies of retailers are constantly evolving in response to structural changes in the overall retail marketplace. In the past few decades, the decline of the central business district (CBD) and the rise of niche retailing has caused a fundamental shift in where and how people shop. There has also been a shift in shopping habits and typology of store formats and concepts (Gable et al. 2008) and retail centers (Goss 1993). More recently, the economic crisis contributed to a plethora of store and chain closures and altered strategies by survivors. For example, there is now a movement towards refurbishing older facilities for new stores as opposed to the grandiose retail centers that proliferated across markets just a few years ago (Kukec 2011). We have also witnessed the increased popularity of low-cost, no-frills, discount stores with a limited assortment featuring private label brands, and their popularity extends beyond just low-income segments (Dekimpe et al. 2011). In response, specialty retailers are touting the overall shopping experience as their means of differentiation, which includes an increased focus on e-commerce.

E-commerce has become increasingly competitive with traditional brick-and mortar stores, especially with the rise of free shipping (Brynjolfsson et al. 2009). E-commerce has the advantage given that it reduces consumer search costs, especially for niche products which can be difficult to find. Dekimpe et al. (2011) discussed how some retailers have been able to reduce their store sizes and increase profitability by moving niche products from their stores to their web channel. Retailers are transitioning from offering a multi-channel experience, where its website competes with stores for sales, to an omni-channel experience, where both the web and the physical store work together to promote a seamless experience to the customer (Bodhani 2012). Participation in one channel can provide awareness and promote participation in another channel. Retailers are aggressively working towards becoming omni-channel because these customers spend more than multi-channel customers, which spend more than single-channel customers (Bodhani 2012). Given these trends, brick-and-mortar stores in the future may not need to be as large in size, but will still continue to play an important role as they are merged within the framework of the overall omni-channel experience.

3.2.4 Literature Conclusions

Despite all the research over the past several decades on shopper types, there is a dearth of knowledge concerning which kinds of retailers have greater exposure to particular segments of the population, and which types of locations are favored by retailers. This study is presented to address these issues and provide the field with a typology of domestic retail locations and discuss the factors that influence location choice.

3.3 Data and Methodology

3.3.1 Theoretical Background to Retail Store Deployment

Although every retail company has its own strategic initiatives, most retailers open new stores to grow or protect sales or market share (Figure 3.1). Notwithstanding the level and sophistication of research invested by companies into the store deployment process, the ultimate choice of each individual location is made by key decision makers within the company, many times basing the final decision on experience or a “gut feel” (Hernandez and Bennison 2000). Ideally, these decision makers choose locations that are consistent with the chain’s value platform (Thrall 2002). Practically, this translates into searching for certain kinds of location types. For instance, specialty retail stores with higher prices may perform better in affluent metropolitan areas when faced with the ubiquitous competition of lower-priced discount stores. Depending on the type of store, there are more or fewer types of locations, and markets for that matter, that can provide a match between what they are selling and the potential customers nearby, and can support the sales thresholds of the stores.

Although every location is unique, each individual *store location* is representative of a certain kind of *location type*. As discussed above, each retailer has one or more types of locations they typically search for and locate in, which we define here as the chain’s *location profile*. The location profile—or collection of location types—is a complex and evolving lynchpin of a retail chain’s overall value platform. To that end, the location profile affects, and is affected by, other aspects of the business, from merchandise

assortments to store formats (sizes, concepts, etc.) to international deployment. The expansion process is based on the availability of potential real estate as well as the ability of the chain's stores to perform in a variety of settings and markets. In the simplified flowchart of Figure 3.1, the "Identify Potentially Suitable Sites" box lists the variables included in this study. Given this broad theoretical framework, the purpose of this article is to search inductively for general patterns in the *types* of location choices of large retail chains. Specifically, our objectives are to: 1) identify distinct location types based on key demographic and situational factors; 2) group together the chains with the most similar location types; and 3) generalize about the factors that affect deployment within and between the categories of retailers.

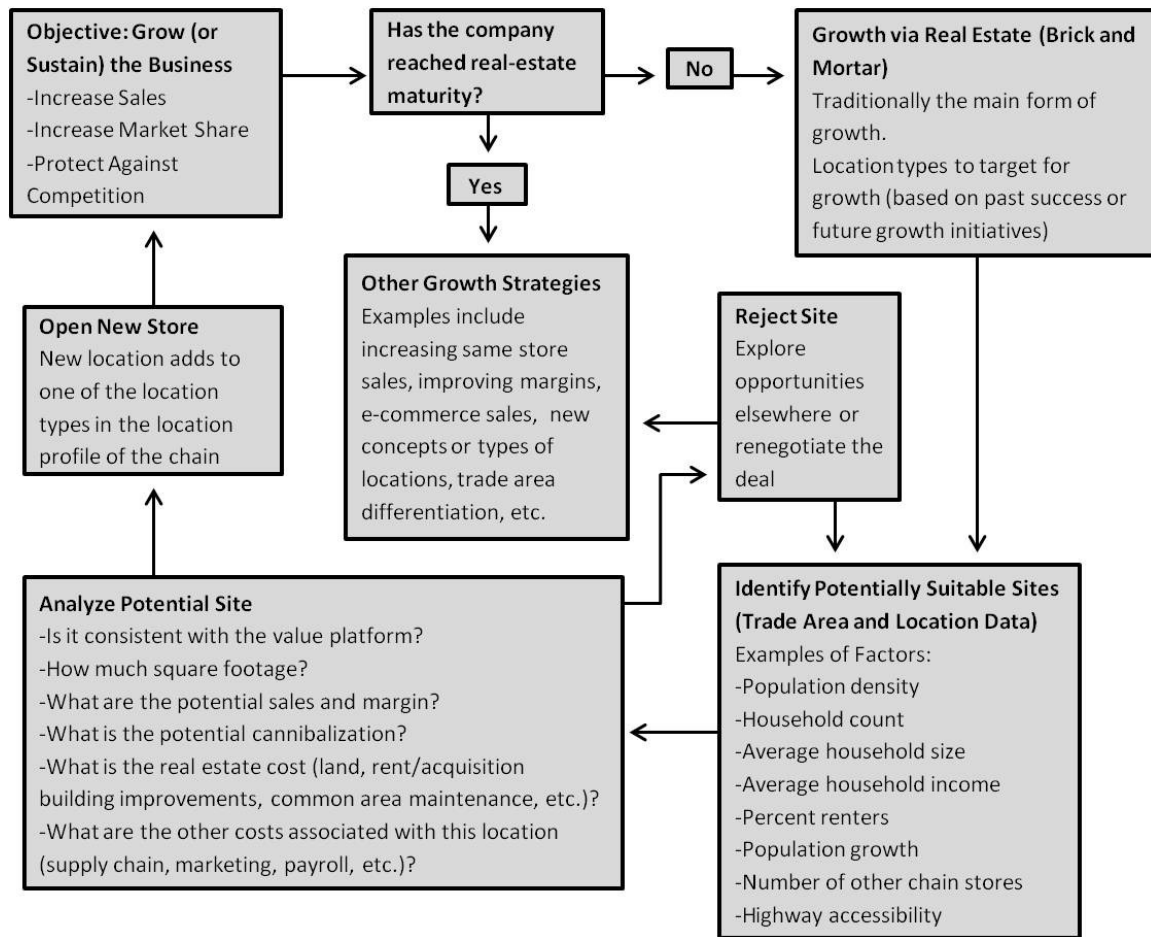


Figure 3.1. Process of Chain Store Expansion

3.3.2 Data

This analysis is based on 70,470 retail stores of fifty of the largest U.S. retailers in the lower forty-eight states. This includes “category killers” such as PetSmart or Sports Authority, general mass merchandisers such as Walmart and Target, and other retail categories such as discount or rent-to-own stores. Home improvement and auto supply are treated as individual retail categories because of the vast size differences when compared to other category killers. These specialty retailers have different flexibilities

and requirements relating to real estate. Consider that a 25,000 square foot clothing store usually does not directly compete with a 150,000 square foot home improvement store or a 5,000 square foot auto supply store for the same space. The general criteria for choosing the studied chains were based on three factors: 1) rank of sales according to the 2008 Fortune 1000 list; 2) minimum average store size of 2,500 square feet; and 3) more than one hundred store locations. Chains with smaller stores (e.g. GameStop or Bath and Body Works) were not included in this study as their level of individual store risk is not comparable to chains with larger stores. Only the standard and in some cases supercenter formats of the chains were studied. We also excluded supermarkets because of the high presence of various regional chains. Store locations were obtained from company websites and Environmental Systems Research Institute (ESRI).

With the use of geographic information systems (GIS), store locations were geocoded and a ten-minute drive time was delineated as a proxy for each store's trade area. The accuracy of the geocoding was reviewed by comparing the ten largest US markets against store locator results on the company websites. Although retail stores undoubtedly have variations in trade area size, the goal is to capture the characteristics of the immediate and surrounding areas of the stores that are accessible to the store. The most common form of trade area has been to use rings, such as five-mile rings used by Karande and Lombard (2005). A ten-minute drive time is generally somewhat comparable to a five-mile ring in terms of land area, but is more representative of a functional trade area, especially in areas of physical or political impediments. Shields and Kures (2007) used ten- and fifteen-minute drive time trade areas to study discount department stores.

3.3.3 Methods

Research Question 1 (RQ1): What are the location types of major U.S. retailers?

Before we can make generalizations about location types of retailers, we first must develop a means of classifying locations into a typology. RQ1 is solved by clustering all 70,470 store locations into smaller groups of similar location types, regardless of retailer affiliation. A location type identifies a group of stores with similar geographic factors including trade area factors—population density, household count, average household size, percent renters, population growth, average household income—as well as the number of other studied retail chains within 1.6 kilometers (1 mile) of the store and the presence of a limited-access highway ramp within 0.8 kilometers (0.5 miles) of store. Adjacency to highways can increase trade area size via increasing the travel speed of customers as well as awareness of the stores through signage or visibility from the highway. The other factors were selected as they are commonly considered by practitioners when evaluating potential sites and selecting analogs for forecasting sales. They are also distinguishing factors that affect the demand for products that consumers want and need to purchase.

The SPSS Two-Step Clustering Component was used as the data-reduction method to develop empirical groupings of store locations. The advantage of this algorithm is its applicability to very large datasets and ability to accommodate both continuous and categorical variables (SPSS 2001). The first step involves pre-clustering the observations into many small sub-clusters. Each individual observation is either assigned to an existing

sub-cluster, or creates its own. The second step clusters the sub-clusters based on the predetermined number. In this case, solutions were evaluated from four to thirteen clusters. ANOVA tests were then used to ensure that the store type clusters are significantly different from each other.

Despite the inductive nature of the analysis, we did have some hypotheses going into it. We expected that some retailers would favor sites that match targeted motivations, such as value or comparison shoppers. For instance, it was expected that general merchandise stores, value, rent-to-own, and auto supply stores would have greater deployment in low-to-medium income clusters. Department stores and category killers were expected to be found in larger retail areas because of agglomeration.

RQ2: Which retailers have similar location types?

A second cluster analysis uses the results from RQ1 to group together the most similar retailers based on their location profiles, or percent share of each location type within the total chain network for each retailer. The clustering algorithm is different from the one used to solve RQ1. We employ Ward's minimum distance, an agglomerative hierarchical clustering method that maximizes the differences between the groups while minimizing the differences within groups (Rogerson 2001). Mathematically, it optimizes an F -statistic. This method begins with every chain as a cluster of one, and continues to group the most similar clusters, one at a time, until there is only one left. It should be noted though that one of the weaknesses of the method is that once an observation is assigned to a cluster, it cannot be undone (Tan et al. 2006). The distance measure is squared

Euclidean distance. As one of the most commonly chosen distance types, squaring the standard Euclidean distance places greater weight on objects that are further apart in multi-dimensional space. Dendrograms are provided to visualize the results. The specific number of clusters is not predetermined but unveils during the analysis. ANOVA testing reveals whether the F -statistics are high and significant. The output also includes a pie chart showing the collective proportion of location types for the retailers that fall in the same group. Competitors are compared on the basis of their cluster membership.

The output from the second cluster analysis helps identify the store deployment strategies of the chains by revealing which chains choose similar types of store locations. In addition to the cluster analysis, we calculate a Gini coefficient for each chain as a diversity index to measure the degree to which chains spread their stores across a greater variety of location types or concentrate them among fewer types (e.g. Imbs and Wacziarg 2003).

We hypothesized that value, rent-to-own, and general mass merchandise stores such as Walmart and Kmart would have similar profiles featuring stores in low- to medium-income location segments. Target, a general merchandiser with a more upscale value platform, was expected to cluster with book stores, with both having more stores categorized in middle- or higher-income clusters in RQ1. Home improvement retailers were expected to cluster with category killers such as pet supply, featuring many stores in areas with more single-family homes.

The final part of solving RQ2 is to examine deployment in the various location types by the category of retailer. We compare chains within and between groups on the basis of

factors such as percent of stores deployed in micropolitan or non-metropolitan areas. We hypothesized that larger stores (in square feet) and specialty retailers are more likely to choose location types in urban areas, which adds to our generalizations of retail deployment by location.

3.4 Results

3.4.1 Retail Types

To analyze location types by retailers and retail categories, we first identify a total of twelve distinct retail location types with the cluster analysis of all 70,470 store locations regardless of chain membership. Distinct clusters, with obvious interpretations, were still appearing after splitting into ten and eleven different groups. After twelve, however, the differences were becoming less obvious. These clusters are listed with their group number and a fitting cluster name (Table 3.1). Diagnostics using ANOVA are significant at the 0.05 level with high F -statistics providing confidence in the differentiation of the clusters.

Table 3.1. Retail Location Types and Averages

Type	Count	Pop. Density	Households	Hhold Size	Renters	Pop. Growth	Hhold Income	HWY ½ mi	Retail 1 mi
(1) Convenient Highway Retail	6,085	1,528	38,535	2.38	34.8%	0.36%	\$58,157	1.00	4.4
(2) Large Retail Areas Near Highways	4,865	2,150	53,243	2.50	37.2%	0.96%	\$66,499	1.00	15.0
(3) Urban Highway	3,749	4,812	125,314	2.82	44.5%	0.85%	\$68,722	1.00	5.8
(4) High Growth and Income Areas Near Highways	3,453	2,178	45,786	2.74	26.5%	2.42%	\$97,120	1.00	7.5
(5) Small Town	18,414	620	10,475	2.41	27.8%	0.27%	\$51,644	0.00	2.8
(6) Isolated Retail	10,637	2,667	60,219	2.38	39.7%	0.45%	\$62,641	0.00	3.9
(7) Large Retail Areas	7,356	1,735	36,360	2.38	34.9%	0.59%	\$61,095	0.00	14.1
(8) Affluent Areas	5,065	2,306	42,501	2.71	24.0%	1.39%	\$100,759	0.00	6.7
(9) Metro Neighborhood	3,041	7,344	164,630	2.77	46.6%	0.51%	\$74,535	0.00	5.5
(10) Large Family Areas	3,636	2,583	44,246	3.12	35.4%	1.55%	\$59,787	0.00	5.0
(11) High Growth Areas	3,274	1,162	18,464	2.71	21.1%	4.47%	\$73,037	0.01	3.3
(12) Dense Urban Areas	895	22,755	589,862	2.55	62.3%	0.43%	\$75,612	0.39	5.8

(1) Convenient Highway Retail

This type of store location is found in smaller retail areas near limited-access highways. The trade areas have smaller household sizes and the second-lowest population growth and income. The chains with the most stores in this type attract value-oriented customers (i.e. Dollar General and Walmart). Retailers that are common to these locations mostly have destination stores with high square footage. It is the leading location type for Home Depot. Menards, another home improvement chain, has 20 percent of its stores in this type.

(2) Large Retail Areas Near Highways

These stores have the highest presence of other national chains, averaging fifteen per store. They are located near limited-access highways. This is the leading store type for department store mall anchors, Dillard's and Macy's. This is also the leading type for category killers such as Best Buy (electronics), Borders¹ (books), Ross (clothing), Sports Authority (sporting goods), and Toys "R" Us (hobby). Best Buy has the most stores followed by department store Sears and Target, a general mass merchandiser.

(3) Urban Highway

This type of store is near limited-access highways, with high household counts and renters in medium-sized retail areas. The highest store count belongs to value chain Family Dollar, followed by Auto Zone (auto parts) and Home Depot. The only chain with this as its leading location type is Big 5 Sporting Goods. The highest share percentage belongs to 99 Cents Only Stores, another value-oriented retailer.

(4) High Growth and Income Areas Near Highways

These location types are in high-growth areas near limited-access highways, rank second in income, and have a medium presence of other chains. Home Depot is the store count leader, again demonstrating its diverse location types. General mass merchandisers Target and Walmart have many stores in these kinds of locations. It is the leading

¹ During the time of the study, Borders closed all of its stores.

location type for the upscale department store Nordstrom and warehouse club Costco. About one of every eight Best Buy and Kohl's (department store) is found in this group.

(5) Small Town

This distinctive group of locations is lowest in population density, households, population growth, income, and presence of other major retailers. It is also the largest group with more than 26 percent of the studied stores. Discount store Dollar General is the leader in both store count and share. Family Dollar, with a similar value platform, has 45 percent of its stores in this location type. Other chains with high share include farm-oriented Tractor Supply; discounters Walmart, Kmart, and Big Lots; rental chains Aaron's and Rent-A-Center; auto supply chains O'Reilly Auto Parts, Advance Auto Parts, and Auto Zone; home improvement chain Menards; and department stores Belk, Sears, and JCPenney.

(6) Isolated Retail

This type of store location is separated spatially from most other national retailers. The trade areas have average population density, household counts, and income. The leader in overall count is Family Dollar. Many of these stores are in older commercial areas, evident by the lack of population growth. The leader in own-store share is Pet Supplies Plus followed by Rent-A-Center. This cluster is well represented by the auto parts chains and chains with value-oriented customers such as Aaron's, Big Lots, Burlington Coat Factory, Dollar Tree, and Kmart.

(7) Large Retail Areas

This location type is similar to (2) Large Retail Areas Near Highways, except the stores are not adjacent to limited-access highways. This is the leading location type for fifteen chains, mostly category killers, i.e. Barnes & Noble and Books-A-Million (book stores), Bed Bath & Beyond (home goods); Dick's Sporting Goods; Hobby Lobby, Jo-Ann Fabrics, and Michael's (hobby); Office Max; Petco, PetSmart, and Pet Supplies Plus; TJ Maxx (clothing); and Toys "R" Us. The leader in store count is Dollar Tree, followed by Walmart, Rent-A-Center, Sears, JCPenney, and Target.

(8) Affluent Areas

These stores are in medium-sized retail areas, serving an affluent and expanding population base. The leader in overall store count is Dollar Tree, demonstrating its appeal beyond low-income and small-town consumers. Auto parts stores also are common in these locations as well as Target, Walmart, and Staples (office supply), among others. Book stores, pet supply, and some other category killers also have considerable shares, as does BJ's Wholesale Club.

(9) Metro Neighborhood

These stores are located in established, dense areas. There is a high percentage of renters and above average income with some retail presence nearby. The store count leader is Auto Zone. The other auto supply chains are well represented, as is Home Depot, Staples

(office supply), and Target. Value-oriented chains—Rent-A-Center, Dollar Tree, Family Dollar, and 99 Cents Only Stores—have many stores in this type of location. 99 Cents Only Stores is the only chain with this as its leading type, again demonstrating the exposure of discount stores to affluent consumers.

(10) Large Family Areas

These stores have the highest average household size in their trade areas. The incomes are modest and these neighborhoods are expanding. The leader in store count is Family Dollar, followed by Auto Zone. The other auto parts chains and discounters, rent-to-own, and dollar stores have considerable presence. No chain has its highest number of stores in this group. The leader in share is 99 Cents Only Stores. Most nationally deployed category killers have avoided deployment in this type of location, although regionally deployed Big 5 Sporting Goods has some presence.

(11) High Growth Areas

These locations are in low density areas, but with rapid population growth. Chains that deploy stores in this kind of site may not follow the “rooftops before retail” mantra of real estate practitioners. With only 3.3 other major retailers within a close proximity, these stores are often the pioneers that are among the first to move into these areas. The leader in store count and share is Dollar General. The auto parts and home improvement chains are well represented as is Walmart. No chain has this as its top location type.

(12) Dense Urban Areas

This is the smallest location type in size, representing just over one percent of stores. This cluster is by far the leader in density, household counts, and renters. Family Dollar has the highest store count, followed by Staples and Auto Zone. While no chain has its highest proportion in this group, the highest share belongs to office supply chain Staples. 99 Cents Only Stores has some of this type of location as do department stores Macy's and Nordstrom, each about 5 percent. Borders also had some of these stores prior to its closing. Fourteen of the chains have fewer than five stores in this location type including Walmart and Dollar General.

3.4.2 Discussion of Location Types

Given the differences among the location types, it is not surprising that there are parts of markets where particular location types are more likely to be found. For example, Figure 2 provides an example of the location types of the second largest discount department store chain (general mass merchandiser), Target, in the Chicagoland area and its adjacent hinterland. Granted, the Chicagoland area is one of the largest markets in the study, and includes the city of Chicago and its surrounding suburbs. It was chosen because it was large and diverse enough to have all types of locations for a particular retailer (i.e. Target). The lack of extreme changes in topography also allows for a gradual decrease in population density from the urban center (i.e. Chicago Loop). From the figure, (12) Dense Urban Areas stores arrange themselves around, and in some cases in, the central business district. For this particular retailer, and in this particular metropolitan area, there

are far and away more stores that have location type of (8) Affluent Areas. That being said, many of these stores are in the suburbs somewhat far from the urban core, with more on the wealthier north side of Chicago. In between the urban core and the suburban areas, there are several stores with the location type of (9) Metro Neighborhood. There are a few examples of large retail areas (Groups 2 and 7). Group 11, High Growth Areas, can be detected in the Southwestern part of the Chicagoland area. Finally, there are a few stores in (5) Small Town, on the extreme ends of the hinterland, in neighboring states.

There are relationships between the clusters and varying degrees of similarities and differences. For example, (1) Convenient Highway Retail is similar to (2) Large Retail Areas Near Highways, but the trade area demographics are more attractive for store deployment in (2) because of more households and higher levels of density, income, and growth. With a sufficient population base to support the sales thresholds of these retailers, more chains locate stores in this location type, especially specialty retailers, which have clearly targeted these locations. (2) Large Retail Areas Near Highways is similar to (7) Large Retail Areas, with the difference being in the immediate highway access. The highway accessibility extends the size of the trade areas and the number of households. Granted, some of the stores in (2) may be located close to stores in (7). There is a strategic reason to locating in the immediate vicinity of a limited-access highway and retailers such as Best Buy may be more likely to “pay up” for real estate sites closer to the highways while many other category killers have deployed more stores in the larger retail areas but not next to highways. Conversely, chains with an upscale value platform and most category killers (specialty retailers) are not often found in (5) Small Towns or

(6) Isolated Retail. It is possible that the stores in (6) Isolated Retail were at one time in a major shopping area for their community. Over time, however, other retailers may have relocated to other parts of the markets and legacy chains like Kmart were left behind as the market changed around them. (12) Dense Urban Areas stores may be a location type targeted for growth as mature chains like Walmart continue to seek places for new deployment.

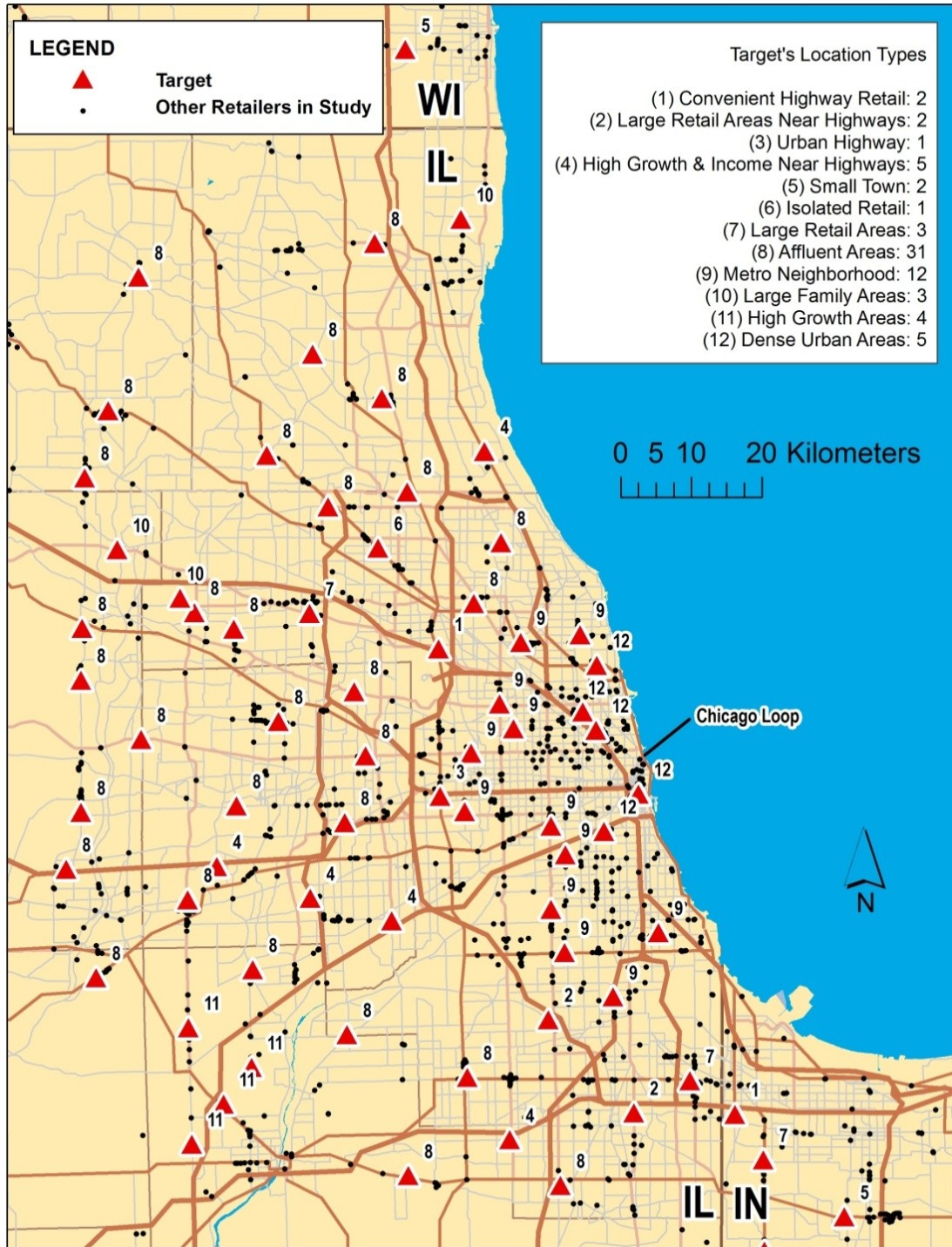


Figure 3.2. Example: Target Locations by Type in the Chicagoland Area

3.4.3 Retailers with Similar Location Profiles

The studied chains have varying levels of deployment in particular location types. Some chains have been more willing to open stores in a variety of types while others have focused their deployment in just a few. Table 3.2 provides the top three location types for each studied chain, arranged by retail category, that is, by the kinds of goods sold in the stores. The table also includes a diversity index (Gini coefficient) to evaluate the chains based on their deployment in a variety of situations. Gini coefficients closer to zero represent a more diverse location profile, whereas a value of 1 would indicate that all of their locations were concentrated within a single type. The chains with the most diverse location profiles include Home Depot, Staples, Ross, Target, and Big 5 Sporting Goods while the least diverse (larger Gini coefficients) are Dollar General, Family Dollar, Tractor Supply, 99 Cents Only Stores, and Advance Auto Parts. Aside from 99 Cents Only Stores, the other low-diversity chains tend to have a considerable presence in (5) Small Towns. Although a chain like Advance Auto Parts has penetrated into denser areas, it is still overweight in small market deployment. Given that small markets outnumber large markets, chains with preference for small market deployment tend to have lower Gini coefficients. At the other end of the diversity spectrum, three of the top nine most diverse chains are office supply, which tend to locate more in metropolitan markets. We revisit the effects of urbanization later in this section.

Table 3.2. Leading Location Types and Gini Coefficient of each Chain, Sorted by Retail

Category					
CATEGORY	LEADING TYPES*	GINI	CATEGORY	LEADING TYPES*	GINI
SPECIALTY (CATEGORY KILLER)			DEPARTMENT STORE		
Staples (Office Supply)	8 (13%), 7, 6	0.22	Kohl's	7 (16%), 8, 4	0.33
Office Depot (Office Supply)	6 (15%), 7, 3	0.29	Macy's	2 (19%), 7, 3	0.39
Office Max (Office Supply)	7 (17%), 2, 8	0.31	Sears	5 (21%), 7, 2	0.40
Big 5 (Sporting Goods)	3 (15%), 10, 9	0.28	Nordstrom	4 (18%), 3, 8	0.42
Sports Authority (Sporting Goods)	2 (20%), 4, 7	0.40	JCPenney	7 (23%), 5, 2	0.46
Dick's (Sporting Goods)	7 (23%), 2, 8	0.46	Dillard's	2 (28%), 7, 6	0.51
Ross (Clothing)	2 (14%), 7, 3	0.26	Belk	5 (32%), 7, 1	0.54
Marshalls (Clothing)	8 (15%), 6, 7	0.29	WAREHOUSE		
Burlington Coat Factory (Clothing)	6 (19%), 7, 2	0.37	BJ's Wholesale Club	8 (16%), 6, 2	0.31
TJ Maxx (Clothing)	7 (22%), 8, 2	0.40	Costco	4 (17%), 3, 2	0.36
Petco (Pet Supply)	7 (16%), 8, 2	0.31	Sam's Club	7 (18%), 2, 1	0.40
PetSmart (Pet Supply)	7 (19%), 2, 8	0.37	HOME IMPROVEMENT		
Pet Supplies Plus (Pet Supply)	6 (25%), 7, 8	0.54	Home Depot	1 (14%), 8, 7	0.22
Barnes & Noble (Books)	7 (20%), 2, 8	0.37	Lowe's	5 (19%), 1, 7	0.35
Borders (Books)	2 (17%), 8, 7	0.37	Menards	5 (27%), 1, 6	0.52
Books-A-Million (Books)	7 (23%), 1, 6	0.46	DISCOUNT STORE		
Michael's (Hobby)	7 (22%), 2, 8	0.42	Dollar Tree	5 (23%), 6, 1	0.40
Jo-Ann Fabric (Hobby)	7 (23%), 6, 2	0.43	Big Lots	5 (22%), 6, 7	0.41
Hobby Lobby (Hobby)	7 (28%), 6, 2	0.45	99 Cents Only Stores	9 (30%), 3, 10	0.56
Toys "R" Us (Hobby)	2 (24%), 7, 8	0.47	Family Dollar	5 (45%), 6, 10	0.63
Bed Bath & Beyond (Home)	7 (22%), 2, 8	0.39	Dollar General	5 (62%), 6, 11	0.73
Best Buy (Electronics)	2 (21%), 7, 4	0.40	RENTAL STORE		
MASS MERCHANDISER			Rent-A-Center	5 (28%), 6, 1	0.49
Target	7 (15%), 8, 2	0.27	Aaron's	5 (33%), 6, 7	0.54
Kmart	5 (27%), 6, 1	0.44	AUTO SUPPLY		
Walmart	5 (34%), 1, 6	0.47	Auto Zone	5 (28%), 6, 10	0.46
Meijer	5 (18%), 1, 7	0.48	O'Reilly Auto Parts	5 (32%), 6, 10	0.47
Tractor Supply	5 (45%), 1, 7	0.61	Advance Auto Parts	5 (35%), 6, 1	0.55

*Percent given for top location type for each retailer.

Location Types: (1) Convenient Highway Retail (2) Large Retail Areas off Highways (3) Urban Highway (4) High Growth and Income Areas off Highways (5) Small Town (6) Isolated Retail (7) Large Retail Areas (8) Affluent Areas (9) Metro Neighborhood (10) Large Family Areas (11) High Growth Areas (12) Dense Urban Areas

The retail categories in Table 3.2 are an a priori grouping based on common terminology used by the retail industry and/or the general public. From Table 3.2, there appear to be some noticeable trends among similar retailers, such as specialty chains having their most stores in large retail areas and discount stores favoring smaller markets for deployment. The second cluster analysis goes beyond these subjective observations to quantitatively group together the chains with the most similar location types. A hierarchical cluster analysis is performed on the 50x12 matrix of each chain's percentage distribution across the twelve location types. Figure 3.3 is the cluster dendrogram illustrating the cluster building process from left to right as the cluster analysis proceeds to higher levels of generalization, with fewer (and broader) clusters and less similar chains being grouped together. Initially, the stage one groupings include:

1. Mass merchandiser Target, and specialty retailers Petco (pet supplies) and Office Max (office supply), which locate in a variety of situations (high diversity);
2. Office Depot (office supply) and Burlington Coat Factory (clothing), which favor interior urban locations;
3. Specialty retailers Toys "R" Us (hobby) and Best Buy (electronics), which deploy in the larger retail areas, especially near limited-access highways;
4. Specialty retailers Michael's (hobby), PetSmart (pet supplies), and Bed Bath & Beyond (home goods), which also are deployed in large retail areas but more stores are removed from immediate highway adjacency;

5. Specialty retailers TJ Maxx (clothing) and Barnes & Noble (books), with a preference for higher income segments;
6. Department stores Sears and JCPenney, mall stalwarts that are commonly in large retail areas and also have a heavy presence in (5) Small Towns;
7. Discounters Dollar Tree and Big Lots, with a large share in (6) Isolated Retail; and
8. Auto supply chains O'Reilly Auto Parts and Auto Zone—heavy in Groups 5, 6, and 10 (Large Family Areas)—demonstrating their ability to deploy in the smallest of markets and the urban areas, many times removed from other major retailers.

Stage two groupings include Marshalls (clothing) and BJ's Wholesale Club (warehouse); Staples (office supply) and Home Depot (home improvement); hobby chains JoAnn and Hobby Lobby; and rental chains Rent-A-Center and Aaron's. In addition, Kmart, a mass merchandiser, joins the group already occupied by discounters Dollar Tree and Big Lots. In stage three, Nordstrom, an upscale department store, joins Costco (warehouse); Kohl's (department store) joins the group already occupied by Target, Petco, and Office Max; Sports Authority (sporting goods) groups with Borders (books); and Dick's Sporting Goods combines with other category killers Bed Bath & Beyond, Michael's, and PetSmart. In stage four, Macy's (department store) joins Best Buy and Toys "R" Us; the Dick's Sporting Goods, Bed Bath & Beyond, Michael's, and PetSmart group unites with the TJ Maxx and Barnes & Noble group; and Advance Auto

Parts joins with Rent-A-Center and Aaron's, chains with high deployment in (5) Small Towns. Advance Auto Parts joins later with its competitors Auto Zone and O'Reilly Auto Parts because of its level of small market deployment. Finally, two discounters—Dollar General and 99 Cents Only Stores—are the last two chains to be assigned to a cluster. The location profiles of these chains are distinct because of their propensity to locate in isolation of other major retailers.

After fourteen stages, there are eight distinguishable groups of similar retailers, which we find to be an insightful level of generalization. Two groups have only one member. The remaining six groups range from four to eleven chains. ANOVA tests reveal that these clusters are statistically significant at the 0.001 level. A summary of each of the eight groups at this stage is also provided, with pie charts illustrating their proportions of location types (Figure 3.4).

Group A (Big 5 Sporting Goods, Costco, Nordstrom, and Ross) includes chains that locate in a variety of situations but favor urban deployment. An interesting connection between these chains is that they all started in large West Coast markets. Group B includes a variety of chains including all three office supply chains. Group C includes many of the category killers and Macy's. The difference between groups B and C is that although they both often locate in larger retail areas, Group B chains have deployed more often in smaller retail areas, denoting greater real estate flexibility. Group E includes three chains—Dillard's, JCPenney, and Sears—that are common mall anchors. It is common for small markets to contain malls but not adjacent power centers with a high number of nationally deployed category killers. Group E also has deployed in large retail

areas most often but has been willing to deploy in small markets much more than the chains in Groups B and C.

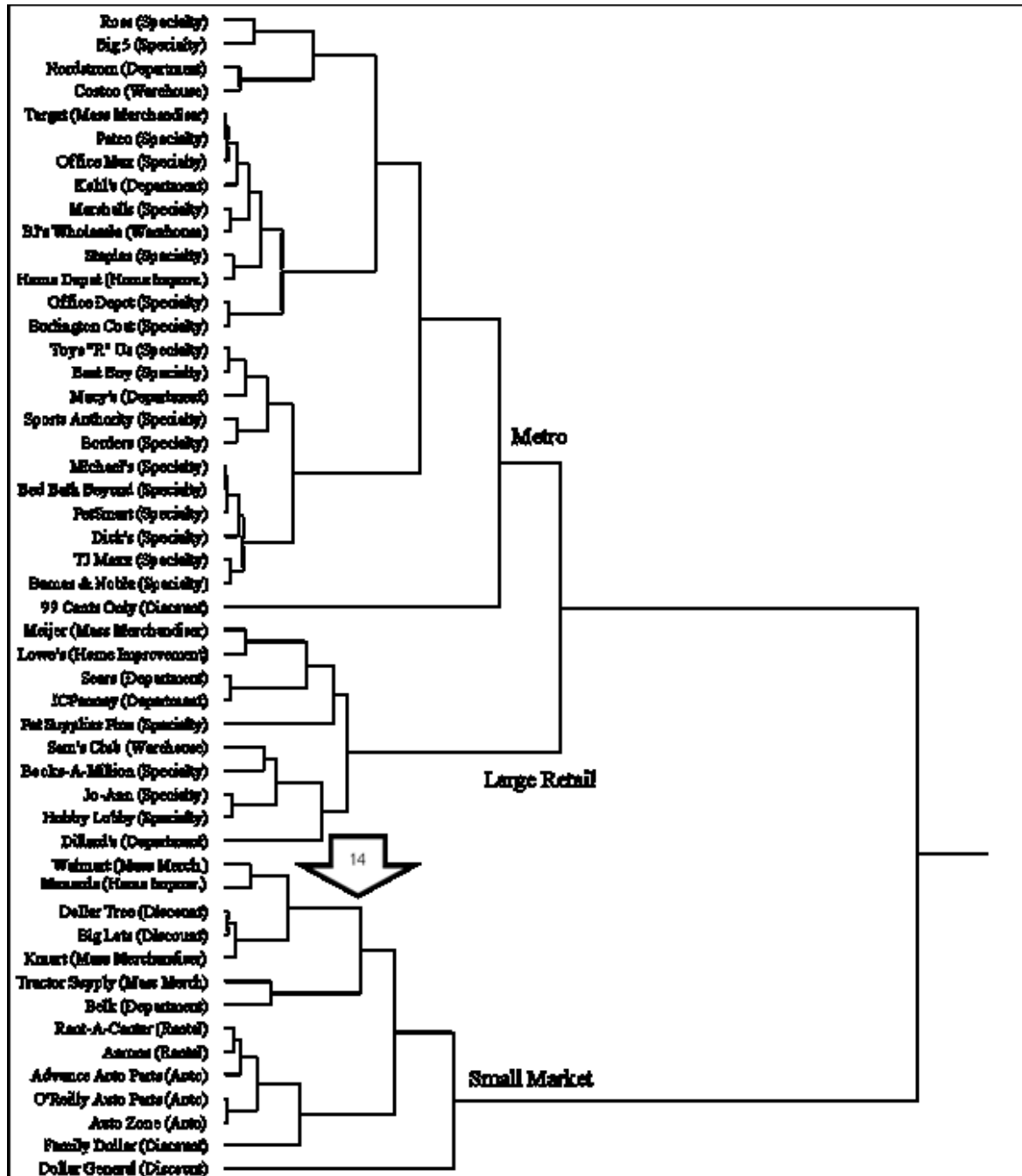
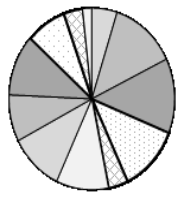
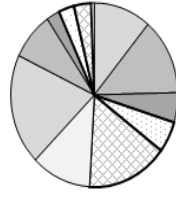


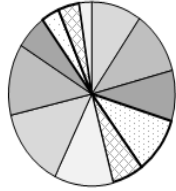
Figure 3.3. Cluster Dendrogram on Location Types



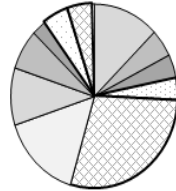
RETAILER GROUP A
 Members: Big 5, Costco, Ross, Nordstrom
 Dominant Location Type:
 Group 3 (Urban Highway): 13.3%
 Gini coefficient: 0.254



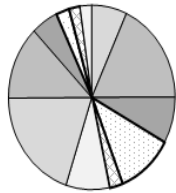
RETAILER GROUP E
 Members: Books-A-Million, Dillard's, Hobby Lobby, Jo-Ann, JCPenney, Lowes, Meijer, Pet Supplies Plus, Sam's Club, Sears
 Dominant Location Type:
 Group 7 (Large Retail Areas): 19.5%
 Gini coefficient: .303



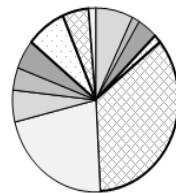
RETAILER GROUP B
 Members: BJ's, Burlington Coat Factory, Home Depot, Kohl's, Marshalls, Office Depot, Office Max, Petco, Staples, Target
 Dominant Location Type:
 Group 7 (Large Retail Areas): 14.0%
 Gini coefficient: 0.248



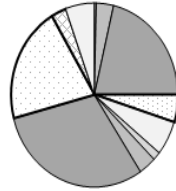
RETAILER GROUP F
 Members: Belk, Big Lots, Dollar Tree, Kmart, Menards, Tractor Supply, Walmart
 Dominant Location Type:
 Group 5 (Small Town): 28.9%
 Gini coefficient: 0.437



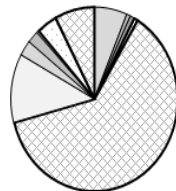
RETAILER GROUP C
 Members: Barnes & Noble, Bed, Bath, & Beyond, Best Buy, Borders, Dick's, Macy's Michael's, PetSmart, Sports Authority, TJ Maxx, Toys "R" Us
 Dominant Location Type:
 Group 7 (Large Retail Areas): 19.9%
 Gini coefficient: 0.385



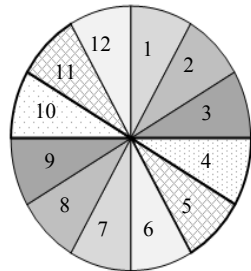
RETAILER GROUP G
 Members: Aarons, Advance Auto Parts, Auto Zone, Family Dollar, O'Reilly Auto Parts, Rent-A-Center
 Dominant Location Type:
 Group 5 (Small Town): 35.0%
 Gini coefficient: 0.516



RETAILER GROUP D
 Member: 99 Cents Only Stores
 Dominant Location Type:
 Group 9 (Metro Neighborhood): 19.9%
 Gini coefficient: 0.564



RETAILER GROUP H
 Members: Dollar General
 Dominant Location Type:
 Group 5 (Small Town): 62.2%
 Gini coefficient: 0.730



KEY

- (1) Convenient Highway Retail
- (2) Large Retail Areas Near Highways
- (3) Urban Highway
- (4) High Growth & Income Areas Near Hwys
- (5) Small Town
- (6) Isolated Retail
- (7) Large Retail Areas
- (8) Affluent Areas
- (9) Metro Neighborhood
- (10) Large Family Areas
- (11) High Growth Areas
- (12) Dense Urban Areas

Figure 3.4. Clusters of Similar Chains

The remaining groups feature many chains that cater to value-minded consumers. Many of these chains have their heritage in the South. Group D includes only 99 Cents Only Stores while Group H includes only Dollar General. Although they have similar concepts, 99 Cents Only Stores focuses on urban deployment while Dollar General has the greatest focus on small markets of any studied retailer. Groups F and G also have considerable but varying degrees of small market deployment. Group F includes mass merchandisers such as Kmart and Walmart. They deploy stores often in small markets but have more deployment in larger retail areas than Group G, which includes the auto parts and rent-to-own chains, as well as Family Dollar. The stores in Group G generally have smaller building sizes than those in Group F, allowing greater flexibility of locating in smaller retail areas and smaller markets.

3.4.4 Generalizations by Retail Type

We observed in the previous discussions that retailers with similar value platform characteristics showed a propensity for having similar location profiles. As the cluster analysis generalizes further, the domestic deployment patterns of U.S. retail chains appear to be more systematic than random. Figure 3.3 shows the eight clusters of chains reduced down to three, which we have labeled 1) Metro, 2) Large Retail, and 3) Small Market. For each of the commonly used a priori retail categories introduced initially in Table 3.2, we have listed the percentage of chains that were clustered into these Metro, Large Retail, and Small Market clusters (Table 3.3). The table also lists the average

aggregated square footage and the percentage of stores in smaller markets, defined as micropolitan or non-metro areas.

Table 3.3. Deployment by Retail Categories by Store and Market Size

RETAIL CATEGORY:	COUNT OF CHAINS BY CLUSTER TYPES			Overall Average Square Footage	Overall Average Percent Micro/Non-Metro
	Metro	Large Retail	Small Market		
Specialty (Category Killer)	18	4	0	29,018	5.6%
Mass Merchandiser	1	1	3	136,475	27.8%
Department Store	3	3	1	121,184	16.3%
Warehouse	2	1	0	133,203	4.3%
Home Improvement	1	1	1	138,227	14.2%
Discount Store	1	0	4	10,208	30.0%
Rental Store	0	0	2	5,841	24.6%
Auto Parts	0	0	3	7,187	20.9%
Overall Average Square Footage by Cluster	56,974	109,168	28,273		
Overall Average Percent Micro/Non-Metro by Cluster	5.2%	16.8%	27.9%		

The Metro group includes retailers that favor locations in urban areas, denoted by the low value of micropolitan and non-metropolitan deployment. It is dominated by category killers. Although these chains favor stores in the biggest markets, they are not the largest in terms of square footage. For most category killers, the value platform supersedes size in terms of what kind of markets can currently support these stores with their standard formats. The Large Retail cluster includes chains that locate in large retail areas, regardless of overall market size. It is the smallest cluster but three of the chains are

department stores, a byproduct of smaller markets where the shopping mall is the primary focus of retail activity. Thus, the square footages are high. Finally, the Small Market cluster has chains with smaller stores in smaller markets, and chains with value platforms oriented towards low-income customers. Not all stores in small markets are small in size, however, as three of the mass merchandisers have their focus here. The smaller markets can support the largest stores more easily than they can support smaller specialty stores.

3.5 Conclusions

We have presented one of the most comprehensive empirical studies on retail geography in the United States. In this article, we developed a location typology of 50 retail chains and their more than 70,000 domestic store locations. Using a two-step cluster analysis, twelve distinct location types emerged, capturing both site and trade area characteristics. For each chain, a location profile included its proportion of each location type. A hierarchical cluster analysis grouped together the chains with the most similar location profiles. In general, competitors and retailers with value platform similarities selected similar locations. For instance, most specialty retailers tended to locate more often in large markets with many choosing to be near other major retailers. Smaller stores such as auto supply and discount stores had a considerable presence in smaller markets. We identified three general types of market choice by retailers including deployment in all market sizes, only large markets, and only in large retail areas. Given the size of store and category of retailer, we found that specialty stores with their higher order goods and deeper product lines favored larger market or shopping area locations while the largest

mass merchandisers and smallest discount stores with lower order goods often deployed in smaller markets. Mass merchandisers, like Walmart, are often found in smaller markets because of the large threshold of distance that consumers are willing to drive for the one-stop shopping experience. Finally, we found urbanization to be associated with the diversity index (Gini coefficient) of the location profiles of the chains. Retailers that favored urban deployment have had the opportunity to locate in more diverse situations within metropolitan areas. Retailers that do not limit themselves to deployment in the largest retail areas had even more diverse location profiles. Retailers that deploy in small markets with high frequency have less diversity because they can choose to be in the best or only retail area in the market. Further, since small markets outnumber large markets, these retailers can identify thousands of markets for deployment in similar situations.

The results provide a glimpse into the deployment behaviors of different types of retail chains, relating the choice of locations to the value platform. As the retail marketplace is constantly evolving, some chains may have to depart from their traditional deployment patterns to continue to grow. Given the maturity of a chain, the opportunities for choosing locations in familiar or desired settings may diminish. For example, we discussed how Walmart has begun venturing into uncharted territory with its urban deployment. The results show that it has considerable room for growth in location types such as (9) Metro Neighborhood, (12) Dense Urban Areas and perhaps in some of the larger retail areas. For a chain that has been accustomed to opening the largest of the big-box stores, learning how to operate smaller stores in urban areas can be challenging. Walmart has introduced their Neighborhood Market concept as well as reducing the size

of the supercenter to fit some locations (Graph 2006). As a number of older malls continue to struggle and lose tenants, a chain like Walmart may be able to embark on a strategy of opening new standard stores or supercenters in these spaces. There is some evidence of this as Ceh and Hernandez (2010) found a successful venture between a new Walmart and an older mall property in Toronto. In order to be successful in new location types, however, chains must carefully consider whether the current value platform will best serve the needs of its potential customers. Walmart's increased focus on groceries, however, contributes to its attractiveness in a variety of settings, especially as many urban cores have become "food deserts" (D'Innocenzio and Beck 2011).

A departing theme to this article is that retailers with diverse location profiles may be able to increase the productivity of individual stores if they are flexible with their value platforms. The clustering also demonstrated that not every location is entirely unique. In other words, there may not be a need to consider every store individually but instead, planning for similar types of stores may be more appropriate. The supermarket chain Vons found income, age, ethnicity, seasonality, and competitors to be the most influential factors differentiating the stores in the chain and identified five distinct store types using cluster analysis and opened up two other store types with distinct value platforms and achieved positive results (Johnson 1997). In fact, customizing the stores to meet the needs of the trade area can provide a distinctive competitive advantage (Grewal et al. 1999).

These data will allow for numerous opportunities for extension of this research. Competitors can be researched further on their geographic differentiation including a

study of the types of locations in which competitors tend to agglomerate most often. Particular retailers can be tracked over time for how their location profiles change as it can be part of a larger study of real estate maturity and the impacts on business practices. Follow-up studies could test the results to a survey of prices or shoppers. Finally, the retailers may be surveyed or investigated for value platform modifications based on retail type. The literature needs continual study of retail location patterns as this industry changes quickly. Simply conducting the exact same study on a regular basis can provide insight as to where the United States is heading with its retailing practices.

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4. Modeling Retail Chain Expansion and Maturity through Wave Analysis: Theory and Application to Walmart and Target

4.1 Introduction

The spatial expansion of retail chains is heavily motivated by the desire to increase sales. Given that many of these companies are publicly traded, this motivation is exacerbated by pressures from the stock market. Companies like Walmart have experienced their highest price-to-earnings (P/E) multiples during eras of high new store deployment (Serpken and Tigert 2006). While undoubtedly, individual business practices among retailers lead to variations in the store deployment process, all retailers must consider the locations of their existing stores before deciding upon new store locations. For example, saturating the region where the retailer opened its first store reduces the opportunity for growth in that region and thus, future deployment may have to occur in more distant regions. After expanding to the other regions, the retailer may need to revisit the original saturated region after a period of time to continue growing its store count. On the other hand, if a retailer spread its initial growth over a larger area, then conceivably it could fill in the gaps within the areas where it already has stores.

This article analyzes retail store contagion, or the growth and diffusion of chains over time and space. The objective is to analyze whether the process of new store deployment is the result of a series of systematic series of stages. If so, does it resemble waves? Cliff and Haggett (2006) examined a similar problem in the epidemiological literature, but this concept has not yet been applied to retail. Other metrics to track the continuity of deployment over space are also presented.

Following the approach of Cliff and Haggett (2006), this article investigates the degree to which waves of store deployment represent a systematic pattern, with periods of swash and backwash. Using the analogy from coastal geomorphology, the initial swash stage involves the introduction of a retailer to a new region through multi-store deployment. Areas closer to the location of the first store of the retailer may be more likely to experience this stage sooner. The retailer shifts to a different region for new store deployment once the closer areas reach saturation. This may be the next closest area, especially for chains that place a high priority on maintaining low distribution costs. The closest area to the first store would experience a backwash stage of fewer store openings. As the retailer eventually expands to all areas, it becomes incumbent to revisit markets for deployment if it wants to keep growing. Consider that the older stores in the area close to the first store of the chain may be some of the most profitable stores because of less expensive real estate costs as well as stronger brand awareness due to the length of time of being deployed in that area. In this case, the retailer accepts the cannibalization of these high performing stores in an effort to secure new sites for store deployment. This represents a re-swash stage for a chain reaching domestic real-estate maturity. This is when most new growth requires significant cannibalization of existing stores (Joseph 2010).

This study focuses on the growth of Target and Walmart. Although similar in many respects, Walmart and Target have been studied for what differentiates them, including their differences in growth patterns, locations, trade areas, customers, and overall value platforms (Graff 2006; Shields and Kures 2007; Joseph 2009, Joseph 2010). The analysis

seeks to identify whether there are systematic processes to their deployment, in the form of swash-backwash waves. This modeling is related to the real-estate maturity of chains, in the sense of saturation of markets. This maturity may affect the locations of new store deployment and could also be linked to alterations in business practices.

4.2 Relevant Literature on Retail Expansion

The processes behind retail expansion have been analyzed using a myriad of methods. Distances from company headquarters have been proven to affect the location of new stores (Brown 1981; Jones 1981; Manuszak and Moul 2008; Zhu and Singh 2009). Joseph (2010) found that distance from the first store was a factor that helped explain the locations of Walmart stores until it reached the stage of domestic real-estate maturity. The locations of Target stores, however, were not affected by the distance to its first store. The locations of distribution centers also play a key role in explaining deployment of retail chains, and can even constrain new locations to a certain area (Laulajainen 1987; 1988; Shields and Kures 2007; Holmes 2011). In fact, the benefit of regional saturation may be realized with improved economies of scale including more efficient distribution costs (Graff 1998). Walmart has kept its distribution costs low by opening up new stores close to its existing stores, (Jia 2008; Holmes 2011). Some retailers may choose to stay regional and diffuse slowly across space because there are advantages to customer familiarity with the brand (Laulajainen 1988). Retailers that opened their first store in smaller markets may seek to deploy in other small markets and *vice versa* for retailers that opened their first store in large markets (Jones and Simmons 1987; Laulajainen

1987). To that end, Walmart, which opened its first store in the small town of Rogers, Arkansas, had much of its early growth in small towns (Graff 1998). Target, on the other hand, has historically opened more stores in larger markets (Graff 2006). Its first store was in the Minneapolis suburb of Roseville, Minnesota. Another option for growth includes acquiring stores from other retailers (Laulajainen 1987). Target had considerable store growth over its first few decades from acquisitions (Joseph 2010).

There are many studies on Walmart, the largest retailer in the world with sales exceeding those of the next five largest US retailers combined (Basker 2007). The success of Walmart has been attributed to technological investment and capitalizing on economies of scale (Basker 2007; Holmes 2011). Walmart maintained a contiguous store network as it diffused from its first location (Holmes 2011). Although it suffered early cannibalization of its younger stores, it more than made up the difference due to cost savings with its supply chain, which enabled it to offer everyday low prices (Graff 2006; Basker 2007). These low prices have changed the retail landscape, affecting competitors and contributing to store closures (Graff 2006).

Retailers generally attempt to remain consistent with the formula that made them successful. Change occurs out of necessity or at times desperation. For example, senior leadership at Walmart announced in 2007 that the retailer would much rather be building larger supercenters (McWilliams 2007). Walmart, however, has become strained by its real-estate maturity. Its high store count means that there are few markets left in the US where it can substantially increase its market share (Serpken and Tigert 2006). In a response to grow sales, Walmart has deviated from its core identity by enacting some

price increases for some of its merchandise. Target, the upscale discounter, was found to offer several items for lower prices than Walmart (Joseph 2009). Recent press also substantiated the higher prices at Walmart, although it has begun to roll back some of these increases and still matches any lower advertised price (D’Innocenzio and Beck 2011). Perhaps its real-estate maturity is most evident as it has begun to deploy aggressively in non-traditional places such as dense urban areas (Ceh and Hernandez 2010) and has introduced a variety of store formats to meet the needs of the new location types (Bonanno 2010).

4.3 Data and Methods

4.3.1 Conceptual Introduction and Adaptation of the Cliff and Haggett Model

The objectives of this article are two-fold. First, this article introduces a method from medical geography used to study epidemiological waves and adapts it to the study of the diffusion patterns of retail stores over time and space. Second, it applies these modified methods to study the spread of Walmart and Target. In particular, these methods will help us understand whether subareas within a larger study area experience deployment in a wave-like manner, with periods of higher or slower growth varying between the subareas at different times. The modeling and analysis contributes to the retail literature by better understanding the systematic processes of retail expansion using unique methods for this field of study.

Cliff and Haggett (2006) presented a number of different metrics and statistics to characterize the spatio-temporal advance and retreat of disease cases as part of a single

wave. They introduced a space-time matrix in which the cells represent the number of cases notified in a given subarea i in a given time period t . The counterpart in retail is the advance of new stores of a retail chain through space and time, with each cell of the matrix providing the number of new stores in subarea i in time t . Cliff and Haggett introduced the concept of the leading edge LE_i , representing “the start of the epidemic wave in the different subareas” (p. 231). The retail equivalent is the first cell for each subarea (the first cell in each row) with a positive entry for number of new stores.

Cliff and Haggett (2006) assumed that the study area was subdivided into subareas such as counties, districts, provinces, or census tracts, numbered in no particular spatial order. After creating the matrix and identifying the leading edge for each subarea, they rearrange the rows of the matrix with the subareas from the earliest to latest leading edge, so that the leading edge progresses in steps upwards and to the right through the matrix. In adapting this model to retail, we propose using distance-based concentric rings originating from the first store location of each chain instead of pre-defined districts. Doing so explicitly tracks whether a retailer expands outward in concentric rings from its first store location; it also avoids the step of rearranging the rows of the matrix.

In Cliff and Haggett’s model, the area of the matrix to the left of the leading edge—that is, the space-time cells with no cases yet—is called the Susceptible area. The retail equivalent would be the Prospective area into which the chain has not yet expanded. To the right of the leading edge is the area of the matrix that Cliff and Haggett term the Infected area, which in retail terms would be the Deploying area.

At this point, our retail adaptation departs from the Cliff and Haggett method. For epidemiological purposes, Cliff and Haggett defined a following edge, representing the time period for each subarea after which no new cases are reported. (It is possible that a cell in the Infected area could have a value of 0, but it would not be the following edge unless *all* cells to the right also have a value of 0.) They re-sort the rows a second time from earliest to latest following edge, and define the area of the matrix to the right of the following edge as the Recovered area, which consists of all zeroes and proceeds in steps up and to the right.

In their article, if new cases arise in the same subarea in later time periods after an extended period of zeroes, they treat it as a new single-wave outbreak. This treatment, however, does not translate well to retail because new store openings tend not to drop to zero in a subarea for any extended period of time due to store closings and replacements, population growth, suburban expansion, urban revitalization, etc. Therefore, rather than identify a following edge defined by a permanent end of store openings, we define a Saturated stage when new stores in the subarea stop increasing over time and begin decreasing.

One important difference introduced here is that retailers may revisit areas for expansion in a second wave once growth has waned in an area. When new stores in a subarea stop decreasing and begin a second increasing stage, we define a fourth phase which we call Revisiting, or Re-Swash. There is no equivalent to this stage in the Cliff and Haggett model, although it could be related to the start of a new epidemic, which they treat as a new independent single wave. Whereas in medical geography the next

epidemic is seen as a mostly independent new episode, in retail geography we see it as a natural follow-up stage driven by the stock market's expectation of continued store growth.

Table 4.1. Equivalency between Epidemiological and Retail Interpretations of the Status of Subarea i in Time t

Coastal Geomorphology	Epidemiological (Cliff and Haggett 2006)	Retail (Proposed here)
	<i>Susceptible (S)</i> No cases yet	<i>Prospective</i> No stores yet
<i>Swash</i> Wave moving up beach	<i>Infected (I)</i> Cases reported	<i>Deploying</i> New store growth
<i>Backwash</i> Wave moving back to sea	<i>Recovered (R)</i> No more new cases	<i>Saturation</i> Fewer new stores than previous period <i>Revisiting (Re-swash)</i> More new stores than previous period

Finally, the Cliff and Haggett method produces a single swash-backwash wave for all subareas combined. They construct the curve from the net spatial change, defined as the number of leading edge cells minus the number of following edge cells, graphed by time period. This produces a swash-backwash curve for the entire region. If more subareas are getting their first cases of the disease than are resolving their last cases, the region as a whole is in swash phase; if the opposite occurs it is in backwash phase. While this could be applied to retail, our goal is not to characterize a chain as a whole as being in expansion or saturation stage. Rather, our goal is to characterize the phase that different rings are in at different times, so that the (re-)swash phase in some rings can be related to the backwash stage of others. Part of our reason for using rings rather than districts, therefore, is to be able to apply the swash-backwash method to assess whether retail

chains follow a distance-based pattern of expanding in an area, followed by slowing in that area while expanding in the next area, and so on until it runs out of room for virgin expansion, after which it begins to revisit some of the previous areas in a systematic way. Therefore, to adapt Cliff and Haggett's swash-backwash curve to separate rings, we calculate and graph the net change in new store count in each ring rather than the net change in the overall district count making a phase transition at the leading or following edges.

4.3.2 Modeling the Expansion of Target and Walmart

The data include the locations of all standard and supercenter Target and Walmart store openings between 1962 and 2009 in the contiguous lower 48 US states. While our main objective is methodological rather than comparative, applying the new method to both retailers will show its utility for characterizing and contrasting their deployment behavior. Target and Walmart, the two largest discount department store chains, are publicly traded companies and carry many of the same lines of merchandise. What's more, these retailers both opened their first stores in 1962, a convenient factor for this type of longitudinal study as it controls for exogenous phenomena such as recessions.

As seen in the literature review, Target and Walmart have employed dissimilar strategies towards the store deployment process. Whereas Target's growth was initially related to real estate opportunities and acquisitions in desirable locations, Walmart has systematically diffused across space from its first store location. In light of these differences, the following research question is addressed: Is retail deployment at

particular distances from the chain's origin subject to cyclical alterations between periods of increasing and decreasing growth? Despite their differences, it was hypothesized that some type of distance-related wave-like pattern will exist to some extent for both chains.

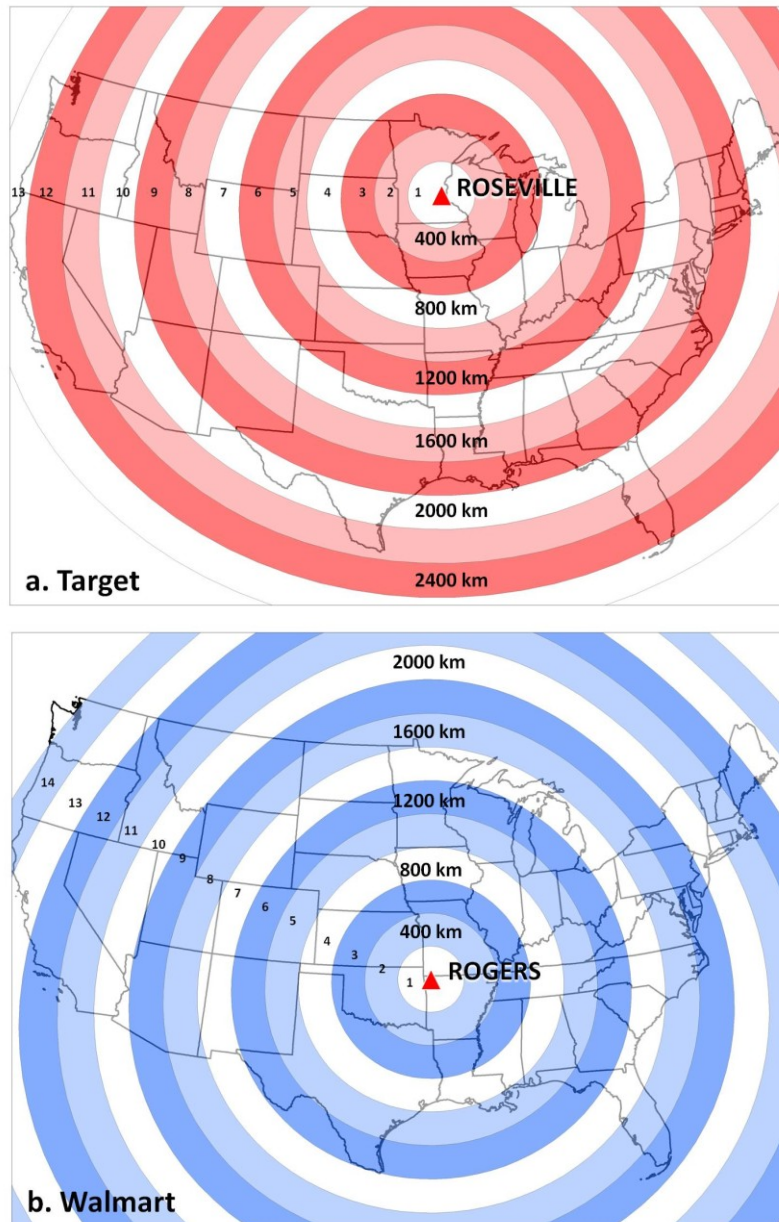


Figure 4.1. 200-km rings from Target's (a) and Walmart's (b) first stores

The first step is to present descriptive statistics to analyze the spatio-temporal deployment of Target and Walmart stores. This includes creating a space-time matrix of store openings for each chain, as well as providing summary tables and graphs based on the data in each matrix. Each subarea (a_i) represents a 200-kilometer ring around the first store location of each chain, with a total number of subareas (A). Figure 4.1 illustrates the locations of the first stores of Walmart (Rogers, Arkansas) and Target (Roseville, Minnesota). The overall duration of the study period (T) is broken down into five-year intervals (t). A cell (q_{it}) in the $A \times T$ matrix represents the overall number of new stores that opened in ring i during time period t . For example, q_{37} for Target includes all new stores located 400-599 kilometers away from Roseville (ring 3) during 1990-1994 (time period 7).

Building upon the work of Cliff and Haggett (2006), we introduce a new metric \bar{s} , the average number of skipped rings across all time periods, to track the spatial discontinuity of deployment. First, we define a corresponding binary matrix in which a 1 indicates at least one new store was opened in ring i in time t , and 0 otherwise. Thus, $m_{it} = 1$ if $q_{it} > 0$ and 0 if $q_{it} = 0$. Given that, \bar{s} , the average number of skipped rings per time period, is defined as follows:

$$\bar{s} = \frac{1}{T} \left[\sum_{t=1}^T \left(\text{Max}_i i \mid q_{it} > 0 \right) - \sum_{i=1}^A m_{it} \right] \quad (1)$$

For each time period, (1) computes the difference between the ring number of the farthest ring experiencing deployment ($Max_i i | q_{it} > 0$) and the total number of individual rings,

$\sum_{i=1}^A m_{it}$, experiencing deployment in time t . This difference tells us how many rings were

skipped in time t . \bar{s} sums up this difference over all time periods and divides it by the number of time periods T to obtain the average number of skipped rings per time period.

\bar{s} indicates whether a chain diffused in a continuous manner over space or if it skipped past areas to open new stores. A value of 0 represents continuous deployment in every time period while larger values signify more sporadic growth.

We hypothesize that the time period in which a store was first located in a given ring is associated with the distance of that ring from the location of the first store of the chain. Following Cliff and Haggett (2006), we calculate the average time period across all rings that the leading edge (\bar{t}_{LE}) arrives. Define $f_{it} = 1$ if time t is the leading edge cell for ring

i . In (2), the number of rings with new store growth *for the first time* ($\sum_{i=1}^A f_{it}$) is

multiplied by the time period in which it is occurring, summed over all time periods, and divided by the number of rings. \bar{t}_{LE} is useful for comparing how quickly different retail chains spread their new store growth to new rings.

$$\bar{t}_{LE} = \frac{1}{A} \sum_{t=1}^T t \sum_{i=1}^A f_{it} \quad (2)$$

The next step is to calculate areal phase transition within the matrix, which designates subareas into stages for a particular time interval based on the number of store openings relative to the previous interval of time. We designate a “Prospective” phase for subareas (rings) that have not yet had a new store opening, followed by “Deploying” and “Saturation” phases. The Deploying phase occurs when a subarea receives its first store opening, and continues for each subsequent t for as long as the number of new store openings exceeds that of the previous period. Once growth begins to slow, with fewer store openings than occurred during the previous period, that subarea is deemed Saturated. We also recognize a fourth stage that we call “Revisiting.” This occurs when the amount of new growth then re-exceeds that of a Saturation stage. Any decreases and increases in new stores beyond that are then considered as additional Saturation and Revisiting stages.

To implement this classification of matrix cells into stages, we track whether a subarea is in the stage of more, fewer, or relatively the same number of new stores openings in a period relative to the previous period. Specifically, equation (3) defines the change between phases. This method essentially controls for the different potential for growth in different areas, because it only compares the store openings in a given ring to openings in the same ring in the previous t .

$$\Delta q_{it} = q_{it} - q_{i(t-1)} \quad (3)$$

A systematic process of deployment may bear a resemblance to a wave over time for an area, with stages of swash and backwash. Plotting (3) for each ring illustrates whether the hypothesized swash-backwash-re-swash, (i.e. deploying-saturating-revisiting) wave behavior is in effect. Subareas that have positive delta values on the vertical axis are considered in a stage of swash while anything negative is considered backwash. Figure 4.2 shows the idealized plot with swash, backwash, and re-swash, and how they correspond to the four phases of Prospective, Deploying, Saturation, and Revisiting.

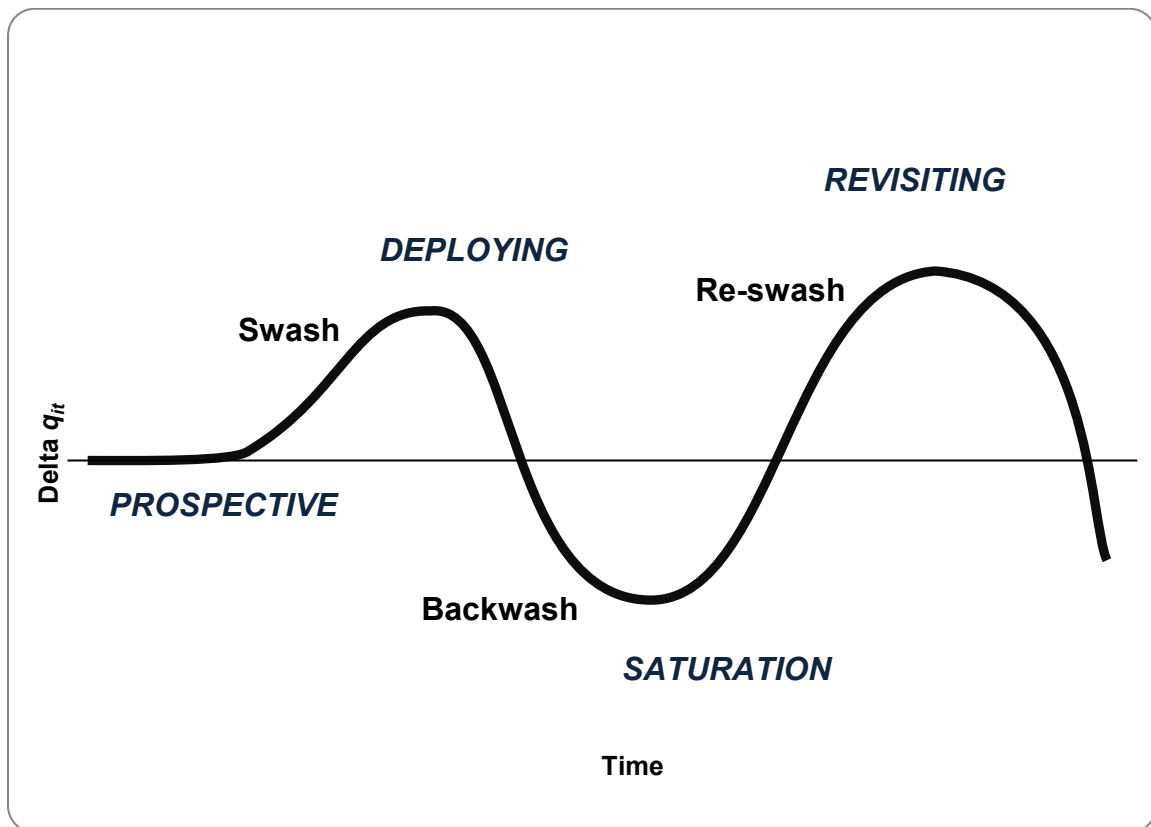


Figure 4.2. Idealized plot of a swash-backwash wave for a single ring. This curve could exemplify the second ring from the original store location if all new stores in the first two time periods were concentrated in the first ring only.

4.4 Results

4.4.1 Deployment Patterns of Walmart and Target

Figure 4.3 presents space-time matrices of new store openings for Walmart (A) and Target (B) respectively. Due to the locations of their first stores, Walmart has a 14x10 matrix: 14 rings of 200 km each, and 10 time periods of 5 years each beginning in 1960. Target's matrix is 13x10 because of the more central location of its first store. The shaded cells represent pairs of rings and time periods that have yet to receive a new store.

A Walmart

	1960-1964	1965-1969	1970-1974	1975-1979	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2009	km
a_{14}	0	0	0	0	0	0	6	13	5	4	2600-2799
a_{13}	0	0	0	0	0	0	35	16	12	3	2400-2599
a_{12}	0	0	0	0	0	0	45	12	17	25	2200-2399
a_{11}	0	0	0	0	0	0	60	54	48	48	2000-2199
a_{10}	0	0	0	0	0	0	32	31	43	61	1800-1999
a_9	0	0	0	0	0	13	87	54	69	33	1600-1799
a_8	0	0	0	0	18	58	88	41	59	40	1400-1599
a_7	0	0	0	0	23	72	71	46	52	23	1200-1399
a_6	0	0	0	0	33	97	100	48	64	52	1000-1199
a_5	0	0	0	0	90	140	132	38	82	4	800-999
a_4	0	0	0	14	143	146	49	18	47	6	600-799
a_3	0	1	11	74	85	61	29	8	35	13	400-599
a_2	0	4	40	59	45	33	6	7	15	13	200-399
a_1	2	8	30	15	16	9	2	2	3	2	0-199
	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	

B Target

	1960- 1964	1965- 1969	1970- 1974	1975- 1979	1980- 1984	1985- 1989	1990- 1994	1995- 1999	2000- 2004	2005- 2009	km
a_{13}	0	0	0	0	16	49	19	30	47	46	2400-2599
a_{12}	0	0	0	0	2	27	17	13	26	33	2200-2399
a_{11}	0	0	0	0	2	8	34	18	29	33	2000-2199
a_{10}	0	0	0	0	0	1	13	5	16	16	1800-1999
a_9	0	0	1	1	4	1	11	56	103	68	1600-1799
a_8	0	0	0	0	3	6	4	91	75	86	1400-1599
a_7	0	2	0	2	4	3	3	16	36	34	1200-1399
a_6	0	1	4	3	8	4	7	32	28	46	1000-1199
a_5	0	0	0	0	6	11	19	21	31	17	800-999
a_4	0	1	1	1	3	10	13	15	26	20	600-799
a_3	0	0	2	2	3	1	34	20	29	23	400-599
a_2	1	0	0	3	1	2	13	5	9	2	200-399
a_1	1	1	0	2	2	4	16	10	17	17	0-199
	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	

Figure 4.3. Space-Time Deployment Matrix for (A) Walmart and (B) Target

Overall deployment is temporally continuous, in that all time periods have some level of new store growth. Both retailers have opened stores in all distance rings from their first store location, providing general areal continuity. Where they differ, however, is that Walmart has never skipped a ring to open a new store in a ring farther away. On the other hand, Target opened up new stores in rings up to 1,400 kilometers away from its first store location as early as the second time interval, which corresponds to the late 1960s, without filling in all the rings in between. Target had discontinuous spatial growth until the late 1980s.

Table 4.2 summarizes the deployment over the time intervals, based on the matrices in Figure 4.3. Unlike Target, Walmart did not deploy stores in regions far away from its

first store during its few decades of existence. It did, however, grow its store count much faster than Target. By the end of fifth time period (1980-1984), Walmart's store count outnumbered that of Target by nearly 9-to-1. Spatially, Target had already expanded to all distance rings except one while Walmart had just finished its continuous expansion to the 1,400-1,600 kilometer subarea. It was not until the early 1990s that both retailers opened up stores in every single distance band, and continued to for the remaining four time periods.

Table 4.2. Summary of Walmart and Target Store Openings in Studied Area

A Walmart	1962 →										2009
	t	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}
New Stores ($\sum q$)	2	13	81	162	453	629	742	388	551	327	
Store Count	2	15	96	258	711	1340	2082	2470	3021	3348	
$\sum_{i=1}^A m_{it}$		1	3	3	4	8	9	14	14	14	14
$Max_i i q_{it} > 0$		1	3	3	4	8	9	14	14	14	14

B Target	1962 →										2009
	t	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}
New Stores ($\sum q$)	2	5	8	14	54	127	203	332	472	441	
Store Count	2	7	15	29	83	210	413	745	1217	1658	
$\sum_{i=1}^A m_{it}$		2	4	4	7	12	13	13	13	13	13
$Max_i i q_{it} > 0$		2	7	9	9	13	13	13	13	13	13

Equation 1 measures the level of spatial continuity. The value of \bar{s} for Walmart is 0, which represents complete spatial continuity. This metric indicates that Walmart never

skipped a ring. Walmart did, however, expand its national presence substantially in t_5 - t_7 (1980-1994), increasing its store count 8-fold from 258 to 2,082 and the number of distance rings from 4 to 14. Target had a \bar{s} of 1.1, meaning it skipped over an average of 1.1 rings per t . For instance, Target expanded out to Ring 7 (1200-1399 km) in t_2 (1965-69) without first filling in Rings 2, 3, and 5, while in t_3 it skipped over Rings 1, 2, 5, 7, and 8. All in all, Target skipped 11 rings over 10 time periods, although by t_6 (1985-89) it had at least one store in every ring.

Breaking down Target's deployment patterns further, most of its stores are less than 20 years old. Still, it located stores far beyond Minnesota early in its history. Unlike Walmart, it did not initially saturate its home base. Instead, its first sizable deployment phase occurred during the late 1980s (t_6) in the most-distant areas—on the east and west coasts. During the early 1990s (t_7), Target did not avoid any regions and ramped up its growth considerably by nearly doubling its store count (from 210 to 413). Target has dramatically increased its deployment since the late 1990s, especially at the medium distances from its first store. In 2000-2004 (t_9), it opened more stores than it did in the previous period in all but two rings.

Comparing the two chains in terms of new store openings and cumulative store count over distance and time, Figure 4.4 illustrates a much more systematic pattern for Walmart than Target. The cumulative curves show that Walmart still has a greater regional focus of its stores near its first location than Target. Target has several different bands where it peaks, with its highest peaks representing saturation in many urban markets in the Northeast, Mid-Atlantic, and California. Consider that even though Walmart has nearly

twice the domestic store count as Target, Target outnumbered Walmart in California (Joseph 2010). Figure 4.4B also illustrates how much of Target's deployment at all distances is concentrated in the more recent years. Another observation from the figure is that the retailers revisit areas for deployment at a later point in time after slowing growth in an area (re-swash—see arrows). This phase is especially evident for Walmart, which began its mass deployment at earlier time. Another observation for Walmart is that when it revisits an area, it only opens up about half of the number of stores as it did during the initial deployment phase. This represents its saturation within these markets and the limits on how many new stores can be opened without excessive cannibalization of existing stores. These behaviors are discussed in the next section.

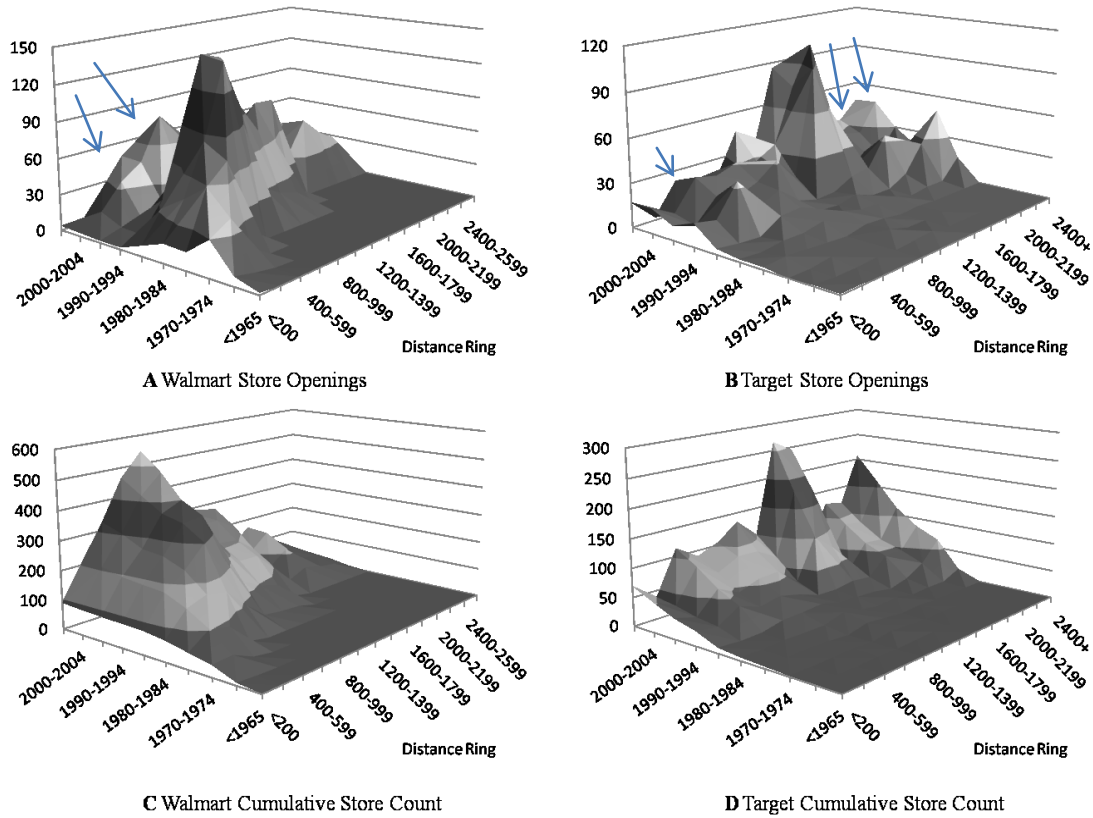


Figure 4.4. Space-Time Deployment of Walmart and Target. Arrows point to revisited areas (Re-swash/Revisiting phase).

4.4.2 Phase Transitions

Equation 3 tracks the difference in store count in a ring between a time period and the immediate previous period. Figure 4.5 classifies the subareas within the following stages—Prospective, Deploying, Saturation, and Revisiting.

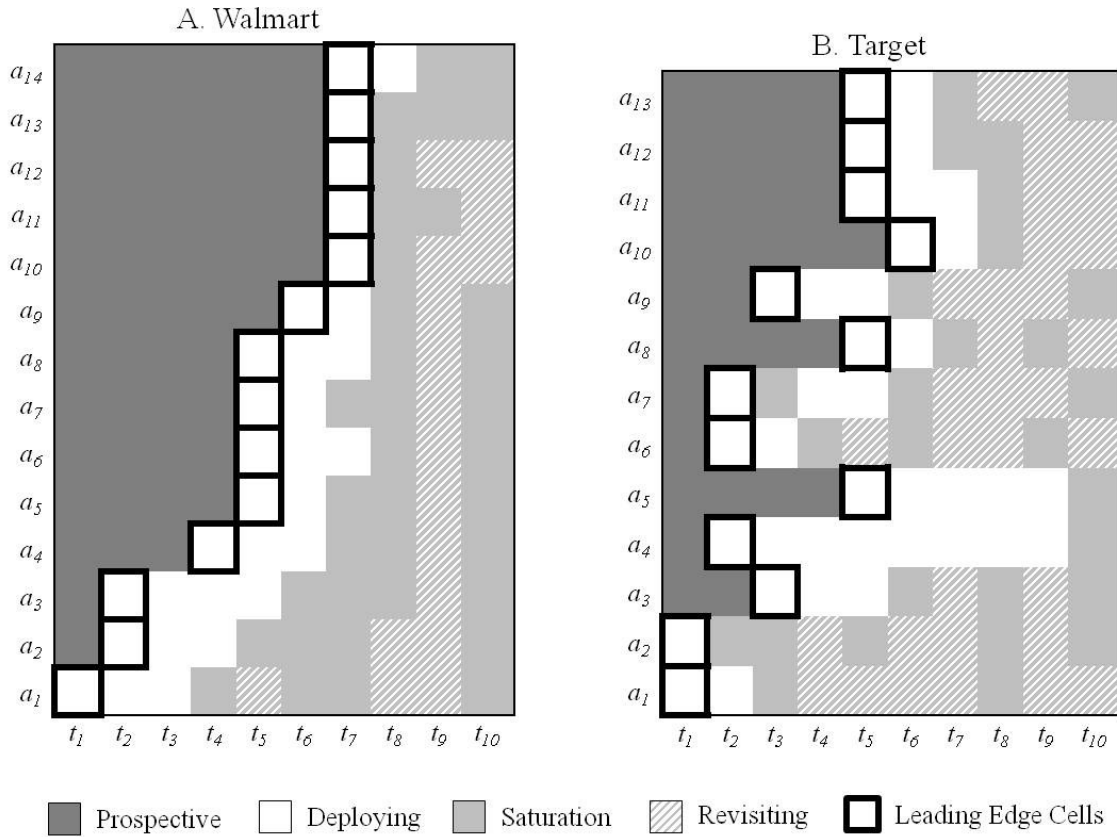


Figure 4.5. Phase Transitions of Deployment

The darker shading in the figure represents areas that were prospective during the time periods shown. Table 4.3 quantifies the differences between the Walmart and Target diagrams in Figure 4.5. Whereas two-fifths of Walmart cells are prospective, the number is less than one quarter for Target. The implication of this is that within the overall studied area, more subareas were exposed to Target stores at an earlier time. Figure 4.5 also shows the leading edge (LE) of deployment. Using (2), the value of \bar{t}_{LE} is 5.00 for Walmart and 3.46 for Target, which means that on average, a ring received its first Walmart store during the 5th time period while a ring received its first Target store

between the 3rd and 4th time periods. This mathematically confirms Target’s exposure to more distance bands at an earlier time than Walmart. Couple this with the fact that Walmart had a much higher store count and the result was that Walmart was a budding regional power while Target was introducing itself in selected markets but without high market share. Only recently has Walmart revisited markets for deployment, which explains its lower revisiting value compared to Target (Table 4.3). Target has been revisiting markets for years. Another way to analyze this is that Walmart systematically targeted a market, saturated it up to the market threshold, and then allowed it time to mature prior to deploying more stores in that area. Thus, it only revisited a market once it ran out of space to grow within the studied area.

Table 4.3. Share of Phase Transitions of Deployment

	Prospective	Deploying	Saturation	Revisiting
Walmart	40.0%	22.1%	25.7%	12.1%
Target	24.6%	27.7%	21.5%	26.2%

The revisiting (cannibalization) phase is not intended to suggest that *all* individual stores were being cannibalized. It does suggest, however, that cannibalization was likely occurring. This follows the assumption that for a growing retailer, there would have been new store deployment within the region at an earlier time if the threshold could have supported additional stores as opposed to seeking growth in farther away regions. Consider the advantages to locating within the same market for reasons such as distribution, marketing, and more. In the revisiting phase, markets once deemed saturated

are revisited for growth. To be fair, once younger stores have matured, companies may be able to withstand the cannibalization once they know the markets better. In addition, the cannibalized stores may be mainly losing customers for whom that store was not very conveniently located in the first place. Or, as in the case of Home Depot, retailers may be strategically attempting to capture or protect market share or preempt location of a competitor (Lowe's)—that is, it may be a strategy of cannibalizing one's own store rather than losing those same customers to a competitor's store (Hernandez, 2003). As different companies have different goals and objectives, the strategy side to growth may take different forms.

4.4.3 Store Deployment as a Swash-Backwash Pattern

The final step is to analyze Walmart and Target in terms of waves with alternating periods of swash and backwash for various distances from the first store locations. Distance rings are aggregated into 400 kilometer intervals (double rings) so that the patterns are more visible to the reader (14 waves makes the diagram too cluttered). Growth prior to 1970 is combined into a single value as the chains had only four stores combined prior to 1965. Using (3) to calculate the difference in new store growth in subarea i in time t versus the period previous (Δq_{it}), Figures 4.6 and 4.7 illustrate the results for Walmart and Target. The lines are smoothed to further illustrate the wave-like motion, although they intersect the actual data points for each time interval.

The deployment of Walmart stores over space clearly exhibits a swash-backwash-re-swash pattern over time. The wave analysis reveals that Walmart systematically moved

from region to region, starting from its home region until it reached the maximum extent of the studied area in the early 1990s. Prior to 1980, Walmart was a regional retailer, focusing its deployment within 800 kilometers of Rogers. During the 1980s, Walmart continued to open new stores in its home region but fewer than in the previous period. In the closest ring, 0-399 kilometers, Walmart had three consecutive periods of swash until 1980 and four consecutive periods of swash in the second closest ring, 400-799 kilometers, until 1985. The innermost ring then experienced three consecutive periods of backwash (saturation) while the second ring also experienced three consecutive periods of backwash, starting ten years later.

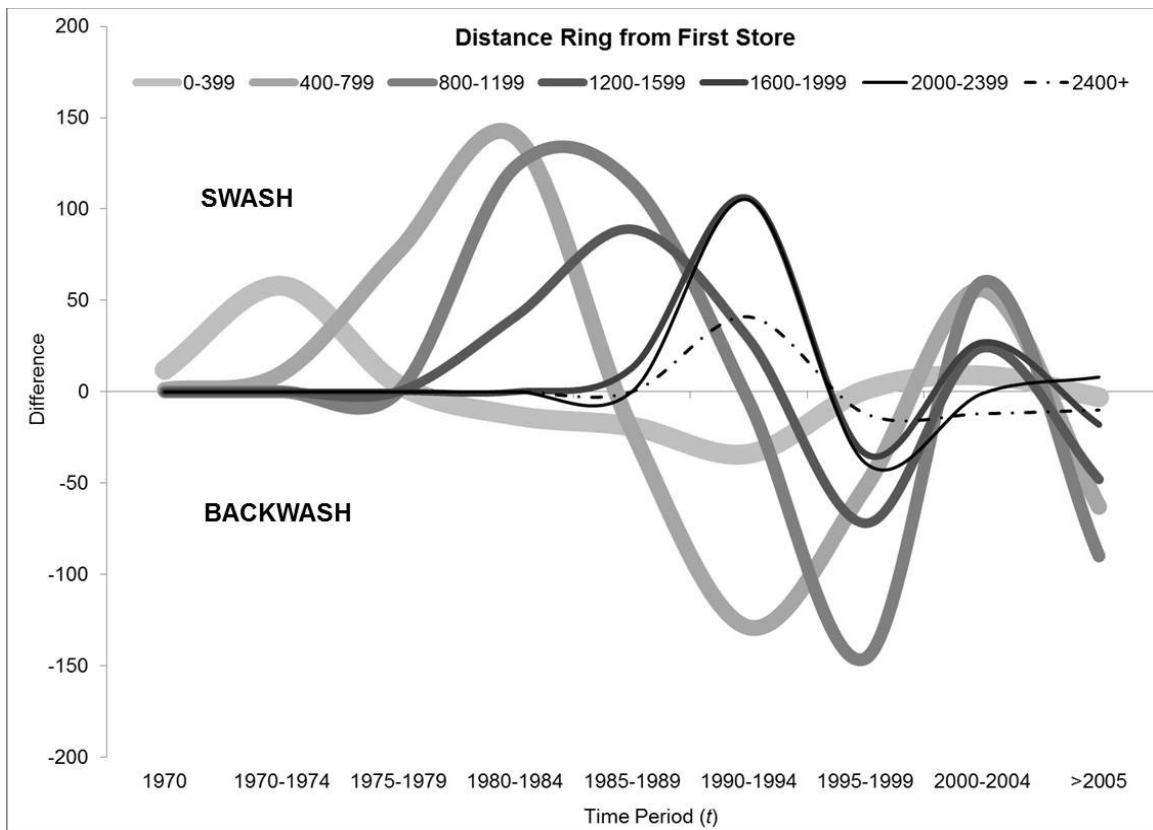


Figure 4.6. Swash, Backwash, and Re-swash Waves for Walmart

Walmart experienced its highest peaks of swash in the 400-799 and 800-1,199 kilometer ranges from its first store during the 1980s. This combination of space and time represented the most intense deployment in Walmart's history. Store count growth in 800-1,199 km range waned in the 1990s though. Walmart saturated the markets in the 400-799 and the 800-1,199 kilometer ranges to such a great extent during the 1980s that it could find fewer than half the number of locations to open new stores in the 1990s. In addition, during the late 1980s, Walmart grew by a considerable amount in the 1,200-1,599 kilometer range. This range would have three consecutive periods of swash following the initial deployment.

Walmart has only been a nationally deployed retailer for less than two decades. By the start of 1990, Walmart only had 13 stores more than 1,600 kilometers away from Rogers and no stores beyond 1,800 kilometers in the lower 48 US states. In the 1990s, however, Walmart completed its expansion to all parts of lower 48. The 1,600-1,999 kilometer range had its initial swash in the late 1980s followed by a greater period of swash in the early 1990s before reaching a period of backwash in the late 1990s. The 2,000-2,399 kilometer range had high swash during its initial deploying phase in the early 1990s, followed immediately by backwash in the late 1990s. The farthest ring, over 2,400 kilometers from Rogers, had its initial swash phase in the early 1990s followed by three consecutive periods of backwash. Walmart avoided deployment in its home region during the 1990s, although they did convert some existing stores to supercenters during that time (Graff, 2006).

After 2000, Walmart began to reach a point of domestic real estate maturity. Evidence for this statement is that it stabilized its number of store openings at various distances as it revisited markets for growth and the opportunities began to wane in the farthest rings. New store growth in the markets that experienced a re-swash stage in the early 2000s was likely to cannibalize existing stores. Walmart even began to search for new locations in some of the small towns within the mostly rural 0-399 kilometer range. Signs of the economic recession can be detected after 2005 as total growth slowed. Another factor affecting the results may be that Walmart began to focus on different store formats (e.g. Neighborhood Market) and international deployment. This type of alteration in strategy could be viewed as a byproduct of the dearth of adequate locations for standard and supercenter stores within the studied area.

Target stores diffused in a much different manner than Walmart. Target grew more slowly than Walmart (Figure 4.7). Most of its stores are less than twenty years old. It significantly increased its store count in the 1990s and more than doubled its store count since 2000. Despite this slow growth, Target has had stores in locations far beyond Minnesota for a long time. Unlike Walmart, it did not initially saturate its home base. Instead, Target had more of an outside-in type of swash-backwash-re-swash, but still showed systematic behavior in its deployment. Its first sizable deployment phase during the 1980s occurred in the range that lies more than 2,400 kilometers from Roseville. More specifically, several stores opened in California, many as a result of acquisition. Demonstrating the wave-like pattern, this farthest subarea experienced backwash in the early 1990s followed by a ten-year period of re-swash. Target's next peak of swash

occurred in the 2,000-2,399 kilometer subarea in the late 1980s with 35 store openings. It continued to grow during the early 1990s but at a slower rate. This subarea then experienced backwash in the late 1990s returning to two back-to-back periods of re-swash.

Target ramped up its growth in most rings in the early 1990s. The highest two peaks were for the 0-399 and 400-799 kilometer inner rings. Both of these bands would alternate between swash and backwash for the remaining periods. One subarea that did not experience swash in the early 1990s was the 1,200-1,599 kilometer range, which had slight backwash. This band's highest swash, however, occurred in the late 1990s, with deployment in many of the urban markets in the Eastern US. Although this ring would experience slight backwash in the early 2000s, it still had considerable new store growth, just not an increase from the previous period. Target continued to find more opportunities for growth in the 1,600-1,999 kilometer range from 1990 through 2005. Growth in this range slowed considerably after 2005, perhaps due to the economic recession in addition to the fact that it had accumulated a high number of stores in this band. Most recently, Figure 4.7 illustrates that Target has entered something resembling a state of equilibrium in the sense that the deltas (change in new store opening from the previous period) have become quite small for all rings except for the aforementioned 1,600-1,999 kilometer ring. This is an indicator that Target reached real estate maturity in the early 2000s as every ring had finished experiencing its first swash and the chain began returning to fill in markets with more stores. Not surprising, Target has recently decided to seek growth in Canada in 2013 by acquiring the store leases of Zellers (Zimmerman and Talley 2011).

While it is pure conjecture to speculate about the future trend of swash or backwash for the different subareas, it is important to note that Target has also experienced alterations between swash and backwash.

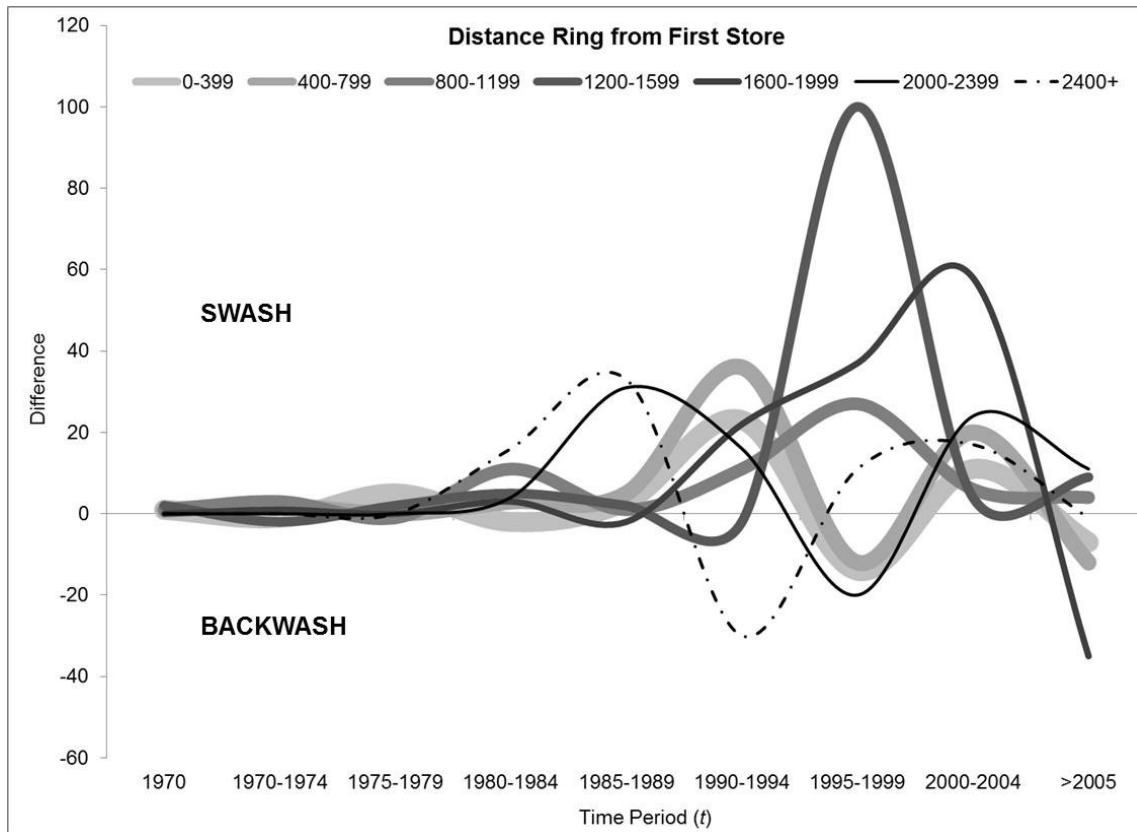


Figure 4.7. Swash, Backwash, Re-swash Wave for Target

4.5 Conclusions

Walmart and Target, the two largest discount department store chains in the United States, which both opened their first store in 1962, have executed vastly dissimilar strategies for new store growth. In its infancy, Walmart grew methodically outward over space from its first store location in Arkansas. Target, on the other hand, sought growth in

a variety of markets, with some evidence of an opposite outside-in pattern with the first major wave of store growth in the 1980s at the farthest distances from Target's first store in Minnesota before filling in the middle distance range. Despite the directional and distance differences between Walmart's and Target's expansion patterns, there are some strong commonalities between the two. Both of these growing retailers first expanded into an area, then reached a point of saturation in that area and opened fewer stores in it, moved on to focus on expansion in other areas, only to revisit the first areas at a later point in time. The spatio-temporal patterns of deployment of both companies were able to be modeled in the form of waves of swash and backwash with additional re-swash evident at later times in the rings that experienced early deployment. Although swash and backwash did not alternate perfectly for all time periods, and did not necessarily move from the first store outwards, there was a distinct general trend for an area to experience increasing swash leading to a peak and then increasing backwash, only to experience a second period of swash after other areas became saturated.

In this article, we modified Cliff and Haggett's wave analysis in a way that suggests a general model or theory for the domestic real estate maturity of chains. This general theory can be applied whatever a company's strategy is, even if it is not a ripple from inside out or from one coast to another, and however the subareas are defined. In our case, subareas were treated as concentric rings extending from the first store of a chain. These subareas were placed into the following stages of retail expansion: Prospective, Deploying, Saturation, and Revisiting. The Prospective stage represents the time before the retailer expands to an area. The Deploying stage includes the time periods that a

retailer progressively increases its store count in that area. Saturation includes the time periods of decreasing store count growth in the area. While the first three have analogs in Cliff and Haggett's work, the Revisiting stage is new. It represents when a retailer revisits an area once considered saturated for new store growth, indicative of real estate maturity.

In addition to the wave analysis, we also introduced a new metric, \bar{s} , to track the spatial continuity of deployment. It measures the level of sporadic growth, based on difference in ring numbers. We also modified Cliff and Haggett's leading edge (*LE*) metric and applied it to the study of chain expansion. In our treatment, the leading edge measures the average number of time periods before a ring experienced new store growth, for all rings. Lower values represent faster deployment over space.

What will happen next after the re-swash and revisiting stages are completed in most subareas remains to be seen. Without considerable population changes or evolution in the structure of retailing in the US, markets may not be able to withstand a third stage of swash. Although the results may be complicated by the recent economic recession, especially as it pertains to suburban housing growth, both chains have altered their behaviors after their second period of backwash. For instance, Walmart is developing formats for urban areas while Target has plans to open its first international stores (Ceh and Hernandez 2010; Zimmerman and Talley 2011).

The next step is to broaden the study with additional retailers and retail types. Future studies would benefit by accounting for the number of store closures, relocations, or the changing in overall store square footage in the areas being studied as repositioning may surpass growing the count for mature retailers. The opportunity for advancement of this

research involves appending factors that can affect deployment, or are manifested by it. For example, the deployment of stores around distribution centers was noted in the literature, especially for Walmart. Thus, do the distribution centers open in areas prior to swash for Walmart? Also, at what point and in what locations do the chains experiment with different formats, or when and where do they deviate from the familiar demographic profile of the trade areas? Another important factor to consider will be the dates of acquisitions or international deployment. Finally, a promising line of research is to develop a method for swash-backwash-re-swash interactions between competitors. In particular, it could be worth exploring whether Target aimed its initial swash phase at the more sophisticated urban coastal markets that Walmart's systematic swash had not yet reached, and developed its more upscale brand and store format to differentiate itself accordingly.

Understanding the systematic process of chain store evolution and the associated strategies put forth by retailers provides foresight for the retailers to make better and preemptive decisions related to store and business development initiatives. Along those same lines, it is also valuable for competitors, developers, investors, communities, and other stakeholders to be better prepared for the impacts of retail expansion.

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5. Conclusions

5.1 Summary of Findings

This comprehensive mega-analysis contributes to the literature with one of the most thorough treatments of retail locational patterns and behaviors on record. It has relevancy to contemporary challenges facing retailers as they continue to find methods to grow despite their maturity. In addition to the company itself, including its employees, investors, leadership, and customers, retail organizations impact other retailers, consumers, communities, developers, and contribute to the overall health of the economy. In other words, since the decision to open one new store is part and parcel of a complex process of chain-store deployment, a wide variety of stakeholders are affected by individual decision making. Taking a static snapshot of a dynamic process, this dissertation can serve as a benchmark of the current US retail landscape. The analysis and discussion should appeal to both practitioners and theorists. The following discussions address some of the major findings in each article, followed by the common linkages between them, and the opportunities for advancing the research on this topic.

In the first article, “Regionalism in US Retailing,” regional bias is found to be associated with store counts, small market deployment, and the location of the founding store, but not the age of the chain. Also, chains that started in smaller markets deploy more stores in other small markets and *vice versa* for chains that started in larger markets. The article has been published by *Applied Geography* in early 2013.

In the second article, “The Location Types of US retailers,” a total of twelve distinct location types were identified using cluster analysis on situational and trade area data at

the geographical scale of the individual stores. Eight groupings of retailers with similar location profiles were identified in a second cluster analysis that grouped together the chains with the most similar location profiles. More often than not, retailers within the same retail business chose similar types of locations and thus were placed in the same clusters. Finally, further clustering into fewer groups revealed that retailers generally restrict their deployment to one of three overall strategies that were identified as metropolitan, large retail areas, or market size variety. While specialty retailers located in large retail areas of urban markets, smaller stores like discount stores, rental, auto supply and one-stop shop large mass merchandisers were commonly found in markets of all sizes, including non-metropolitan areas, indicating the continued importance of market thresholds and urban hierarchy. The article was submitted to *Economic Geography* in April 2012. A decision was rendered was to revise and resubmit. The primary improvements to the article included streamlining the analysis and discussion, as well as better motivating the article with additional theory. Follow revisions, the article as presented here was resubmitted in February 2013. At the time of writing this dissertation, no further decision has been made by the journal editors.

In the final article, “Modeling Retail Chain Expansion and Maturity through Wave Analysis: Theory and Application to Walmart and Target,” we study retail store deployment through the analysis of waves, with alternating periods of faster or slower growth of chain expansion in an area. Using a space-time matrix of new store openings, we identify four stages: prospective, deploying, saturation, and revisiting. By analyzing the net change from one period to the next at increasing distances from a retailer’s

original store, the stages can be represented as swash, backwash, and re-swash waves. We found that Target and Walmart adopted dissimilar strategies, with Walmart diffusing gradually from Arkansas and Target growing from the coasts inward. They were similar, however, in that after expanding into an area they reached a point of saturation and opened fewer stores, then moved on to other areas, only to revisit the earlier areas for new stores. This article was submitted to the *International Journal of Applied Geospatial Research* in November 2012. We have received feedback from the editor to expect reviewer comments in April 2013.

There are no specific areas of conflict between the articles. The articles support each other when they are viewed as a group. In fact, some gaps in one paper are filled by the findings in the others that help explain causal behaviors. For instance, in the first article, regionalism was found to be associated with whether a chain started in a small or large market. Chains that started in small markets chose other small market locations with greater frequency than chains that started in large markets. This finding also helps explain the diversity of the location profiles of the chains, which were discussed in the second article. In the third article on Walmart and Target, Walmart was noted for its methodical diffusion over time and space. Again going back to the first article on regionalism, Walmart started in a small market, which also seemed to influence its early strategy towards deployment as it could grow in other small markets nearby. Of course, this behavior cannot be viewed in isolation of other strategies by retailers such as Walmart's desire to keep distribution costs low. It is interesting, however, to note the connection between such factors for many of the studied chains.

New theory emerged from each article, and when taken together, they establish a theoretical basis for why retailers choose to deploy in particular markets or sites, and the resultant effects on the spatial structure of the chain network. Value platforms and retail types are the primary factors in determining target customers. Depending on the amount and distribution of particular types of consumers, a market can support a certain number of stores. For example, modest income consumers outnumber affluent consumers. Along those lines, a chain with a value platform that targets modest income customers (e.g. Dollar General) has more potential sites to choose from, thus staving off real-estate maturity and allowing it to keep its regional focus despite its high store counts. Business practices and chain heritage influence the types of markets chosen. A retailer attempts to identify new locations that match the profile of some of its most successful existing locations. If the retailer is accustomed to having success in small towns, then it will continue to deploy in other small towns (e.g. Walmart). The hierarchy identified in this dissertation was not related to size of the store, but to the value platform. Category killers have deployed more in urban areas and the largest retail areas, while retailers that target price-conscious consumers were found to deploy in all markets.

While the value platform affords retailers the opportunity for organic growth in a particular amount of locations, all retailers have a breaking point when they can no longer deploy new stores without encroaching upon the trade areas of existing stores. This stage of real-estate maturity has been experienced by some chains, and it leads to slowing growth or alterations in business practices. For example, Walmart has altered its value platform with a new retail concept in order to open stores in urban settings (i.e.

Neighborhood Market) as it exhausted most of its opportunities for growth in lower density areas. The stage of real-estate maturity is not associated with the age of the chain. Instead, it relates to store count deployment and value platform.

5.2 Future Work

This research has provided motivation for additional articles after the dissertation. One of the revisions to “The Location Types of US Retailers” was to remove a research question concerning clustering the chains by the lifestyle segmentation composition of their trade areas. This section has been targeted as its own article for submission to a special retail edition of *The Professional Geographer*. Another article deriving from this process seeks to explain how the 50 retailers are statistically associated or disassociated with each other in space, using the cross- K function. A short version of this treatment was published in the 2012 edition of *Papers of the Applied Geography Conferences*. It tested the spatial relationships between Target, Walmart and the other remaining chains in the Chicagoland area.

The articles also have a common thread regarding the future potential for extension of the research. Overall, this research can be leveraged to not only understand behavior better, but to predict where and when stores will be built, and what retailers are going to build them. It provides a glimpse into possible changes to the future retailing marketplace. The first two articles could benefit by adding a temporal scale whereas the third article can benefit by studying more chains beyond Walmart and Target. There is also an opportunity to further analyze the theory behind store deployment decision-

making along the lines of factors such as store formats and concepts, micro-merchandising, international growth, and deployment in areas that deviate from traditional areas for particular chains. There is also the potential to expand to a scale beyond the US lower 48 contiguous states. For instance, possible research questions could include asking at what point in the maturity process do retailers first deploy internationally and to what extent. Another related question would be to survey how international value platforms compare to their domestic counterparts. A coverage model would provide how much of the population is within a certain distance of particular retailers, which could be related to real-estate maturity.

5.3. Practical Application

Retail is dynamic and the participants in this sector of the economy must be forward thinking concerning opportunities for growth. The discussions highlight practitioner strategies for practical implementation from value platform initiatives to market positioning among competitors. The managerial significance is that the results can help retailers make more informed decisions through increased cognizance of behavior patterns regarding store deployment. Retailers should have foresight concerning when they will reach real-estate maturity and be proactive with developing creative growth strategies accordingly, whether it be driven by brick and mortar store deployment, omni-channel retailing, international development, or alterations to the value platform to better serve local consumer demand.

There is greater need for the use of geographic methods by practitioners beyond the real-estate deployment process. For example, an untapped area of growth may be to improve productivity at existing stores instead of relying on constant growth to satisfy markets. While young expanding retailers are more concerned with finding real estate opportunities, mature chains, such as many of those in the dissertation, and saturated markets provide the impetus for differentiation and the challenge to cater to local demand (Johnson 1997). As early as the 1960s, Buzzell et al. (1965) discussed how growth and saturation impacted the profitability of grocery stores. When growth stops, retailers need to improve internally and geographic methods can be quite useful for increasing business efficiencies. By understanding the diversity of the location profiles and the levels of saturation, the suggested managerial implications in the articles may also provide foresight to predict changes in retail spatial patterns and the associated business practices for the next several years.

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APPENDIX

Michael Kuby coauthored each of the three articles. He has granted his permission for the publication of this dissertation.