THE EXPANSION OF A RETAIL CHAIN: AN ANALYSIS OF WAL-MART LOCATIONS IN THE UNITED STATES

Anthony P. Ostrander, B.A.

Thesis Prepared for Degree of

MASTER OF SCIENCE

UNIVERSITY OF NORTH TEXAS

May 2011

APPROVED:

Murray Rice, Major Professor
Donald Lyons, Minor Professor and
Program Coordinator for
Department of Geography
Sean Tierney, Committee Member
Matt Fry, Committee Member
Paul Hudak, Chair of the Department of
Geography
James D. Meernik, Acting Dean of the
Toulouse Graduate School

Ostrander, Anthony P. The Expansion of a Retail Chain: An Analysis of Wal-Mart Locations in the United States. Master of Science (Applied Geography), May 2011, 57 pp., 22 tables, 8 illustrations, reference list, 33 titles.

Retail geography is an expanding field that is becoming increasingly important within academia, the business environment, and the national and global economy. The focus of this study is to provide insight and additional understanding of the site selection processes employed by Wal-Mart in the United States. The research studies Wal-Mart from a national perspective and investigates the patterns of retail store expansion across the United States from 1990 to 2005. The study employs the use of a continuous Poisson model to check for significant clustering, and a single and multiple correlation analysis to identify the types of relationships that exist between retail stores and location. The results of the study make apparent several distinct patterns of retail store dispersion within the United States between the years 1990 to 2005.

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INTRODUCTION

Retail geography seeks to understand retail store location based on proximity to customers, competitors, and infrastructural needs. The approach first gained ground in the early 1980s when the books, *Retail Location and Retail Planning* (Guy 1980) and *Retail Geography* (Dawson 1980), were published (Brown 1993). The books outlined the importance of spatial variations between retail stores and consumers, and ushered in a new train of thought in market location strategy. Firms specializing in customer analytics and site location analysis have been increasingly sought by retailers, because of their ability to provide diverse, yet geographic specific, information about consumers and site selection opportunities. These firms have aided in the market segmentation efforts and store location strategies of retailers at the local, regional, and national level in the United States (Birkin et al., 2002). Additionally, technological advancements in the form of GIS (Geographic Information Systems) and other related geo-analytical software has added to the breadth and depth of the subfield's capabilities (Benoit 1995).

Over the past half century, the retail environment in the United States has undergone a dramatic shift away from traditional "mom and pop" stores and towards large scale "big-box" retailing. Target, K-Mart and Wal-Mart each opened their first discount store in 1962; Target located in a Minneapolis suburb, K-Mart in a Detroit suburb, and Wal-Mart in the small town of Rogers, Arkansas. Over the next several decades, these retailers expanded strategically across the United States (Graff and Ashton, 1994). Target and K-Mart grew quickly and located stores in major metropolitan areas. Wal-Mart chose to locate stores in smaller towns close to their home office of Bentonville, Arkansas.

Over time Wal-Mart recognized their business model afforded them the ability to offer goods and services to consumers at lower price-points than competitors, and as a result, began an aggressive campaign of expansion. In 2010, Wal-Mart operated over 4,200 stores nationally and had annual global sales exceeding $400 billion (Wal-Mart 2010). In the United States, Wal-Mart operates a variety of stores including discount, Supercenter, Sam's Club, Neighborhood Market, Marketside, and Supermercado de Wal-Mart. The research analyzes both discount store and Supercenter store locations at the regional level in an effort to understand the undertones of how the nation's largest retailer chose to expand from 1990 to 2005.

The results of this study will provide evidence of clusters of stores by store type and location and also identify underlying relationships that exist between types of stores, store location, year store constructed and distance to a distribution center. Additionally, a correlation analysis will be completed to determine whether average household income, population density, and percent unemployed are related to store type and store location. The study will enhance our understanding of the locations Wal-Mart has selected for particular types of stores, improve our knowledge of the site selection process applied by Wal-Mart, and reinforce the importance of retail geography in developing effective business plans.

LITERATURE REVIEW

Wal-Mart's new-store location decisions have far-reaching economic impact and have been the subject of significant scholarly attention (Basker 2007; Drewianka 2007; Goetz and Swaminathan 2004; Graff 2006; Hicks 2008; Holmes 2011; Jia 2008; Neumark 2010; Sobel and Dean 2007; Stone 1997). These studies have used various methods in an attempt to quantify whether or not Wal-Mart's entrance into a given community strengthens or weakens the surrounding economy. However, due to geographically diverse study areas, inconsistent methodologies, and a lack of a consistent study period, the research performed up to this point has concluded with mixed results. Nevertheless, it is important to review these articles as the outcomes of this study have the potential to add to or detract from the results of such research.

The sections that follow provide a structured overview of retail geography and Wal-Mart in the marketplace. The study begins with a brief survey of retail geography and its principles, followed by a review of how Wal-Mart first achieved its competitive advantage in the retail environment. Also touched upon will be Wal-Mart's construed effect on the labor market and a review of the impact Wal-Mart has had on consumers. Finally, this section discusses the effect Wal-Mart has had on its competitors and concludes with a brief synopsis of the literature presented. The subsequent sections provide data that relate to retail geography and the study of Wal-Mart within the context of its position in the retail environment.

Retail Geography

Retail geography combines principles from two of the more mainstream geographic fields of economic geography and urban geography to create its foundation

(Wrigley 1988). Within retail geography, there are two schools of thought. The first is theoretical, which links consumer decision making processes to the concept of central place theory (Parr 1995). The other approach looks at retail geography from an applied point of view, where marketing and planning take a distinct spatial focus to the store location decision making process (Jones and Simmons 1993). Despite one side being more theoretical and the other more applied, retail geography is ultimately concerned with the role that distance, whether actual or perceived, plays in the site location and consumer decision making process (GeoDZ 2009).

In a rational sense, retailers want to locate as close and as cost-effectively as possible to their customer base. As utility maximizers, consumers will choose the retailer that offers the goods and services they want at the lowest time and monetary costs to them. Retail geography thus takes into consideration these factors and uses physical distance (i.e. time and cost) as the obstacle that must be overcome in order for the two to exist beneficially in the marketplace. However, there are times when businesses and consumers operate irrationally (Tversky and Kohneman 1986). Thus, retail geography also attempts to explain the gap that sometimes exists between retailer and consumer.

Wal-Mart's Competitive Advantage

Wal-Mart owes much of its success to its ability to provide consumers with items at low cost (Basker 2005b). Graff (2005) explains that Wal-Mart has been able to gain and maintain their competitive advantage of being the low cost provider in the marketplace through their culture, supply systems, price and cost control, innovation, and market destabilization practices. Culture, systems, pricing, and innovation provide

the framework for creating Wal-Mart's low-cost structure, while the final characteristic, market destabilization, comes at the expense of competitors. As Wal-Mart increases its market share and drives prices down, its competitors are forced to lower prices to compete, thus decreasing their profitability and presence in the marketplace.

Wal-Mart has also employed a site selection process that has garnered marked efficiencies through their distribution channels. Holmes (2011) identified the wave-like patterns associated with Wal-Mart's growth strategy and the monetary savings related to distribution costs afforded by having a dense network of store locations. Holmes relates Wal-Mart's growth pattern as being similar to dropping a rock into a pond and watching the ripples radiate outward (Fettig 2006). The model he developed draws on a data-set of store locations, beginning with the first store built in Rogers, Arkansas in 1962 and ends with stores constructed in 2005. The model shows a radial expansion outward from this central location into areas of southern Missouri, northeast Oklahoma, and additional locations within Arkansas and then on to other areas of the United States. Figure 1 provides a geographic rendering of Holmes' expansion model.

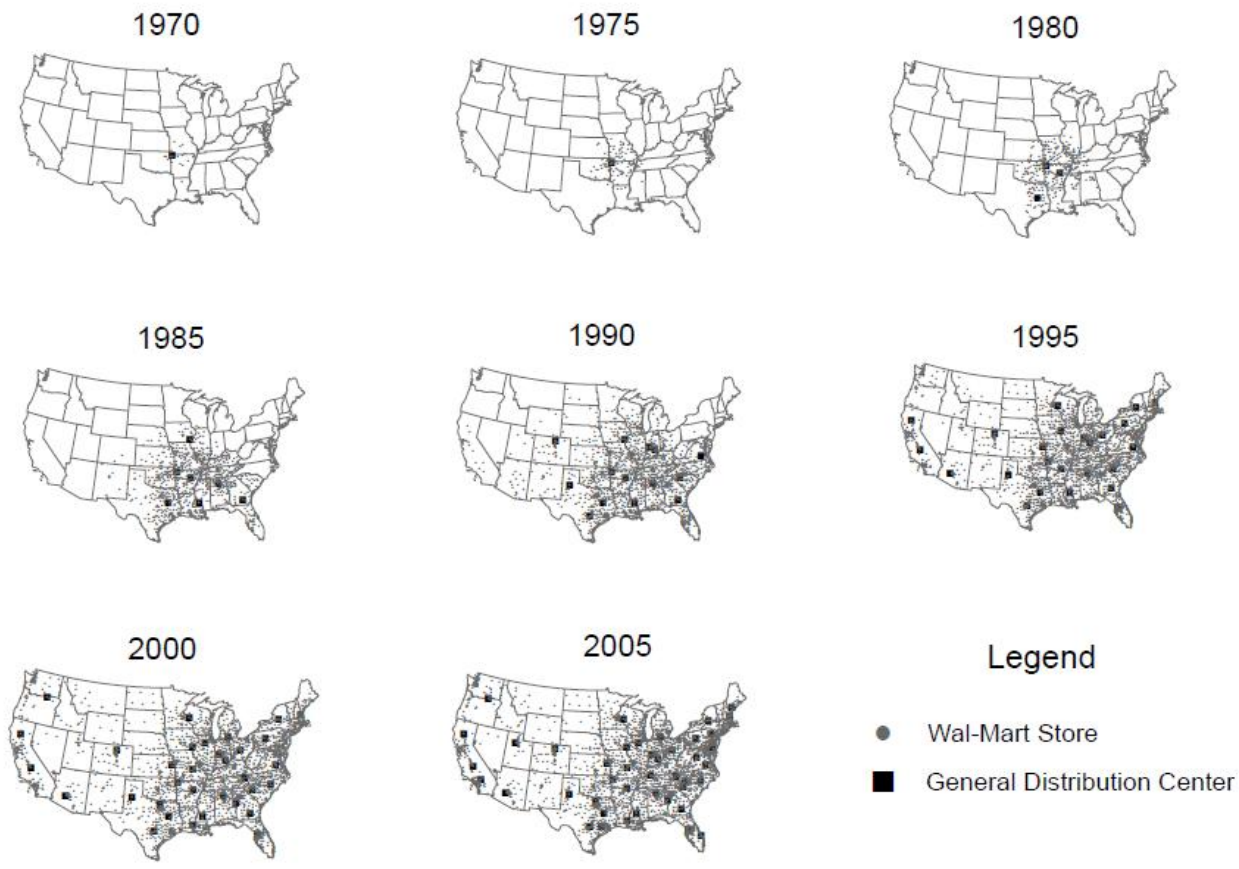

Figure 1 Diffusion of Wal-Mart Stores (Holmes 2011)

The significance of this pattern of retail dispersion, as explained by Holmes, is that by locating stores in close proximity to one another and by expanding locally and regionally, Wal-Mart on average, saves around $3,500 a year, per store, if they locate just one mile closer to a distribution center than by being one mile further away from a distribution center.

Graff (1998) analyzed Supercenter store site selection decisions and methods used by Wal-Mart and K-Mart in the United States during the 1990s. He found that Wal-Mart's strategy for constructing Supercenter stores was the same pattern of expansion used for the construction of Wal-Mart discount stores between 1962 and 1990. Graff points out that Wal-Mart was once again constructing a dense network of stores using

roughly the same dispersion pattern as before. Wal-Mart's store location strategy has afforded them a distinct competitive advantage in the marketplace.

Wal-Mart's Effect on the Labor Market

The effect Wal-Mart has had on the labor market is of great debate and many researchers have attempted to quantify Wal-Mart's impact on the marketplace Basker (2005a); Drewianka and Johnson (2006); Global Insight (2005); Graff (1998); Hicks and Wilburn (2001); Neumark et al. (2010); and Sobel and Dean (2007). Much of the research involves overcoming endogeneity, which can be considered as the economic growth or decline that would have occurred in a location regardless of whether or not Wal-Mart entered into the area. To construct an accurate measure of Wal-Mart's true effect on local and regional economies and the national economy, researchers and professionals, have attempted to account for endogeneity using various methods and procedures (Hicks 2008). Many of the previous studies have focused on county-wide data as a means of determining change in local economies. Variables tested have included growth and prosperity, a measurement of the lag between announced and actual openings, and finally a time/distance function from Wal-Mart's corporate headquarters in Bentonville, Arkansas (Hicks 2008).

Hicks (2008) argues that much of the research conducted up to this point has produced conflicting results. He attributes these outcomes to the fact that studies are being performed for different locations and different time periods. He goes on to note that endogeneity will change between locations and time periods as well, thus creating a greater rift between studies. Finally, he states that research needs to be performed at smaller geographic levels and time periods for results to be accurately comparable.

The resounding issue prompting the mixed results previously discussed has been the need to understand the variables that Wal-Mart has used to make market entrance decisions (Hicks 2008). Due to the inconclusive results, Hicks (2008) mentions that demographic factors relating to income, population density, and distance from key wholesalers may be the decision making factor(s) that prompt Wal-Mart to build a particular type of store in a given location. This study addresses demographic variables related to income and population density and looks to define whether or not the two variables are indeed part of the store location decision making process.

Wal-Mart's Effect on Consumers

The effect Wal-Mart is having on consumers comes in the form of lower prices (Princeton Survey Research Associates International 2005). Their findings indicate that 50 percent of respondents chose "low prices" as the reason they shop at Wal-Mart. Another 32 percent of respondents chose "broad selection of items" and "convenience" as their motive for purchasing goods and services at Wal-Mart. The research also reveals that over 50 percent of those individuals with an annual income of less than $30,000 shop at Wal-Mart on a regular basis. When compared to individuals who responded as having an income of greater than $50,000 annually, only 33 percent shop at Wal-Mart on a regular basis. Additionally, 57 percent of respondents located in the southern United States said they shop at Wal-Mart on a regular basis as compared to 41 percent, 34 percent, and 24 percent of respondents in the Midwest, West, and Northeast respectively. The above information supports Wal-Mart's business model of having a large number of stores located in the southern United States (Princeton Survey Research Associates International 2005).

Chiou (2009) tells us that consumers have developed a preference for shopping at Wal-Mart over most other retailers and mass merchants. She attributes this to a recent shift in consumer preference of moving away from traditional department stores and a gradual progression towards discount retailers. She also states that the average sample male consumer (35 years old with children under the age of 18, a college education, and income of $40,000 a year) would be willing to pay more for a DVD at Wal-Mart rather than acquiring it from another retailer at a lower cost. The reason for such behavior, she explains, is that consumers become very familiar with the Wal-Mart brand and feel more comfortable going to Wal-Mart to purchase the DVD versus going to a less familiar retailer.

Wal-Mart's Effect on Competitors

The competitive marketplace can be divided into two distinct groups. The first group includes smaller "mom and pop" department stores that are locally owned and operated. These retailers typically find it hard to survive once Wal-Mart enters the marketplace in their area, as Wal-Mart cuts into their market share and profit margins (Basker 2007). Jia (2005, as cited in Basker 2007) found that at the county level, there are 2-3 fewer general merchandise stores in areas with Wal-Mart stores than in areas without them. As a result, 50-70 percent of small discount store closures in the United States between 1988 and 1997 were attributed to Wal-Mart's expansion.

Though Wal-Mart tends to have a negative effect on smaller discount stores that offer similar products, it can also have positive economic effects. Zhu et al. (2005) found that it can be beneficial for a local grocer to be located next to a Wal-Mart discount store. Their results indicate that Wal-Mart acts as an anchor tenant and draws people

into a shopping plaza. As a result, a grocery store is able to benefit from the draw of consumers as experienced through increased sales. It should be noted that this is only applicable when the Wal-Mart store is a standard discount store and not a Supercenter store. Locating a Supercenter store, which combines a grocery store and a discount store, next to a stand-alone grocer will typically result in negative sales to the grocer. As Wal-Mart's prices tend to be at a lower price-point on average when compared to grocers as a whole (Basker and Noel 2007).

Wal-Mart tends to impact its larger retail chain competitors differently, or in more complex ways than local mom-and-pop retailers. For instance, K-Mart and Target tend to emulate the business practices of Wal-Mart (Basker 2007). Additionally, both K-Mart and Target take into account Wal-Mart's current and potential store locations when deciding on whether to enter a market (Basker 2007). This becomes especially important in regional areas as Wal-Mart has an extremely strong presence in the southern United States and tends to be weaker in the northeast and western United States (Pew Research Center 2005). It is also worth noting that Wal-Mart is having an increasingly significant impact on Internet retailers. Forman et al. (2006, as cited in Basker 2007) found that the types of books purchased from Amazon.com changes in a given geographic area when Wal-Mart is introduced. Their study indicates that more popular titles, likely to be carried by Wal-Mart, decrease in sale at Amazon. This indicates that consumers would rather purchase the book from Wal-Mart, than purchase it over the Internet through Amazon.com.

Analysis of Literature

The voluminous amount of research that has been conducted up to this point provides empirical data noting Wal-Mart's economic benefit and detriment in the locations they do business. Additionally, much of the literature focuses on identifying and overcoming endogeneity. Because reliable data sets concerning wages, education, benefits, and employment are difficult to come by or are conducted over non-overlapping time periods, results tend be misleading when determining the net impact Wal-Mart has on an area. As a result, Hicks (2008) suggests that more precise studies focusing on demographic characteristics are needed in order to understand Wal-Mart's store location decision making process.

Basker (2007) provides an excellent overview of Wal-Mart's actual and potential effects on consumers and competitors and goes to great lengths in explaining findings both for and against Wal-Mart in the marketplace. From a spatial perspective, Holmes (2011) does a good job interpreting the relationship that exists between store location and distribution center location at the monetary level. He also shows the benefits Wal-Mart receives from locating stores in close proximity to one another and does an exceptional job portraying the dispersion pattern of Wal-Mart's growth in the United States from 1970 to 2005. However, the literature fails to provide any concrete explanation as to why Wal-Mart chose the locations they did for either the construction or upgrading of a store.

Based on the preceding literature review, it is clear that gaps exist in the body of knowledge related to retail location in general, and Wal-Mart's location practices in particular. This study proposes to identify possible demographic triggers Wal-Mart has

used in deciding to enter into an area, and from that information, identify any trends that may be occurring in relation to store type and location at the regional level. The results of this analysis aim to add to what is known about Wal-Mart's market entry strategies.

CASE STUDY

The study that follows analyzes the dispersion and associated market characteristics of Wal-Mart locations between the years 1990 and 2005 in the United States. The goal of the research is to determine whether or not a relationship exists between store location and type of store in the markets Wal-Mart serves, and if so, what the underlying factors for the relationship are. The first year, 1990, was selected because it is the first year that block level census data was available. Additionally, it marks the beginning of a large scale upgrading process of original discount stores to Supercenter stores in the United States. The final year, 2005, was selected because the data set used in this study ends at 2005. Tables 1 and 2 below outline the number of stores by store type in each region and the percentage of stores by store type in each region respectively.

Table 1 *Number of Stores by Type in each Region (2005)*

Region	Number of Original Discount Stores	Number of Original Supercenter Stores	Number of Converted to Supercenter Stores	Number of Original & Converted Supercenter Stores	Total: All Stores
Northeast	212	59	45	104	316
Midwest	203	106	287	393	596
South	128	249	736	985	1,113
West	209	79	120	199	408
All Regions	752	493	1,188	1,681	2,433

Table 2 *Percentage (%) of Stores by Type in each Region (2005)*

Region	Percent Original Discount Stores	Percent Original Supercenter Stores	Percent Converted to Supercenter Stores	Percent Original & Converted Supercenter Stores	Total %: All Stores
Northeast	67%	19%	14%	33%	100%
Midwest	34%	18%	48%	66%	100%
South	12%	22%	66%	88%	100%
West	51%	20%	29%	49%	100%
All Regions	31%	20%	49%	69%	100%

In order for an analysis to take place, a breakdown of the techniques used to determine the relationship between store location and type of store constructed is in order. Each Wal-Mart store is first divided by store type. The three store types used are as follows: original discount stores, original Supercenter stores, and stores that have been “Converted to Supercenter”. An original discount store is a Wal-Mart store that offers goods and services related to general merchandising such as home and garden, electronics, automotive, apparel, and sporting goods. An original Supercenter store is a Wal-Mart store that combines the goods and services offered by an original discount store along with food items. A “Converted to Supercenter” store is defined as a store that was originally constructed as a discount store and that was later expanded or renovated into a Supercenter store. Distribution centers are divided into two types: discount and “Grocery”. A discount distribution center supplies original discount stores, original Supercenter stores, and “Converted to Supercenter” stores with the general merchandise mentioned above. A Grocery distribution center supplies original

"Supercenters" stores and "Converted to Supercenter" stores with the food items mentioned previously.

Research Questions

In looking at the distribution of Wal-Mart stores across the United States, it is difficult to identify whether certain regions are more likely than others to have a particular type of store dominate the landscape. Furthermore, it is not obvious what the trajectory of store development has been by region, where certain regions have seen their discount stores upgraded more or less rapidly to Supercenter format. As a result, the first objective of this study is to identify the location and type of each Wal-Mart store: original discount stores, original Supercenter stores, and "Converted to Supercenter" stores. *Specifically, I ask: to what extent is clustering of Wal-Mart store types taking place, and is there any distinction between clustering at the regional level?*

Expanding on the results of the first question, the second research objective is to explain any patterns that are observed in the data set. The primary factor that needs to be investigated is the connection between the year a particular type of store was constructed in a region and its proximity to its nearest distribution center ("Standard" or "Grocery"). As a result, the second research question asks: *is there a relationship between the year an original discount, original Supercenter, or "Converted to Supercenter" store was constructed and its proximity to its nearest distribution center?*

The final aim of this research is to identify whether the site selection process for a new Wal-Mart store is based upon standard demographic triggers. It has been established that most retailers locate stores based upon proximity to their target market (Fettig 2006). Thus, this part of the research hopes to determine if 1990 and 2000

average household income, 1990 and 2000 population density, and 1990 and 2000 percent unemployed influence the location of a new store. The final research question proposed is: *of stores built between the years 1990 and 2005, does 1990 and 2000 "average household income", 1990 and 2000 "population density", and 1990 and 2000 "percent unemployed" help to explain the pattern of store construction at the regional level?*

Data Sources

Data for the 16 year study period came from a list compiled by Holmes. The data set consists of the following variables: Store Number, Date discount Store Opened, Date Supercenter Store Opened, Date discount Store "Converted to Supercenter" Store, County, State, City, Zip Code, Street Address, and Store Type. Additional data related to Wal-Mart stores constructed between the years 2006 and 2010 is currently available however; it will not be used in this study as census data for 2010 is not yet fully available.

For the Wal-Mart stores included in this study, each address has been geocoded using Alteryx Street Geocoder. The Street Geocoder assigns accuracy of the geocoding process by percentage, based upon the accuracy of the latitude and longitude provided within the software. The most precise geocode a record can receive is 100%, which means that the address, city, state, and zip code were all found exactly within the software. This informs us that the latitude and longitude coordinates provided are a 100% match and no geocoding errors should be present for that particular store location. For those stores that do not result in 100% accuracy, additional tools such as CASS coder were added to the analysis in an attempt to get a 100% address match. It

should be noted that every attempt to correctly geocode the location of each individual Wal-Mart store was made. Of the 2,804 stores included in the original data set, 371 could not be fully verified with a 100% address match. As a result, these stores were omitted from the study.

The primary software packages used to create graphical representations of the data used in the study are Alteryx and ArcGIS. When analyzing data by region, the locations have been divided using Census Region boundaries defined by the United States Census Bureau: Northeast, South, Midwest, and West. Regions were defined in this manner in order to stay consistent with the regions used in the data analysis portion of this study, which involves the use of United States Census Bureau data. Figure 2 depicts a geographic rendering of the U.S. Census Bureau region designations.

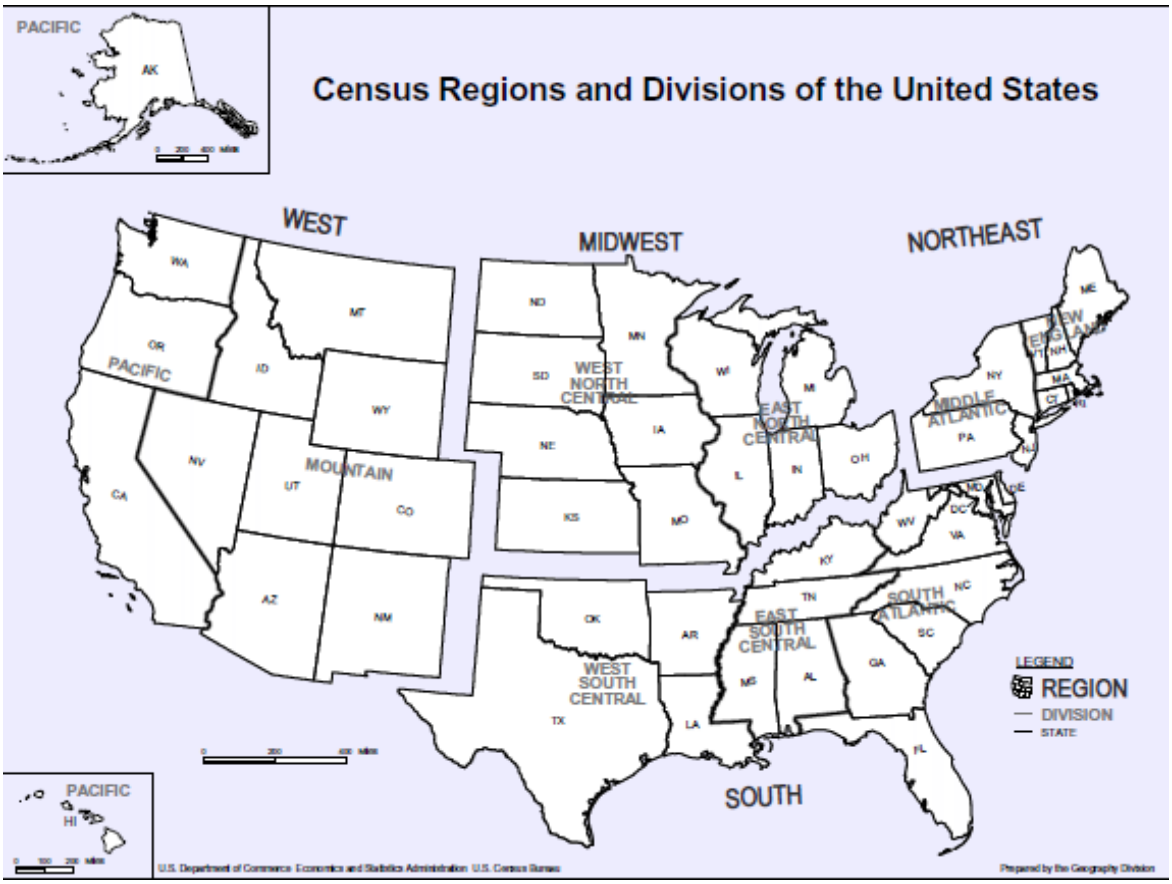

Figure 2 *United States Census Bureau Region Boundaries*

Demographic data related to 1990 and 2000 average household income, 1990 and 2000 population density, and 1990 and 2000 percent unemployed came from block level data provided through the Alteryx software. Block level data was used, because it is the most geographically detailed level of data available for the study. The independent variables of 1990 and 2000 average household income, 1990 and 2000 population density, and 1990 and 2000 percent unemployed were chosen because Hicks (2008) suggests that Wal-Mart could be locating stores based upon particular demographic factors. This study provides a venue for further testing of this premise.

The demographic characteristics mentioned above were analyzed by constructing a five mile trade area around each store location. It should be noted that not all trade areas, especially those in urban areas, have a five mile radius, as trade area overlap has been eliminated from the study. An example of how trade area overlap has been eliminated in an urban setting is provided in Figure 3. A five mile trade area was chosen so that a representative sample of the population closest to each store location could be gathered. Holmes (2011) also provides precedent for use of five mile trade areas by using the same size trade area in a similar study.

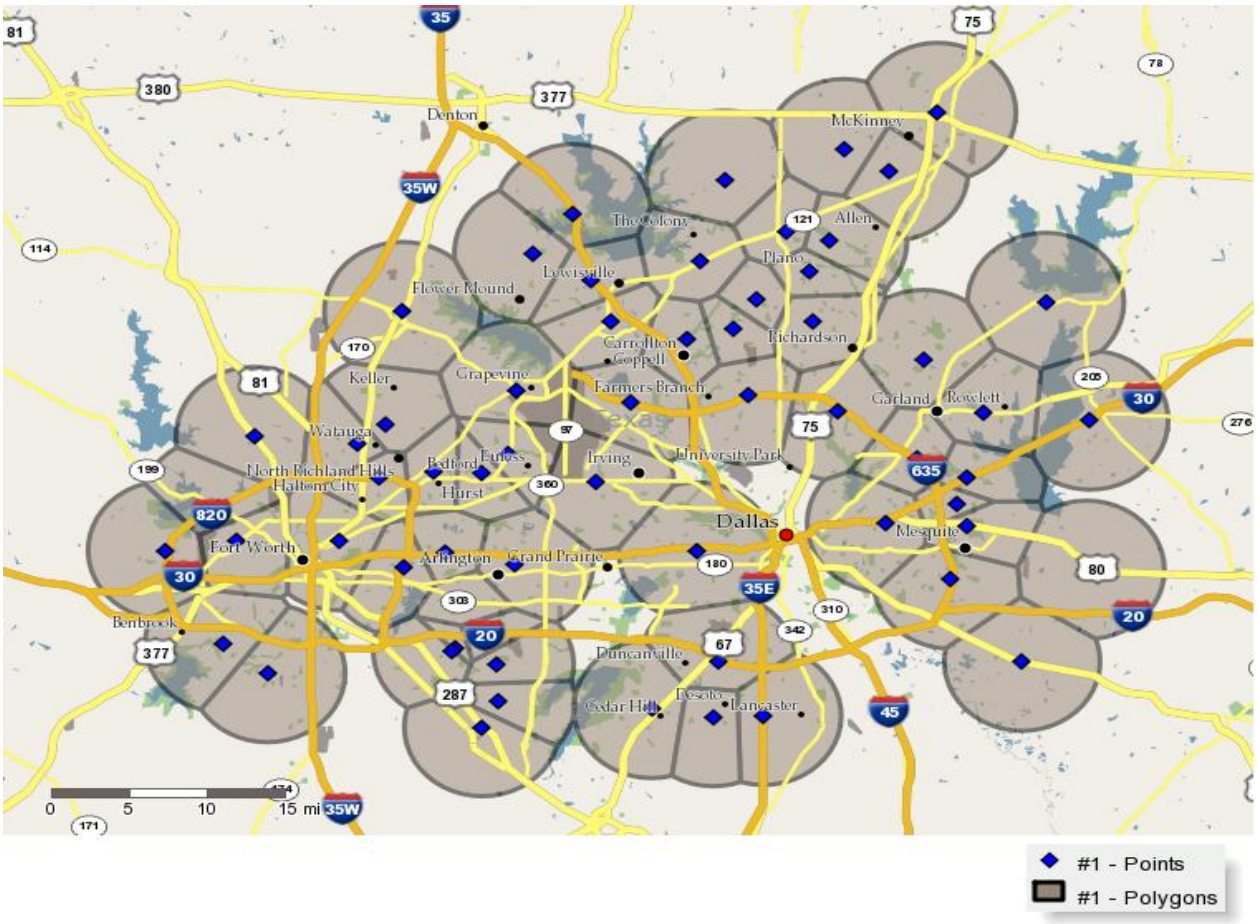

Figure 3 *Trade Area Overlap in Metropolitan Areas*

METHODOLOGY

The primary variables for this research are store type, designated as original discount, original Supercenter, or “Converted to Supercenter” and distribution center type (discount or “Grocery”). Secondary variables include: year store constructed, distance from distribution center, 1990 and 2000 average household income, 1990 and 2000 population density, and 1990 and 2000 percent unemployed. SPSS and SaTScan software were used for all statistical analyses. These software packages were chosen because of my personal familiarity and skills obtained with each program.

Research Objectives

Objective one provides a regional division of Wal-Mart locations by store type. In an attempt to provide insight into areas where types of stores are clustered, a continuous Poisson model was utilized. The continuous Poisson model was chosen because it uses a moving spatial scanning tool to detect clusters of points within a specified region or study area (Kulldorff 1997). The model assumes that under normal conditions, all points within the study area are evenly dispersed or constant. Additionally, the analysis uses the total number of Wal-Mart stores in the study as a baseline. Clusters are identified when the number of stores within a given location is more than what would be expected. The data included in this study consists of store location, store type, and region. The results of the study render a geographic representation of clustering within the data set by store type and region. Clusters are considered to be significant at the .05 significance level or better.

Objective two identifies whether or not a relationship exists between type of store, year store constructed and distance from distribution center. The analysis takes

store locations by type of store and compares year store constructed with the distance in miles back to the nearest distribution center. It should be noted that original discount stores were measured in miles back to discount distribution centers and original "Supercenters" and "Converted to Supercenter" stores were measured in miles back to "grocery" distribution centers. A single correlation analysis of year store constructed and distance back to nearest distribution center was performed to determine if a relationship exists that supports a systematic construction of stores by type of store around a distribution center.

The final objective attempts to explain the locations Wal-Mart has selected, referring at this final stage to variables outside of Wal-Mart's own network of stores and distribution centers. Because the locations Wal-Mart has selected are not random, a multiple correlation analysis was performed to gain insight into the locations they have selected to enter based on demographic characteristics. The variables included in the multiple correlation analysis consist of 1990 and 2000 average household income, 1990 and 2000 population density, and 1990 and 2000 percent unemployed. These variables were selected, because as Hicks (2008) points out, Wal-Mart may be using demographic characteristics related to income and population density as key market entrance factors. The variables were combined with distance from distribution center and year store constructed results in order to provide insight into the role that these three factors play in the site selection process over space and time.

RESULTS

The following section outlines the final results of testing for each statistical test and methodology used in this study. Inferences drawn from these results will be discussed in the conclusions section of this study. The goal of this study is to identify an association between store type and location at the U.S. Census Bureau regional level. To address this topic, three research questions were investigated separately.

Question 1: Wal-Mart Store Clustering

The first question tested included all Wal-Mart stores constructed between the years 1990 and 2005. The question being tested is whether Wal-Mart stores are clustered by type of store at the regional level. The cluster analyses resulted in a total of 26 clusters across the United States that are significant at the .05 significance level or better. This indicates a 5% or less chance of these clusters emerging by random chance. In looking at the number of clusters by store type, there are 10 original discount store clusters, 10 original Supercenter store clusters, and 6 “Converted to Supercenter” store clusters. The clusters range in size with the smallest cluster consisting of 4 stores and spanning a distance of 6.7 miles, while the largest cluster contains 230 stores and spans a distance of 235.9 miles. The largest clusters in terms of size and geographic area can be found in the Midwest, Northeast, and South regions. While the smallest clusters in terms of size and geographic area can be found in or around major metropolitan areas in the Midwest, South, and West regions. Figures 4, 5, and 6 depict the locations and approximate geographic sizes of clusters by store type (discount, Supercenter, and “Converted to Supercenter”). Figure 7 combines the clusters of all three store types.

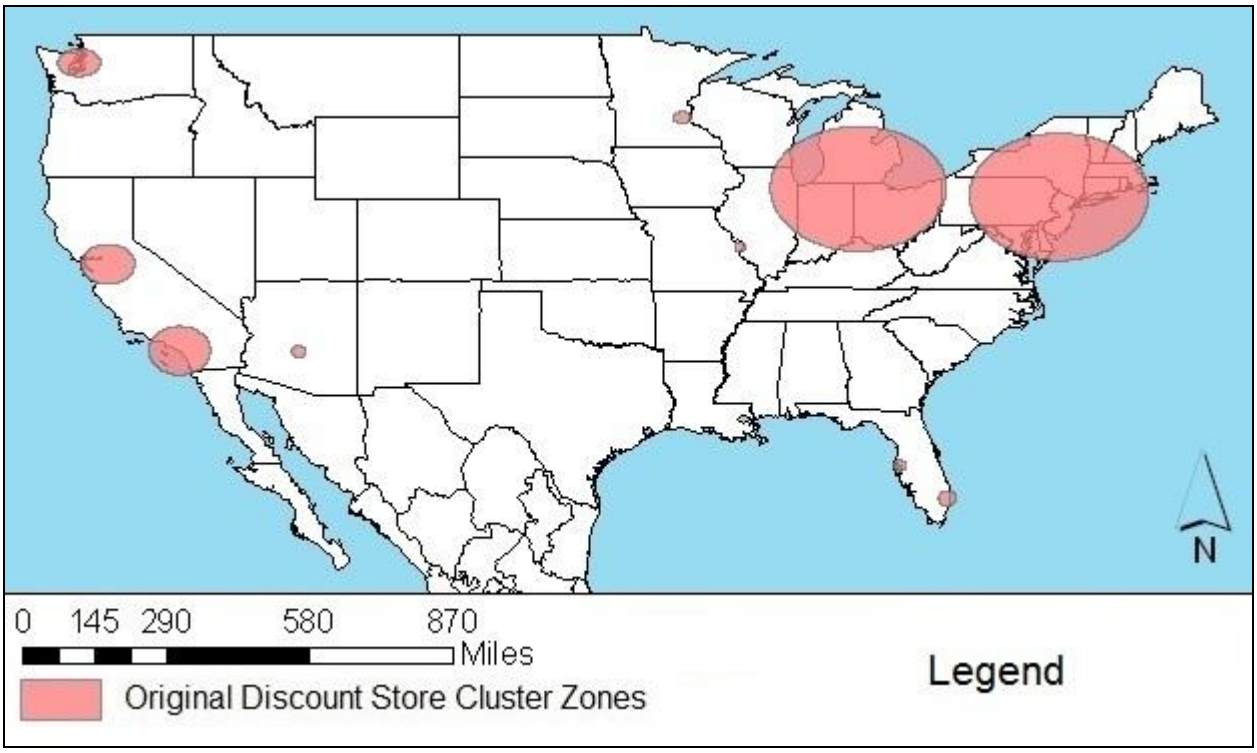

Figure 4 *Original discount Store Cluster Zones (2005)*

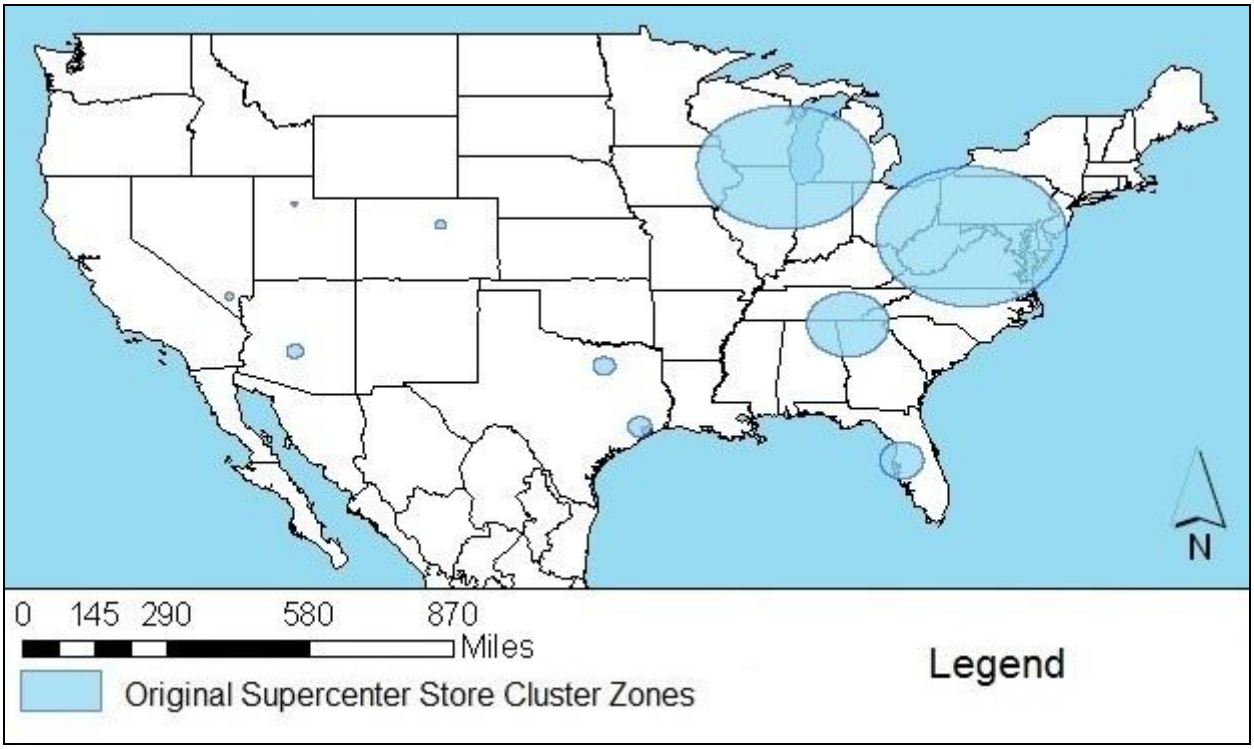

Figure 5 *Original Supercenter Store Cluster Zones (2005)*

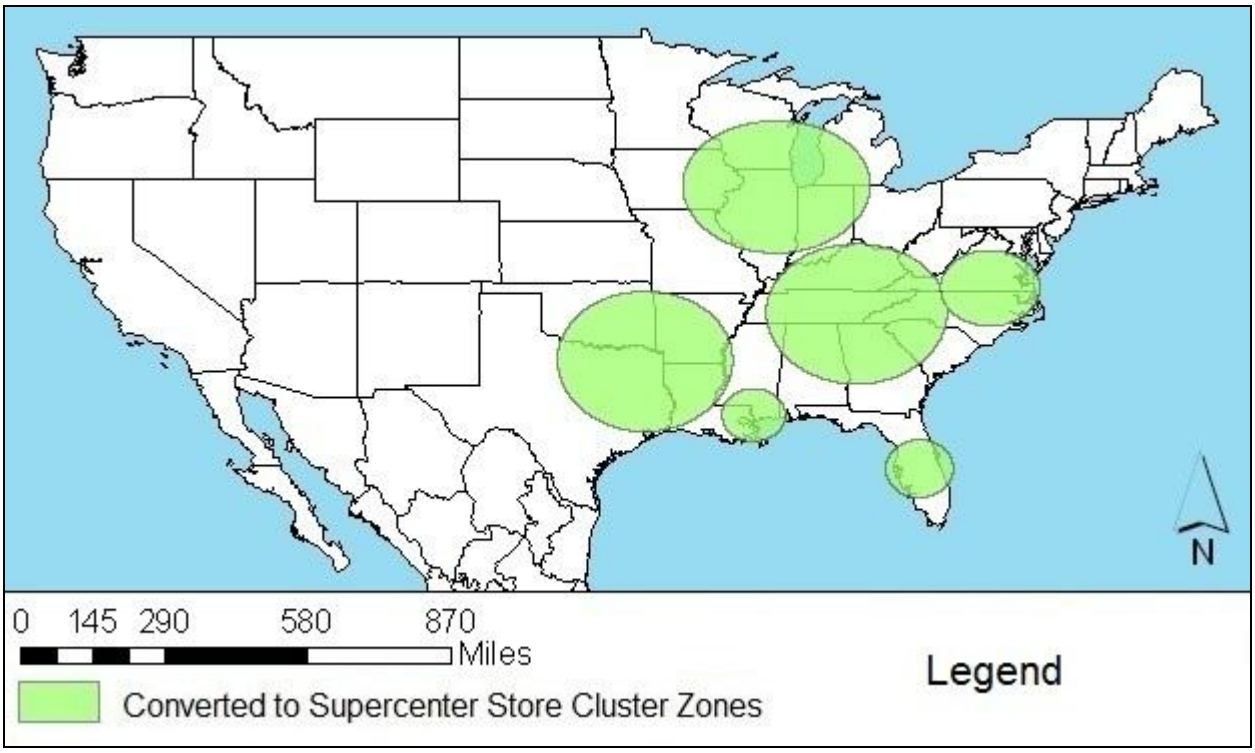

Figure 6 *"Converted to Supercenter" Store Cluster Zones (2005)*

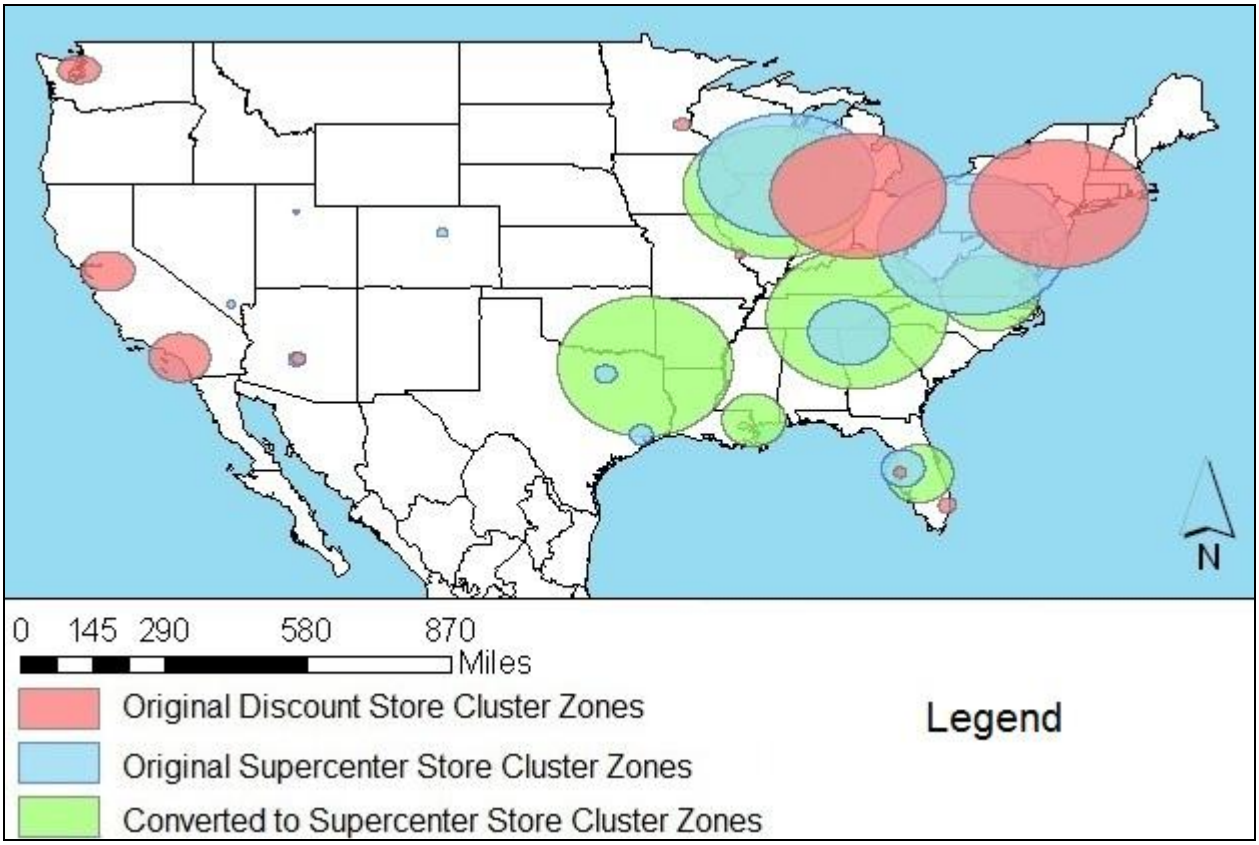

Figure 7 *Store Cluster Zones - All Store Types (2005)*

In reviewing the cluster breakdown by region, the Northeast region contains 1 original discount store cluster, 1 original Supercenter store cluster, and no “Converted to Supercenter” store clusters. In the Midwest region there are 3 discount store clusters, 1 original Supercenter store cluster, and 1 “Converted to Supercenter” store cluster. In the South region there are 2 discount store clusters, 4 original Supercenter store clusters, and 5 “Converted to Supercenter” store clusters. In the West region there are 4 discount store clusters, 4 original Supercenter store clusters, and no “Converted to Supercenter” store clusters.

Looking strictly at original discount stores, the largest clusters in terms of geographic area and number of stores are located in the Northeast region and Midwest region, with stores located in and around the major metropolitan areas of: Washington D.C., Baltimore, Philadelphia, the greater New York City area, Boston, Chicago, Detroit, Cleveland, and Cincinnati. Moving down in geographic size and number of stores, the West region contains 3 medium sized clusters located in and around: San Diego, Los Angeles, San Francisco, and Seattle. The smallest clusters in terms of geographic size and number of stores are found in the metropolitan areas of: Miami, Tampa, Saint Louis, Minneapolis / Saint Paul, and Phoenix. One of the most interesting results of this pattern of dispersion is that original discount stores appear to be significantly clustered and concentrated in and around major metropolitan areas only.

After analyzing the results of the cluster analysis performed for original Supercenter stores it becomes apparent that unlike the clusters for original discount stores, the stores appear to be much more geographically dispersed. This is particularly true for the two largest clusters found in the Northeast and Midwest regions. The

clusters also do not appear to be located within major metropolitan areas, but are rather clustered around the outer edges of the major metropolitan areas in these two regions. Switching to the South and West regions, it becomes obvious that unlike the previous two regions, original Supercenter stores are clustered within metropolitan areas. Specifically, stores seem to be clustered in: Tampa, Houston, Dallas, Denver, Salt Lake City, Las Vegas, and Phoenix.

"Converted to Supercenter" store clusters are located almost entirely in the South region. The only exception is the large geographic cluster of stores located in the Midwest region. Unlike the first two store types, stores located within these clusters appear to be found in both metropolitan and rural areas; this is not surprising as there are a total of 736 "Converted to Supercenter" stores located within the South region (See Table 2). The geographically large cluster of stores in the Midwest region is interesting in that it is located in approximately the same exact geographic location and is nearly the same geographic size as the cluster of Original Supercenter stores in the Midwest region. Also comparable to the results of the original Supercenter store cluster analysis are the locations of the "Converted to Supercenter" stores. They appear to be located around the outer edges of metropolitan areas in the Midwest region as well. Additionally, cluster overlap between "Converted to Supercenter" stores and original Supercenter stores occurs in the Midwest region around major metropolitan areas, and in the South region in major metropolitan areas.

Results of the cluster analyses indicate that certain store types dominate certain geographic areas. Original discount stores are the only significant store type found clustered in major metropolitan areas in the Northeast region. Though not the only

significant clusters in the Midwest and West regions, this store type arguably has the highest concentration of stores in the largest metropolitan areas in each region respectively. On the other hand, original Supercenter stores appear to be located on the outer edges of major metropolitan areas in the Northeast and Midwest regions. They also tend to be clustered in select metropolitan areas in the South and West regions. “Converted to Supercenter” stores are predominately clustered in the South region and due to the large number of stores and geographic size of the clusters; these clusters contain stores located in both metropolitan and rural areas. The most cluster overlap between store types involves original Supercenter stores and “Converted to Supercenter” stores in and around major metropolitan areas in the Midwest and South regions.

Question 2: Store and Distribution Center Locations

The second question also includes all Wal-Mart stores constructed between the years 1990 and 2005. This question focuses on whether Wal-Mart stores are constructed in a continuous radial fashion outward from a distribution center at the regional level (i.e. stores developed near to the distribution center first, then built progressively further away until the distribution center’s service area is fully populated) or if store development has less of a relationship with distribution center development (i.e. stores are not necessarily developed close to distribution centers). This analysis provides an indication of whether Wal-Mart, when constructing a particular type of store, builds its distribution centers before its stores are developed.

The results of the single correlation analyses for this question indicate that store location is negatively correlated with distance to distribution center and year of store

construction at a .01 significance level or better. This suggests that store/distribution center distances decreased over time and that locating stores in close proximity to a distribution center is not a primary factor in the initial site selection process. Information contained in Table 3 details the results of the single correlation analyses by store type and region.

Table 3 *Year Store Built & Distance to Distribution Center Correlation Results*

Store Type	Northeast	Midwest	South	West
Discount	-.611**	-.414**	-.234**	-.503**
Supercenter	-.793**	-.482**	-.483**	-.549**
“Converted”	-.546**	-.424**	-.426**	-.448**

** Correlation is Significant at the .01 Level

The results of the study show that in every case, a significantly negative relationship exists between distance to distribution center and year store constructed. This signifies that in each region and for every store type, stores were not constructed in a continuous radial fashion outward from a distribution center, but were rather constructed in almost the exact opposite manner. These results seem counter intuitive because constructing stores far away from a distribution center is connected to elevated transportation costs. These findings suggest that distance to distribution center is not one of the more crucial criteria that Wal-Mart considers when selecting store locations. This is especially true in the Northeast, where the significantly negative correlations between year store constructed and distance to distribution center show the greatest degree of negative correlation.

To further illustrate the negative relationship that exists between store construction and distance to distribution center, Table 4 depicts original discount stores built in the Northeast between 1991 and 2005 and demonstrates the year over year decline in distance to distribution center. The distance in miles was calculated by taking the distance each store was from its nearest distribution center, at the time of construction, and then dividing by the total number of stores constructed that year to come up with an average distance all stores were from their nearest distribution center. What occurs over space and time is a reaching effect, where Wal-Mart appears to have distinct locations chosen for stores and initially are willing to transport goods over longer distances to these locations. Over time, infill around these choice locations takes place as additional stores and possibly a distribution center is added. Tables 11-22 in the appendix provide year store constructed and average distance back to distribution center details for the other store types and regions.

Table 4 *Northeast Original discount Stores Constructed by Year with Average Distance Measures*

Year	Number of Stores Built	Average Distance (Miles)
1991	9	335
1992	10	402
1993	30	265
1994	18	172
1995	26	171
1996	8	131
1997	15	115
1998	14	102
1999	6	101
2000	12	121
2001	18	121
2002	17	91
2003	13	91
2004	8	81
2005	6	71

Results of the single correlation analyses performed suggest that contrary to what might be expected, Wal-Mart does not construct stores in a continuous radial fashion outward from a distribution center, but rather has other considerations that prompt them to locate in the areas they choose. This is not to say that Wal-Mart does not locate stores in close proximity to distribution centers. Rather, Wal-Mart constructs stores around distribution centers in a manner not consistent with a strictly continuous expansion that increases with time. Additionally, it appears that Wal-Mart deploys this type of store location strategy in all regions. The Northeast and West regions show the greatest degree of synchronicity with this particular store construction pattern.

Question 3: Wal-Mart Store Locations and Market Demographics

Similar to the first two questions, the third research question involves all Wal-Mart stores constructed between the years 1990 and 2005. The question focuses on whether or not Wal-Mart stores are constructed based upon the demographic characteristics of average household income, population density, and percent unemployed. The demographic data for each store location is combined with the results from question two above to determine any distance to distribution center and year store constructed correlations. Multiple correlation analysis results were gathered at the regional level for all three store types. It should be noted that percent unemployed showed no significant correlation, either positive or negative, with any of the variables included in this research. A structured overview of the results are provided below, beginning with original discount stores, moving to original Supercenter stores, and ending with “Converted to Supercenter” stores. Results of the multiple correlation analyses vary by region and store type.

Original discount Stores

Similar to the single correlation results from question 2 above, distance to distribution center has a negative correlation with 1990 and 2000 average household income and 1990 and 2000 population density in the Northeast and West regions for original discount stores. This indicates that stores that are located further from a distribution center tend to have lower average household incomes and lower population densities than stores that are in closer proximity to a distribution center. Table 5 outlines the relationship between distance to distribution center and 1990 and 2000 average household income and 1990 and 2000 population density for original discount stores.

Table 5 *Original discount Stores Correlation Results (Distribution Centers)*

Region	Correlation Variable Tested	1990 Household Income	2000 Household Income	1990 Population Density	2000 Population Density	Year Built
Northeast	Distance to Distribution Center	-.162*	-.162*	-.175*	-.172*	-.611**
Midwest	Distance to Distribution Center	-.134	-.121	-.189**	-.189**	-.414**
South	Distance to Distribution Center	-.086	-.107	.155	.191	-.234**
West	Distance to Distribution Center	-.262**	-.235**	-.223**	-.213**	-.503**

* Correlation is Significant at the .05 Level
** Correlation is Significant at the .01 Level

When reviewing the relationship between year store constructed and 1990 and 2000 average household income and 1990 and 2000 population density for original discount stores, all but one relationship in all four regions is significantly positively correlated. This shows that, in every region, as stores were constructed year over year, average household income and population density increased. This signifies that lower

average household income and lower population density locations were selected for store construction early on (i.e. highest priority stores, the ones they want to make sure to get into first) and as time progressed, Wal-Mart located stores in higher average income areas and higher density locations (i.e. lower priority stores, markets they are content to address later in their development program). Table 6 outlines the relationship between year store constructed and 1990 and 2000 average household income and 1990 and 2000 population density for original discount stores.

Table 6 *Original discount Stores Correlation Results (Year Store Built)*

Region	Correlation Variable Tested	1990 Household Income	2000 Household Income	1990 Population Density	2000 Population Density	Distance to Distribution Center
Northeast	Year Built	.428**	.407**	.362**	.365**	-.611**
Midwest	Year Built	.179*	.158*	.345**	.339**	-.414**
South	Year Built	.326**	.292**	.187*	.157*	-.234**
West	Year Built	.172*	.131	.348**	.320**	-.503**

* Correlation is Significant at the .05 Level
** Correlation is Significant at the .01 Level

Original Supercenter Stores

Results of the multiple correlation analyses performed for original Supercenter stores reveal non-significant correlations between distance from distribution center, and 1990 and 2000 average household income, and 1990 and 2000 population density in all regions except the South, where a highly significant negative relationship exists. The results suggest that as distance to distribution center increases, average household income decreases. This shows that in the South region, those stores that are further

away from a distribution center tend to be lower average income areas than those that are closer to a distribution center. This suggests that Wal-Mart is willing to go further distances from a distribution center, which increases their transportation costs, in order to locate stores in lower-income areas. Table 7 details the results of the multiple correlation analysis performed between distance to distribution center and 1990 and 2000 average household income and 1990 and 2000 population density for original Supercenter stores.

Table 7 *Original Supercenter Stores Correlation Results (Distribution Centers)*

Region	Correlation Variable Tested	1990 Household Income	2000 Household Income	1990 Population Density	2000 Population Density	Year Built
Northeast	Distance to Distribution Center	-.185	-.161	-.098	-.107	-.793**
Midwest	Distance to Distribution Center	-.083	-.092	-.084	-.095	-.482**
South	Distance to Distribution Center	-.303**	-.334**	-.074	-.103	-.483**
West	Distance to Distribution Center	.106	.024	-.116	-.143	-.549**

* Correlation is Significant at the .05 Level
** Correlation is Significant at the .01 Level

The results of the multiple correlation analysis performed in relation to year store constructed and 1990 and 2000 average household income and 1990 and 2000 population density for original Supercenter stores ends with the same outcome noted above. Looking at Table 8, the only significant result between the variables is found with year store constructed and 1990 and 2000 average household income in the South region. This indicates that as year store constructed increases, average household

income also increases. These results suggest, in the South region, that original Supercenter stores were first constructed in lower income areas and increasingly over time were constructed in more affluent, higher income locations.

Table 8 *Original Supercenter Stores Correlation Results (Year Store Built)*

Region	Correlation Variable Tested	1990 Household Income	2000 Household Income	1990 Population Density	2000 Population Density	Distance to Distribution Center
Northeast	Year Built	.166	.169	.105	.113	-.793**
Midwest	Year Built	.024	.045	.026	.032	-.482**
South	Year Built	.209**	.237**	.109	.144	-.483**
West	Year Built	.121	.156	.080	.089	-.549**

* Correlation is Significant at the .05 Level
** Correlation is Significant at the .01 Level

"Converted to Supercenter" Stores

The multiple correlation analysis performed for "Converted to Supercenter" stores indicates a significant negative relationship when correlating distance from distribution center and 1990 and 2000 population density in the Northeast and West regions. These results suggest that as distance from distribution center increases, population density decreases. This shows that those stores located further from a distribution center in the Northeast and West regions tend to have lower population densities than those stores in close proximity to a distribution center. Table 9 outlines the relationship between distance to distribution center and 1990 and 2000 average household income and 1990 and 2000 population density for "Converted to Supercenter" stores.

Table 9 *"Converted to Supercenter" Stores Correlation Results (Distribution Centers)*

Region	Correlation Variable Tested	1990 Household Income	2000 Household Income	1990 Population Density	2000 Population Density	Year Built
Northeast	Distance to Distribution Center	-.076	-.116	-.406**	-.381**	-.546**
Midwest	Distance to Distribution Center	-.028	-.008	-.023	-.021	-.424**
South	Distance to Distribution Center	-.015	-.045	-.029	-.044	-.426**
West	Distance to Distribution Center	-.117	-.097	-.184*	-.084*	-.448**

* Correlation is Significant at the .05 Level
** Correlation is Significant at the .01 Level

When looking at the results of the multiple correlation analysis performed for year store constructed and "Converted to Supercenter" stores, a number of significant results exist. The first is that there is a significant positive relationship between year store constructed and 1990 and 2000 average household income in the Midwest and West regions. This suggests that "Converted to Supercenter" stores in these regions were first constructed in lower income areas to begin with and over time, were constructed in increasingly higher income locations. There is also a significant positive correlation between year store constructed and 1990 and 2000 population density in the Northeast, South, and West regions. These results signify that "Converted to Supercenter" stores in these regions were first constructed in lower density areas to begin with, and similar to average household income, were constructed in increasingly higher density areas as time progressed. Table 10 details the results of the multiple correlation analysis performed for "Converted to Supercenter" stores in all regions.

Table 10 *"Converted to Supercenter" Stores Correlation Results (Year Store Built)*

Region	Correlation Variable Tested	1990 Household Income	2000 Household Income	1990 Population Density	2000 Population Density	Distance to Distribution Center
Northeast	Year Built	.254	.261	.361*	.356*	-.546**
Midwest	Year Built	.135*	.140*	.057	.059	-.424**
South	Year Built	.019	.019	.112**	.113**	-.426**
West	Year Built	.287**	.226*	.223*	.238**	-448**

* Correlation is Significant at the .05 Level
** Correlation is Significant at the .01 Level

The results for the multiple correlation analyses support the results of the cluster analyses and single correlation analyses performed above in the first two research questions. These outcomes suggest that Wal-Mart is not just simply selecting locations to construct particular types of stores based upon a straightforward strategy of placing stores in close proximity to a distribution center. Rather, they are taking into consideration factors such as income and population density into their decision making process. In the case of this study, it appears that they are targeting lower income and lower population density areas first and then over time constructing stores in increasingly higher income and more densely populated locations. A more detailed discussion of this conclusion will be discussed in the section that follows.

DISCUSSION AND CONCLUSION

This study has focused on three questions that relate to retail location strategy and Wal-Mart store locations within the United States. This final section briefly summarizes the results related to each research question, and explains some conclusions that can be drawn from each. The conclusions presented offer insight into the statistical outcomes of the study performed and attempt to provide a means of interpreting the site selection process employed by Wal-Mart in the United States between 1990 and 2005.

First Question: Wal-Mart Store Clustering

The first research question addressed was: *are Wal-Mart stores clustered by type of store at the regional level*? Three cluster analyses were performed to identify the location of the most statistically significant clusters. Original discount stores, original Supercenter stores, and "Converted to Supercenter" stores were analyzed by location and significance level. The cluster analyses were performed to identify locations where certain types of stores dominate a particular geographic area.

Looking at original discount stores, statistically significant clusters occur primarily in major metropolitan areas in the Northeast, Midwest, and West regions. The results indicate a focus of constructing discount stores between the years of 1990 and 2005 in some of the most densely populated areas of the country. A possible explanation for this distinct pattern of clustering revolves around the need to place a smaller square footage store (compared to Supercenters) in these areas, as land in metropolitan locations often has a higher market value per acre than land in a rural setting. Because discount stores are smaller in size than Supercenter stores, it makes sense for Wal-

Mart to construct discount stores in these locations. This also explains why many of the discount stores in these areas have not been converted to a Supercenter. When the cost of acquiring land to build a store is high, placing an original discount store in an area makes the most business sense, because less land is needed to construct a discount store versus a Supercenter store.

Switching over to the results of original Supercenter stores, the study finds that the largest clusters in terms of geographic scale and number of stores are located predominately in the Midwest and Northeast regions. The analysis also makes the distinction that original Supercenter stores are predominately located around the perimeter or edge cities of many of the large metropolitan areas in the Northeast and Midwest regions. In the South and West regions, the study finds that original Supercenter clusters are found to be located within metropolitan areas. Due to large plots of land in metropolitan areas in the South and West regions being predictably more available, this pattern of dispersion would be rational.

Of the three store types, “Converted to Supercenter” stores have the largest and most geographically diverse clusters. Unlike original discount stores and original Supercenter stores, “Converted to Supercenter” stores only have clusters located in the South and Midwest regions. Of the six total “Converted to Supercenter” store clusters, five are located in the South region. This result makes sense, as 66% of all stores located in the South region are “Converted to Supercenter” stores. Additionally, 88% of all stores in the South region are either original Supercenter stores or “Converted to Supercenter” stores, which leave only 12% of stores in the South region as original discount stores. When reviewing the locations of the “Converted to Supercenter” stores

in the South region, stores are located within both metropolitan and rural areas. In contrast, for the single cluster of “Converted to Supercenter” stores in the Midwest region, stores are clustered around the outer edges of major metropolitan areas. Again, the results suggest that when land is available, Wal-Mart chooses to convert original discount stores to “Supercenters”.

To reinforce the conclusion that Wal-Mart locates original discount stores in more densely populated locations than Supercenter stores in the Northeast and Midwest regions; population density results from Tables A.1, A. 2, A. 3, A. 4, A.5, and A. 6 in the Appendix have been compared with Figure 8 below. The average population density for original discount stores in the Northeast region in 1990 is 1,677 people per square mile, while the average population density for original Supercenter and “Converted to Supercenter” stores in the Northeast region is 529 and 568 people per square mile respectively. In the Midwest region, the average population density for original discount stores is 1,547 people per square mile, while the average population density for original Supercenter and “Converted to Supercenter” stores is 570 and 401 people per square mile respectively. When average population density values for each store type is compared with store locations in Figure 8, it becomes apparent that original discount stores in the Northeast and Midwest regions are clustered in predominately higher density, metropolitan locations and original Supercenter and “Converted to Supercenter” stores are located in primarily less dense, outer edge metropolitan and rural areas.

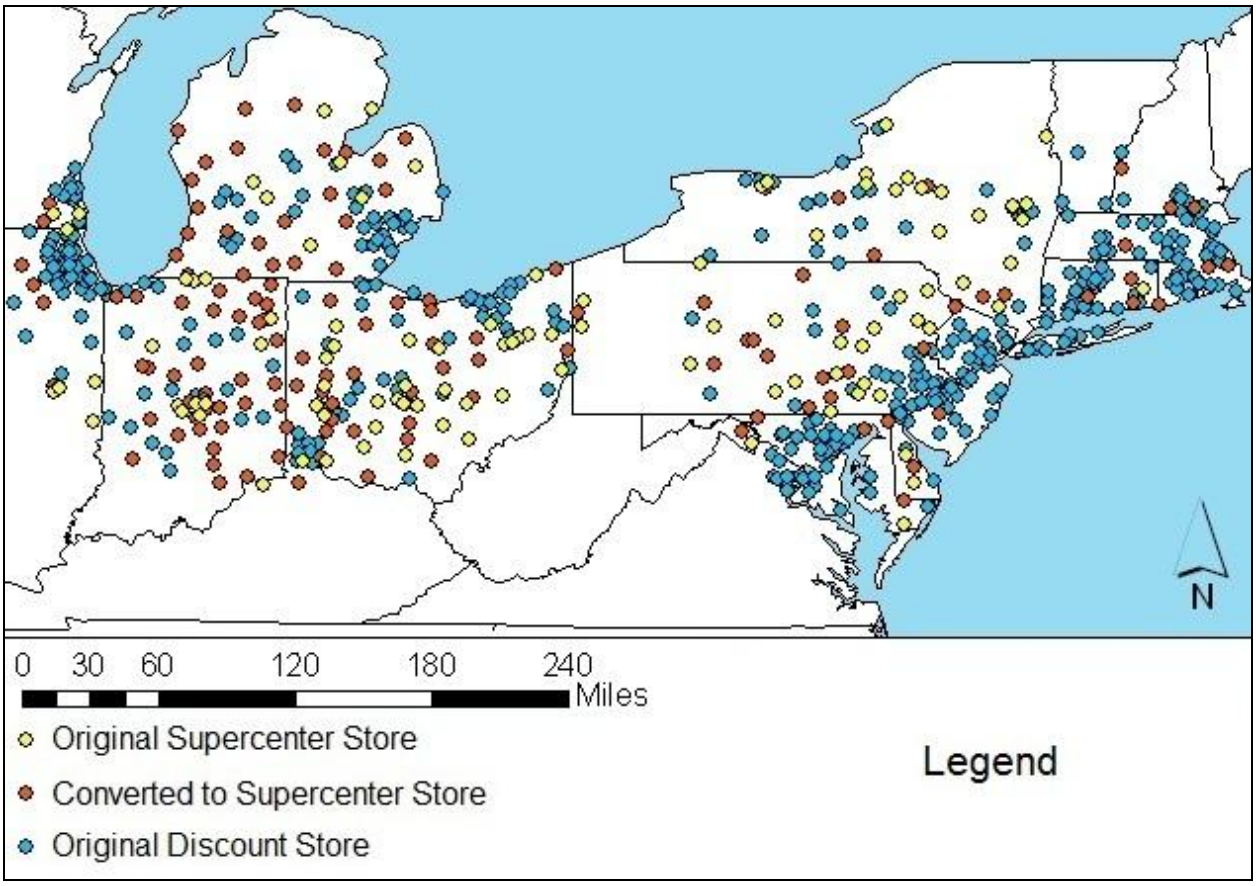

Figure 8 *Location Comparison of Northeast & Midwest Original discount Stores (2005)*

Continued research in this area could include looking at the relationship between store clusters and property values. Because clusters of original discount stores are primarily located in high density metropolitan areas, property values could be compared with that of other store types and locations. This would provide more insight regarding the locations in which Wal-Mart chooses to locate particular types of stores. Another avenue of research could be to add in additional business types, such as Sam's clubs and Neighborhood markets. The addition of the new stores would provide a greater variety of store types to examine and would afford an even greater analysis. The store types used in this study are beneficial in that they provide a substantial basis for which statistical analyses and conclusions can be drawn. Nevertheless, additional information

would allow for an even greater understanding of the site selection choices employed by Wal-Mart between 1990 and 2005.

Second Question: Wal-Mart Store and Distribution Center Locations

The second research question asks: *is there a relationship between the year a particular type of store was constructed and its distance from the nearest distribution center*? The objective of this question is to determine whether or not stores are constructed in a year over year radial fashion outwards from a distribution center or whether stores are constructed in a given area before a distribution center is added? To answer this question, a correlation analysis was performed between year store constructed and distance in miles from the nearest distribution center. The analyses resulted in regional results; one set of results for each store type and region.

The outcome of the correlation analyses indicates a highly significant (.01 or better) negative relationship in every region and for each of the three store types (See Table 3). This confirms that over time, distance from distribution center decreases. The end conclusion, in every case, is that distribution centers are constructed in an area after an established population of stores has already been built (distribution center construction does not precede store construction). This conclusion is reinforced when year over year store construction patterns are reviewed in all four regions. Tables 11-22 in the appendix provide additional information on this unique expansion pattern.

A plausible explanation for this fashion of expansion would be that Wal-Mart is constructing pilot or test stores in new locations to determine the viability of additional development in that area. In the event the test sites prove to be profitable, then decisions are then made to construct a distribution center in that area to better serve

existing and future stores. It may also be that Wal-Mart is using the locations of the initial stores as a way to establish a service area. Based upon the locations of the stores included in the service area, a distribution center is then centrally located to best serve all current and future stores within a specified geographic area. The most likely conclusion is that Wal-Mart is locating stores in this fashion because there are factors related to demographic characteristics involved in the site selection process. Despite these locations being at a further distance from a distribution center initially, stores are built with the confidence that they will be successful despite higher transportation costs in the early stages of store growth.

Future work in this area could include taking a look at how the number of stores per distribution center changes over time. The results of such a study would provide further insight into the site selection process employed for both distribution centers and store locations. It may also provide information regarding capacity plateaus in relation to the maximum number of stores a particular type of distribution center is able to support.

The relationship between year store constructed and distance from distribution center offers up valuable information regarding site selection strategies used by Wal-Mart. The current analysis suggests that there are additional factors at work when selecting store locations other than placing them in close proximity to a distribution center. Further research in this area could uncover new underlying patterns associated with Wal-Mart's site selection process.

Third Question: Wal-Mart Store Locations and Market Demographics

The third and final research question asks: *is there a relationship between 1990 and 2000 average household income, 1990 and 2000 population density and 1990 and*

2000 percent unemployed in relation to distance from distribution center and year store constructed? The purpose of this question is to determine if stores were constructed by type and location based upon a single or some combination of these demographic factors. The results of the multiple correlation analyses indicate a number of significant results.

As stated earlier, the multiple correlation analyses performed for 1990 and 2000 percent unemployed showed no significant results. Consequently, percent unemployed does not appear to be a factor in Wal-Mart's site selection decision making process. Perhaps this is due to the volatility of unemployment rates; as a large company Wal-Mart may be less interested in short-term economic conditions but rather is more interested in assessing the long-term prospects for its store locations. With this in mind, 1990 and 2000 percent unemployed should not be considered a reliable indicator or driver of Wal-Mart store locations.

When summarizing the regional multiple correlation results, several common threads bind store type and location together. The first is that original discount stores, in all regions, show a negative relationship between distance from distribution center and 1990 and 2000 average household income and 1990 and 2000 population density. The only exception to the previous statement involves the positive relationship between distance from distribution center and 1990 and 2000 population density in the South region. However, after analyzing this outcome, one can deduce that this relationship is expected, given the trend of locating discount stores in lower income and lower population density areas during the initial phases of store construction, beginning in 1962 in the South region.

When looking at the relationship between year store constructed and 1990 and 2000 household income and 1990 and 2000 population density for original discount stores, a significant and positive relationship exists in almost every region. When these results are combined with the outcome of the distance from nearest distribution center multiple correlation results, for original discount stores, it becomes evident that Wal-Mart appears to have a bias towards lower income, less dense locations in the early stages of original discount store construction. Additionally, they appear to be willing to locate initial stores at a considerably further distance from a distribution center. Over time, Wal-Mart will construct a distribution center to service the initial stores that were built and add additional stores in increasingly higher income and higher density locations as time progresses.

Due to the limited significant correlation data associated with original Supercenter stores in all regions, there is only a single conclusion that can be drawn with confidence. The only region that shows any significant correlation results is the South. In this case, distance from distribution center is significantly negatively correlated with 1990 and 2000 average household income and year store constructed is significantly positively correlated with 1990 and 2000 average household income. It appears this relationship is due in part to Wal-Mart's change in strategic business direction from discount stores to Supercenter stores during the time period between 1990 and 2005. Because much of the south was saturated with existing discount stores and many of those existing discount stores were undoubtedly scheduled to be "Converted to Supercenter" stores, remaining locations that were targeted for store construction were selected to be constructed as original Supercenter stores based upon

income characteristics. The end result is a construction pattern that begins with lower income areas further away from a distribution center in the early years and over time, original Supercenter stores were constructed in areas with increasingly higher average incomes, closer to a distribution center.

Summarizing the results of “Converted to Supercenter” stores in all regions, the Northeast and West regions possess almost identical multiple correlation analysis results. The same can be said for the Midwest and South regions, though the results for all but two variables are non-significant. In the case of the Northeast and West regions, distance from distribution center and 1990 and 2000 population density are significantly negatively correlated and year store constructed and 1990 and 2000 population density are significantly positively correlated. In this case, Wal-Mart has converted original discount stores to Supercenter stores in these two regions by selecting stores in lower density areas that were further away from a distribution center first and over time went into increasingly more dense areas that were located closer to a distribution center. Assuming this trend continues, many of the original discount store clusters that are located in less dense areas of major metropolitan areas in the Northeast and West regions could be “Converted to Supercenter” stores in the future. This is of course dependent upon sufficient land being available for conversions to take place.

Wal-Mart does indeed take demographic characteristics into consideration when selecting store locations. This general finding is no surprise, but the specific findings highlighted here are not necessarily intuitive. Average household income and population density show significant correlation, both negatively and positively, with distance to distribution center and year store constructed respectively. These results suggest that

lower income and lower density locations receive initial preference in the site selection process. Additionally, Wal-Mart appears to be willing to transport goods over greater distances to service these initial stores. Accordingly, store clusters mimic this method of dispersion as original discount stores are clustered in densely populated areas of the country and original Supercenter stores and “Converted to Supercenter” stores are primarily clustered in less dense locations.

Future research related to Wal-Mart’s site selection process could expand upon the findings from this study. The addition of other demographic variables compared with year store constructed and distance to distribution center would provide further insight into the locations Wal-Mart enters. One variable that may prove to be significant is the property value associated with the land surrounding each individual store. Another possible extension of this research would involve creating regions based upon distribution center locations. This would allow store construction patterns that develop over time dictate the geographic location of regions, rather than having pre-established United States Census Bureau boundaries determine regional limits.

It is evident that after performing this study that original discount stores tend to be located in densely populated metropolitan areas in the Northeast, Midwest, and West regions, while original Supercenter stores and “Converted to Supercenter” stores tend to be clustered in the less dense surrounding periphery of metropolitan areas in the Northeast and Midwest regions. Conversely, in the South and West regions, original Supercenter stores and “Converted to Supercenter” stores have stores clustered within metropolitan areas and rural locations.

Wal-Mart does not simply construct a distribution center and build stores outward from a central location in a gradual radial fashion. Rather, Wal-Mart appears willing to construct initial stores in a region at a substantial distance from a distribution center. After a population of stores has developed over time, a distribution center is then constructed to best serve existing and future stores in that area. Consequently, the distance a store is from a distribution center is not a critical factor when Wal-Mart is initially placing stores in a given geographic area.

This study has attempted to provide additional insight into the site selection process employed by Wal-Mart at the regional level. Results of the study indicate that Wal-Mart has a distinct strategy when selecting locations to place or upgrade the different types of stores it operates. The most significant factor in the store location process appears to be population density, followed closely by average household income. Additionally, locations with lower densities and lower average household incomes appear to be preferred at the onset of store construction in a region. Over time, Wal-Mart appears to locate stores in sequentially higher density and higher income locations. However, there appears to be a limit or set of limits, in metropolitan areas in the Northeast and Midwest that prompts Wal-Mart to only place discount stores in higher density locations. Though several significant conclusions have been drawn from the results of this study, additional research needs to be performed in order to continue in the quest to better understand Wal-Mart's site selection processes.

APPENDIX

SUPPLEMENTAL TABLES

A.1 Northeast Original discount Stores Constructed by Year, with Distance to Distribution Center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1991	9	335	38,031	52,828	687	737
1992	10	402	36,932	51,288	763	786
1993	30	265	36,691	51,690	852	907
1994	18	172	37,716	52,355	919	920
1995	26	171	40,344	56,758	1,417	1,448
1996	8	131	46,016	63,900	1,486	1,570
1997	15	115	45,426	63,127	1,291	1,326
1998	14	102	43,666	63,084	1,407	1,441
1999	6	101	41,072	57,175	462	498
2000	12	121	53,265	76,262	1,000	1,053
2001	18	121	49,228	69,063	1,767	1,867
2002	17	91	48,905	68,016	2,006	2,104
2003	13	91	53,978	75,248	3,385	3,513
2004	8	81	52,692	75,282	4,226	4,418
2005	6	71	42,400	59,683	3,489	3,387

A. 2 Northeast Original Supercenter Stores Constructed by Year, with Distance to Distribution Center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1995	5	415	30,054	42,627	399	391
1996	3	462	31,477	46,656	607	628
1997	4	477	33,289	48,585	662	678
1998	3	219	29,316	39,991	155	156
1999	9	178	32,813	44,877	633	618
2000	2	127	44,295	60,686	319	427
2001	6	123	37,225	52,815	692	708
2002	11	114	33,598	47,468	845	834
2003	3	165	33,537	48,899	306	317
2004	7	86	33,310	47,116	726	723
2005	3	81	31,430	44,535	485	489

A. 3 Northeast Converted to Supercenter" Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1997	2	433	28,933	41,214	519	534
1998	3	326	31,314	47,336	377	384
1999	6	399	36,460	50,258	437	471
2000	6	117	37,016	51,875	461	486
2001	3	218	41,390	60,045	462	505
2002	7	145	33,319	44,617	641	649
2003	5	129	39,046	54,666	695	754
2004	5	102	32,686	46,984	691	649
2005	10	163	41,324	59,445	834	913

A. 4 Midwest Original discount Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1990	33	209	39,617	58,336	647	768
1991	37	201	36,975	55,419	807	915
1992	25	210	40,557	59,741	1,323	1,412
1993	15	133	42,451	62,133	1,903	2,089
1994	8	104	37,365	53,795	1,881	1,906
1995	12	110	37,077	54,998	1,438	1,438
1996	8	128	42,769	62,571	1,140	1,227
1997	6	147	31,710	48,213	1,415	1,397
1998	4	193	37,555	54,639	1,671	1,842
1999	10	158	47,362	68,751	2,089	2,174
2000	4	166	47,787	65,890	4,084	4,255
2001	8	98	39,722	57,022	3,140	3,062
2002	5	110	46,421	67,015	2,276	2,462
2003	6	76	42,844	64,928	957	1,141
2004	10	85	45,477	66,755	2,307	2,422
2005	7	72	45,559	65,617	1,717	1,910

A.5 Midwest Original Supercenter Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1994	1	87	28,534	45,129	56	95
1995	1	118	49,941	69,096	795	978
1996	2	364	33,045	45,652	943	934
1997	4	232	30,650	46,953	326	336
1998	5	228	31,290	47,189	477	499
1999	7	238	33,538	48,806	819	905
2000	17	179	36,848	55,046	552	610
2001	15	172	34,344	52,075	516	600
2002	9	108	30,953	46,927	524	547
2003	16	106	38,288	57,256	704	767
2004	16	94	35,989	53,748	579	678
2005	14	132	32,839	49,790	552	592

A. 6 Midwest “Converted to Supercenter” Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1993	5	267	26,030	39,088	313	315
1994	10	245	28,736	42,834	486	505
1995	10	300	26,662	40,053	214	230
1996	14	248	32,412	47,557	249	287
1997	11	214	34,325	50,860	383	430
1998	16	183	30,865	47,035	359	392
1999	22	203	31,433	47,425	414	464
2000	22	206	33,241	48,756	632	709
2001	21	102	33,975	51,337	422	513
2002	41	137	32,143	47,311	547	596
2003	29	123	30,538	46,633	348	389
2004	45	112	31,705	46,784	461	490
2005	41	136	33,157	49,950	393	438

A. 7 South Original discount Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1990	24	189	35,992	51,848	1,177	1,429
1991	22	148	35,775	52,672	947	1,070
1992	12	131	45,338	64,896	1,144	1,459
1993	14	119	44,107	64,710	1,117	1,390
1994	9	112	51,501	77,364	2,011	2,667
1995	17	127	45,693	65,106	1,769	2,134
1996	2	135	54,363	77,460	998	1,298
1997	3	197	43,482	65,189	827	1,007
1998	2	104	45,111	63,083	1,510	1,885
1999	6	143	46,209	65,697	1,479	1,624
2000	3	89	42,265	58,348	1,471	1,692
2001	3	132	50,092	74,301	223	294
2002	4	136	43,123	61,844	2,958	2,897
2003	3	118	56,034	80,900	1,464	1,619
2004	2	80	52,546	74,485	1,282	1,660
2005	1	51	47,236	62,324	4,248	4,325

A. 8 South Original Supercenter Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1993	1	699	18,675	28,339	197	256
1994	-	-	-	-	-	-
1995	5	339	32,515	46,832	618	636
1996	3	203	33,585	47,702	298	378
1997	11	211	33,699	48,940	681	764
1998	14	191	33,731	49,039	489	624
1999	21	162	29,340	43,449	534	606
2000	36	127	33,933	51,439	621	828
2001	28	93	41,708	63,768	747	1,088
2002	28	92	40,429	60,500	757	1,010
2003	19	68	35,243	54,708	1,033	1,304
2004	45	76	38,099	56,935	933	1,120
2005	39	98	34,585	53,172	1,008	1,210

A. 9 South “Converted to Supercenter” Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1993	9	253	29,296	44,504	314	351
1994	65	237	30,248	44,366	520	594
1995	70	237	31,080	46,334	411	484
1996	77	185	31,080	46,791	466	534
1997	52	149	33,162	49,320	576	669
1998	49	147	33,132	48,965	619	714
1999	57	121	32,523	48,168	664	802
2000	49	116	31,122	46,492	534	613
2001	33	108	33,434	49,069	586	727
2002	84	92	33,621	49,811	770	923
2003	55	77	31,840	47,925	747	862
2004	69	88	32,414	47,245	754	858
2005	61	84	28,857	43,767	494	555

A. 10 West Original discount Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1990	8	541	37,774	53,190	2,479	3,248
1991	17	776	37,509	51,147	1,263	1,625
1992	21	259	38,842	57,721	811	1,186
1993	28	280	37,880	53,331	1,245	1,470
1994	20	212	38,614	55,388	1,597	1,829
1995	18	263	46,697	68,468	2,302	2,651
1996	13	302	38,994	54,280	1,234	1,397
1997	9	146	38,616	56,669	2,358	2,737
1998	12	194	41,353	56,149	2,882	3,292
1999	9	157	45,952	64,964	1,361	1,643
2000	7	152	41,669	59,049	3,217	3,629
2001	6	148	43,309	62,048	1,599	1,928
2002	16	153	43,135	59,163	2,769	3,076
2003	7	164	39,200	54,295	4,856	5,376
2004	12	120	45,116	61,715	4,029	4,472
2005	5	136	39,767	59,700	2,774	3,103

A. 11 West Original Supercenter Stores Constructed by Year with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1998	3	557	27,035	41,129	166	188
1999	3	251	27,415	44,892	1,829	2,457
2000	10	271	37,625	56,285	457	760
2001	11	320	36,371	54,891	526	879
2002	9	256	36,506	54,918	1,782	2,290
2003	12	190	34,330	51,266	465	799
2004	14	156	39,483	61,272	1,415	1,854
2005	16	119	36,932	57,658	939	1,390

A. 12 West “Converted to Supercenter” Stores Constructed by Year, with Distance to Distribution center, Average Household Income, and Population Density

Year	Number of Stores Built	Average Distance (Miles)	1990 Avg. Household Income ($)	2000 Avg. Household Income ($)	1990 Population Density	2000 Population Density
1994	1	697	27,248	41,947	831	1,027
1995	1	637	26,042	41,236	171	201
1996	2	662	31,585	48,438	2,525	2,891
1997	1	707	24,735	39,291	84	102
1998	11	597	28,999	43,535	406	490
1999	5	194	30,457	46,897	541	693
2000	17	275	32,655	48,962	462	665
2001	11	322	29,979	45,894	649	776
2002	15	280	31,692	46,744	638	828
2003	20	345	33,316	49,944	902	1,106
2004	14	218	32,652	49,176	938	1,228
2005	19	241	35,800	53,505	1,352	1,676

REFERENCE LIST

Basker, Emek. 2005a. Job Creation or Destruction? Labor-Market Effects of Wal-Mart Expansion. *Review of Economics and Statistics* 87 (1):174:183

Basker, Emek. 2005b. Selling a Cheaper Mousetrap: Wal-Mart's effect on Retail Prices. *Journal of Urban Economics* 58:203-229

Basker, Emek. 2007. The Cause and Consequences of Wal-Mart's Growth. *Journal of Economic Perspectives* 21 (3):177-198

Basker, Emek and Noel, Michael D., 2007. The Evolving Food Chain: Competitive Effects of Wal-Mart's Expansion into the Supermarket Industry. *Journal of Economics & Management Strategy* 18 (4):977-1009

Benoit, D., 1995. Using GIS for retail location analysis of United Kingdom supermarkets. *Geo Info System* 9:46-51

———. 2002. *Retail Geography and Intelligent Network Planning*. Wiley, John & Sons, Ltd.

Brown, S., 1993. Retail Location Theory: Evolution and Evaluation. *The International Review of Retail* 3:185–229

Chiou, L., 2009. Empirical Analysis of Competition between Wal-Mart and Other Retail Channels. *Journal of Economics and Management Strategy* 18:285-322

Drewianka, Scott, and Dain Johnson, 2006. Wal-Mart and Local Labor Markets, 1990–2004. Department of Economics, University of Wisconsin-Milwaukee

Fettig, David. 2006. Thomas J. Holmes on Wal-Mart's Location Strategy. *Fedgazette* 3:11-13

Forman, Chris, Anindya, Ghose, and Avi, Goldfarb. 2006. Geography and Electronic Commerce: Measuring Convenience, Selection, and Price. *Working Papers. Department of Economics, University of Missouri*. June 15

———. 2009. *Geography of Retailing*. *G*eoDZ the earth encyclopedia

Global, Insight. 2005. The Economic Impact of Wal-Mart. *Business Planning Solutions* November 2005

Graff, Thomas, O., and Ashton, Dub. 1994. Spatial Diffusion of Wal-Mart: Contagious and Reverse Hierarchical Elements. *The Professional Geographer* 46:19-29

Graff, Thomas, O., 1998. The Locations of Wal-Mart and Kmart Supercenters: Contrasting Corporate Strategies. *The Professional Geographer* 50:46-57

Graff, Thomas, O., 2006. “Unequal Competition Among Chains of “Supercenters: Kmart, Target, and Wal-Mart. *The Professional Geographer* 58:54-64

Goetz, S., Swaminathan, G., 2004. Wal-Mart and County-Wide Poverty. Paper presented at the American Agricultural Economics Association Annual Meeting, Denver, Colorado 1-3 August.

Hicks, Michael, J. 2008. Estimating Wal-Mart’s Impact in Maryland: A Test of Identification Strategies and Endogeneity Tests. *Eastern Economic Journal* 34:56-73

Hicks, Michael, J., and Wilburn, Kristy. 2001. The Regional Impact of Wal-Mart Entrance: A Panel Study of the Retail Trade Sector in West Virginia. *Review of Regional Studies* 31:305-313

Holmes, Thomas, J. 2011. The Diffusion of Wal-Mart and Economies of Density. *Econometrica* 79 (1):253-302

Jia, Panle. 2008. What Happens When Wal-Mart Comes to Town: An Empirical Analysis of the discount Industry. Econometrica 76 (6):1263-1316

———. 1993. *Location, location, location: analyzing the retail environment*. Toronto: Nelson

Kulldorff M. 1997. A spatial scan statistic. *Communications in Statistics: Theory and Methods* 26:1481-1496

Neumark, David, Junfu Zhang, and Stephen Ciccarella. 2010. The Effects of Wal-Mart on Local Labor Markets. Journal of Urban Economics 67 (1):1-168

Parr, Methuen, A. 1995. Alternative approaches to market area structure in the urban System. *Urban Studies* 32 (8):1317-29

Pew Research Center for the People and the Press. 2005. Wal-Mart: A Good Place to Shop but Some Critics Too. *Pew Research Center for the People and the Press* December 15. http://people-press.org/reports/display.php3?ReportID=265.

Sobel, R., Dean, A. 2007. Has Wal-Mart Buried Mom and Pop?: The Impact of Wal-Mart on Self Employment and Small Establishments in the United States. *Economic Inquiry* 46 (4):676-695

Stone, Kenneth, E. 1997. Impact of the Wal-Mart Phenomenon on Rural Communities. *Increasing Understanding of Public Problems and Policies.* Farm foundation

Tversky, A. and Kahneman, D. 1986. Rational choice and the framing of decisions. *Journal of Business* 59:251–294.

Wal-Mart Stores. Inc. 2009. Wal-Mart Corporate. *History Timeline*.

Wal-Mart Stores. Inc. 2010. Corporate Fact Sheet. *Wal-Mart by the Numbers*.

———. 1988. *Retail restructuring and retail analysis. Store choice, store location and market analysis*. London: Routledge

Zhu, Ting, Vishal Singh, and Anthony, Dukes. 2005. Local Competition and Impact of Entry by a Dominant Retailer. *CIE Discussion Papers, University of Copenhagen. Department of Economics* May