THE EFFECT OF GEOGRAPHIC LOCATION ON NHL TEAM REVENUE

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Abstract

This study attempts to explain the effect geographical location has on a National Hockey League (NHL) team's revenue. The effect location has will be compared to other determinants of revenue in the NHL. Data sets were collected from the 2006-2007 and the 2007-2008 seasons. Regression results were analyzed from these data sets. This study found that attendance, city population, and win percentage has a positive and significant effect on revenue.

KEYWORDS: (Location, National Hockey League, Revenue,)

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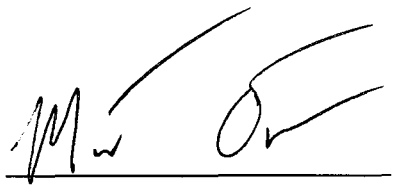

Signature

I would like to thank my thesis advisor Alexandra Anna for her guidance and patience throughout this process. I would also like to thank my parents for their full support of me from start to finish. None of this could have been possible without these people.

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CHAPTER I

INTRODUCTION

The Phoenix Coyotes of the National Hockey League (NHL) have been at the bottom of the league for total revenue ever since their existence as a franchise[1]. Finally on May 5, 2009 the Phoenix Coyotes filed for bankruptcy. What could have been the reason the Coyotes' revenue was below par? That is a question the former owners of the Coyotes probably wish they had figured out a long time ago. A good possibility is that the city of Phoenix might have had some effect on the low-revenue numbers. It is important to know what kind of effect location has on an NHL team's revenue so one would know where to place an NHL franchise and to know what franchises have a solid future with the league. Knowing where a franchise can or cannot be successful is vital information for many people working within the NHL. Owners need to know where a franchise can survive so they can make educated decisions on what to do with their teams; buy, sell, or keep the teams in their current locations. It is important for coaches and players because if they have any option at all, they will know what will be a safe team to sign with. It is important for agents to know the effect location has on an NHL franchise because they need to know what teams to steer their clients towards. It is also important to local businesses so they can decide if it is a good idea to sponsor the team or not. Some teams in the league are suffering and some teams in the league have excelled

[1] "NHL Revenue," available from http://www.forbes.com; accessed December 15, 2009.

for many years. It is hard to ignore the notion that the city, state, or province that the team is located in plays a major role. This thesis will study the effects geographical location has on an NHL team's revenue.

The National Hockey League is considered one of the four major sport leagues in the United States, along with the National Basketball Association (NBA), Major League Baseball (MLB), and the National Football League (NFL). However, it can be said that the NHL is the least popular of these four professional sports leagues. It was in 2004 when the league hit an all time low. The NHL became the first major professional sports league to cancel an entire season. That lost season is referred to as the lockout season. The NHL and the National Hockey League Players Association failed to agree on a new collective bargaining agreement for the 2004-2005 season. Prior to the lockout, owners could spend their money freely on their rosters. This hurt teams in smaller markets. The Buffalo Sabres and the Ottawa Senators had to file for bankruptcy in 2003[2]. The league then proposed a salary cap which linked player's salaries to team revenue[3]. The Players Association did not cooperate and a labor dispute carried out for a long time. The NHL lost an entire 82 game season and for the first time in the league's history, no Stanley Cup was awarded. A new collective bargaining agreement (CBA) was assembled. The new CBA instituted a salary cap, new minimum and maximum player salaries, and revenue sharing[4]. With the new CBA, the teams in the league are required to share their revenue with the other teams in the league. The teams that finish in the top half of the league in revenue have to give a specific percentage of their revenue to the teams that finished in

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[2] Michael Traikos. "Decade in Sport: The NHL Lockout." *The National Post* (2009).

[3] Ibid

[4] "Collective Bargaining Agreement." Available from http://www.nhl.com/; accessed March 7, 2010.

the bottom half for revenue[5]. The percentages vary depending on where they rank in terms of revenue numbers[6].

Although the reasons for the cancellation had nothing to do with the popularity of the league; the year hiatus did hurt the league's popularity once the next season started. Over the last few years, the NHL has made it a priority to increase its popularity. They have worked hard on increasing attendance, television ratings, and league revenue through advertisements, marketing star players, and even playing games in unusual venues. For example, they started an annual event called the "Winter Classic" in 2008 where they play one game on New Year's Day outdoors either on a football field or a baseball field. The "Winter Classic" has worked well as of late for the NHL in terms of TV ratings and attendance. The first "Winter Classic" game between the Pittsburgh Penguins and the Buffalo Sabres in 2008 turned in the best TV ratings for a regular season game in nearly 11 years[7]. It wasn't until the 2008-2009 season that the NHL saw an increase in both TV ratings and attendance since the lockout season[8]. They also instituted new rule changes after the lockout season. The most notable was the addition of the shootout. If a regular season game is tied after three periods and five minute overtime, then the teams go to a shootout.

The NHL consists of 30 teams. 24 of the teams are scattered across the continental United States and 6 teams are located in Canada. The purpose of this study is

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[5] Ibid

[6] Ibid

[7] "TV ratings bonanza for Winter Classic," available from http://www.nbcsports.msnbc.com/id/22476623/; accessed March 7, 2010.

[8] Tripp Mickle, "NHL's attendance, TV ratings both show increases."*Sports Business Journal*, (2009) 3

to examine the effect that geographical location has on an NHL team's revenue. There are many factors that can possibly affect an NHL team's revenue. One of those factors may be the city or region in which the team is located. Is it possible that the population of a city plays a role in a team's revenue production? Does the average income level of a city contribute positively or negatively to revenue numbers for NHL teams? How does the average yearly temperature of a city affect revenue numbers? This thesis will also research other determinants of revenue for an NHL team. Possible determinants such as winning percentage could have just as much of an effect on revenue as location does, if not more. Other professional sports teams within the same market could also possibly influence NHL revenue numbers. It will be important to compare the effect location has on revenue to the effect of other possible determinants.

This chapter has introduced the topic of this thesis and gave a brief history of the NHL and its issues with revenue. This chapter also stated the importance of researching the topic of location and its effect on NHL team revenue. The next chapter will be the literature review. Past research will be evaluated and discussed in the literature review chapter to gain a better understanding of this theses' research question. Past research is important to note so that this thesis can move in a new direction and discover new research and results. Chapter three will describe the data that will be used in the regression models as well as the methods that will be used. This chapter will also provide the predicted relationships for the data that will be collected. In chapter four, the regression analysis results will be displayed. A correlation matrix will also be provided to show the relationship of the variables with one another. In the conclusion chapter, the variables selected will be broken down and analyzed. Chapter five will compare the

predictions with the actual results and will offer suggestions for future research on location and its effect on NHL revenue.

CHAPTER II

LITERATURE REVIEW

The purpose of this chapter is to review and evaluate previous research related to the geographical location of National Hockey League (NHL) teams and NHL revenue. This chapter also reviews the previous research that has been done about other factors that would account for producing revenue for an NHL franchise. Analyzing this information will be essential in achieving the goal of answering the thesis question of how does geographical location affect an NHL team's revenue. The past research that has been done on this subject should help with the understanding of what makes a particular location a quality place for an NHL franchise to set up. There has been some extensive research published about twenty years ago specifically comparing the teams and their revenues based on the city or region they are based out of, which is similar to the purpose of this thesis. This particular research was done a long time ago and no one has conducted up to date research regarding the effects of location on the NHL. Today the teams and the NHL are different. There are many more teams in new locations today and the results could very well be different from what was found over twenty years ago.

Even with thirty teams in the National Hockey League today, the league is still looking to expand. The NHL is searching for cities that could hold an NHL franchise. The league is desperately hoping to boost its overall income, television ratings, and

attendance numbers. After the lockout season in 2005, the NHL was down in all those categories. Since then, the league has improved their income, TV ratings, and attendance numbers somewhat, but still needs to keep building on that improvement[1]. With that being said, it is essential to consider the question of how does geographical location effect NHL revenue.

Location

In 1988, J.C.H. Jones and D.G. Ferguson wrote a detailed article regarding location and the role it plays in the National Hockey League. They focus on the effect location has on attendance, market power, and long run team quality in the 1977/78 season[2]. They address three important questions. One is why do teams survive in a particular location? The authors attack this question by setting up short and long run models of a team's spectator demand, which enable them to consider the relevance of location and other factors for revenue generating in existing or potential locations[3]. "Specifically, we consider teams as local monopolists and set up a simple two equation model of demand with price and attendance as the endogenous variables "(Jones and Ferguson p.444)[4]. Through this model, they are able to develop a measurement for location quality and team quality[5]. From this point, Jones and Ferguson consider the

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[1] http://www.nhl.com

[2] J.C.H. Jones and D.G. Ferguson, "Location and survival in the National Hockey League." *The journal of industrial economics,* (1988): 443-457

[3] Ibid

[4] Ibid

[5] Ibid

other revenue sources as well as other costs to determine team profit[6]. Once they determine the team's profit, they are able to decipher whether or not a team is fit for survival, "These estimates, combined with other revenue sources and costs, determine team profit which then permits us to examine survival, and the effects of potential relocation and expansion in both the short run and long run with endogenous team quality" (Jones and Ferguson p.444)[7]. The model set up by Jones and Ferguson is quite effective for determining the quality of each team's location as well as determining the correlation between location and survival. But there are still factors that have not been considered. For example, it is important to consider how many youth hockey teams are in the area. The sport of hockey would prove to be more popular in a location that has more youth hockey teams, which would most likely result in a positive correlation for the NHL team's revenue. This thesis will address that factor along with other key variables.

Another question Jones and Ferguson look at is why the better quality locations produce the better quality teams. They answer this question when they come to the conclusion that attendance and winning percentage are positively correlated[8]. More attendance means more revenue. More revenue means they can afford better quality players because unlike today, there was no salary cap in 1977. In their study, there is more of a positive correlation between the quality of a team and quality of their location. In this thesis, the results may differ because of the salary cap. Before the lockout season in 2005, the NHL had no luxury tax, revenue sharing, salary floor, or salary cap. After negotiations during the lockout season, the National Hockey League Players Association

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[6] Ibid

[7] Ibid

[8] Ibid

agreed on a hard salary cap based on league revenues[9]. Today, with the institution of a salary cap, there is more parity in the NHL, which will prove to be more difficult to decipher between a good quality team and a poor quality team.

The last question Jones and Ferguson research is why the league expands to one city and rejects expansion to another. "In 1977/78 The NHL expanded to Edmonton, Hartford, Quebec City, and Winnipeg. In addition, the league permitted Atlanta to move to Calgary, and Denver to move to New Jersey. But rejected other proposed relocations such as St. Louis to Saskatoon. Therefore, it will be instructive to determine which location factors may have led to the acceptance of some new sites but rejection of others." (Jones and Ferguson p.444)[10]. This is relevant to the work that will be done in this thesis, except there will be more franchises that have moved to examine. The NHL went from 22 teams in 1991 to 30 teams in 2001. It will be important to examine why these new teams are located where they are and whether or not they have been successful since becoming a franchise. Jones and Ferguson conclude that population plays a minor role along with geographic locations in Canada, but most importantly, they conclude that the quality of the location is the key element in a franchise's revenue determination[11]. However, in this thesis, different variables will be considered to determine whether or not a location is a quality location. This will be done to get a different perspective on the effect of geographic location. The conclusion on this subject written by Jones and Ferguson goes along with another article co-authored by Jones. He teamed up with

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[9] "Salary Cap," in Wikipedia, The Free Encyclopedia [database online]. [cited 2007]. Available from http://en.wikipedia.org/wiki/Salary_cap#Salary_cap_in_the_NHL

[10] J.C.H. Jones and D.G. Ferguson, "Location and survival in the National Hockey League." *The journal of industrial economics,* (1988): 443-457

[11] Ibid

Angelo Cocco and wrote an article in 1997 addressing the reason why small market Canadian teams are struggling economically. They conclude that the small market Canadian teams struggle because of poor location[12]. Neil Longley researched whether or not the specific location in Canada can affect a player's salaries.[13] He wanted to find out if English-speaking Canadians are discriminated against in their salary if they play for a team in a French-speaking Canadian city and vice versa.[14] He concludes that there is no proof of this being true, "This paper finds little or no statistical support for the possibility that reciprocal discrimination exists; that is, there appears to be no discriminatory treatment of English Canadiens playing for teams based in Quebec." (Longley p.413).[15] Jones and Cocco mention in their article that small market teams also struggle because there is no salary cap[16]. That is no longer a factor because, as mentioned before, the cancellation of the 2004-05 season forced team owners and players to collaborate and develop a new collective bargaining agreement that instituted a salary cap. The salary cap still exists today so it will be important to know if those same small market teams still struggle the way they used too. Jones and Cocco succeed in noticing that revenue sharing and salary caps would help the small market teams but the most attractive option is relocating the franchise south to a U.S. city[17]. Daniel Mason also addresses the failure

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[12] Angelo Cocco and J.C.H. Jones, "On going south: The Economics of Survival and Relocation of Small Market NHL Franchises in Canada." *Applied Economics,* (1997): 1537-1552

[13] Neil Longley, "Salary discrimination in the National Hockey League: The effects of team location." *Canadien Public Policy,* (1995): 413-422

[14] Ibid

[15] Ibid

[16] Angelo Cocco and J.C.H. Jones, "On going south: The Economics of Survival and Relocation of Small Market NHL Franchises in Canada." *Applied Economics,* (1997): 1537-1552

[17] Ibid

of small market teams in Canada. He says the real reason they are failing is because they are burdened by currency and taxation issues that favor U.S. based teams[18]. Mason's article is more current so his reasons apply to the current small market teams in Canada. Mason also teamed up alongside Gregory H. Duquette in another article to consider the relationship between local western Canadian hockey franchises and tourism development. They make a recommendation that it would be beneficial to emphasize the team's importance as a winter activity tourist attraction that celebrates the sport and local culture.[19] Based on previous research, it is clear that location plays a major role in the success or failure of an NHL franchise. But there are other variables that determine what makes a location a quality location. Therefore, these variables also factor into the successes and failures of a franchise as well.

Attendance

Attendance numbers are crucial for an NHL team. A loud, sellout crowd can motivate the home team and can rattle the visiting the team. From an ownership standpoint, a sellout crowd equals more revenue. A good location can play a major role in a franchise's attendance.

It is important to know what cities or states have people who want to go to a hockey game. Jeffery Borland and Robert Macdonald offer an article that includes empirical evidence on key determinants of attendance at sporting events. They generate

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[18] Daniel S. Mason, "Addressing the Small Market Problem for Canadian NHL Franchises." *International Journal of Sport Finance,* (2006): 227-238

[19] Daniel S. Mason and Gregory H. Duquette, "Exploring the relationship between local hockey franchises and tourism development." *Tourism Management,* (2008): 1157-1165

the idea that higher contests led to higher attendance.[20] This statement shouldn't come as a shock. In most cases, an NHL game would produce a higher attendance than an American Hockey League game. The American Hockey League is a minor league system to the NHL. Most people would want to see the highest level of competition. David Forrest and Rob Simmons also noted in an article that higher competition means higher attendance.[21] Forrest and Simmons look at how mid-week English Premier Football league games affect the attendance of lower league games. They concluded that when the premier league, the highest level of English Football, has a game the same time as the lower league game, the lower leagues gate attendance takes a huge hit.[22] If its true that the NHL takes precedence over the American Hockey League and other minor league systems, then it doesn't matter if any of those minor leagues have a game at the same time as the NHL game because people will pick the NHL over the minor league game.

Arne Fedderson and Wolfgang Maennig mention the quality and the type of stadium play a role in attendance.[23] The size and condition of a team's stadium is an important factor when looking at attendance numbers. If a team has a state of the art arena, fans will come just for the experience of being in the building a lot of the time. If a team has a poor quality arena, the viewing experience is not as good and will most likely drive fans away. Fedderson and Maennig specifically look at the difference in

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[20] Jeffery Borland and Robert Macdonald, "Demand for Sport." *Oxford Review of Economic Policy,* (2003): 478-502

[21] David Forrest and Rob Simmons, "New Issues in Attendance Demand." *Journal of Sports Economics,* (2006): 247-266

[22] Ibid

[23] Arne Fedderson and Wolfgang Maennig, "Arena vs. Multifunctional Stadiums." *Journal of Sports Economics,* (2009): 180-191

attendance at a mono-functional arena and a multi-functional facility in the German Elite Soccer League.[24] They conclude that the mono-functional arenas average 2,800 more fans than the multi-functional arenas.[25] This would make sense because mono-functional arenas are built primarily for one sport. The architects can focus more on how to make the viewing experience better if they are building a mono-functional arena versus a multi-functional arena. Fedderson and Maennig's study focuses only on the German Elite Soccer league. In that league, the mono-functional arena averages more fans because the multifunctional stadiums include a track, which takes away seats so the attendance is lower on average.[26] They also conclude that the atmosphere is better in a mono-functional arena, "Officials of clubs often argue that the atmosphere in an arena is significantly better than that of a multi-purpose facility and that spectators prefer such an atmosphere. Estimated panel regression with fixed effects shows a significant positive effect of a mono-functional soccer stadium on spectator demand. Controlling for other demand determinants in the Bundesliga, an isolated effect of around 2,800 additional spectators a game can be found." (Feddersen and Maennig p.180).[27] The results might not necessarily be the same for the NHL. If an arena is a multi-functional arena, it doesn't mean that it holds less people than a mono-functional arena. For the NHL, the condition and quality of the arena should have more of an effect on attendance than whether or not it is multi or mono functional.

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[24] Ibid

[25] Ibid

[26] Ibid

[27] Ibid

Dennis Coates and Brad R Humphreys investigate the effect of new facilities on attendance in professional basketball, baseball, and football.[28] They found a strong, positive effect in baseball and basketball, and little effect in football.[29] "Size and duration estimates imply that baseball teams sell 2,500,794 additional tickets over the first eight seasons, basketball teams 293,878 over the first nine seasons, and football teams 137,792 over the first five seasons, implying an increase in revenues that could defray public subsidies that state and local governments provide for new sports construction projects."(Coates and Humphreys p.436).[30] Since they only research those three sports, there is an opportunity to do similar research but for the NHL. It is likely that the effect on the NHL would be similar to that of the NBA's because their arenas are essentially the same. It wouldn't be far-fetched to say the NHL could have less of an effect as well because its popularity is less than the NBA's in the U.S.

Based off of past research, attendance has proven to be a major contributor to revenue. If a team has an attractive stadium, then they will draw more fans and increase their income. If a team is in a quality location, there attendance numbers are higher and generate more revenue. It is important for a team to be able to market themselves in a productive way to increase attendance and revenue.

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[28] Dennis Coates and Brad R. Humphreys, "Novelty effects of new facilities on attendance at professional sporting events." *Contemporary Economic Policy,* (2005): 436-455

[29] Ibid

[30] Ibid

Star Players

It is important to gather research with information about whether or not the number of star players on a team influences the team's revenue. It is possible that fans will come to a game just to see a star player perform. A star player can boost the team's popularity with the fans and can help market the team. Leaf Brandes makes the point that star players in the German Premier Soccer League play a large role in promoting fan interest[31]. The attendance and revenue go up for home and away games when a team has more star players.[32] A similar point about boosting away games attendance is addressed in an article by Jerry A. Hausman and Gregory K. Leonard. "These superstars are quite important for generating revenue, not only for their own teams but for other teams as well." (Hausman and Leonard, vol. 15, no.4).[33] For example, Michael Jordan had a value to other NBA teams of approximately $53 million.[34] David J. Berri makes the point that having more star players is somewhat significant in producing more revenue, but the main component is win percentage[35]. The more wins the more revenue increases.

Winning Percentage

Winning percentage is an important factor to note when considering the revenue produced by that team. It is important to know what kind of effect winning percentage has on revenue because it is very possible that it could be more influential than any other

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[31] Leif Brandes, et. al. "Local Heroes and Superstars." *Journal of Sports Economics,* (2008): 266-286

[32] Ibid

[33] Jerry A. Hausman and Gregory K. Leonard, "Superstars in the National Basketball Association: Economic value and policy." *Journal of Labor Economics,* (1997): vol. 15, no. 4

[34] Ibid

[35] David J. Berri, et. al. "Stars at the gate." *Journal of Sports Economics.* (2004) 33-50

factor. In an article by Nate Silver, he accentuates the importance of winning. Silver collects revenue numbers from the major league baseball franchise the Cleveland Indians in 1997 when the team went public and released their revenue figures, as well as other financial data from all MLB teams from 1997-2004.[36] He uses the data collected to find the relationship between wins and marginal revenue. Silver discovers through his research that one win was worth 1.196 million dollars in revenue for the 1997 season.[37] However, Silver fails to mention the importance of making the playoffs as well as the impact that playoff games have on producing revenue.

All four of the major professional sports leagues in the U.S. have a playoff system. Teams that make the playoffs see an increase to some extent in their marginal revenue. Extra home games produce more revenue, and since it's the playoffs, it is likely the attendance will be higher than if it was a regular season game. John Vrooman's "The theory of the big dance: the playoff payoff in pro sports leagues" specifically examines the economic aspects of championship playoffs in the four major professional sports teams along with the English Premier League.[38] He notes the NHL takes 50% of playoff revenue of top 10 revenue clubs, 40% of middle 3rd revenue clubs and 30% of bottom 3rd revenue clubs, which is redistributed as revenue sharing.[39] Vrooman fails to clarify if it is an advantage to go deep into the playoffs considering the revenue sharing laws.

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[36] Nate Silver, "Is Alex Rodriguez overpaid?" Baseball between the numbers: Why everything you know about the game is wrong. New York: Basic Books, 2006. 174-198

[37] Ibid

[38] John Vrooman. "Theory of the big dance: the playoff payoff in pro sports leagues." 2009. Vanderbilt University. Aug. 2009 http://www.vanderbilt.edu/Econ/faculty/Vrooman/vrooman-big-dance3.pdf

[39] Ibid

Ticket Prices

Ticket pricing is another area of research that proves important for this thesis question. Kenneth G. Stewart concludes that ticket pricing by NHL teams are consistent with profit maximization[40]. Stewart's model only focuses on the effect ticket pricing has on profit maximization, he does not include other aspects that factor into profit. Arthur Okun says in his book, Prices and Quantities: A Macroeconomic Analysis, "fair" ticket pricing behavior is instrumental to profit maximization[41]. Fair ticketing pricing means the prices always stay the same regardless of the profit margins. Daniel Kahneman agrees with Okun's opinion on fair ticket pricing in his article "Fairness as a constraint on profit seeking: entitlements in the market".[42] However, neither Okun's or Kahneman's research is connected to sports, they only are examing the effects in customer and labor markets. This thesis will investigate whether or not fair ticket pricing is essential for profit maximization in the National Hockey League.

Competing Sports Teams

Most of the cities with an NHL team also have a team in one of the other three major sports leagues. Columbus, Montreal, Ottawa, Calgary, Edmonton, Vancouver, and San Jose are the only cities that host only an NHL franchise. Every other NHL team competes with an MLB, NFL, or NBA team. This competition causes a negative effect

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[40] Kenneth G. Stewart, et. al, "The Pricing of Sporting Events: Do Teams Maximize Profits?" *The Journal of Industrial Economics,* (1991): 297-310

[41] Arthur Okun, Prices and Quantities; A Macroeconomic Analysis. Washington D.C.: *The Brooking Institution,* 1981

[42] Daniel Kahneman, et. al. "Fairness as a Constraint on Profit Seeking: Entitlements in the Market," *The American Economic review,* (1986): 728-741

on ticket sales. Nathaniel Grow states that the only economic competition engaged in by professional sports leagues are with the other, competing forms of entertainment like any of the other major professional sports leagues.[43] Competition between teams in the same league is rare because fans most likely root for their hometown team. Grow gives this example: "MLB's Detroit Tigers compete for Detroiters' entertainment dollars with the NBA's Detroit Pistons, the NHL's Detroit Red Wings, and the NFL's Detroit Lions, in addition to other forms of entertainment, such as movies, theater, and concerts." (Grow p. 193).[44] In the case where one city has two teams in the same league, Grow argues that there still isn't as much competition because each team already has their own loyal fan base.[45] This thesis will explore this case more specifically using ticket sales and revenue numbers as hard evidence, especially the effect an NBA team has on an NHL team because their seasons are played the same time of year. Daniel A. Rascher, Matthew T. Brown, Mark S. Nagel, and Chad D. Mcevoy team up in an article that focuses more on the competition specifically between the NBA and the NHL. Their article, "Where did National Hockey League fans go during the 2004-2005 lockout?", includes an experiment involving the NHL's 2004-2005 lockout to assess the competitiveness of the NHL with the NBA as well as four minor hockey leagues.[46] This is what they found: "On average, the five potential competitor leagues attained a 2% increase in demand, all else equal,

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[43] Nathaniel Grow, "There's no "I" in "league": professional sports leagues and the single entity defense." *Michigan Law Review,* (2006): 184-208

[44] Ibid

[45] Ibid

[46] Daniel A. Rascher, Matthew T. Brown, Mark S. Nagel, and Chad D. Mcevoy, "Where did National Hockey League fans go during the 2004-2005 lockout? An analysis of economic competition between leagues." *International journal of sports management and marketing,* (2009): 183-195

during the lockout period. For the NBA this translates into more than $1 million per team in increased incremental ticket revenue." (Rascher, Brown, Nagel, and Mcevoy p. 183).[47] If the absence of an NHL season benefited the NBA season in the same year, then one would believe that the inverse is true as well. When the two leagues are playing at the same time, they each take ticket sales and revenue away from each other. It is a negative effect.

Conclusion

After reading past research regarding this thesis topic, some questions have been answered yet some still remained to be answered. It has been learned that the quality of the location is the key element in generating revenue. But what makes a location a quality location? Through past research, there are many factors that boost attendance, but which factor is the most influential? From the research regarding star players it is safe to say that having star players on the team will help revenue, but by how much? These are just some of the questions that will be attempted to answer in this thesis. One can take a lot from the past research that has been done regarding the topic of this thesis and it will be important to answer the remaining questions and uncertainties.

[47] Ibid

CHAPTER III

DATA AND METHODOLOGY

The purpose of this chapter is to describe the data set collected as well as the variables used in the model. Quantitative research is used to analyze the effect geographical location has in determining revenue for an NHL franchise. Quantitative research is best for this topic because of the extensive statistics that are available. These statistics are easily attainable and are applicable to this thesis. This approach was chosen over a qualitative approach because it would have been more difficult to conduct interviews with personnel inside the National Hockey League. This chapter will discuss the sources consulted for the data and statistics used in the empirical model as well as the time frame used for data collection. This chapter will also predict whether each independent variable will have a positive or a negative effect on the dependent variable.

Time Frame

For every variable in the empirical model, data has been collected from the past nine years. There have been eight NHL seasons played within the last nine years. There was no season in 2004-2005 because of the lockout. The first season that was researched was the 2000-2001 season. Every season played after that was also researched up to the 2008-2009 season. This time frame was chosen because it is recent and there is plenty of

data to be collected over nine NHL seasons. Nine years is a long enough time period for consistent trends to be easily recognized, so it will be clear who the successful franchises are. Also, the 00-01 season was the first season that included 2 expansion clubs the Minnesota Wild and the Columbus Blue Jackets. There haven't been any changes to the teams in the league since that season. There are 30 teams in the NHL. Data was collected from every team in the league for each of the nine years.

Dependent Variable

The dependent variable used in this thesis is revenue. Each team reports their gate revenue numbers at the end of each season. The gate revenue numbers from each team over the past nine seasons will be used as the dependent variable. This thesis will define an NHL team's success by examining their revenue numbers. It is also possible to define success for an NHL team by the number of Stanley cups won, but since this thesis is about the effect location has on a team's revenue, a team's success is going to be defined is by their revenue produced. Looking at revenue will prove the worth of a team's location better than any other possible variable.

This thesis will look at the numbers before the revenue is shared. As mentioned before, the NHL instituted revenue sharing after the lockout season in 04-05. Looking at the numbers before the revenue is shared among all the teams will make it easier to decipher a team that is making money from a team that is not. The revenue numbers will be collected from www.forbes.com. Independent variables that will be mentioned later in the chapter are used to determine what affects a team's revenue.

Independent Variables

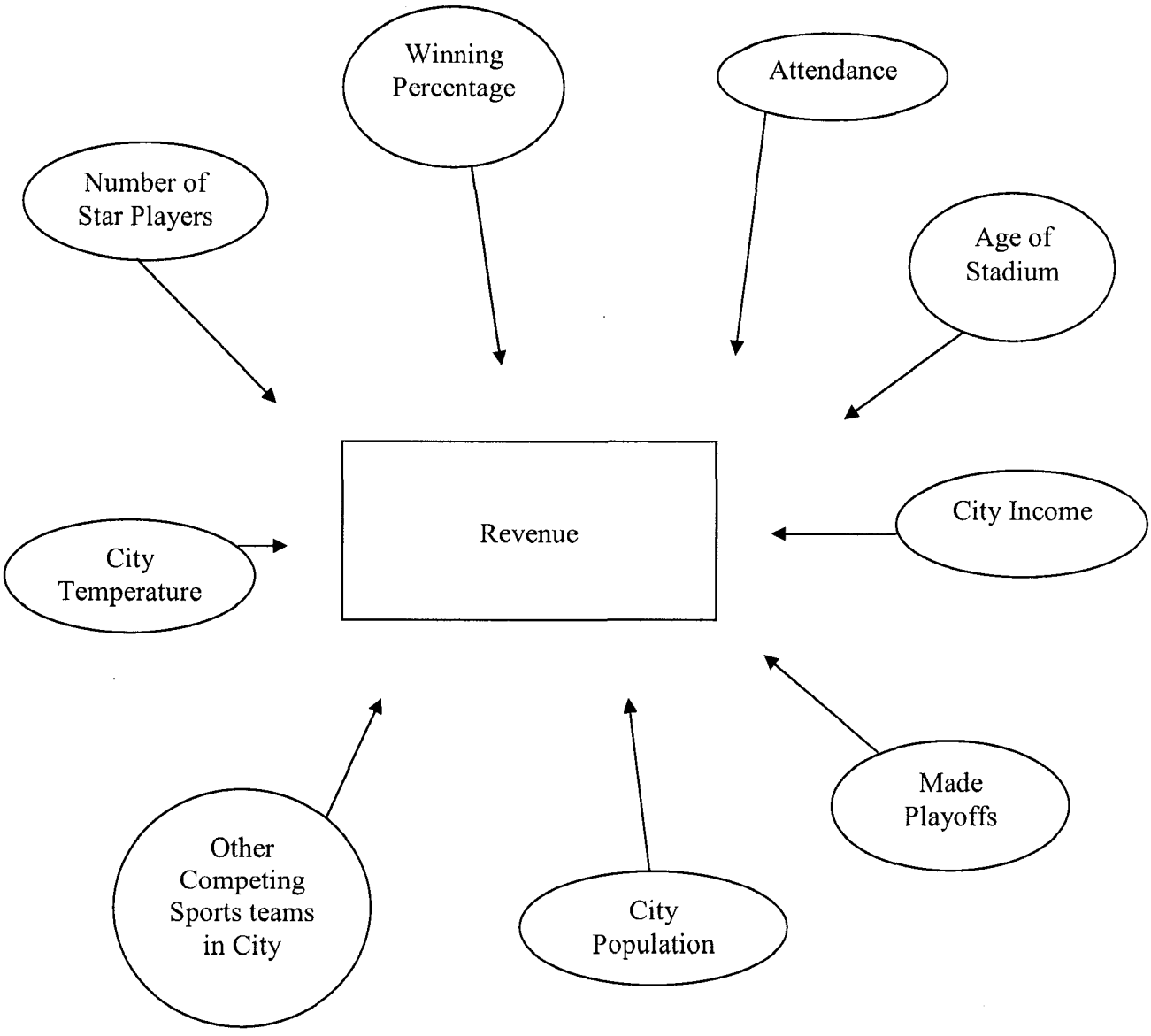
There are many different variables affecting a NHL team's revenue. It would be unrealistic and too extensive to consider every possible variable that affects revenue. This thesis will narrow it down and focus on a select few independent variables. More specifically, it will take into account eight independent variables. Those variables are attendance, winning percentage, star players, competing sports teams, age of stadium, population, income, and temperature. These variables were chosen because of the possibility that they will be of great significance to the dependent variable. Each variable is important to consider for this thesis.

Dummy Variable

This thesis will also include one dummy variable. That variable will be playoffs. This variable does not contain a numerical value, so it will be assigned a value of one or zero depending on the subject's result. This variable is included because like the independent variables, it holds great significance on the impact on an NHL team's revenue.

FIGURE 3.1

Determinants of Revenue in the National Hockey League



The regression equation is:

$$Rev = \beta 0 + \beta 1\ ATTEND + \beta 2\ WIN + \beta 3\ STAR + \beta 4\ CST + \beta 5\ STAD + \beta 6\ POP + \beta 7\ INCOME + \beta 8\ TEMP + \beta 9\ PLAYOFF$$

Attendance

The variable ATTEND represents attendance. Attendance refers to the number of spectators that are at the game. This is an important variable because every spectator pays money for a ticket to come watch a game. The attendance variable will have a strong correlation with the dependent variable in this thesis. This variable will be measure by a team's average attendance per game for their home games in that season. There are 82 games in a season, and each team plays 41 games at home and 41 games on the road. This variable will only include the attendance numbers from a home game because attendance numbers do not financially affect the away team. The average game attendance for each team can be found at www.espn.go.com/nhl/attendance.

Winning Percentage

The variable WIN represents team winning percentage. This is defined as the percentage of games a team wins. The NHL uses a point a system. A win is worth two points, a tie or overtime loss is worth one point, and a loss is worth zero points. This variable will be measured by dividing the team's total points by the number of possible points available. To find the number of possible points available, one would simply multiply 2 by 82, where 2 is the maximum number of points a team can earn from one

game, and 82 is the number of games each team plays in a season. This will come out to 164, the maximum number of points a team can earn. It is predicted that winning percentage will have a positive effect on revenue. Winning percentage numbers can be found at www.hockey-reference.com.

Star Players

The variable STAR represents star players. This thesis considers a player to be a star player if he made the all-star roster for that particular season. For most seasons, an all-star game is played in the middle of the regular season. The all-star game consists of two teams with a full roster of players on each team. The number of players each team has that had been selected to an all-star roster will define this variable. This is a significant factor because star players can attract more people to come to the games. With more people coming to the games, a franchise can quite possibly see an increase in their revenue. This variable will account for star players on the home team only and will not be including the effect a star player from the visiting team has. This data can be collected at www.hockey-reference.com.

Competing Sports Teams

The variable CST represents competing sports teams. This variable will consider the effect another sports team in the same city has on that NHL team. This thesis will only consider teams from the other three major sports leagues, the NFL, MLB, and NBA. This is an important factor because other sports teams in the same city are often a substitute good. For example, if an NFL game is being played the same time an NHL

game is being played, it is possible a local fan that normally attends the NHL game will choose to attend the NFL game instead. Some NHL teams even have another NHL team located in the same city. This would have a significant effect on a team because not only does that team have to compete for fans from sports teams in other leagues, but they also have to compete for loyal hockey fans. The prediction for this variable is that other sports teams located in the same city will have a negative effect on a NHL team. This is predicted because it is likely that these other sports teams can only take spectators away from the hockey games and NHL teams cannot benefit in any way from other sports teams. All of this data can be found at www.espn.com.

Age of Stadium

The variable STAD represents the age of stadium. This variable simply refers to how old the arena is that a NHL team plays their home games in. It could be possible that the age of an arena will have an impact on revenue. A new, state of the art arena can attract more fans to come to the games. A quality stadium can be used as a marketing tool to increase attendance. If a team has an old, rundown arena, it makes it less attractive to fans and will keep them from coming. However, in some cases an old, historic arena can attract just as much, if not more fans as a new arena. For example, Madison Square Garden is one of the older rinks in the NHL, but still turns in impressive attendance numbers. It can be argued that it is considered a historic monument and draws fans for that reason. The prediction for this variable is that the newer the stadium is, the effect will be more positive on revenue. The data for the age of each stadium will be collected from www.wikipedia.org/list_of_National_Hockey_League_arenas.

Population

The variable POP represents population. The number of people within the team's geographical surroundings will be measured. Exact numbers will be taken from within the city limits of that franchise. This is a key variable for determining the effect location has on a franchises gate revenue. Past research has insinuated that a higher population will lead to higher attendance levels, which in turn produces higher gate revenue[1]. That is similar to the prediction in this thesis regarding the POP variable. A higher city population should lead to higher revenue numbers. Population numbers will be collected from the U.S. Census Bureau as well as the Canadian Census.

Income

The variable INCOME represents the income levels of the people within a franchise's city limits. The average income level of the city will be taken into account in this thesis. This is another important variable when considering location's effect on a team's revenue. Hockey tickets usually don't come cheap, so it is predicted that the higher the city's average income, the higher the attendance numbers thus higher revenue numbers. Income data will be collected from the U.S. Bureau of Economic Analysis.

Temperature

The variable TEMP represents the temperature of the city in which a franchise is located. The average yearly temperature will be recorded for each city that has an NHL

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[1] Walker, Bruce. "The Demand for Professional League Football and the Success of Football League Teams: some city size effects." *Urban Studies* (1986): 209-219

franchise. This variable relates to the effect of location as well. Hockey is a game played on ice, so it is predicted in this thesis that a city with cold weather would have a larger hockey fan base than a city with warm weather. When lakes or ponds freeze over in the winter, it provides an opportunity to skate or play hockey on the ice and this can spark an interest in the sport. The more popular the sport is with the people of the city, the better chance the NHL team has at increasing their attendance and their revenue. Temperature data will be collected from www.weatherbase.com.

Playoffs

The variable PLAYOFF represents the fact that a team made the playoffs or did not make the playoffs. The NHL holds a playoff every year following the 82 game regular season. The playoffs include 16 teams, 8 from the Eastern conference and 8 from Western conference. Within each conference are three divisions. There are five teams in each division. The Western conference includes the Central division, Northwest division, and the Pacific division. The Eastern conference includes the Atlantic division, Northeast division, and Southeast division. The winner of each division is awarded a top 3 seed in the playoffs. The following 5 seeds are settled by the amount of points those teams have earned throughout the regular season. This is a significant variable because a playoff has an opportunity to possibly earn more revenue for that season. They are awarded more home games for attendance revenue. It is likely the attendance numbers for a playoff game would be high considering the importance of a playoff game. In this regression equation, the playoff variable will be a dummy variable. If a team made the playoffs, they will be given a value of 1. If a team did not make the playoffs, they will be given a

value of 0. This data can be found at www.hockey-reference.com. It is predicted that this variable will have a positive effect on team revenue.

Table 3.1 below is a list of the independent and dummy variables that will be used in the regression model. The table also includes the variable's abbreviations and the data sources.

TABLE 3.1

Summary of Variables

Variable Name	**Abbreviations**	**Data Source**
Attendance	ATTEND	ESPN.com
Winning Percentage	WIN	hockey-reference.com
Star Players	STAR	hockey-reference.com
Competing Sports Teams	CST	ESPN.com
Age of Stadium	STAD	wikipedia.org
Population	POP	census.gov
Income	INCOME	bea.gov
Temperature	TEMP	weatherbase.com
Playoffs	PLAYOFF	hockey-reference.com

Table 3.2 below refers to the expected outcomes of the independent and dummy variables. Each variable will have an effect on revenue which is the dependent variable. Each variable will have either a positive (POS) effect or a negative (NEG) effect.

TABLE 3.2

Predicted Outcome of Variables

Variable	**Expected Outcome**
Attendance	POS
Winning Percentage	POS
Star Players	POS
Competing Sports Teams	NEG
Age of Stadium	POS
Population	POS
Income	POS
Temperature	POS
Playoffs	POS

Conclusion

This chapter has identified and discussed the dependent, independent, and dummy variables that will be used in this regression analysis. It explained the importance of each variable as well as the predicted outcomes and data sources for each variable. It also introduced the basic regression model used in this thesis. The following chapter will provide the test results from the regression analysis.

CHAPTER IV

RESULTS

The summaries of statistics are provided below in Table 4.1. The table shows the mean, standard deviation, minimum, and maximum of each variable that was used in the models. These statistics were collected from all 30 NHL teams from the years 2007 and 2008.

TABLE 4.1

Summary Statistics

VARIABLE	MEAN	S.D.	MIN	MAX
All star players	1.416666667	.743141902	0	4
Attendance	17142.16667	2103.774293	12520	21273
Competing Teams	2	1.646773939	0	6
Playoffs	.533333333	.503097749	0	1
Population	1627449.967	2124930.598	270919	8363710
Age of Stadium	14.56666667	10.01247809	0	40
Temperature	55.06666667	9.594961013	37	76
Winning Percentage	.556166667	.082118799	.341	.701
Revenue	86383333.33	21054482.73	60000000	160000000

Presented in Table 4.2 below are the initial regression analysis results. The entire data set from each variable is examined in this regression analysis. The T-statistics and coefficient values are listed in the table. The R-squared values and F-statistics are listed as well. The T-statistics are considered significant if they are greater than 1.96. This was the regression equation that was tested:

$$Rev = \beta 0 + \beta 1\ ATTEND + \beta 2\ WIN + \beta 3\ STAR + \beta 4\ CST + \beta 5\ STAD + \beta 6\ POP + \beta 7\ TEMP + \beta 8\ PLAYOFF$$

TABLE 4.2

Regression Analysis Results

(t-Statistic displayed in parentheses)

Variables	Results
Attendance	5854.582 (5.303)
Winning Percentage	24556060 (0.795)
Star Players	-1101628 (-0.334)
Competing Sports Teams	-345083.1 (-0.217)
Age of Stadium	-361820 (-1.521)
City Population	5.010 (2.971)
City Temperature	-186698.5 (-0.817)
Playoffs	1534364 (0.248)

Shown on the following page, Tables 4.3 presents the initial correlation matrix. This correlation matrix provides the relationship the independent variables have with one another. The variables attendance (ATTEND), winning percentage (WIN), star players (STAR), competing sports teams (CST), age of stadium (STAD), city population (POP), playoffs (PLAYOFF), and temperature (TEMP) are examined in the correlation matrix.

TABLE 4.3
Correlation Matrix

	Star Players	Attendance	Competing Sports Teams	Playoffs	City Population	Age of Stadium	City Temperature	Winning Percentage
Star Players	1.000							
Attendance	0.209	1.000						
Competing Sports Teams	-0.208	-0.366	1.000					
Playoffs	0.302	0.237	-0.041	1.000				
City Population	-0.214	-0.023	0.554	-0.062	1.000			
Age of Stadium	0.027	0.035	0.310	0.198	0.471	1.000		
City Temperature	0.134	-0.349	0.298	-0.119	-0.089	-0.345	1.000	
Winning Percentage	0.312	0.316	-.213	0.795	-0.146	0.143	-0.184	1.000

Table 4.3 proves that there is multicollinearity between numerous variables. There is multicollinearity between the variables *winning percentage* and *playoffs (r = .79)*. This strong relationship is not surprising because a team with a high winning percentage gets rewarded with a playoff berth. Also, there is multicollinearity with the variables *city population* and *competing sports teams (r = .55)*. Because of the multicollinearity problem, the initial regression analysis has to be adjusted. To fix the problem with population and competing sports teams, the log of the population numbers were taken which eliminated multicollinearity between those two variables. Table 4.4 shows the correlation matrix with the altered population variable, which is labeled *city population2* (POP2).

TABLE 4.4
Correlation Matrix

	Star Players	Attendance	Competing Sports Teams	Playoffs	City Population2	Age of Stadium	City Temperature	Winning Percentage
Star Players	1.000							
Attendance	0.209	1.000						
Competing Sports Teams	-0.208	-0.366	1.000					
Playoffs	0.302	0.237	-0.041	1.000				
City Population2	-0.192	0.082	0.369	-0.142	1.000			
Age of Stadium	0.027	0.035	0.310	0.198	0.326	1.000		
City Temperature	0.134	-0.349	0.298	-0.119	-0.148	-0.345	1.000	
Winning Percentage	0.312	0.316	-.213	0.795	-0.224	0.143	-0.184	1.000

It is evident in Table 4.4 that there is still multicollinearity between the variables *winning percentage* and *playoffs* (r = .79). To address this problem, two models were run. The variable winning percentage is omitted from the first model and the variable playoffs is omitted from the second model. This should avoid the problem with multicollinearity. The two models are listed below.

Model Equations

Model 1

$$REVENUE = \beta 0 + \beta 1\ ATTEND + \beta 2\ STAR + \beta 3 CST + \beta 4\ STAD + \beta 5\ POP2 + \beta 6\ TEMP + \beta 7\ PLAYOFF$$

Model 1 omits the variable *winning percentage* (WIN).

Model 2

$$REVENUE = \beta 0 + \beta 1\ ATTEND + \beta 2\ STAR + \beta 3\ CST + \beta 4\ STAD + \beta 5\ POP2 + \beta 6\ TEMP + \beta 7\ WIN$$

Model 2 omits the variable *playoffs* (PLAYOFF).

The corrected and final regression analysis results are presented on the following page in Table 4.5. Results from both models are examined. The T-statistics and coefficient values are listed for each variable from both models. The R-squared values and the F-statistics are also provided. The T-statistics are considered significant if they are greater than 1.96.

TABLE 4.5

Final Regression Analysis Results

(t-Statistics displayed in parentheses)

Variables	Model 1	Model 2
Attendance	5763.94 (5.609)	5624.712 (5.652)
Winning Percentage		45481617 (2.229)
Star Players	-1507447 (-0.472)	-1611816 (-0.490)
Competing Sports Teams	545575.3 (0.402)	813226.7 (0.592)
Age of Stadium	-202395.6 (-0.908)	-217138.4 (-0.956)
City Population	20917560 (3.533)	21685086 (3.548)
City Temperature	-149519.5 (-0.691)	-137475.7 (-0.624)
Playoffs	5804658 (1.489)	

Model 1

The first model analyzed 6 independent variables and 1 dummy variable. This model did not include the variable *winning percentage* (WIN). The R-squared value was .59, which means the variables accounted for about 59 percent of the variation in revenue. Four of the variables had a positive effect on the dependent variable while three of the variables had a negative effect. The four positive variables were *attendance* (ATTEND), *competing sports teams* (CST), *playoffs* (PLAYOFF), *and city population* (POP2). The three that had a negative effect were *star players* (STAR), *age of stadium* (STAD), and *temperature* (TEMP).

Two of the variables produced a significant t-Statistic. The variables attendance and city population had a t-Statistic greater than the critical value of 1.96. Both variables showed they were positively significant to the dependent variable revenue. The other five variables were not considered significant based on their calculated t-Statistic. The variable playoffs was positive but was not significant. The variables star players, age of stadium, and temperature were negative but were not below the critical value of -1.96, which means they were not considered negatively significant.

Model 2

The second model analyzed seven independent variables. This model did not include the dummy variable *playoffs* (PLAYOFF). The R-squared value was .60, which means the variables in this model accounted for around 60 percent of the variation in revenue. Much like the first model, the second model had 4 variables that had a positive effect on the dependent variable. Those variables were *attendance* (ATTEND),

competing sports teams (CST), *city population* (POP2), and *winning percentage* (WIN). The second model also had 3 variables that had a negative effect on the dependent variable. Those variables were once again *star players* (STAR), *age of stadium* (STAD), and *temperature* (TEMP).

Three of the variables produced a significant t-Statistic. The variables attendance, city population, and winning percentage all had a t-Statistic greater than the critical value of 1.96. All three of these variables were positive, so they had a significantly positive effect on team revenue. The other four variables were not considered significant because their t-Stat was not greater than 1.96. None of the variables however, were below the critical value of -1.96 so they were not considered negatively significant.

Conclusion

This chapter described and discussed the two regression equations as well as the results of these equations. The following chapter will analyze the regression results further and will discuss each variable's effect in more detail. Suggestions for future studies will be mentioned as well as the limitations this study encountered.

CHAPTER V

CONCLUSION

There were a few limitations that this study encountered. This chapter will acknowledge those limitations as well as the opportunity for future research on this topic. This chapter will also discuss the results of the study in further detail.

Variable Analysis

The *attendance* (ATTEND) variable was predicted to have a strong and positive correlation with team revenue. This prediction turned out to be true. Attendance had the highest and most significant t-Statistic than any other variable in all the models tested. This prediction, and conclusion, makes sense because a team with high attendance numbers will collect more gate revenue. The attendance variable was the most vital variable in this study because of its strong, positive effect on the dependent variable of the study.

The *winning percentage* (WIN) variable was predicted to have a positive effect on team revenue. After the regression analysis, winning percentage did prove to have a positive and significant effect on team revenue. It was not predicted however, that winning percentage would create multicollinearity with the dummy variable *playoffs* (PLAYOFF). The multicollinearity problem was fixed by omitting winning percentage

from the first model. It was in the second model, which omitted playoffs, that winning percentage proved to be positive and significant. Winning percentage brings fans to the game and produces higher revenue for an NHL team.

The variable *star players* (STAR) predicted that if a team has a high number of all-stars on their roster, then that team will have higher attendance and revenue numbers. This was predicted because star players can be used as marketing tools. Star players are vital for a team because they can help advertise the team. Some fans might only be coming to games just to watch one specific star player. However, the regression analysis disproved this hypothesis. In all models tested, the star players variable had a negative, but insignificant effect on the dependent variable revenue. An explanation for this could be that fans would rather come watch a team game instead of a game that revolves around a few star players.

The variable *competing sports teams* (CST) had a surprising result. It was predicted that this variable would have a negatively significant effect on the dependent variable. This was predicted because if there are other sports teams in town, they would be competing with the NHL team for fans. But after the regression was analyzed, the competing sports teams variable proved to be positive with an insignificant effect on revenue. An explanation for this could be that cities with more sports teams have proven that they will turn in high attendance numbers regardless of the number of professional teams are in town.

The prediction for the *age of stadium* (STAD) variable was that the older the stadium, the more negative the effect on revenue will be. The regression analysis proved that prediction right. The older the stadium meant a more negative effect on the

dependent variable. However, the age of stadium variable was insignificant to the dependent variable revenue. Fans do not consider the age of the stadium as much as they do some other variables.

The *city population* (POP, POP2) variable had a positive and strong correlation to the dependent variable. It was the second most significant variable behind the attendance variable. The prediction made earlier in this thesis regarding the city population was that the greater the city's population was, the higher the revenue for that team. This prediction was proven true. City population was an important variable for this study because of the significantly positive effect on revenue. This makes sense because a more populated city will most likely have a higher population of hockey fans.

The prediction for the *city temperature* (TEMP) variable was that if a city has a lower average yearly temperature, then the NHL team in that city will produce higher revenue. Based off of basic knowledge, hockey is often more popular in colder regions. The regression analysis proved this prediction was correct. However, the t-Stat for this variable was insignificant.

The *playoffs* (PLAYOFF) variable was predicted to have a strong and positive correlation with the dependent variable revenue. This is predicted because if a team makes the playoffs, they will play more home games and can generate more revenue. After the results, it was true that it would have a positive effect on revenue but it was not a significant variable. The t-Stat was 1.489 in model 1, which is less than the critical value of 1.96. This thesis' regression analysis states that if a team makes the playoffs, their revenue will increase but not a significant amount.

Study Limitations

This thesis encountered limitations while collecting data and during the regression analysis. Initially, it was planned to incorporate city income as an independent variable. The city income variable was going to account for the average household income within a city's limits. The income variable had to be dropped because the average income level for the Canadian cities could not be accessed. Also, this thesis chose not to include ticket pricing as a variable. There is too much variance in the price of tickets. It would have been an extensive data set to collect.

Another limitation was encountered when running the regression analysis. This study first had eight seasons of data in the regression equation. This caused problems because of the high number of outliers. Another problem with using eight seasons of data was that the many of the variables numbers were skewed because of the lockout season. This problem was fixed by using two seasons that were played after the lockout season in the regression analysis. By analyzing fewer seasons, the R-squared was higher, meaning there was higher variance between the independent and dependent variables.

Future Research

An area for future research on location's effect on NHL team's revenue would be to incorporate an income variable. If one would have access to all the NHL cities income numbers, then that should prove to be interesting to study. Another area of possible future research, would be to study the effect star players on visiting teams have on a home team's attendance and revenue numbers. This study showed that all-star players on the home team do not have a significant effect. It is possible that when a visiting team

with a star player comes to play a home team, then more fans from the home team will come to see this player on the visiting team. Also, ticket pricing could prove to be a significant variable if one could collect the data. All of these areas of future research could help add to this body of literature. This thesis has come across interesting discoveries. Attendance contributes the most to a team's revenue numbers; this shouldn't come as a shock. But it can be concluded that geographical location in some ways is the second most important factor to consider for producing revenue. This study proved that a team can generate more revenue if the franchise is located in a highly populated area. It has been proven that the population of a city has more of an effect on revenue than a team's winning percentage. While there is much more work to be done, this thesis has supplied a great amount of information and results on the effect location has on NHL revenue.

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