BIRGING AND CORFING IN THE NHL

————————————————

A THESIS

Presented to

The Faculty of the Department of Economics and Business

The Colorado College

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Arts

By

Bryan Yoon

May 2022

BIRGING AND CORFING IN THE NHL

Bryan Yoon

May 2022

Economics

Abstract

This paper builds on the previous research done on basking in reflected glory (BIRGing) and cutting off reflected failure (CORFing). The aim was to be a stepping stone on the topic of BIRGing and CORFing and generalize a population of fans to see if there were tendencies of BIRGing and CORFing to be present. Using 14 seasons of data from the 2005-2006 season to the 2018-2019 season multiple ordinary least square regressions were used to analyze if BIRGing and CORFing were present in the NHL. This study hypothesizes that BIRGing and CORFing are present in the NHL and that fans are likely to CORF if a team is failing to have success in the given season. The study also looks at if Canadian and US teams have a different tendency to BIRG or CORF as well as an analysis on whether or not fighting has an effect on total attendance. This study found that fans in the NHL have a tendency to BIRG and CORF and both the US and Canadian fan base BIRG relatively equal. There is also evidence that Canadian teams have a more loyal fanbase and are less likely to CORF than teams in the US. Lastly, my evidence didn't suggest a correlation between fighting and total attendance, possibly suggesting that fighting isn't the key factor in fans attending games.

KEYWORDS: (BIRGing, CORFing, National Hockey League, Fighting, Fan Behavior)

JEL CODES: (Z20)

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED
UNAUTHORIZED AID ON THIS THESIS

Bryan Yoon

_____

Signature

TABLE OF CONTENTS

Introduction

The NHL, while being one of the four major sports leagues in the US, hasn't been researched and studied as much as the NFL, MLB, or NBA. Perhaps this is due to the NHL bringing in the lowest amount of revenue of the four major sports or that the NHL has a lower fan population. The NHL has been researched, but the majority of these studies research the effects of winning a game or how to maximize profits in the league.

In this paper I analyze fan attendance and the role of fighting in the NHL. Although, research has studied attendance for marketing purposes, I look at the behavior trends of consumers in the NHL. The NHL doesn't have the biggest fan base in the world and trying to grow the audience is important. For small markets that haven't had the turnout that they want, I want to see if there are other factors that are preventing them from getting the turnouts they need. The two specific concepts I am going to analyze are basking in reflected glory (BIRG) and cutting of reflected failure (CORF) (Wann, 1990, Campbell, 2004, Yoshida, 2014, and Peters, 2011). These two concepts are a behavioral trait that apply to fans in-role and extra-role behaviors. In-role behaviors are behaviors that are stemmed from self-interest (Yoshida, 2014). Examples of in-role behaviors are attending, watching, or reading about a team (Yoshida, 2014). Extra-role behaviors are behaviors that are directed towards the team or other fans by fans as a moral obligation of being a fan (Yoshida, 2014). Examples of extra-role behaviors are engaging in positive word-of-mouth, collaborative event attendance, and helping other fans (Yoshida, 2014). BIRGing refers to fans that attend and celebrate teams that are winning and having success (Wann, 1990, Campbell Jr, 2004, Yoshida, 2014, & Peters, 2011). This includes a spectrum of people from die-hard fans to fans that enjoy the occasional game. This also includes bandwagon fans that only celebrate teams that are successful. CORFing on the other hand is the

behavior of fans to distance themselves when times are tough for the team and they are not having success (Wann, 1990, Campbell Jr, 2004, Yoshida, 2014, & Peters, 2011). These fans are usually low identified fans but are none-the-less important. BIRGing and CORFing lead us to the other behavioral tendencies from fans of basking in reflected failure (BIRF) and cutting off reflected success (CORS) (Peters, 2011, Campbell, 2004, & Aiken, 2005). BIRFing is when the fan sticks with the team regardless of how well they are doing in the league. This explains die-hard fans and why teams that are lower in the standings still get a turnout. CORSing describes when fans start to disassociate themselves from the team while they are being successful. This can be due to several reasons such as too many bandwagon jumpers and management decision. While BIRGing, CORFing, CORSing, and BIRFing have been researched, the aim of this paper is to try and test if NHL teams experience these concepts and what NHL markets experience them.

What makes the NHL unique from the other sports is that players aren't subjected to suspension or other penalties if they fight. Fighting has been a major debate in the hockey world for a while now. The league has implemented rules such as instigating in order to try and minimize the amount of fights in a given season. An instigating penalty is when there is a player that deliberately starts a fight, they would get an extra two-minute penalty that puts them a man down. Fans and players seem to be split on whether or not fighting should be kept in the league. The league wants to showcase the skill of their players and in doing so has tried to implement a style of play that benefits skilled finesse players. Leading to higher scoring and a faster game, almost losing the enforcer role in the sport. Recent events such as the death of some former enforcers have also sparked the conversation on whether fighting should be allowed or not. With head trauma and post-concussion symptoms being of the utmost importance in sports now,

fighting has taken the brunt of discussion in the NHL. The league is trying to protect their

players and fighting has been researched to see if it still has a place. The other side believes that

fighting has an important role in the sport. Fighting and having that enforcer role on a team acts

as a way of policing the game. Players would think twice about committing a dangerous play if

they knew they had to answer to these enforcers for their actions. This accountability is the

players way of order and how they protect themselves. The other reason people want to keep

fighting in the league is that teams and fans believe that fighting is a momentum shift for their

team. There is a belief within the hockey community that winning a fight changes the momentum

for a team.

Literature Review

2.1 Winning and UOH

Throughout all four major sports leagues in the US, studies on the relationship between team success and attendance have had a positive correlation through multiple studies (Coates, 2010 & Coates, 2012). The NHL hasn't been covered quite to the extent that other major leagues in the US, but the results are similar. Team success throughout has been a focal point of research on attendance for the NHL. Specifically analyzing the home team, attendance tends to be greater when the home team is favored to win (Coates, 2012). This research provided us with some evidence that fans may be loss averse when it comes to their decision to consume tickets. A balance is also present when it comes to how much the home team is favored. Teams that tend to have higher scoring per game also tended to have a lower attendance holding constant in both the US and Canada (Paul, 2003). A possible theory for high scoring leading to less attendance is that fans want to experience good teams play a close game (Paul, 2003 & Coates, 2010). There has also been evidence that the amount of success a team had in the previous season has a correlation to fan attendance (Paul, 2003). Teams that have a great regular season and don't perform in the playoffs have a negative correlation with attendance from the previous season (Paul, 2003). This relationship is only regarded with the previous season and after the next season, that season fails to be significant (Coates, 2010).

The uncertainty of outcome hypothesis (UOH), along with team success, has an effect on attendance. The UOH, also referred to as competitive balance, are the odds that one team will win against another team. If the UOH was perfect, then for any given match either team has an equal chance to win. Coates conducted a model over the English Football league and concluded that if the UOH was perfectly equal, or maximized, there would be an aggregate drop of 11% of

attendance in the 22-year sample (Coates, 2010). Fans are more likely to attend games when the home team is favored to win (Coates, 2012). If UOH was maximized than this relationship between home attendance and winning would cease to exist as every team would have an equal chance to win any game (Coates, 2010). From a team perspective, in order to maximize profits, winning has a positive correlation to attendance. Therefore, a team is responsible for minimizing the UOH in order to maximize their profits and attract more fans (Jones, 1984). Teams do this by allocating the best team they can while still following league requirements such as the salary cap. The league is responsible for maximizing the joint profit and in doing so is attempting to maximize the UOH (Jones, 1984). This combination of the individual team and the league is vital for there to be a balance in the system. In order to survive, the NHL and all leagues need to have some level of uncertainty. However, there also has to be some level of competition, otherwise the validity of the league would be uncertain (Jones, 1984). The NHL maximizes the UOH by implementing rules and regulations that effect all teams within the league. A recent rule change that the NHL implemented was the changes to overtime during the regular season. The implementation of overtime and the shoot-out in the NHL has balanced competitive balance much more than overtime rules for the other major leagues in the US (Bowmana, 2018). There has also been evidence that home teams have a greater percentage of winning, due to the format of the NHL that has given the home team an advantage (Leard, 2010). These formats include more days off before games and more power play opportunities for the home team (Leard, 2010).

2.2 BIRGing and CORFing

BIRGing is the tendency of individuals to increase their association with others that are successful (Wann, 1990). This follows the intuition that Coates studied in that winning has a positive correlation to attendance (Coates, 2010, & Coates, 2012). The concept of BIRGing is

stemmed on the self-esteem of fans and the self-image of the team they associate with (Campbell, 2004). Fans believe that their respective teams are held high in status and feed of them being successful in social situations (Campbell, 2004). CORFing is the tendency for fans to separate themselves from a team that isn't being successful or winning (Wann, 1990). CORFing is also a behavioral trait that is due to the fans self-esteem or self-image. Instead of seeming lesser in front of their peers for supporting an unsuccessful team, these fans will lose their connection with the team. BIRGing and CORFing resemble how team identification has a direct relationship with fan engagement and fan participation (Wann, 1990).

BIRGing has often been acknowledged by how fans engage with their respective teams (Wann, 1990). This isn't only shown by the tendencies of fans to show up and attend games (Wann, 1990 & Yoshida, 2014). Fans that BIRG are more likely to wear and support their team after a win (Wann, 1990, Campbell, 2004 & Yoshida, 2014). This is due to the self-image that is associated with a successful team and how fans associate themselves in a positive light when their team is successful (Campbell, 2004). This allows the fan to build a link to the team by associating themselves with their behavior (Campbell, 2004). BIRGing also leads to more fan attendance as fans who tend to BIRG are more likely to express and reach out to widen their social groups. This is due to the extra-role behaviors that BIRGing fans participate in that include but are not limited to spreading positive word-to-mouth, recruiting more consumers, and collaborating with other consumers (Yoshida, 2014). CORFing has been studied to have close to the opposite results as BIRGing but can be explained similarly. Prospect theory states that consumers value expected loss more than they value expected gain (Kahnemann, 1979). Under prospect theory it would intuitively make sense that fans have the tendency to cut off ties with teams that are failing to have success. However, CORFing doesn't only explain the behavioral

trends of fans for just attending games. Similar to BIRGing, CORFing is associated with the self-image that fans see themselves and their association with the team. If the team is unsuccessful fans are less likely to represent the team or altogether distance themselves from the team (Wann, 1990). This behavior can be explained as fans trying to protect their self-image from harm and causing them to disassociate from the team (Peters, 2011).

Another concept introduced is BIRF and CORS (Aiken, 2005). BIRFing and CORSing go against what our intuition tells us but can aid in the explanation of fan behavior. BIRFing is a behavior that represents the fans involvement with the team and reflects their self-image as well. Fans that BIRF often refer to themselves as loyal to the team (Aiken, 2005). The success of the team doesn't apply to the behavioral trends of these fans because they revere themselves on the fact that through thick and thin, they are loyal to their team (Aiken, 2005). Fans that behave in BIRFing can also be categorized as die-hard fans (Wann, 1990). It could also be explained that rooting for the underdog is more exhilarating for the fan to experience (Aiken, 2005). For the identified individuals to CORF would reflect to them as being a quitter or a fair-weather fan (Aiken, 2005). Fans that behave in CORSing, can be attributed to the decision making of the team as well as the association of other fans (Aiken, 2005). These decisions can be attributed to the whole sale change of team personnel, player, or coaches (Aiken, 2005). Another reason a fan might behave as CORSing is the resentment towards other fans that have joined with the team's success (Aiken, 2005). These new fans, referred to as bandwagon jumpers, have only became fans because the team has started to have success recently. Since the bandwagon jumpers weren't loyal to the team when they were struggling, the die-hard fans that were there distance themselves to prove their individualism (Aiken, 2005).

Within BIRGing and CORFing, however, an entire fan base cannot be categorized has either BIRG or CORF. Depending on the fan's engagement level with the team we can predict the risk that fans will conduct BIRGing or CORFing behavior (Wann, 1990 & Yoshida, 2014). Fans are categorized into three different engagement or identification levels; high, moderate, or low (Wann, 1990 & Yoshida, 2014). Evidence has shown that this separation in fans identification or engagement level allows researchers to predict whether or not fans are more likely to BIRG, CORF, BIRF, or CORS. Fans are highly identified with the team are more likely to BIRG after a victory than those that are moderately of low in association with the team (Wann, 1990). Those individuals that lie in the middle of the spectrum are often expected to fall between the low and high of BIRGing and CORFing. Moderately identified individuals are less likely to CORF than those low in identification, while those low in identification are most likely to CORF (Wann, 1990).

BIRGing and CORFing has presented some challenges when it comes to documenting or conducting research on the concept. The majority of studies have used survey's and classification as the base for fans BIRGing and CORFing (Aiken, 2005, Wann, 1990, & Yoshida, 2014). Aiken and Wann's research both used the data from college students and their willingness to associate themselves with their respective college basketball team (Aiken, 2005 & Wann, 1990). These surveys provided both studies with evidence that students are more likely to BIRG and CORF with respect to how successful the basketball team had done (Aiken, 2005 & Wann 1990). The other survey was used during a professional soccer game in Japan that included questions about their management cooperation, prosocial behavior, and performance tolerance (Yoshida, 2014).

One study that I came across did calculate BIRGing and CORFing through a similar model. However, they were using a model that examined BIRGing and CORFing by the average building capacity through winning percentage (Peters, 2011). My model instead looks at the amount of points a team receives during a season. These are very similar as a team receives two points for a win, however, just looking at the winning percentage doesn't include overtime losses that still allow teams to gain points. Meaning that a team could have more points and be ranked higher in the standings than another team and have less wins than that team. Peters' also looks into how fans attendance reacts at the halfway point of the season (Peters, 2011). Peters' model demonstrated that large markets are less susceptible to fluctuations in attendance than smaller markets at the halfway point (Peters, 2011). As well as some teams seeing improvements in attendance from team success and other teams seeing a decrease due to the lack of team success at the halfway mark (Peters, 2011). The model I made doesn't include the halfway mark but instead analyzes an entire season. This inclusion of the halfway mark is something that should be considered if this research is continued.

2.3 Fighting

Fighting has in recent years been a topic of discussion for the league and the fans. Violence in the sport depends on the preference of the consumer, if they prefer violence then fighting should have a positive correlation with attendance (Paul, 2003). The majority of literature has evidence that fighting has a positive effect on attendance (Paul, 2003 & Paul, 2013). The preference for fans appears to be that they prefer the home team to win and have a tendency for violence than for there to be a high scoring, low violence game (Paul, 2003). Fans show evidence of this preference of violence; however, it is worth mentioning that there were a couple contradictory studies. While fights per game for the home team are highly significant and

positive, Canadian teams that had a tendency to fight had a negative correlation with attendance (Paul, 2003). Rockerbie also conducted a study that found fighting to have a small negative impact on attendance (Rockerbie, 2015). Rockerbie theorized that if a general manager was to maximize profits then they would want to reduce the amount of fighting (Rockerbie, 2015). Part of Rockerbie's study involved fighting teams to be associated with other violent penalties such as spearing and boarding.

The literature on fighting and the success of the team is a main point of emphasis for research. There hasn't been significant evidence that fighting has a positive effect on winning (Engelhardt, 1995, York, 1970, & Paul, 2013). One hypothesis for why winning and fighting isn't correlated is the impact of more European skilled forwards (Engelhardt, 1995). The role of fighting and the leagues efforts to minimize it has brought in more players that have more skill. Encouraging teams to play a style of more finesse and skill rather than brute force and violence (Engelhardt, 1995). Another hypothesis is that there is evidence that teams that have a tendency to fight are the weaker teams in the league (Engelhardt, 1995). This is a marketing strategy that these teams participate in as a way of getting fans to the gates and something for them to look forward to (Engelhardt, 1995). It may also be because the players start to get increasingly frustrated with the team's lack of success and leads to an increase in fighting (Engelhardt, 1995). When the regular season is over and playoffs begin there is no is no statistical significance with fighting and the team that wins the Stanley Cup or makes the finals (York, 1970). While fighting can lead to some strategic on-ice play styles, the evidence explains that there isn't a correlation between winning and fighting.

Data

My data set was a collection of data from the 2005-06 NHL season to the 2018-19 season. This specific time frame was chosen for two reasons in particular. The 2005-06 season was the first year after the NHL lockout during the 2004-05 season. In the 2004-05 season the NHL was on a complete lockout due to a labor dispute revolving around the salary cap. During the 2004-05 season the NHL decided that there would be no games as the dispute couldn't be resolved. The 2005-06 season was the first full season back after the lockout and is where my data set starts. The 2018-19 season was the last complete season before the pandemic hit the US causing a halt on the world. The 2019-20 season data could have been used up to the point of the pandemic hitting however, the decision was made to use the data from the last compete season and not include the 2019-20 season. The 2012-13 season was also a lockout year due to labor disputes, however, this particular lockout didn't conclude with the ending of the season. Instead of 82 games the NHL played 48, because of this continuation in play I have included this data into my data set.

There are two team's worth mentioning in my data set. The first is the Las Vegas Golden Knights who became an NHL franchise in 2017. Their first inaugural season began in the 2017-18 NHL season. I have excluded the Knights from my data set as there has been evidence that inaugural seasons have a positive correlation with attendance (Coates, 2012). The other team is the Seattle Kraken, which is the newest franchise in the NHL. The Kraken have been excluded from my data as they weren't a franchise during the time period and are competing in their inaugural season during the 2021-22 season.

There are two other teams are worth noting and they are the Atlanta Thrashers and the Winnipeg Jets. During the 2011-12 season the Atlanta Thrashers were relocated to Winnipeg

becoming the Winnipeg Jets. Unlike the Knights and the Kraken there was enough data from the years following to not have the inaugural season affect the model.

My primary source of data has been provided by NHL.com for the majority of control variables. These variables include per season stats from teams' averages per season. These stats include a team's success and is measured by the amount of points a team had received during a season. Points is used as the primary measurement for how a team is ranked throughout the league. A team receives two points for every win, whether or not it was in overtime, and one point if the team losses in overtime. I also gathered the variable goals for per game (gfgp) and goals against per game (gagp). Gfgp and gagp is a measurement of the average scoring that happened during a game for the entire season. Gfgp and gagp were used to see how fans behavior would change with regard to a high scoring or low scoring team.

ESPN.com has collected the data for attendance from NHL franchises from 2005-2019. From this data set I gathered my data for the total attendance for each NHL team from 2005-2019. The total attendance accounts for all home and away games for a team for a given season and is the dependent variable in the models.

Fighting was a rather hard variable to find data for, as the NHL doesn't want to make fighting a focal point in the league. This caused some difficulty in finding data on the amount of fights for each franchise during a season. However, hockeyfights.com provided information on the amount of fights each team had during the regular season from 2005-19 NHL season and is represented by the totalfights variable.

3.1 Variables

- Totalattendance is the total attendance for a team for a given season from 2005-2019.

- gfgp represents the average amount of goals for per game for an entire season and is measured by the amount of goal for over games played.

- gagp represents the average amount of goals against per game for an entire season. and is measured by the amount of goals against over games played.

- totalfights is measured by the amount of regular season fights a team had for a given season.

- team_Arizona, team_Atlanta, team_Boston, team_Buffalo, team_Calgary, team_Chicago, team_Colorado, team_Columbus, team_Dallas, team_Detroit, team_Edmonton, team_Florida, team_LosAngeles, team_Minnesota, team_Montreal, team_NYIslanders, team_NYRangers, team_Nashville, team_NewJersey, team_Ottawa, team_Philadelphia, team_Pittsburg, team_SanJose, team_StLouis, team_TampaBay, team_Toronto, team_Vancouver, team_Washington, and team_Winnipeg: are dummy variables that represent each team in the NHL and are represented by the city name of the team. The teams are in respect to Anaheim as Anaheim was dropped.

- team_C is a dummy variable, 1 if the team is located in Canada and 0 if not.

- 2006-07 is a time variable that represents the 2006-07 NHL season and is with respect to the 2005-06 season.

- 2007-08 is a time variable that represents the 2007-08 NHL season and is with respect to the 2005-06 season.

- 2008-09 is a time variable that represents the 2008-09 NHL season and is with respect to the 2005-06 season.

- 2009-10 is a time variable that represents the 2009-10 NHL season and is with respect to the 2005-06 season.

- 2010-11 is a time variable that represents the 2010-11 NHL season and is with respect to the 2005-06 season.

- 2011-12 is a time variable that represents the 2011-12 NHL season and is with respect to the 2005-06 season.

- 2012-13 is a time variable that represents the 2012-13 NHL season and is with respect to the 2005-06 season.

- 2013-14 is a time variable that represents the 2013-14 NHL season and is with respect to the 2005-06 season.

- 2014-15 is a time variable that represents the 2014-15 NHL season and is with respect to the 2005-06 season.

- 2015-16 is a time variable that represents the 2015-16 NHL season and is with respect to the 2005-06 season.

- 2016-17 is a time variable that represents the 2016-17 NHL season and is with respect to the 2005-06 season.

- 2017-18 is a time variable that represents the 2017-18 NHL season and is with respect to the 2005-06 season.

- 2018-9 is a time variable that represents the 2018-19 NHL season and is with respect to the 2005-06 season.

<p style="text-align:center;">**Theory**</p>

The purpose of this study is to examine if there is a tendency for fans to BIRG and CORF in the NHL. As previous literature has shown evidence of the positive correlation between attendance and winning (Coates, 2010 and Coates, 2012) it is reasonable to assume that BIRGing and CORFing are present in the NHL. My hypothesis is that the team's success has a direct correlation with total attendance theorizing that BIRGing and CORFing are present in the league. Multiple ordinary least squares (OLS) regressions were used in order to analyze the model.

Method

The first model is as follows:

$$\text{Total Attendance} = \beta_0 + \beta_1 \text{points} + \beta_2 \text{team\_Arizona} + \beta_3 \text{team\_Atlanta} + \beta_4 \text{team\_Boston}$$
$$+ \beta_5 \text{team\_Buffalo} + \beta_6 \text{team\_Calgary} + \beta_7 \text{team\_Carolina} + \beta_8 \text{team\_Chicago} +$$
$$\beta_9 \text{team\_Colorado} + \beta_{10} \text{team\_Columbus} + \beta_{11} \text{team\_Dallas} + \beta_{12} \text{team\_Detroit} +$$
$$\beta_{13} \text{team\_Edmonton} + \beta_{14} \text{team\_Florida} + \beta_{15} \text{team\_LosAngeles} + \beta_{16} \text{team\_Minnesota} +$$
$$\beta_{17} \text{team\_Montreal} + \beta_{18} \text{team\_NYIslanders} + \beta_{19} \text{team\_NYRangers} + \beta_{20} \text{team\_Nashville} +$$
$$\beta_{21} \text{team\_NewJersey} + \beta_{22} \text{team\_Ottawa} + \beta_{23} \text{team\_Philadelphia} + \beta_{24} \text{team\_Pittsburg} +$$
$$\beta_{25} \text{team\_SanJose} + \beta_{26} \text{team\_StLouis} + \beta_{27} \text{team\_TampaBay} + \beta_{28} \text{team\_Toronto} +$$
$$\beta_{29} \text{team\_Vancouver} + \beta_{30} \text{team\_Washington} + \beta_{31} \text{team\_Winnipeg} + \beta_{32} 2006\text{-}07 +$$
$$\beta_{33} 2007\text{-}08 + \beta_{34} 2008\text{-}09 + \beta_{35} 2009\text{-}10 + \beta_{36} 2010\text{-}11 + \beta_{37} 2011\text{-}12 + \beta_{38} 2012\text{-}13 +$$
$$\beta_{39} 2013\text{-}14 + \beta_{40} 2014\text{-}15 + \beta_{41} 2015\text{-}16 + \beta_{42} 2016\text{-}17 + \beta_{43} 2017\text{-}18 + \beta_{44} 2018\text{-}19 + \varepsilon$$

Where:

- Total Attendance is the dependent variable and is the total attendance for a team for a given season.

- $\beta_1$points is a representation of the wins, losses, and overtime record of a team in a given year.

- $\beta_2 \dots \beta_{31}$ represent dummy variables for every given team with respect to Anaheim.

- $\beta_{32} \dots \beta_{44}$ represent dummy variables for the given season with respect to the 2005-06 season.

- This model was used to see the relationship points had on total attendance for a given season. It was also used to see how different teams reacted to points with respect to Anaheim and a given season with respect to the 2005-06 season.

The second model is as follows:

Total Attendance = β_0 + $\beta_1$gfgp + $\beta_2$gagp + β_3Totalfights + $\beta_4$team_Arizona + $\beta_5$team_Atlanta + $\beta_6$team_Boston + $\beta_7$team_Buffalo + $\beta_8$team_Calgary + $\beta_9$team_Carolina + β_{10}team_Chicago + β_{11}team_Colorado + β_{12}team_Columbus + β_{13}team_Dallas + β_{14}team_Detroit + β_{15}team_Edmonton + β_{16}team_Florida + β_{17}team_LosAngeles + β_{18}team_Minnesota + β_{19}team_Montreal + β_{20}team_NYIslanders + β_{21}team_NYRangers + β_{22}team_Nashville + β_{23}team_NewJersey + β_{24}team_Ottawa + β_{25}team_Philadelphia + β_{26}team_Pittsburg + β_{27}team_SanJose + β_{28}team_StLouis + β_{29}team_TampaBay + β_{30}team_Toronto + β_{31}team_Vancouver + β_{32}team_Washington + β_{33}team_Winnipeg + β_{34}2006-07 + β_{35}2007-08 + β_{36}2008-09 + β_{37}2009-10 + β_{38}2010-11 + β_{39}2011-12 + β_{40}2012-13 + β_{41}2013-14 + β_{42}2014-15 + β_{43}2015-16 + β_{44}2016-17 + β_{45}2017-18 + β_{46}2018-19 + ε

Where:

- Due to multicollinearity between goals for per game and goals against per game on points a second model was needed to analyze the relationship between goals for and against per game for a season on total attendance.

- Total fights were also introduced to look at the relationship between fighting and total attendance.

The third model is as follows:

Total Attendance $= \beta_0 + \beta_1$Points $+ \beta_2$Team_C $+ \beta_3$2006-07 $+ \beta_4$2007-08 $+ \beta_5$2008-09 $+$

$\beta_6$2009-10 $+ \beta_7$2010-11 $+ \beta_8$2011-12 $+ \beta_9$2012-13 $+ \beta_{10}$2013-14 $+ \beta_{11}$2014-15 $+ \beta_{12}$2015-

16 $+ \beta_{13}$2016-17 $+ \beta_{14}$2017-18 $+ \beta_{15}$2018-19 $+ \varepsilon$

Where:

- Team_C represents a dummy variable, 1 if the team is located in Canada and 0 if not.

Table 1

Correlation Test

	totalf~s	points	sowin	gfgp	gagp	pppct	pkpct	shotsgp	sagp	fowpct	lag_po~s	lag_fi~s	team_C
totalfights	1.0000												
points	0.0308	1.0000											
sowin	0.2361	0.2224	1.0000										
gfgp	-0.1082	0.5887	-0.0967	1.0000									
gagp	-0.0223	-0.5080	-0.1468	-0.0382	1.0000								
pppct	-0.1566	0.3632	-0.1622	0.5478	-0.1202	1.0000							
pkpct	0.1145	0.3435	0.1347	0.0534	-0.5944	-0.0064	1.0000						
shotsgp	-0.2147	0.3790	-0.0594	0.4663	-0.1121	0.2689	-0.0141	1.0000					
sagp	-0.0457	-0.2536	-0.0701	-0.0396	0.5020	0.0042	-0.3493	-0.0572	1.0000				
fowpct	-0.0676	0.2084	0.0048	0.1267	-0.2126	0.1049	0.1026	0.2826	-0.2405	1.0000			
lag_points	-0.0399	0.2437	-0.0650	0.2665	-0.2226	0.1778	0.1465	0.2071	-0.1838	0.2063	1.0000		
lag_fights	0.5922	-0.0292	0.1943	-0.1190	-0.1702	-0.0858	0.1001	-0.0737	-0.0811	-0.0210	0.0327	1.0000	
team_C	0.0488	-0.0994	-0.0966	-0.0038	0.1139	-0.0209	-0.0611	-0.0785	0.1207	-0.1238	-0.0935	0.0495	1.0000

Table 1 above, shows the problem of multicollinearity within the model. Due to this multicollinearity I decided to run multiple OLS regressions instead to analyze the variables points, goals for per game, goals against per game, and total fights.

These models were at risk of heteroskedasticity; therefore, a Breusch-Pagan test was used on each model and there were no signs of heteroskedasticity within the models.

Results

The purpose of my research was to see whether or not BIRGing and CORFing have a tendency in the NHL. The first model was used to examine the relationship between points and total attendance in the NHL. Table 2 shows the results from the first model.

Points is statistically significant at the 1% level with a $P > |z|$ value of 0 and has a coefficient of 1231.12 with a 95% confidence interval of 866.87 to 1595.38. As expected, there is a positive correlation between winning and total attendance. Fans prefer to see their team win, which agrees with the previous literature as well as intuition (Leard, 2011, and Paul, 2003).

Next, every team is statistically significant with respect to Anaheim except for Atlanta, Colorado, Columbus, Florida, Nashville, New Jersey and Winnipeg. These results allow us to compare the intercepts between each team with respect to Anaheim. The intercepts are important for this model as it shows us the base number of die-hard fans within each organization if points were zero with respect to Anaheim. This combination between teams and points shows evidence that NHL fans do participate in BIRGing. Points having a positive coefficient and being statistically significant provides evidence that as points increase so does fans involvement with the team. In other words, if a team is having more success during the season, on average more fans will attend the games.

Lastly, the only season that was statistically significant was the 2012-13 with respect to the 2005-06 season. This is interesting as the 2012-13 season was the only season in the data set with a lockout that forced the season from 82 games to 48. The lack of games could be the reason why the coefficient is so high at -222836.4 as fans aren't able to attend just under half the normal amount of games.

Table 2

Points on Attendance

totalattendance	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
points	1231.124	185.246	6.65	0.000	866.8725	1595.375
team_Arizona	-76909.92	17880.2	-4.30	0.000	-112067.9	-41751.9
team_Atlanta	-23120.89	23065.44	-1.00	0.317	-68474.69	22232.92
team_Boston	39638.45	17606	2.25	0.025	5019.595	74257.31
team_Buffalo	113015.2	17821.28	6.34	0.000	77973.05	148057.4
team_Calgary	128741.2	17661.18	7.29	0.000	94013.86	163468.6
team_Carolina	-31022.91	17725.99	-1.75	0.081	-65877.71	3831.896
team_Chicago	166591.5	17619.36	9.46	0.000	131946.4	201236.7
team_Colorado	15111.95	17780.28	0.85	0.396	-19849.59	50073.48
team_Columbus	-10328.54	17782.13	-0.58	0.562	-45293.73	24636.64
team_Dallas	47499.87	17632.61	2.69	0.007	12828.69	82171.04
team_Detroit	151901.4	17605.8	8.63	0.000	117283	186519.9
team_Edmonton	69632.22	18070.95	3.85	0.000	34099.14	105165.3
team_Florida	-31506.54	17799.27	-1.77	0.078	-66505.42	3492.349
team_LosAngeles	79540.14	17698.48	4.49	0.000	44739.44	114340.8
team_Minnesota	109637.5	17648.35	6.21	0.000	74935.4	144339.7
team_Montreal	212505.6	17638.8	12.05	0.000	177822.2	247188.9
team_NYIslanders	-99355.91	17795.39	-5.58	0.000	-134347.2	-64364.65
team_NYRangers	79523.95	17618.33	4.51	0.000	44880.85	114167
team_Nashville	3756.811	17606	0.21	0.831	-30862.05	38375.67
team_NewJersey	-28524.07	17668.78	-1.61	0.107	-63266.37	6218.225
team_Ottawa	93480.64	17698.48	5.28	0.000	58679.94	128281.3
team_Philadelphia	151504.1	17665.46	8.58	0.000	116768.3	186239.9
team_Pittsburg	69895.07	17608.26	3.97	0.000	35271.77	104518.4
team_SanJose	47267.91	17618.33	2.68	0.008	12624.81	81911
team_StLouis	64936.45	17633.35	3.68	0.000	30263.82	99609.08
team_TampaBay	103661.3	17636.41	5.88	0.000	68982.7	138340
team_Toronto	146079.4	17778.43	8.22	0.000	111121.5	181037.3
team_Vancouver	110426.4	17647.44	6.26	0.000	75726.05	145126.7
team_Washington	56920.22	17605.72	3.23	0.001	22301.91	91538.52
team_Winnipeg	-31007.63	20783.93	-1.49	0.137	-71875.28	9860.025
Season						
2006-07	253.7667	12026.78	0.02	0.983	-23394.61	23902.14
2007-08	14850.4	12026.91	1.23	0.218	-8798.224	38499.03
2008-09	21338.03	12026.78	1.77	0.077	-2310.349	44986.41
2009-10	942.3176	12027.41	0.08	0.938	-22707.3	24591.94
2010-11	1805.634	12027.18	0.15	0.881	-21843.54	25454.81
2011-12	20016.05	12057.16	1.66	0.098	-3692.067	43724.16
2012-13	-222839.4	13984.43	-15.93	0.000	-250337.2	-195341.7
2013-14	25139.92	12057.47	2.09	0.038	1431.188	48848.65
2014-15	21704.39	12057.42	1.80	0.073	-2004.235	45413.01
2015-16	25997.08	12057.31	2.16	0.032	2288.681	49705.48
2016-17	22321.53	12056.98	1.85	0.065	-1386.237	46029.29
2017-18	20100.47	12057.63	1.67	0.096	-3608.575	43809.52
2018-19	20511.84	12058.34	1.70	0.090	-3198.595	44222.28
_cons	523972	23646.7	22.16	0.000	477475.3	570468.8

Observations = 420
F(44, 375) = 50.96
Prob > F = 0.0000
R^2 = 0.8567

Table 3

Goals For and Goals Against Per Game on Attendance

totalattendance	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
gfgp	44526.29	9252.467	4.81	0.000	26332.76	62719.83
gagp	-25225.47	8826.436	-2.86	0.005	-42581.28	-7869.654
totalfights	-273.1728	244.8212	-1.12	0.265	-754.5755	208.23
team_Arizona	-85564.37	18643	-4.59	0.000	-122222.9	-48905.82
team_Atlanta	-37954.82	24229.48	-1.57	0.118	-85598.32	9688.679
team_Boston	30997.6	17759.08	1.75	0.082	-3922.866	65918.06
team_Buffalo	100645	18589.61	5.41	0.000	64091.43	137198.6
team_Calgary	120436.6	17869.74	6.74	0.000	85298.56	155574.7
team_Carolina	-44218.93	19225.3	-2.30	0.022	-82022.48	-6415.377
team_Chicago	153364	18378.55	8.34	0.000	117225.4	189502.5
team_Colorado	4063.514	18333.02	0.22	0.825	-31985.51	40112.54
team_Columbus	-18023.76	17914.33	-1.01	0.315	-53249.49	17201.98
team_Dallas	40190.71	17989.83	2.23	0.026	4816.507	75564.91
team_Detroit	138486.3	19560.36	7.08	0.000	100023.9	176948.7
team_Edmonton	57901.07	18292.66	3.17	0.002	21931.4	93870.74
team_Florida	-40697.78	18460.23	-2.20	0.028	-76996.95	-4398.606
team_LosAngeles	70141.24	18150.83	3.86	0.000	34450.46	105832
team_Minnesota	102730.4	18474.92	5.56	0.000	66402.39	139058.5
team_Montreal	202373.8	18469.77	10.96	0.000	166055.9	238691.7
team_NYIslanders	-109672.3	18623.54	-5.89	0.000	-146292.6	-73052.02
team_NYRangers	70722.92	17960.03	3.94	0.000	35407.31	106038.5
team_Nashville	-2974.484	18310.35	-0.16	0.871	-38978.93	33029.96
team_NewJersey	-31367.65	18476.89	-1.70	0.090	-67699.57	4964.275
team_Ottawa	80785.04	18104.5	4.46	0.000	45185.35	116384.7
team_Philadelphia	142065.6	17937.56	7.92	0.000	106794.2	177337
team_Pittsburg	56971.7	18397.19	3.10	0.002	20796.48	93146.91
team_SanJose	39303.84	18114.79	2.17	0.031	3683.926	74923.75
team_StLouis	60075.58	17769.25	3.38	0.001	25135.12	95016.03
team_TampaBay	91169.37	18531.75	4.92	0.000	54729.57	127609.2
team_Toronto	131926.3	18637.36	7.08	0.000	95278.78	168573.7
team_Vancouver	103124.4	17915.6	5.76	0.000	67896.12	138352.6
team_Washington	45287.08	18561.08	2.44	0.015	8789.596	81784.56
team_Winnipeg	-42927.4	21284.48	-2.02	0.044	-84780.01	-1074.792
Season						
2006-07	3710.877	12230.01	0.30	0.762	-20337.53	27759.28
2007-08	24024.08	13211.78	1.82	0.070	-1954.836	50002.99
2008-09	29788.61	13057.12	2.28	0.023	4113.811	55463.4
2009-10	11411.35	13245.95	0.86	0.390	-14634.75	37457.44
2010-11	11440	13094.08	0.87	0.383	-14307.47	37187.48
2011-12	29338.6	13201.98	2.22	0.027	3378.964	55298.23
2012-13	-264575.5	13323.73	-19.86	0.000	-290774.6	-238376.5
2013-14	33936.5	12991.7	2.61	0.009	8390.332	59482.66
2014-15	28380.82	13192.89	2.15	0.032	2439.05	54322.58
2015-16	30414.76	13253.63	2.29	0.022	4353.559	56475.96
2016-17	26748.15	12894.76	2.07	0.039	1392.603	52103.69
2017-18	18670.11	12536.67	1.49	0.137	-5981.302	43321.52
2018-19	16311.59	12710.02	1.28	0.200	-8680.689	41303.87
_cons	596023.9	46554.56	12.80	0.000	504481.6	687566.2

Observations = 420
F(46, 373) = 48.73
Prob > F = 0.0000
R^2 = 0.8573

Table 3 shows the results from the second model. With goals for per game and goals against per game being collinear with points, this model was used to analyze attendance in regard to scoring. Goals for and goals against per game are both statistically significant with P values below 0.01. There are no surprises with these results, and they provide more evidence of how winning has a positive correlation with attendance. If on average a team scores one more goal than they can expect their total attendance to increase by 44526.29 people on average. In contrast if a team allows one more goal per game than that team can expect on average a decrease of 25225.47 people to attend for a season. This result contradicts previous research that fans don't prefer higher scoring games as an increase in goals for leads to an increase in total attendance (Paul, 2003).

The results also show that total fights are statistically insignificant in the model. Total fights being insignificant indicates that there is no evidence of fighting increasing total attendance for a game.

The introduction of fighting within the model also caused some of the team dummy variables to become statistically insignificant. Atlanta, Boston, Carolina, Colorado, Columbus, Dallas, Florida, Nashville, New Jersey, San Jose, Washington, and Winnipeg became insignificant at the 1% level.

The 2012-13 lockout season was still statistically significant at the 1% level with a coefficient of -264575.5. This makes sense as there weren't as many games for the fans to attend. The following year 2013-14 also became statistically significant at the 1% level with a positive coefficient of 33936.5. This could be due to the fans being excited for a full season of the NHL after the lockout.

Table 4 shows the results from the third model. To analyze the difference between the US and Canadian markets for NHL teams and look at fan's tendency to BIRG and CORF. The important variable in model three is team_C as it represents a dummy variable for Canadian teams. There wasn't any evidence of BIRGing within this model that indicates Canadian fans BIRG more or less than US teams. The slope for US and Canadian teams is the same in my model as it is indicated by the coefficient for points. Since US and Canadian teams have the same slope, it is assumed that US and Canadian fans BIRG similarly. However, lack of CORFing for Canadian teams with respect to US teams is present. Team_C is statistically significant at the 1% level with a coefficient of 73397.64. Showing evidence that the intercept for Canadian teams is higher than US teams for total attendance.

Table 4

Canadian and US NHL teams

totalatten~e	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
points	2117.182	294.7541	7.18	0.000	1537.739	2696.626
team_C	73397.64	9766.973	7.51	0.000	54197.2	92598.07
Season						
2006–07	253.7667	21213.53	0.01	0.990	−41448.91	41956.45
2007–08	15116.22	21213.71	0.71	0.477	−26586.82	56819.26
2008–09	21308.49	21213.53	1.00	0.316	−20394.19	63011.18
2009–10	351.6117	21214.44	0.02	0.987	−41352.86	42056.08
2010–11	1333.069	21214.11	0.06	0.950	−40370.76	43036.89
2011–12	16745.4	21217.18	0.79	0.430	−24964.46	58455.26
2012–13	−191908.2	23968.86	−8.01	0.000	−239027.5	−144789
2013–14	21662.52	21218.02	1.02	0.308	−20048.99	63374.03
2014–15	18256.53	21217.88	0.86	0.390	−23454.72	59967.77
2015–16	23464.82	21216	1.11	0.269	−18242.73	65172.36
2016–17	19375.76	21216.31	0.91	0.362	−22332.39	61083.92
2017–18	17745.42	21216.14	0.84	0.403	−23962.4	59453.24
2018–19	18422.61	21216.66	0.87	0.386	−23286.23	60131.45
_cons	487019.5	31085.88	15.67	0.000	425909.3	548129.8

Observations = 420
$F_{(15, 404)}$ = 29.15
Prob > F = 0.0000
R^2 = 0.5198

The 2012-13 lockout season is still statistically significant at the 1% level and has a coefficient of -191908.2. Again, this could be due to the lockout and the lack of games causing such a high negative coefficient.

An interaction variable was brought to my attention that might be beneficial for these models. However, when I ran the regressions with the interaction variable PointsTeamC (Points * team_C) was found it to be insignificant. Therefore, the model is not shown as it did not provide any other useful information that hasn't already been observed.

<center>**Conclusion**</center>

In sports there are up and down seasons and the idea of BIRGing and CORFing has been studied along with these tendencies. This research was done in order to see whether or not there was a tendency in the NHL for fans to participate in BIRGing or CORFing behavior. Since BIRGing and CORFing isn't an individual's behavior, it isn't possible to generalize a whole population. This paper is aimed to be a stepping stone to test if there are tendencies for fans to participate in BIRGing or CORFing behaviors.

The results provided evidence that winning has a positive correlation with total fan attendance. This relationship could be evidence that fans have a tendency to BIRG when their team is being successful and CORF when their team is lacking success. Previous literature has provided evidence that a previous teams success has a positive correlation with fan attendance (Coates, 2012). While my model didn't examine the relationship of the previous season as research has been shown to have a correlation with attendance (Paul, 2003). If more research would be done, a lag variable could be introduced to the model as season tickets are offered at the end of the previous season. It would be expected that there wouldn't be a difference from the die-hard fans to attend games from these season tickets, but the other fans that are more susceptible to BIRGing and CORFing may. This information could help increase the understanding of BIRGing and CORFing in the NHL

Between the US and Canadian teams, there also isn't any evidence in the research that BIRGing is more likely to happen. Instead the evidence suggests that US and Canadian teams both react to team success relatively the same on average. The evidence that I did find is that Canadian fans are less likely to CORF than US fans. This could be for various reason, but one theory that could be the most reasonable is that hockey is more a part of the culture in Canada.

<center>25</center>

Canada is the birth place of hockey and could help explain why this behavioral difference is present. It could be that Canadians take more pride with their respective sport while in the US, fans can enjoy a more variety of mainstream sports such as the NFL, MLB, or NBA.

Lastly, not the primary goal of this research but the role of fighting was also analyzed. Fighting was found to be statistically insignificant within my research. This could be because fighting is a rarer occurrence in the NHL than the other variables. Not every game is going to have a fight, possibly implying that fighting isn't the main source for fans choosing to attend games. Previous research (Engelhardt, 1995, York, 1970, & Paul, 2013) suggests that fighting doesn't have any significance on winning. Supporting the main goal of this research that fans would rather participate in BIRGing and have their team be successful than to watch violence at games.

References

Aiken, D. K, Campbell Jr, R.M, & Park, R. "An Empirical Examination of Unusual Fan Behaviors: Basking in Reflected Failure and Cutting off Reflected Success." *Enhancing Knowledge Development in Marketing*, vol. 16, 2005, pp. 116–122.

Bowman, R. A.R, Lambrinos, J., & Ashman, A. "Prospective Measures of Competitive Balance Application to Money Lines in the National Hockey League." *Applied Economics*, vol. 50, no. 46, 2018, pp. 4925–4936., doi:10.1080/00036846.2018.1444262.

Campbell Jr, R.M., Aiken, D., & Kent A. "Beyond BIRGing and CORFing: Continuing the Exploration of Fan Behavior." *Sport Marketing Quarterly*, vol. 13.3, 2004.

Coates, D., & Humphreys B.R. "Week to Week Attendance and Competitive Balance in the National Football League." *International Journal of Sport Finance*, vol. 5, ser. 4, 2010, pp. 239–252. *4*.

Coates, D, & Humphreys B.R. "Game Attendance and Outcome Uncertainty in the National Hockey League." *Journal of Sports Economics*, vol. 13, no. 4, 2012, pp. 364–377., doi:10.1177/1527002512450260.

Engelhardt, G.M. "Fighting Behavior and Winning National Hockey League Games: A Paradox." *Perceptual and Motor Skills*, vol. 80, no. 2, 1995, pp. 416–418., doi:10.2466/pms.1995.80.2.416.

ESPN, ESPN Internet Ventures, www.espn.com/nhl/attendance/_/year/2006.

Jones, J. C. "Winners, Losers and Hosers: Demand and Survival in the National Hockey League." *Atlantic Economic Journal*, vol. 12, no. 3, 1984, pp. 54–63., doi:10.1007/bf02304577.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. Econometrica, 47(2), 363-391.

Leard, B., & Doyle, J.M. "The Effect of Home Advantage, Momentum, and Fighting on Winning in the National Hockey League." *Journal of Sports Economics*, vol. 12, no. 5, 2010, pp. 538–560., doi:10.1177/1527002510389869.

"NHL Stats." *NHL.com*, www.nhl.com/stats/teams?reportType=season&seasonFrom=20182019&seasonTo=20182 019&gameType=2&filter=gamesPlayed%2Cgte%2C1&sort=points&page=0&pageSize=5 0.

Paul, R.J., Weinbach, A.P., & Robbins D. "American Hockey League Attendance: A Study of Fan Preferences for Fighting, Team Performance, and Promotions." *International Journal of Sports Finance*, 2013.

Paul, R.J. "Variations in NHL Attendance. the Impact of Violence, Scoring, and Regional Rivalries." *American Journal of Economics and Sociology*, vol. 62, no. 2, 2003, pp. 345–364., doi:10.1111/1536-7150.t01-2-00003.

Peters, D. *Winning Percentage and Attendance in the NHL*. 2011.

Rockerbie, D.W. "Fighting as a Profit Maximizing Strategy in the National Hockey League: More Evidence." *Applied Economics*, vol. 48, no. 4, 2015, pp. 292–299., doi:10.1080/00036846.2015.1078446.

"Teams." *Hockey Fights*, Hockey Fights, www.hockeyfights.com/teams.

Wann, D.L., & Nyla R. Branscombe. "Die-Hard and Fair-Weather Fans: Effects of Identification on BIRGing and Corfing Tendencies." *Journal of Sport and Social Issues*, vol. 14, no. 2, 1990, pp. 103–117., doi:10.1177/019372359001400203.

York, K., & Miree, C. "The Hanson Brothers Effect: Is Rough Play a Winning Strategy in the NHL?" *Journal of Business Strategies*, vol. 37, no. 2, 1970, pp. 46–65., doi:10.54155/jbs.37.2.46-65.

Yoshida, M, Gordon, B., Nakazawa, M. & Biscaia, R. "Conceptualization and Measurement of Fan Engagement: Empirical Evidence from a Professional Sport Context." *Journal of Sport Management*, vol. 28, no. 4, 2014, pp. 399–417., doi:10.1123/jsm.2013-0199.