RETAIL DISTRICT EVOLUTION: AN EXPLORATION OF RETAIL STRUCTURE

AND DIVERSITY, A CASE STUDY IN DENTON, TEXAS

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It is well established that national retail chains impact small, single location retail businesses in terms of revenue generation, retail structure, retail type diversity, and location. This study examines the retail structure and diversity of five retail districts in the City of Denton, Texas. The analysis focuses on one central business district (CBD), one traditional retail strip center (University Drive, also known as US HWY 380), one special retail district (Fry Street District), one traditional enclosed shopping mall and associated development (Golden Triangle Mall), and one power retail center (Denton Crossing). The empirical foundation for the investigation is a historical business database covering years 1997 to 2010, obtained from Info Group's Reference USA. This Reference USA database includes location, industry, and status (single versus chain location) information for each business. Retail diversity and evenness were measured for each of the five retail districts using the Simpson's Diversity Index and the Simpsons Measure of Evenness, leading to specification of the differences that exist in retail structure and diversity among the districts. Golden Triangle Mall and Denton Crossing were primarily chain location in composition while Fry Street District, the CBD, and University Drive were primarily single location in composition. Across all years, the single versus chain status of the local business communities did not substantially change within any of the districts. The Fry Street District exhibited the most change in diversity as well as the lowest overall diversity among the retail districts, followed by University Drive and Golden Triangle Mall. The CBD did not experience any major change in retail type diversity. However, all retail districts experienced major changes in

retail evenness. Overall for the city, single location retail businesses accounted for the majority of all the retail businesses, however, chain locations employed more people. In total, these findings indicate that the development of retail districts composed primarily of chain location retailer's affects retail district diversity and evenness but not retail structure.

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CHAPTER 1

INTRODUCTION

Small businesses play a critical role in building the strength of local economies while driving innovation, growth, and competition. Small businesses also stimulate local economies through employment opportunities, local charity donation, and community involvement, among others. In fact, small businesses account for 54% of all business sales and 55% of all jobs in the United States (US Chamber of Commerce Foundation, 2016). While there has been overall growth in the small business sector in the U.S. in terms of sales and employment, small, single location *retail* businesses – retail stores with fewer than fifty employees operating only one store - have been losing retail market share to large retail chains over the past few decades (Jarmin et al., 2009). Growth and expansion in the retail industry shifted in favor of these large retail chains from 1952-1992 (Boyd, 1997), a process that has since continued (Miller et. al, 1999; Han, 2000; Joseph, 2009; Kem, 2017). While the number of large retail firms more than doubled from 1963-2000, there was a subsequent decline in small, single retail businesses during the same period (Jarmin et. al., 2009). In a 2014 National Retail Federation (NRF) report titled "The Economic Impact of the US Retail Industry," PricewaterhouseCoopers found that 95% of all retail businesses operate only a single location (NRF, 2014) – often referred to as "Mom and Pop" stores (Haltiwanger et al., 2010). What makes this interesting is the remaining 5% of all retail businesses operate out of more than one location, i.e. retail chains, but these larger and more complex businesses account for more than 60% of retail consumer spending (Basker et al., 2012). With such a large share of the retail market, large retail chains appear to be outcompeting small, single location retailers, which is changing the retail structure in communities nationwide.

Despite these overwhelming numbers, there is a case to be made that small, single location retail businesses also provide substantial qualitative and quantitative benefits to their local communities. For instance, small business retailers typically locate in "humanly-scaled, pedestrian friendly shopping districts, as opposed to the sprawling, isolated experience of a chain store parking lot" (Mitchell, 2000). Unlike large retail chains, the local retail fabric is the primary generator of a sense of place. Kip Bergstrom, an economic developer with the city of Providence, RI, suggests, "Retail is the thing that makes a place interesting. Without retail you don't have a place" (Robare, 2016). With all of the preceding background in mind, the question is no longer, *if* small, single location retail businesses matter (they clearly do), or if they are impacted by large retail chains (they absolutely are), but instead the key question becomes *how* these small business benefits and impacts are occurring over time and space. Thus, the goal of this research is to explore the relationship between small, single location retail businesses and large retail chains in terms of changes in location and business type diversity. The study investigates this question in terms of the specific local context provided by five unique retail districts in the City of Denton, Texas, over the period 1997 to 2010. This study's contribution comes from its situation within the field of business geography and subfield of retail geography, and its application of retail geography principles, methods, and techniques to this space and time context.

Business Geography

To understand retail geography and its applications, this focused conceptual framework must be positioned within the broader context of business geography. Business geography, as a spatial science, employs the use of geographic theory, logic, methods, and technologies with the

goal of improving business decisions (Thrall, 2002). It is important to differentiate business geography from economic geography, i.e. the study "of the location of factors of production in space" (Krugman, 1990). Where economic geography attempts to explain or describe the arrangement of location factors, business geography applies these concepts and findings to provide solutions to complex business problems (Thrall, 2002). Indeed, business geography does draw upon "ideas and insight[s] from economic geography by applying its findings to improve the functionality of business" (Testa, 2015), however the process of translating the products of research in economic geography to a framework where they can be applied in a business setting has led to the emergence of business geography as a distinctive field of research and education. Additionally, it is important to note that the emerging field of location intelligence has been associated with business geography for obvious reasons but differs slightly in practice. Location intelligence is the broader application of spatial data analytics to facilitate and improve decisions spanning many industries by detecting spatial patterns, risks, and opportunities (Pitney Bowes, 2006). Essentially, business geography is location intelligence within the business environment.

Retail Geography

Retail geography is the application of location intelligence and business geography principles and techniques within retail praxis with a focus on generating solutions to retail development, marketing, and infrastructural needs (Plummer and Sheppard, 2006). Studies in site selection methods and techniques have long dominated the retail geography literature, however, recent and unprecedented shifts in retail formats have placed evolutionary concerns at the center of debate within the field over the past decade. Retail has experienced major

evolutionary changes in recent years, shifting from traditional shopping centers and retailers to a plethora of big box retailers, power centers, and lifestyle centers (Hernandez et. al., 2004; Joseph, 2009). These major shifts in retail formats have led to challenges for small, single location retail businesses trying to compete in a complex and increasingly dynamic marketplace where economies of scale and geographic scope play important roles. Most of the existing literature within retail development studies attempt to identify and explain a-spatial relationships between retailers and local consumers, with many of these studies conducted at the national or regional scale. Primarily utilizing quantitative methods, these studies lack the geographic component that is needed to enhance the business decision making process.

The goal of this research is to apply retail geography theory, principles, and methods to identify and understand how retail structure, diversity, and evenness changed from 1997 to 2010 in response to retail district evolution and chain store development within five unique retail districts in the City of Denton, Texas. The general question at hand is "How has Denton's retail districts evolved in terms of structure, diversity, and evenness, and what factors contributed to these changes?" For this research, "retail structure" is defined as the composition of the retail community as measured in two different ways: by single versus chain location totals and by employment totals in a given district. "Diversity" refers to the measurement of retail variety, i.e. the number of different retail business classifications, found in a given retail district. "Evenness" refers to how equal a retail district is numerically, i.e. an indexed value based on the number of retail businesses found within each retail business classification in a given retail district. This research attempts to discover how Denton's retail districts changed from 1997 to 2010 at a granular level by examining the retail environment of five unique retail districts in the City of

Denton. This study seeks to contribute to existing location intelligence, economic, business, and retail geography literature by providing a local level analysis that allows public entities, as well as private firms to gain valuable insight into how retail environments have changed over time in cities like Denton, Texas.

CHAPTER 2

LITERATURE REVIEW

Retail Literature Background

Perhaps the earliest theoretical foundation for retail geography was provided through the works of Walter Christaller and August Lösch's "Central Place Theory" which established the basis for applications within business and retail geography. Central Place Theory conceptualizes space in an organized manner that maximizes its efficient use for the consumer. Key to the understanding of central place theory is the assumption that there is a limited distance one will travel to purchase goods, known as the "range of a good" (Berry and Garrison, 1958). The formation of a hierarchal spatial distribution is highlighted by central place theory's "upper and lower limits" which are arranged in an industrialized network of central places. Although major limitations in central place theory exist in contemporary applications due to advances in technologies that question the assumptions associated with travel costs, a range of a good, and supply and demand characteristics, central place theory provides a substantial and well-known theoretical and conceptual spatial framework for studying retail applications.

Stemming from the influential work of Christaller and Lösch, retailer geographers began implementing spatial techniques into retail studies during the first half of the 20th century. Early modern investigation in retail geography focused on consumer behavior (Green, 1936; Applebaum, 1951) and the movement of large-scale retail trade (Whitley, 1936; Converse & Mitchell, 1937; Cox & Bratcher, 1939; Doherty, 1941). By the end of the 1970s, the quantitative revolution brought retail location and distribution strategies to the forefront in the retail literature (Wilson, 1967; Forbes, 1972). For instance, Applebaum (1966) and Ghosh & Craig

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(1983) developed location strategy models aiding retailers to plan for and react to changes in varying retail environments. However, retail environments have changed quite dramatically over the past fifty years beginning with central business districts, retail strip centers, and traditional shopping malls (Goss, 1993; Bloch et al., 1994) to power retail formats of the present day (Hahn, 2000). Prior to the 1990s, due to its failure to incorporate more than store location and mapping, Retail Geography was considered an inferior sub-discipline of economic and cultural geography (Ducatel & Blomley, 1990; Bromley & Thomas, 1993; Crewe, 2000; Lowe & Wrigley, 2000). In the 1990s, several prominent retail geographers stressed the importance of retail geography in the consumption and location of spaces and places, garnering attention that resulted in retail geography gaining broader acceptance (Crewe, 2000). The following summarizes the retail geography literature that provides a foundation for the present investigation.

Schapker (1956) examined how a planned shopping development consisting of several large retail chains affected the retail type diversity of an older, well-established retail center that traditionally served the same market area. He found that certain types of retailers, such as clothing and jewelry retailers that were part of an older retail center were adversely affected more than others in terms of generating sales revenue. This study only identified the effects between two different retail developments but did not account for the impacts of large retail chains on local CBD retail businesses.

Pratt and Pratt (1960) in their study on the impacts of suburban retail shopping center development on a central city (i.e. New York and New Jersey) and suburban downtown retailers found that new suburban retail developments caused a "reshuffling" of market shoppers. This realignment refers to retail shoppers changing their shopping patterns in response to the

establishment of the two regional suburban shopping centers. This reshuffling resulted in central city retailers and suburban CBD retailers seeing a decrease in sales and shoppers. This study concentrated only on consumer behavior patterns induced by new suburban retail development.

Dickinson and Rice (2010) studied the shifts in retail business types caused by a traditional shopping mall development at the local scale of Port Huron, MI between 1980 and 2006. They found that the shopping mall greatly influenced retail location changes between the CBD and the shopping mall development. However, the opening of the shopping mall development did not directly affect the retail business density of the pre-mall era. Their study focused on Port Huron because of its simple retail landscape, having only a single retail development type, i.e. the traditional shopping mall, being developed in competition with an historic CBD that dominated the local retail landscape before the mall opening. While this study answers important questions about retail evolution in an urban area, its dual "mall and CBD" focus leaves unaddressed the question of impacts of further retail development due to the emergence of even newer retail formats, including big box stores, power centers, and lifestyle centers.

In addition to the literature mentioned above, more recent studies have been made available in response to the changes in retail format evolution during the 1990s that brought power retail formats to dominate large format retail developments. As with much of the previous literature written throughout the evolution of retail formats, power retail literature focuses on defining and analyzing changes in power retail evolution (Hernandez & Simmons, 2006), customer behavior and purchasing patterns (Bodkin & Lord, 1997), and large format retailer competition (Graff, 2006). Only recently has attention been given to the relationship between small, single location retailers and chain stores. However, the focus of this research has been on

employment and labor issues (Haltiwanger et. al., 2010), together with small business owner perceptions of chain stores (Cotton & Cachon, 2007), leaving the meaning of the "single-location versus chain store" dynamic unexplored in a geographic context.

Additionally, many studies highlight national level impacts on retail chain competition (Graff, 2006; Lawrence, 2009 & 2010), location strategies (Ghosh & McLafferty, 1987; Ceh & Hernandez, 2010), consumer behavior (Singh et al., 2006), and retail chain growth and expansion (Jarmin et. al., 2009; Basker et. al., 2012). At the national level, however, even in the impact-focused research theme the effects of chain stores on small, single location retail business in different retail formats have been under-investigated. Hernandez et al. (2004) provided a useful contribution by analyzing power retail and its associated impacts on surrounding regional retail developments in two of the largest metropolitan regions in North America; however, the study only focused on retail chains and did not include single location retailers. Furthermore, Buliung & Hernandez (2009) studied power retail growth strategies related to consumer travel patterns in the Greater Toronto Area but did not include their interaction with single location retailers or retail business districts of other types within their analysis.

Since this research focuses on retail district evolution, it is important to provide an understanding of the developmental trajectory of each of the retail district types included. Much literature exists that characterizes different types of retail districts, however, Buliung and Hernandez (2013) provide a good summary of retail district evolution by stating that "traditionally chain stores have tended to dominate the planned shopping centers while the independents have normally been restricted to unplanned central city or retail strip locations."

To build upon Buliung and Hernandez's (2013) summary, the following sections generalize the different types of retail districts associated with this study.

Central Business District Retail

CBDs have been centers of economic and cultural activity in cities and towns since ancient times. CBDs were central locations of markets where locals would trade with merchants. Modern day CBDs were the outcome of centralized industrialization that resulted from rapid growth and development spurred by coal burning energy production. Traditional CBDs are characterized by low mobility, pedestrian oriented transportation in which retail shops, variety stores, financial institutions, and restaurants were centrally located (Harris & Ullman, 1945). Central business districts tend to be arranged by a high-density core that includes retail, office, and entertainment space, and an outer zone of low density civic or municipal structures (Knox & McCarthy, 1994).

Retail Strip Centers

Beginning in the 1920s, Fordism, i.e. the emergence of mass production through assembly line manufacturing, caused a rapid increase in suburbanization, the outward movement of what were originally central city residents to the rural outskirts of the surrounding areas, and periphery growth because it gave people and businesses the ability to relocate further away from city centers (Burayidi, 2001). "However, during the post-World War II era, populations shifted to the suburbs, automotive transportation became widely available, and the first suburban shopping centers were developed…Thus, there was a strong economic incentive for retailers offering diverse goods to abandon their downtown locations and to agglomerate in central locations such

as suburban shopping centers and malls" (Padilla & Eastlick, 2009). As suburbanization continued

through the 1950s - 1970s, downtown central business districts were plagued with economic and

community stagnation as more and more residents moved further out into rural areas and

frequented rural shopping centers instead of traditional CBDs.

Shopping Malls

Through the last half of the 20th century, enclosed suburban shopping malls became the

"new Main Streets of America" (Consumer Reports, 1986). Suburban shopping malls are

characterized by their enclosed structure consisting of several large anchor tenant department

stores with multiple junior anchors connected by a common walkway with parking surrounding

the outside perimeter (ICSC, 2017). Originally designed as a community center where people

could shop, socialize, and enjoy a cultural experience (Gruen & Smith, 1960), shopping malls

became the primary social and retail epicenter of their communities (Feinberg, & Jennifer, 1991).

Sternlieb and Hugh's (1981) suggest that by the early 1980s that shopping malls reached the

mature life cycle phase in which retail market share and sales peaked and stabilized, giving way

to a new retail format known as power retail.

Power Retail Centers

A single, standard definition of power retail centers does not exist (Hahn, 2000), although

the International Council of Shopping Centers (ICSC) defines power retail centers as large, open

air centers between 250,000-600,000 square feet having three or more category killer or big box

anchor stores (ICSC, 2017). Additionally, Hahn (2000) defines power retail centers as an

"agglomeration of big-box stores." Table 1 provides more detail for the available power retail

definitions. Big box retailers are large warehouse like structures and offer value-oriented pricing,

such as Target, Wal-Mart, Bed Bath and Beyond, and Kohl's (Hahn, 2000). Category killers are

specialized big box stores that offer products in a single retail category (Hahn, 2000), such as

Lowes, Home Depot, Best Buy, and Hobby Lobby. In a study comparing power retailing between

the U.S. and Canada, Hernandez and Simmons (2006) further classify power retail centers into

two categories – "power strips" and "power clusters" (Hernandez et al., 2006) (Table 2).

Table 1: Defining Characteristics of Power Retail Centers

Source	Type	Concept	Sq. Ft.	Acreage	# of Anchors (minimum)	Anchors (Type)	Anchor %	Primary Trade Area (miles)
ICSC (1999)	Power Center	Category-dominant anchors; few small tenants	250,000 to 600,000	25 - 80	3	Category killer; home improvement; disc. dept. store; warehouse club	75 - 90%	5 - 10
Hahn (2000)	Power Center	Category killers; low-price stores; some smaller local retailers	> 250,000	N/A	1 (100,000 ft^2) 4 (20-25,000 ft^2)	Category killers & Big Box Retailers; discounters; warehouse clubs	N/A	5 - 15

Table 2: Power Retail Configuration Types and Characteristics

Retail Structure	Typical Configuration
Power Cluster	Three or more freestanding big- boxes located typically around a major intersection, not all sharing the same parking facilities. May include other ancillary smaller commercial services.
Power Strip	Three or more freestanding big boxes located contiguously along arterial routes within 800 meters of each other, not all sharing the same parking facilities or pan of the same development. May include other ancillary smaller commercial services.
Power Node	One power center with additional big boxes or power centers within a one-kilometer radius, typically centered on a major intersection.
Regional Power Node	Two or more power centers and/or power strips with a minimum of 20 big box retailers. These nodes have a large retail draw, with sizeable trade areas. The node will typically encompass a number of intersections, and may run contiguous along major arterial corridor. These developments are often found surrounding major shopping malls.

Power strips are "three or more free standing big boxes located contiguously along arterial routes

within 800 meters of each other, not all sharing the same parking facilities or part of the same

development and may include other ancillary smaller commercial services" (Hernandez et al.,

2006). Power clusters are "three or more free standing big boxes - large warehouse like structures

offering value-oriented pricing (Hahn, 2000) - located typically around a major intersection, not all sharing the same parking facilities, and may include other ancillary smaller commercial services" (Hernandez et al., 2006).

Discussion of Research Needs

Since the late 1990s, traditional shopping mall formats have become less popular (Lee et al., 2006), while there has been an increase in the development of power retail formats (Hahn, 2000). These power retail formats are anchored by large retail chains which have led growth among all retailer types in the United States since the 1970s in terms of overall generation of sales (Foster et al., 2015), product offerings (Holmes, 2011), and the implementation of new distribution and processing technologies (Holmes, 2001). Simultaneously, there has been a reemergence of historic downtown central business districts (Robertson, 1997 & 2004) in conjunction with growth in power retail. Meanwhile, there has been very little examination into the effects of chain stores on single location retail businesses within these different types of retail districts. Specifically, there is a need to identify how the findings of national level studies have played out over space at a finer scale, such as the city level, particularly since the success of downtown revitalization efforts hinge primarily on the success of local retail establishments.

To address the research gaps defined above, the objective of this research is to Identify and understand the extent to which single location retail businesses in five unique retail districts have been impacted, in terms of the number of retail businesses and the types of retail businesses, by the establishment of large retail chains within the retail districts, primarily those in Denton Crossing.

CHAPTER 3

RESEARCH DESIGN AND METHOLOGIES

Study Region

The City of Denton is located along the I-35 corridor at the northern tip of the Dallas-Fort Worth Metroplex and encompasses approximately 97 square miles. The City of Denton was incorporated in 1866 having an economy based primarily on the agricultural production of grain, cotton, and cattle. By 1880, the city grew in population to approximately 1,200 residents (Odom, 2010). However, the arrival of the railroad in 1881 resulted in increased population and urban growth. Population growth was further spurred by the establishment of the Texas Normal College (known as University of North Texas today) in 1890 and Texas Women's University in 1901 (Odom, 2010). It is interesting to note that Texas Normal College was originally located in the upper floor of the former B.J. Wilson hardware store on the Denton courthouse square but relocated to its current off-square campus as it grew and developed. This is a development sequence that has been repeated by other organizations in the years since.

The city continued to grow throughout the twentieth century, becoming a well-established part of the Dallas Fort-Worth Metroplex after the construction of the Dallas Fort-Worth International Airport in 1974 (Cochran, 2013). Denton also became home to a few large manufacturing companies, such as Victor Equipment in 1965, and the Peter Motor Company in 1980 (Odom, 2010). As of 2018, the City of Denton has roughly 130,000 residents (US Census, 2018) with a local economy heavily based on service and manufacturing industries, such as universities, information technology, retail, and medical services (City of Denton Economic Development Department, 2018). Denton has experienced steady population growth over the

last century with the majority of growth occurring in the past two decades when population grew by 73%. Demographically, Denton has a large Caucasian population consisting of about 61%, a smaller Hispanic population of about 23%, and an African-American population of about 10%, with other ethnicities making up the remaining 6% (US Census, 2015).
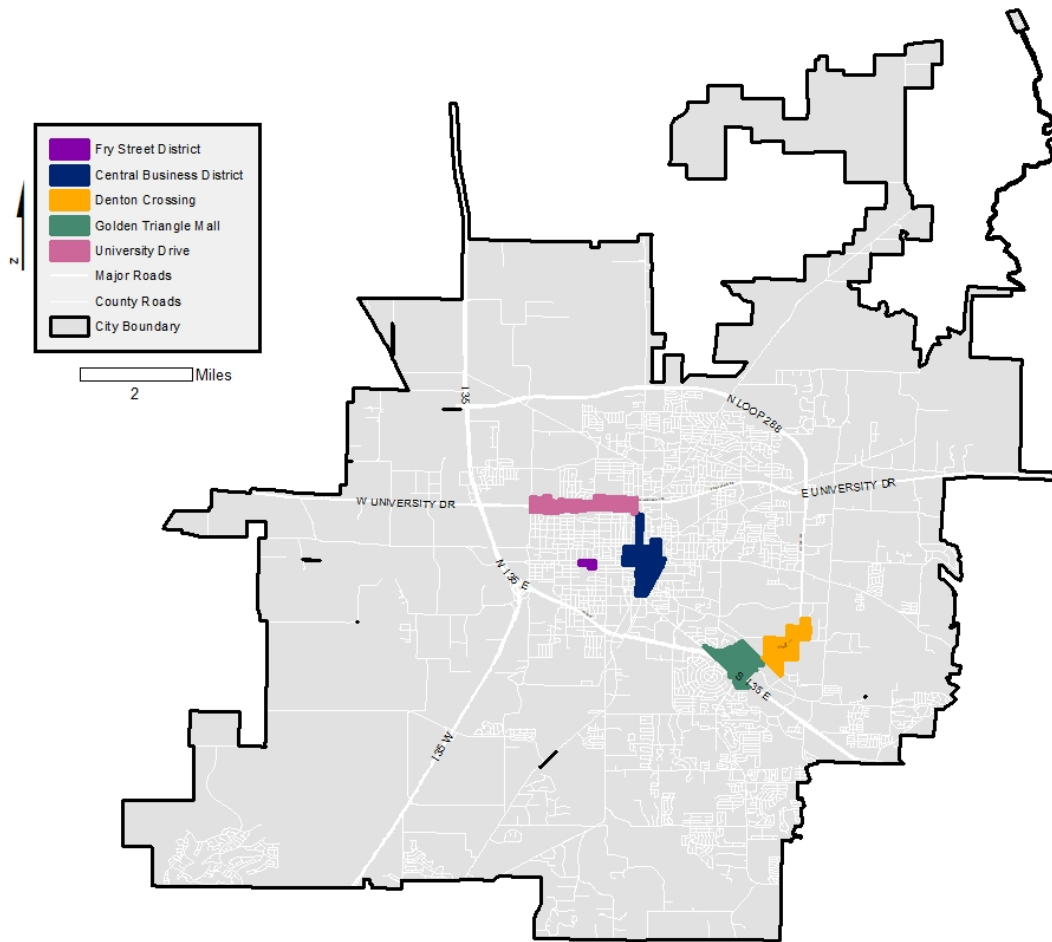
Figure 1: Map of the City of Denton with Retail Districts

Although the research study area is the City of Denton, there are five focus study areas within the city itself – Denton's Central Business District, the Fry Street District, Golden Triangle Mall and associated area, University Drive, and Denton Crossing (Figure 1). Using the year-built attribute field from GIS land parcel data acquired from the City of Denton Open GIS data portal,

the general era of development was identified for each retail district (Figure 2). Primary eras of development for each retail district were: CBD from the late 1800s to the 1930s, University Drive between the 1950s and 1970s, Golden Triangle Mall from 1980s to 1990s, and Denton Crossing around the early 2000s. The Fry Street District is unique in that it appears to have been primarily developed between the 1990s to 2000s, however, the district has seen several redevelopments in recent years but was originally developed around the 1960s. The following discussion characterizes each of the five retail districts in turn.
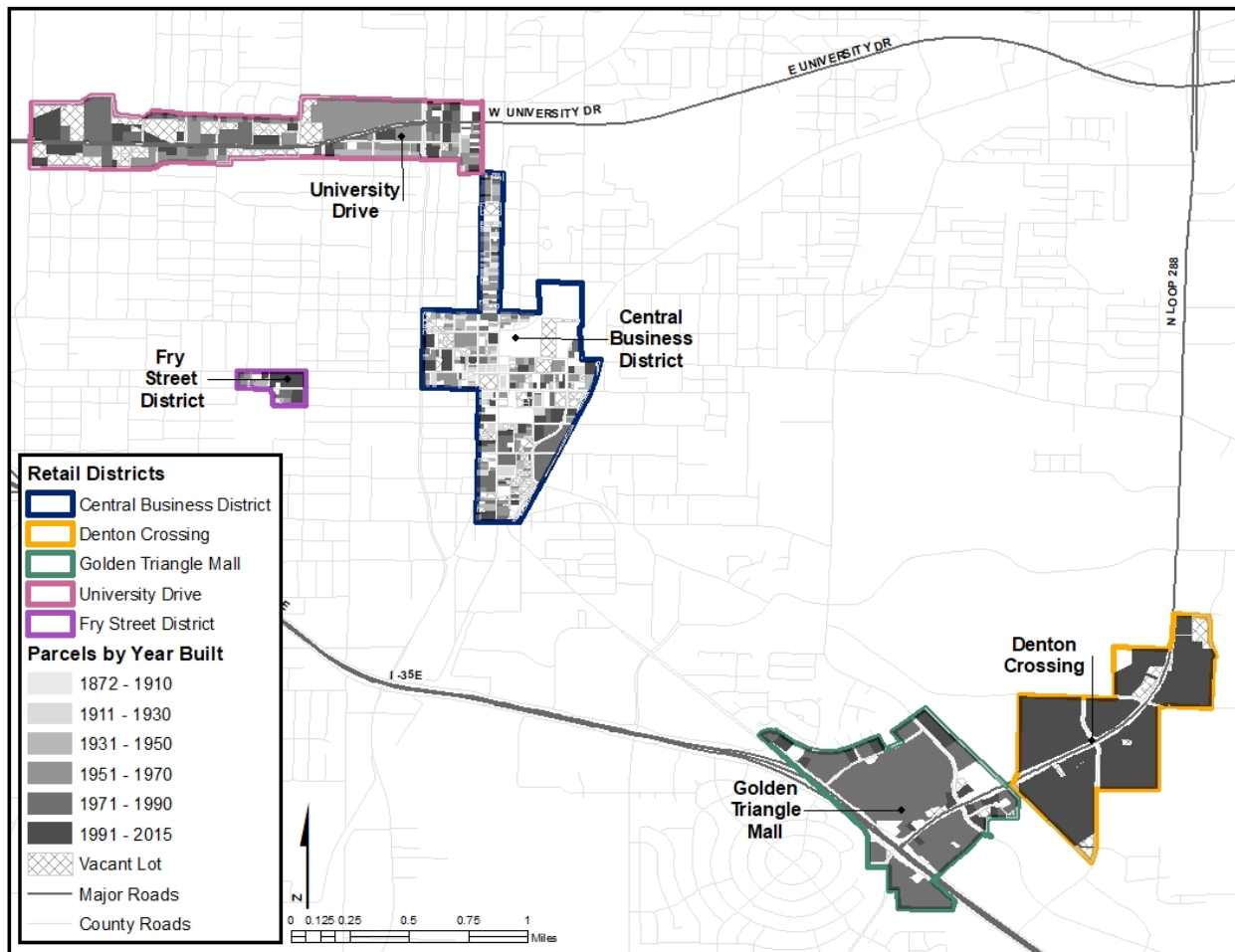
Figure 2: Retail District Focus Areas Symbolized with Land Parcel by Year Built

Retail Districts

Denton's Central Business District

Denton's CBD was established in the late 1890s when the County courthouse was built in its current location. Originally, the CBD was the downtown area containing the Courthouse Square, bounded by Pecan Street to the north, Austin Street to the east, Walnut Street to the south, and Cedar Street to the west. This area is now known as the historic district while the current CBD has become larger. Denton's CBD now stretches from West College Street to the north, Carrol to the west, East of Bell Ave. to the east, and Eagle to the south (Figure 3).
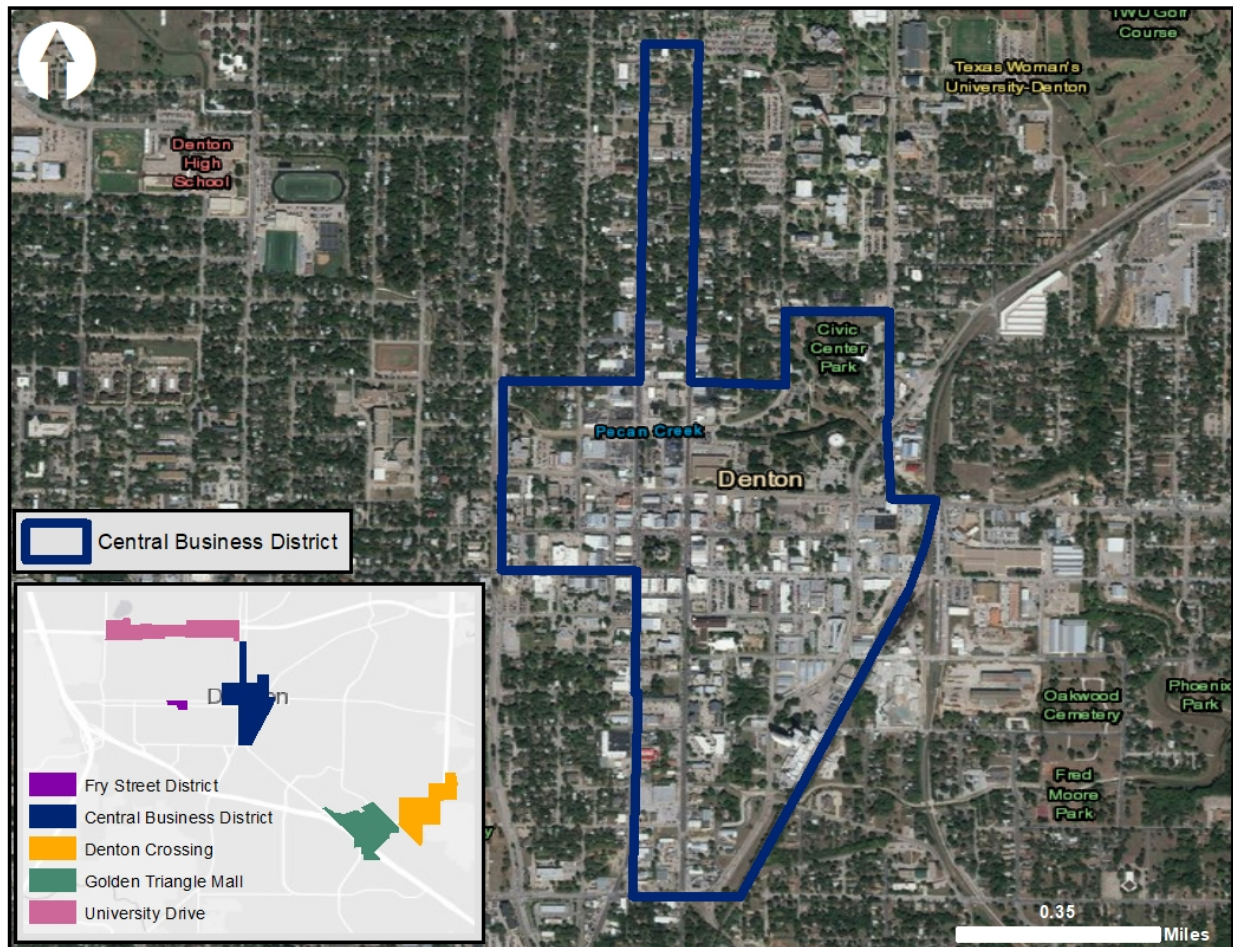
Figure 3: Denton's Central Business District Boundary

Economic stagnation and community decline, stemming from the mass exodus of residents to suburban areas in the 1950s-1960s, saw many downtown central business districts lose their cultural and social significance. Residential neighborhoods and retail centers were developed further away from the downtown central business districts, previously the primary place of local business and community activity. During the declining years of Denton's central business district between the 1950s and 60s, many single establishment retail businesses – i.e. retail stores locally owned, operated, and having only one location - moved away from the city core in response to suburbanization. Large retail chains followed, locating in shopping centers on the periphery of the city, leading small single store retailers to succumb to value pricing and inventory pressures, ultimately closing their doors.

In 1999, the City of Denton drafted and published the first comprehensive plan that outlined how the city regarded local retail in the downtown CBD. The Comprehensive Plan prioritizes "local business ownership and small business creation" (City of Denton, 1999). With a total of 138 new businesses and an increase in building occupancy from 70 to 98 percent since 2007, downtown Denton has seen massive amounts of investment, exceeding $18 million since 1989 (Main Street America, 2008). In Denton today, retail alone makes up over sixty-percent of the downtown occupancy consisting of businesses such as restaurants, bars, and boutiques (City of Denton, 2015). For further details and site-specific information for Denton's Central Business District, please refer to Appendix A.

Fry Street District

When the Texas Normal College, now the University of North Texas, became a state

funded institution in 1901, demand for residential housing increased in the area (City of Denton, 1999). With increased student enrollment, the need for student services grew and "in order to meet this demand, business houses for college trade were established along Avenue A and Hickory Street in what would later be referred to as the "Fry Street Special Overlay District" (City of Denton, 1999) (Figure 4).
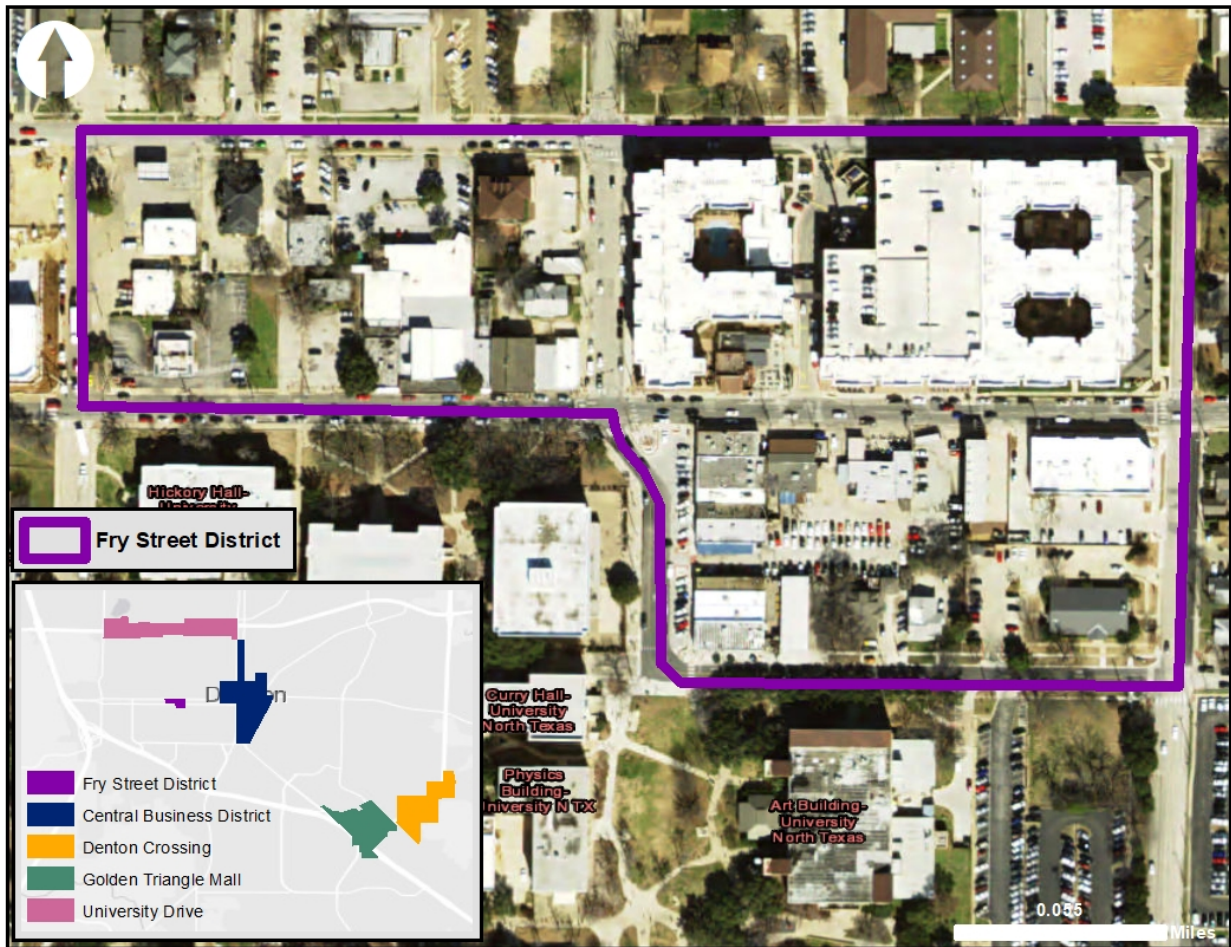
Figure 4: Fry Street District Boundary

Over the years the Fry Street District has seen many changes from being predominately residential and student housing oriented to primarily commercially developed with a multi-use development as the main anchor in the district. Although many retail business changes have

occurred over the years, the Fry Street District plays a critical role in the identity of Denton residents and UNT alumni, making the district a place of significance within the city. Today, along with the student apartment housing, retail in the Fry Street District is comprised of several bars, fast casual chain restaurants, and a few locally operated reputable food and beverage establishments. The City of Denton's development code subchapter 7 defines "The Fry Street District" as the area bounded by Welch Street to the east, Oak Street to the North, Ave B to the northwest, Ave A to the southwest, Mulberry Street to the south, and Hickory to the southwest (City of Denton, 2018). The Fry Street District is area at the northeast corner of the University of North Texas and just a few blocks west of the CBD. For further details and site-specific information for the Fry Street District, please refer to Appendix A.

University Drive

The University Drive retail district is the only retail district in this study that was not a planned development or an identified district by the City of Denton. University Drive grew and developed organically during the late 1940s into the 1970s. As the automobile became the preferred mode of travel, retail business owners and commercial developers moved outward from the CBD, along University Drive. Many different and disjointed retail shopping centers were opened along the University Drive corridor starting from the intersection of University Drive and N. Elm Street to the east to the intersection of University Drive and N. Bonnie Brae to the west. For this study, the University Drive retail district boundary was created using the aforementioned intersections for the east and west boundaries and one block off University Drive for the north and south boundaries (Figure 5). Although this district does not have established boundaries

created by the City of Denton or a private developer like the other four retail districts in this study, the researcher lives in the City of Denton and is familiar with the University Drive retail district, which gives justification for the established boundaries. For further justification please see Appendix A, which is a map of the University Drive Retail District with parcels by property type that helps justify the chosen University Drive boundary.
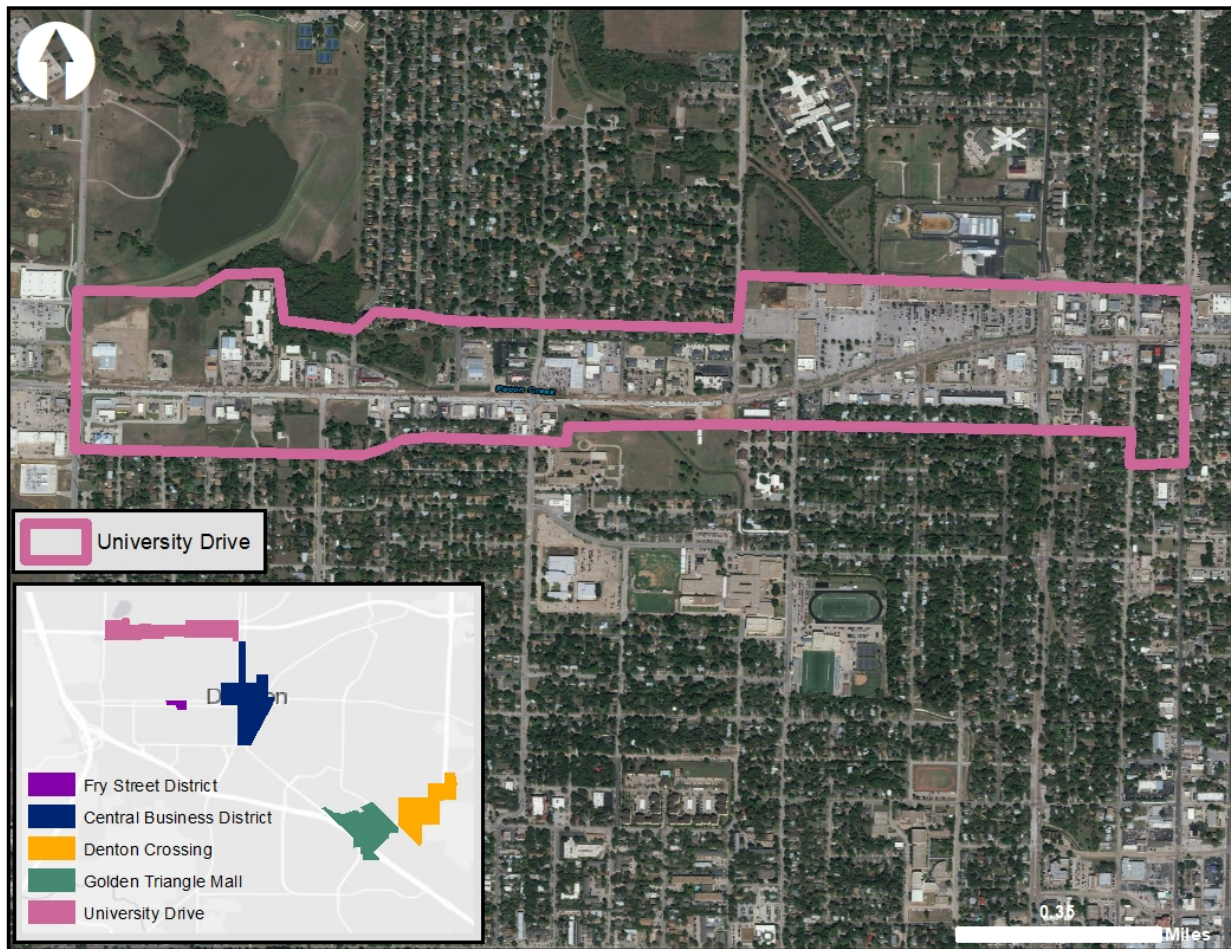
Figure 5: University Drive Boundary

Golden Triangle Mall

    Golden Triangle Mall, Denton's first planned large-scale retail development, opened in 1980 drawing shoppers from around the entire county and increasing the economic pressure

faced by local retail business owners. Golden Triangle Mall is a single-level suburban shopping mall just shy of 800,000 square feet, located at the intersection of I-35 and S Loop 288 to the southeast of Denton's city center. For this study, the Golden Triangle Mall retail district includes the commercial retail parcels surrounding the mall itself, Denton Town Center which is the commercial retail development directly across S Loop 288, and the commercial retails parcels directly across Interstate 35E that were developed during the same period as the mall (Figure 6). For further details and site-specific information for Golden Triangle Mall, Denton Town Center, and surrounding retail parcels, please refer to Appendix A.

Figure 6: Golden Triangle Mall Boundary

Denton Crossing

Denton Crossing East and West are on the north side of S Loop 288. Denton Towne Crossing is directly across S Loop 288, to the south of Denton Crossing East and West. Denton Crossing completed development in 2008 Denton Crossing East and West have a combined 338,852 sq. ft. with shared parking spaces, and as of 2008 consisted of 52 retail establishments of which 12 were big box or category killer anchors (Weir & Levinson, 2008). Denton Town Crossing has 29 different retail establishments with Target and Home Depot as the retail anchors (Westwood Financial, 2017). In addition to Denton Crossing East and West, and Denton Town Crossing, the Wal-Mart Addition and Lowes are included in this retail district. This retail district is collectively referred to as Denton Crossing from here on (Figure 7).
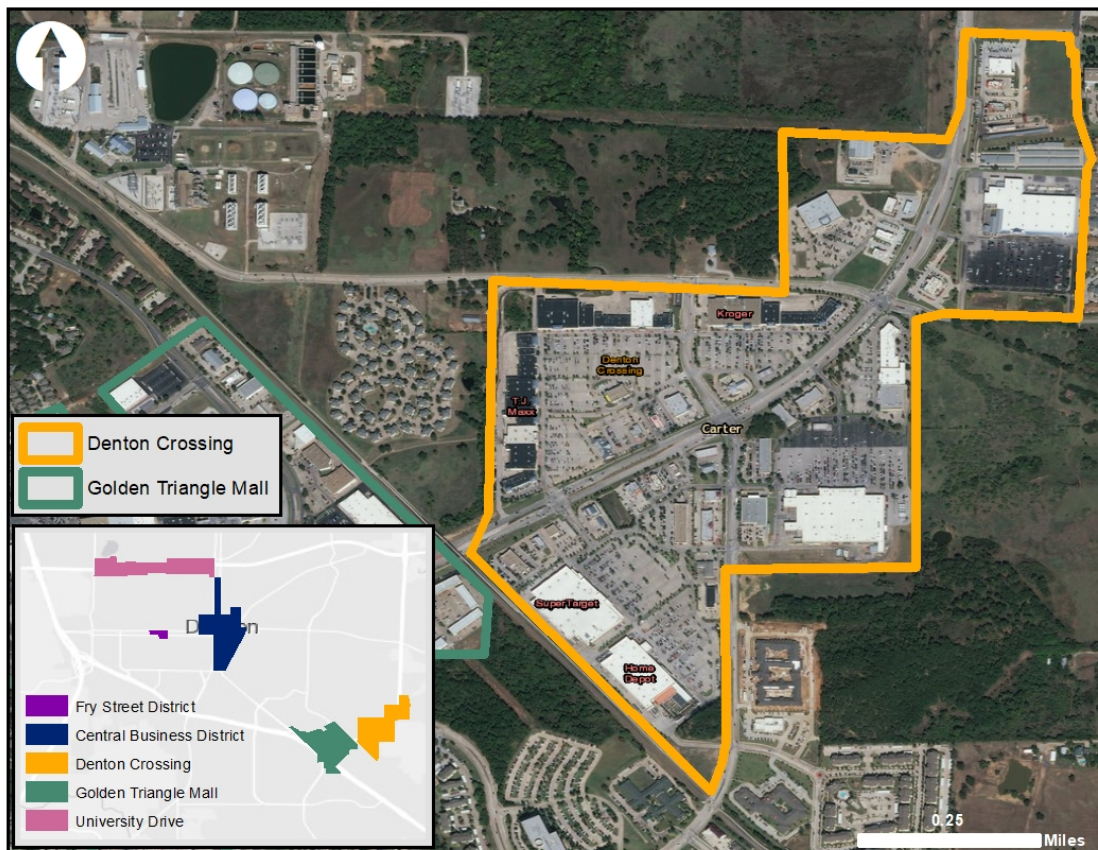
Figure 7: Denton Crossing Boundary

Denton Crossing is defined as power retail cluster consisting of a combination of separately developed retail centers that share location and retail characteristics. For further details and site-specific information for Denton Crossing East and West and Denton Towne Crossing, please refer to Appendix A.

<center>Study Period</center>

The study period for this research is from 1997 to 2010. These dates were chosen primarily due to data availability and costs from the Reference USA provider (earlier data were not available from this provider, while later data were not chosen because it would have included the Rayzor Ranch retail development which is currently still under development). However, beyond availability issues, this period also coincides with strategic changes in Denton's retail evolution, relative to the completed establishment of Denton Crossing in 2008. For instance, in 1996 Lowes (Denton County Appraisal District, 2017) and Wal-Mart (Holmes, 2010) were the first two large retail chains to establish in what became known as Denton Crossing. Because the data set is continuous from 1997 to 2010, use of this source provides a comprehensive means of tracking retail structure changes across Denton in the years following the major retail events mentioned above. It is important to note that it took a few years after Lowes and Walmart were established in their current locations for the remaining Denton Crossing retail business to complete construction, which generally occurred between 2002 and 2008. Thus, analysis of the entire early 2000s period is necessary to represent the adjustment of the Denton retail community to the entire set of changes along Loop 288. Also, it is important to recall that the opening of Golden Triangle Mall occurred in 1980. Thus, use of 1997 as the start year of the

analysis allows us to focus on changes relative to Denton Crossing's establishment, and to assume

that the major structural changes arising from the mall opening have been completed.

<center>Research Questions</center>

Research Question 1: How has the structure of each the five retail districts changed over time in terms of the types and number of retail businesses and employment totals?

As introduced earlier, by investigating structural change, the study aims to define the

evolving composition of the business community in each of the five districts, considering the

various retail and service subsector possibilities that could develop (e.g. automotive, grocery,

apparel, etc.). To address this research question, an analysis of spatial data in tabular form is

conducted to provide an understanding of what patterns exist and how those patterns compare

among the five retail districts analyzed. Expected findings are that as Denton Crossing was

developed, there was a subsequent shift in retail types and locations among single location

retailers, primarily within and out of the CBD. For instance, in their study of shopping mall

development and CBD impacts in Port Huron, Dickinson and Rice (2010) found that apparel and

automotive retailers relocated closer to the shopping mall development while financial and

entertainment retailers found increased opportunity in the CBD. Similar to these findings, the

study expectation here is to find that the development of Denton Crossing resulted in a shifting

of retail activity among and within the retail districts. In terms of change in employment totals,

this study expected to find that chain locations accounted for the majority of retail employment.

Also, any substantial increase in employment totals was expected to be attributed to an increase

in chain locations. These expected findings are drawn from Hernandez, Helik, & Moore (2007)

who studied employment and retail change in Toronto's retail strip centers. They found that

chains accounted for the majority of employment even though there were less chain stores

introduced than single location retailers during the study period.

Research Question 2: How has retail diversity within the five retail districts changed from 1997
to 2010?

The goal of this analysis is to determine if certain retail districts have seen a greater

amount of change in retail diversity in response to the introduction of chain stores, primarily

chain stores in Denton Crossing. In other words, the research interest here focuses on change in

the distribution of business types among all retail and food service sector possibilities. This

analysis looks at retail classification using the NAICS 2012 sector classifications to determine if

the overall composition of the business community in each district has shifted to specialize in

certain types of retail. Given the overall declines that characterize the small business category in

general, it is especially important to identify if certain types of retail are particularly impacted. If

certain retail types are affected more than others, this could mean that the diversity of single

location retail businesses operating in the community is shrinking, or to put the same idea

differently, that these businesses are becoming more concentrated in a smaller number of

business categories. The likely result of such change is an increased patronage of large retail

chains, an increased amount of specialized small single location business, or both. Drawing upon

studies by Dickinson and Rice (2010) and Yarbrough and Rice (2013), the study expectation is that

the composition of the business communities in the other districts across the city has shifted in

favor of retail types that are not in direct competition with the retail and service types located in

Denton Crossing. This study thus expects to find that the development of Denton Crossing has

been accompanied by a decrease in retail diversification (or to put the same thing in different words, an increase in concentration in fewer business types) in the other four retail districts.

Research Question 3: How has retail evenness within the five retail districts changed from 1997 to 2010?

The goal of this analysis was to determine if certain retail districts saw a greater amount of change in retail evenness in response to the introduction of chain stores, primarily chain stores in Denton Crossing. To accomplish this, we measure the abundance of retail businesses represented in each of the NAICS four-digit retail classifications present in a given retail district. Put more simply, the focus here is on change in the amounts of retail businesses existing within each retail and food service sector classifications. Similar to question two, this study analyzed retail classification using NAICS 2012 to determine if the overall evenness shifted in favor of certain types of retail. This study expectation is to find that the distribution of retail businesses by classification became less even over time, meaning that only a few types of retail classifications account for the majority of the retail businesses present. This expectation is supported by recent retail studies finding that number of small retail businesses and retail business types have declined over the years, primarily due to big box and chain store introduction to the local community (Armstrong, 2012; Litz & Pollack, 2015; Vandegrift & Loyer, 2015; Goodman & Remaud, 2015). Observations of changes in the Denton retail environment made by the author of this research support this expectation as well.

Data

This research uses a complex historical business dataset acquired from Infogroup's

Reference USA. Infogroup's Reference USA is the "premier source of business and residential information for reference and research…offer[ing] the most up-to-date data available in the market…(which is) continuously updated from more than 5,000 public sources" (Devlin, 2017). Infogroup conducts approximately 100,000 phone calls a day to "ensure absolute accuracy" (Infogroup, 2017). Infogroup provides data solutions to many Fortune 100 companies (Infogroup, 2017). Additionally, Infogroup provides business data to Environmental Systems Research Institute (ESRI) available for use with ESRI's ArcGIS Business Analyst extension (ESRI, 2017). The acquired database consists of all business records in the Reference USA historical database from 1997 to 2010 that are in the following Denton zip codes: 76201, 76205, 76207, 76208, 76209, 76210, and 76269 (Figure 8). These zip codes were chosen for maximum coverage of the City of Denton, with the goal of including all five retail districts identified earlier.
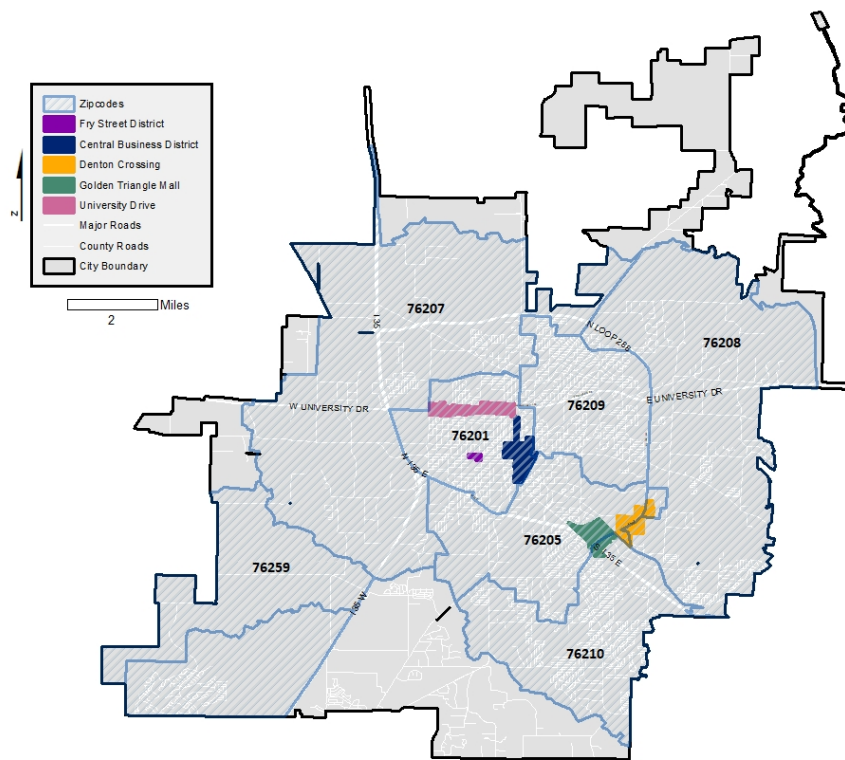
Figure 8: Map of Denton City and Zip Code Boundaries

Although there is not complete coverage of the City of Denton, there is complete coverage for all areas with retail activity. Records that fell outside the city limits were excluded from the analysis. All business locations in the database came geo-coded using the same coordinate system, WGS84, to ensure consistency. Table 3 is a comprehensive list of variables in the database for each retail business. Only records that had complete information for address, primary North American Industry Classification System (NAICS) 4-digit code and description, and business status code were included in the study. The reason only records with complete data entries were included is because there was no way to verify a business's location if the address was not provided nor could the type of business be verified if the primary NAICS 4-digit code and description were missing. Since this study is concerned with chain and single location retailers, it was critical that there be a valid entry for business status code which identifies if the business is a chain or single location.

Although the acquired historical database consisted of all businesses in Denton in a respective year, this study is only concerned with retail business and food and beverage establishments, i.e. NAICS 2-digit 44-45 Retail Trade and 72 Accommodation and Food Services. Therefore, only records that had these general NAICS 2-digit codes were used in this study. Latitude and longitude were provided for each record from Reference USA however, only those records that were matched to the site or parcel were used without re-geocoding. Business addresses were re-geocoded using the ArcGIS Online World Geocoding Service for records that did not originally match to the site or parcel and were only used in the final data set if they matched to the site or parcel after re-geocoding was completed. Table 4 provides a list of retail

business counts by year for the originally acquired database and the final data set used for each

the five retail districts in this study.

Table 3: Data Variables and Descriptions

Database Variables, Descriptions/Defitinions, & Code/Decode Information		
Varibable	**Variable Definition/Description**	**Code/ Decode**
Company	Name Of Business	
Address Line 1	Historical Address	
City	Historical Address City	
State	Historical Address State	
Zipcode	Historical Address Zip Code	
Zip4	Historical Address Zip Code Zip + 4	
Area Code	Area Code Of Business	
ID Code	The Code That Indentifies The Yellow Page Listing Is For A Business Or For An Individual. This Field Helps Clients Indentify If The Record Represents A Professional	1 = Indiviudlal, 2 = Firm
Location Employee Size code	Code Indicating Range Of Employees At That Location.	A = 1-4, B = 5-9, C = 10-19, D = 20-49, E = 50-99, F = 100-249, G = 250-499, H = 500-999, I = 1,000-4,999, J = 5,000-9,999, K = 10,000+, ** = Blank
Location Sales Volume Code	Corporate Sales Volume Code (Ranges) Represents The Total Sales Company Wide	A=<$500K, B=$500K--$1Mil, C=$1Mil-$2.5Mil, D=$2.5Mil-$5Mil, E=$5Mil-$10Mil, F=$10Mil-$20Mil, G=$20Mil-$50Mil, H=$50Mil-$100Mil, I=$100Mil-$500Mil, J=$500Mil-$1Bil, K=Over $1Bil, ** =Blank
Primary NAICS2 Code	Primary NAICS2 Code	
Primary NAICS2 Description	The Desciption For The NAICS2 Code	
Primary NAICS3 Code	Primary NAICS3 Code	
Primary NAICS3 Description	The Desciption For The NAICS3 Code	
Primary NAICS6 Code	Primary NAICS6 Code	
Primary NAICS6 Description	The Desciption For The NAICS6 Code	
Primary NAICS8 Code	Primary NAICS8 Code	
Primary NAICS8 Description	The Desciption For The NAICS8 Code	
Archive Version Year	Year Of Data	
Yellow Page Code	A Numeric Value Assigned To Yellow Page Heading For The Sic	
Employee Size (5) - Location	Number Of Employees At That Location, Could Be Modeled	
Sales Volume (9) - Location	Sales Volume At That Location (In Thousands)	
Business Status Code	Indicates If Record Is a Headquarters, Subsidiary, Or Branch location	1=Headquarter, 2=Branch, 3=Subsidiary, 9=Single Location
Industry Specific First Byte	Contains "Number Of" Info. (# Beds For Nursing Homes, # Rooms For Hotels)	
Year Established	Year The Business Began Operating	
ABI	Abi Number, Infogroup Number Or Location Number, This Provides A Unique Identifier For Each Business In The	
Census Tract	Identifies A Small Geographic Area For The Purpose Of Collecting And Compiling Population And Housing Data. Census Tracts Are Unique Only Within Census County, And Census Counties Are Unique Only Within Census State.	
Census Block	Census Tracts/Block Groups Are Assigned To Address Records Via A Geocoding Process.	
Latitude	Parcel Level Assigned Via Point Geo Coding. Provided In A Formatted Value, With Decimals Or A Negative Sign.	
Longitude	Parcel Level Assigned Via Point Geo Coding. Provided In Its Formatted Value, With Decimals Or A Negative Sign.	
Match Code	Parcel Level Match Code Of The Business Location.	0=Site Level, 2=Zip+2 Centroid, 4=Zip+4 Centroid, P=Parcel, X=Zip Centroid, ** =Unknown

Table 4: Business Counts

Year	Original Counts	Cleaned Counts	Final Counts
1997	796	703	344
1998	792	705	330
1999	831	740	336
2000	819	730	330
2001	834	736	350
2002	910	786	372
2003	910	807	369
2004	912	791	377
2005	984	855	409
2006	959	833	402
2007	923	805	391
2008	997	881	435
2009	1,004	902	437
2010	982	886	425
Total	12,653	11,160	5,307

There were 12,653 records which included all business types in the original database of which 11,160 remained after cleaning and re-geocoding. After filtering for NAICS 2 codes of 44-45 and 72, there were 5,307 records in the final data set that were in the five retail districts. It is important to note a major data limitation is that there is no way to verify if every business that was in operation during the study period is captured in the dataset. However, this dataset is the most comprehensive list available. Finally, given the total amount of businesses recorded in the dataset, the sample size should be large enough to provide an accurate representation of Denton's retail business changes over time.

Methods

The following sections outline methods employed for each research question. For each section, a thorough explanation of methodology is provided for each research question.

To address Research Question 1, a series of tabular analysis was used to identify the retail structure from 1997 to 2010. The retail business dataset was housed in an excel database format and a pivot table was generated to sum the number of chain and single location retail businesses by year and retail district. The same technique was used to sum employment totals for chain and single location retail businesses by year and retail district. Single to chain location ratios were calculated using a proportional calculation with output values ranging from 0 to 1, allowing for all five retail districts to be compared across time. The following calculation was used:

$$Indexed\ Ratio\ Value\ = \frac{S}{S+C}$$ (Eq. 1)

In this equation, S is the number of single location retail businesses in a given retail district for the given year, and C is the number of chain location retail businesses in the same retail district for the same year. The values were plotted, and simple linear regression equations were observed for each district. Positive slope values indicate a shift towards chain locations, while negative slope values indicate a shift towards single location retail businesses.

To address research question two and three, an ecological measure of diversity and evenness known as the Simpson's Diversity Index and the Simpson's Measure of Evenness (Smith and Wilson, 1996; Magurran, 2004) were used. Rice (2004) used a relative entropy measure that is a similar version of the Simpson's diversity Index employed in this research. Rice (2004) defines relative entropy as "a measure of the dispersion in a system as a percentage of the total dispersion possible." Rice (2004) utilized relative entropy to measure economic diversification

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among regions in Canada. Similarly, Dickinson and Rice (2010) used relative entropy to measure

changes in retail diversity in the Port Huron, Michigan central business district over a 20-year

period.

In order to measure diversity, it was important to consider sample size. If the sample size

is two large, i.e. many NAICS categories but only one business in each category, or if the sample

size was too small, i.e. not enough NAICS categories, then a diversity index would be unable to

be calculated. Therefore, to account for sample size considerations, the four-digit primary NAICS

code provided in the acquired database was used as the categorical value for which the *D* statistic

was calculated. The four-digit category provided an ample number of categories but did not

divide the categories into such detail that it diluted the sample size. NAICS is "the standard used

by Federal statistical agencies in classifying business establishments for the purpose of collecting,

analyzing, and publishing statistical data related to the U.S. business economy" (NAICS, 2016).

NAICS codes can be two, three, four, six, or eight digits; with the more digits a code has the more

detailed the classification. For example, a NAICS code of 44 and 45 together represent "retail

trade" as a broad category, while a NAICS code of 4411 represents automobile dealers within the

retail trade category, and a NAICS code of 441110 captures new car automobile dealers

specifically (under the broader automobile dealer/retail categories).

For retail diversity, the analysis used the Simpson's Diversity Index (Magurran, 2004):

$$D = \frac{\sum n(n-1)}{N(N-1)} \qquad \text{(Eq. 2)}$$

In this equation, *D* is the Simpson's Diversity Index (SDI) measure, n is the number of retail

businesses in a given NAICS category, and N is the total number of NAICS categories represented.

The index measures the probability that two individuals randomly selected from a sample will

belong to the same NAICS 4-digit classification. SDI values range between 0 to 1, with 0 representing infinite diversity and 1 representing no diversity. Simply put, the larger the value of D, the lower the diversity in the given retail district.

For retail evenness, the analysis used the Simpson's Measure of Evenness (Magurran, 2004):

$$E_D = \frac{\frac{1}{D}}{DMax} \qquad \text{(Eq. 3)}$$

In this equation, E_D is the Simpson's Measure of Evenness measure, D is the Simpson's Diversity Index, and D_{Max} is total number of NAICS categories in the retail district during the given year. E_D was calculated by taking the reciprocal of the Simpson's Diversity index (1/D) and expressing it as a proportion of the maximum value D could assume if retail businesses in the retail districts were completely evenly distributed (D_{Max}). Equitability takes a value between 0 and 1, with 1 being complete evenness.

CHAPTER 4

RESULTS

Retail District Structure

To identify and understand change to the retail structure in the five retail districts, the first research question asks, "How has the structure of each the five retail districts changed over time in terms of the types and number of retail businesses and employment totals?" To answer this question, a total of 5,307 retail business entries consisting of 2,461 unique retail businesses in the five retail districts spanning from 1997 – 2010 were extracted from the acquired Reference USA historical dataset for the City of Denton. Employment totals were then aggregated for each retail district. The counts of retail businesses by retail district were calculated using business status codes to show the proportion of chain location and single location retail businesses.

The retail structure, measured by *change in retail business counts,* was consistent across all retail districts and through all study years. Table 5 shows the retail business counts for single locations by year and retail districts. Table 6 shows retail business counts for chain location retail businesses by year and retail district. Growth in both single and chain location retail businesses in Denton Crossing is highlighted by the percentage change column of Table 5 and 6. For single locations, the only retail district that experienced negative percent change (-21%) in single location retail businesses was the Fry Street District. University Drive (10%), Golden Triangle Mall (41%), and Denton Crossing (800%) all experienced positive percent change in single location retail businesses from 1997-2010. The CBD displayed zero percent change in single location retail businesses during the same period. For chain locations, the Denton Crossing development is highlighted by its 1,867% change in chain location retail businesses from 1997-2010. Golden

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Triangle Mall was the only other retail district with positive percent change (12%) from 1997 - 2010. Both University Drive and the CBD experienced a decrease in percent change of -27% and -11%, respectively. Fry Street District had zero percent change in chain locations from 1997 - 2010.

Table 5: Single Location Retail Business Counts

Single Location Retail Business Counts (Business Status Code = 9)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	% Change (1997-2010)
Fry Street	19	17	17	17	15	17	23	21	21	22	19	17	17	15	-21%
University Drive	60	58	57	56	62	66	60	61	63	68	63	65	59	66	10%
CBD	101	90	85	86	99	103	102	90	109	94	92	103	102	101	0%
Denton Crossing	2	1	1	2	3	4	3	9	10	9	10	14	18	18	800%
Golden Triangle Mall	32	40	41	41	45	42	48	45	50	37	32	47	48	45	41%

Table 6: Chain Location Retail Business Counts

Chain Location Retail Business Counts (Business Status Code = 2)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	% Change (1997-2010)
Fry Street	4	4	5	4	4	5	4	5	6	6	6	5	5	4	0%
University Drive	48	40	38	36	34	36	35	38	34	38	37	39	41	35	-27%
CBD	9	6	7	5	6	5	9	7	9	9	11	10	10	8	-11%
Denton Crossing	3	3	4	3	6	8	11	32	38	47	52	53	58	59	1867%
Golden Triangle Mall	66	71	81	80	76	86	74	69	69	72	69	82	79	74	12%

Although all five retail districts experienced a percent change in the total count of single or chain location businesses from 1997 - 2010, this alone does not indicate if the structure of retail shifted in each retail district. Therefore, the ratio of single to chain locations were analyzed using equation 1, then the values were plotted, and their regression equations were observed to determine the rate of change. Regression equations in Figure 9 are written as $y = mx + b$, where m is the slope and b is the y intercept, commonly referred to a slope-intercept form.

Results indicated a shift towards chain locations in the CBD (m = -.002) and Fry Street district (m = -.0028), although both districts were primarily composed of single location retail

businesses. As Figure 7 shows, the Fry Street district and the CBD had a relatively consistent single to chain location ratio above .8 and .9, respectively. University Drive (m = .0044) and Golden Triangle Mall (m = .002) experienced a trend towards single location retail businesses however both districts exhibited a relatively even single to chain location ratio between ~ .5 and ~.6. On the other hand, Denton Crossing (m = -.0113) increasingly became composed of chain location retail businesses with fewer single locations as indicated by its decreasing single to chain location ratio shift from ~.35 to ~.20.
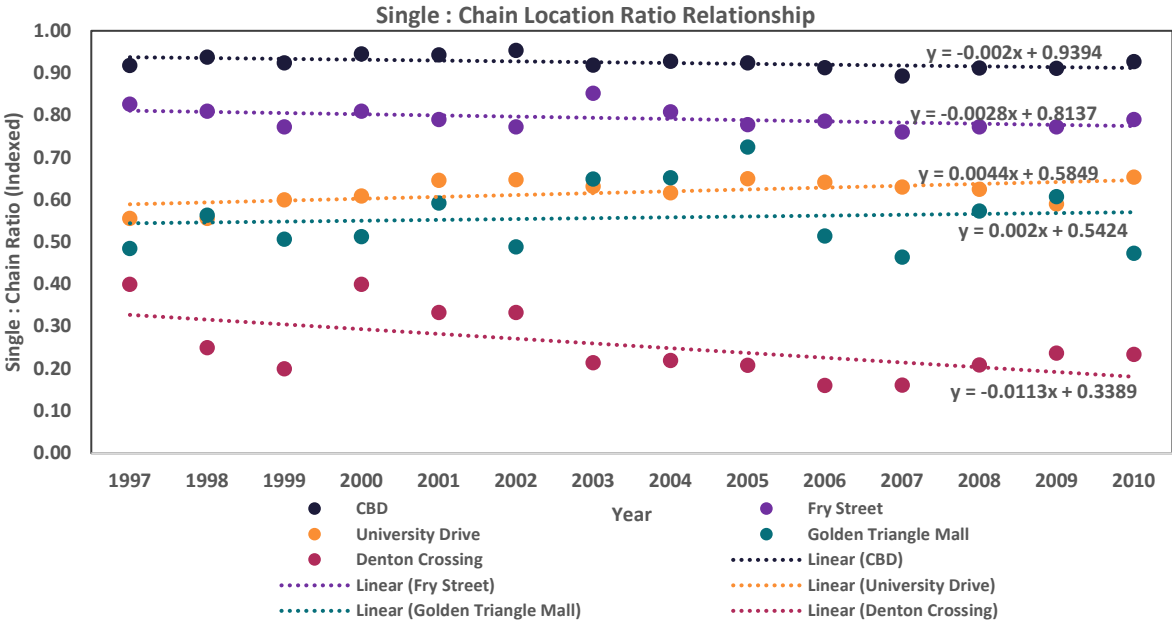
Figure 9: Single to Chain Location Ratio Relationships

Additionally, the analysis broke out employment totals for each district and business status code from 1997-2010 to further identify and understand change in retail structure from yet another perspective. Employment totals were aggregated and summed by retail district for each study year. Table 7 shows single location employment totals and Table 8 shows chain location employment totals by year and retail district. Most notably, the Fry Street district decreased in single location employment (-8%) but increased (26%) in chain employment.

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Table 7: Chain Location Employment Totals

Chain Location Employment Totals (EmpSize5Loc)

Year	Fry Street	University Drive	CBD	Denton Crossing	Golden Triangle Mall
1997	43	886	158	172	1,421
1998	38	816	130	254	1,660
1999	72	776	132	286	1,892
2000	61	759	117	264	1,765
2001	57	717	41	305	1,580
2002	69	743	35	345	2,010
2003	51	752	65	381	1,503
2004	65	781	72	912	1,458
2005	76	705	121	873	1,621
2006	86	817	128	1,010	1,603
2007	95	809	141	1,948	1,646
2008	80	807	136	2,155	2,405
2009	69	829	110	2,240	2,100
2010	54	781	75	2,277	1,831
% Change (1997-2010)	26%	-12%	-53%	1224%	29%

Table 8: Single Location Employment Totals

Single Location Employment Totals (EmpSize5Loc)

Year	Fry Street	University Drive	CBD	Denton Crossing	Golden Triangle Mall
1997	174	476	466	7	272
1998	159	396	391	0	306
1999	137	261	416	0	341
2000	137	275	372	4	344
2001	141	310	721	40	337
2002	141	286	746	21	282
2003	190	385	550	16	363
2004	177	343	483	49	290
2005	180	324	617	67	342
2006	195	323	584	55	251
2007	187	324	633	75	184
2008	195	400	712	81	216
2009	188	353	739	172	200
2010	160	402	721	161	234
% Change (1997-2010)	-8%	-16%	55%	2200%	-14%

The CBD showed the most change in employment totals with a percent change of 55% in single location and -53% in chain location employment from 1997-2010. This, along with the above mentioned single and chain location ratio changes in the CBD (Table 8) indicates that the CBD moved closer to the expected findings of having an increasing proportion of single location retail

and employment from 1997 to 2010. On the other hand, Golden Triangle Mall (29%) and Denton Crossing (1,224%) saw an increase in chain location employment totals, however Golden Triangle Mall exhibited a decrease (-14%) in single location employment while Denton Crossing experienced an increase (2,200%). Denton Crossing was expected to increase in employment and retail business totals because it went from only a few businesses in 1997 to being fully developed in 2008. The only retail district to experience a decrease in employment percent change in both single locations (-16%) and chain locations (-12%) from 1997-2010 was University Drive. This is interesting because it indicates that University Drive may have experienced more negative impacts from the development of Denton Crossing than the CBD, which was not expected. The Fry street District decreased in single location employment total percent change with -8% but increased in chain location employment total percent change to 26%.

<div align="center">Retail Diversity</div>

The second question in this study asks, "How has retail diversity within the five retail districts changed from 1997 to 2010?" To answer this question the Simpson's Diversity Index (SDI) (*D*) was used to measure retail diversity in each retail district. For this study, the NAICS 4-digit categories were used as the retail classification input for the SDI. SDI measures the probability that two individuals randomly selected from a given sample will belong to the same NAICS 4-digit classification. As mentioned above in the methods section, SDI values range between 0 to 1, with 0 representing infinite diversity and 1 representing no diversity. Simply put, the larger the value of *D*, the lower the diversity in the given retail district. Table 9 displays the SDI values calculated for each year and retail district in this study. It is important to understand

that the SDI measures the number of NAICS 4-digit classifications represented and gives more

weight to those classifications that have more individuals. That is, the SDI only provides part of

the diversity picture. The Simpson's Measure of Evenness, which accounts for the number of

individuals represented in each NAICS 4-digit classification will provide the other part. It is

important to calculate both measures to fully understand the overall diversity of retail in each

retail district. The following section layout the results of the SDI.

Table 9: Simpson's Diversity Index Values

	Simpson's Diversity Index (D) Primary NAICs 4 Digit				
Year	CBD	Fry Street	Denton Crossing	University Drive	Golden Triangle Mall
1997	0.06	0.17	0.00	0.12	0.09
1998	0.06	0.19	0.00	0.14	0.09
1999	0.07	0.14	0.00	0.14	0.10
2000	0.07	0.12	0.00	0.16	0.10
2001	0.06	0.15	0.00	0.11	0.10
2002	0.07	0.18	0.00	0.11	0.10
2003	0.07	0.19	0.00	0.13	0.12
2004	0.06	0.20	0.09	0.15	0.11
2005	0.06	0.20	0.12	0.15	0.11
2006	0.06	0.26	0.09	0.15	0.11
2007	0.06	0.29	0.10	0.15	0.13
2008	0.06	0.21	0.11	0.15	0.11
2009	0.07	0.21	0.13	0.17	0.11
2010	0.07	0.30	0.14	0.16	0.11

All five retail districts are closer to 0 (complete diversity) than to 1 (no diversity), but all

experienced a decrease in diversity with D values moving through the study period closer to 1.

The most diverse retail district across all study years being was CBD. The CBD (D = .061 in 1997

and D = .071 in 2010) is quite diverse relative to the other four retail districts. The Fry Street

District experienced a decrease in diversity (D = .17 in 1997 and D = .30 in 2010). Denton Crossing

became less diverse as it developed over the study period (D = .0 in 1997 and D = .14 in 2010).

Retail Evenness

The third research question asks, "How has retail evenness within the five retail districts changed from 1997 to 2010?" Retail evenness refers to the number of individual retail businesses represented in each NAICS 4-digit classification. Where the SDI puts more emphasis on richness, the Simpson's Measure of Evenness gives more weight to evenness. Evenness is a measure of the relative abundance of each of the different NAICS 4-digit classifications that collectively make up the richness in each retail district. By definition, a retail district that is dominated by a large number of businesses in only one NAICS 4-digit classification is less diverse than a retail district having multiple NAICS 4-digit classifications each with similar numbers of businesses. Table 10 displays the Simpson's Measure of Evenness values calculated for each retail district by year.

Table 10: Simpson's Measure of Evenness Values

Simpson's Measure of Evenness (ED)
Primary NAICs 4 Digit

Year	CBD	N	Fry Street	N	Denton Crossing	N	University Drive	N	Golden Triangle Mall	N
1997	0.71	23	0.65	9	*	4	0.36	23	0.52	21
1998	0.74	21	0.53	10	*	4	0.30	23	0.57	20
1999	0.61	23	0.64	11	*	5	0.30	23	0.51	20
2000	0.67	22	0.73	11	*	5	0.28	23	0.50	20
2001	0.71	24	0.68	10	*	9	0.39	23	0.43	23
2002	0.61	25	0.56	10	*	9	0.41	23	0.47	21
2003	0.56	26	0.53	10	*	11	0.29	27	0.37	23
2004	0.67	23	0.51	10	0.74	15	0.26	26	0.39	23
2005	0.60	27	0.56	9	0.61	14	0.26	25	0.40	23
2006	0.68	25	0.38	10	0.57	19	0.28	24	0.42	21
2007	0.66	26	0.43	8	0.54	19	0.29	24	0.40	20
2008	0.63	26	0.67	7	0.46	19	0.26	26	0.45	21
2009	0.58	24	0.67	7	0.38	20	0.22	27	0.42	21
2010	0.59	24	0.56	6	0.37	20	0.25	25	0.43	21

* When there is complete diversity (D=0), the Simpson's Measure of Evenness does not result in a meaningful value.

All five retail districts experienced a decrease in retail evenness from 1997-2010. That is, certain NAICS 4-digit categories became more dominate. Denton Crossing exhibited the biggest

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decrease in retail evenness moving from E_D = .74 in 1997 to E_D = .37 in 2010. Note that Denton

Crossing increased in N during the study period as well. This indicates that as Denton Crossing

neared completion, one or two retail categories became dominant. For instance, the number of

retail categories (N) in Denton Crossing increased from 2004 to 2010, but evenness (ED)

decreased during the same period. This means that more retail business types were introduced

into the district but most of the retail business were in only one or two NAICS 4-digit categories.

The CBD experienced relatively large decrease in retail evenness from 1997 to 2010, going from

E_D = .71 to E_D = .59.

To better visualize changes in retail evenness, a series of histograms are provided below

(Figures 10 to 19) Since Simpson's Measure of Evenness essentially measures the shape of the

histogram curve, these histograms allow you to see how the decreases in evenness within each

retail district documented in Table 10 changed from 1997 to 2010. More importantly, the

histograms help identify which NAICS 4 digit categories are more or less dominate within each

district. For example, the CBD was a majority NAICS 4533 (Used Merchandise Stores) and 4431

(Electronics and Appliance Stores) in 1997 but NAICS 7225 (Restaurants and Other Eating Places)

and 4511 (Sporting Goods, Hobby, and Musical Instrument Stores) in 2010. Only NAICS 4-digit

codes were displayed in the charts below due to space and legibility, however, for purpose of

reference, Table 11 displays NAICS 4-digit descriptions for every category represented in this

study. It is important to note that the vertical axis is to the same scale when comparing the same

retail district to itself for 1997 and 2010 but are not to the same vertical axis scale when

comparing retail districts to each other. Since evenness was calculated for each retail district by

NAICS 4-digit category, the following histograms include single and chain locations together,

however, Appendix B provides histograms by retail district for both 1997 and 2010 but separates

single and chain location retail businesses to give a more detailed view of the change in evenness

each district experienced over time. The following subsections link the Simpson's Measure of

Evenness results with the retail evenness histograms by retail district.

Table 11: 2012 NAICS 4-digit Codes and Descriptions

| Code	Description
4411	Automobile Dealers
4412	Other Motor Vehicle Dealers
4413	Automotive Parts, Accessories, and Tire Stores
4421	Furniture Stores
4422	Home Furnishings Stores
4431	Electronics and Appliance Stores
4441	Building Material and Supplies Dealers
4442	Lawn and Garden Equipment and Supplies Stores
4451	Grocery Stores
4452	Specialty Food Stores
4453	Beer, Wine, and Liquor Stores
4461	Health and Personal Care Stores
4471	Gasoline Stations
4481	Clothing Stores
4482	Shoe Stores
4483	Jewelry, Luggage, and Leather Goods Stores
4511	Sporting Goods, Hobby, and Musical Instrument Stores
4512	Book Stores and News Dealers
4521	Department Stores
4529	Other General Merchandise Stores
4531	Florists
4532	Office Supplies, Stationery, and Gift Stores
4533	Used Merchandise Stores
4539	Other Miscellaneous Store Retailers
4541	Electronic Shopping and Mail-Order Houses
4542	Vending Machine Operators
4543	Direct Selling Establishments
7211	Traveler Accommodation
7212	RV (Recreational Vehicle) Parks and Recreational Camps
7213	Rooming and Boarding Houses
7223	Special Food Services
7224	Drinking Places (Alcoholic Beverages)
7225	Restaurants and Other Eating Places

Retail District Evenness Histograms

Central Business District

In the CBD, retail evenness decreased from ED=.71 (N=23) in 1997 to E_D=.59 (N=24) (Table 12) in 2010. This can easily be seen in Figure 10 and 11 by looking at the change in the total retail businesses and the change in the dominate NAICS 4-digit codes. In 1997 there were 3 NAICS 4-digit codes that had above 10 retail businesses each, which were 4533 (Used Merchandise Stores), 4431 (Electronics and Appliance Stores), and 7225 (Restaurants and Other Eating Places). By 2010, there was only one NAICS 4-digit code with more than 10 retail businesses, that being NAICS 7225. This decrease in retail evenness is seen by the steep drop off in the number of retail businesses after NAICS 7225 in 2010.
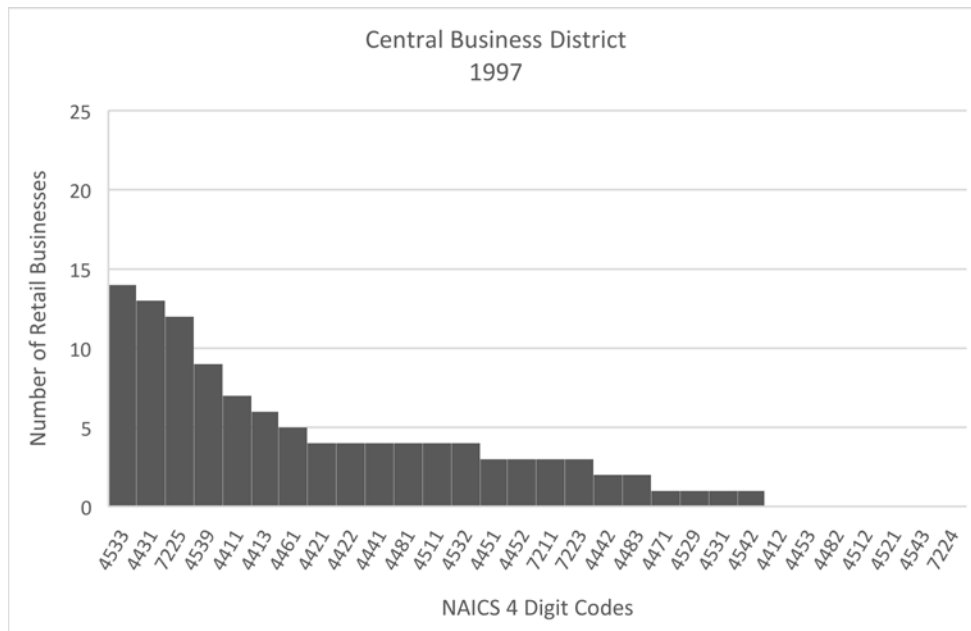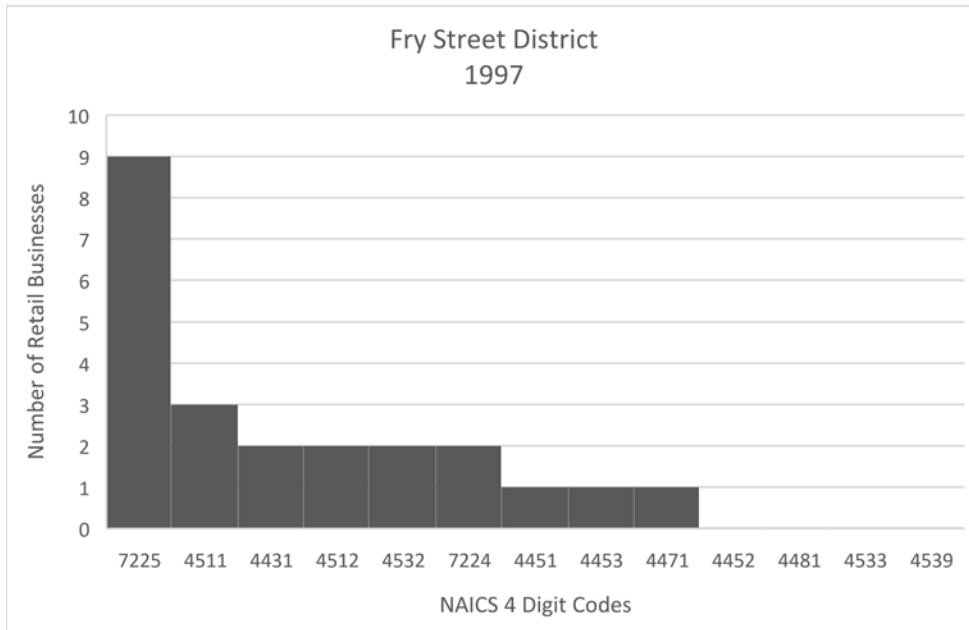

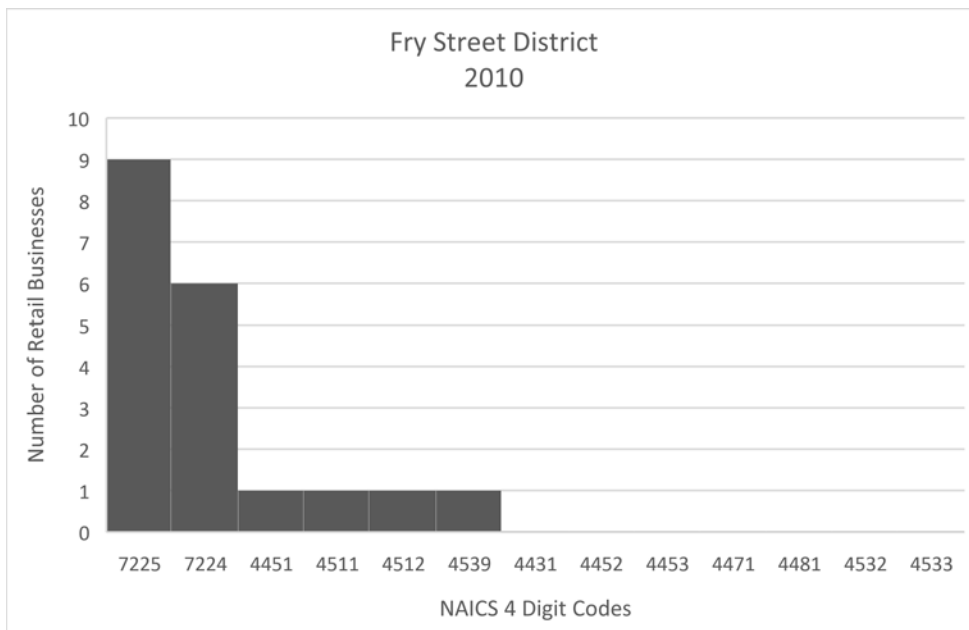**Figure 10: CBD 1997 Retail Evenness Histogram**
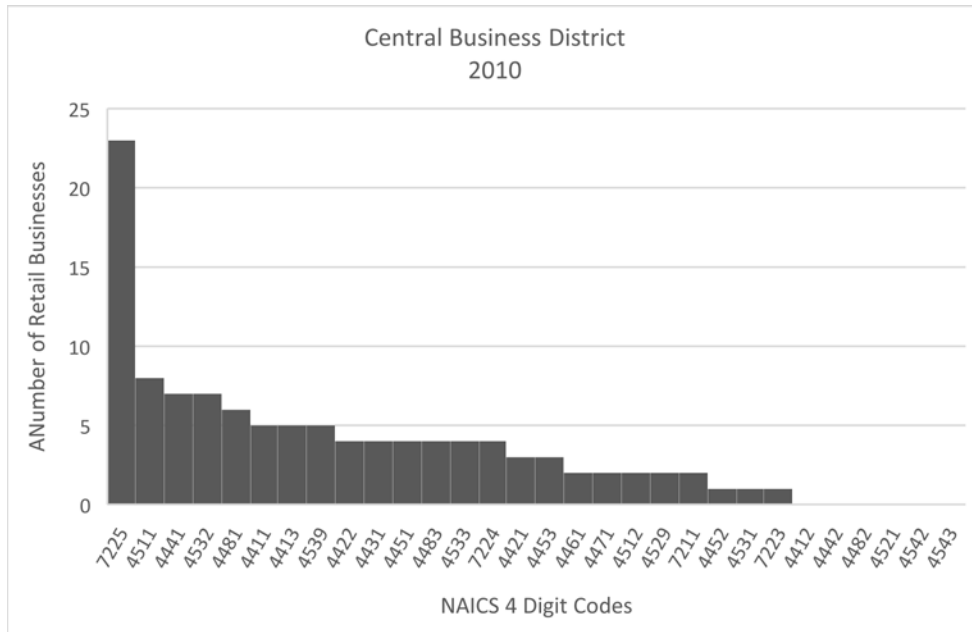
Figure 11: CBD 2010 Retail Evenness Histogram

Fry Street District

In the Fry Street District, retail evenness decreased from ED=.65 (N=9) in 1997 to ED=.56 (N=6) (Table 10) in 2010. In 1997 there was 1 NAICS 4-digit code with more than 3 retail businesses, which was NAICS 7225 (Restaurants and Other Eating Places) (Figure 12). By 2010, there were two NAICS 4-digit codes with more than 3 retail businesses, those being NAICS 7225 and 7224 (Drinking Places (Alcoholic Beverages)) (Figure 13). It should be noted that an increase in the number of NAICS 4-digit codes with more than 3 retail businesses would result in an increase of evenness, however, the remaining NAICS 4-digit codes represented in 2010 only had 1 retail business each resulting in a decrease of evenness. This decrease in retail evenness is seen by the steep drop off in the number of retail businesses after NAICS 7225 and 7224 in 2010.

**Figure 12: Fry Street District 1997 Retail Evenness Histogram**

**Figure 13: Fry Street District 2010 Retail Evenness Histogram**

Denton Crossing

The Simpson's Measure of Evenness was unable to be calculated for Denton Crossing

from 1997 to 2003 because the sample size was too small, thus retail evenness is only reported

in Denton Crossing for 2004 to 2010. However, the retail evenness histograms still indicate a

decrease in evenness in Denton Crossing from 1997 to 2010. The Simpson's Measure of Evenness

for 2010 in Denton Crossing was ED=.37 (N=20) (Table 10). In 1997 there were 5 retail businesses

in total, each in a separate NAICS 4-digit category except for NAICS 4521 (Department Stores)

which had 2 total retail businesses (Figure 14). By 2010, there was one dominate NAICS 4-digit

category that has more than 10 retail businesses, which was NAICS 7225 (Figure 15). This

decrease in retail evenness is seen by the steep drop off in the number of retail businesses after

NAICS 7225 in 2010.
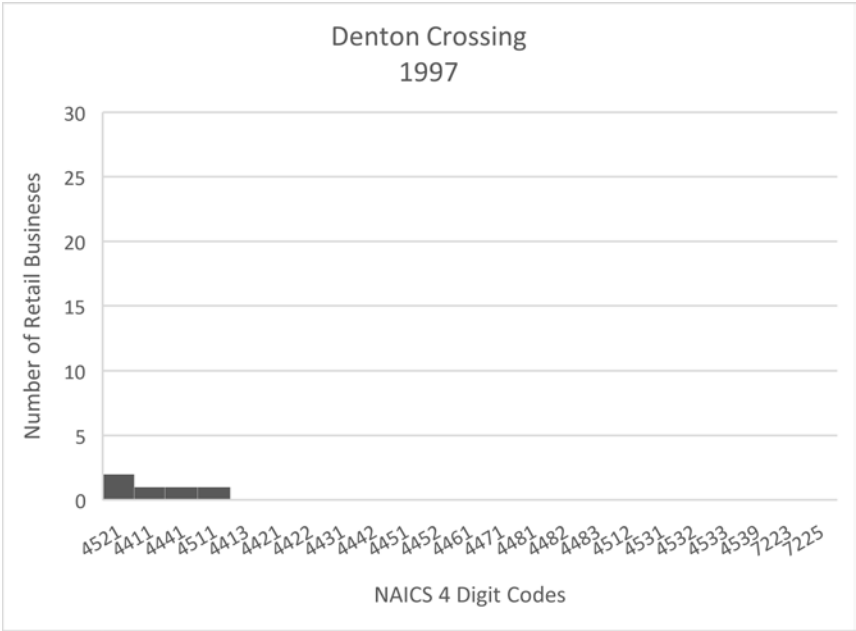
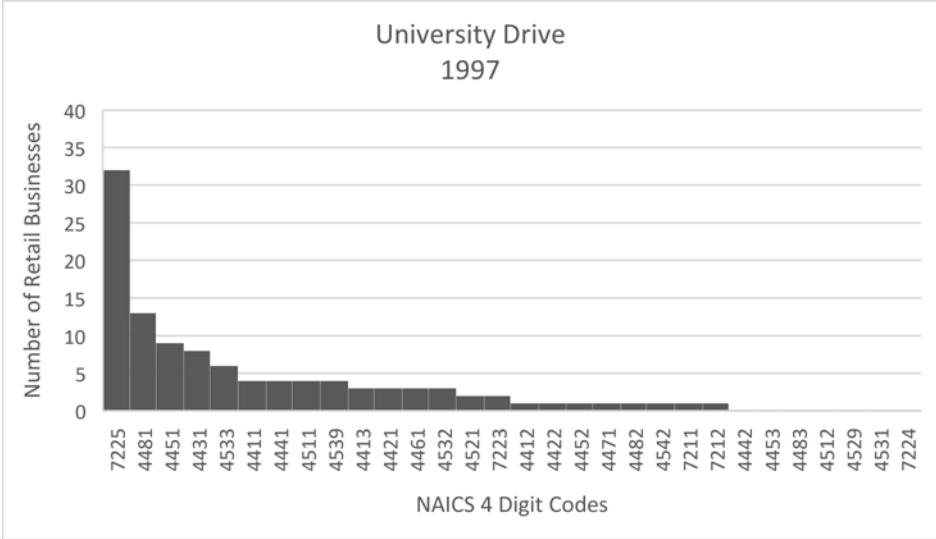**Figure 14: Denton Crossing 1997 Retail Evenness Histogram**
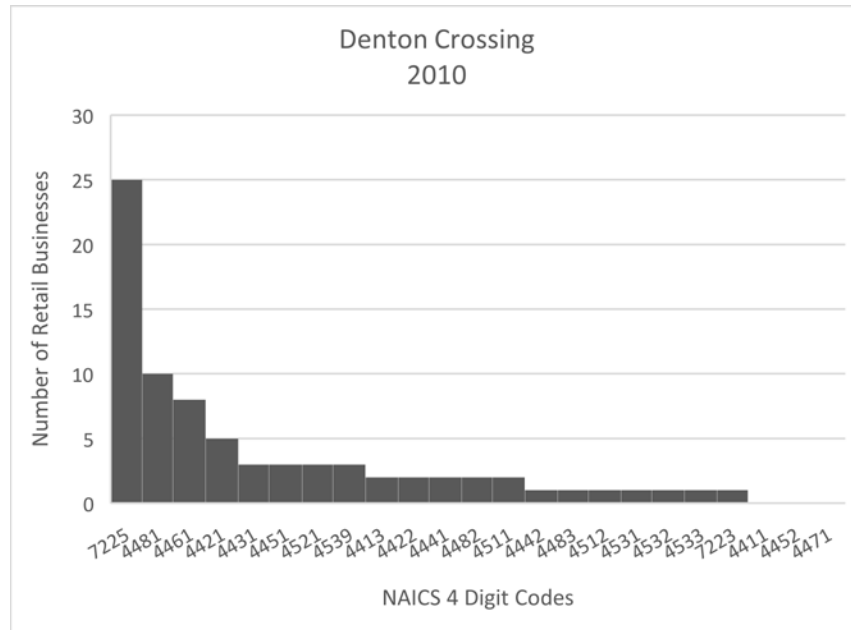
Figure 15: Denton Crossing 2010 Retail Evenness Histogram

University Drive

In the University Drive retail district, retail evenness decreased from ED=.36 (N=23) in 1997 to ED=.25 (N=25) (Table 10) in 2010. In 1997 NAICS 7225 had more than 30 retail businesses (Figure 16). The second NAICS 4-digit category in 1997 was NAICS 4481 (Clothing Stores) which had just over 10 retail businesses. By 2010, there were more than 35 retail businesses in NAICS 7225 but fewer than 10 in the next highest NAICS category, NAICS 4461 (Health and Personal Care Stores) (Figure 17). Although it may appear that there was only a minor decrease in retail evenness in the University Drive retail district, when taking into consideration the number of retail businesses present within each NAICS 4-digit category represented, the change in retail evenness is substantial. This decrease in retail evenness is seen by the steep drop off in the number of retail businesses after NAICS 7225 in 2010.

**Figure 16: University Drive 1997 Retail Evenness Histogram**
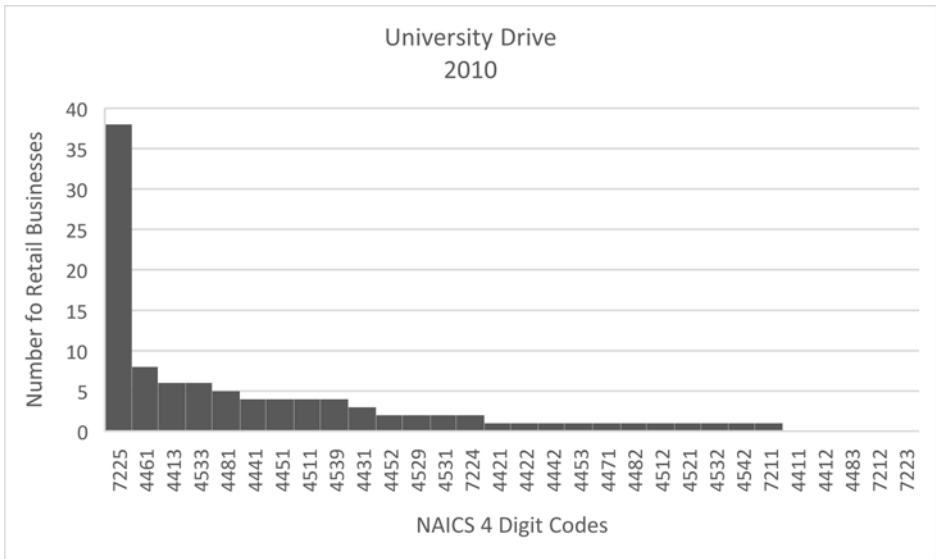
**Figure 17: University Drive 2010 Retail Evenness Histogram**

Golden Triangle Mall

In the Golden Triangle Mall Retail District, retail evenness decreased from ED=.52 (N=21) in 1997 to ED=.43 (N=21) (Table 10) in 2010. The same pattern persisted here as with the aforementioned retail districts in that the number of retail businesses in NAICS 7225 increased from a little man than 20 in 1997 to over 30 in 2010 (Figures 18 and 19). In 1997 and 2010 NAICS

4461 (Health and Personal Care Stores) and 4481 (Health and Personal Care Stores) were the second and third highest NAICS 4-digit codes by retail businesses, respectively. It is difficult to see, however, there is a substantial change in the drop off of the curve after NAICS 7225 and then again after NAICS 4461 and 4481 in 2010, whereas the curve was much smoother in 1997 in the same position.
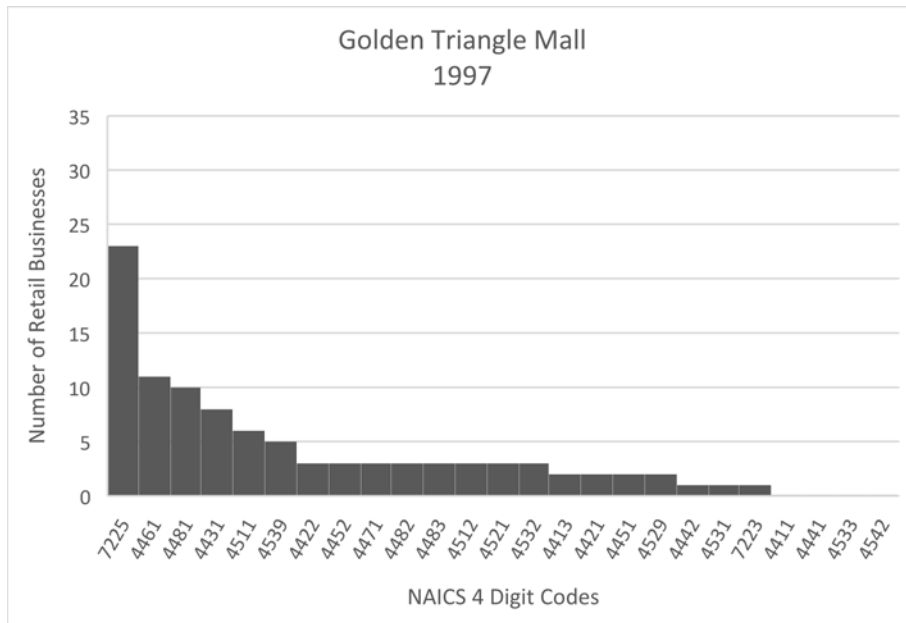
Figure 18: Golden Triangle Mall 1997 Retail Evenness Histogram
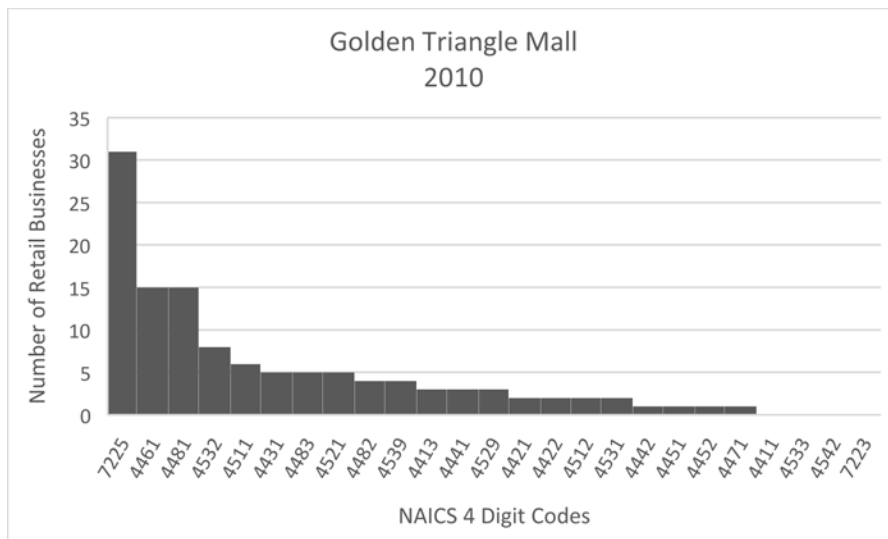
Figure 19: Golden Triangle Mall 2010 Retail Evenness Histogram

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CHAPTER 5

DISCUSSION AND CONCLUSION

Business geography improves business decisions by applying geographic concepts, reason, methods, and technology to real-world business problems. If businesses can successfully implement location strategies into their decision-making process, they can enhance their effectiveness in serving their target markets while maintaining stability during economic fluctuations. To accomplish this, however, business geographers must be employed to analyze massive datasets within a spatial framework to improve the decision-making process. The importance of retail geography resides in its application of geographic reason and methods to improve business decisions by better understanding spatial patterns unseen by other means of inquiry. The purpose of this study was to identify changing retail structure and diversity patterns within the Denton retail environment to provide an understanding of how different retail districts have evolved over time. Specifically, this research was interested in evolving retail structure in terms of employment and single versus chain location retail businesses, and retail diversity and evenness in terms of retail business classifications within each retail district.

This study asked three questions that focused on retail district evolution in five unique retail districts in the City of Denton from 1997 to 2010. The following summarizes the key results for each of the research questions found in the previous chapter. A summary of the research results is provided in Table 12, allowing for easier comparison among the retail districts. Further discussion extracts the major conclusions to be taken away from this investigation. Finally, the study concludes with a future research and application section that identifies further research

gaps and highlights the importance of this study for local and regional planners as well as retail business owners.

Key Findings by Question

The first research question asked, "How has the structure of each the five retail districts changed over time in terms of the types and number of retail businesses and employment totals?" The goal of this question was to understand the structural dynamics of each retail district, as well as to understand how that structure changed over the study period. This research measured retail business count changes, single versus chain location ratios, and changes in employment totals. This study found that the structure of each of the five retail districts did not substantially change from its original structure. Most notably, retail districts established prior to the Golden Triangle Mall in 1980, experienced a loss to marginal gain of single locations while at the same time experienced a decrease in chain locations. Golden Triangle Mall and Denton Crossing (the only two retail districts in this study that were completed post 1980) experienced gains in both single and chain location retail businesses from 1997 to 2010. To provide an additional perspective on retail structure, this research analyzed single to chain location ratios to identify any changes in retail structure. The CBD and the Fry Street district experienced a shift towards chain locations while University Drive and Golden Triangle Mall experienced a trend towards single locations. Denton Crossing increasingly became composed of chain location retail businesses with fewer single locations. Employment totals provide a third perspective in measuring retail structure. The majority of retail employment in the City of Denton has been attributed to both Denton Crossing and the Golden Triangle Mall, however this is primarily from

chain locations. Although Hernandez et. al. (2007) primarily studied retail strip centers, their findings of employment change support the findings presented here in which retail anchored by chain stores accounted for the largest share of employment as well as the largest share of employment growth over the study period. University Drive experienced a decrease in both single and chain location employment, a fact not surprising due to the decrease in the number of chain stores it experienced over the study period. The CBD exhibited an increase in single location employment with a decrease in chain location employment, again a fact correlated with the CBD's gain in single location retail businesses. Denton Crossing experienced substantial gains in employment totals from 172 employees in 1997 to 2,277 in 2010 in chain stores alone. The findings from research question one indicates that although there were minor changes in retail district structure, the structure overall for each district follows its original era of development.

Research Question 2 asked "How has retail diversity within the five retail districts changed from 1997 to 2010?" The intent of this question was to find out if the types of retail businesses present in each retail district changed over time. The Simpson's Diversity Index was used to analyze change in retail district diversity by measuring the number NAICS 4-digit classifications present in each year sample. All five retail districts experienced decreasing retail diversity with the Fry Street district experiencing the most change from $D =.17$ in 1997 to $D = .30$ in 2010. The CBD was the most diverse overall, only experiencing a slight decrease. This finding is consistent Dickinson and Rice (2010) which found a CBD experienced changes in the dominant types of retail ("retail evenness") but maintained a high level of overall diversity similar to diversity levels prior to the introduction of the new regional shopping mall development in Port Huron, MI. This is likely attributed to the CBD's high ratio of single to chain locations, i.e. with more single location

retailers you often have a greater variety of retail. Denton Crossing showed a large decrease in diversity; however, this can be attributed to its development during the study period. Also, with more chain locations there is often less variety among retail types because chains typical provide a vast array of product at lower prices resulting in consumer behavior changes and fewer stores needed (Brennan & Lundsten, 2000), whereas single locations are generally more specialized leading to more diversity.

Research Question 3 asked "How has retail evenness within the five retail districts changed from 1997 to 2010?" Since diversity consists of richness and evenness, it is important to understand both in detail. Therefore, this study employed Simpson's Measure of Evenness which provides an indexed measure that helps to understand changes within each NAICS 4-digit category that occurred in each retail district from 1997 to 2010. This question focused on finding out how each retail district changed in terms of the abundance of retail businesses present in each retail category. Findings of this research suggest that substantial changes in evenness occurred over the study period. All five retail districts experienced a decrease in retail evenness which means that there were one or two NAICS 4-digit categories that dominated each retail district in terms of the total number of retail businesses. Specifically, Restaurants and Other Eating Places (NAICS 4-digit code 7225) was the dominating category in all five retail districts across all years with two exceptions. First, in 1997 the CBD was dominated by used merchandise sales (NAICS 4533) and electronic and appliance stores (NAICS 4431), however by 2010 the CBD was dominated by restaurants and eating places (NAICS 7225). As mentioned earlier, findings from Dickinson and Rice (2010) showed that the CBD experienced significant changes in retail evenness but maintained a high level of overall diversity. Where this study and the Dickinson and

Rice (2010) study diverge regarding findings, is Dickson and Rice (2010) found a decrease in food and drink establishments while this study found all five retail districts exhibited substantial increases in restaurants and eating places. The second exception is Denton Crossing in 1997 when there were fewer than 5 total businesses and the dominate category was NAICS 4521 (Department Stores), however by 2010 there close to 25 retail businesses in the NAICS 7225. Overall, in all five retail districts, the decrease in retail evenness was accompanied by an increase (and domination) of NAICS 7225 Restaurants and Other Eating Places.

Table 12: Research Results Summary

Retail District	SL : CL Ratio		Employment Patterns				Diversity			Evenness			# of 4 Digit NAICS		NAICS Trends
	Pattern	Trend	SL	Trend	CL	Trend	Pattern	Comparison	Trend	Pattern	Comparison	Trend	1997	2010	
CBD	H SL, L CL	S	VH	I	L	D	VH	1	S	E	1	D	23	25	Toward restaurants
Fry Street	H SL, L CL	S	L	D	VL	D	VL	5	D	M	2	D	9	6	Added Drinking Places
Universty Drive	E SL & CL	S	M	D	H	D	M	3	D	L	5	D	23	25	Toward restaurants
GTM	E SL & CL	S	M	D	VH	I	H	2	S	M	3	D	21	21	Added restaurants
Denton Crossing	L SL, H CL	D in SL	L	I	VH	I	L	4	D	L	4	D	4	20	

SL = Single location, CL = Chain location
Trend: D = Decreasing, S = Steady, I = Increasing
Pattern: VH = Very high, H = High, M = Moderate, L = Low, VL = Very Low, E = Even

Conclusions

Together, this complex set of findings suggest two major conclusions. First, while there are structural differences that distinguish each of the retail districts examined in this thesis, individually each district has retained similar structural characteristics through the study period. This can be seen in terms of a high level of consistency in single versus chain location ratios, locations and employment totals, except for Denton Crossing which became increasingly abundant in chain locations. Additionally, it is also evident that the age of each district relates to

the structure of the district in specific ways: the newer the retail district, the more dominant the role of chain stores in the district. Where chain stores dominate, they account for more employment but fewer total retail businesses. These findings are in line with those from Jones and Doucet (2000) and Jarmin et. al. (2009) who suggest chains stores increasingly capturing market share and account for more employment while smaller retailers in the surrounding trade areas have declined in the percentage share of total stores. The growth of chain-store-dominant retail districts, and the concentration of retail offerings in a smaller number of large stores, is one crucial, defining feature of local retail evolution in Denton.

Second, there has been considerable change in the diversity of retail businesses operating within each district. One way in which this can be seen links to food services. The development of large, chain-store-dominant retail districts has been accompanied by substantial increases in the offerings of food service establishments operating in the newest retail districts. This is consistent with the previous findings of Bodkin and Lord (1997), who interpreted this shift as being an outcome of convenience shopping. Also, concurrent with this restaurant and chain store development, diversity in the number of unique types of retail businesses has steadily declined over the years. The findings here echo those of Haltiwanger et al. (2009), who found substantial negative impact from the introduction of large specialized chains on smaller chains and single location retailers. However, this impact occurred only in the area proximate to large chain stores, and to retailers that were in the same retail classifications. Our study supports Haltiwanger et. al. (2009) but further suggests that all retail districts may experience negative impacts with the introduction of newer chain-dominate retail districts, even those located at a further distance. Specifically, all five retail districts experienced decreasing diversity, in both richness and evenness

as defined previously, suggesting that chain-store dominant retail districts disrupt the retail setting at a greater distance than previous studies suggest. As Denton's retail environment continues to evolve, Denton will have difficulty managing retail as it tries to keep a desired level of balance between an array of retail offerings and local and chain store composition.

Future Research and Application

Although large retail chains can have negative impacts on our communities in terms of single location retail displacement, there is in fact a solid economic rationale for these businesses to survive and thrive (Robertson, 1997; Foster et. al., 2015), This can become especially problematic when we try to create and preserve a sense of place and culture in our cities in the form of supporting local business ownership. In Denton, there is a very strong sense of place and cultural identity that has historically been associated with the Central Business District. However, over the past two decades, many large chains have encroached upon local retail businesses by locating new stores in two retail centers on the city's periphery. Therefore, this research quantified these changes in a manner that will help city officials, urban planners, and retailers make better business decisions that benefit single location retailers as the evolution of retail development continues to unfold.

For Denton, these research findings can aid local policy makers, business owners, and residents in future planning decisions. The City of Denton's 20/30-year plan (City of Denton, 2015) clearly lays out the vision for future development and redevelopment. In terms of retail, the following statement is found 21 times in the 20/30 plan:

> A compact development pattern which includes expanded areas of mixed-use, a broad array of housing and retail choices responding to changing demographics and market

preferences, and reinvestment and infill in established areas of the city. (City of Denton, 2015)

The frequency of this statement suggests that retail plays a critical role in the vision of Denton's future. Thus, the findings of this research support the need for planners, residents, and business owners to consider the changes in retail that have occurred in the city's past. Specifically, the fact that the above quote states "a broad array…of retail choices" indicates that retail diversity is a key factor in the planning vision for the city. Additionally, the plan calls for the downtown compatibility area and neighborhood mixed-use areas to have a local retail focus, while regional mixed-use areas should have a national retailer focus (City of Denton, 2015). To successfully implement these strategies, local planning officials need to be aware of the retail structure and diversity within the existing retail environment, so they can better understand what a "broad array of retail options" means and which area of the city need more retail options and why. Presumably, other cities across the nation have similar plans for future development that call for a stronger retail experience that will draw people from surrounding areas while driving regional tourism. If this is true, this research provides a framework for other cities to understand historical retail district trends that need to be considered in planning for future development.

This study does not provide an end to retail district evolution research. Future research in retail district evolution should focus on the following questions identified by the results of this study. First, "Are there specific retail chains that can be attributed as the cause for decreasing retail diversity trends?" If certain chains are found to be causing decreasing retail diversity, we may next ask how can or does local policy play a role in mitigating this trend? For instance, do certain types of local policies off set or aid in decreased retail diversity? Another aspect of future

research should focus on understanding if restaurants and other eating places (NAICS 7225) are dominating retail districts in cities nationwide. If this study is any indication of retail districts nationwide, then this category of retail is a substantial factor in decreasing diversity. But why? Why do these types of establishments dominate in number while simultaneously there is a compression of most other retail classifications? Also, "how will restaurants and eating places compete with e-commerce, will restaurants and eating places be places that offer the experience people need that e-commerce lacks?" Meaning, one could speculate that e-commerce retailers may partner with restaurants and eating places to provide an efficient (e-commerce) and social (service) experience. If this happens, how might the abundance of restaurants and eating places in Denton change in response to e-commerce partnership competition? Finally, and perhaps most importantly, future research should ask "How are brick and mortar retail districts in general, like those in this study, changing in response to an increasing internet retail experience?" It is no secret that an increasing percentage of retail transactions are taking place online. However, this alone does not suggest that brick and mortar retail is becoming obsolete, a fact supported by recent moves made by online retailers to secure a brick and mortar presence. For example, Amazon, Warby Parker, Bonobos, and Athleta were exclusively online retailers but now have a bolstering brick and mortar presence, citing consumer experience as the main factor for this phenomenon. Therefore, understanding how different types of retail districts changed or are changing in response to changes in retail evolution is critical moving forward.

This study sought to contribute to retail and business geography literature by identifying and understanding how different retail districts have changed over time. Additionally, few retail studies have employed the use of ecological models to measure retail change. This is quite

surprising since retail businesses can be treated as individuals and their NAICS classifications be treated as their species. Relevant use of these ecological measures can provide a different perspective when combined with spatial analysis as was the case for this study. Therefore, this research not only filled a gap in retail district literature but added to this literature by combing two different fields of study, location analysis and ecology. The combination of these methods and techniques strengthens the field of retail geography.

APPENDIX A

RETAIL DISTRICT SITE MAPS AND DETAILS

Denton Central Business District Map. Appendix B of the City of Denton Site Design Criteria Manual, April 1998.
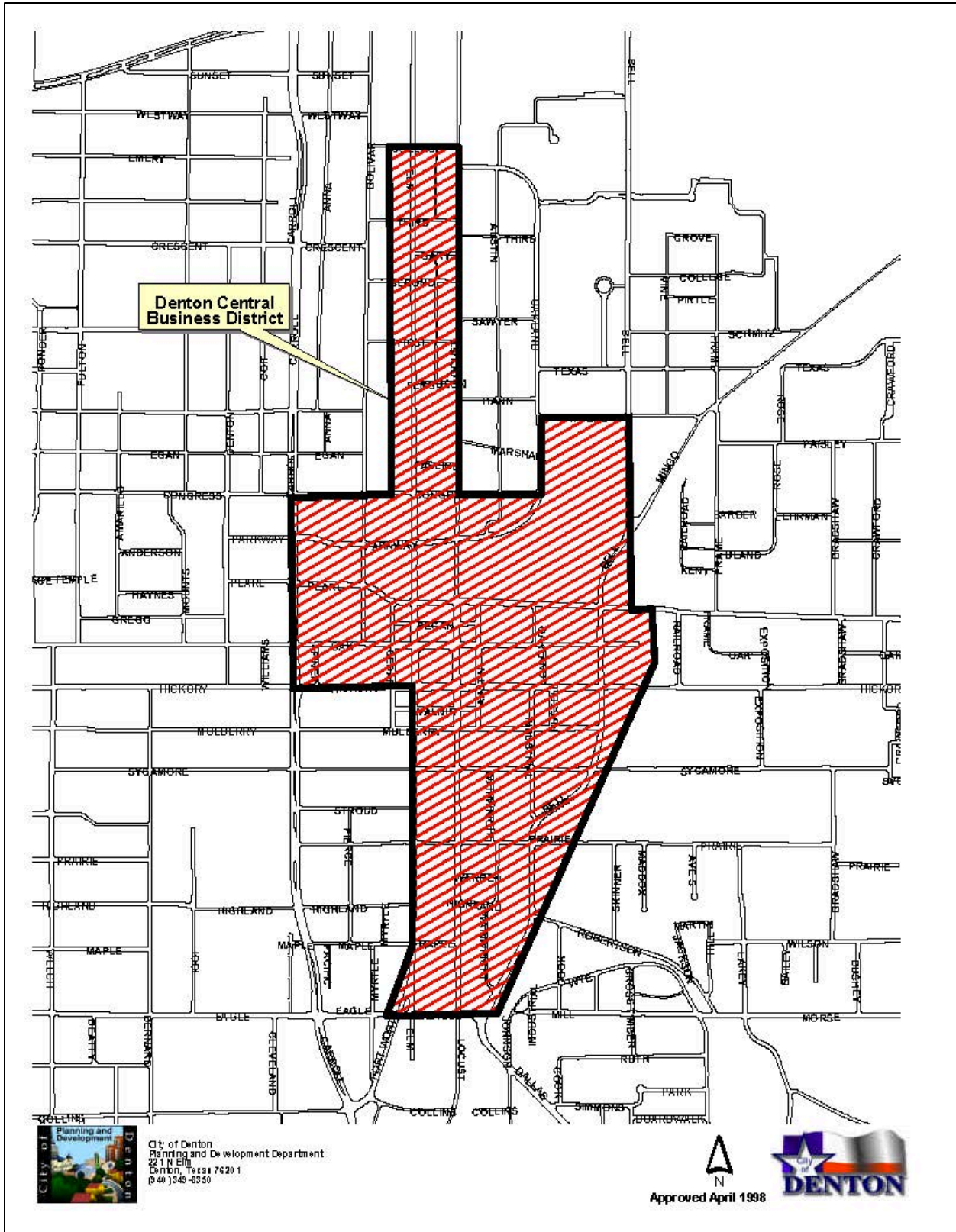
Fry Street Special Overlay District Map. Fry Street Small Area Plan, Denton, Texas, An Element of the Comprehensive Plan of the City of Denton, June 1999, Resolution number R99-025.
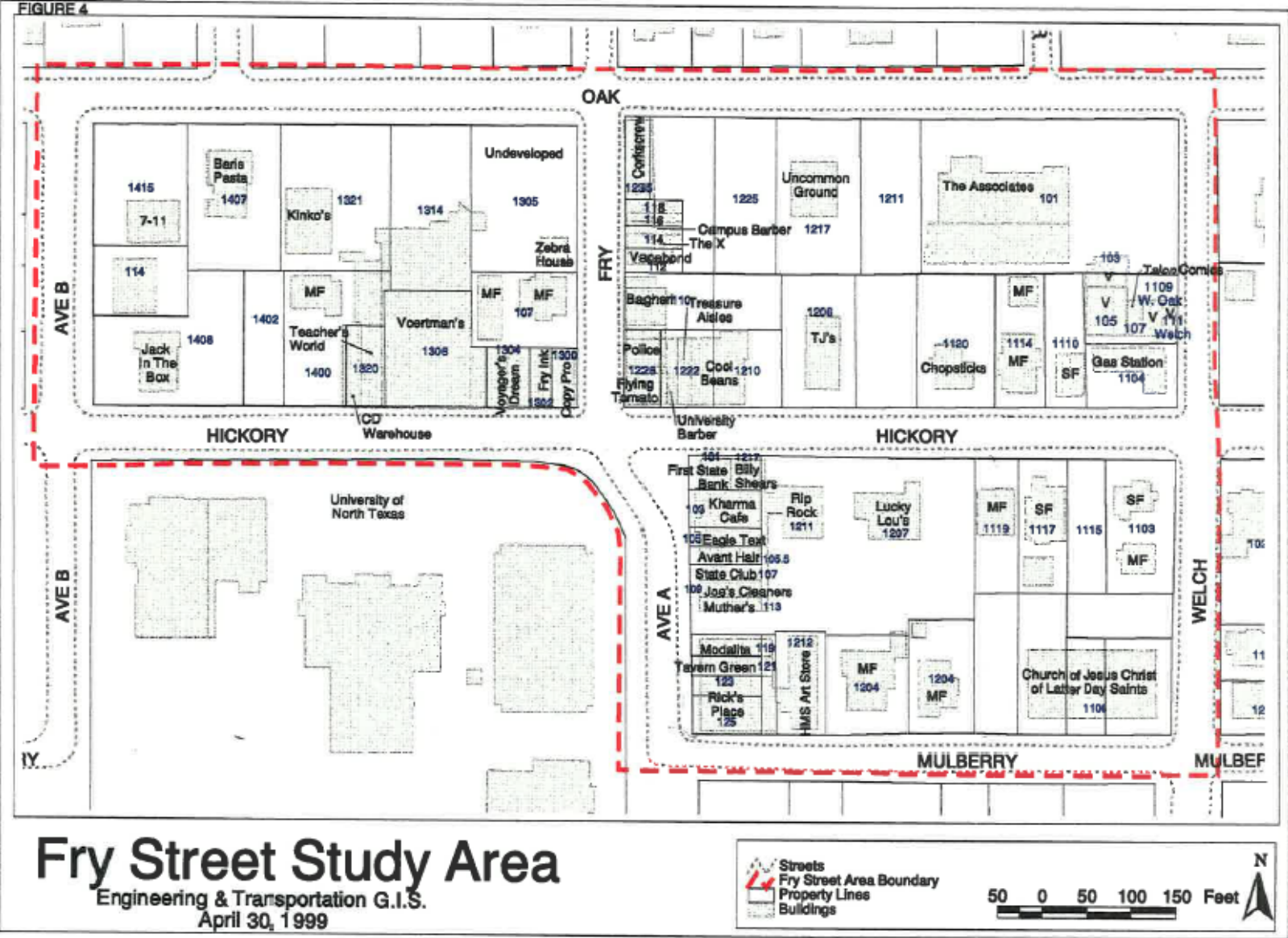
Denton Crossing East and West Map. Denton Crossing, 1400-1800 South Loop 288, Denton, TX, 76205, Retail Properties of America, May 2012.
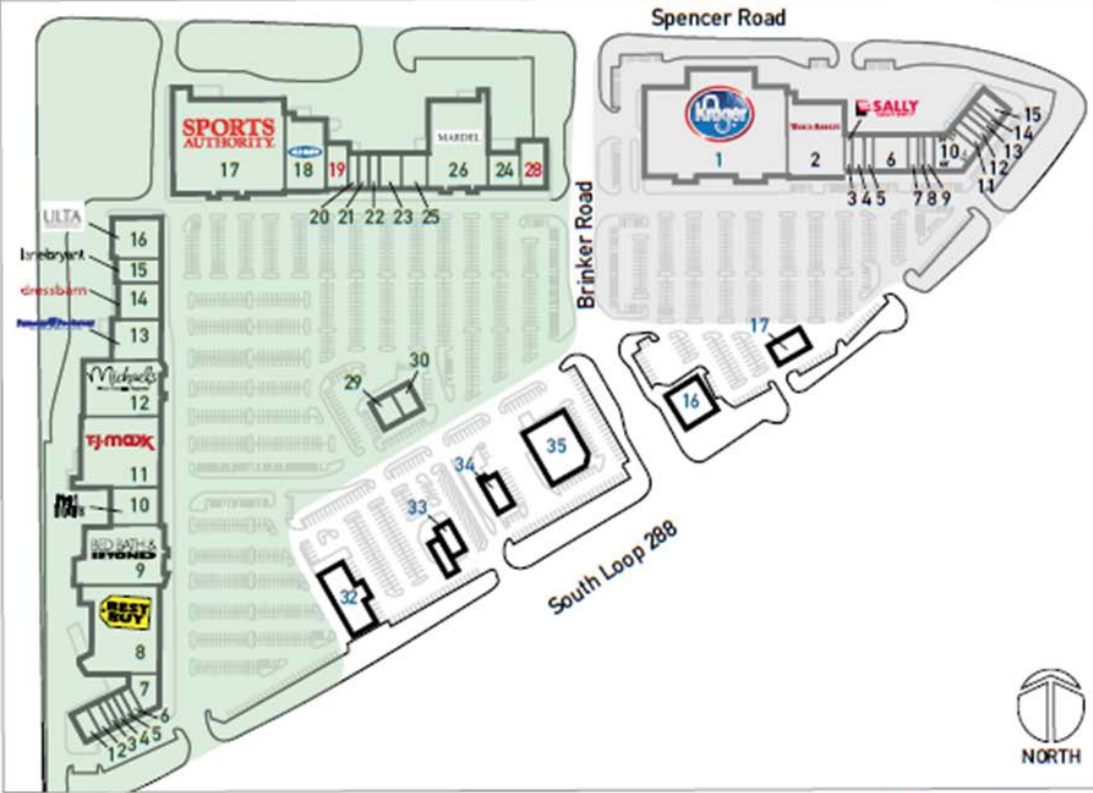
RPAI
Retail Properties of America, Inc.

Denton Crossing
1400 - 1800 South Loop 288, Denton, TX 76205

Unit#	Sq. Ft.	Tenant
Denton Crossing West: 290,135 Sq. Ft.		
1	2,578	Chipotle Mexican Grill
2	1,807	Wing Pit
3	1,200	EZ Money
4	1,297	Happy Nail Spa
5	1,207	Yogurt Story
6	1,818	Jersey Mike's Subs
7	4,553	Mattress Giant
8	30,000	Best Buy
9	34,000	Bed Bath & Beyond
10	9,500	Pier 1 Imports
11	28,000	T.J. Maxx
12	21,163	Michaels
13	10,000	Famous Footwear
14	8,000	Dressbarn
15	5,000	Lane Bryant
16	10,000	Ulta
17	50,000	Sports Authority
18	14,800	Old Navy
19	5,000	Available
20	2,000	Motherhood Maternity
21	2,000	Sweet Basil - Thai Bistro
22	2,000	Davanti Salon
23	4,250	The Children's Place
24	5,480	rue21
25	3,780	Justice
26	25,100	Mardel Christian Bookstore
28	6,002	Available
29	5,930	Fuddruckers
30	3,670	AAA of Texas
32		Golden Corral
33		Popeyes Chicken
34		Whataburger
35		Walgreens
Denton Crossing East: 48,717 Sq. Ft.		
1		Kroger
2	18,300	World Market
3	1,600	Sally Beauty Supply
4	2,000	H&R Block
5	1,873	T-Mobile
6	6,000	Mattress Firm
7	1,600	Weight Watchers
8	1,500	New York Subs
9	1,440	Advance America
10	6,300	Buffalo Wild Wings
11	1,500	IYD Breakfast Café
12	1,500	Scottrade
13	1,300	Fantasy Nails
14	1,400	Sport Clips
15	2,504	J Sushi
16		Venus Real Estate Advisors
17		Kroger Fuel Station

Information given in this presentation is subject to verification and no liability for errors or omissions is assumed.

Items in blue are owned by others.

2012 Demographics

	Population	Avg. HH Income	Center Size:
1 Mile	3,587	$40,622	338,852 Sq. Ft.
3 Mile	64,359	$60,073	Leasing Contact : Jason Kasal
5 Mile	140,893	$66,576	Jason.Kasal@rpai.com | 855.646.RPAI

Spencer Road
Brinker Road
South Loop 288
NORTH

Property managed by RPW Southwest Management, LLC - The RPW name and logo are registered trademarks being used under license.

5/18/2012

Denton Towne Crossing Map. Denton Towne Crossing, Brinker Road & South Loop 288, Denton, TX, Westwood Financial, 2008.

Denton Towne Crossing

SUITE	TENANT	GLA SF
A100	Palm Beach Tan	3,000
A101	Dental Central	2,936
A102	Supercuts	1,200
A103	Catherine's - Women's & Children's Clothing	4,000
A104	Plato's Closet	2,698
A105	Elite Spa & Nails	1,700
A106	Connect Hearing	1,202
A107	Payless ShoeSource	2,800
B108	Verizon Wireless	4,200
C109	McAlister's Deli	3,800
C110	The Men's Wearhouse	4,000
C111	Games Workshop	1,000
C112	Pei Wei Asian Diner	3,180

Available Future Availability Leased NAP (not a part)

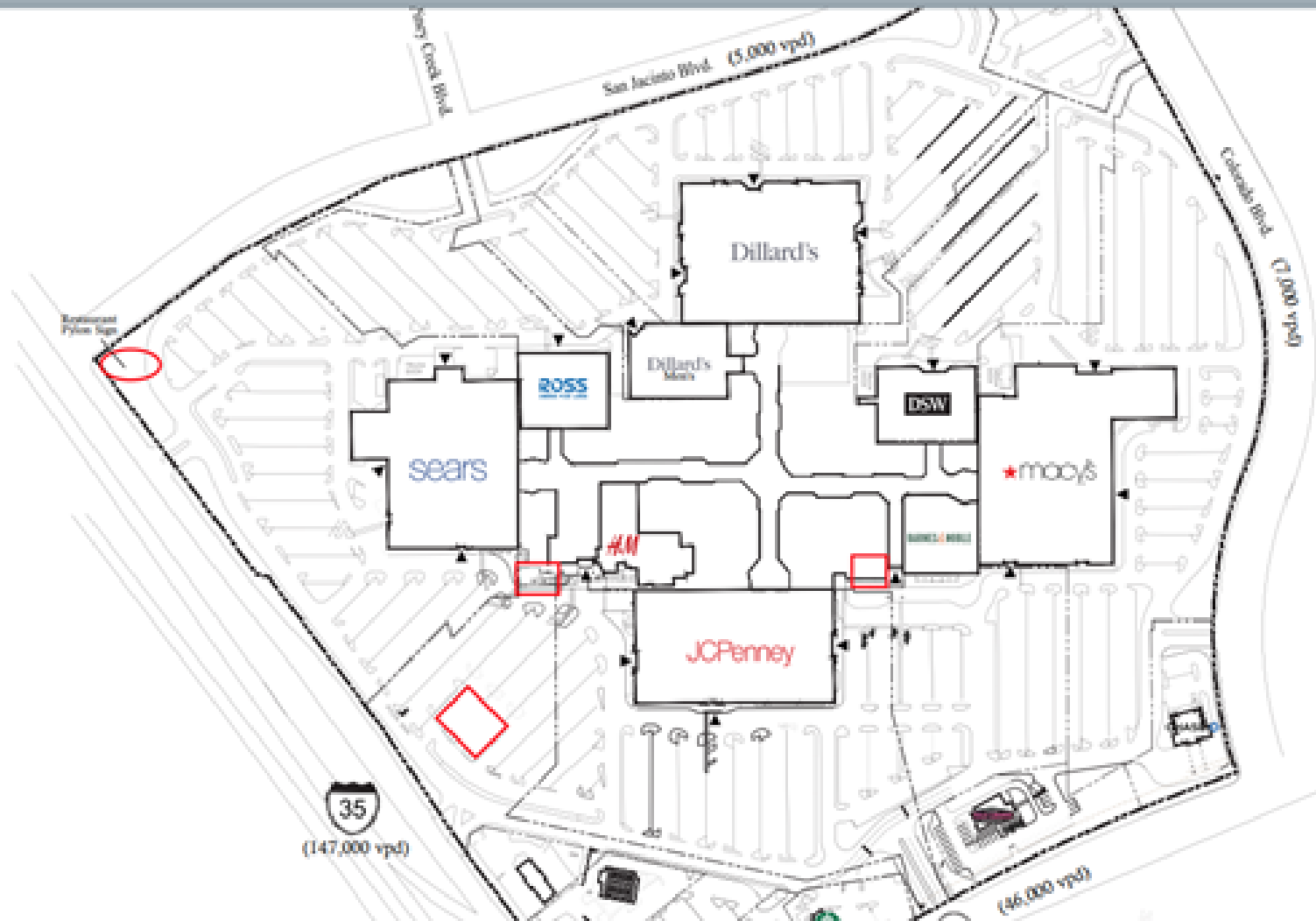westwood FINANCIAL Retail. Evolved.

www.westfin.com/denton-towne-crossing
11440 San Vicente Blvd, 2nd Floor, Los Angeles, CA 90049 | 800.899.5443 | CA License #02014116

No warranty or representation, express or implied, is made as to the accuracy of the information contained herein, and same is submitted subject to errors omissions, change of price, rental or other conditions, withdrawal without notice, and to any specific listing conditions, imposed by our principals.

Denton Town Center Map. Denton Town Center, Denton Texas, IH 35E & Loop 288, Across from Golden Triangle Mall, Site Plan, pg. 8, Byrne Company, August 2016.
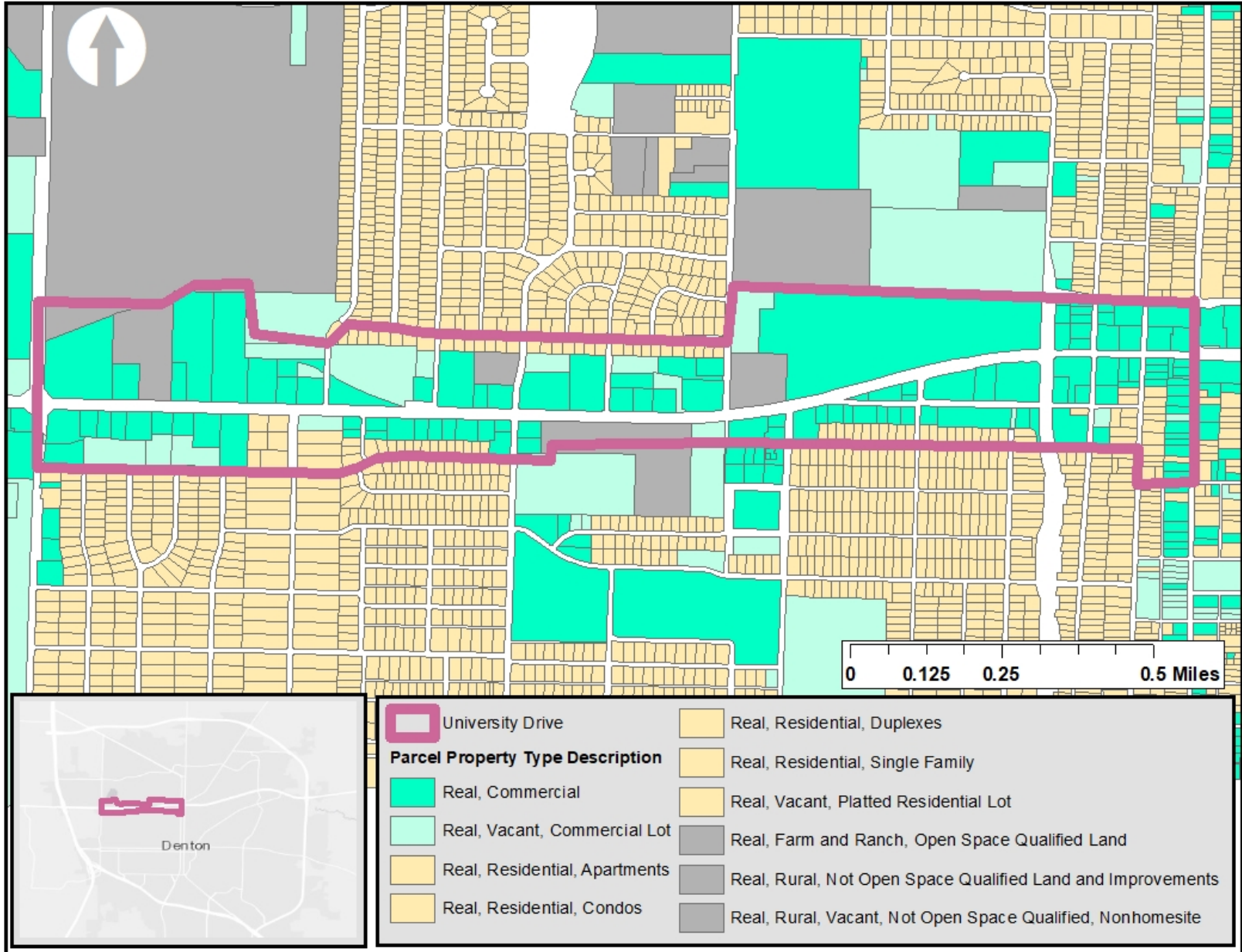
Golden Triangle Mall Site Map. Golden Triangle Mall, Site Plan, Weitzman Group, November 2015.

University Drive Retail District Map. Parcels by Property Type, City of Denton Planning GIS Department, 2018.

|	
▢ **University Drive**	▢ Real, Residential, Duplexes
Parcel Property Type Description	▢ Real, Residential, Single Family
▢ Real, Commercial	▢ Real, Vacant, Platted Residential Lot
▢ Real, Vacant, Commercial Lot	▢ Real, Farm and Ranch, Open Space Qualified Land
▢ Real, Residential, Apartments	▢ Real, Rural, Not Open Space Qualified Land and Improvements
▢ Real, Residential, Condos	▢ Real, Rural, Vacant, Not Open Space Qualified, Nonhomesite

Denton

APPENDIX B

SINGLE AND CHAIN LOCATION HISTOGRAMS BY RETAIL DISTRICT FOR 1997 AND 2010

Central Business District single and chain location histograms by4 digit NAICS category for 1997 and 2010.
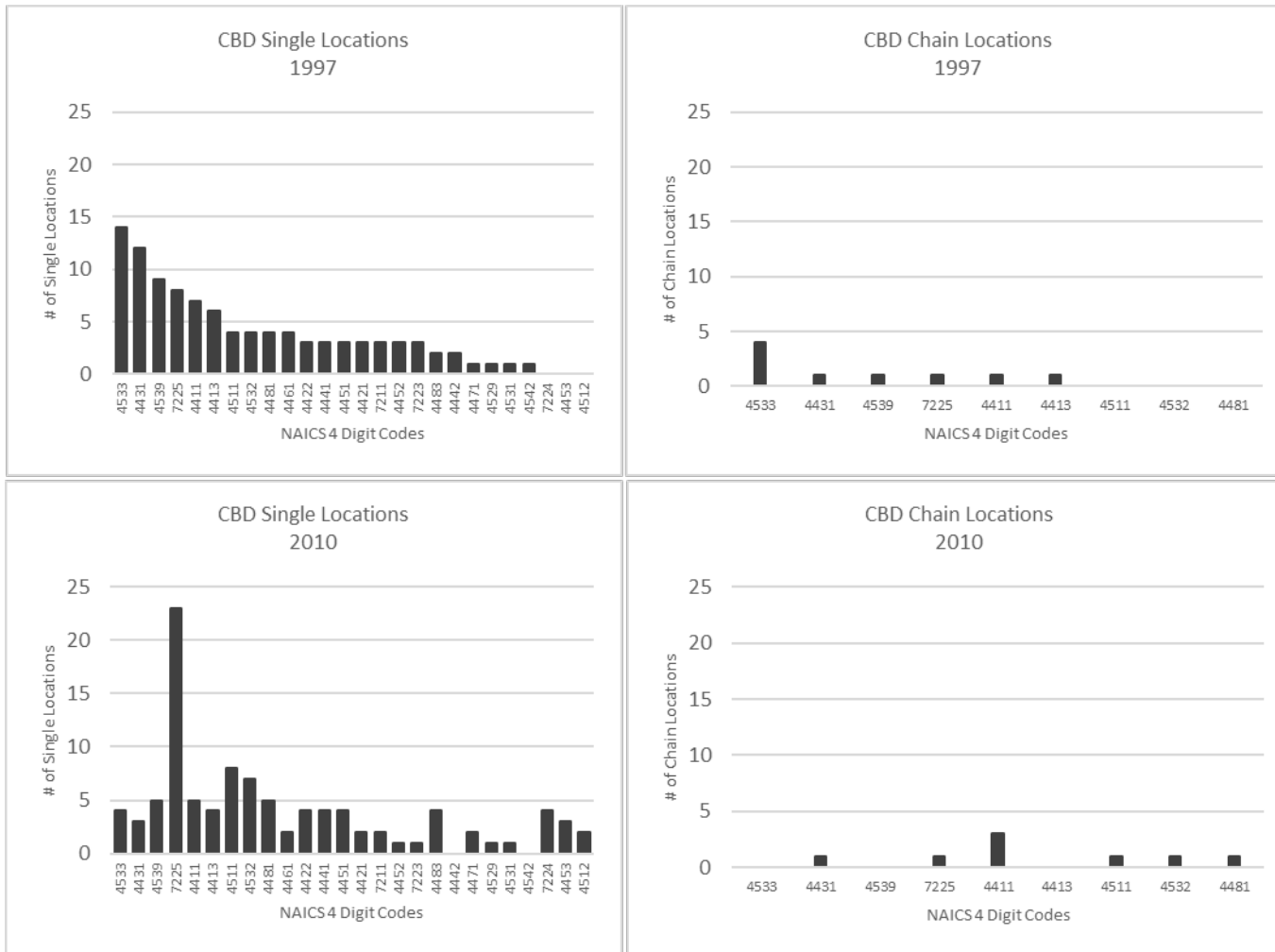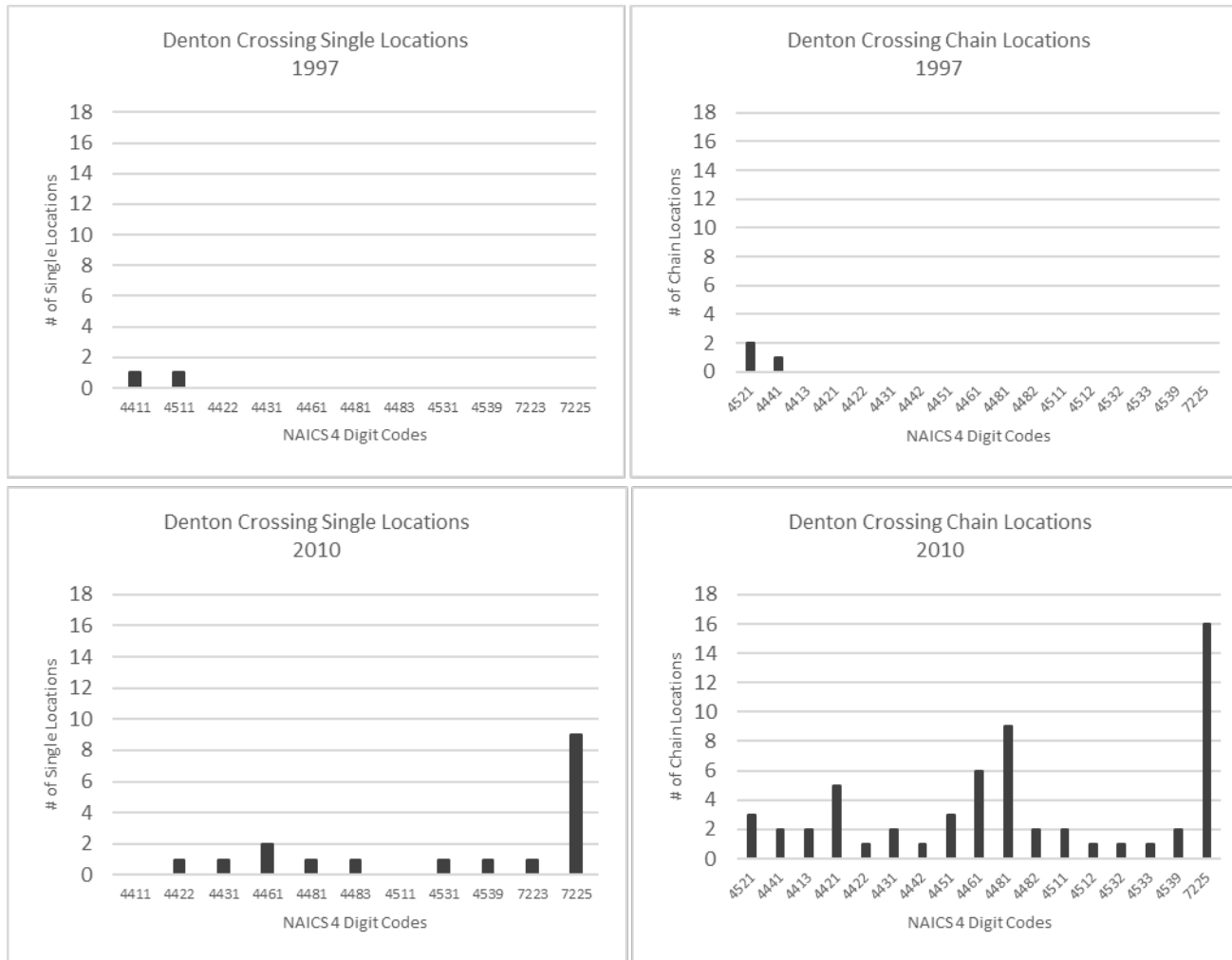
Fry Street District single and chain location histograms by 4 digit NAICS category for 1997 and 2010.
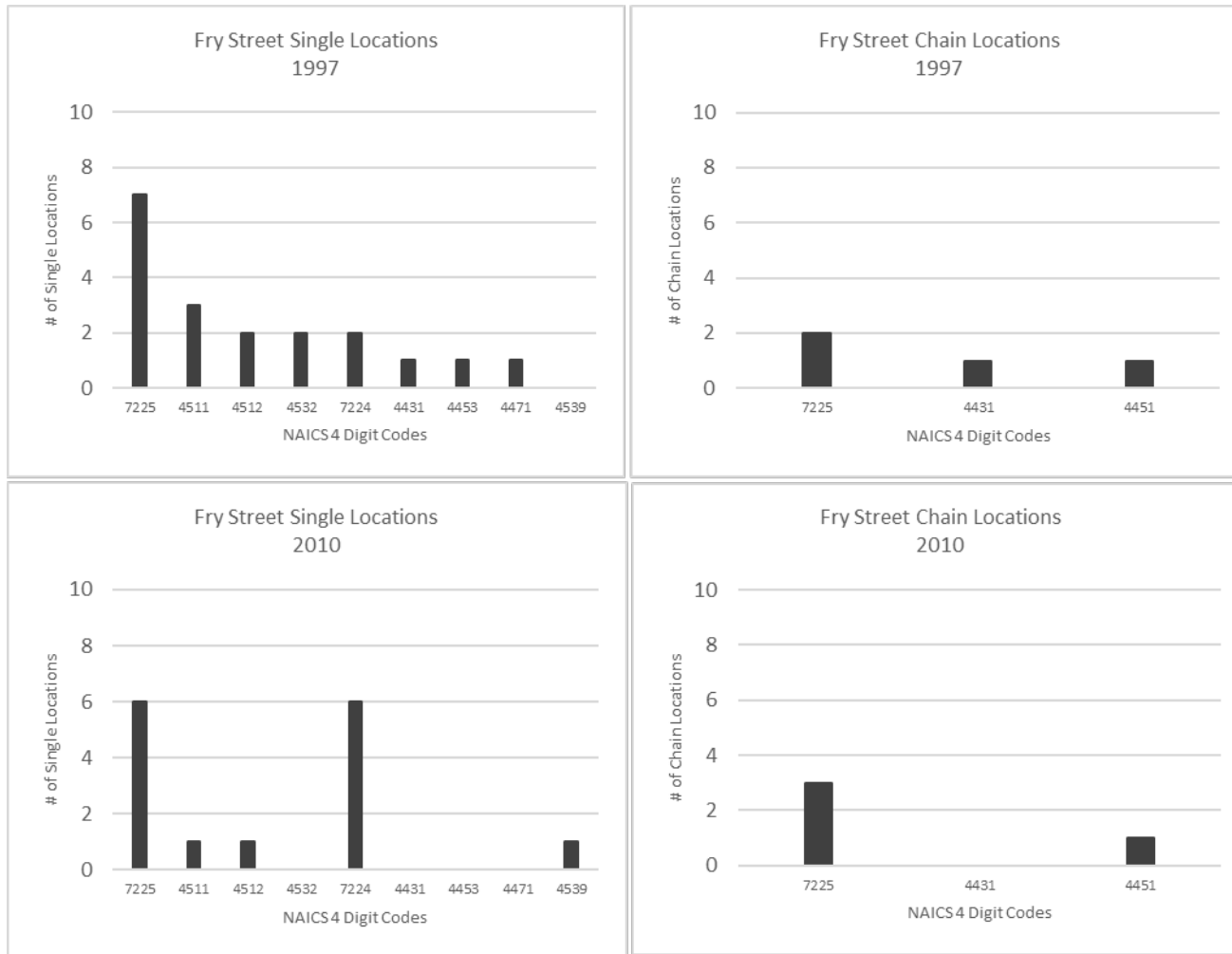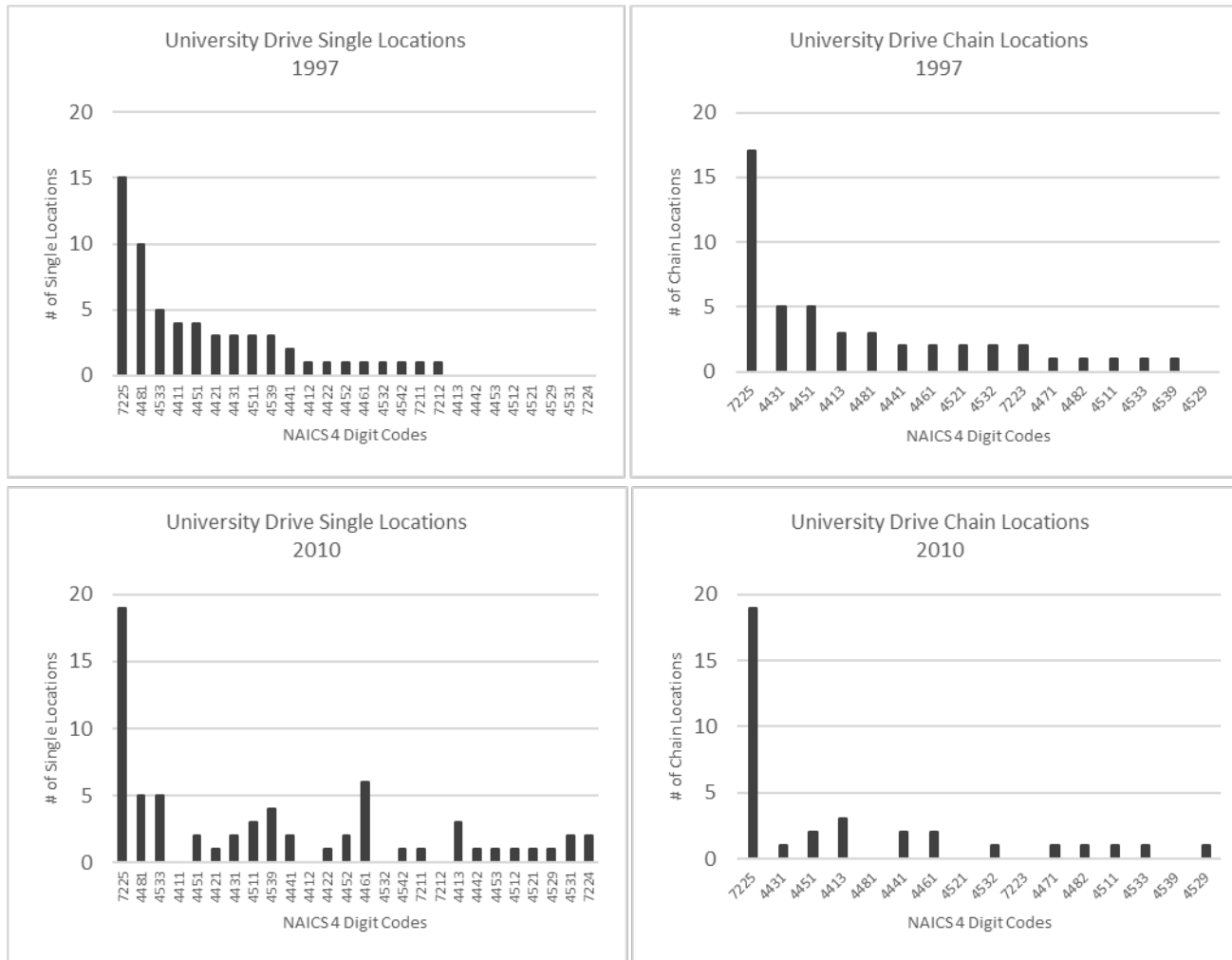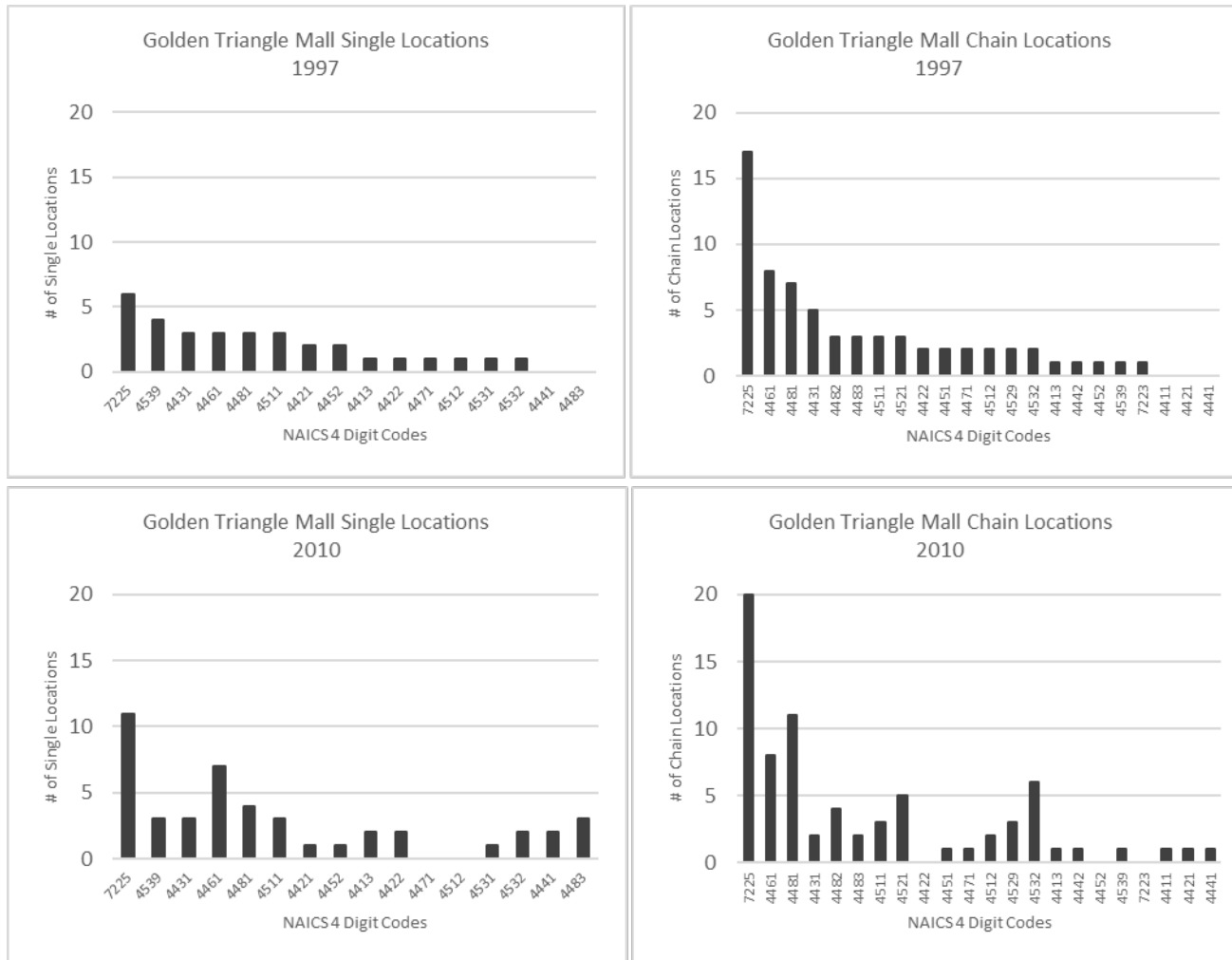
Denton Crossing single and chain location histograms by4 digit NAICS category for 1997 and 2010.

University Drive single and chain location histograms by 4 digit NAICS category for 1997 and 2010.

Golden Triangle Mall single and chain location histograms by 4 digit NAICS category for 1997 and 2010.

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