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ABSTRACT

AN EXAMINATION OF THE MARKET TERRITORIES
OF BASEBALL FRANCHISES

By

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Three parties who are interested in the geographical market territories of baseball franchises are: franchise owners, leagues, and communities including their public officials. However, the methods that these parties employ in order to determine the trade areas of franchises are either inefficient or inadequate. Therefore, a potential model is examined to ascertain if it can provide accurate estimates of the market territories of baseball franchises. Data was obtained from six minor league baseball organizations in order to test the model's predictions. Log-linear least squares regression and the standardized root mean square error test statistic were applied to estimate the parameters of the model and to evaluate the goodness-of-fit of the model. The results indicate that the model is able to provide accurate predictions of the market territories of baseball franchises, although competing destinations and outliers can affect the calibration of the model. Suggestions are made that would allow the model to give better estimations of the trade areas and this thesis offers an approach with regard to applying the model to other regions not studied in this work.

To Simona and My Parents

Thank you for your encouragement, patience, and love.

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TABLE OF CONTENTS

LIST OF TABLES vii

LIST OF FIGURES viii

LIST OF ABBREVIATIONS x

CHAPTER I
THE IMPORTANCE OF THE GEOGRAPHICAL MARKET TERRITORIES OF BASEBALL FRANCHISES 1
- The Proposed Research 1
- Interested Parties 3
  - Franchise Owners 3
  - Leagues 5
  - Communities and Public Officials 8

CHAPTER II
METHODS OF DETERMINING THE TRADE AREAS OF FRANCHISES 13
- Problems With Current Methods 13
  - Franchise Methods 14
  - League Methods 16
  - Methods Used in Economic Impact Analyses 19
- Background of the Gravity Model 22
- The Components of the Gravity Model 24
- The Advantages of the Gravity Model 26
  - Benefits for Owners 27
  - Benefits for Leagues 28
  - Benefits for Economic Impact Analyses 29

CHAPTER III
METHODOLOGY 31
- Outline of the Methodology 31
- The Potential Model 32
- Estimation of the Potential Model 37
  - Regression Analysis 39
  - The Standardized Root Mean Square Error 41
- Residual Analysis 42
  - Expansion of the Models 45

CHAPTER IV
RESULTS OF THE EXAMINATION....49
Results of the Models....49
Examination of the Residuals....52
The Elimination of Distant Observations....52
Results of the Models After Elimination....57
Influence of Competing Destinations and Outliers....68

CHAPTER V
CONCLUSIONS AND FUTURE ANALYSIS....89
Improvements to the Model....89
The Inclusion of Demographic Variables....90
A Competing Destinations Variable....97
Application of the Model....100
Relevance of this Research....102

BIBLIOGRAPHY....112

LIST OF TABLES

TABLE 1: Franchise Name, Location, League, and Number of Zip Codes....................34

TABLE 2: Demographic Variables Analyzed and Their Reason For Inclusion.............43

TABLE 3: Hypothetical Pearson's Correlation Coefficient Values for Beloit.............47

TABLE 4: Results of the Transformed Potential Model....................................50

TABLE 5: Results of the Potential Model..50

TABLE 6: Beta Values...51

TABLE 7: Characteristics of the Data Sets
After the Elimination of Remote Observations....................................64

TABLE 8: Results of the Transformed Potential Model:
Before and After the Elimination of Remote Observations......................65

TABLE 9: Results of the Potential Model:
Before and After the Elimination of Remote Observations......................65

TABLE 10: Beta Values: After the Elimination of Remote Observations..................66

TABLE 11: Competitors of the Franchises Under Study....................................69

TABLE 12: Locations of the Zip Codes that are
Affected by Competing Destinations...69

TABLE 13: Correlation Values of Demographic Variables
and Regression Residuals...91

TABLE 14: Correlation Values of Demographic Variables
and SRMSE Residuals..92

TABLE 15: The Number of Meaningful Correlation Coefficient Values
for each Demographic Variable...94

LIST OF FIGURES

FIGURE 1: Locations of Franchises that Supplied Data....35

FIGURE 2: West Michigan's Market Territory
Proportion of Regression Error against LN Dij....53

FIGURE 3: West Michigan's Market Territory
Leverage against LN Dij....54

FIGURE 4: West Michigan's Market Territory
Proportion of SRMSE Error against LN Dij....56

FIGURE 5: Market Territory of Beloit....58

FIGURE 6: Market Territory of Charleston....59

FIGURE 7: Market Territory of Charlotte....60

FIGURE 8: Market Territory of Clinton....61

FIGURE 9: Market Territory of High Desert....62

FIGURE 10: Market Territory of West Michigan....63

FIGURE 11: West Michigan's Market Territory
Potential Model's Predicted Attendance Values vs
The Actual Attendance Values....67

FIGURE 12: Zip Codes of Beloit's Market Territory
that are Influenced by a Competing Destination....70

FIGURE 13: Zip Codes of Clinton's Market Territory
that are Influenced by a Competing Destination....71

FIGURE 14: The Zip Code of High Desert's Market Territory
that is Influenced by Competing Destinations....72

FIGURE 15: Zip Codes of West Michigan's Market Territory
that are Influenced by Competing Destinations....73

FIGURE 16: Clinton's Market Territory
Proportion of Regression Error against Dij
(After the Removal of Remote Observations)....75

FIGURE 17: West Michigan's Market Territory
Proportion of SRMSE Error against Dij
(After the Removal of Remote Observations)....76

FIGURE 18: Charleston's Market Territory
Values of the Regression Residuals against Dij
(After the Removal of Remote Observations)....79

FIGURE 19: Charleston's Market Territory
Values of the SRMSE Residuals against Dij
(After the Removal of Remote Observations)....80

FIGURE 20: Outliers in Charleston's Market Territory....81

FIGURE 21: Outliers in Beloit's Market Territory....82

FIGURE 22: Outliers in Charlotte's Market Territory....83

FIGURE 23: Outliers in Clinton's Market Territory....84

FIGURE 24: Outliers in High Desert's Market Territory....85

FIGURE 25: Outliers in West Michigan's Market Territory....86

FIGURE 26: Beloit's Market Territory vs The BTA....105

FIGURE 27: Charleston's Market Territory vs The BTA....106

FIGURE 28: Charlotte's Market Territory vs The BTA....107

FIGURE 29: Clinton's Market Territory vs The BTA....108

FIGURE 30: High Desert's Market Territory vs The BTA....109

FIGURE 31: West Michigan's Market Territory vs The BTA....110

LIST OF ABBREVIATIONS

b	=	a coefficient to be estimated; the coefficient of Pi
BTA	=	The Basic Trade Area
c	=	a coefficient to be estimated; the coefficient of Dij
CBD	=	Central Business District
D_{ij}	=	a variable representing spatial friction between place i and place j; the amount of distance between the geometric centroid of zip code origins and the geometric centroid of the zip code destination.
k^*	=	a constant of proportionality to be determined; embedded in this term is the seating capacity of the stadiums and the number of games where attendees were surveyed.
P_i	=	a mass variable representing the origin; the population of the zip code origins
R^2	=	the test statistic of the coefficient of determination statistical measure.
SMSA	=	Standard Metropolitan Statistical Area
SRMSE	=	a constant of proportionality to be estimated
STF 3B	=	Summary Tape File 3B of the 1990 United States census
T_j	=	the potential of place j to receive flows of movement; the predicted amount of attendees between the zip code origins and the zip code destination.

CHAPTER I

THE IMPORTANCE OF THE GEOGRAPHICAL MARKET TERRITORIES OF BASEBALL FRANCHISES

The Proposed Research

Baseball franchise owners, baseball leagues, and communities and their public officials all have an interest in knowing the geographical market territories of baseball franchises. Team owners must understand their franchise's market area in order to maximize revenue (Baade, 1987). Leagues give great importance to maintain an economically viable association. Recognizing the trade areas of franchises allows leagues to realize if ballclubs are able to attract the market threshold needed for solvency (Baade and Sanderson, 1997). Community officials should acquire knowledge about the market territories of baseball franchises so that public administrators can make rational decisions regarding the public subsidization of ballteams (Danielson, 1997).

However, the methods that these three interested parties utilize to obtain information regarding the geographical market territories of baseball franchises are either inefficient or inadequate. In order to learn where attendees reside, interested parties either conduct surveys; examine information resulting from ticket sales; or they apply the Basic Trade Area (BTA), which is a little larger than the size of a city's standard metropolitan statistical area, or other arbitrary ranges of distance from the stadium (Rosentraub and Swindell, 1993). Although well designed surveys generally produce fairly accurate predictions of market territories, it is extremely time consuming and expensive to perform them. This is also true with regard to obtaining information about a market area from ticket sales. On the other hand, assigning an arbitrary boundary, such as the BTA, to represent the geographical market territory of baseball organizations is an expeditious method. But, it is very possible that this latter approach does not correspond with the interaction behavior of baseball fans. Moreover, applying this approach does not allow one to realize which areas of the region produce more attendees than others.

In recent years spatial interaction models have been utilized frequently in the discipline of geography, as well as in the profession of marketing, to estimate the trade areas of various phenomena (Thompson, 1986; Fotheringham, 1988). It has been demonstrated that the gravity model, which is an example of a spatial interaction model, is able to provide reliable predictions of the trade areas of universities (McConnell, 1965; Kariel, 1968; and Leppel, 1993); state parks (Ellis and Van Doren, 1966; Cheung, 1972); and recreational trips (Baxter and Ewing, 1981). However, there appears to be no documentation of the use of gravity models to analyze the market areas of baseball franchises.

It is likely that a well calibrated spatial interaction model would be a more efficient method than conducting surveys or examining information derived from ticket sales. It is also probable that it would provide better predictions of the trade areas of baseball teams than the utilization of the BTA and other arbitrary ranges. Another advantage of spatial interaction models is that they are able to estimate the number of spectators that emanate from different origins. As a result, an operational model would benefit all interested parties. Therefore, it is the purpose of this thesis to determine if a gravity model is able to predict accurately the geographical market territory of professional baseball franchises, to indicate how the model can be improved upon, and to demonstrate how one can apply the model.

Interested Parties

Three different parties are concerned about the trade areas of baseball organizations. Owners of franchises, as well as their front office employees, hope to maximize revenue. They realize that the amount of income that they can earn is strongly dependent upon the size and the characteristics of their market territory. Leagues, which usually consist of a president, other league officials, and all the team owners that participate in the league desire to create and maintain a profitable association. They require that all of the teams that partake in the league reside in geographical trade areas which are able to sustain a ballclub. Public officials, and the communities that they represent, need also to be concerned. It is believed that baseball franchises can impact the local economies of principalities that host ballclubs; and of those that do not. The extent to which teams influence local economies relies heavily upon the origins of the attendees.

Franchise Owners

Prospective franchise owners, or owners who are contemplating moving their ballteam to another area, attempt to locate in a market that can generate enough revenue for their ballclub to make a profit. Regions with large populations generally offer more financial benefits than those with smaller populations. This is true because heavily populated areas often provide more ticket buyers than those with fewer inhabitants (Baade, 1987). Moreover, if an organization has arrangements that allow it to collect income from concession sales and souvenir purchases, it is beneficial for the franchise to be located in a market that can potentially produce a large number of spectators (Danielson, 1997).

Also important is the fact that proprietors obtain a fair amount of their earnings from advertising within the stadium. Due to the premise that large markets produce high attendances, companies believe that they will be promoting their products to large numbers of people. Consequently, owners can increase the asking price for stadium advertising space, and thus add to their total revenues (Danielson, 1997).

Because large attendances increase the amount of possible revenue, established baseball organizations attempt to incorporate within their market territory populous areas that are located at relatively great distances from their stadium. One example of a franchise that attempts to add to their trade area is the Baltimore Orioles. Lawrence Lucchino, the Team President of the Orioles, states:

> We embarked on a regionalization campaign... there was a great opportunity available in areas like Washington; York; Pennsylvania; and Annapolis. Regionalization became our watchword (Euchner, 1993).

The demographic characteristics of a trade area are arguably just as important as its size with regard to increasing the amount of income derived from ticket sales, food, beverages, souvenirs, as well as advertising within the stadium. Franchises hope to reside in a wealthy territory because it is easier to attract attendees who have a large quantity of recreational funds at their disposal. Such spectators are also more likely to purchase meals within the stadium and to acquire other stadium merchandise (Danielson, 1997).

Many advertisers target their commodities to people with disposable income. Owners hope to draw affluent customers to the ballpark so that all types of businesses will be willing to acquire advertising space within the stadium. As a result, wealthy markets can add to the demand for in-stadium advertising, thus increasing potential revenue for baseball organizations (Euchner, 1993).

Due to the notion that affluent attendees generate more revenue for ballclubs, already established baseball franchises also direct their marketing endeavors to the prosperous areas of their market territory. Generally, such attendees reside in the suburbs of the region. Not only do organizations market towards suburban residents, but they have also built stadiums within suburbs, or close to the suburbs, in order to make the stadium more accessible for suburbanites (Euchner, 1993). Franchises that construct stadiums within central cities commonly locate the stadiums near expressways so that suburban commuters can easily travel to and from the stadium (Johnson, 1993).

Since market size and its characteristics affect the amount of income that a baseball franchise can earn, the geographical trade area of a ballclub greatly influences the monetary value of a franchise (Scully, 1989). Therefore, it is clear that franchise owners must be aware of the traits of the region that their team occupies. Additionally, it is necessary for prospective proprietors and owners that intend to relocate their teams to closely examine the possible locations that they may inhabit.

Leagues

Leagues are interested in the geographical market territories of baseball franchises for reasons pertaining to relocation and expansion. League officials and owners of ballclubs understand that the financial health of all of the teams that make up the league is important to its economic well being. Therefore, league administrators and owners want all baseball organizations within a league to locate in economically viable markets. Leagues expect their franchises to locate in large and wealthy regions for the same reasons that franchise owners want their own team to occupy such areas (Baade and Sanderson, 1997).

In order to prevent competition between organizations within a region, leagues grant territorial rights to their franchises. Although there is a limited number of markets that accommodate more than one ballteam, territorial rights assure baseball organizations that they alone will occupy the market territory in which they reside. Regions that do contain more than one team generally have an extraordinarily high population (Markham, 1981). Leagues do not want franchises competing with one another for revenue, because one team may gain a competitive advantage over the other, which would increase the possibility that a franchise could become insolvent (Danielson, 1997).

League members have absolute authority regarding team relocation. Franchise owners who desire to relocate their franchise must receive the approval of a significant percentage of the other team owners (Johnson and Frey, 1985). The size of the population and the market characteristics of the proposed area often affect the owners' decisions (Euchner, 1993). Owners also take into strong consideration the territorial rights of franchises. Leagues are more willing to allow relocations if the proposed market lacks a franchise. The likelihood of being allowed to relocate also increases if the ballclub that is asking permission to move is, at the time, competing with another franchise within its current market. This is evident when one examines the five team relocations that occurred within major league baseball during the 1950's. Major league owners determined that the proposed locations had the size and prosperity necessary to secure a ballclub. Furthermore, all of the five teams that were allowed to relocate were sharing a region with another team. Since the proposed areas were not occupied by another franchise, there was relatively little resistance from the league (Danielson, 1997).

Baseball owners also have complete control with reference to the addition of new teams in the league. Similar to decisions regarding relocation, current owners vote upon which prospective owners will be granted the right to own a franchise (Johnson, 1993). The size and characteristics of the potential markets, as well as concerns regarding territorial rights, are some of the most important subjects that owners consider when deciding in which markets to expand (Danielson, 1997). In the past decade, the cities of Denver, Miami, Phoenix, and St. Petersburg successfully obtained major league expansion teams. Baseball promoters from these four areas emphasized the potential of attracting numerous wealthy customers (Euchner, 1993; Danielson, 1997). The city of Buffalo also attempted to acquire an expansion franchise during this same time period. An important reason why Buffalo failed to obtain a franchise is because their market is smaller than the afore-mentioned four regions. Major league owners also rejected Washington D.C.'s application for an expansion team. This was predominantly due to the perception that the Baltimore Orioles have included Washington D.C. as part of their own market, and owners do not want two teams competing for these same customers (Danielson, 1997).

The size of the proposed area for an expansion team also is extremely important to minor league officials and owners of minor league teams. Baseball organizations that are hosted by small communities are less likely to succeed economically than those that reside in larger principalities. In fact, from 1987-1991, approximately two-thirds of all minor league franchise relocations took place in regions that had accommodated less than one-hundred thousand people (Johnson, 1993). As a result, minor league owners are skeptical that ballclubs in sparsely populated areas can survive, and are, therefore, wary of awarding a franchise to a small community.

Communities and Public Officials

Because the demand for franchises is much greater than the supply, owners of sports franchises have a better negotiating position than do local officials (Baade, 1987). The great demand from local authorities is mostly attributable to the notion that a sports franchise can generate economic development within the host community. The limited number of franchises is generally due to the fact that leagues have the power to control the number of teams. Owners use this advantage to request financial assistance from state, county, and local governments. The fact that erecting a major league stadium may cost two hundred million or more dollars indicates the potential amount of public assistance needed in order to build a stadium (Noll and Zimbalist, 1997). The cost of stadium construction for minor league teams is decidedly less expensive than that of major league stadiums. Normal construction costs for minor league stadiums are about ten to twelve million dollars (Johnson, 1993). However, cities that host minor league baseball franchises are smaller than those that are home to major league baseball franchises (Chalip and Johnson, 1996). Therefore, for these communities such an investment is often of major proportions.

Major and minor league owners also request subsidies from governments for a number of other amenities. Local authorities often include all or most of the following in a stadium package: free or subsidized land, favorable leases, tax breaks, improved roads near the stadium, and police protection surrounding the area (Johnson, 1993; Danielson, 1997). If their demands are not met, many owners will refuse to locate in a particular area, or will threaten to leave the present locale for another principality that is willing to meet their demands (Johnson and Frey, 1985; Johnson, 1993).

Many public authorities of cities and suburbs attempt to obtain a baseball team or to prevent a ballclub from relocating, because they believe that baseball is an export industry. According to export base theory, businesses are separated into those which produce goods and services for the export market, and those which provide for the local market (Tiebout, 1956a). The economic development of regions is undoubtedly associated with those industries that create products for the export market. This is true because export industries primarily sell commodities to people who reside outside the jurisdiction in which the industry is located. Therefore, such businesses obtain money from other areas and much of this money gets filtered throughout the local economy. The flow of this money allows residentiary businesses, who only provide for the local market, to be established within the principality. Not only do residentiary industries subsist due to the existence of export businesses, but also residentiary activities can expand and increase in number only if the export activities within a principality can generate additional money into the local economy (North, 1955).

There appears to be a slight difference between typical export businesses and baseball organizations as export industries. Typical export businesses ship goods out to markets, and money flows into the host community. On the other hand, with regard to baseball organizations, the market travels to the export industry for its goods. Due to this fact, one can argue that baseball teams contribute to the local economy in more ways than do typical export businesses. Not only will money flow throughout the local economy because of the existence of the franchise, but attendees may also purchase goods and services from residentiary activities outside the ballpark.

However, many academicians maintain that the existence of a franchise does not contribute to the local economy. They suggest that if most of the attendees are residents of the host community, a great portion of the leisure money that the franchise obtains is money that is simply shifted away from other recreational activities in the principality to the baseball organization (Chalip and Johnson, 1996). Since residents may redistribute some of their income from other businesses to the ballteam, it is possible that any economic development that is created by the franchise will eliminate other forms of economic activity in the principality (Rosentraub and Swindell, 1993). Baade and Dye echo this notion:

> (the) fundamental issue is the extent to which the stadium causes a net income in area activity rather than a mere reallocation or redistribution of the same level of activity (Danielson, 1997).

It is obvious that communities and their public officials need to understand the geographical market territory of franchises so that accurate regional economic impact analyses can be performed. The major premise of the concept of export sales is that the geographical market territory of baseball franchises extends outside city borders. It should seem obvious that the larger the geographical market territory, the greater the potential economic impact that the host community receives from export sales. On the other hand, if the market territory of a baseball franchise is relatively small, the potential economic impact that the city receives will be less. In this instance, most of the spectators are from the principality that hosts the franchise. Therefore, a great portion of the money being spent in and around the stadium may simply be leisure money that is being redistributed from other recreational activities within the city to the baseball organization and businesses surrounding the stadium (Baade, 1995).

Assuming that baseball franchises behave like export industries, communities need also to be concerned with the geographical market territory of franchises in order to estimate the impact of import substitution. The principal supposition of import substitution is that due to the existence of the baseball organization, people from within the community will remain in the community in order to attend a baseball game. As a result of the presence of the baseball franchise, money is retained in the principality, and can add to the amount of money injected into the local economy. If the ballclub were not located within the city, the baseball fans from the community would travel to another principality to attend a baseball game. Therefore, the local economy would lose potential leisure money, because its own city is now within the trade area of a baseball franchise in another city (Baade, 1995). As a result, with regard to the economic impact of import substitution, it may be in communities' best interests to accommodate a team. On the other hand, if baseball franchises do not operate like export industries, there is little economic reason for a community to attempt to obtain a team.

Clearly, franchise owners, leagues, public officials and the communities that they represent have a strong interest in knowing the geographical market territories of baseball teams. Owners realize that the size and the characteristics of the market can greatly influence the amount of revenue that they collect. Leagues desire viable markets for each of its franchises, and they also want to avoid competition by granting territorial rights to their teams. Public officials and communities must recognize that the trade area of a franchise greatly influences a baseball organization's impact upon local economies. The following chapter will discuss current methods that are utilized to determine the trade areas of teams; it will attempt to demonstrate the inefficiency or the inadequacy of each of these approaches; and it will propose a new method of realizing the market territories of ballteams.

CHAPTER II
METHODS OF DETERMING THE TRADE AREAS OF FRANCHISES

Problems With Current Methods

Existing methods utilized to determine the geographical market territories of baseball franchises are either extremely time consuming and expensive, or are based on assumptions with little theoretical or empirical basis; whereas, the application of gravity models to gain knowledge of trade areas is a relatively efficient and inexpensive process (Thompson, 1986). Although the theoretical justifications regarding the use of gravity models have been questioned, gravity models have produced extremely accurate predictions of the trade areas of various phenomena (Niedercorn and Bechdolt, 1969; and Haynes and Fotheringham, 1984). Furthermore, it is possible that a gravity model could provide valuable information pertaining to the market areas of ballteams that other approaches are unable to furnish. However, before the gravity model and its advantages are examined, the discussion will first focus upon what information teams, leagues, and those who perform economic impact analyses hope to obtain from examining the geographical market territory of ballclubs. This section of the discussion will also attempt to demonstrate that the methods that these three interested parties utilize are either inefficient, or are not able to fulfill the needs of the interested parties.

Franchise Methods

Understanding various aspects of their teams' geographical market territories allows baseball franchise owners to increase their profits. For example, recognizing where most of their attendees originate allows the current owners and their front office to direct their marketing efforts appropriately. Additionally, for the purposes of marketing, owners should attempt to understand how their teams' trade areas have changed over time. Furthermore, owners who are planning to build a new stadium ought to determine the location that would draw the most attendees.

For this project, several teams' officials supplied previously collected data concerning the trade areas of their respective organizations. In order to obtain this information, teams deemed it necessary to survey their attendees. The use of properly contrived surveys to determine a market area usually yields reliable estimates (Fotheringham, 1986). Geographers, marketing professionals, and transportation planners, as well as members of other disciplines and professions conduct surveys in order not only to ascertain the market territories but also to determine the market characteristics of various enterprises (Fotheringham, 1986; Harvey, 1987; and Timmermans, Borges, and Waerden, 1992). Therefore, assuming that the ballclubs prepared properly designed surveys, the franchises acquired quality assessments of the origins of their attendees, the quantity of spectators that emanate from each origin, and several demographic characteristics of the attendees. As a result, the owners and the front offices of these ballteams are able to direct their marketing efforts accordingly.

However, surveys are expensive to conduct and the costs of performing surveys have been rising (Rossi, Wright, and Anderson, 1983). It also takes a great amount of time to collect, categorize, and interpret the data that result from surveys (Babbie, 1990). For example, one franchise disclosed that it was necessary to conduct three surveys in order to acquire enough responses which would accurately represent the team's market territory. Consequently, the organization required nearly three months to merely accumulate the requested information. The effort that is needed to employ surveys decreases the amount of time that employees possess to accomplish other job requirements. Although gaining knowledge of their team's market territory is very important regarding the amount of revenue that a franchise receives, the opportunity costs and the monetary costs that are encompassed within surveys may influence owners and their front office officials not to perform them. According to a 1996 survey conducted by Baade and Sanderson, most minor league baseball franchises acknowledged that they are not aware of the origins of their attendees (Baade and Sanderson, 1997). Therefore, a more efficient method of determining the market areas of baseball organizations will not only save time and money for those franchises that actually attempt to acquire information about their trade area, but it may also increase the number of ballclubs that might begin to closely examine their markets.

Because surveys are an inefficient and an expensive approach to understanding the trade areas of baseball franchises, they are not able to provide some pertinent information. For example, to know how a market territory has changed over time, a franchise would be required to conduct surveys continually. This may not be fiscally possible for many ballclubs. Furthermore, it is not possible to conduct the number of surveys needed in order to realize the best location to construct a stadium. Consequently, another approach is needed in order to acquire this knowledge.

League Methods

Leagues wish to maintain economic stability within their respective leagues. Therefore, they want to know that a proposed region for an expansion franchise can provide the attendance and income thresholds needed to support a ballteam. Moreover, in order to prevent instability, leagues do not allow most teams to compete for attendees. This is accomplished by granting teams territorial rights. These rights do not permit a team to locate in another franchise's trade area. Therefore, leagues also attempt to discern the market boundaries of baseball franchises.

From 1903 to 1952, there were no major league franchises that relocated to another region. Previous to 1953, a unanimous vote of league owners was required to permit a team to move from their current home to another city (Danielson, 1997). However, franchise owners and league officials relaxed rules concerning team relocation. The new rule allows an owner to move a franchise with the permission of at least three-quarters of the other team proprietors. After 1953, mostly due to this modification, seven teams received approval to relocate (Scully, 1989).

It appears that as franchises were beginning to relocate, Major League Baseball officials merely studied certain demographic characteristics when attempting to discern if a proposed region could sustain a baseball franchise. League administrators only considered the population, the growth potential, and the income of the market in question. This procedure only begins to describe the qualities of prospective territories. Consequently, the Kansas City Athletics and the Milwaukee Braves, two of the organizations that had moved, later claimed that they were struggling financially due to poor market areas. The owners of these two franchises were later granted permission to relocate to Oakland and Atlanta respectively (Miller, 1990). Nevertheless, team owners gave other franchises to Kansas City and Milwaukee through expansion. Fay Vincent, a former Commissioner of Major League Baseball, comments critically on these two cities as well as on other cases:

> We moved from Kansas City to Oakland and replaced it with a team in Kansas City. What was the point of that? We moved from Washington twice and now Washington makes an effort to get a team. We moved from Milwaukee, we moved from Seattle and in each case the teams were replaced (Danielson, 1997).

Obviously, Major League Baseball officials would like to prevent future instability within the sport. This can be accomplished by determining if a region can supply the minimum attendance, as well as income, threshold needed in order to support a baseball franchise. Therefore, in an effort to acquire this information, owners currently demand that expansion applicants sell season tickets to area residents (Danielson, 1997). As a result, league administrators and owners are able to determine immediately if the size of the potential market is large enough to sustain a ballteam. Moreover, since season ticket packages are generally expensive, leagues can comprehend if the proposed location will draw relatively wealthy patrons (Zimbalist, 1992).

In order to obtain this knowledge, prospective owners must spend a great deal of time and money. Those who desire to acquire a franchise must market the proposed ballteam to area residents; and they must be prepared to process ticket orders. Therefore, potential proprietors may have to invest in an infrastructure such as renting offices and buying computers. They also must hire and pay an office staff, marketing consultants, and a public relations department. Furthermore, it is necessary to buy advertising space or commercial time in newspapers and magazines, on billboards, as well as on radio stations and television networks (Markham 1981; Zimbalist, 1992). Clearly, possible owners, who are not successful in obtaining a team, can sustain substantial monetary and opportunity costs without reward. Although Major League Baseball's arduous demands of determining the market areas of proposed franchises are probably quite effective, it seems that prospective proprietors would welcome a more practical method so that the costs of applying for an expansion franchise are diminished.

Leagues also attempt to maintain stability by preventing teams from competing for attendees. In their attempt to maintain one market area for one team, baseball leagues grant territorial rights to their franchises. The authorities of Major League Baseball arbitrarily established a fifty to seventy-five mile range from a ballteam's host city as a franchise's market area (Danielson, 1997). Minor league baseball officials declared that no other minor league baseball organization is allowed to locate within a thirty-five mile radius from another ballclub's stadium (Johnson, 1993). These distances have not been modified since the dramatic acceleration of the growth of metropolitan areas. As a result, this method probably does not allow for the inclusion of numerous areas that provide franchises with attendees (Danielson, 1997). Therefore, another approach is needed to examine the effect of urban expansion upon the trade areas of teams, so that owners do not lose potential customers to other baseball organizations that locate near their present territorial boundary.

Moreover, it is possible that franchises have different market ranges. Some analysts who examine the markets of baseball teams believe that setting arbitrary boundaries of the market territories of teams may be disadvantageous to leagues. It is possible that a league would not allow an owner to locate a franchise in an area that is capable of supporting a ballclub; that is, if the market territory of another ballteam is relatively small. On the other hand, a league might permit a proprietor to locate in a region that will not sustain a baseball team; that is, if the trade area of another franchise is relatively large (Markham, 1981). Consequently, another approach is required in order to advance the interests of baseball leagues.

Methods Used in Economic Impact Analyses

In order to obtain accurate estimates of the economic impact of baseball franchises upon local economies, it is necessary to know the geographical market territories of organizations. This is true, because with this knowledge one can understand the amount of leisure money that enters the community from attendees who reside outside the principality, which is equivalent to knowing the effect of export sales. One can also estimate the amount of leisure money that a community loses due to its residents traveling to another community that hosts a franchise; the equivalent of knowing the impact of import substitution. With the aid of this information, government officials can decide if it is fiscally wise to subsidize baseball franchises either to obtain, or to retain, a team.

Many analysts who have conducted examinations of the economic impact of baseball franchises upon regional economies fail to consider the geographical market areas of teams. Therefore, the phenomena of redistributed spending, export sales, and import substitution are not considered in these studies (Baade, 1987; Steinhoff, 1988; Johnson and Owen, 1993). On the other hand, some investigators make the effort to perform surveys so that they are able to realize the market territories of ballclubs. Noll and Zimbalist write:

> To estimate the exports attributable to a team, local economic impact studies frequently conduct surveys of those in attendance at games to ascertain where fans live and then count as tourists attracted by the team all fans who reside outside the area (Noll and Zimbalist, 1997).

As previously mentioned in this paper, well designed surveys are able to provide very accurate predictions of the trade areas of baseball organizations, but they are extremely expensive and time consuming. As a result, in order to save time and money, many authors of economic impact studies assume that the Basic Trade Area correctly defines the market territories of ballclubs.

The 129th edition of the Rand McNally Commercial Atlas and Marketing Guide provides a definition of the Basic Trade Area:

> An area surrounding at least one Basic Trading Center. Each Basic Trading Area is named after one or more cities which are its Basic Trading Centers. All Basic Trading Area boundaries follow county lines and are drawn to include the county or counties whose residents make the bulk of their shopping goods purchases in the area's Basic Trading Center or its suburbs. Some Basic Trading Areas have two or more Basic Trading Centers, generally because residents may conveniently shop at either one.

The 129th edition of the Rand McNally Commercial Atlas and Marketing Guide gives the definition of Basic Trading Centers as follows:

> A city which serves as a center for shopping goods purchases for the surrounding area... Basic Trading Centers also serve their surroundings with various specialized services, such as medical care, entertainment, higher education, and a daily newspaper.

It should be mentioned that the Basic Trade Area of a city is larger than the Standard Metropolitan Statistical Area (SMSA) defined by the Bureau of Census. This is the case because the BTA includes rural communities that depend upon large urban centers for recreational activities. Rosentraub and Swindell write, "it is common to use the BTA, not SMSA, as the geographical area of reference in calculating attendance at games and spending." (Rosentraub and Swindell, 1993).

Clearly, this a rough estimate of the influence that baseball franchises have upon the surrounding area. It is possible that a baseball franchise does not serve an entire metropolitan area, and thus any calculations of export sales may be overestimated. As a result, the baseball organization will not have the economic impact that is projected upon the host community. Conversely, the range of a franchise may be larger than the estimate of the BTA. If this is the case, projections of the economic impact of export sales will be underestimated.

The utilization of the Basic Trade Area may also cause poor assessments of the effect of import substitution upon communities that do not host ballteams. This may be true because if the BTA incorporates an area that does not supply attendees to ballgames, then the projection of the economic influence of import substitution upon this community will be exaggerated. On the other hand, the BTA may not encompass a principality in which its residents do attend games. Therefore, authors who apply this method would probably conclude falsely that the baseball organization does not impact the local economy of this community.

Furthermore, employing the BTA does not allow one to determine the quantity of spectators who originate from different areas of a market territory. Without this knowledge, those who conduct economic impact studies cannot be certain of what proportion of money a host community receives is derived from export sales. Also, one is not able to ascertain the quantity of money that a principality loses to the community that hosts the ballclub. As a result, another method must be utilized in order to assist investigators who attempt to determine the economic impact of baseball organizations upon local economies.

Background of the Gravity Model

Applying a gravity model to predict the geographical market territories of baseball franchises may have numerous advantages over the previously mentioned methods. However, before these benefits are discussed, the background of the model, as well as the components of the model, will be addressed.

The gravity model is based upon the normative theory of economic geography. The foundation of this theory is that people behave in similar fashions. Therefore, it is possible to use scientific approaches and models in order to examine the phenomena that occur within the discipline of economic geography. The gravity model, which is a modification of Newton's law of gravitation, is one of the original spatial interaction models to be employed in the discipline of geography (Haynes and Fotheringham, 1984). Instead of using the model to predict gravitational pull in the cosmos, social scientists (such as Isbell, 1944; Stewart, 1947; and Carrothers, 1956) began to utilize this mathematical formulation in order to forecast human spatial interaction (Desta, 1988). Using a model that was created from the laws of physics has caused some uncertainty whether the model should be applied toward human spatial phenomena, because there is little theoretical basis that explains why humans should behave like objects in outer space (Niedercorn and Bechdolt, 1969). However, Alan Geoffrey Wilson in 1970 resolved this dilemma by demonstrating that the model can be derived from entropy maximization methodology (Desta, 1988).

Since its creation, the model has been expanded so that there currently exists an entire family of gravity models (Wilson, 1971). The advent of the other models has allowed the gravity concept to be used frequently to describe different types of spatial interaction patterns (Haynes and Fotheringham, 1984). For example, several forms of the gravity model have been used to determine the market areas of such activities as state parks (Ellis and Van Doren, 1966); recreational trips (Baxter and Ewing, 1981); secondary schools (Pacione, 1989); and universities (McConnell, 1965; Kariel, 1968; Leppel, 1993). Academicians, as well as marketing professionals, have illustrated that gravity models are able to provide reliable estimates of trade areas (Pooler, 1994).

The Components of the Gravity Model

The formula for the traditional gravity model is as follows:

$$T_{ij} = k(P_j^{\,a} P_i^{\,b}) \;/\; D_{ij}^{\,c} \qquad \text{(E1)}$$

where:

T_{ij}	=	the predicted spatial interaction between place i and place j
P_i	=	a mass variable representing place i, the origin
P_j	=	a mass variable representing place j, the destination
D_{ij}	=	a variable representing spatial friction, or deterrence, between place i and place j
k	=	a constant of proportionality to be estimated
a,b,c	=	coefficients to be estimated

(Wilson, 1971)

This formula attempts to predict spatial interaction patterns by assuming that the amount of spatial movement that occurs between an origin and a destination is directly proportional to the mass of the origin multiplied by the mass of the destination, and inversely proportional to the spatial friction between an origin and a destination (Kariel, 1968). It must be made clear that the gravity model is applicable only to the aggregate population, not to individuals (Fotheringham, 1988). However, social scientists often assume that if the aggregate population behaves in a certain manner, it is likely that a typical individual will behave in the same way (Greenwood and Sweetland, 1972). Applying this notion, the model is able to produce relatively accurate estimations of the likelihood of an individual participating in the activity that is being examined (Kariel, 1968).

In order to comprehend how the traditional gravity model is able to provide reliable predictions of spatial interaction behavior, it is necessary to understand the variables which compose the formula. The origin mass variable represents a characteristic, or characteristics, of origins which demonstrates the origins' capability to send to destinations the units that one is investigating. Some examples that are often used as the origin mass variable characteristics are: the population of an origin, the origin's population density, and the median household income of the area (Haynes and Fotheringham, 1984). The population of zip code origins is employed in this thesis in order to predict the spatial interaction patterns of baseball game attendees (this will be discussed in greater detail in Chapter III). The destination mass variable often depicts the allure of places (Niedercorn and Bechdolt, 1969). For example, the number of square feet of a supermarket or a retail outlet is often applied in examinations of the trade areas of these destinations (Fotheringham, 1988). The seating capacity of baseball stadiums is used as the destination mass variable in this thesis (this will also be expounded upon in Chapter III). Consequently, as the values of the mass variables increase, the greater the likelihood that interaction occurs between the origins and the destinations. However, the mass variables may not equally contribute to the explanation of the interaction behavior between places. Therefore, coefficients, or parameters, are incorporated into the mass variables as exponents. The coefficients allow one to determine which of the two mass variables have a greater impact upon spatial interaction (Johnston, 1978). The higher the value of an exponent, the greater the effect that a particular mass variable has upon interaction behavior (Haynes and Fotheringham, 1984).

Also included within the traditional gravity model is a variable that delineates spatial friction. Spatial friction negatively affects the magnitude of spatial movement that occurs among places (Batty and Mackie, 1972). This is true because as spatial friction expands, people have less knowledge of places, the financial expenditures that are needed to interact increase, and psychological impediments toward interaction grows (Leppel, 1993). Generally distance between places, or the time that is needed to travel between places, is employed as the spatial friction variable in most examinations. Distance in miles is used in this thesis (this will be discussed in greater detail in Chapter III). The variable is also modified by a parameter to determine the influence of spatial friction upon spatial movement. High parameter values indicate that the spatial friction variable is a strong deterrent with regard to the interaction between places (Haynes and Fotheringham, 1984).

The constant that is incorporated within the model is a coefficient of proportionality (Johnston, 1978). The variables that compose the model are usually measured in different units. Therefore, the constant is needed in order to balance the entire formula (Haynes and Fotheringham, 1984).

The Advantages of the Gravity Model

Spatial interaction models have been previously used to calculate the number of people that may attend an event (Fotheringham, 1996). However, there is no evidence that a spatial interaction model has been employed to determine the geographical market territories of baseball franchises. The use of a gravity model may produce more accurate estimates of the trade areas of baseball organizations than the use of the BTA, or other arbitrary delineations. The model is also a more efficient method than performing surveys or obtaining information from ticket sales (Thompson, 1986). If a well calibrated gravity model is able to accurately predict the trade areas of ballclubs, it would benefit all interested parties.

Benefits for Owners

A well calibrated gravity model, which is a model which has been fitted by a goodness-of-fit test in order to ascertain reliable parameter estimates, would be able to provide information that is pertinent to the interests of prospective owners. For example, the model would be advantageous to those who are applying for an expansion franchise. A gravity model would be able to approximate the number of people who would attend a game, as well as the number of wealthy attendees who would travel to the stadium. Therefore, it would no longer be necessary for leagues to require that potential owners sell season tickets in order to demonstrate that a region could financially support a ballclub. Clearly, this would ease the burden of those applying for an expansion franchise.

An operational model also would be able to help direct marketing efforts of established franchises because it can divide a market territory into different sections (Thompson, 1986). Therefore, the model can predict which areas of a market territory would send the most attendees. Moreover, the model can assess if a team's trade area incorporates communities with large populations that are located at relatively great distances from the stadium.

However, the trade areas of baseball organizations are dynamic. This is true because teams' market territories are affected by demographic changes that occur in the areas where franchises reside (Danielson, 1997). Nevertheless, an operational gravity model would be able to efficiently demonstrate how market areas have transformed during a certain time period, and it could predict how trade areas will vary in the future. It would, therefore, aid future marketing endeavors.

A functional gravity model would assist prospective owners, as well as current owners, who are attempting to decide upon a location for a stadium. Not only would a gravity model allow one to determine which location will draw the largest number of attendees, it can also reveal the location that will draw the largest possible number of affluent attendees.

It is true that surveys can provide some of the information that a gravity model provides, but they are extremely time consuming. It is also true that surveys cannot collect some of the information which gravity models are able to furnish relatively expeditiously.

Benefits for Leagues

Applying a gravity model to determine the market areas of teams may also benefit leagues. Instead of granting territorial rights by arbitrarily employing ranges of distance, a working model can ascertain the market boundaries of ballclubs. The model may disclose that teams have different market boundary ranges. Therefore, the model could indicate that there are locational opportunities for leagues to place teams, or it may reveal that a ballteam's market territory already encompasses an area that is attempting to obtain a ballclub. The current method that leagues use to allot territorial rights might be too static, and it is possible that the current approach does not allow league officials to have the flexibility needed to make wise decisions regarding the placement of franchises. As a result, the model could assist leagues in finding the best regions to locate ballteams.

Benefits for Economic Impact Analyses

Due to the fact that a gravity model is able to separate a market territory into several segments, analysts can better estimate the economic impact that a baseball franchise has upon the local economies of the region that hosts the ballclub. This is the case because applying an effective gravity model would allow one to efficiently and accurately estimate the economic effects of export sales and import substitution.

This is beneficial for communities that are contemplating providing public subsidies to retain a baseball franchise. Interested parties can realize the number of residents, as well as residents of other principalities, that attend ballgames. Therefore, elected officials will be able to determine the proportion of money that the local economy receives as a result of export sales or redistributed spending. Public officials that encounter this situation must also understand the economic impact of import substitution. With the use of the model, public authorities could project how many people from their principality would attend games if the team were to move to another city within the region. As a result, government officials would comprehend the amount of money that would leave the community.

An operational model would help communities that do not host ballclubs as well. Since city administrators could discern the spatial behavioral patterns of attendees, they would be able to determine the amount of money that the community would acquire due to export sales, if it were to become host to a baseball franchise. They could also ascertain how much money they are presently losing to another community where the ballteam resides.

If a gravity model is able to provide reliable predictions of the geographical market territories of baseball franchises, it would no longer be necessary for investigators to conduct surveys in order to acquire this information. Moreover, it would provide a better alternative than the application of the BTA.

The use of a well calibrated gravity model may be advantageous to all interested parties. Franchise owners and their front offices could make logical and efficient locational decisions, create strategic marketing plans, and study the changes that occur to their trade areas over a period of time. Moreover, the burden of applying for an expansion franchise would be lessened. The gravity model may also assist leagues in making insightful decisions regarding the location of teams. Finally, the model would benefit entire communities who want to determine if it is economically wise to offer public subsidies to team owners.

However, gravity models are sometimes limited in their explanatory power of trade areas. Often other variables must be considered in order to accurately explain a market territory. Therefore, it is the purpose of this thesis to determine how well a gravity model predicts the geographical market territory of baseball franchises and to evaluate other variables that may add to the explanatory power of the model. The following chapter will outline the methodology of this examination.

CHAPTER III
METHODOLOGY

Outline of the Methodology

In order to test a gravity model's predictive ability with regard to the geographical market territories of baseball franchises, actual data was obtained from six Single A minor league baseball franchises. Single A baseball franchises are considered to be the lowest level of the hierarchy of professional baseball franchises that play a full season. (This will be discussed in greater detail in Chapter V). Due to the nature of the data, the potential model, which is discussed in this chapter, was employed to predict the geographical market territories of the six franchises. In order to ensure that the results of the model were valid, two different goodness-of-fit tests, the coefficient of determination (R^2) and the standardized root mean square error (SRMSE), were applied to the results of the potential model. Therefore, this section of the thesis will present a reasonable description of the potential model and its capability of producing accurate predictions of the trade areas of baseball franchises.

Past research has stated that the demographic characteristics of a region's population influences a franchise's market territory (Euchner, 1993; Stix, 1993: and Danielson, 1997). Therefore, demographic data was collected to determine if other variables can add to the predictive power of the potential model. A detailed account of the selection of the demographic variables is provided later in this chapter. In order to discern if a relationship exists between the demographic variables and the regression residuals, Pearson's correlation coefficient test statistic was employed. Pearson's correlation coefficient test statistic was also utilized to ascertain if a relationship exists between the demographic variables and the SRMSE residuals. Variables that are correlated with either the regression residuals, or the SRMSE residuals, should be incorporated into the model appropriately. This too will be expounded upon later in this chapter. Therefore, this section of the analysis should allow one to realize other variables that are able to add to the explanatory power of the potential model, and also in what form they should be included in the model.

The Potential Model

The potential model is a derivation of the traditional gravity model (Isard, 1960). Therefore, it, too, is based upon the normative theory of economic geography and Newton's law of gravitation (please refer to Chapter II). This model has been used extensively to predict or to examine the market areas of several different types of phenomena (McConnell, 1965; Kariel, 1968; Cheung, 1972; Pacione, 1989; and Talen and Anselin, 1998). Unlike the traditional gravity model, the potential model estimates the amount of movement between one area and all other areas of interest (Haynes and Fotheringham, 1984). Therefore, one can examine the unidirectional spatial interaction between multiple origins and a single destination (Niedercorn and Bechdolt, 1969). Because this is the same type of phenomenon that I am analyzing, I employed the potential model in order to predict the geographical market territories of minor league baseball franchises.

The equation of the potential model that is utilized in this thesis is given on the following page:

$$T_j = k^* \times (\sum P_i^b / D_{ij}^c) \qquad \text{(E2)}$$

where:

T_j	= the potential of place j to receive spatial flows of movement
P_i	= a mass variable representing place i, the origin
D_{ij}	= a variable representing spatial friction, or deterrence, between place i and place j
k^*	= a constant of proportionality to be determined; embedded in this term is the seating capacity of the stadium and the number of games where attendees were surveyed
b,c	= coefficients to be estimated

By examining the formula of the traditional gravity model (please refer to Chapter II), one can understand how the potential model is derived. As previously mentioned, the traditional gravity model attempts to predict the spatial interaction flows between many origins and many destinations. In order to predict the amount of movement to only one destination, the formula of the traditional gravity model must be modified. Therefore, only the orgin mass variable, P_i is divided by the spatial friction variable, D_{ij}. Since there is only one destination, the destination mass variable, P_j is now embedded in the constant k^* which is used to multiply the quotient of P_i and D_{ij}. Consequently, one who employs this model attempts to understand a destination's potential of receiving flows of movement from the surrounding area.

To test the explanatory power of the potential model it is necessary to obtain actual data from baseball franchises. The following studies all utilized actual spatial movement data in order to investigate the capability of a gravity model to produce accurate estimates of interaction: McConnell, 1965; Ellis and Van Doren, 1966; Kariel, 1968; and McAllister and Klett, 1976. Therefore, I requested the number of tickets sold per zip code from over one-hundred minor league ballclubs. The use of zip codes as the unit of study is acceptable since it has been used in other geographic studies (Pacione, 1989; Leppel, 1993). Six Single A organizations responded with 1997 sample data that they had collected. Table 1 shows the franchises that responded with information, the host city and state of the organization, the league in which the franchise participates, and the number of zip codes from which the sampled attendees originate. Figure 1, on page 35, displays the locations of these franchises.

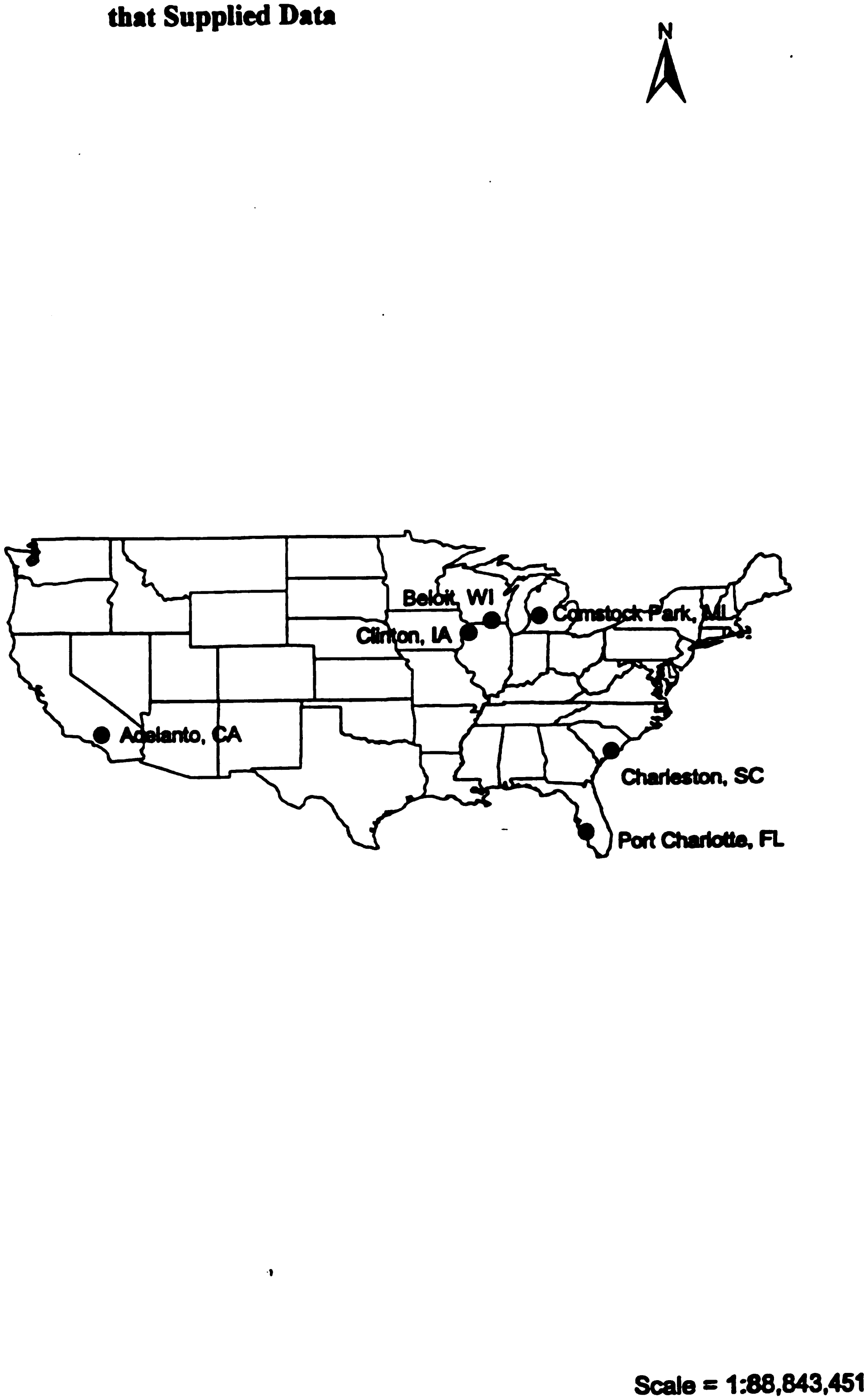
TABLE 1
Franchise Name, Location, League, and Number of Zip Codes

FRANCHISE	LOCATION	LEAGUE	ZIP CODES
Beloit Snappers	Beloit, WI	Midwest	78
Charleston RiverDogs	Charleston, SC	South Atlantic	50
Charlotte Rangers	Port Charlotte, FL	Florida State	24
Clinton LumberKings	Clinton, IA	Midwest	142
High Desert Mavericks	Adelanto, CA	California	40
West Michigan Whitecaps	Comstock Park, MI	Midwest	178

As one can realize, the six data sets that were applied for this thesis are rather diverse. Six different states and four different leagues are represented, and the number of zip code origins in each data set ranges from twenty-four to one-hundred seventy-eight.

The size of the population of each zip code under study was utilized as the origin mass variable, P_i. The populations of the zip codes were obtained from the Summary Tape File 3B (STF 3B) of the 1990 United States census. The STF 3B contains one-hundred percent counts for total persons in each zip code in the United States. The literature is well documented with reference to using population as a mass variable within

FIGURE#1: Location of Franchises that Supplied Data



gravity models. McConnell, 1965 and Kariel, 1968 both employed population as the origin mass variable in order to test the predictive ability of a potential model with regard to the origins of enrolled university students. Cheung, 1972 utilized population as a mass variable in order to explain recreational park visitation patterns. Haynes and Fotheringham, 1984 also applied population as the push variable in an attraction constrained gravity model which was used to predict attendance at conventions.

The Pythagorean distances, or the straight-line distances, between the geometric centroids of the zip code origins and the geometric centroids of the zip codes that contain the stadium were used to represent the deterrence variable, D_{ij}, in the potential model. The distances were obtained from ZipFind, http://link-usa.com, which is an Internet company. Distance is often employed as the spatial friction variable in spatial interaction models, and it is excellent for estimating intraurban spatial movement (Ewing, 1980; Ottensmann, 1997). Pacione, 1989 utilized straight-line distance in order to study accessibility to secondary schools. However, it is also necessary to calculate the distance traveled by attendees who reside in the zip code that contains the stadium, or the intrazonal separation within the host zip code. This was accomplished by dividing the distance value of the zip code nearest to the stadium in half. Thrill, 1995 applies this method when attempting to model store choices.

As a result, the potential model employed in this thesis assumes that the number of people that attend baseball games, T_j, is directly proportional to the population of the zip code origin, P_i, and is inversely proportional to the distance between the centroids of the zip code origins and the centroid of the zip code that hosts the stadium, D_{ij}.

Estimation of the Potential Model

The potential model predicts attendance values for each zip code of a franchise's market territory. In order to test the explanatory power of the model for each of the six franchises, a loglinear least-squares regression analysis was applied. This is the conventional approach of calculating the parameters of a gravity model (McAllister and Klett, 1976). For example, both McConnell, 1965 and Kariel, 1968 employed loglinear least-squares regression to test their potential models. This method is able to demonstrate causal relationships between the dependent variable and the independent variables. That is, with regard to this thesis, one can understand the contribution of both P_i and D_{ij} with reference to explaining the variance of the actual number of attendees. Additionally, a researcher using ordinary least squares regression analysis is capable of testing the significance of estimated parameters, subject to specific assumptions (Thompson, 1986).

However, it must be noted that regression analysis is an imperfect method. Therefore, another goodness-of-fit test, the standardized root mean square error (SRMSE), was also applied to test the predictive ability of the potential model. Before the SRMSE statistical test is discussed, some of the problems that are associated with regression analysis will be addressed.

First, one must be cautious of creating an uninterpretable equation. For example, if there is multicollinearity among the independent variables of the regression equation, that is, when two or more variables are strongly correlated, the results will most likely be uninterpretable (McAllister and Klett, 1976; and Thompson, 1986).

Another problem is that the coefficient of determination should not be used to assess a model's results across different data sets. That is, an investigator should not make any conclusions by comparing a model's R^2 values of two different sets of data. This is due to the fact that the variance of the actual data values influences the value of the test statistic (Knudsen and Fotheringham, 1986).

Since the loglinear least-squares regression is a function of the observed data, the resulting parameter values may be inaccurate. This is because the analysis gives different weights to the observations. That is, each observation of the data is not treated equally. Therefore, it is possible that outliers are given too much weight by the analysis, thus causing inaccurate parameter values (Batty and Mackie, 1972).

To obtain coefficient values and to test the goodness-of-fit of the potential model, the standardized root mean square error (SRMSE) was also applied to each of the six data sets. This goodness-of-fit test employs a series of iterations in order to determine the explanatory power of the model and to obtain the parameter values. The SRMSE statistical test is also included in the methodology, because it is considered to be the best test statistic to determine if there is a statistically significant difference between actual and expected spatial interaction flows (Knudsen and Fotheringham, 1986). Knudsen and Fotheringham, 1986 studied several goodness-of-fit examinations that are able to be employed to assess the results of aggregate spatial interaction models. Both, the SRMSE and the R^2 test statistics were examined in their study. Knudsen and Fotheringham concluded that the SRMSE test statistic is superior to the other goodness-of-fit tests that were studied. The major determinant that led to this conclusion is that by applying the SRMSE test statistic, the goodness-of-fit of different data sets can be compared using metric properties. In other words, suppose an analyst applies the SRMSE test statistic to a model's predictions of two different data sets: Data Set #1 and Data Set #2. If the error value, the test statistic value, is two times larger for Data Set #1 than for Data Set #2, then one is able to infer that the model is twice as accurate for Data Set #2 as it is for Data Set #1. Knudsen and Fotheringham also concluded that this line of reasoning cannot be made using the coefficient of determination. Another advantage of the SRMSE test statistic with regard to the R^2 goodness-of-fit test is that the SRMSE test weighs each observation equally, unlike the coefficient of determination. Therefore, outliers are less likely to cause inaccurate parameter estimates (Knudsen and Fotheringham, 1986).

Because the optimum value of goodness-of-fit tests is usually found with different parameter values, the use of two tests results in two different sets of test statistics and parameter values for each of the six data sets. As a result, there are six sets of multiple squared R test statistics and six sets of SRMSE statistical tests. From both of these analyses, one should have a fairly accurate idea of how well the potential model predicts the geographical market territory of Single A baseball franchises.

Regression Analysis

In order to use least-squares regression analysis as a method to estimate the parameters, and to test the goodness-of-fit of the model, it is necessary to transform the variables of the model (Johnston, 1978). This is due to the fact that the potential model (E2) is multiplicative with exponents requiring estimation. Regression equations should have an additive, or linear, relationship between the dependent variable and the independent variables. If this relationship is not additive, the results of the regression analysis will most likely be erroneous (Clark and Hosking, 1986). Since transformations are able to make nonlinear functions intrinsically linear, Talen and Anselin, 1998, transformed a potential model which was utilized to estimate origin-destination flows of playgrounds (Thompson, 1986). The logarithmic form of the potential model is given as:

$$\ln T_j = \ln k^* + (\sum b \ln P_i - c \ln D_{ij}) \qquad \text{(E3)}$$

To estimate the coefficients (b and c) of the independent variables (P_i and D_{ij}), and to test the explanatory power of the model, the dependent variable (T_j) and the independent variables were transformed and ordinary least-squares regression was applied in the statistical computer program Systat. The estimation of the population coefficient b allows one to realize the slope of the relationship between T_j and P_i, with D_{ij} held constant. In like manner, one can also understand the slope of the relationship between T_j and D_{ij}, with P_i held constant, by estimating the distance coefficient c (Johnson, 1978). To examine the statistical significance of the estimated coefficient values, the student's t test was employed, using a one-tailed test and an alpha level of 0.05.

The coefficient of determination allows one to realize the total contribution of P_i and D_{ij}, that is the variables' combined contribution as well as each variable's separate contribution, with regard to accounting for the proportion of the variance of T_j (Johnston, 1978). The coefficient of determination ranges from 0 to 1. A value of zero signifies that there is not a relationship between the dependent variable and the independent variables. On the other hand, a value of one demonstrates that there is complete correspondence between the dependent variable and the independent variables (Knudsen and Fotheringham, 1986). The F-ratio, applying an alpha level of 0.05, was utilized to determine if the value of the coefficient of determination is statistically significant.

The Standardized Root Mean Square Error

Because it is irrelevant to the calculations of the SRMSE test statistic that the potential model has a multiplicative form, there is no need to transform the model in order to conduct this goodness-of-fit examination. The formula of the standardized root mean square error is as follows:

$$SRMSE = \{\sum_i (t_{ij} - \hat{t}_{ij})^2 \ / \ n\} \ / \ (\sum_i t_{ij} \ / \ n) \qquad \text{(E4)}$$

where:

t_{ij} = an element of the observed flows

$\hat{t}_{ij}$ = an element of the predicted flows

n = the number of observations

The objective of the SRMSE goodness-of-fit test is to educe parameter values that minimize the value of the SRMSE test statistic, which is also referred to as simply the error value (Desta, 1988). With regard to this project, the error is the average difference between the actual attendance values and the number of attendees that the potential model has predicted. In order to obtain the lowest error value possible, an analyst inputs starting values for every parameter value to be calculated, and then runs the SRMSE goodness-of-fit test which conducts a series of iterations to find the parameter values which minimizes the error value. For this project the starting values were set equal to one, which is the normal practice. This was conducted in Microsoft Excel's Solver option. The lower limit of the SRMSE test statistic is zero, which denotes completely accurate model predictions of the observed data. Conversely, large error values signify poor model predictions. However, there is no upper limit of this test statistic. Theoretically, the value of the error can continue towards infinity (Knudsen and Fotheringham, 1986).

Residual Analysis

Gravity models cannot fully explain a market territory. In order to build a better model, the residuals must be examined. The investigation of residuals assists in recognizing other elements that affect spatial interaction. As a result, one can improve a model's predictive powers (Baxter and Ewing, 1981).

Residuals are the differences between the actual number of trip flows and a model's predicted number of trip flows (Ewing, 1980). Regarding this project, positive residuals indicate zip codes that provide more attendees than would be expected given the values of P_i and D_{ij}. Therefore, zip codes with positive residuals show that the potential model is underpredicting the number of attendees who actually attend baseball games. On the other hand, residuals with negative values denote zip codes from which fewer attendees travel to the stadium than the potential model predicts. In this case, the model is overpredicting the number of attendees that originate from these zip codes. Therefore, after examining the influence of population and distance, the patterns of residuals may provide information that would suggest future improvements to the model.

In an attempt to add to the explanatory power of the potential model, the SRMSE residuals are correlated with selected demographic variables. These demographic variables were also correlated with the regression residuals of the transformed potential model. This procedure allows one to ascertain if other variables can contribute to the explanatory power of the models. Furthermore, the investigation of the regression residuals also reveals if the assumptions of the coefficient of determination goodness-of-fit test have been met. However, before the methodology of this operation is discussed, the selection of the demographic variables will be addressed.

Demographic data at the zip code level was collected in order to examine the residuals. This information was acquired from the Summary Tape File 3B (STF 3B) of the 1990 United States Census which contains sample data weighted to represent the total population of the zip code. Table 2 illustrates which demographic variables were examined and a summary of the reason for their inclusion.

TABLE 2
Demographic Variables Analyzed and Their Reason For Inclusion

Demographic Variables	**Vernacular**	**Reason For Inclusion**
Median Household Income	Income	Baseball
% of Family Households	Families	Baseball
% of Males	Males	Baseball
% of Minorities	Minority groups	Baseball
% of People 16 and Over Employed in Professional Positions	Professional-Managerial Positions	Baseball
% of Home Owners	Home Owners	Retail Sales
% of Multiple Person Households	Multiple Person Households	Retail Sales
% of People 15 and Over Married	Marital Status	Retail Sales
% of People 18 and Over with Some College Education	Education	Recreational Activities
% of People with Ages of 25-59	Age	Recreational Activities

The above variables have been chosen for various reasons. Five of the above variables are said to directly influence the market characteristics of sports and baseball. *Income* is included because affluent markets offer more potential customers than areas with less wealthy residents (Danielson, 1997). Danielson, 1997 adds that since the middle of the twentieth century sports have been marketed toward *families*. However, *males* have been more likely to attend games than females (Danielson, 1997). According to a study conducted by Sager and Culbert, 1992 African-Americans are less inclined to attend baseball games than Caucasians (Stix, 1993). Since Hispanics and Asians have increasingly become interested in baseball, I have included all *minority groups* with regard to this variable (Sands and Gammons, 1993). The lower middle class has traditionally supplied most of the attendees of ballgames. However, in recent years baseball franchises have increased ticket prices (Danielson, 1997). As a result, baseball franchises are marketing towards people with employment in *professional or managerial positions* (Euchner, 1993). The following list illustrates which categories from the STF 3B file tape I utilized in order to determine the percentage of people who are employed in professional or managerial positions within each zip code: Executive, Administrative, and Managerial Occupations; Professional Specialty Occupations; Technicians and Related Support Occupations.

Researchers have used the ensuing five variables to describe the market areas of other phenomena, not including baseball franchises. These five variables are: *home owners*, *marital status*, *multiple person households*, *age*, and *education*. Because this is an exploratory exercise, I have included these five variables in the examination in order to determine if they also affect the geographical market territory of baseball franchises. Both home owners and marital status affect the patronage of grocery stores (Fotheringham, 1988). Multiple person households also affect retail sales (Thompson, 1986). McAllister and Klett, 1976 report that participation for recreational activities varies greatly by age. Similarly, Mueller and Guerin, 1961 found that age and education assist in explaining park visitation patterns (Cheung, 1972). The age range of 25-59 was chosen for this thesis because data collected from baseball franchises suggest that this age range contributes approximately sixty to eighty percent of the total number of sample attendees. Information obtained from baseball organizations also indicates that people with at least some college education account for almost seventy-five percent of the total number of attendees sampled.

It should be mentioned that the total population of each zip code was used to create the percentages for the variables of age, gender, and race. Furthermore, in order to create percentages for family households, home owners, and multiple person households, it is necessary to obtain the total number of households within each zip code. The STF 3B tape file also consists of one-hundred percent counts of total housing units within each zip code of the United States.

Expansion of the Models

Because other variables may be able to add to the models' predictive ability, it is necessary to discern if it is possible to expand the models. As previously mentioned, this can be accomplished by examining the residuals apropos of the demographic variables. To determine if there is a statistical relationship between the demographic variables and the residuals, Pearson's correlation coefficient was employed. This statistical test is able to demonstrate the correlation between two variables. The range of values for Pearson's correlation coefficient varies from -1 to 1, where a value of 1 indicates a perfect positive correlation between two variables. Conversely, a value of -1 denotes a complete negative correlation between two variables. A value of 0 indicates absolutely no correlation between two variables. Therefore, extreme values generally demonstrate that a correlation with the observed sign occurs in the population (Johnston, 1978). As a result, demographic variables that have a statistical relationship with the residuals should be incorporated into the model in order to add to its explanatory power.

Because the regression residuals result from a transformed potential model, the values of the residuals are in a transformed form. Therefore, if the demographic variables have a statistical relationship with the regression residuals, then the demographic variables should be incorporated into the potential model in a multiplicative form. On the other hand, the SRMSE residuals are absolute because one does not need to transform the potential model in order to conduct the standardized root mean square error goodness-of-fit test. Consequently, demographic variables that have a statistical relationship with the SRMSE residuals ought to be included into the potential model in an additive form.

Each franchise data set has two sets of correlations: the demographic variables against the regression residuals, and the demographic variables against the SRMSE residuals. To determine if the demographic variables have a significant correlation with the regression residuals or the SRMSE residuals, Pearson correlation coefficient values of 0.3 and -0.3 were used as guides. Therefore, if a demographic variable has a correlation value of above 0.299, or below -0.299, it was concluded that it should be incorporated into the appropriate model.

An example using hypothetical Pearson correlation coefficient values should assist to clarify the above methodology. Suppose the Beloit data set has the following Pearson correlation coefficient values (please see Table 3). In this hypothetical example, only the income variable has a significant Pearson correlation coefficient value with the regression residuals. Therefore, income should be included into the transformed potential model in a multiplicative form. On the other hand with regard to the SRMSE residuals, income and age have significant Pearson correlation coefficient values. As a result, they ought to be incorporated into the potential model in an additive form.

This chapter has described the methodology employed in order to determine if the potential model is able to accurately predict the geographical market territories of Single A minor league baseball franchises. In order to ensure that the predictive results of the

TABLE 3
Hypothetical Pearson's Correlation Coefficient Values for Beloit

DEMOGRAPHIC VARIABLES	RESIDUALS	ERROR TERMS
Median Household Income	0.302	0.324
% of Family Households	0.242	0.225
% of Males	0.211	0.223
% of Minorities	-0.023	-0.124
% of People 16 and Over Employed in Professional Positions	0.233	0.226
% of Home Owners	0.228	0.224
% of Multiple Person Households	0.283	0.292
% of People 15 and Over Married	0.238	0.221
% of People 18 and Over with Some College Education	0.183	0.142
% of People with Ages of 25-59	0.293	0.372

potential model were accurate, two different goodness-of-fit tests were applied to the model. To determine what other variables may add to the explanatory power of the model, and in what form they should be incorporated into the model, the regression residuals and the SRMSE residuals were correlated against specific demographic variables. The following chapter will show the results of the examination.

CHAPTER IV
RESULTS OF THE EXAMINATION

This chapter begins with an analysis of the models' predictions regarding the six market territories under investigation. The discourse then illustrates how zip codes located at great distances from the stadium adversely affect the results of the models. Reasons for eliminating these observations, as well as an explanation of how these zip codes were removed from the data sets, are discussed. The models are then reexamined without these observations. The chapter concludes by demonstrating that competing destinations and outliers impair the models' estimations.

Results of the Models

The transformed potential model and the potential model were applied to each of the six data sets. The results are tested using the coefficient of determination and the standardized root mean square error respectively. Table 4 displays the results of the regression analysis, and Table 5 shows the SRMSE test statistics.

An alpha level of 0.05 was employed to test the statistical significance of R^2. Since, for each of the six franchises, the values of R^2 are significantly different from zero, there is a less than five percent probability that the results have occurred by chance. The transformed potential model performs well with regard to the trade areas of Charleston, Charlotte, and West Michigan. However, this model produces less accurate estimations of the trade areas of Beloit, Clinton, and High Desert, which have R^2 values below 0.5. The distance coefficients (c) for all of the franchises are statistically significant, and four of the six franchises have statistically significant population coefficients (b). High Desert's and Charlotte's population coefficients are not statistically significant.

TABLE 4
Results of the Transformed Potential Model

Franchise	R^2	Distance Coefficient	Population Coefficient
Beloit	0.491	-0.743	0.178
Charleston	0.743	-0.993	0.546
Charlotte	0.654	-0.833	not significant
Clinton	0.49	-0.994	0.305
High Desert	0.465	-1.052	not significant
West Michigan	0.784	-1.7	0.451

TABLE 5
Results of the Potential Model

Franchise	SRMSE	Distance Coefficient	Population Coefficient
Beloit	1.538	0.462	0.367
Charleston	1.323	0.333	0.543
Charlotte	0.976	0.61	0.358
Clinton	0.88	1.357	0.761
High Desert	1.317	1.304	0.688
West Michigan	0.974	0.896	0.691

Standardized partial regression coefficients, or beta values, indicate the change measured in standard deviations in the dependent variable associated with a one standard deviation change of an independent variable, with the effects of all other independent variables held constant (Johnston, 1978). Therefore, through the examination of the beta values, it is possible to determine which variable contributes more to the model's predictive ability. Table 6 lists the statistically significant beta values of D_{ij} and P_i for all six franchises. It is clear that D_{ij} is the more powerful of the two variables for each of the market territories.

TABLE 6
Beta Values

Franchise	Beta Value for D_{ij}	Beta Value for P_i
Beloit	-0.718	0.174
Charleston	-0.789	0.348
Charlotte	-0.871	not significant
Clinton	-0.787	0.367
High Desert	-0.669	not significant
West Michigan	-0.831	0.283

The potential model, which was tested with the standardized root mean square error, generated fairly accurate predictions for each of the six franchises. The value of the SRMSE test statistic ranges between zero and infinity, where a value of zero denotes completely accurate model predictions of the observed data. The test statistic values for the six franchises varied from 0.88 to 1.538. The trade areas in which the potential model provides its best predictions are Clinton, West Michigan, and Charlotte.

It appears that D_{ij} and P_i capture much of the variation in the trade areas of baseball franchises. Moreover, in all of the examinations, the dependent variable and the independent variables have the expected relationships. D_{ij} has an inverse relationship with T_j, and P_i has a positive relationship with T_j.

Examination of the Residuals

By examining the residuals, one can discern that zip codes which are located at relatively great distances from the franchises' stadiums impair the models' estimates of the trade areas. The following section not only illustrates that this is true, but it also provides reasons for eliminating these observations as well as an explanation of how these zip codes were removed from the data sets.

The Elimination of Distant Observations

Figure 2, on page 53, applies to the model tested with the coefficient of determination statistical measure. This figure shows the proportion of error regarding the model's predictions of attendees against the logarithm of distance for the West Michigan trade area. In order to obtain the proportion of error in the number of attendees, in their antilog form the regression residuals were divided by the actual number of attendees. This graph depicts that as distance increases from West Michigan's stadium, the magnitude of the error of the model's predictions becomes larger. In other words, the model does not accurately predict the number of attendees that originate from distant zip codes. This is also true for the market territories of the other five franchises.

Figure 3, on page 54, exhibits the relationship between leverage and the logarithm of distance for West Michigan's trade area. Leverage values demonstrate the weight that each observation has upon the results of the R^2 statistical test. Therefore, an observation that has a high leverage value contributes more to the R^2 analysis than an observation with a small leverage value. Through the examination of Figure 3, one can realize that observations that are near to West Michigan's stadium have high leverage values. More

FIGURE #2: **West Michigan's Market Territory**
Proportion of Regression Error against LN Dij

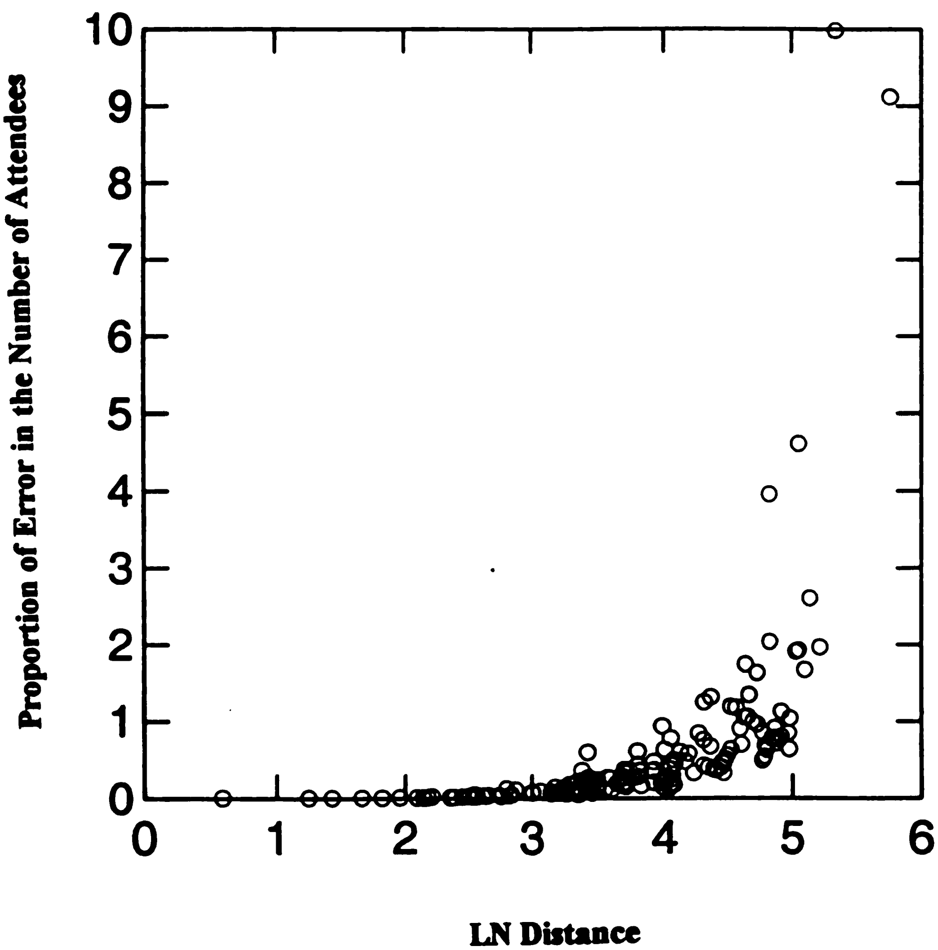
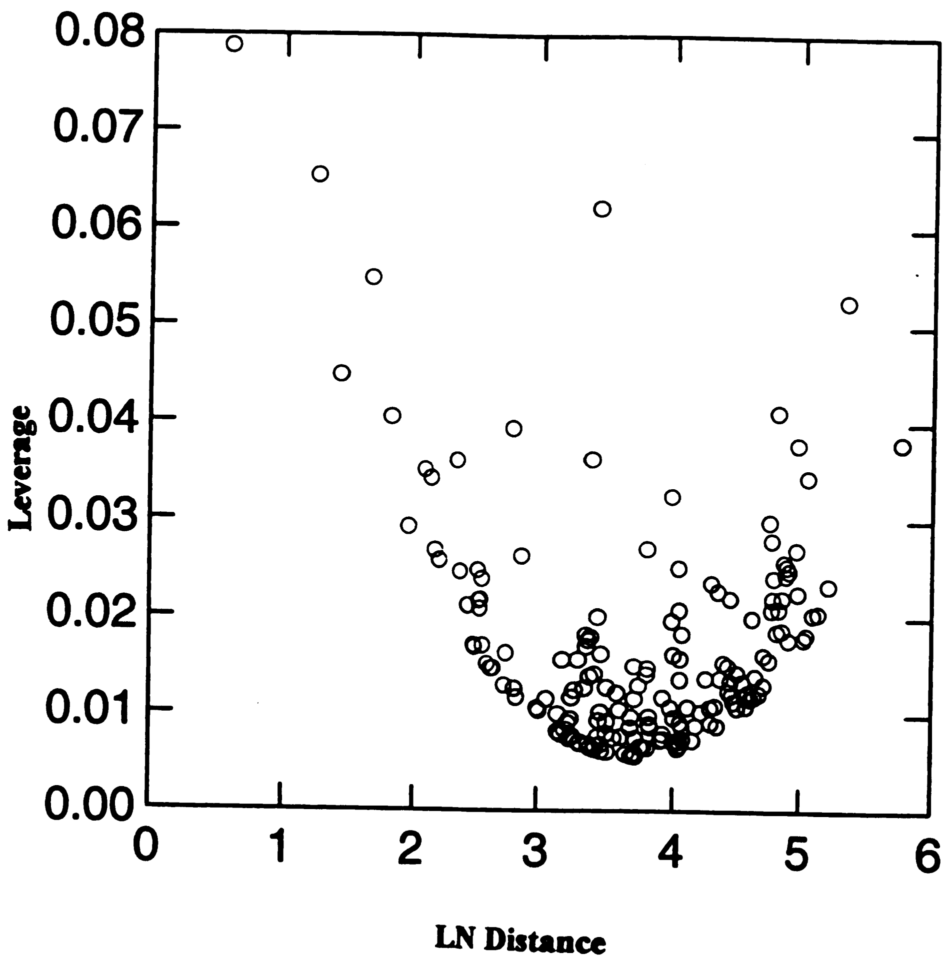


FIGURE #3: West Michigan's Market Territory
Leverage against LN Dij

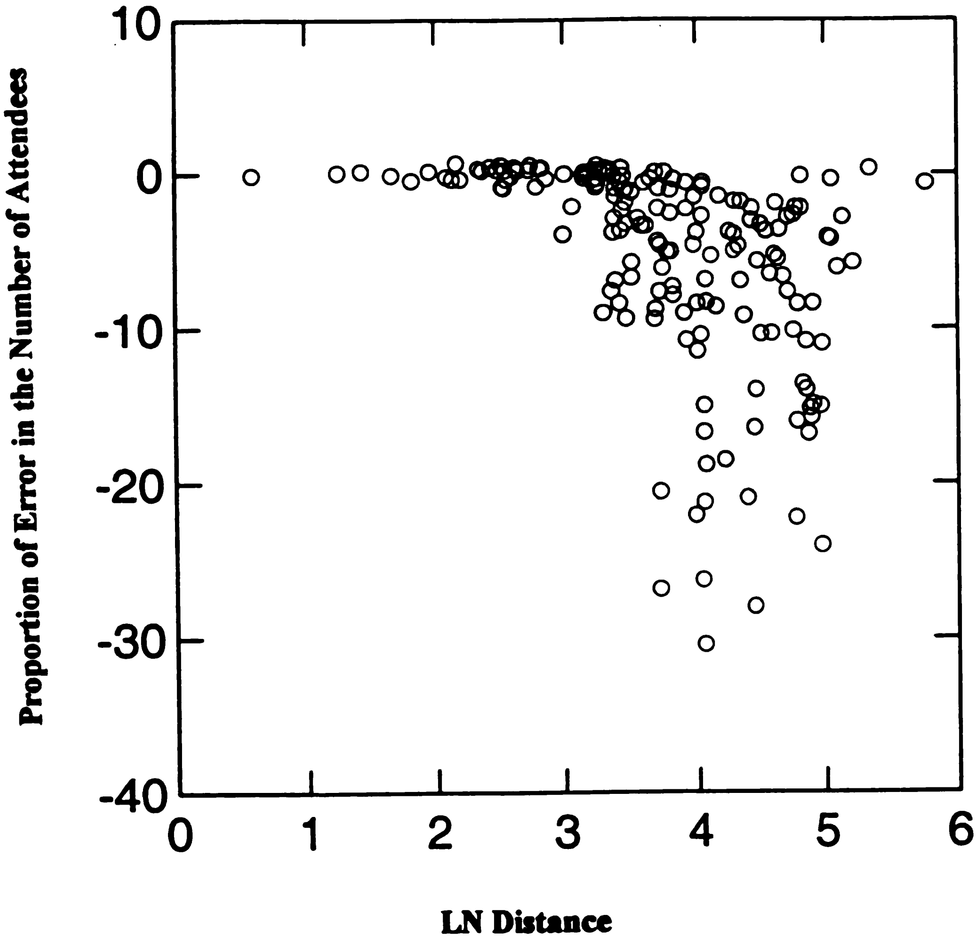


importantly, zip codes that are located at great distances from the ballpark have high leverage values as well. This is also the case with regard to the trade areas of the other five franchises. Therefore, Figures 2 and 3 reveal that the model estimated with the R^2 test statistic provides poor predictions for remote zip codes, and that these zip codes heavily influence the model's estimates of the market territories. As a result, these observations adversely affect the performance of the model.

The model tested with the SRMSE goodness-of-fit test also has difficulty in accurately estimating the number of attendees that originate from distant zip codes. Figure 4, on page 56, displays the proportion of error regarding this model's predictions of attendees against the logarithm of distance for West Michigan's market territory. To acquire the proportion of error in the number of attendees, the SRMSE residuals were divided by the actual attendance values. This figure exhibits that as distance increases from West Michigan's ballpark, the magnitude of the error of the potential model's predictions enlarges. In fact, the model greatly overpredicts the number of attendees that originate from remote zip codes. This phenomenon can also be observed for the trade areas of the other five franchises. Therefore, the zip codes that are located at relatively great distances from the franchises' stadiums are impairing the predictive ability of the potential model. However, because the SRMSE statistical measure weighs each observation equally when calculating its test statistic and parameter values, distant observations probably do not affect the results generated by the standardized root mean square error as much as they influence the results produced by the R^2 statistical measure.

Observations that are located at great distances from the franchises' ballparks do not provide many attendees to the franchises. It is argued that these attendees, who reside

FIGURE #4: West Michigan's Market Territory Proportion of SRMSE Error against LN Dij



in the remote zip codes, are most likely business travelers, people who are visiting friends and family, or tourists. Consequently, the distant zip codes do not appear to be an integral part of the franchises' normal market territories. In order to improve upon the models' predictive powers, especially for the local market, the remote zip codes were eliminated from the data sets and the models were again applied to all six market territories under examination. Therefore, all zip codes that are located beyond the point of distance where the models' predictions begin to worsen were removed from the data sets. As a result, with regard to West Michigan's trade area, all zip codes located beyond 50.6 miles from the stadium (3.9 on a logarithmic scale) were eliminated from the data set. Referring back to figures 2 and 4 allows one to discern that at this point of distance the models' predictions begin to worsen.

The elimination of distant observations should allow the models to provide better parameter estimates, which in turn would permit the models to furnish more accurate predictions of the market territories. Precedence for eliminating observations in order to improve a spatial interaction model's predictions can be found in Kariel, 1968 and Pooler, 1992.

Results of the Models After Elimination

The number of zip codes that remain in each of the data sets, as well as the ranges of each franchises' market territory are presented in Table 7, on page 64. Figures 5-10 on pages 58-63 show the actual trade areas of all six franchises.

FIGURE #5: Market Territory of Beloit

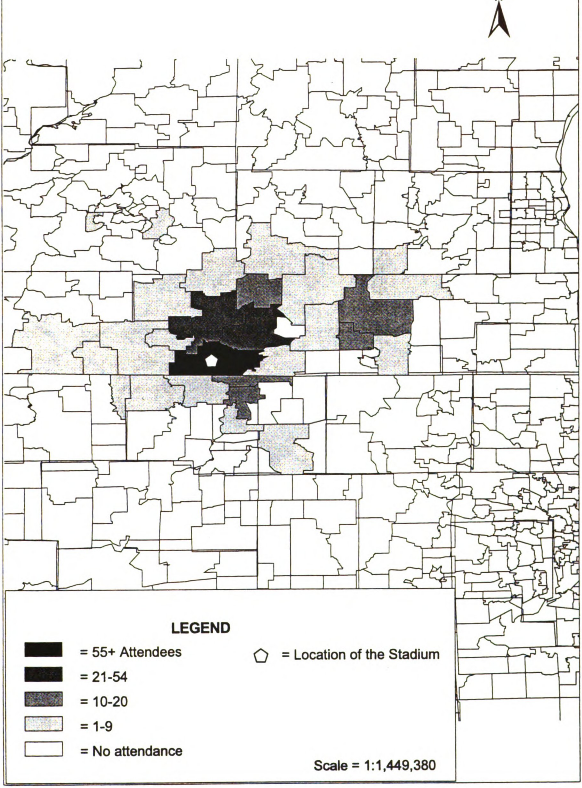


FIGURE #6: Market Territory of Charleston

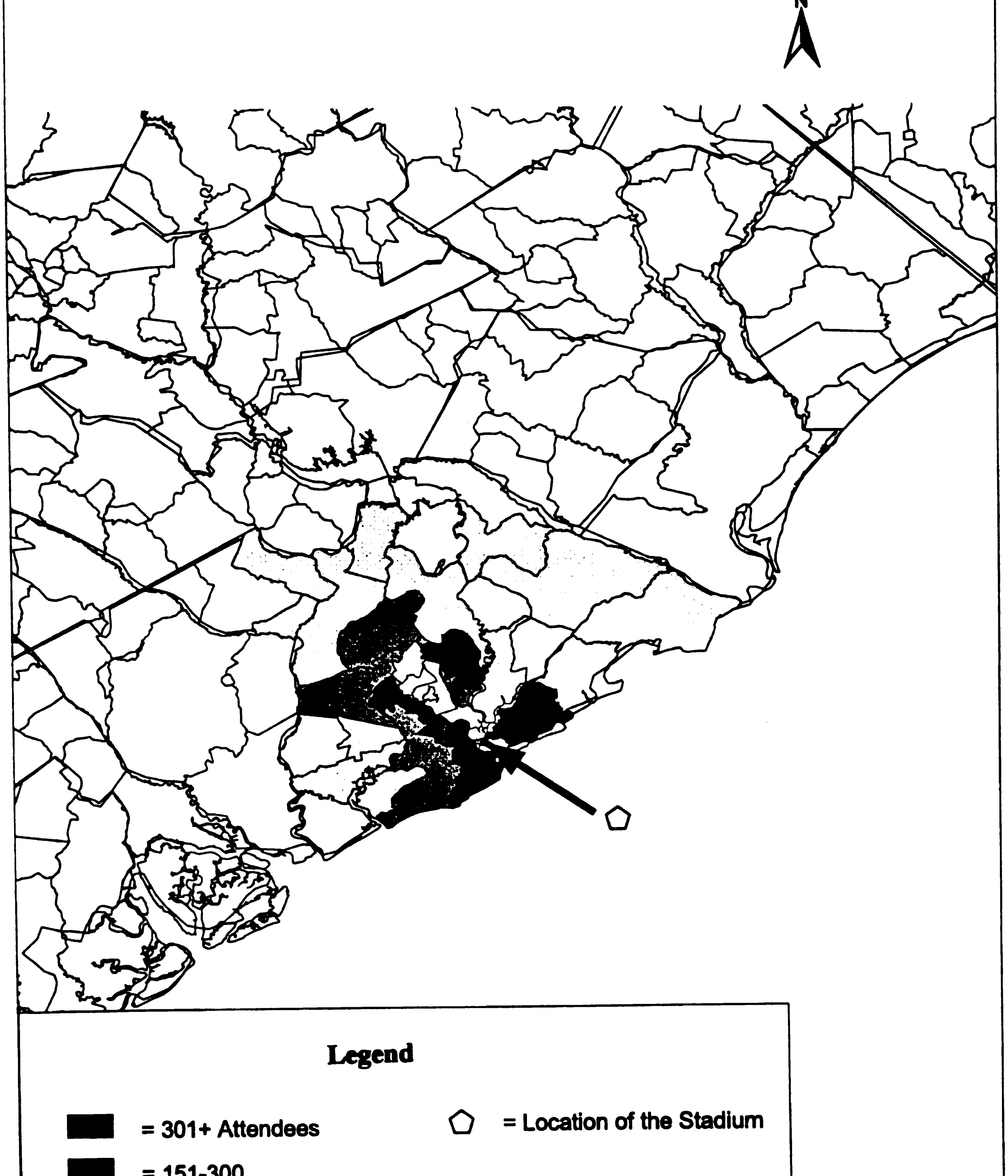


FIGURE #7: Market Territory of Charlotte

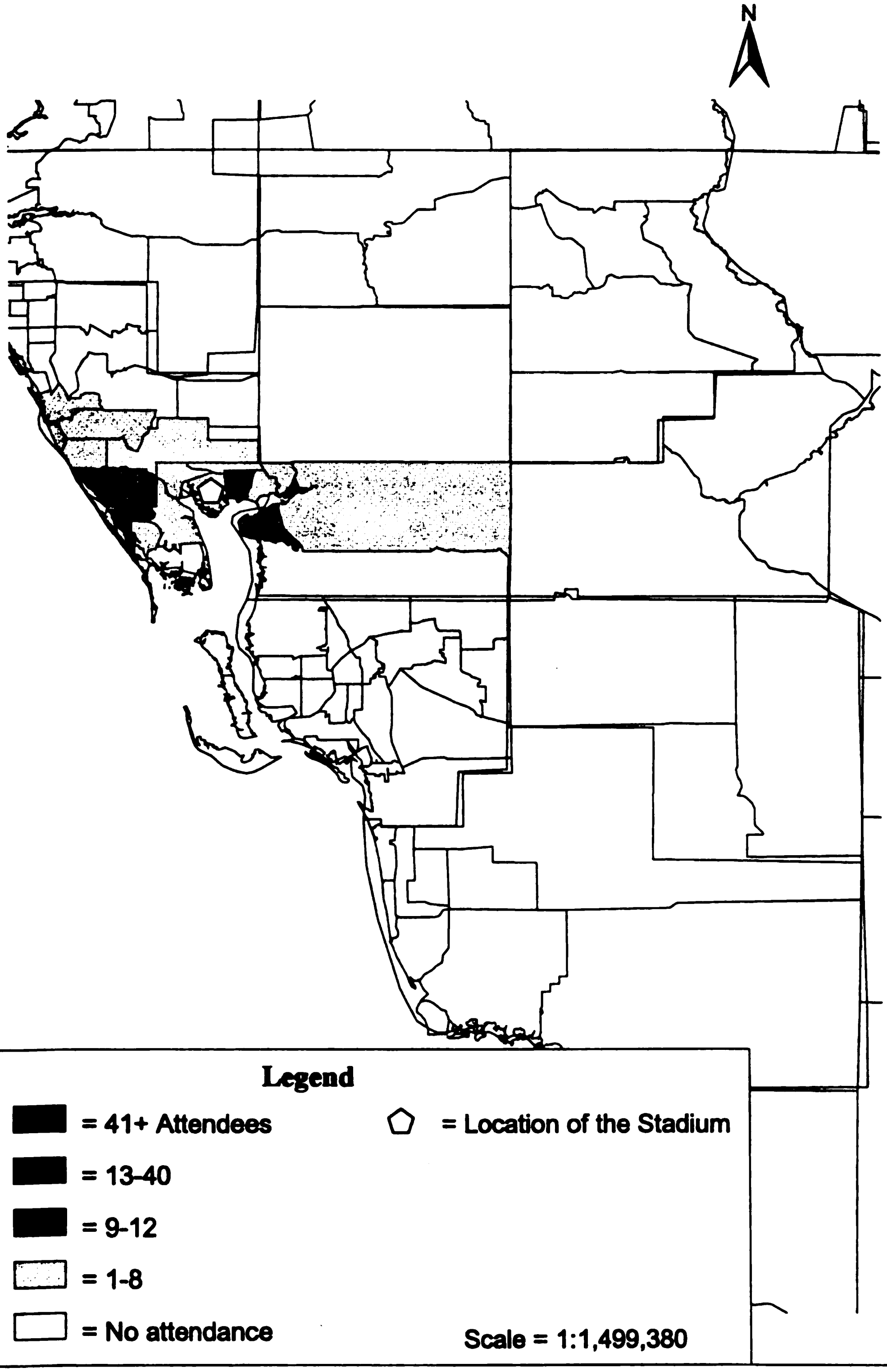


FIGURE #8: Market Territory of Clinton

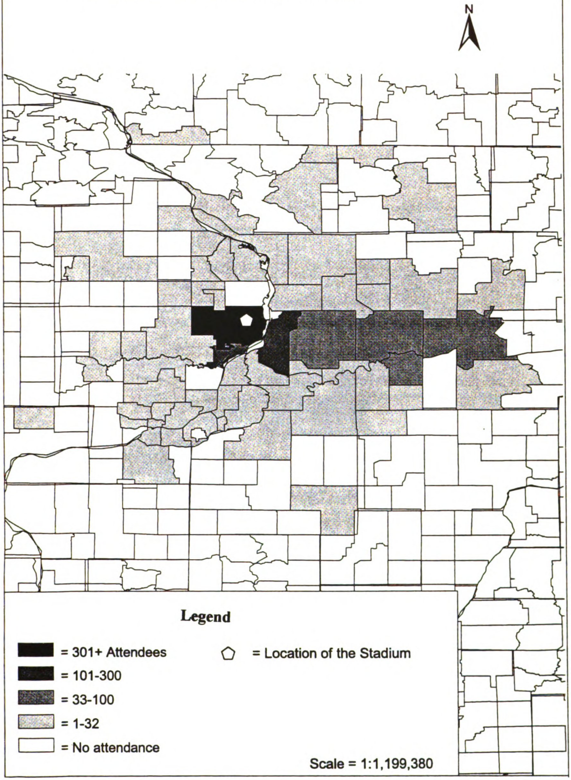


FIGURE #9: Market Territory of High Desert

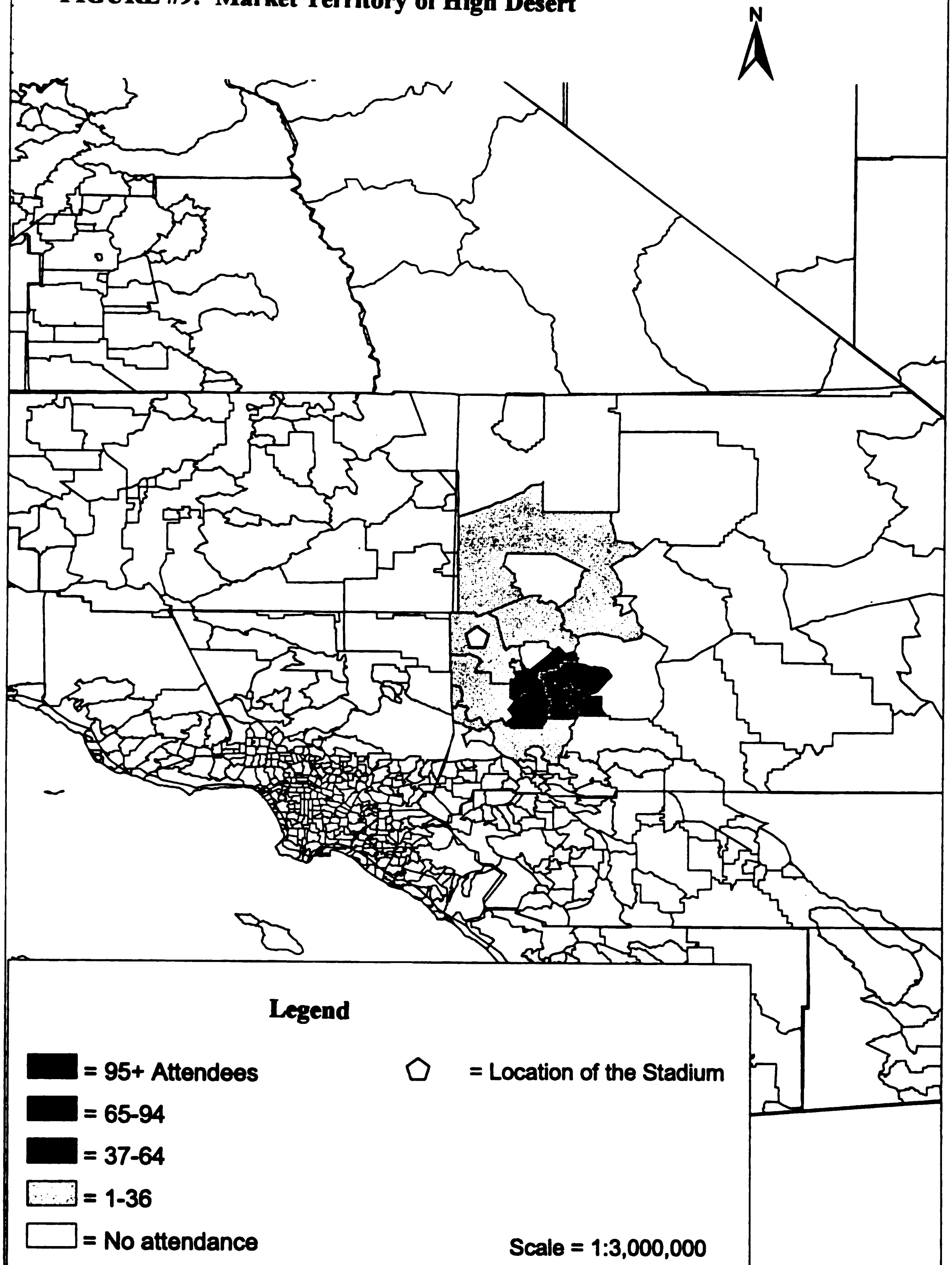


FIGURE #10: Market Territory of West Michigan

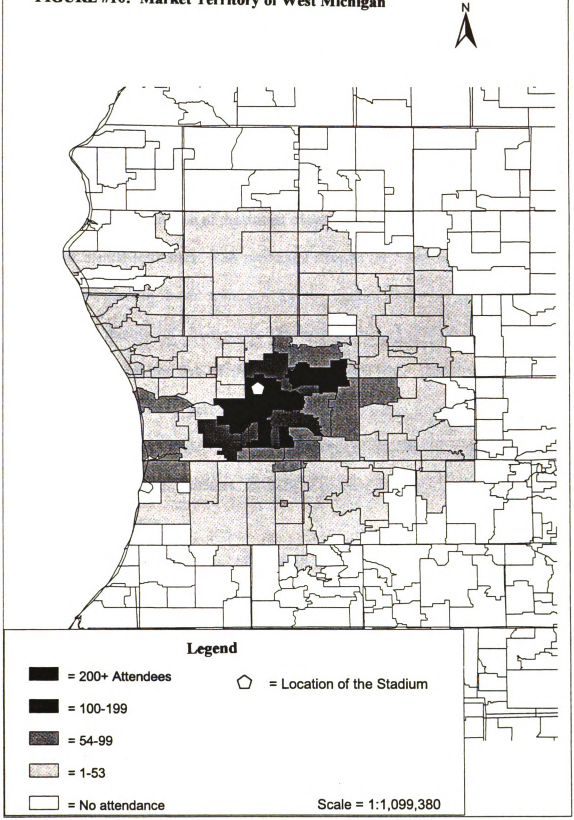


TABLE 7

Characteristics of the Data Sets After the Elimination of Remote Observations

Franchise	# of Zip Codes	Range of Market Territory
Beloit	28	41. 8 miles
Charleston	30	38.9 miles
Charlotte	17	21.7 miles
Clinton	62	49.2 miles
High Desert	12	31.3 miles
West Michigan	102	50.6 miles

After the elimination of the distant observations, both models were applied to each of the six market territories. This procedure allowed the transformed potential model to produce considerably better estimates for the market territories of Clinton and High Desert. The removal of observations also enabled the potential model to provide much improved estimates for five of the six market territories. However, the transformed potential model and the potential model generated worse predictions with regard to Charlotte's trade area. Table 8 and Table 9 on page 65, display the goodness-of-fit results, as well as the parameter estimates, for both of the models before and after the elimination of distant observations.

Relative to its predictions of the other four market territories after the removal of remote zip codes, the model tested with the R^2 test statistic does not successfully estimate the trade areas of Beloit and Charlotte. Nonetheless, the distance coefficient for each of the data sets are statistically significant, and five of the population coefficients have significant values. However, P_i appears to be unable to explain the variation within the High Desert trade area.

TABLE 8
Results of the Transformed Potential Model:
Before and After the Elimination of Remote Observations

Franchise	R^2	Distance Coefficient	Population Coefficient
Beloit (b)*	0.491	-0.743	0.178
Beloit (a)*	0.474	-0.706	0.571
Charleston (b)	0.743	-0.993	0.546
Charleston (a)	0.735	-0.469	0.933
Charlotte (b)	0.654	-0.833	not significant
Charlotte (a)	0.356	-0.721	not significant
Clinton (b)	0.49	-0.994	0.305
Clinton (a)	0.615	-1.636	0.566
High Desert (b)	0.465	-1.052	not significant
High Desert (a)	0.702	-2.343	0.002
West Michigan (b)	0.784	-1.7	0.451
West Michigan (a)	0.793	-1.71	0.742

TABLE 9
Results of the Potential Model:
Before and After the Elimination of Remote Observations

Franchise	SRMSE	Distance Coefficient	Population Coefficient
Beloit (b)*	1.538	0.462	0.367
Beloit (a)*	0.907	0.569	0.41
Charleston (b)	1.323	0.333	0.543
Charleston (a)	0.93	0.139	0.524
Charlotte (b)	0.976	0.61	0.358
Charlotte (a)	1.024	-0.025	0.246
Clinton (b)	0.88	1.357	0.761
Clinton (a)	0.606	1.312	0.758
High Desert (b)	1.317	1.304	0.688
High Desert (a)	0.54	0.681	0.564
West Michigan (b)	0.974	0.896	0.691
West Michigan (a)	0.698	0.808	0.679

*note for both tables: (b) = the results of the examination before the removal of distant zip codes.
(a) = the results of the examination after the removal of distant zip codes

With the exception of the market territory of the Charleston franchise, D_{ij} explains more of the variation within the trade areas than does P_i (however, the explanatory power of D_{ij} and P_i are almost equal for Beloit's market area). This can be understood by examining Table 10, which displays the statistically significant beta values of D_{ij} and P_i after the elimination of distant zip codes.

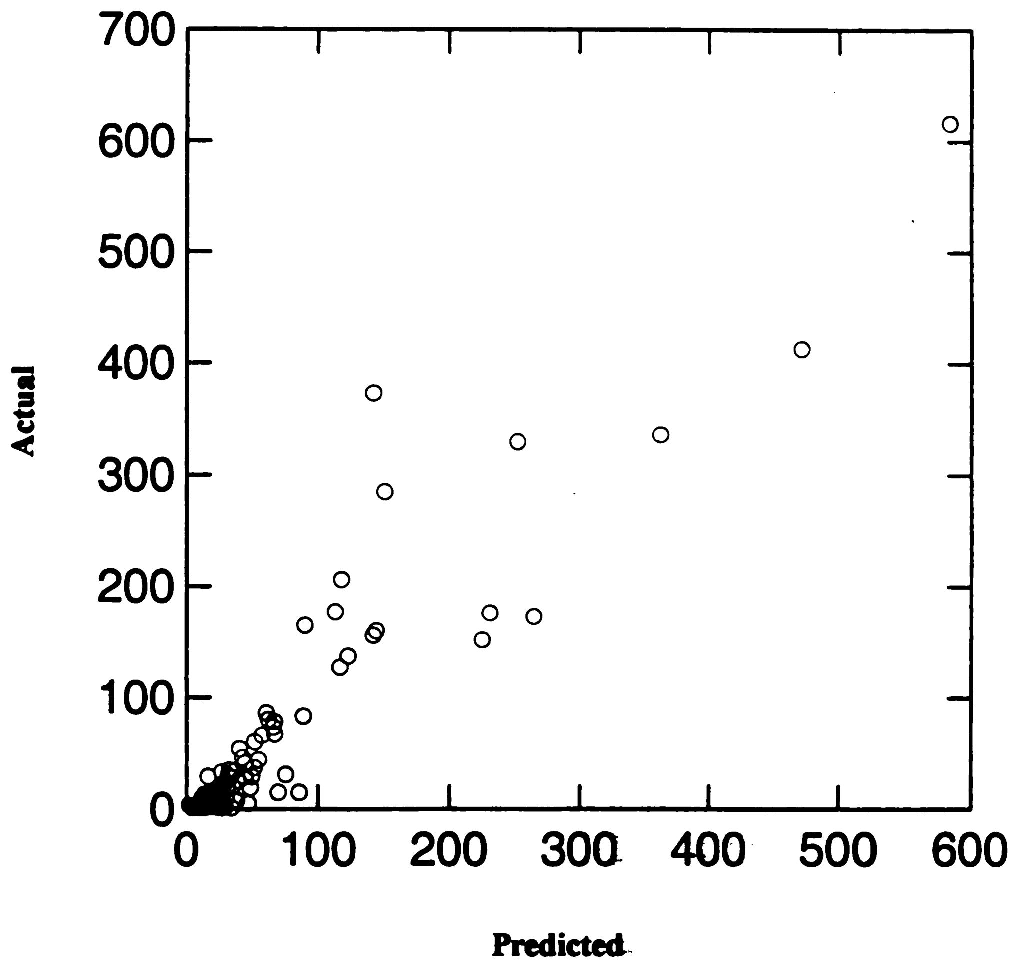
TABLE 10
Beta Values:
After the Elimination of Remote Observations

Franchise	Beta Value for D_{ij}	Beta Value for P_i
Beloit	-0.443	0.44
Charleston	-0.28	0.693
Charlotte	-0.598	not significant
Clinton	-0.658	0.514
High Desert	-0.503	0.193
West Michigan	-0.612	0.444

Similar to the analysis with the inclusion of the distant observations, the potential model generates accurate predictions for more of the market territories than does the transformed potential model. The SRMSE values reveal that the potential model successfully predicts the market territories of: Beloit, Charleston, Clinton, High Desert, and West Michigan. Examining Figure 11, on page 67, confirms this notion. This figure depicts the model's predicted attendance values against the actual attendance values for West Michigan's market territory. As one can realize, for most of the observations, the potential model gives reasonable predictions with regard to the number of attendees that originate from each of the zip codes. Graphs of the same nature show that the model also

FIGURE #11: **West Michigan's Market Territory**

Potential Model's Predicted Attendance Values
vs
The Actual Attendance Values



provides reliable estimations for the trade areas of Beloit, Charleston, Clinton, and High Desert.

However, the results of the SRMSE statistical measure demonstrate that the potential model is unable to provide an accurate estimate of the Charlotte trade area. In fact, with regard to the Charlotte franchise, D_{ij} does not account for the number of people that attend their games (please refer to Table 9).

Influence of Competing Destinations and Outliers

Because the distant observations have been eliminated from the trade areas, it is now possible to realize that competing destinations are influencing the models' estimates for the following franchises: Beloit, Clinton, High Desert, and West Michigan. The removal of remote zip codes also facilitates the examination of the residuals within the cores of the trade areas for all six franchises. One can now recognize outliers within the heart of the trade areas, which in most of the market territories are either located within the central city, or are suburban zip codes that are located near to the periphery of the city. The succeeding discourse will focus upon these two issues.

Beloit, Clinton, High Desert, and West Michigan compete with other ballteams for attendees in specific areas of their respective market territories. Table 11, on page 69, reveals the competitors of these four franchises. These competitors provide alternatives, especially for the residents of certain zip codes. As a result, the zip codes that are influenced by competing destinations send fewer than the predicted number of attendees to the franchises that are examined in this project. Therefore, the competing destinations are forcing the models to overpredict the zip codes in which the franchises must compete for attendees. Figures 12-15, on pages 70-73, shows the relative location of the competitors of the franchises under investigation, as well as the zip codes that the models overpredict due to the existence of the competing destinations. It should be mentioned that in order to denote zip codes that are affected by competing destinations, both models must have overpredicted zip codes that are located relatively close to a competing franchise. The locations of these zip codes relative to the stadiums of the franchises that under study are listed in Table 12.

TABLE 11
Competitors of the Franchises Under Study

Franchise Under Study	Competitors
Beloit Snappers	Rockford Cubbies
Clinton LumberKings	Quad City Bandits
High Desert Mavericks	Rancho Cucamonga Quakes San Bernadino Stampede
West Michigan Whitecaps	Lansing Lugnuts Michigan Battle Cats

TABLE 12
Locations of the Zip Codes that are Affected by Competing Destinations

Franchise	Location of the Affected Zip Codes from the Host Zip Code
Beloit	3.1-20.6 miles
Clinton	18.2-45.3 miles
High Desert	27.4 miles*
West Michigan	27-45.5 miles

*note: Only one zip code is affected by High Desert's competitors.

FIGURE #12: Zip Codes of Beloit's Market Territory that are Influenced by a Competing Destination

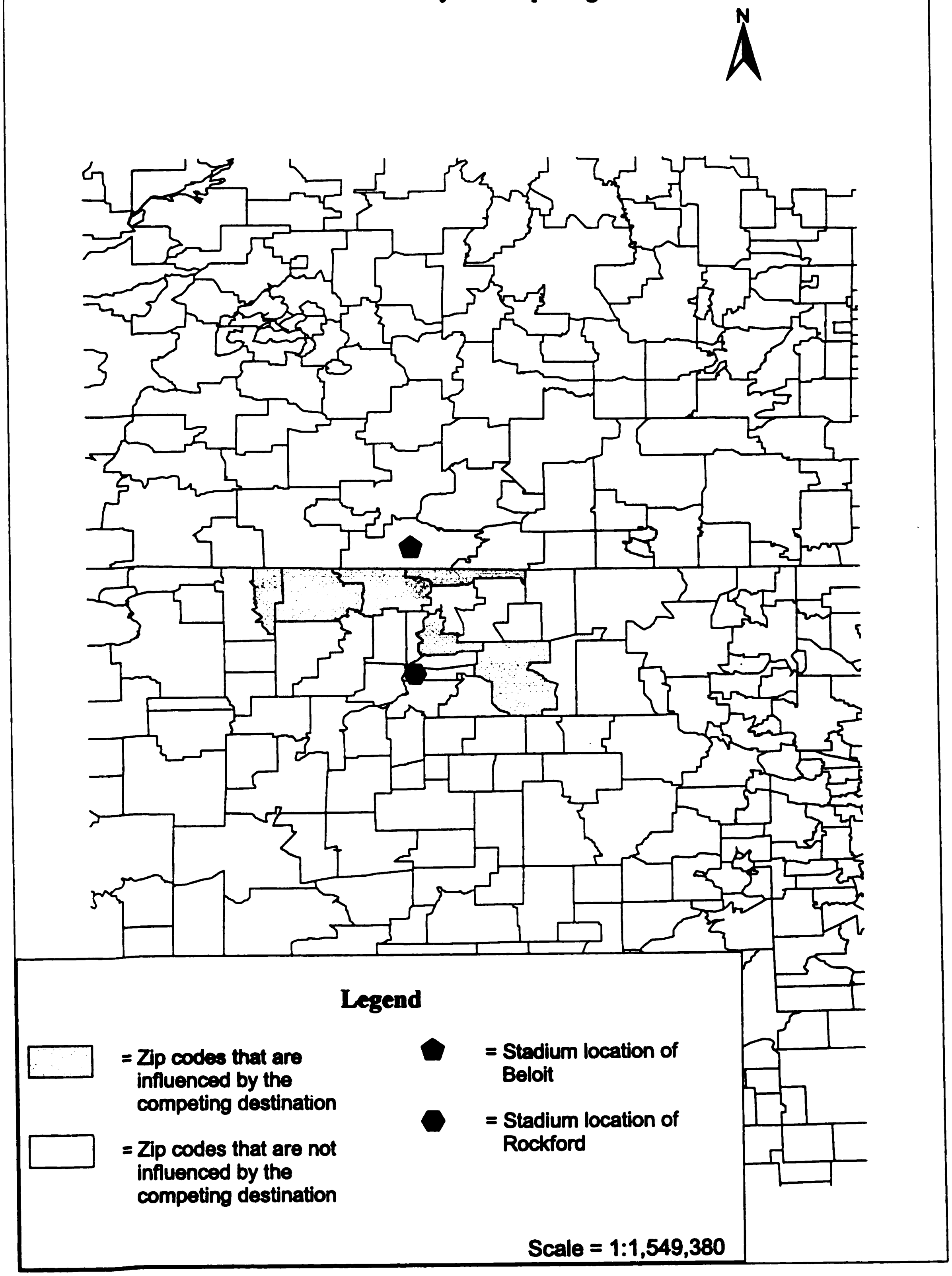


FIGURE #13: Zip Codes of Clinton's Market Territory that are Influenced by a Competing Destination

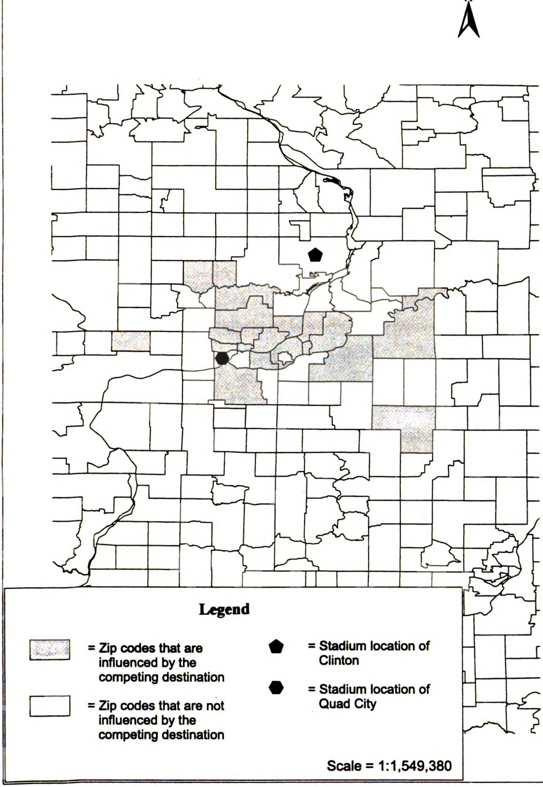


FIGURE #14: The Zip Code of High Desert's Market Territory that is Influenced by Competing Destinations

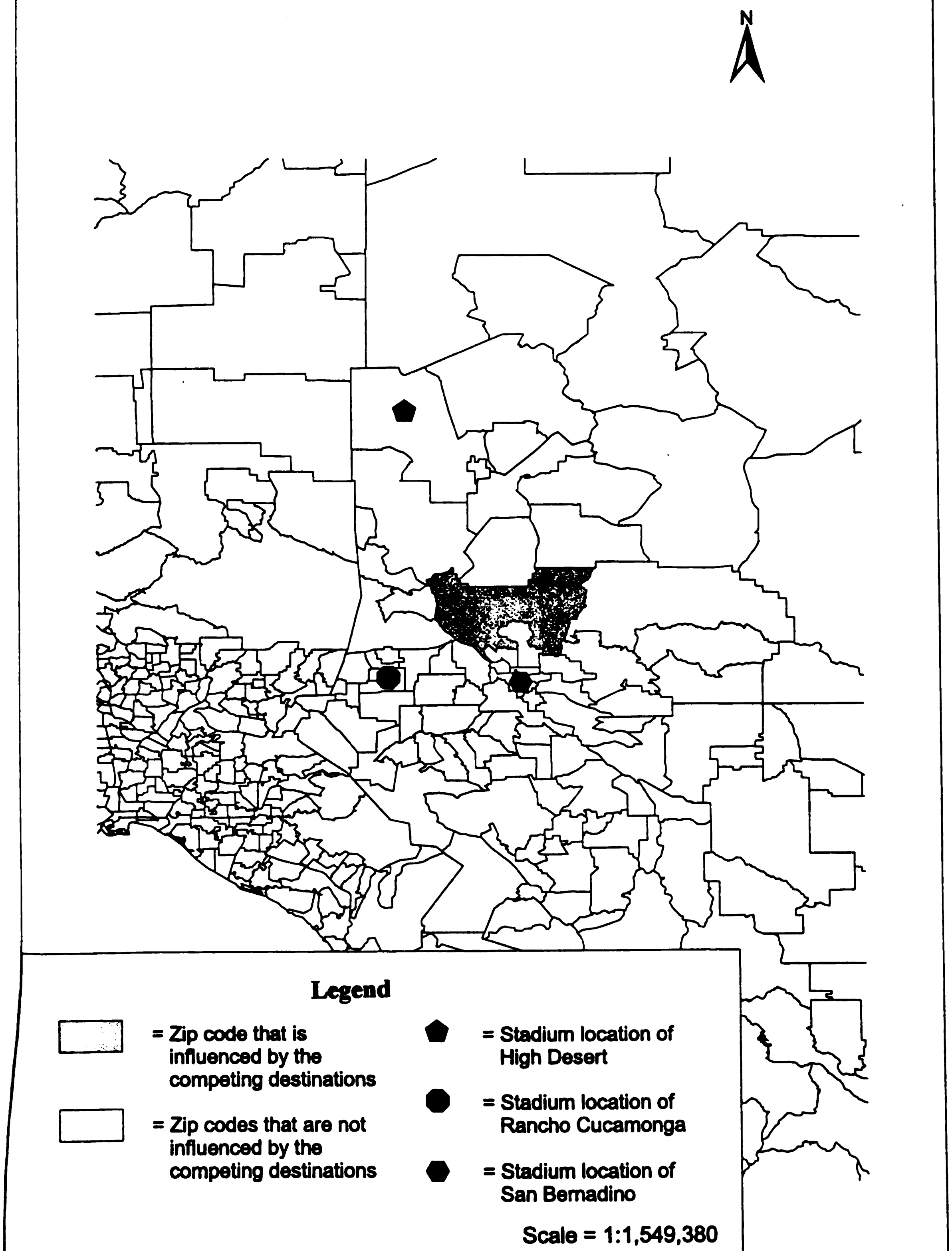
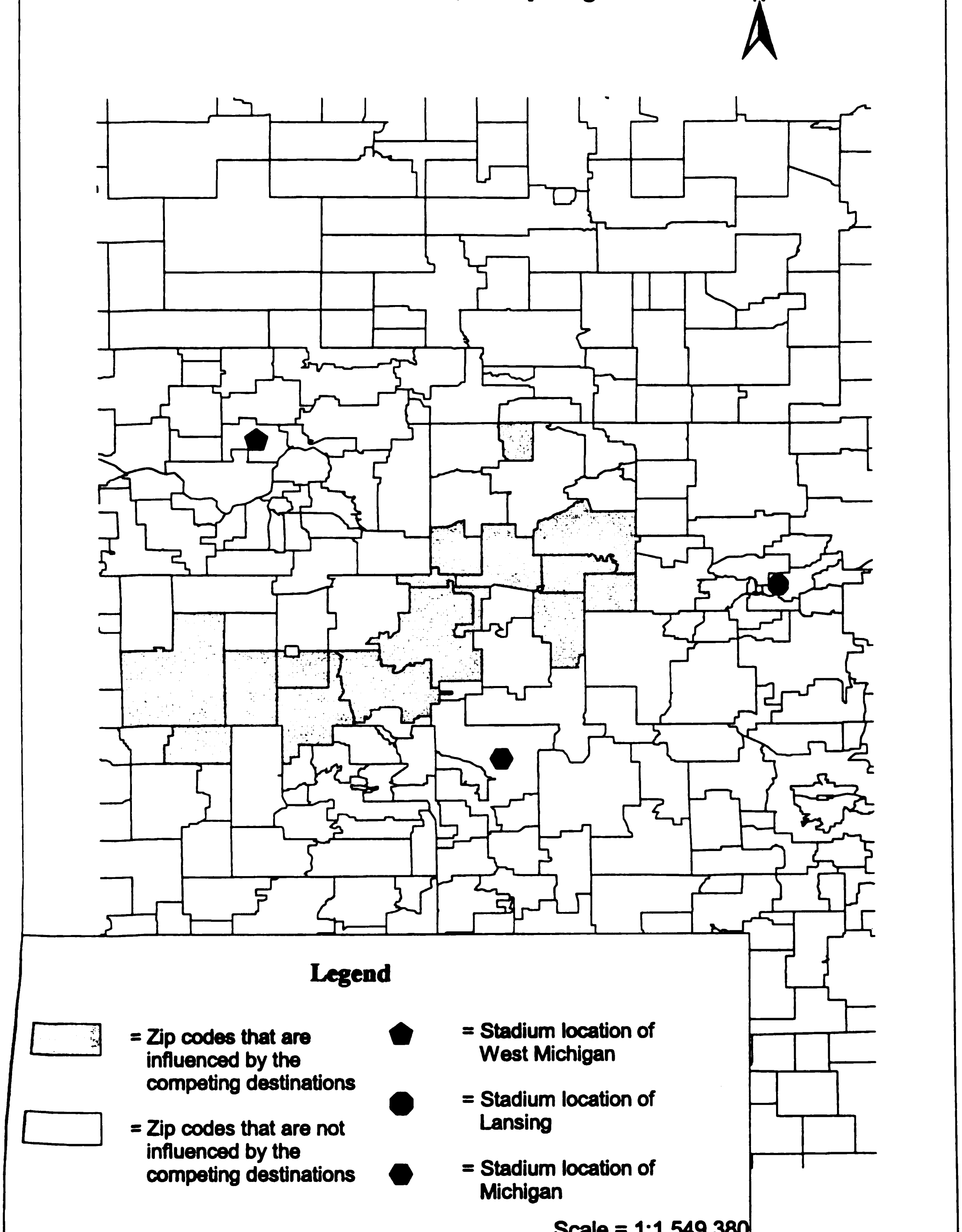


FIGURE #15: Zip Codes of West Michigan's Market Territory that are Influenced by Competing Destinations



The zip codes that are affected by competing destinations have the greatest proportion of error with regard to the models' predictions. Figure 16, on page 75, which pertains to Clinton's market territory after the elimination of distant zip codes, exhibits the proportion of error apropos of the transformed potential model's estimations of attendees against D_{ij}. Like the analysis before the removal of remote observations, the accuracy of this model decreases as D_{ij} increases. However, the zip codes that are affected by the Quad City franchise have the greatest magnitude of error in the number of people that attend Clinton's games. The affected zip codes are located between 18.2-45.3 miles from Clinton's stadium (again, to denote these zip codes, both models must have overpredicted observations that are located relatively close to the competing franchise). Studying Figure 16, it is possible to estimate that within this range of distance there are many zip codes that have extremely large proportions of error in the number of attendees. The observations that have large magnitudes of error are those that are affected by Quad City. This model also generated similar patterns of the proportion of error in the number of people that attend games for the market territories of Beloit, High Desert, and West Michigan.

The potential model has difficulty in accurately predicting the number of attendees that originate from zip codes that are influenced by competing destinations as well. This can be realized through the examination of Figure 17, on page 76, which shows the proportion of error pertaining to the potential model's estimations of attendees for West Michigan's market territory against D_{ij}. Similar to the examination of the residuals before remote observations were eliminated, this model greatly overpredicts the remanent distant

FIGURE #16: Clinton's Market Territory
Proportion of Regression Error against Dij
(After the Removal of Remote Observations)

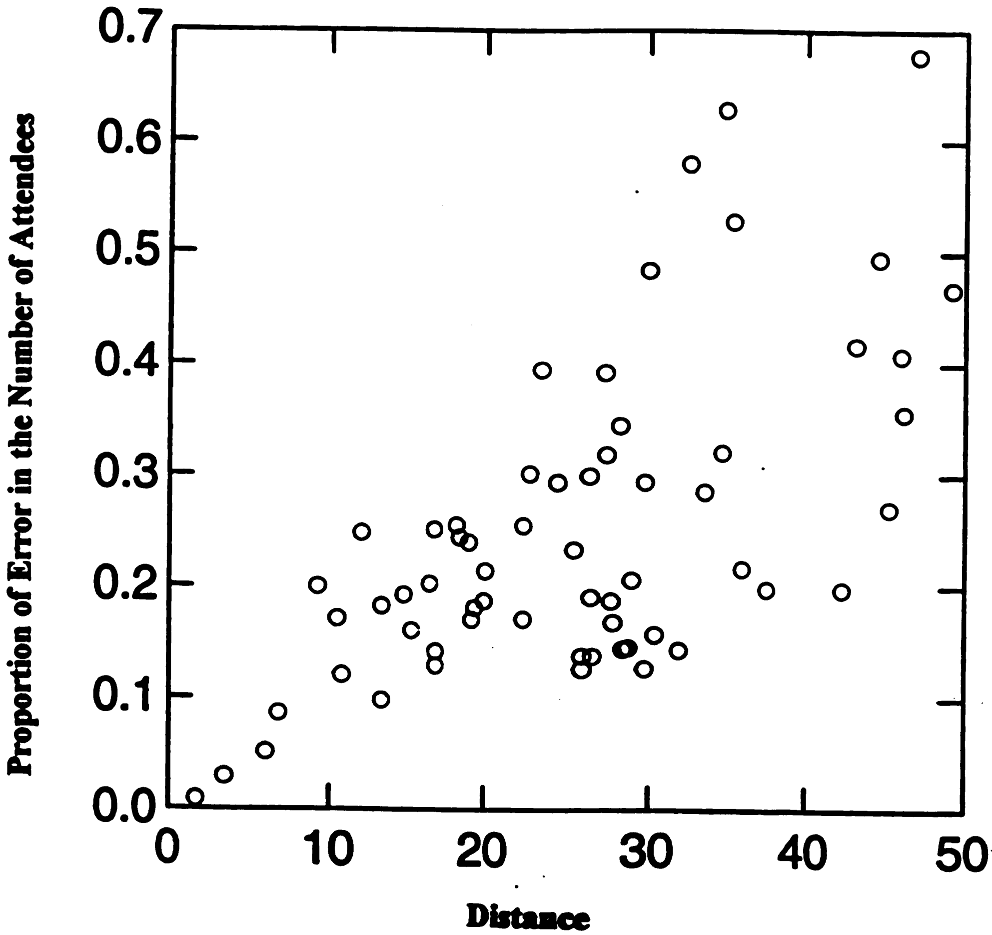
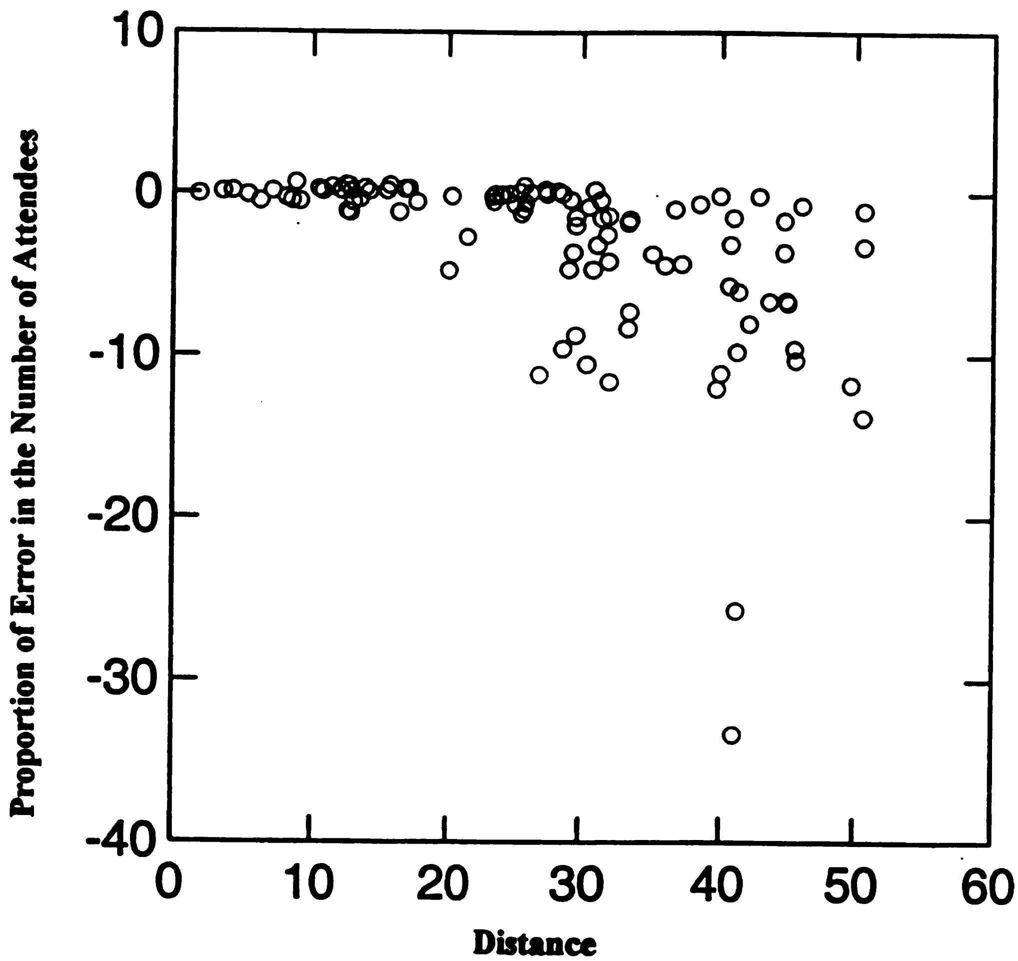


FIGURE #17: West Michigan's Market Territory Proportion of SRMSE Error against Dij (After the Removal of Remote Observations)



zip codes. However, the zip codes that are influenced by the Lansing and the Michigan franchises have the largest magnitudes of error with regard to the number of people that attend the games of West Michigan. The observations that are affected by these two franchises are located between 27-45.5 miles from West Michigan's ballpark (again, to denote these zip codes, both models must have overpredicted observations that are located relatively close to the competing franchises). Through the investigation of Figure 17, one is able to recognize that as distance nears 30 miles, the proportion of error in the number of attendees becomes eminently greater for many observations. This is due to the fact that the franchises of Lansing and Michigan are affecting several zip codes beyond this point of distance. The affected zip codes have the highest proportions of error in the number of people that attend games. The potential model produced resembling configurations of the magnitude of error in the number of attendees for the market territories of Beloit, Clinton, and High Desert, as well. As a result, zip codes that are influenced by competing destinations contaminate the predictive ability of both models.

As previously mentioned, remote observations had been eliminated from the data sets because they did not appear to be an integral part of the franchises' market territories. However, the examination of the residuals after the removal of the distant zip codes suggests that many of the eliminated observations may also have been influenced by competitors of the franchises under study. This may explain why the proportion of error in the models' predictions before the elimination of distant zip codes became larger as distance increased from the franchises' stadiums.

Although the magnitude of the models' error is not as great for zip codes that are located near to the stadiums as they are for distant zip codes, there is evidence that the models have difficulty in accurately estimating the number of attendees that originate from various zip codes within the cores of the trade areas as well. This is clear when examining the values of the residuals for each of the observations. Unlike the proportion of error values which demonstrate the magnitude of the error of the models' predictions in the number of attendees, the values of the residuals indicate the difference between the actual number of attendees and the models' estimated number of attendees in real numbers. This measure of examining the residuals is equally as important as the former approach because it reveals outliers within the data sets. Most of these outliers are either central city zip codes, or they are suburban zip codes that are located near to the city.

Figure 18 on page 79 displays, for Charleston's market territory, the values of the regression residuals against D_{ij}; and Figure 19 on page 80 exhibits the values of the SRMSE residuals against D_{ij}. One can observe that almost all of the outliers are located within ten miles of Charleston's stadium. The outliers are those observations that are either greatly overpredicted or underpredicted. The observations that the models overpredicted are located within the city of Charleston. On the other hand, the underpredicted observations are suburban zip codes that are on the periphery of the city. Figure 20 on page 81 depicts the zip codes within the cores of the trade areas that both models poorly predict for Charleston's trade area. Examining the values of the regression residuals and the values of the SRMSE residuals for the other five franchises revealed similar patterns of outliers within the cores of these market territories as well. Figures 21-25 on pages 82-86 show the zip codes within the heart of the trade areas that both models badly estimate for the other five franchises.

FIGURE #18: **Charleston's Market Territory**
Values of the Regression Residuals against Dij
(After the Removal of Remote Observations)

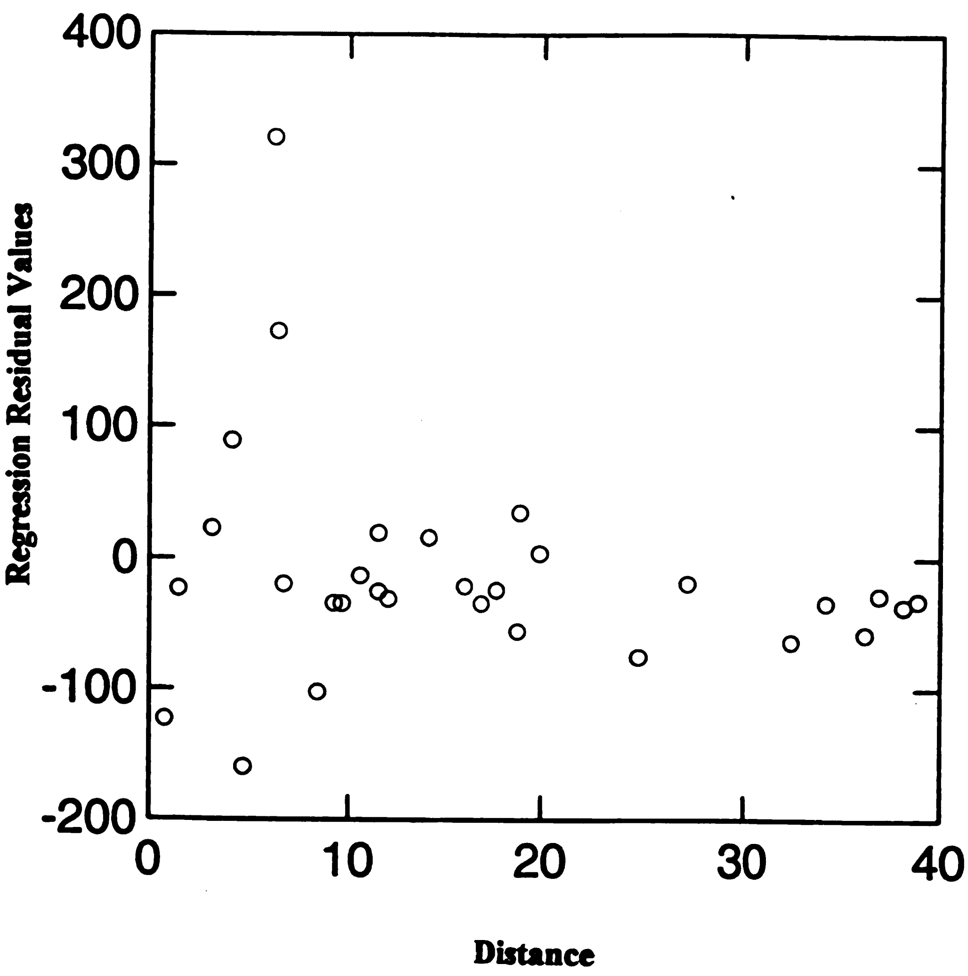


FIGURE #19: Charleston's Market Territory
Values of the SRMSE Residuals against Dij
(After the Removal of Remote Observations)

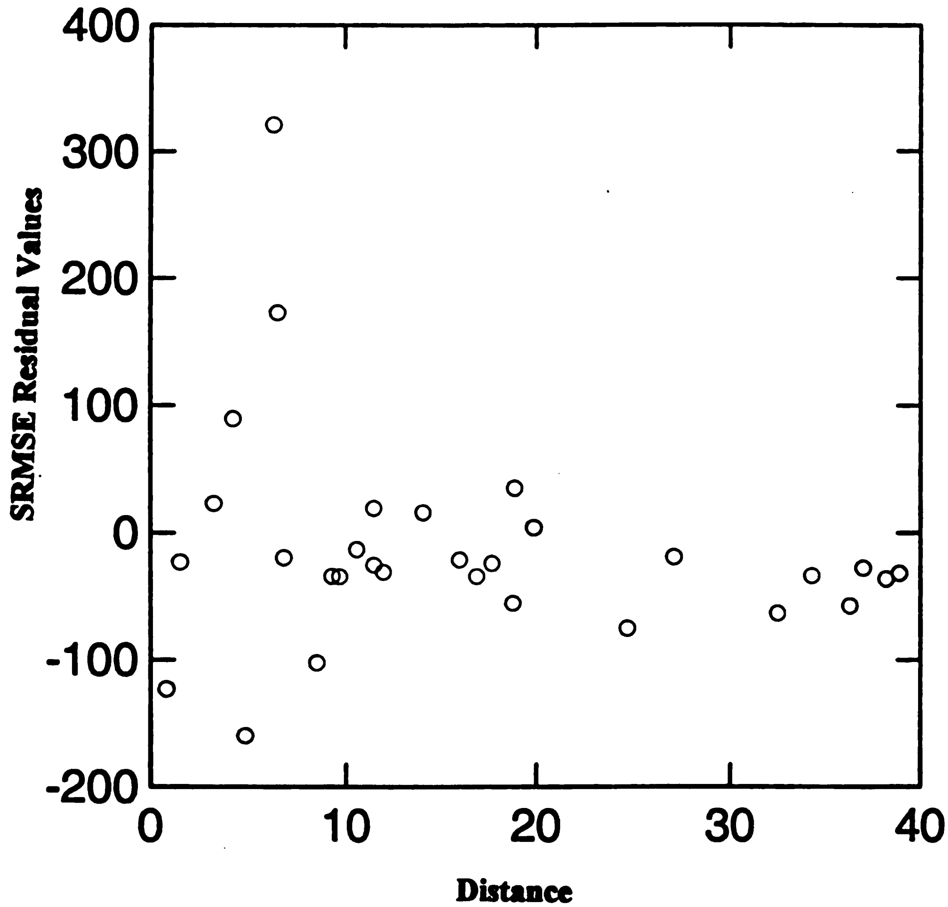


FIGURE #20: Outliers in Charleston's Market Territory

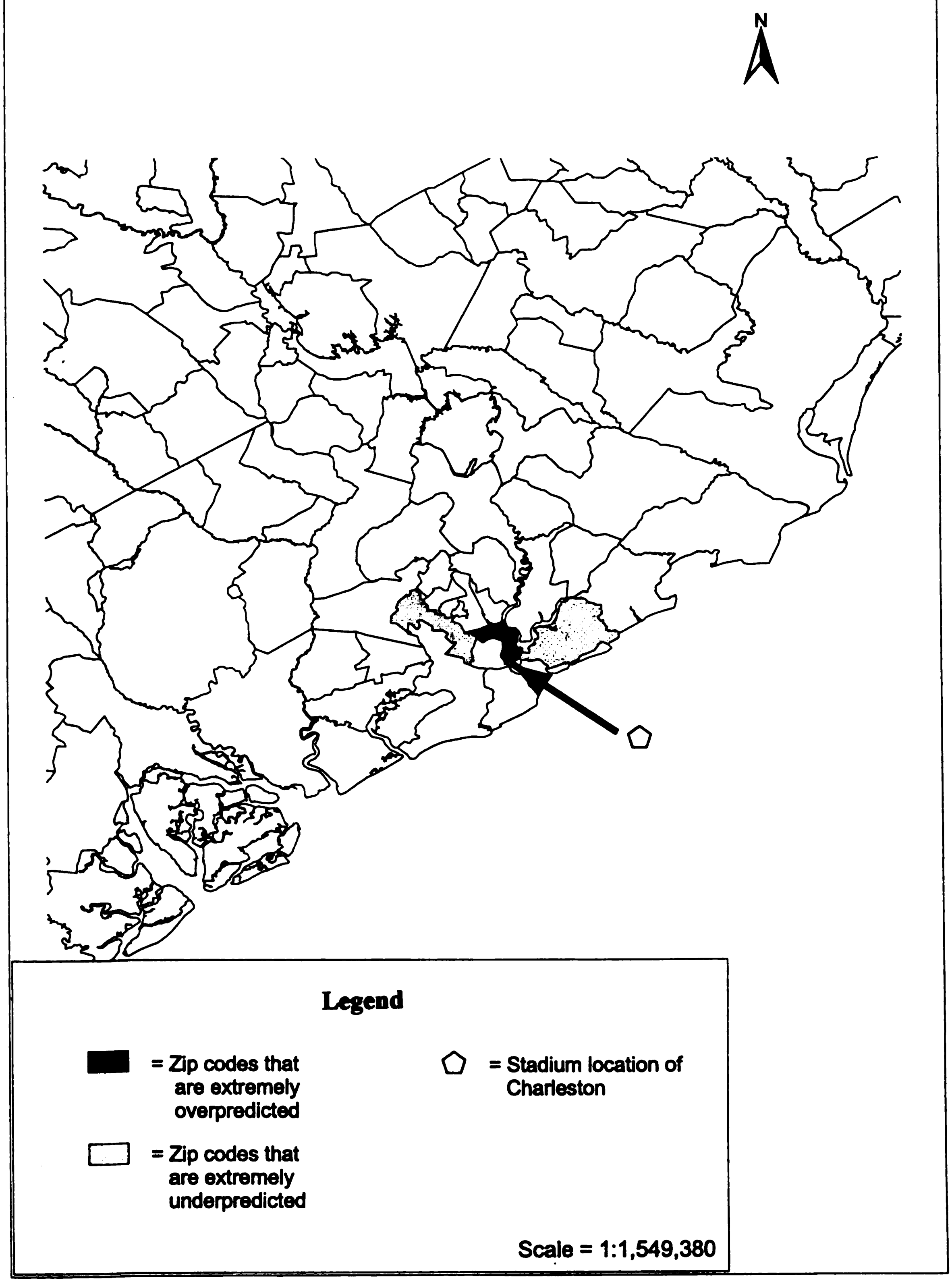


FIGURE #21: Outliers in Beloit's Market Territory

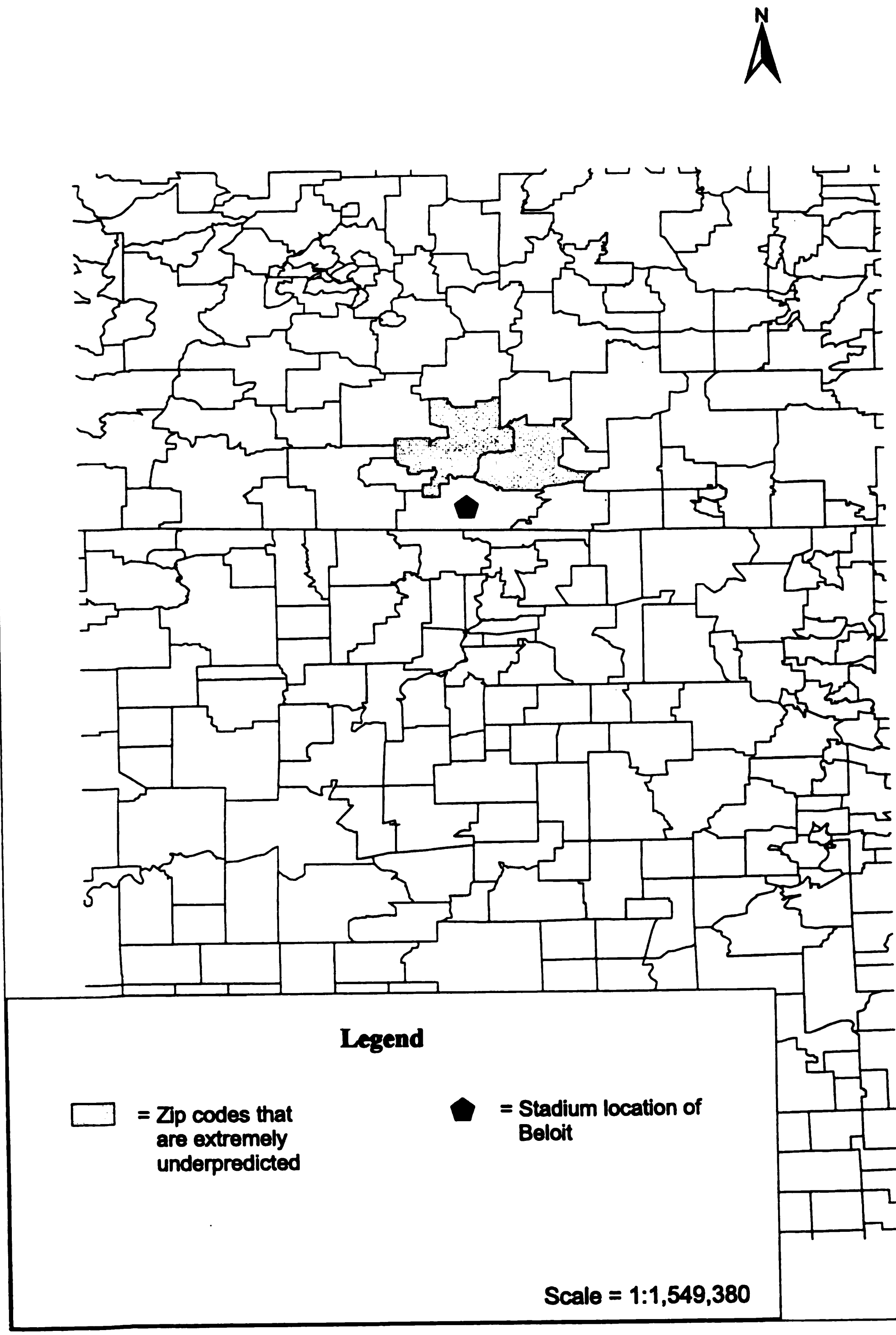


FIGURE #22: Outliers in Charlotte's Market Territory

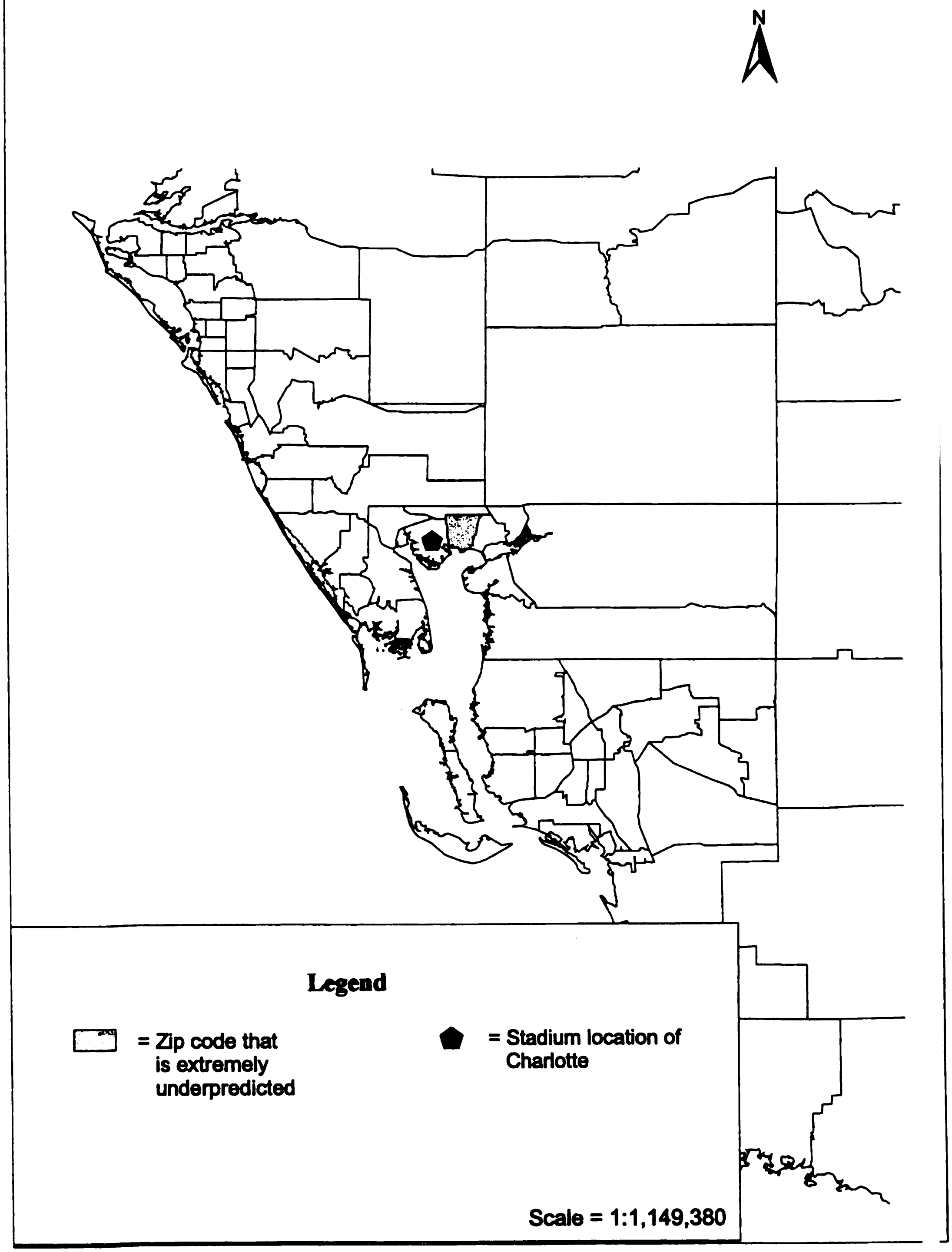


FIGURE #23: Outliers in Clinton's Market Territory

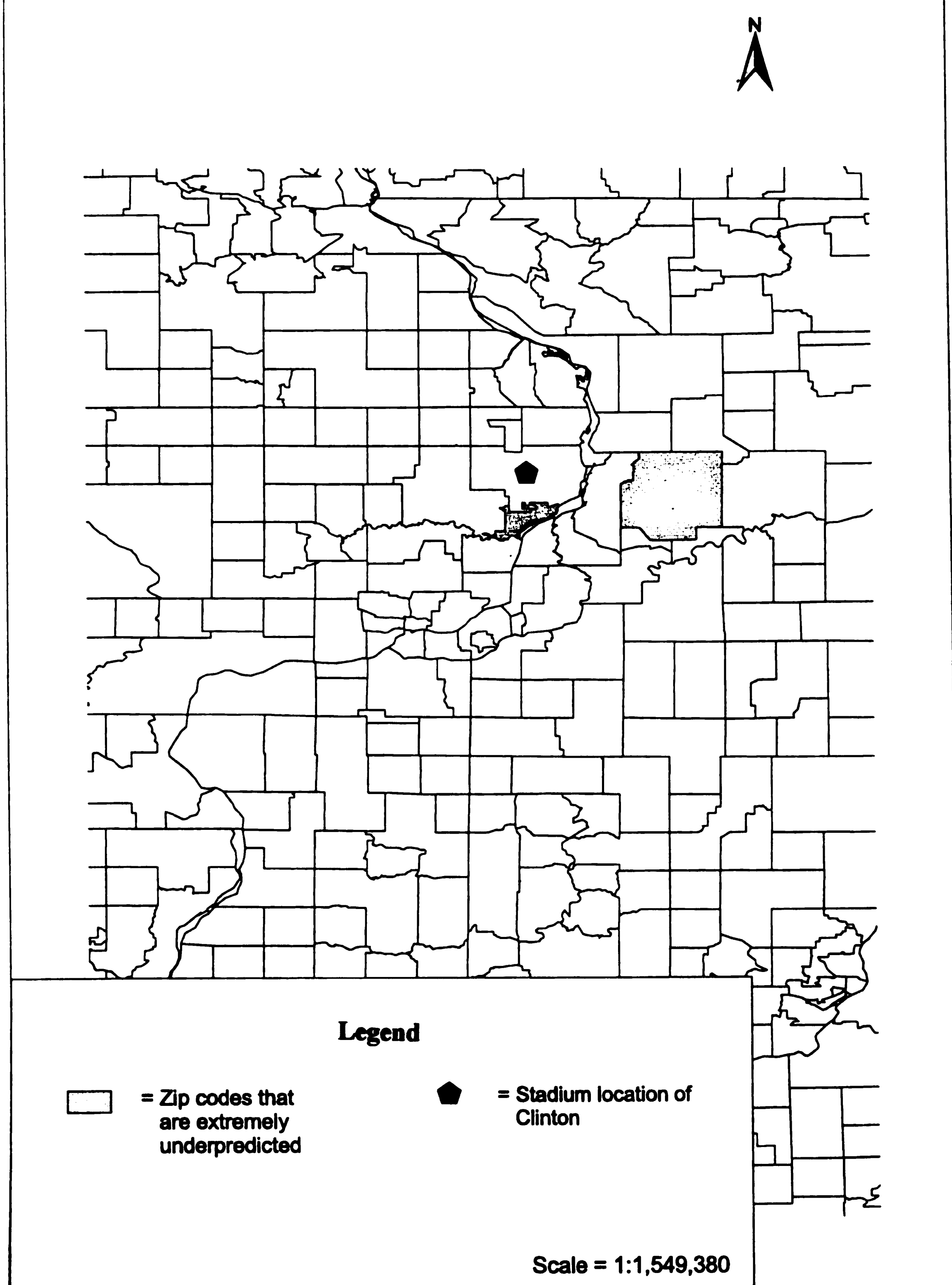


FIGURE #24: Outliers in High Desert's Market Territory

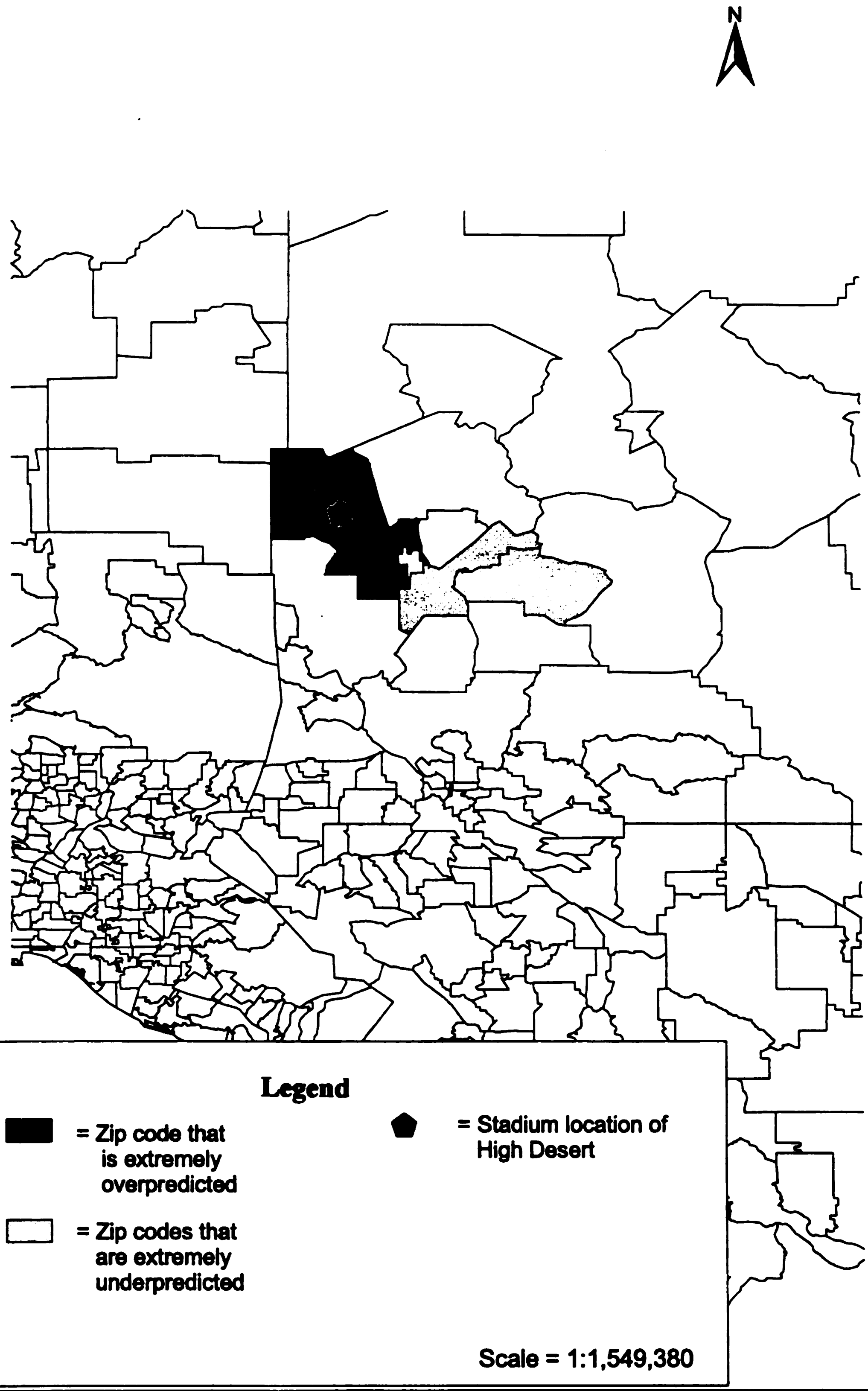
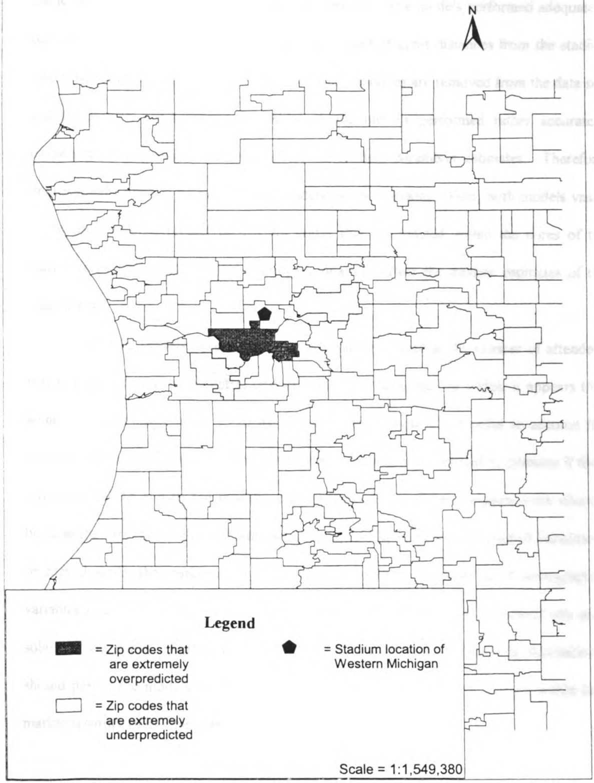


FIGURE #25: Outliers in West Michigan's Market Territory



This chapter has described the results of the methodology that was addressed in Chapter III. Both models were applied to each of the six data sets and were tested with the R^2 and the SRMSE goodness-of-fit test statistics. The models performed adequately, but it was discovered that zip codes that are located at great distances from the stadium affect the results of the models. Therefore, such zip codes are removed from the data sets and the models are reexamined. Although the models performed rather accurately, outliers and competing destinations affect the models' parameter estimates. Therefore, improvements need to be made to the models for two reasons. First, both models vastly overpredict or underpredict certain zip codes that are located within the cores of the market territories. Secondly, competing destinations affect the models' estimates of the trade areas.

Since the models have difficulty in accurately estimating the number of attendees that originate from certain central city zip codes and suburban zip codes, it appears that some type of measure needs to be incorporated into the models in order to account for different levels of affluence. In Chapter III, ten variables were selected to examine if they might be able to add to the models' explanatory power. These variables were chosen because they are said to directly influence the market characteristics of baseball franchises, or they describe the market areas of other phenomena. The addition of demographic variables could allow the models to provide more reliable estimates of central city and suburban zip codes. Furthermore, a variable that accounts for competing destinations should permit the models to produce better predictions of zip codes that are within the market territory of another franchise.

The succeeding chapter reveals that adding particular demographic variables into the models would improve the models' predictions for some of the market territories. The potential benefit, as well as the problems of incorporating a variable that accounts for competing destinations, is also discussed. This thesis concludes with suggestions for a researcher who would like to apply one of the models to an area, and who has no prior knowledge of the origins of a franchises' attendees.

CHAPTER V
CONCLUSIONS AND FUTURE ANALYSIS

Improvements to the Model

In order to find a better method of determining the market territories of baseball franchises, this thesis has proposed a methodology to ascertain whether a spatial interaction model is able to predict accurately the origins of attendees. Only six Single A minor league baseball franchises responded to more than one-hundred requests for data, thus any conclusions may not be resolute. Nevertheless, a potential model and a transformed potential model were tested upon the actual trade areas of these six franchises. The transformed potential model gave accurate predictions for four of these franchises' market territories, and the potential model produced sound estimations for five trade areas. Neither model was able to effectively capture the variation within Charlotte's trade area.

Through the examination of the residuals, one can distinguish outliers for all six of the trade areas. This chapter demonstrates if additional variables are added into the model, the model should be able to provide relatively accurate predictions for all observations. The chapter also suggests how the model can be applied to a region that is not studied in this thesis, and it concludes with a discussion of the general relevance of this work.

The Inclusion of Demographic Variables

In order to discover other variables that may be incorporated into the models, and thus allow for better predictions of the market territories, ten demographic variables were correlated with the residuals. Five of these variables are believed to affect the market areas of baseball franchises. The other five variables are said to characterize the trade areas of different activities. Please refer to Table 2 on page 43 to review these ten variables and the reasons for their inclusion in this analysis.

Demographic variables that have significant Pearson correlation coefficient values with the regression residuals must be added to the transformed potential model in a multiplicative form. Conversely, variables that are significant with the SRMSE residuals need to be incorporated into the potential model in an additive form. Table 13, on page 91, reveals the hypothesized demographic variables that have correlation coefficients of at least 0.3 or -0.3, against the regression residuals for each of the six franchises. Table 14, on page 92, displays the same information with reference to the SRMSE residuals.

It should be noted that a positive Pearson correlation coefficient value signifies that the model underpredicts zip codes which have a large proportion of its households, or its residents, that meet the criteria of a certain demographic variable. For example, the percentage of family households in a region is said to directly impact the number of people who attend baseball games. Therefore, if the families variable has a large positive coefficient, then the appropriate model underpredicts zip codes that contain many family households. A positive Pearson correlation coefficient value also indicates that the model overpredicts observations which have a small percentage of homes, or inhabitants, that satisfy the criteria of a selected demographic variable. Therefore, if the family variable has a large positive coefficient, then the pertinent model overpredicts observations that consist of few families.

TABLE 13
Correlation Values of Demographic Variables and Regression Residuals

Variables	Beloit	Charleston	Charlotte	Clinton	High Desert	West Michigan
Income		0.55				
Families		0.302				0.308
Males						
M.G.		-0.598				
P.M.P.		0.398	-0.31			
H.O.		0.364		0.331	0.363	
M.P.H.		0.385				0.379
M.S.		0.746				
Education						
Age		0.665			0.348	

*notes: M.G. = minority groups
P.M.P. = professional and managerial positions
H.O. = home owners
M.P.H. = multiple person households
M.S. = marital status

TABLE 14
Correlation Values of Demographic Variables and SRMSE Residuals

Variables	Beloit	Charleston	Charlotte	Clinton	High Desert	West Michigan
Income		0.479	-0.476			0.38
Families						
Males						
M.G.		-0.409				-0.326
P.M.P.		0.526				
H.O.		0.345	0.345		0.501	
M.P.H.						
M.S.		0.366			0.319	0.309
Education		0.446	-0.354			
Age		0.508				

*notes: M.G. = minority groups
P.M.P. = professional and managerial positions
H.O. = home owners
M.P.H. = multiple person households
M.S. = marital status

Conversely, a negative value denotes that the model overpredicts zip codes which have a large number of people that fit the criteria of a particular demographic variable. That is, if the minority groups variable has a large negative coefficient, then the relevant model overpredicts zip codes that consist of a large number of minorities. A negative Pearson correlation coefficient value also signifies that the model underpredicts observations which have a small proportion of its residents that meet the criteria of a certain demographic variable. Therefore, if the minority groups variable has a large negative coefficient, then the appropriate model underpredicts observations that contain a small number of minorities.

After examining Tables 13 and 14, it is obvious that the incorporation of demographic variables would allow for better estimations of certain trade areas more than others. There are many demographic variables that are able to add to the models explanatory power with reference to Charleston's market territory. On the other hand, with regard to Beloit's trade area, the results demonstrate that none of these variables can contribute to the models' predictive ability. Assuming that there is a small amount of collinearity among the variables, the addition of one to three variables would probably be sufficient to allow the models to produce better estimates of the trade areas for the other four franchises.

Table 15 shows the number of meaningful correlation coefficient values that each demographic variable has with the regression residuals as well as the SRMSE residuals. This table reveals that the home owners variable can add to the explanation of the variation of more trade areas than can any of the other variables. This is true because this variable has significant correlation coefficient values for three sets of regression residuals, and three sets of SRMSE residuals. The income and the marital status variables have significant values for one set of regression residuals and three sets of SRMSE residuals. Therefore, other than the home owners variable, these two variables are able to explain the variation of more market territories than the other variables that are examined.

TABLE 15
The Number of Meaningful Correlation Coefficient Values for each Demographic Variable

Variables	Regression Residuals	SRMSE Residuals
Income	1	3
Families	2	0
Males	0	0
Minority Groups	1	2
Professional-Managerial Positions	2	1
Home Owners	3	3
Multiple Person Households	2	0
Marital Status	1	3
Education	0	2
Age	2	1

Interestingly, of these three variables, only income has been said to influence the market characteristics of baseball (please refer to Table 2 on page 43).

All of the demographic variables have the expected relationship with the residuals, with the exception of the two sets of correlation tests that pertain to Charlotte's market territory. The professional positions variable has a negative relationship with the regression residuals (please refer to Table 13). The income and education variables have negative correlation values against the SRMSE residuals (please see Table 14). Therefore, the models overpredict zip codes that have large values of these three variables, and they underpredict observations that contain few people that meet the criteria of these variables. On the other hand, the home owners variable has a positive correlation value with the SRMSE residuals. Consequently, the potential model underpredicts observations that contain a large number of home owners, and it overpredicts zip codes that have a small quantity of residents who own homes.

These results suggest that residents who own homes in and around Port Charlotte, FL, do not have relatively large amounts of income, are not employed in professional or managerial positions, nor did they attend college. These circumstances probably contradict the suppositions of most people. As a result, the tests of correlation reveal that Charlotte's market territory is an anomaly with regard to the trade areas of the other five franchises under investigation.

However, this set of conditions may be describing elderly residents. Most senior citizens are not employed, thus they receive a limited income. Moreover, they were raised during a period of time when attending a university was not the norm. Nevertheless, it is very possible that they have earned enough income in their lifetimes to have bought a home. The reason that the age variable did not capture this phenomenon is because this variable represents the percentage of people that are 25-59 years old who reside within a zip code. Therefore, this variable, as it is presently specified, is not able to isolate the impact that elderly residents may have upon this market territory.

As previously mentioned, the models do not predict Charlotte's market territory very well. Therefore, it is possible that D_{ij} and P_i do not adequately explain the variation in trade areas in which senior citizens make up most of the attendees. Including a variable that represents elderly residents might allow the models to produce better forecasts of Charlotte's market territory.

If there are certain subareas of a market territory that have a high proportion of African-Americans, an argument could be made to add a variable that accounts for this particular minority group. Of the six franchises, the trade areas of West Michigan, Charleston, and High Desert have zip codes with relatively high percentages of minorities.

Two of these market territories, Charleston and West Michigan, show a relationship between the minority groups variable and the residuals.

The Charleston and High Desert market territories consist of many zip codes that have a high percentage of minority groups that are located throughout their trade areas. However, only in the trade area of Charleston could the minority groups variable add to the models predictive powers (please refer to Tables 13 and 14). This may be due to the fact that the minorities that reside in Charleston's market territory are African-Americans, while Hispanics and Asians make up most of the minorities that inhabit High Desert's trade area. In Chapter III it was stated that African-Americans are not inclined to attend baseball games, and that Hispanics and Asians have become more interested in baseball. Therefore, if a trade area being examined contains subareas that are heavily populated by African-Americans, it is advisable to add a variable to account for this minority group.

West Michigan's market territory provides more evidence to incorporate a variable that accounts for African-Americans as opposed to all minority groups. In West Michigan's trade area, the only observations that consist of a large number of minorities are zip codes located within the cities of Grand Rapids and Muskegon. These observations contain relatively large numbers of African-Americans. The correlation test of the SRMSE residuals reveal that there is a negative relationship between the minority groups variable and the residuals for this market territory (please see Table 14). Because most of the minorities that reside in this region are African-Americans, the minority groups variable basically describes the percentage of African-Americans in each of the zip codes. This may explain why this variable has significant correlation coefficient values.

Although it was found that the home owners, the income, and the marital status variables would contribute to the explanatory power for more of the market territories, it appears that in certain circumstances it would be appropriate to add other variables into the models. For instance, for Charlotte's trade area, incorporating a variable that accounts for the percentage of elderly residents within all zip codes would likely allow the models to provide a better estimation of that market area. Moreover, adding the percentage of African-Americans that reside in each of the zip codes would probably contribute to the models' explanatory power for Charleston's and West Michigan's market territories. However, none of the ten variables would increase the predictive ability of the models for all six of the trade areas. Therefore, there is not one set of variables that is able to elucidate upon all the trade areas of baseball franchises. Instead, each market territory has its own characteristics; and, thus, different sets of variables should be incorporated into the models to obtain accurate estimates. However, it is not necessary to thoroughly investigate every market territory of every baseball franchise. Employing the analog approach allows one to apply the results of this thesis to other regions. This will be discussed later in this chapter.

A Competing Destinations Variable

In four of the franchises under study, competitors affected the results of the models. In order to obtain more precise predictions, a variable that accounts for competing destinations should be included into the model. Obviously, this only needs to be accomplished in cases where a competitor is infringing upon the market territory that is being investigated. Incorporating a variable that represents the amount of distance between an observation and the nearest competing destination should allow the models to provide accurate estimates of the number of attendees that originate from zip codes that are a part of another market territory.

This task is more difficult than it may appear and will only be discussed here. This is true because a hierarchy exists in the sport of baseball. Professional baseball teams, that is, those franchises who pay salaries to players for their abilities, are separated into two categories: the major leagues and the minor leagues. In 1997, the average attendance for a major league game was 28,229 (www.sportsline.com). On the other hand, in 1997 the average attendance for minor league teams that played a full season ranged from 2,552 to 5,680 (www.minorleaguebaseball.com). This attendance figure is dependent upon the level of minor league baseball, which will be discussed shortly.

The major reason for the large discrepancy in attendance levels between major league baseball and minor league baseball is due to the fact that there is a higher caliber of play in the major leagues. Because many minor league franchises are owned by a major league franchise, the role of the minor league team is to develop young players for the major league ballclub. Judging by attendance levels, fans would rather attend games that offer the highest caliber of play. Therefore, it should seem obvious that major league franchises have much larger catchment areas than minor league franchises.

The hierarchical structure is even more complex than simply the major and the minor leagues. There are three levels that constitute the minor leagues: Triple A, Double A, and Single A. Near the top of the hierarchy, just below the major leagues, is Triple A baseball. The primary reason that it derives this status is due to the fact that when players are needed major league teams normally call up players from this level. Therefore, Triple

A teams consist of the most talented ballplayers who play in the minor leagues. Double A baseball and Single A baseball are the next two tiers of the hierarchical structure within minor league baseball. Their position in the hierarchy is based on the same reason given for Triple A baseball, modified accordingly (Johnson, 1993). As mentioned earlier, the franchises that were examined in this study are Single A baseball teams.

Based on attendance figures, the difference between each of the classes within the hierarchy of the baseball industry is not uniform. The difference between major league baseball and Triple A baseball is much greater than the disparity between the other levels of the baseball industry. A major league franchise probably has a much larger geographical market territory than do minor league baseball teams. Moreover, it is quite possible that Triple A baseball teams have larger trade areas than the trade areas of Double A and Single A franchises. This may also be true with reference to Double A and Single A baseball franchises.

Therefore, franchises of different levels of the hierarchy most likely have different powers of attraction. This poses challenges for incorporating a competing destinations variable into the models. For example, suppose a major league franchise and a Triple A franchise encroach upon the market territory of a Single A ballteam. For one zip code within the trade area of the Single A franchise, the major league ballclub is located forty miles from this zip code, and the Triple A franchise is positioned twenty miles from this observation. In order to account for competing destinations, it was previously suggested to add a variable that represents the distance between an observation and the nearest competing destination. However, in this example, is the Triple A franchise more attractive to the potential attendees that reside in this zip code than is the major league franchise merely because it is closer? Attendance levels suggest that the major league franchise would entice more people to attend its games. As a result, in order to add a variable into the models that would completely capture the effect of competing destinations upon a franchise's market territory, further research must be conducted to determine the differences in the powers of attraction for franchises within different levels of the baseball hierarchy.

Application of the Model

As stated earlier, it appears that all franchises do not have identical market characteristics. Therefore, applying a uniform model would not effectively predict the market territory for all franchises. The addition of certain demographic variables would add to the models' predictive abilities for some trade areas, but not for all trade areas. Furthermore, not all market territories are affected by competing destinations. However, by employing the analog method it is possible to apply the results of this thesis to other trade areas.

The basic assumption of this approach is that if one has reliable information about the characteristics of a trade area, then it is possible to apply this knowledge to analogous regions (Thompson, 1986). In order to employ one of the models with no prior knowledge of a trade area, correct parameter values must be inserted so that the model provides accurate estimates of the origins of the attendees. To achieve this, a researcher must consider whether D_{ij} or P_i should have more influence with regard to a model's predictions. This can be accomplished by examining the market characteristics of the six franchises that were investigated in this thesis.

According to the beta values, P_i is a stronger predictor of attendees than is D_{ij} for only one franchise, Charleston (please refer to Table 10 on page 66). This is probably due to the fact that of the six stadiums, only Charleston's stadium is located in the central business district (CBD). Therefore, many zip codes that are located relatively close to the ballpark are within the central city. Through the examination of Figure 6 on page 59, one can realize that zip codes that are located within the central city send relatively few attendees to the franchise. These zip codes are surrounded by suburban zip codes that submit a larger number of patrons. Studying the zip codes that are located in the central city reveals that the demographic characteristics of the residents are those that would indicate that the residents are not likely to attend games. That is, these zip codes contain: few people with high incomes, a small number of married couples, few people that are between the ages of 25-59, etc. (please refer to Tables 13 and 14 on pages 89-90). Moreover, zip codes located in Charleston's central city consist of a large number of minorities, more specifically African-Americans. Therefore, it appears that the demographic characteristics of those who reside in central city zip codes are negating the predictive power of D_{ij}.

Consequently, it appears that the location of the stadium seems to be an important factor in determining whether D_{ij} or P_i should have a higher parameter value when applying one of the models to another area. In the case that the stadium is not located in the CBD of the major city in the region, as are the stadiums of the other five franchises, there is no evidence to suggest that D_{ij} should not have more influence in forecasting the market territory than does P_i. Conversely, if the ballpark is located downtown, and the residents who live near to the stadium have demographic characteristics similar to those in the Charleston trade area, it may be wise to input the parameter values so that P_i has more influence. However, with only six data sets, this conclusion is not resolute.

Although it seems that P_i should be stronger than D_{ij} when the above conditions are met, this does not resolve the problem of determining the values of b and c. A researcher could either use the appropriate parameter values (for example, if the stadium of the franchise is located downtown, then the researcher should use the parameter values that were calculated for the Charleston franchise) that were computed by regression analysis, or by the SRMSE statistical measure. Because the R^2 test, unlike the SRMSE examination, weighs certain observations more than others when calculating its test statistic value and its parameter values, the coefficient of determination examination is more likely to be influenced by outliers and competing destinations than the standardized root mean square error. Therefore, it may be wise for an investigator to utilize the parameter values that were estimated by the SRMSE test statistic.

Although it may be sensible to use the parameter values that were computed by the SRMSE statistical measure, it is not necessary. This is the case because other variables will be added to the model to account for outliers and competing destinations. In order to incorporate proper variables into the model, one should study the market characteristics of the six franchises examined in this thesis. For example, if the region that is under investigation is located in the sun belt, studying the market characteristics of Charlotte would probably be appropriate. It appears that for teams situated in the sun belt the proper variable to incorporate into the model is one that accounts for elderly residents. Suppose the stadium of another franchise is located in the CBD, and the demographic characteristics of central city residents are similar to those of Charleston's city inhabitants. It would then be prudent for an investigator to add a number of demographic variables into a model. However, it is necessary to be aware of multicollinearity between the variables and it is best if the model is parsimonious. Thompson, 1986 suggests using one variable for every twenty observations.

In some circumstances, it appears that one should not add other demographic variables into the model. For instance, if the area that is being studied is similar to that of Beloit's market territory, it appears that the addition of demographic variables will not contribute to the model's predictive powers. Instead, it is necessary to add a variable that accounts for competing destinations. Again, further research needs to be conducted in order to determine the difference in the strength of attractiveness for franchises within different levels of the baseball hierarchy.

It should be mentioned that the addition of demographic variables is a subjective process. This is the case because no two trade areas are exactly alike. Therefore, the analog method provides options to an investigator who is applying one of the models for another franchise. For example, assume that the region that a researcher is examining is similar to that of West Michigan. The tests of correlation demonstrated that five variables would add to the explanatory power of the models with reference to West Michigan's trade area: families, multiple person households, income, marital status, and minority groups. As stated earlier in this chapter, a variable that represents the proportion of African-Americans that reside in zip codes would capture more of the variation within trade areas than the current variable that delineates all minority groups. Therefore, if the region that is being examined does not contain a large number of African-Americans, but in every other manner is similar to West Michigan's market territory, then this variable should not be incorporated into the model. As a result, there is not a uniform model that effectively portrays the market territories of analogous regions. Instead, the analog method furnishes ideas to researchers who must use their own discretion when deciding what other variables should be added to the model.

Relevance of this Research

This thesis has demonstrated that three parties are interested in the geographical market territories of baseball franchises. However, the methods utilized by franchises, leagues, and economic impact analyzers are either inefficient or inadequate. Gaining knowledge of a market territory through the use of surveys or by selling season tickets are cumbersome and costly approaches. The application of arbitrary measures is a deficient method of estimating the market territories of baseball franchises. Through the examination of Figures 26-31 on pages 105-110, one can realize that a city's Basic Trade Area does not effectively portray the trade areas of the six franchises under investigation. Therefore, estimates of the economic impacts of export sales and import substitution may be erroneous. Another unsatisfactory measure of depicting franchises' trade areas is the minor leagues' arbitrary designation for granting ballclubs territorial rights. As previously mentioned, no minor league baseball franchise is able to locate their team within thirty-five miles of another team's stadium. Referring to Table 7 on page 64, it is clear that the ranges of some franchises' trade areas are less than thirty-five miles, while others are larger than this distance. Assuming that all minor league teams have different market ranges, it is possible that leagues are not allowing proprietors to locate a franchise in a region that is

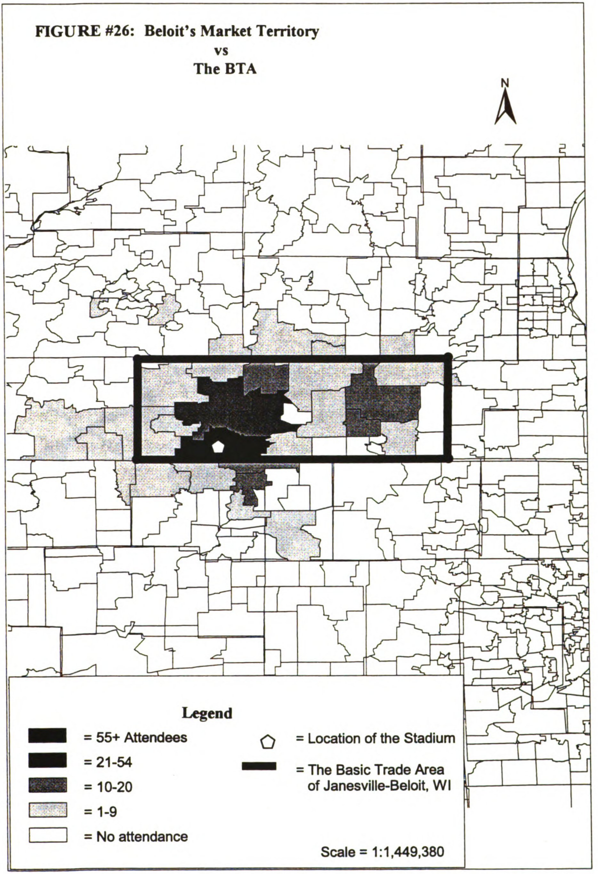


FIGURE #26: Beloit's Market Territory
vs
The BTA
N
Legend
= 55+ Attendees
= 21-54
= 10-20
= 1-9
= No attendance
= Location of the Stadium
= The Basic Trade Area
of Janesville-Beloit, WI
Scale = 1:1,449,380

FIGURE #27: Charleston's Market Territory
vs
The BTA

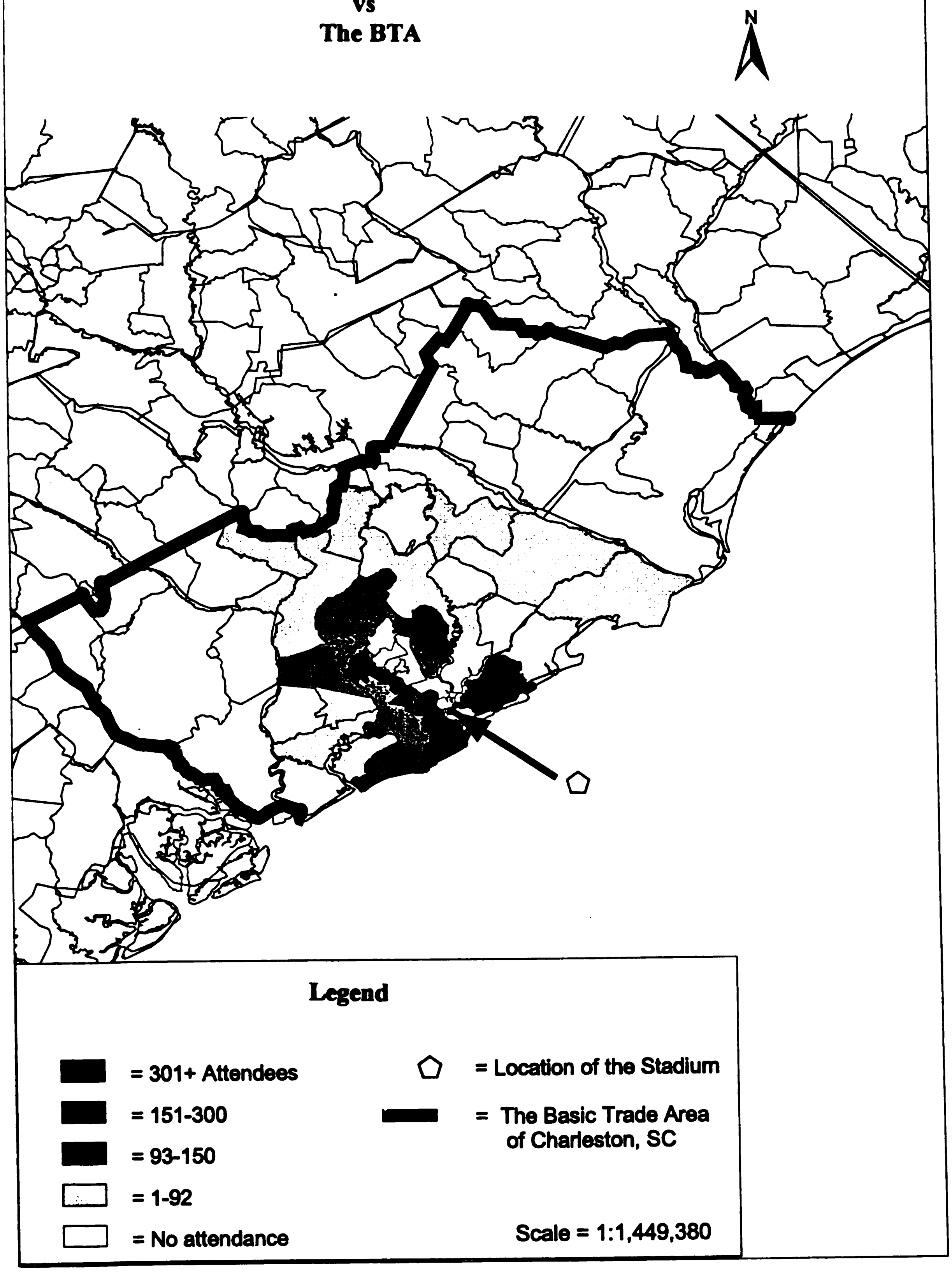


FIGURE #28: Charlotte's Market Territory
vs
The BTA

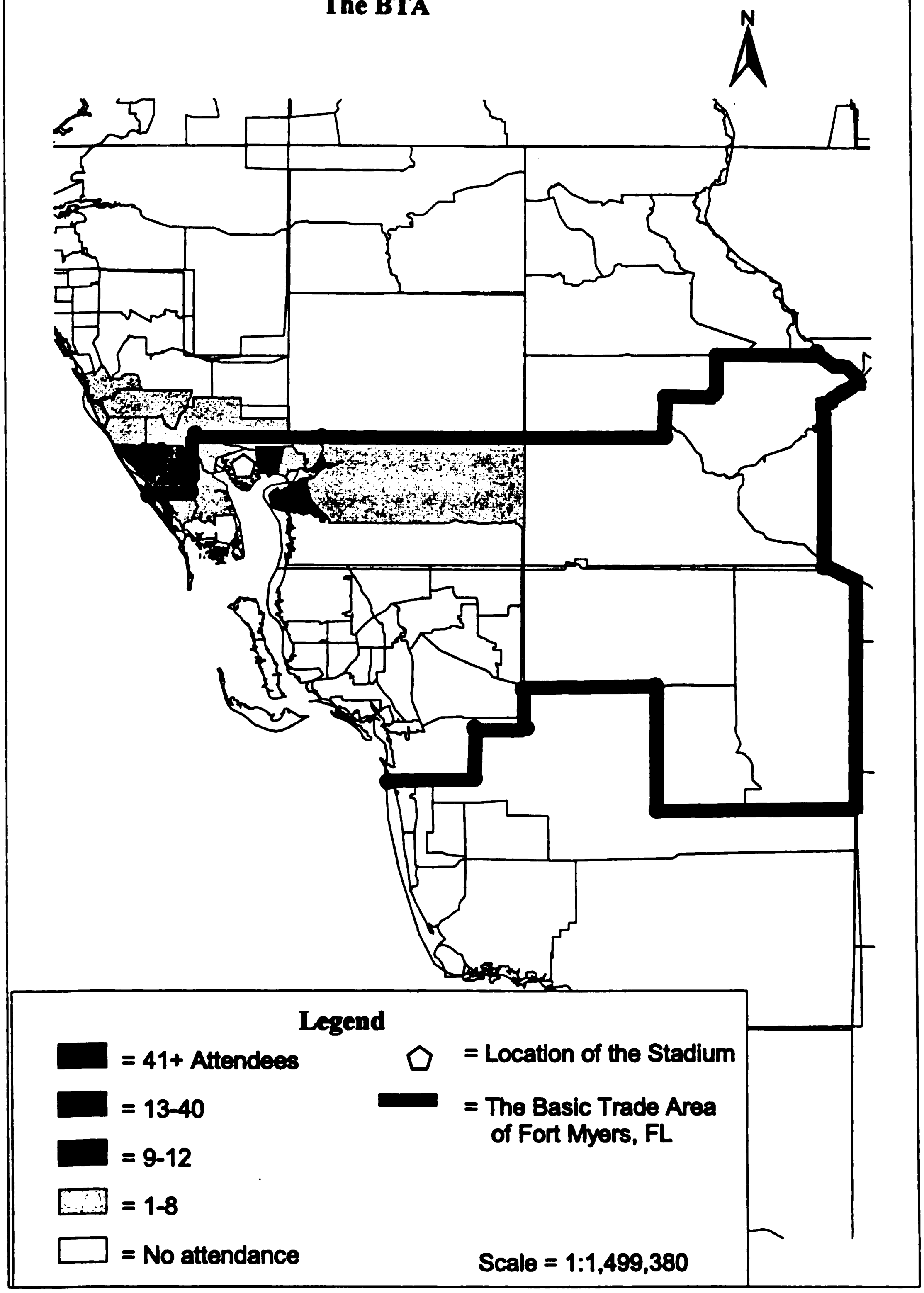


FIGURE #29: Clinton's Market Territory
vs
The BTA

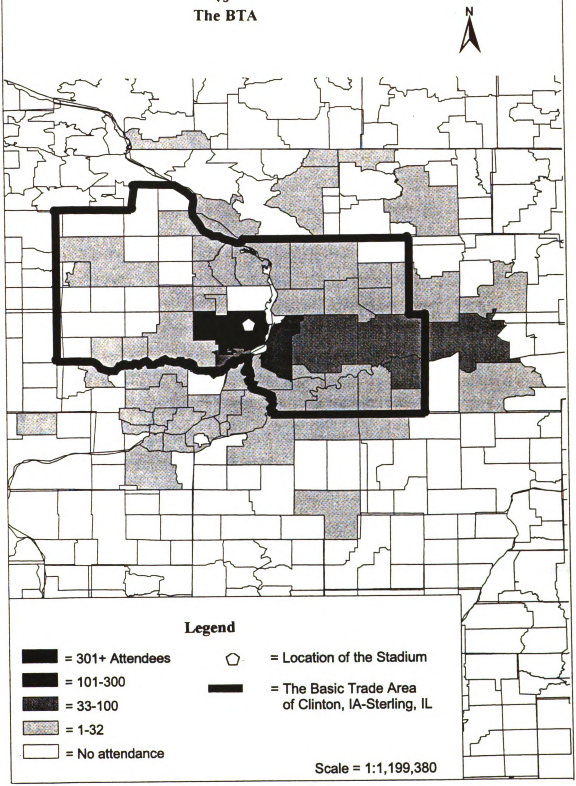


FIGURE #30: High Desert's Market Territory
vs
The BTA

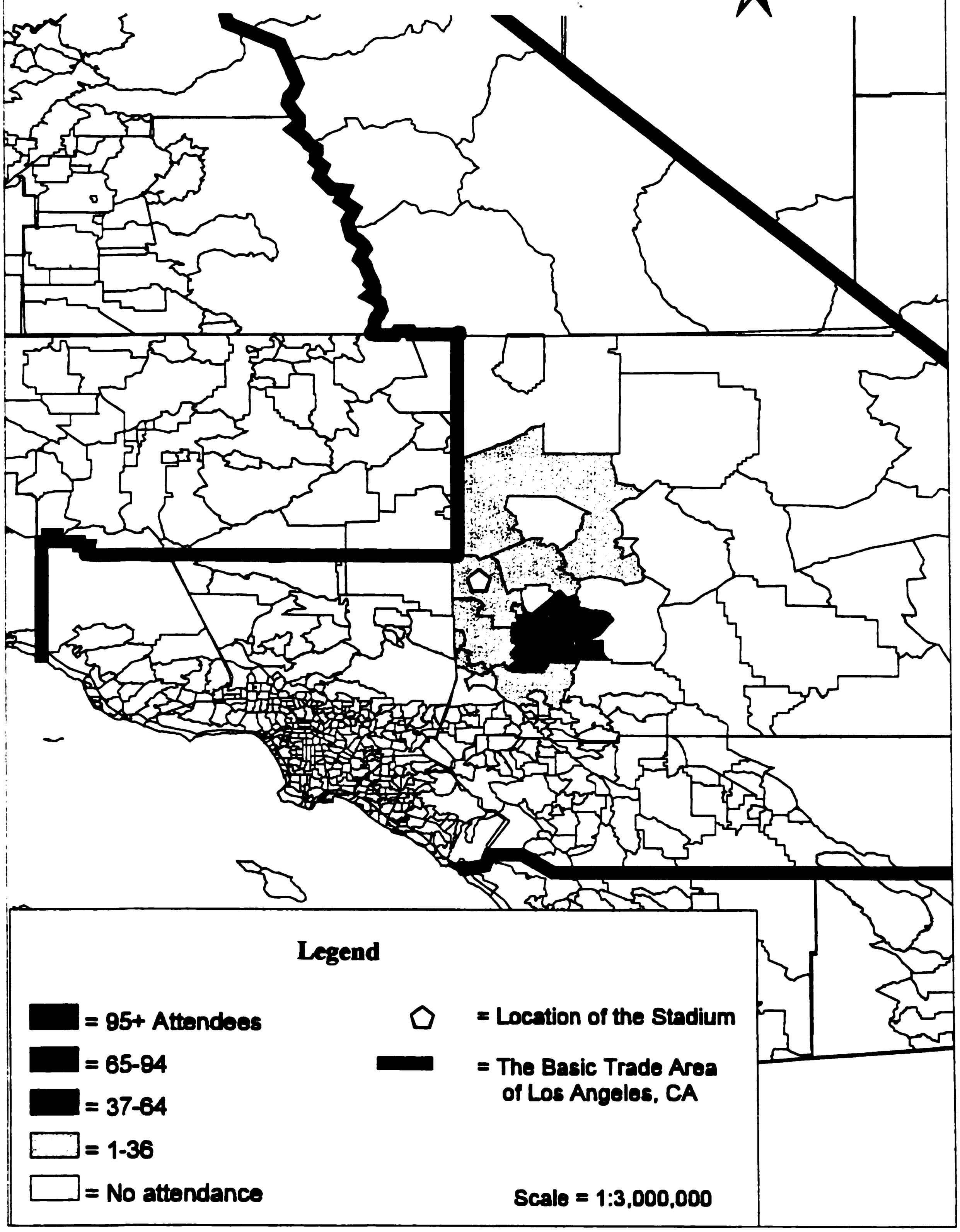
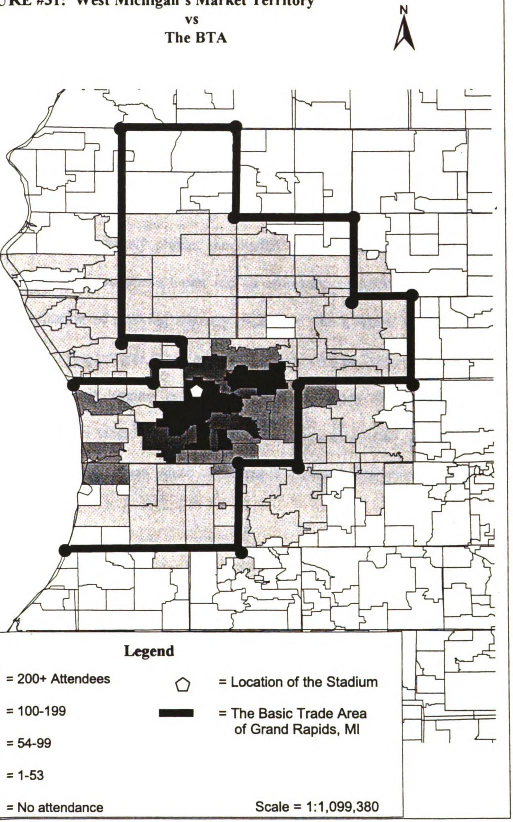


FIGURE #31: West Michigan's Market Territory
vs
The BTA



capable of supporting a baseball team. On the other hand, leagues may be permitting owners to locate in an area that is not able to support a ballclub. Therefore, a better method is needed in order to allow for efficient and effective predictions of the trade areas of baseball franchises.

This thesis reveals that using population and distance as the variables within a potential model -and with the incorporation of pertinent demographic variables; and when appropriate, the addition of a variable that accounts for competing destinations- the model should be able to accurately predict the market territories of all baseball franchises. Therefore, the model provides a better tool of estimating a team's market territory than does the application of applying arbitrary measures. As a result, the potential model would improve measurements of the effects of export sales and import substitution upon local economies, and leagues could place teams in more advantageous locations. Moreover, the model would provide franchise owners with a more efficient method of learning about their trade areas, which should result in a more profitable operation.

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