Factors influencing attendance of ice hockey games in Sweden

Master’s thesis within Business Administration

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Abstract

Commercialization of sport has been growing since 80s and club owners tend to pay more and more attention not just to cups and titles but to commercial success as well. Nevertheless, fans are still the key source of revenues. Besides direct spending while attending games popular clubs and crowded stadiums grab attention of generous advertisers. That is why the problem of sports attendance becomes more and more important though ice hockey attendance is still not the most popular topic among sports marketing researchers. The majority of them cover Canada and the United States while European leagues suffer from the lack of studies as much bigger attention is paid to sport number one – soccer. In the same time, Sweden is one of the few countries in the world where ice hockey might be as popular as soccer. Swedish ice hockey league is one of the strongest in the world but still many clubs fail to sell out their arenas at every game. So the main purpose of this research is to identify factors that influence attendance of ice hockey games in Sweden and reveal their impact on attendance.

The analysis is conducted using quantitative methods, where econometrical and statistical approaches are primary tools. In order to test factors influencing attendance a multiple regression model was set up. The dataset was compiled using secondary data and consisted of 1317 regular season ice hockey matches played during 4 seasons (from 2008/2009 to 2011/2012) of the top Swedish ice hockey league called Elitserien. The main sources for compiling the dataset were game reports provided by Swedish Ice Hockey Association and Elitserien.

The present study has shown that several factors have strongly positive effect on attendance. Scheduling (games on Friday, Saturday and during Christmas holidays) and rivalry are the most important factors that bring crowds to arenas. Moreover, it can be concluded that higher prices do not affect attendance negatively and clubs can slightly increase ticket prices to improve match day revenues. Finally, on-ice violence attracts Swedish fans while opposite trend exists in North America.
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<thead>
<tr>
<th>AB</th>
<th>Aktiebolaget</th>
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<tr>
<td>AHL</td>
<td>American Hockey League</td>
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<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
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<td>e.g.</td>
<td>exempli gratia</td>
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<td>et al.</td>
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<td>i.e.</td>
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<td>IIHF</td>
<td>International Ice Hockey Federation</td>
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<td>KHL</td>
<td>Kontinental Hockey League</td>
</tr>
<tr>
<td>MLB</td>
<td>Major League Baseball</td>
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<tr>
<td>NBA</td>
<td>National Basketball League</td>
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<tr>
<td>NFL</td>
<td>National Football League</td>
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<td>NHL</td>
<td>National Hockey League</td>
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<tr>
<td>OLS</td>
<td>ordinary least squares</td>
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<tr>
<td>QMJHL</td>
<td>Quebec Major Junior Hockey League</td>
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<tr>
<td>SICO</td>
<td>Sveriges Ishockeyspelares Centralorganisation</td>
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<td>SVT</td>
<td>Sveriges Television</td>
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<td>WC</td>
<td>World Championship</td>
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Introduction

Over the past couple decades sport has turned into a profitable industry with enormous cash flows coming in and out. Today a manager in a sports club is like CEO in a company with a similar scope of goals and responsibilities. Clubs are not non-profit organizations anymore, therefore most of their owners demand not only sports success, but financial too. The world’s most valuable sports club Manchester United is worth $1.86 billion with annual revenue around $330 million, according to Forbes (Badenhausen, 2011) and Deloitte (Deloitte, 2012), that might be compared with large multinational corporations. Price for broadcasting rights of sports events have been raising drastically in the recent years, for instance NFL will get $6 billion dollars annually starting from 2014 (Love, 2011). While television rights became the main source of income, attendance remains one of the most important factors of financial success. Attendance has always been in the core of the sports events because the very sense of sport would die off without supporters at the stadium. Besides this, attendance plays a major role for sports clubs as commercial companies. Profit increases when a bigger number of spectators attend games as these spectators do not only buy tickets but purchase merchandising and spend money in cafes and restaurants at arenas. For instance, in National Hockey League (NHL) more than half of total clubs’ revenues are generated by spectators spending. Moreover, team popularity among fans increases attractiveness to sponsors, investors and advertisers because they are interested not just in clubs which are successful in competitions but also in those teams which manage to attract large audience. While sometimes live spectators bring smaller part of total revenue package, these fans remain a necessary ingredient to all the other revenue sources. Without live spectators sponsors will not advertise at the venue. Without spectators television will not broadcast games to the masses (Pecha & Crossan, 2009), because viewers prefer to watch fully crowded stadiums. A sports event is an excitement and experiment good, which value is created by each customer, therefore high attendance is one of the key goals for clubs administration.

Typically, teams do not compete randomly but participate in leagues and tournaments. It should be noticed that there is a sufficient difference in leagues’ structure in North America and Europe. All biggest American Leagues (NFL – football, MLB – baseball, NBA – basketball and NHL – ice-hockey) are closed. This means that typically there is a certain number of teams and they cannot relegate to a lower league or, on the contrary, promote. A franchise can be excluded from the league only in case of poor financial performance but usually it is just relocated to another city. Moreover, there is a salary cap which diminishes the difference between rich and poor clubs and as a result outcome uncertainty is higher. European system is completely different. The major amount of leagues are open and teams which occupy the lowest positions in the final standings relegate and are substituted by teams finished in the top of lower division. This influences team battles for avoiding demotion as in this case a club can lose a bigger part of its revenues (gate receipts and TV revenues decrease because of lower competition level) while clubs from lower divisions can improve their financial performance after promotion.

1.1 Background

Ice hockey is one of the most popular team sports in the world. There are 70 official members of the International Ice Hockey Federation (IIHF), which is the worldwide
governing body for ice hockey, with over 1.5 million professional players totally. The game is most popular in the countries with a climate, which is cold sufficiently to provide natural ice cover, such as Canada, Russia, Sweden, Finland, the US, the Czech Republic, Germany, etc. A game is played between two teams with six players, while one of them is a goalkeeper. Five members of each team skate up and down the ice trying to take the puck and score a goal against the opposing team.

Sweden is one of the countries, where ice hockey is more or less equal with football, the sport number one in the world, in terms of attendance and popularity (Pakarinen, 2010). The first Swedish ice hockey championship was held in 1922, whereas current top-level professional league, named Elitserien, was established in 1975. Twelve teams participating in Elitserien together share equal stake of Hockeyligan AB, which operates the league and promotes its sports and commercial interests (Hockeyligan AB, 2012). The Elitserien season is divided into a regular season from late September through the beginning of March, when teams play against each other in a pre-defined schedule, and a playoffs from March to the beginning of April, which is an elimination tournament where two teams play against each other to win a best-of-seven series in order to advance to the next round. The final remaining team is crowned the Swedish champion. The two lowest ranked teams after the regular season have to play in a regulation series called Kvalserien together with four teams from the second tier league HockeyAllsvenskan. The top two teams of Kvalserien qualify for the next Elitserien season, while the other four are demoted to HockeyAllsvenskan. Theoretically, there is a possibility that 0, 1 or 2 new teams will play in Elitserien at the beginning of each season, which highlights element of uncertainty. As of 2011, Elitserien is the world's most evenly matched professional ice hockey league (Merk, 2011). However, the National Hockey League (NHL) and the Kontinental Hockey League (KHL) are considered as the best hockey leagues in the world, which attracts players through higher salaries and level of competition.

![Figure 1-1. Average regular season match attendance, seasons 1999/2000-2011/2012](image)

The Figure 1-1 shows the average number of spectators per game in recent seasons. The lowest number was recorded in season 1999/2000, when the attendance was 4,875. The
marked upward trend reached maximum in 2004/2005 with the amount of 6 229 spectators. The main reason which explains why attendance had increased by 500 persons in one season was the 2004 lockout in the NHL. The cancelation of entire NHL season forced players to move to European hockey leagues. As a result, 75 NHL players played this season in Sweden, including top-stars like Peter Forsberg and Sedin brothers. The comeback definitely attracted many spectators as they got an opportunity to see the best players.

Since 2005/2006 attendance has been fluctuating. The lowest attendance was recorded in 2005/2006 (6155 spectators) and 2010/2011 (6160 spectators). A small but visible decrease in attendance might be caused by establishing of the KHL in Russia. Until 2008 Elitserien was considered to be the second strongest league in the world after NHL. However, now best Swedish players choose KHL (in case they do not have offers from North America), thanks to higher salaries. For instance, one of the most popular Swedish clubs HV 71 became a champion in 2010 and then lost 9 best players who decided to move to NHL and KHL. As a result HV 71 failed to reach semifinal two times in a row. Moreover, in April 2009 five biggest Swedish hockey teams (Farjestad, Frolunda, Djurgarden, Linkoping and HV71) looked upon a possibility to cooperate with KHL (Abrahamsson & Persson, 2009). Furthermore, the KHL itself made an invitation to AIK, a popular yet financial unstable hockey club from Stockholm, to join the league (SVT, 2009). The club took the offer positively, however the Swedish Ice Hockey Association declined its request to join another league (Grevfe, 2010).

1.2. Problem

Vast majority of studies dedicated to ice hockey attendance covers North-American hockey leagues, from National Hockey League (NHL) to minor and even youth leagues whereas European scholars just begin researching. Moreover the problem isn’t sufficiently covered among Swedish researchers, a fortiori, most of their papers are written in Swedish and then are inaccessible for foreign researchers. Undoubtedly, results of North American studies can be applicable for European hockey leagues as well. However, each country has its own tradition, consumer habits and preferences.

While the attendance seems to be stable in the whole Elitserien, some clubs suffer from a low number of spectators. Only two clubs, HV 71 and Vaxjo Lakers, filled up more than 90% of their arenas capacities in the last season. Sodertalje’s arena capacity was filled up only by 59% in the season 2009/2010, AIK’s arena attracted only 64% of maximum in season 2011/2012. A low number of spectators affect finance of teams which leads to decrease in sports performance. As a result, teams have to sell their best players, superstars leave league to get a higher level of opponents, the league gets less from sponsorship and TV revenues.

1.3. Purpose

The purpose of the thesis is to investigate factors that affect attendance of ice hockey games on the basis of Elitserien and discuss how the findings might increase the attendance of particular club in the league. In order to fulfill the purpose, the analysis of the previous researches will be done, the model of the hockey attendance in Elitserien will be composed and tested using statistical and econometrical methods. The major research question is:
1. Which determinants affect Elitserien attendance and what is their impact on attendance?

Revelation of the main factors will assist clubs’ managers to focus on main determinants, allocate resources for attracting customers to arenas and build a popular and financially successful team. The results will be applicable to predict future attendance as well. Moreover, the results will be helpful to league’s management. The model will show which months and days of the week attract more customers to arenas, therefore the league might adjust schedule to get a stable attendance during the whole season and avoid overcrowdings. Newly promoted clubs will also get benefits from the research, because it will be create a possibility for them to predict changes in attendance.
2. Theoretical framework

All existent researches investigating the problem of sports attendance could be divided into two major groups. First of them includes studies that examine various sociological aspects of sports attendance. In other words, they try to answer the question: “What encourages people to attend different sport events?” These studies implement various sociological and consumer behavior theories in order to understand fans’ motivation. The main goal of these studies is to investigate reasons that influence decision to attend a game along with consumer profiles. Usually they deal with primary data which is obtained by distribution questionnaires to fans. The second group consists of researches which examine various factors that influence demand for games of a particular club or league. These studies treat clubs as a firm due to the reasons that have already been discussed in Introduction part. They use attendance as a dependent variable and check how various factors (both economical and non-economical) influence it in a long-run period (one season and more). As far as the current thesis belongs to the second group the primary literature analysis is based on previous studies from that group.

2.1. Direct demand for sports

According to Borland and Macdonald (2003) the concept of demand for sports contests can be divided into two major groups: direct demand and derived demand. The first type includes fans who attend games at arenas and fans who watch it on pay-per-view basis. In the same time the second type exists when a sports game is just an intermediate good (e.g. when a company advertises at arenas and pays for TV commercial or when consumers purchase merchandizing and food at stadiums while attending games). Direct demand can be considered as demand for any other entertainment good which is precisely described by Andersson A. and Andersson D. (2006):

Each consumer has its own utility function and budget constraint. Utility function can be presented in the following way:

\[ U = u(k_1, k_2, ..., k_n, q, C), \]

where

- \( k_i \) is the level of quality of type \( i \)
- \( q \) is the consumed quantity of the good with different variable quality characteristics
- \( C \) is the basket of consumption of all other goods with a given quality

It is assumed that each consumer is rational and tries to maximize own utility function which is also influenced by consumer preferences. In the same time consumption is restricted by consumer’s income and results in budget constraint:

\[ p(k_1, k_2, ..., k_n)q + C - b = 0 \]

where

- \( k_i \) is the level of quality of type \( i \)
- \( p(k) \) is a price of entertainment good as a function of quality
- \( C \) is the basket of consumption of all other goods with a given quality
- \( B \) is a predetermined budget level
As a result a consumer has to select a set of goods which has maximum utility and is limited by consumer’s income. For simplicity it can be assumed that in case of ice hockey games there are just two groups of goods: ice hockey games and other consumption. Consequently a consumer faces a choice between attending an additional hockey game at the stadium or instead of this spend income on additional unit of other goods and services. This choice can be shown as a following graph:

![Graph 1: Consumer choice](image)

**Figure 2-1.** Consumer choice (Andersson A. & Andersson D., 2006).

The number of goods a consumer can purchase depends on prices. If a price of one good increases then a consumer reduces its consumption and in the same time slightly increases consumption of another good. In case of ice hockey if ticket prices decrease while the quality remains stable it will result in increase in consumption of ice hockey games.

![Graph 2: Changes in consumer choice](image)

**Figure 2-2.** Changes in consumer choice (Andersson A. & Andersson D., 2006).

Consequently, demand for ice hockey games can be illustrated as a typical demand curve with downward slope. Along with demand for any other good demand for ice hockey games can be influenced by several factors (McConnell & Brue, 2008):

- **Tastes** – if consumer preferences change and a good becomes more desirable usually it leads to increase in demand. For instance, recent success of a national team usually lead to higher attendance in local leagues. According to Allan (2004) each victory of English national football team increases attendance of the following Premier League games by 5.4 per cent.
• Expectations – consumer expectations about higher future prices might also influence demand (one of the most intuitive examples is oil prices). Demand for ice hockey is also influenced by future expectations. For instance, if fans see that during pre-season a club strengthens squad they might expect better performance during the season and higher demand for tickets. In order to avoid queues and secure the best seats for the most interesting games they purchase season tickets and as result have to attend even those games that they are less interested in. Another example was observed in Europe during season 2004/2005. Due to lockout in NHL many top-star players moved to European leagues in order to stay fit. As negotiations between clubs’ owners and Players Association were held during the whole season lockout could finish any day. In this case NHL would have started which means that all star players would have immediately gone back to North America and fans would not had an opportunity to watch them anymore so they tried to attend as many games as possible what was one of the reasons for higher attendance across the whole Europe.

• Substitute goods also have a strong impact on demand. Rise in prices for substitute goods leads to increase of consumption. In case of ice hockey lots of substitutes can be taken into account from cinema and concerts to football and other sports games. Existence of substitutes for ice hockey games and its actual influence will be discussed more precisely in the next chapters.

• Complement goods along with substitutes can also influence demand. If a price for complement good rises (for instance, cars) it will lead to decrease in consumption (in this case, car tires). Ice hockey games also have several complements: arena parking, public transportation, catering prices can influence fans decision whether to attend a hockey game or not.

• Number of buyers typically has an impact on demand. Migration to bigger cities increases demand for food and services in such metropolitan areas. Relation between population and ice hockey attendance is usually positive though there are some exceptions. It will be further investigated in the next chapters.

Demand and supply equilibrium for the majority of goods differs significantly from entertainment goods (while ice hockey games are a part of them). Usually supply function has upward slope and in case of increase (or decrease) in demand producers can modify supply. One of the key features of sports games is that they are usually played at arenas that have limited capacity. As a result supply function is a vertical line and no sports club can influence it. The only thing they can do is just to renovate a stadium or play some games at stadiums with bigger capacity. For instance, derby games between two Stockholm based ice hockey clubs AIK and Djurgarden are played at Globen Arena (capacity 13850) while other their home games are usually played at Hovet (capacity 8094).
2.2. Previous studies on sports attendance

Though this topic gained popularity in the end of 80s the pioneer research was made already in 1956 by Simon Rottenberg. The main focus of his research was labor market in American baseball and the problem of talent distribution. He makes an assumption that richer clubs can attract better players (as they can afford their contracts) and this can lead to decreasing in outcome uncertainty and as a result attendance. Then he defines attendance as a function dependent on income level, ticket price, availability and relative quality of substitutes and sports performance of a home team.

For a long time it has been a controversial issue what is the primary goal of a sports club: profit maximization or sports success. According to Sloane (1971) soccer clubs tend to maximize their utility function which depends on sports success, profit and attendance (though two latter are usually interrelated). In other words, they try to be as successful as possible within a given budget. If a sports club has extra profit it can either invest in improving stadium facilities (which will later lead to higher attendance and higher revenues) or strengthening the squad in order to improve their performance.

In 70s and 80s the vast majority of attendance related studies were made either in North America or Great Britain. This can be explained by rich traditions and higher development of local leagues. American researchers specialized in baseball and football (not soccer) rather than basketball and hockey due to the higher popularity of former. In the same time British researchers traditionally paid their attention to the most popular sports – soccer and rugby. Much poorer attention was paid to ice hockey. Significant studies on North American ice hockey attendance were made by Jones and Ferguson (1988), Stewart, Ferguson and Jones (1992), Jones, Stewart and Sundermann (1996), Paul (2003), Leadley and Zygmont (2006), Rascher, McEvoy, Nage and Brown (2009), Coates and Humphreys (2011), Paul and Chatt (2011) and Paul and Weinbach (2011). The number of researchers in European countries is relatively smaller. Suominen (2009) examined attendance of top Finnish ice hockey league while Lahvicka (2010) performed a deep attendance investigation in Czech Extraleague. Both authors admitted that there is a lack of European studies in this field.
2.3. Fans’ categories

Though the majority of researchers used aggregate attendance in their studies some authors made distinction between various groups of spectators. The key reason for this distinction is that fan’s decision to attend a game may be influenced by various factors and thus should be considered separately. Although such separation might lead to more accurate results it is usually neglected separately as this information is usually unavailable.

- Season-ticket holders vs non-holders.
Forrest and Simmons (2002) admit that fans can be interested just in visiting more exciting games but are afraid that they will not be able to purchase a ticket. That is why they have to purchase a season ticket and visit even those games which are not attractive to them. In the same time spectators who prefer single games would be more sensitive to match specific factors.
Allan and Roy (2008) found that season-ticket holders’ behavior is not affected by game’s characteristics and is relatively stable throughout the season. Moreover pay-at-gate fans for some reasons can be even more important for the club as they are expected to spend more on merchandizing and catering due to infrequency of visits comparing to season ticket holders.

- Home team vs away team fans
It is obvious that factors affecting attendance are different for home and away spectators. Guest fans bear higher costs as they have to spend more money and time on travel. Allan and Roy (2008) admit that visiting fans prefer games with lower win probability of the home team.

- Standing viewers vs seating viewers
This issue is typical for European clubs as arenas in North America usually have only seating accommodation. Terraces (for standing audience) used to be extremely popular in England but after Hillsborough disaster Football Association forced clubs to renovate their stadiums. Nowadays standing seats can be rarely met at soccer arenas though majority of Czech, Finnish and Swedish ice hockey clubs still have terraces as a cheaper option. Dobson and Goddard (1992) came to conclusion that attendance demand for standing and seating accommodation is influenced by different factors. Current team performance, game importance and rivalry have bigger influence on standings while seated is more influenced by club’s traditions.

2.4. Groups of factors

Based on Rottenberg’s (1956) findings the majority of researchers divided all factors which could influence attendance into four groups: economic aspects, expected quality, opportunity costs and others. Garcia and Rodriguez (2009) also added uncertainty of outcome factors to the model as this issue has become one of the major questions within attendance related studies. Forrest and Simmons (2006) studied attendance in English lower divisions and provided a more complicated model deriving several additional groups of factors:

- Support (previous season attendances, distance between clubs and rivalry)
- Form (recent teams’ performance)
- Promotion contention (whether both teams are involved in promotion contention during different parts of season)
- Outcome uncertainty
• Television (if any games between best European clubs are televised in the same
  time)
• Schedule
• Other dummies (month dummies and dummies for teams with greater support)

The only author who studied ice hockey attendance and implemented factors division
into groups was Lahvicka (2010). He derived five major groups of variables which are
similar to Rottenberg’s approach:

• Home team and season fixed effects
• Match attributes (team quality/reputation; team form; team rivalry; team fresh-
  ness/newness; match excitement/uncertainty; seasonal uncertainty; arena quali-
  ty)
• Economic and demographic factors (ticket price; population; distance between
  home and away teams)
• Substitution effects and opportunity costs (match day/time; TV broadcast;
  weather; schedule congestion; substitution with other ice hockey teams; substi-
  tution with soccer)

In the present paper a similar approach is used as all the factors are divided into five
groups: team effect variables, season effect variables, economic variables, match quality
variables and variables, which measure opportunity costs.

2.5. Economic factors

2.5.1. Price elasticity

Economic factors include those which are typical for any demand model: ticket prices,
prices of substitutes, area population where the club is based etc. The major obstacle in
calculating price elasticity is that sports clubs set differentiated prices for the same
game. Usually it depends on viewing quality (i.e. standing and seated; central lower and
upper corner levels etc.) and spectators’ category (usually there are discounts for stu-
dents and seniors). Garcia and Rodriguez (2009) outline several possible solutions for
this problem:

• Average ticket price (e.g. Baimbridge, Cameron & Dowson, 1996)
• Average price of sold tickets (total revenue is divided by the number of tickets
  sold; e.g. Avgerinou & Giakoumatos, 2009)
• Minimum ticket price (e.g. Garcia & Rodriguez, 2002)
• Weighted average price (takes into account the tickets’ total number of a cer-
  tain price category; e.g. Benz, Brandes & Franck, 2009)

De Santana and Da Silva (2009) and Madalozzo and Villar (2009) studies on Brazilian
soccer attendance showed that clubs deliberately tend not to maximize profits but make
stadiums crowded. They admit that even if a club decides to increase admission price
the attendance will decrease slower as demand is inelastic at the point. This can be sup-
ported by majority of researchers (e.g. Allan, 2004; Bruggink & Roosma, 2003; Coates
& Humphreys, 2007 etc.) who also found demand to be inelastic. Madalozzo and Villar
(2009) concluded that even if a club gives 50 per cent discount on ticket prices sales
will increase just by 16 per cent. Moreover Simmons (1996) claims that pay-at-gate fans
have greater price elasticity comparing to season-ticket holders. Ice hockey clubs also
tend to keep demand in inelastic point which was supported by Suominen (2009) and Lahvicka (2010) findings.

Clubs operate in inelastic point due to several reasons. Usually club revenues have several other sources except gate revenues. Firstly, a club with a higher number of supporters is more attractive for advertisers and sponsors. Secondly, TV channels tend to select for broadcasting those games which have lower number of empty seats in order to create a unique atmosphere and as a result TV revenues are higher. Finally, supporters spend money on merchandising, catering and parking and as it was abovementioned casual fans tend to spend more. So based on previous studies it follows that,

**Hypothesis 1:** The higher are ticket prices the less number of fans attend the game.

### 2.5.2. Population

Several researchers also analyzed the impact of population size on game attendance. Falter and Perignon (2000), García and Rodríguez (2002), Paul (2003), Suominen (2009), Paul and Chatt (2011) found a positive relationship between city population and number of spectators. In the same time Paul (2003) admits that positive relationship exists only for Canadian teams in NHL while for American teams it is negative. Typically just total city population is taken into account but Barajas and Crolley (2005) included province population while Benz et al. (2009) used just male population considering men to be the majority of spectators.

It is a typical situation for bigger cities to have more than one local club in the highest division. For instance, this season London hosts 5 clubs of English Football Premier League. As a result it can be challenging to calculate a number of people who reside in the area of each club. It is possible to divide total population by the number of clubs but Garcia and Rodriguez (2002) distributed it in accordance with the number of sold season tickets.

More complicated approach was implemented by Buraimo and Simmons (2006). Using special software they constructed 5 and 10 miles concentric rings around each stadium based on findings that loyal fans usually reside within 10 miles distance from arena. They found that if a team has a population within 10 miles that is 100,000 greater than another team, the team with larger population density is predicted to have 0.79 per cent greater attendance. Difference in away team population of 100,000 translates into an increase in attendance of 0.32 per cent.

Another interesting result was received by Lemke, Leonard and Tihokwane (2010). They split the whole league data set into three groups based on city population. The main result is that attendance of small market teams is much more sensitive to factors surrounding the game and then is attendance of large market teams. They explained it by the fact that in large markets a franchise has more season ticket holders or more people to sell tickets to regardless of the game’s characteristics. As a result, they came to the conclusion that small market teams have to pay more attention to game characteristics in order to increase demand for tickets.

Following these arguments it can be expected that,

**Hypothesis 2:** The bigger is population of a city the bigger number of fans attend a game.
2.6. Expected quality

The second group of factors deals with expected quality of the game. Intuitively fans prefer to see better performance and there are various approaches how to measure attractiveness of every match.

2.6.1. Roster quality

One of the possible solutions to measure squad quality is to estimate teams’ budget. It can be assumed that teams with higher budgets can hire more skilled players and as a result achieve bigger success. Falter and Perignon (2000) along with Garcia and Rodriguez (2002) used budgets of both teams and found a positive relationship between budget and attendance. Though players’ salaries usually are the biggest expenses of a club sometimes it can be misleading. For instance, a team can spend a sufficient part of its budget on improving training or stadium facilities during renovation period. As a result it can be more reasonable to use total team payroll as an indicator of team’s roster (Barajas & Crolley, 2005; Buraimo, 2008; Barilla, Gruben & Levernier, 2008). The latter found that in American baseball an increase in a team’s player payroll of $10 million attracts 610 more fans on average. As a team plays 81 home games per year a $10 million investment in a team’s payroll might increase total attendance by 49,400 fans. Teams’ wage bills can be interpreted not only in absolute figures but also in relation to average payroll in league (Forrest, Simmons & Buraimo, 2005; Buraimo & Simmons, 2006, 2008; Di Domizio, 2010). A positive relationship between teams’ payroll and attendance exists though Buraimo (2008) found that home team wage bill is less important as it remains the same during the whole season. Moreover Mongeon and Winfrey (2011) came to the conclusion that fans pay more attention to actual performance of a team rather than to team’s payroll.

Unfortunately data on team’s budgets in Europe (especially in ice hockey) is not always available so other proxies can be used to measure team’s quality. Baimbridge et al. (1996) along with Garcia and Rodriguez (2002) used a number of overseas players, played in international game and found a positive relationship. In the same time research on Brazilian soccer done by De Santana and Da Silva (2009) showed that existence of players with international experience is not significant for attendance demand.

It was already mentioned that fans prefer to watch best players so a bigger number of superstars should increase attendance. The biggest obstacle is that usually it can be problematic to measure this indicator credibly. Jones and Fergusson (1988) used a number of stars and found a positive relationship. The major disadvantage is that their assessment was not based on any figures and was rather subjective. Stewart et. al. (1992) used a number of selections to all-star team and number of players scoring more than 20 points. The same approach was implemented by Bruggink and Roosma (2003) and they found that home stars are more important: every star brings 4.5 per cent increase comparing to 2.4 per cent by away star. The opposite result was obtained by Berri, Shopst and Brook (2004) as it turned out that team performance is much more important than existence of stars in the roster. Brandes, Franck and Nuesch (2008) used a number of top 2% highly paid players in the league and found that stars bring fans to the stadium when they are on road (attendance increases by 4 per cent). This means that a team spends money on star players though this does not influence home attendance but attracts spectators when a team plays in another city. Nevertheless, it can be expected that,
Hypothesis 3: The better is quality of a home team the bigger number of fans attends a game.
Hypothesis 4: The better is quality of an away team the bigger number of fans attends a game.
Hypothesis 5: The quality of away team roster is more important than the quality of home team’s roster.

2.6.2. Teams’ league performance

Besides players in team’s roster fans are definitely interested in team’s performance. There are various measures which can help to understand team’s success. Due to the nature of team sports, league standing might be the most important indicator of team’s success. Czarnitzki and Stadtmann (2002) found that there is a positive relationship between league position of both teams and attendance. Later Buraimo and Simmons (2006) pointed out that performance of home team is more important comparing to away team which was also confirmed by Lahvicka (2010). Moreover he admits that fans pay much more attention to home performance than to away games. This means that if a team is successful at home but loses away games it would have higher attendance than it if it is equally average both at home and on road. In order to classify teams in the league standing points are assigned according to game results. In order to measure team performance usually average number of points per game is used. Results obtained by Paul (2003), Forrest and Simmons (2006), Buraimo (2008) and Suominen (2009) confirmed the previous assumption that fans pay more attention to home team performance rather than to the opponents. The only problem is that in the first round every team has zero points, so average number of points is also equal to zero. There are two possible solutions: first round games can be excluded from the model or average number of points can be taken from previous season.

It is evident that a team has to score as much as it can to win a game so fans should prefer higher scoring teams. Results of Coates and Humphreys (2011) supported this assumption while interesting results were obtained by Paul (2003). He analyzed attendance in NHL and found that fans prefer teams that win and have tendencies towards fighting and violence, as opposed to high-scoring, low-violence teams. Two later studies on minor American hockey leagues showed that in AHL fans value higher scoring teams and they enjoy higher attendance (Paul & Chatt, 2011) but in QMJHL the number of goals scored has no impact on the number of spectators (Paul & Weinbach, 2011). All in all, it follows that,

Hypothesis 6: The better is league performance of a home team the bigger number of fans attends a game.
Hypothesis 7: The better is league performance of an away team the bigger number of fans attends a game.
Hypothesis 8: Performance of a home team in home games is more important than in away games.
Hypothesis 9: Performance of a home team is more important than performance of an away team.
Hypothesis 10: The bigger number of goals scores a team the bigger is the number of fans who attend a game.

2.6.3. Latest team form

Apart from total league standing which represents how successful is a team during the whole season short-term factors can also influence attendance. Due to various sports and psychological reasons team performance may differ from month to month. Fans can notice recent improvements and become more motivated to attend games. This indicator can be highly significant: for instance, Iho and Heikkila (2010) found out that if a team loses last five games instead of five wins it will lead to 31.6 per cent decrease in next game attendance.

Overwhelming majority of researchers used the a similar approach to identify latest team form: they took into account the total number of points gained in the last 3-5 games. Some of them (e.g. Garcia & Rodriguez, 2002; Benz et al, 2009) also introduced an additional dummy variable if a team has a streak of several wins in a row. Everyone except Allan and Roy (2008) found a positive influence of team form on game attendance while in the latter study it turned out to be insignificant. Besides this, Czarnitzki and Stadtmann (2002) along with Forrest and Simmons (2006) underline that home team form is more important for fans in comparison with visitors. In European ice hockey studies this trend was confirmed. Suominen (2009) found that Finnish fans were not interested in the recent performance of a visiting team while Lahvicka (2010) concluded that short-term results are more important than overall league position. Consequently, it can be expected that,

Hypothesis 11: The better is latest home team’s form the bigger number of fans attends a game.

Hypothesis 12: The better is latest away team’s form the bigger number of fans attends a game.

Hypothesis 13: Recent form of a home team is more important than recent form of an away team.

2.6.4. Violence

Violence factor has always been a controversial topic for ice hockey researches. Jones et al. (1996) found fighting to be attractive for fans. Their study of NHL attendance showed that in late 80s violence could become one of the tools to promote franchise. However, they admit that there were significant regional differences. Canadian fans did not want their team to fight though more violent visiting teams attracted higher audience. On the contrary, spectators in the US preferred teams with more aggressive play style. Their findings were later confirmed by Paul (2003). He admits that on-ice violence is attractive for fans in both countries and for US teams coefficient is even higher than for Canadian. Over the last decade North American leagues tried to reduce the number of fights and recent studies showed that violence is not attractive anymore and cannot increase attendance. Coates and Humphreys (2011) and Paul and Chatt (2011) found negative influence of violence on the number of spectators. Paul and Weinbach (2011) who examined attendance in QMJHL (arguably the best junior hockey league in Canada and worldwide) state that such contradiction can be explained by Canadian passion for pure hockey without violence. Lahvicka (2010) also mentioned cultural differ-
ences and excluded this factor from his model as according to him fighting has never been popular in Europe so it cannot be a determining factor in explaining attendance. Following latest researches it can be expected that,

*Hypothesis 14: There is no correlation between the number of fights and the number of fans who attends a game.*

### 2.6.5. Rivals

Games between historical and geographical rivals usually attract higher audience. Sometimes results of these games can be even more important for fans than club's position in the final standing. Usually these derbies arise between two neighboring clubs but sometimes rivalry exists between historical opponents (for instance, El Clasico game between Real Madrid and Barcelona in Spanish soccer). The majority of researchers introduce dummy variable in order to capture this effect though selection principles are different. Buraimo and Simmons (2008) assigned variable equal to one in case both teams are from the same city or province. Forrest et al. (2005) estimated rivalry based on their subjectivity. Lahvicka (2010) selected games as rival if travel time between two cities is not more than 45 minutes.

Expectedly increase in number of fans is rather high: Forrest et al. (2005) found 7 per cent improvement while Buraimo (2008) - 14.4 per cent. Moreover, Lahvicka concluded that the main Czech derby between Sparta and Slavia (both teams are from Prague) attracts 60 per cent more fans ceteris paribus. As a result it follows that,

*Hypothesis 15: If both clubs are rivals it brings more fans to a game.*

*Hypothesis 16: If both clubs are from Stockholm it brings more fans than to any other game between two rivals.*

### 2.6.6. Short-term reputation

Successful clubs usually enjoy higher attendance not only at home but also when they are on road. Fans can be expected to be more motivated to attend a game when one of participants is a recent title holder. Researchers usually introduce dummy variable in order to capture this effect. Allan (2004) found that every trophy won by a visiting team leads to average increase in attendance by 0.88 per cent. Moreover, Madalozzo and Villar (2009) came to the conclusion that the effect is even greater if a visitor is a recent champion. Soccer championships usually consist just of one stage while in ice hockey regular season is followed by playoff round when champion is determined. Paul (2003) noticed an interesting trend in NHL attendance. If a home team made playoff but lost in the first round it has a negative influence on future season attendance which can be explained by fans’ disappointment. In the same time qualifying for the second round has a strong positive influence on future attendance. However, Lemke et al. (2010) admit that a visiting team which was successful in the previous season attracts larger audience just in the beginning of the season but after first two months this effect diminishes. A possible explanation is that in the middle of the season fans start valuing current team results rather than past titles. Nevertheless, it can be expected that,

*Hypothesis 17: If a home team secured the title last year the bigger number of fans attends a game.*
Hypothesis 18: If an away team secured the title last year the bigger number of fans attends a game.

Hypothesis 19: If a home team made playoff last year the bigger number of fans attends a game.

Hypothesis 20: If an away team made playoff last year the bigger number of fans attends a game.

2.6.7. Long-term reputation

Recent team success and trophies won in a previous season can be a strong predictor of current higher attendance. Besides this fans can be also attracted by clubs with strong traditions and past success. A home team that achieved higher results in previous years typically has a large number of loyal fans who continue supporting their favorite club even in worse times. One of the most famous examples is a Spanish soccer club Atletico Madrid. In 2000 it relegated from Spanish top division but fans were still devoted to them and their attendance in the lower league was even higher than during the previous year in elite. In a similar way clubs with strong traditions can attract large crowds when they are on road. Russian soccer club Spartak Moscow has not won any national trophy over the last ten years but still has the highest attendance among any other visiting teams due to club’s success both in Russia and Europe in 90s. Czarnitzki and Stadtmann (2002) developed an indicator which allows to evaluate a long-term team reputation. It is equal to

$$REP = \sum_{t=1}^{T} \frac{n}{x_t \sqrt{t}} \quad \text{with} \quad T = 20$$

$x_t$ is the team’s final ranking in the championship $t$ years ago and $n$ is the number of teams in the first division.

In a similar way fans can be attracted not only by a well-known team but also by a newcomer: a team which has never played in a top division before or is just promoted after playing in a lower division. Lahvicka (2010) came to the conclusion that new teams attract higher attendance both at home and on road while this novelty effect was equal to 8 per cent. Consequently, it can be expected that,

Hypothesis 21: The higher is reputation of a home team the bigger number of fans attends a game.

Hypothesis 22: The higher is reputation of an away team the bigger number of fans attends a game.

Hypothesis 23: If a home team has just promoted the bigger number of fans attends a game.

Hypothesis 24: If an away team has just promoted the bigger number of fans attends a game.
2.7. Uncertainty of outcome

Uncertainty of outcome is one of the most debated issues in sports attendance studies. The core idea is based on assumption that close games (when difference in teams' strength is minimal) should attract more spectators due to uncertainty of the final result. Garcia and Rodriguez (2002) following previous studies suggested distinguishing between season and match uncertainty as these factors can influence attendance in a different way.

2.7.1. Playoff, season uncertainty

Fans are interested not just in a win of their favorite team in a particular game but in overall club's success based on the whole season as well. There are several basic approaches how to measure season uncertainty. Baimbridge et al. (1996) introduced several dummy variables equal to 1 if a team is from top-4 or low-4 clubs (which means that a team battles for the title or avoiding relegation). He found that relegation leads to fans' frustration and sharply decreases attendance. Similar methods were also used by other researchers:

- Garcia and Rodriguez (2002) used a dummy variable when a team lost chances to win championship or avoid relegation. According to them, attendance rapidly decreases when season outcome becomes clear for fans.
- Forrest and Simmons (2006) took into account top-6 teams and found that there was a significant positive relation between uncertainty and game attendance.
- Madalozzo and Villar (2009) came to the conclusion that attendance increases if a team still keeps chances for winning the title or avoiding relegation.
- According to Iho and Heiikila (2010) attendance of insignificant matches (those when no team still battles for a better position to qualify for European competitions or avoid demotion) is 13.6 per cent lower.

A more complicated measure was used by Czarnitzki and Stadtmann (2002). They introduce a special variable $U$:

$$U = \begin{cases} 
100 & \text{if } c - b \leq m - 3t \\
0 & \text{if } c - b > m - 3t 
\end{cases}$$

where $c$ denotes to the points needed to win championship, $b$ the number of points a team already has and $t$ the number of games already played, $m$ is the maximum number of points a team can collect during the season.

The major disadvantage of this approach is that it can be measured properly just after the end of the season. Before its finish no one can calculate how many points a team needs to become a champion.

Ice hockey studies rarely took this factor into account. One of the possible explanations is that a champion is determined during playoffs that is why regular season is less important. Majority of teams usually keep chances to qualify for playoffs until the end of the season as usually more than a half of the teams reach it. Paul (2003) used a dummy variable for games during the last two months of regular season as they have larger impact on identifying teams which are qualified for playoffs. Much more complicated
method was implemented by Lahvicka (2010). Using Monte-Carlo simulation he simulated possible results of each game and based on that calculated winning probabilities and as a result reaching playoffs or avoiding relegation. Finally, he came to the conclusion that attendance sharply decreases as a team loses chances to participate in playoffs or avoid relegation to the lower division. In the same way, it can be expected that,

_Hypothesis 25: If there is no season uncertainty the smaller number of fans attends a game._

### 2.7.2. Match uncertainty

Defining match uncertainty could be even a more difficult task. All approaches used in previous studies can be divided into two groups: results in current championship and betting odds.

- **Difference in league positions**
  Baimbridge et al. (1996) found no evidence of influence on attendance while Benz et al. (2009) came to the conclusion that if a difference between teams’ positions increases by 1 point then attendance decreases by 1.6% per cent.

- **Squared difference of league positions**
  Garcia and Rodriguez (2002) received mixed results. On the one hand, a low difference increased attendance (this confirms assumptions that fans can be attracted by games where both teams are almost equal) but on the other hand, if an away team was much higher in the league table than a home team attendance also increased.

- **Points difference**
  De Santana and Da Silva (2009) used simple difference in points gained by the date of the match but found this factor to be insignificant. This approach can lead to biases as close to the end of the season this difference can be quite sufficient though teams can occupy next positions in the league table.

- **Positions in the league standing**
  Jones et al. (1996) used a dummy variable if both teams were from top-3 and if one team was from top-3 and another was from bottom-3. The former coefficient turned out to be significant unlike the latter. This method also has a disadvantage as higher attendance of games involving teams from top-3 can be influenced by a range of other factors (e.g. star players and expectations of high-class performance). In the same time, a game between both teams which occupy positions in the middle of league table can also be uncertain.

- **Home prospects**
  More complex approach was introduced by Forrest et al. (2005) when analyzing factors which can influence TV-audience watching soccer games. They measure game uncertainty as "home advantage plus points-per-game to date of the home team minus points-per-game to date of the visiting team, where home advantage is equal to mean points-per-game by all home teams in the previous season minus mean points-per-game by all away teams in the previous season. The same method was later used by Buraimo (2008) who found it to be insignificant.

- **Probability of dramatic game**
  Lahvicka (2010) used another approach to measure uncertainty. He calculated a special variable called "drama probability" and constructed a model to predict
final result of each game. If there was an evidence that difference in goals scored by both teams is not more than one it can be attractive for fans (if there is a draw then teams will play overtime while if difference is equal to one then one team can pull a goalkeeper and substitute him with additional player in order to score equalizer). He came to the conclusion that match uncertainty has a positive impact on attendance.

- **Betting odds**
  Some could think that betting odds might be a good predictor of each team chances to win and as a result it could be a measure of outcome uncertainty. Despite of this Forrest and Simmons (2002) found that betting odds can provide biases as sometimes bookmakers provide superior returns when betting on underdogs and less supported teams. Nevertheless, results of Buraimo and Simmons (2009) study showed that match uncertainty has insignificant influence on attendance. Moreover, they admit that Spanish soccer fans tend to prefer games with high (when fans are sure that team will win) or low (when a strong opponent is coming) probability of home team win.

Even though previous results are mixed it can be expected that,

*Hypothesis 26: The higher is game uncertainty the bigger number of fans attends a game.*

### 2.8. Opportunity costs and other factors

#### 2.8.1. Day of the week

Visiting a game is a similar leisure activity as any other. As people usually have less leisure time on weekdays it should have a significant impact on attendance. The majority of studies found attendance to be lower during midweek (e.g. Allan, 2004; Forrest & Simmons, 2006) while on weekend the number of spectators is higher by 10 per cent on average (Suominen, 2009; Lahvicka, 2010). Christmas and public holidays when people typically prefer to go out attract even bigger number of spectators from 14 per cent (Allan, 2004) to 20-23 per cent (Lahvicka, 2010) more. It follows that,

*Hypothesis 27: If a game is played on Friday the bigger number of fans attends it than if it is played on a weekday.*

*Hypothesis 28: If a game is played on Saturday the bigger number of fans attends it than if it is played on a Friday.*

*Hypothesis 29: If a game is played during Christmas holidays the bigger number of fans attends it than if it is played on a Saturday.*

#### 2.8.2. Opening night

Ice hockey season in North America starts in October and finishes in June. European leagues usually start in September and finish in April so fans do not have an opportunity to see their favorite team during 4 or 5 months. Of course they can attend pre-season games in August but these matches are used for improving player's form, try new tactics and do not have any importance that is why they are called "friendly" games. As a result fans have to wait for the start of the season and first game attracts larger audience. Ac-
According to Lahvicka (2010) first games have 9 per cent higher attendance but Coates and Humphreys (2011) found that opening night attracts 22 per cent spectators more than other games of the season. In the same time, Paul (2003) admits that even though attendance of the first match is significantly higher next games have smaller audience as the quality of hockey is relatively low and season uncertainty is not so high. Moreover, in the US the most important football and baseball games are played in autumn so this can also decrease ice hockey attendance. Consequently, it can be expected that,

_Hypothesis 30: If a game is the first home match of the season the bigger number of fans attends it._

### 2.8.3. Series of home games

Game schedule in top soccer leagues is organized in a way that a team plays one game a week at home and the next week on road. In lower divisions sometimes teams have to play two consecutive games at home. As a result, fans might prefer to attend just one match out of two which reduces attendance. Forrest and Simmons (2006) found that fans usually prefer to visit the first game. Ice hockey schedule is slightly different and sometimes teams play two, three or even four games in a row at home. Probably this could influence attendance in a negative way especially if interval is relatively short. Lahvicka (2010) estimated that if there is just one day between two consecutive games at home then attendance is 2 per cent lower for the first game and 4 per cent lower for the second. It follows that,

_Hypothesis 31: The smaller is the break between two consecutive home games the smaller number of fans attends a game._

### 2.8.4. Distance

As it has already been mentioned attendance of a particular game consists not only of home spectators but also of visiting team supporters. Away team fans face higher opportunity costs as they have to spend more time and money to get to another city. As a result if a distance between two cities is smaller a higher number of visiting fans can be expected. The majority of previous studies (e.g. Forrest & Simmons, 2006; Allan & Roy, 2008; Buraimo, 2008) used two variables in order to estimate this effect – distance in kilometers and distance squared. Benz et al. (2009) substituted distance with travel time obtained from Deutsche Bahn (German Railways) website as the majority of fans use trains to reach another city. Some German clubs even combine train and game tickets thus giving their fans a sufficient discount. Expectedly, distance has a negative impact on attendance as it reduces the number of away fans and decreases rivalry. As a result, it can be expected that,

_Hypothesis 32: The less is the distance between two teams the bigger number of fans attends a game._

### 2.8.5. Substitution with other clubs

Sports game is not similar to any other good. In case there are two teams from the same city, fans do not choose which game to attend. They have their own favorite team and will not go to see another team's game. Lahvicka (2010) came to the conclusion that two teams from the same city are poor substitutes. In the same time, if there are two clubs from the same province it can lead to higher attendance due to increasing rivalry. Breuere (2009) found that if an additional club from the same city enters the league it leads to
higher ticket sales for both clubs due to raise of interest towards soccer in the city. However, it is a quite common situation when there are two sports clubs in the same city, for instance soccer and an ice hockey. As a result, some fans cannot afford supporting both teams and have to make their choice. Existence of a soccer club in the same city results in 5 per cent decrease in attendance. So it can be expected that,

Hypothesis 33: If there is a football or an ice hockey game in the same day in the same city the number of fans who attends a game will be smaller.

2.9. Team and season variables

Previous chapters described a great deal of factors that influence sports attendance. Nevertheless, there are some trends that cannot be captured by any abovementioned variable. Specific team’s or season’s variable were rarely used in previous studies. Lahvicka (2010) introduced a special dummy variable for each team that was included in the dataset. According to him, this variable describes such factors as overall level of team popularity, quality and capacity of the arena. Besides this, he also used a season variable that can help to capture changes in rules and other factors that change only once a season (for instance, a national team might win a World Cup or Olympic games and that led to raise of ice hockey popularity across the country). Later a similar approach was implemented by Paul and Weinbach (2011). They introduced dummy variable for each home and away team and found that some teams are much popular both at home and on road. Based on these arguments, it can be expected that,

Hypothesis 34: Every team has its own base attendance.

Hypothesis 35: Attendance is influenced by a respective season effect.
3. Method

The analysis is conducted using quantitative methods, where econometrical and statistical approaches are primary tools. In order to test factors influencing the attendance a multiple regression model was set up.

Regression analysis helps to understand how the typical value of dependent variable changes when any independent variable is varied, while other independent variables are held fixed. The regression analysis is widely used for prediction and forecasting and also used to understand which independent variables are related to dependent variable and to explore the forms of these relationships (Archdeacon, 1994). Therefore, it is the most appropriate method to reveal which factors commonly affect attendance of hockey games. Moreover, using regression techniques allows predicting future attendance and changing ticket prices and promotion strategies based on this knowledge. To estimate the parameters of the regression ordinary least squares (OLS) method was used. IBM SPSS Statistics software package version 19 was used to calculate the regression.

The model can be summarized in this equation: \( \ln(\text{match attendance}) = f(\text{home team effects, season effects, match quality attributes, economic factors, and opportunity costs}) + \text{error term} \)

In total, there are 61 independent variables in the model (home team effects: 13 variables; season effects: 3 variables; match attributes: 29 variables; economic factors: 2 variables; opportunity costs: 14 variables).

3.1 Data Collection

The dataset is compiled using secondary data and consists of 1320 regular season ice hockey matches played during 4 seasons (from 2008/2009 to 2011/2012) in the top Swedish ice hockey league called Elitserien. Three fixtures were excluded from the model due to their specific nature. These games were played outdoor, therefore they excited public more than any other game and attendance was not affected by arenas’ capacities. Therefore, the model consists of 1317 observations from 4 latest seasons. Previous seasons are also used to construct lagged team reputation variable. The main sources for compiling the dataset are game reports provided by Swedish Ice Hockey Association and Elitserien. The data is collected and provided by official authorities, which organize the competition.

The number of players participated in Olympic Games and World Championships along with the number of the players, who have played in NHL, was derived from the official information provided by the organizers of these competitions: International Olympic Committee, International Ice Hockey Federation and National Hockey League respectively. The source of city population was Swedish Statistical Bureau (Statistiska centralbyrån). The web-service ViaMichelin were used to calculate distances between cities.

Ticket prices are obtained by examining clubs’ websites, internet ticket merchant www.ticnet.se and provided by clubs’ management, when data was not available from public sources.
3.2 Delimitations

Multiple regression analysis creates a possibility of developing a wrong model or wrong model interpretation, including statistically insignificant factors or rejection of statistically significant factors as well as problems of autocorrelation and multicollinearity, etc. These problems might reduce the predictive power of the model or make it inappropriate. According to Studenmund (2006), to avoid and solve these problems statistical tests, such as t-test, F-test, variance inflationary factor should be carried out. The results of the tests facilitate to choose an appropriate and reliable model.

The analysis of Elitserien puts certain limits to use it for other hockey leagues, since it is located in a specific socio-geographic area with certain consumer habits and preferences. Moreover, playoff games were not included in the analysis because these games are influenced by other factors and have different rules of competition, so authors do not intend to discuss them in this paper.

3.3 Variables

The purpose of the analysis is to investigate which factors have influence on game attendance. In order to test this, a linear regression model is set up and an OLS regression is run. The dependent variable in the model is “Attendance”. A natural logarithm of the officially registered number of spectators who visit each particular game was used in order to address issues with its raw distribution.

All independent variables which affect attendance are divided into 5 groups: team effect variables, season effect variables, economic variables, match quality variables and variables, which measure opportunity costs.

The match quality variables mainly describe sports characteristics of a team. This group includes: “HomeTeamHomePoints”, “HomeTeamAwayPoints”, “HomeTeamGoals”, “AwayTeamHomePoints”, “AwayTeamAwayPoints”, “AwayTeamGoals”. These variables depict the average number of points/goals per game gained by home/away team at home or on road from the start of the season. For the first game of each season the value was obtained from the previous season. The maximum number of points, which a team can get in one game is 3, the minimum is 0. Data sources were official reports from each game of the Elitserien.

“MatchUncertainty” variable is related to previous variables. It is measured as home advantage plus average number of points of the home team minus average number of points of the visiting team, where home advantage is equal to average points of all home teams in the previous season minus average points gained by all away teams in the previous season.

“LastFormHome” and “LastFormAway” variables were calculated by summing up number of points gained by home/away team in the last 5 matches prior to a current game. These variables range from a minimum 0 (denoted 5 straight loses in the regular time in the last 5 matches) to a maximum 15 (denoted 5 straight wins in the regular time in the last 5 matches). Variables were recalculated for each observation.

“HomeReputation” and “AwayReputation” variables imply long-term sports performance of the team. The variables are calculated using the following formula:
\[ REP = \sum_{t=1}^{T} \frac{n}{x_t\sqrt{t}} \]

where \( T=5 \), \( x_t \) - is the team's final ranking in the championship \( t \) years ago and \( n \) - is the number of teams in the first division. The minimum value, which is 1.68 was obtained by the number of teams, which promoted to Elitserien in the reviewed period.

“HomeFights” and “AwayFights” variables describe an average number of fights per game from the start of the season.

“HomeChampion” and “AwayChampion” dummy variables describe whether a home or an away team won the previous season Playoffs (Slutspel); “HomePlayoff”, “AwayPlayoff” whether a home/away team was qualified for the previous season Playoffs; “HomePromoted”, “AwayPromoted” if a home/away team was delegated from the lower league Allsvenskan to Elitserien for a current season. If the answer for above mentioned questions is yes, then variables take the value 1, in the other cases – 0.

“HomeNoQualify” and “AwayNoQualify” dummy variables describe the possibility of a team to participate in the upcoming Playoffs. If a team lost a chance to qualify for the Playoffs, the value is 1, if not - 0.

The number of players participated in Olympic Games and World Championships along with the number of the players, who have played in NHL, was derived from the official information provided by the organizers of these competitions: International Olympic Committee, International Ice Hockey Federation and National Hockey League respectively. “HomeOlympics” and “AwayOlympics” variables include the number of players, who have played at least 5 games in men’s ice hockey tournaments at Olympic Games. The variables “HomeWC” and “AwayWC” include the number of players, who have played at least 20 games in men’s ice hockey World Championships. The variables “HomeNHL” and “AwayNHL” include the number of players, who have played at least 200 games in National Hockey League.

“StockholmRival” dummy variable describes games between two Stockholm-based teams: AIK and Djurgarden. The variable takes 1, when AIK and Djurgarden were playing against each other, and 0 for all other games. It should be mentioned, that those games were played in the most capacious ice hockey arena in Stockholm, Globen. Whereas other games are played in the Hovet, which capacity is almost 6,000 seats less. Therefore, there is no surprise that Stockholm’s derby attracts more than 10,000 spectators every game. The dummy variable “Rival” describes geographical derbies. The variable takes 1, when the distance between cities is less than 150 km, and 0 for all other games. The variable takes 0 for games between AIK and Djurgarden as well.

The group of economic variables includes “Population” and “Price”. The variable “Population” describes the number of inhabitants living in the city, where each hockey team is based. The source of the data is the Swedish Statistical Bureau (Statistiska centralbyrån).

The variable “Price” is the natural logarithm of average ticket price for an adult person. The logarithm was used due to the raw distribution. The value was calculated for each team once a season. If a team implemented variable pricing the value was calculated for
each game. Price sources were clubs’ websites, management and internet ticket merchant www.ticnet.se.

The third group of variables describes opportunity costs.

“Opening Night” dummy variable is used for the first games at home for each team at the start of each season. The variable takes 1 if the game is the first at home for a team, and 0 if not.

“Friday”, “Saturday” and “Sunday” dummy variables describe the day when the game was held. If the game was played on Friday, Saturday or Sunday the variable takes the value 1, while the others take 0 respectively. When the game was played on weekday, all the variables are equal to 0.

“Break” variable describes a number of days between two consecutive home games of each team. The minimum value for the variable is 1, when the team has 1 day break between two home games; the maximum is 24. There were no home games played in two consecutive days. For the first games of each season the variable takes the value of the longest break during the season, since the opening night has the longest break from the previous game by nature, but using 6-months break is not rational to understand the significance of this factor.

“Christmas” dummy variable is used to specify games played during Christmas holidays. The variable takes 1 if the game were held during this period and 0 if not.

Dummy variables “September”, “October”, “November”, “December”, “January”, “February” and “March” describe the month when the game was held. If the game was played in September, October, November, December, January, February or March the variable takes the value 1, while the others take 0 respectively. The variable “September” is a reference variable and is omitted from the model.

A distance between two team-based cities is described by the variable “Distance”. The value of the variable is calculated using web-service ViaMichelin, which provides data for road distance between team-based cities in kilometers.

The variable “Football” is a dummy variable and takes the value 1 in two cases. Firstly, if a hockey team played at home on the same day as a football club from the same city played at home as well. Secondly, if any hockey team played on the same day as Swedish men’s national football team played official match irrespective home or away. There were 23 games that fulfill the condition. National football games intersected ice hockey games 4 times in Octobers 2008, 2009, 2010, 2011, affected totally 13 games. Other 10 matches were affected by football teams played in the same time in Stockholm, Gothenburg and Gavle. For all other observations the variable takes 0.

Several variables were introduced to depict fixed effects of each seasons and teams. The dummy variables "Season 0809", “Season0910”, “Season1011”, “Season1112” denote the date when the game was played. Elitserien regular seasons was scheduled from September to March, therefore, if the game was held from September 2008 to March 2009 the value of “Season0809” is 1, “Season0910”, “Season1011 and “Season1112” is 0. The same rule applies for the season 2009/2010, 2010/2011 and 2011/2012. The variable "Season 0809" is a reference variable and is omitted from the model.
Dummy variables “AIK”, “Brynas”, “Djurgarden”, “Farjestad”, “Frolunda”, ”HV71”, ”Linkoping”, ”Lulea”, ”Modo”, ”Rogle”, ”Skelleftea”, ”Timra” and ”Vaxjo” describe a home team of each game and is equal to one for all home matches of a particular team. The variable ”Sodertalje” is a reference variable and is omitted from the model.
4. Results

4.1. Attendance

The minimum number of spectators was 2424 at Sodertalje – Rogle game, the maximum was 13850 at several games between AIK and Djurgarden. The least attended club during last 4 years is Sodertalje SK with an average 3900 spectators at each home game. The most attended club is Frolunda with 10441 spectators on average. HV has the most stable audience, which fluctuates from 6526 to 7038 visitors per game. The most unstable club in terms of attendance is AIK. Their difference between minimum and maximum level of spectators is more than 10.000. The average attendance in the league is 6221 spectators per game.

<table>
<thead>
<tr>
<th>Team</th>
<th>Minimum</th>
<th>Mean</th>
<th>Maximum</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIK</td>
<td>3153</td>
<td>5531</td>
<td>13850</td>
<td>2373</td>
</tr>
<tr>
<td>Brynas</td>
<td>3978</td>
<td>5950</td>
<td>8538</td>
<td>1213</td>
</tr>
<tr>
<td>Djurgarden</td>
<td>3319</td>
<td>7075</td>
<td>13850</td>
<td>1630</td>
</tr>
<tr>
<td>Farjestad</td>
<td>5125</td>
<td>6605</td>
<td>8583</td>
<td>933</td>
</tr>
<tr>
<td>Frolunda</td>
<td>7501</td>
<td>10441</td>
<td>12044</td>
<td>1271</td>
</tr>
<tr>
<td>HV</td>
<td>6526</td>
<td>6894</td>
<td>7038</td>
<td>149</td>
</tr>
<tr>
<td>Linkoping</td>
<td>5365</td>
<td>6983</td>
<td>8500</td>
<td>876</td>
</tr>
<tr>
<td>Lulea</td>
<td>3857</td>
<td>5166</td>
<td>6300</td>
<td>549</td>
</tr>
<tr>
<td>Modo</td>
<td>4852</td>
<td>6309</td>
<td>7600</td>
<td>777</td>
</tr>
<tr>
<td>Rogle</td>
<td>3223</td>
<td>4497</td>
<td>5095</td>
<td>506</td>
</tr>
<tr>
<td>Skelleftea</td>
<td>3891</td>
<td>5066</td>
<td>6001</td>
<td>564</td>
</tr>
<tr>
<td>Sodertalje</td>
<td>2424</td>
<td>3900</td>
<td>6189</td>
<td>812</td>
</tr>
<tr>
<td>Timra</td>
<td>3612</td>
<td>4997</td>
<td>6000</td>
<td>593</td>
</tr>
<tr>
<td>Vaxjo</td>
<td>4406</td>
<td>5099</td>
<td>5502</td>
<td>290</td>
</tr>
<tr>
<td>Total</td>
<td>2424</td>
<td>6221</td>
<td>13850</td>
<td>1873</td>
</tr>
</tbody>
</table>

4.2. Model summary

The model is significant at 99% level according to F-test, which means that results are trustworthy and might be applicable. Coefficient of Determination is 0.833, therefore 83 per cent of total variation in attendance is explained by variation in the chosen independent variables. It is a quite high value (especially comparing to previous similar studies), sustaining the applicability of the model.

Another important characteristic of the model is the Durbin-Watson statistic. This indicator measures how a dependent variable correlates in time regardless of influence of factors. In our model DW statistic has value 1.444, which is close to 2. It means that the model is not autocorrelative and OLS can be applied to estimate coefficient of determination of this model.
The variance inflation factor (VIF) describes multicollinearity between independent variables. High value of this index indicates that factors in the model are highly correlated between themselves, which leads to biased estimation of the coefficients. In our case just a few variables have VIF higher than critical value 5. They are Home WC, Home NHL, Home Reputation, Price and some team effect variables. The reason is that team fixes factors already take into account influence of above-mentioned variables.

Chart 4-2 presents coefficients for the model and effect of each variable. The coefficients are unstandardized, which means that the magnitude of their values is relative to means and standard deviations of independent and dependent variables in the equation. Coefficients show amount of change in the dependent variable (Attendance) that is associated with change in one unit of the independent variable. Since the dependent variable is a natural logarithm, it is not easy to interpret an effect of each factor to attendance, therefore the column “Effect” was added. To estimate the effect of a variable the constant e was raised to the power equal to the value of coefficient. The column effect shows the percentage changing attendance by changing each particular variable by 1 unit. The effect for the variable “Distance” is calculated per each 100 kilometers, for the variable “Population” for each 10,000 inhabitants. The effect of price is equal to coefficient because this variable was already logged. Team effects were calculated by adding the team coefficients to the constant and raised to the power. The constant itself might be interpreted as a fan base for Sodertalje in September 2008. It can be easily checked by running an OLS regression with the dummy variable Sodertalje, excluding the constant. All the variables will have the same coefficients, while the variable Sodertalje will take the value of “Constant” equal to 7.298. Therefore, team effects show basic number of home games visitors by September 2008.
Chart 4-2. Estimation results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Effect</th>
<th>Variables</th>
<th>Coefficient</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Team effect variables</strong></td>
<td></td>
<td></td>
<td><strong>Match Quality variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIK</td>
<td>7.487***</td>
<td>1 785</td>
<td>HomeTeamHomePoints</td>
<td>0.004</td>
<td>0.44%</td>
</tr>
<tr>
<td>Brynas</td>
<td>7.673***</td>
<td>2 150</td>
<td>AwayTeamAwayPoints</td>
<td>0.009</td>
<td>0.89%</td>
</tr>
<tr>
<td>Djurgarden</td>
<td>7.799***</td>
<td>2 438</td>
<td>HomeTeamAwayPoints</td>
<td>0.004</td>
<td>0.39%</td>
</tr>
<tr>
<td>Farjestad</td>
<td>7.737***</td>
<td>2 291</td>
<td>AwayTeamHomePoints</td>
<td>0.025**</td>
<td>2.50%</td>
</tr>
<tr>
<td>Frolunda</td>
<td>8.178***</td>
<td>3 561</td>
<td>HomeTeamGoals</td>
<td>0.041***</td>
<td>4.15%</td>
</tr>
<tr>
<td>HV71</td>
<td>7.702***</td>
<td>2 214</td>
<td>AwayTeamGoals</td>
<td>-0.011</td>
<td>-1.10%</td>
</tr>
<tr>
<td>Linkoping</td>
<td>7.832***</td>
<td>2 520</td>
<td>MatchUncertainty</td>
<td>0.007</td>
<td>0.74%</td>
</tr>
<tr>
<td>Lulea</td>
<td>7.602***</td>
<td>2 001</td>
<td>HomeForm</td>
<td>0.006***</td>
<td>0.59%</td>
</tr>
<tr>
<td>Modo</td>
<td>7.699***</td>
<td>2 206</td>
<td>AwayForm</td>
<td>-0.002</td>
<td>-0.18%</td>
</tr>
<tr>
<td>Rogle</td>
<td>7.420***</td>
<td>1 669</td>
<td>StockholmRival</td>
<td>0.806***</td>
<td>123.83%</td>
</tr>
<tr>
<td>Skelleftea</td>
<td>7.528***</td>
<td>1 860</td>
<td>Rival</td>
<td>0.101***</td>
<td>10.68%</td>
</tr>
<tr>
<td>Sodertalje</td>
<td>7.298***</td>
<td>1 478</td>
<td>HomeChampion</td>
<td>0.029</td>
<td>2.91%</td>
</tr>
<tr>
<td>Timra</td>
<td>7.549***</td>
<td>1 898</td>
<td>AwayChampion</td>
<td>-0.011</td>
<td>-1.08%</td>
</tr>
<tr>
<td>Vaxjo</td>
<td>7.491***</td>
<td>1 791</td>
<td>HomePlayoff</td>
<td>0.003</td>
<td>0.30%</td>
</tr>
<tr>
<td><strong>Season effect variables</strong></td>
<td></td>
<td></td>
<td><strong>Opportunity costs variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Season0910</td>
<td>-0.037**</td>
<td>-3.65%</td>
<td>HomePromoted</td>
<td>0.045†</td>
<td>4.58%</td>
</tr>
<tr>
<td>Season1011</td>
<td>-0.048***</td>
<td>-4.65%</td>
<td>AwayPromoted</td>
<td>0.001</td>
<td>0.13%</td>
</tr>
<tr>
<td>Season1112</td>
<td>-0.024</td>
<td>-2.41%</td>
<td>HomeOlympics</td>
<td>0.008</td>
<td>0.84%</td>
</tr>
<tr>
<td><strong>Opportunity costs variables</strong></td>
<td></td>
<td></td>
<td><strong>Economic variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OpeningNight</td>
<td>0.104***</td>
<td>10.98%</td>
<td>HomeNHL</td>
<td>-0.001</td>
<td>-0.09%</td>
</tr>
<tr>
<td>Friday</td>
<td>0.05*</td>
<td>5.18%</td>
<td>AwayOlympics</td>
<td>0.013*</td>
<td>1.29%</td>
</tr>
<tr>
<td>Saturday</td>
<td>0.096***</td>
<td>10.08%</td>
<td>AwayWC</td>
<td>-0.013***</td>
<td>-1.27%</td>
</tr>
<tr>
<td>Sunday</td>
<td>0.016</td>
<td>1.62%</td>
<td>AwayNHL</td>
<td>0.002</td>
<td>0.24%</td>
</tr>
<tr>
<td>Christmas</td>
<td>0.103***</td>
<td>10.90%</td>
<td>HomeNoQualify</td>
<td>-0.121***</td>
<td>-11.43%</td>
</tr>
<tr>
<td>Break</td>
<td>0.002**</td>
<td>0.24%</td>
<td>AwayNoQualify</td>
<td>-0.003</td>
<td>-0.25%</td>
</tr>
<tr>
<td>October</td>
<td>0.053**</td>
<td>5.43%</td>
<td>HomeReputation</td>
<td>0.007†</td>
<td>0.71%</td>
</tr>
<tr>
<td>November</td>
<td>0.053**</td>
<td>5.43%</td>
<td>AwayReputation</td>
<td>0.004**</td>
<td>0.45%</td>
</tr>
<tr>
<td>December</td>
<td>0.017</td>
<td>1.68%</td>
<td>HomeFights</td>
<td>0.314**</td>
<td>36.92%</td>
</tr>
<tr>
<td>January</td>
<td>0.04*</td>
<td>4.09%</td>
<td>AwayFights</td>
<td>0.246*</td>
<td>27.85%</td>
</tr>
<tr>
<td>February</td>
<td>0.074***</td>
<td>7.69%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>0.12***</td>
<td>12.75%</td>
<td>Overall Model F</td>
<td>102,283***</td>
<td></td>
</tr>
<tr>
<td>Football</td>
<td>-0.065*</td>
<td>-6.33%</td>
<td>R Square</td>
<td>0.833</td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>-0.001***</td>
<td>-0.42%</td>
<td>Adjusted R Square</td>
<td>0.824</td>
<td></td>
</tr>
<tr>
<td><strong>Economic variables</strong></td>
<td></td>
<td></td>
<td><strong>Std. Error</strong></td>
<td>0.119</td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>0.001**</td>
<td>0.04%</td>
<td>Durbin-Watson</td>
<td>1.444</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>0.129**</td>
<td>12.9%</td>
<td>N=1317; Ip&lt;0.1; **p&lt;0.05; **p&lt;0.01; ***p&lt;0.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3. Hypothesis testing

All independent variables which affect attendance are divided into 5 groups: team effect variables, season effect variables, economic variables, match quality variables and variables, which measure opportunity costs. 35 hypotheses on ice hockey attendance in Sweden were tested.

Higher ticket prices do not lead to smaller number of fans attending the game. Quite the contrary, the higher are ticket prices the greater number of fans attend the game (b=0.129, p<0.01). Therefore hypothesis 1 is rejected.

The bigger is city population the bigger number of fans attend a game (b=0.001, p<0.01). It fully supports hypothesis 2.

Roster quality characteristics of home team itself have a small correlation with attendance (r=0.335, r=0.465, r=0.248, p<0.001) and are not significant in the model. However, characteristics of away team roster are more significant (b=0.013, p<0.01 and b=-0.013, p<0.001) Therefore hypothesis 3, 4 and 5 are partly confirmed.

Performance of a home team in both home and away games is slightly correlated with attendance (r=0.182, r=0.148, p<0.001) and not significant in the model. Thus, hypothesis 6 is partly confirmed and hypothesis 8 is supported. The performance of an away team is significant in the model (b=0.025, p<0.01), therefore hypothesis 7 is supported and 9 is rejected. Hypothesis 10 is fully supported for a home team (b=0.041, p<0.001) Hypothesis 11 is confirmed (b=0.006, p<0.001), hypothesis 12 is rejected, since there is no significant correlation between latest away team form and attendance. Thus, hypothesis 13 is fully supported.

Fights have a significant impact on attendance. Both, average number of home team's fights and away team's fights are important (b=0.314, p<0.01 and b=0.246, p<0.05). Therefore, hypothesis 14 is rejected.

Hypothesis 15 and 16 are supported both for rivalry (b=0.101, p<0.001) and Stockholm rivalry (b=0.806, p<0.001).

Home team title and making playoffs in a previous season have a positive correlation with attendance (r=0.133, p<0.001 and r=0.321, p<0.001), however are insignificant in the model. Thus hypothesis 17 and 19 are partly supported. Hypothesis 18 and 20 for an away team are not significant at all and rejected.

Hypothesis 21 and 22 are confirmed for home (b=0.007, p<0.1) and away teams (b=0.004, p<0.01).

Hypothesis 23 for home team, which has just promoted is confirmed (b=0.045, p<0.1), hypothesis 24 for away team is rejected since there is no significant correlation between attendance and newly promoted away team.

Team's possibility to qualify for the Playoffs is significant (b=-0.121, p<0.001), therefore hypothesis 25 is supported.

Match uncertainty is insignificant in the model and has a slight correlation with attendance (r=0.125, p<0.001). Hypothesis 26 is partly confirmed.
Public prefer to attend games on Saturday (b=0.096, p<0.001) more than on Friday (b=0.05, p<0.05). The biggest impact, meanwhile, has a Christmas break (b=0.103, p<0.001) Thus, hypothesis 27, 28 and 29 are supported.

The relation between attendance and the first home match is positive and significant (b=0.104, p<0.001), that supports hypothesis 30.

The greater is a break between two consecutive home games the bigger number of spectators will attend a game (b=0.002, p<0.01), that supports Hypothesis 31.

Bigger distance decreases the number of spectators (b=-0.001, p<0.001), therefore hypothesis 32 is confirmed.

There were no clashes between two hockey teams playing on the same day in the same city. However, there was a negative influence of football intersection with hockey (-0.065, p<0.05), therefore hypothesis 33 is partly confirmed.

All teams have different base attendance (p<0.001), season 09/10 (b=-0.037, p<0.01) and season 10/11 (b=-0.048, p<0.001) have different coefficients, however season 11/12 does not show a significant influence, therefore hypothesis 34 is confirmed and 35 is partly confirmed.
Chart 4-3. Correlation table on attendance

<table>
<thead>
<tr>
<th>Team Effect</th>
<th>Economic variables</th>
<th>Match quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
<td><strong>Correlation</strong></td>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>AIK</td>
<td>-0.106***</td>
<td>Population</td>
</tr>
<tr>
<td>Brynas</td>
<td>-0.025</td>
<td>Price</td>
</tr>
<tr>
<td>Djurgarden</td>
<td>0.156***</td>
<td>OpeningNight</td>
</tr>
<tr>
<td>Farjestad</td>
<td>0.097***</td>
<td>Friday</td>
</tr>
<tr>
<td>Frolunda</td>
<td>0.585***</td>
<td>Saturday</td>
</tr>
<tr>
<td>HV71</td>
<td>0.152***</td>
<td>Sunday</td>
</tr>
<tr>
<td>Linkoping</td>
<td>0.159***</td>
<td>Christmas</td>
</tr>
<tr>
<td>Lulea</td>
<td>-0.160***</td>
<td>Break</td>
</tr>
<tr>
<td>Modo</td>
<td>0.051H</td>
<td>October</td>
</tr>
<tr>
<td>Rogle</td>
<td>-0.214***</td>
<td>November</td>
</tr>
<tr>
<td>Skelleftea</td>
<td>-0.182***</td>
<td>December</td>
</tr>
<tr>
<td>Timra</td>
<td>-0.197***</td>
<td>January</td>
</tr>
<tr>
<td>Vaxjo</td>
<td>-0.081**</td>
<td>February</td>
</tr>
<tr>
<td>Season0910</td>
<td>-0.037</td>
<td>March</td>
</tr>
<tr>
<td>Season1011</td>
<td>-0.02</td>
<td>Football</td>
</tr>
<tr>
<td>Season1112</td>
<td>0.050I</td>
<td>Distance</td>
</tr>
</tbody>
</table>

N=1317; †p<0.1; **p<0.05; ***p<0.001
5 Analysis and discussion

5.1 Analysis

Chart 4-2 shows that some factors have bigger influence than others. One of the most important factors are schedule related factors. It is not surprising that people prefer to consume sport competitions during their leisure time like any other entertainment good. Therefore, matches scheduled on Fridays bring 5 per cent more spectators than midweek games; Saturday matches 10 per cent more and games on Christmas 11 per cent more than midweek. Also, the first home game of the season attracts additional 10 per cent of fans due to cumulated unsatisfied demand from the end of the season in April until the start in September.

It is interesting, that other games in September attract less number of fans than games in any other month. October, November, January, February and March add respectively 5 per cent, 5 per cent, 4 per cent, 8 per cent and 13 per cent more visitors to stadiums comparing to September. December impact is partly obtained by Christmas effect. Nature of low attendance in September might be explained as teams play only few games during September. On the one hand, part of the impact is covered by Opening game effect, on the other hand teams are not fully fit due to half-year break and cannot show impressive performance. These findings fully support previous studies and have the same pattern as attendance in North American ice hockey league (see Paul, 2003; Paul & Chatt, 2011; Paul & Weinbach, 2011).

People prefer to attend hockey games more when the break between games is greater. Approximately 0.24 per cent more spectators are added by each day of break. It perfectly fits utility theory: the utility of each additional hockey game for spectators is decreasing and consumers prefer to allocate resources to other goods. A relatively low impact of this factor might be explained as season ticket holders and desperate fans attend every single game, because they have already bought tickets until the end of the season or have a habit to watch every game. It is a fruitful observation, since scholars have not looked precisely at this factor before.

There is a huge negative impact of football on hockey attendance. When a football game intersects hockey, the sport with stick and puck suffers 6 per cent decrease in attendance. The football is a substitute good for ordinary sports fans, which prefer to substitute hockey with football in their entertainment goods' consumption basket. Researchers have found the same correlation in other leagues (see Paul, 2003; Lahvicka, 2010).

Rational consumers try to maximize their utility function and prefer to consume goods with higher level of quality with respect to certain level of budget constraint. There are many factors affecting a quality of the sports game, however not all of them have a significant impact. One of the most important factors is the average number of goals of a home team from the start of a season. Goals are the most exciting event in a hockey game, except a result. Each additional goal leads to 4 per cent increase in an attendance. It characterizes tastes of Swedish hockey fans, because not all nationalities pay attention towards goal-scoring teams, according to previous studies.

One of the main measures of quality for sports competitions is sports performance of a team. The biggest part of public enjoys watch winning and scoring team. Each goal
adds 4 per cent to attendance, while each win in a regular time in the latest 5 matches adds approximately 2 per cent. The mid-term characteristics of a home team such as last season result and average number of points in the current season are not important for fans. The current situation is more essential: when a team has lost chances to qualify for the Playoffs, the attendance drops by 11 per cent. However, long-term reputation is important, since it creates a stable fan base for a club. The most successful team gets 5 per cent more spectators than newly promoted team.

The quality of the game depends not only on characteristics of the home team, but on away team's features as well. The most successful team attracts 3.3 per cent more spectators, than the least reputable. Surprisingly, the model shows that number of away team's home points is significant for visitors. This characteristic might be assessed as a proxy for an away team's performance in the current season: public like to watch games against strong opponents. One important conclusion might be drawn, Swedish fans pay more attention to the last results and final league standings and do not care about intermediate standings. That can be explained by the fact that clubs are very close in the standings and position changes after each game. Therefore, fans pay less attention to this indicator.

One of the most interesting findings is that fights attract public to hockey games. If a team fights in every game, the number of spectators will increase by enormous 37 per cent comparing to a craven team. Moreover, even a warlike away brings to a stadium additional 28 per cent of the audience. The violence was always an underestimated and overlooked factor for hockey bosses and scholars in Europe. The finding presents an easy and powerful tool for a management to increase attendance of their games.

It was revealed, that superstars in away team attract public: each Olympic player adds 1.3 per cent to attendance. Olympic players usually are more qualified and skilled and therefore attract public. On the other hand, each away world cup player decreases attendance by 1.3 per cent. This unexpected result might be explained as many World Cup stars are not as attractive to public, as Olympic stars.

The distance between cities is also an important factor in terms of attractiveness. If an opponent is within radius of 150 kilometers, then attendance grows by 10 per cent. People like to feel confrontation and superiority over their geographic neighbors. That is why rivalry attracts people. Long distance, quite the contrary decrease attendance by 0.4 per cent for each 100 km as it complicates arrival of the away fans. A marked confrontation between two Stockholm-based teams AIK and Djurgarden attracts more than double audience to their derby. It's not only hockey rivalry: these clubs have a long history of confrontation. It's a great example when management has used this knowledge and moved these games to the arena with a higher capacity. Another major socio-economical factor, population, is also influential. Each 10,000 citizens add 0.04 per cent to club's attendance. It is obvious, that a big city creates bigger potential audience. However, the effect is not so big, because in megalopolises like Stockholm people have much more substitutes to hockey games.

The model shows a positive correlation between price and attendance. It means that the number of spectators is greater when the price for tickets is higher (1 per cent increase in price leads to 0.12 per cent increase in attendance). However, it contradicts previous findings that raising prices will cause total attendance to decrease. There are possible explanations of this result. First of all, the model basically revealed differences between
clubs in pricing policy, but not a price fluctuation. The price level of each club has not changed dramatically during examined period. Therefore, popular and successful teams with a big fan base and a huge attendance in the past were able to set high prices, whereas less popular clubs had to determine low prices and even in that case couldn't get a full stadium due to a low fan base.

According to the results, each club has a basic attendance, which exists independently from other factors. It can be considered as a number of devoted fans who attend every single game regardless of previous results, a visiting team and day of the week. It's exactly the attendance which team might be sure of, build into budget and target for season tickets sale. This knowledge is a very useful for club's management and should be taken into account. AIK has 1785 persons as a basic attendance, Brynas - 2150, Djurgarden - 2438, Farjestad - 2291, Frolunda - 3561, HV - 2214, Linkoping - 2520, Lulea - 2001, Modo - 2206, Rogle - 1669, Skelleftea - 1860, Sodertalje - 1478, Timra - 1898 and Vaxjo - 1791.

An alarm signal for the league administration is a declining figure for seasonal fixed effects. The model revealed that the total league attendance had a more rapid decrease than official numbers declared. For the season 2009/2010 it was 3.65 per cent, for the season 2010/2011 it was 4.65 per cent, for the season 2011/2012 the model also shows negative dependence, however not statistically significant. Thereby, the total attendance grew only because less popular teams was substituted by more popular, while interest towards hockey in other cities was becoming lower.

5.2. Practical implications

Based on the findings which were described in the previous chapters several practical implications can be carried out. First of all, it can be seen that some factors have a strong impact on attendance. This means that if clubs take this information into account they can better estimate attendance of future games. One of the most evident solutions is variable pricing. Surprisingly, this tool is rarely used by Swedish ice hockey clubs though is rather popular in North America. To authors knowledge, just Farjestad and HV 71 fully used this method in past seasons. Other clubs (e.g. Frolunda Indians, Lulea and Skelleftea) charged higher prices just for games against geographical rivals. Consequently, it can be recommended to clubs to take into account other factors except opponent’s image. Games on Friday, weekends or during Christmas holidays along with longer breaks between home matches tend to attract more spectators so clubs can charge higher prices and as a result increase their revenues.

In the same time due to abovementioned reasons decreasing prices for games that are less attractive is not the best choice. Probably, it will not lead to higher attendance but financial losses will be sufficient. Instead of this, clubs might think about moderating their marketing activities or try to introduce various game promotions. This tool is widely used in North America but is almost ignored in Europe though game-day promotions can significantly increase the number of spectators. Of course, even within the United States there are sufficient differences: Paul and Chatt (2011) admit that the same type of promotion has a different impact at West Coast and in Florida. Nevertheless, authors strongly believe that Swedish clubs should pay more attention to this and start developing this direction though deeper analysis should be conducted.
Another practice that can be borrowed from NHL is dynamic pricing. Its’ core principle is similar to pricing strategies of transport companies (airlines, bus and train operators) which change prices depending on expected and existing demand. The main difference between variable and dynamic pricing is that dynamic pricing allows taking into account current performance, goals, fights and other factors that influence attendance but cannot be predicted before start of the season. This strategy has already been implemented by several NHL franchises (e.g. Anaheim Mighty Ducks and Washington Capitals) so Elitserien clubs might also consider it.

It is a typical situation that sometimes clubs play several home games in a row. As a result, fans which purchase single game tickets have to select which game to visit and attendance decreases. A possible solution of this problem is to sell ticket packages consisting of tickets for these consecutive games. It can be especially effective when a higher number of spectators can be expected for one of the games (for instance, a weekend or rival game) so this might motivate fans to attend both matches.

Another factor that can influence increase in attendance of ice hockey games is arena modernization. Leadley and Zygmont (2006) along with Coates and Humphreys (2011) found that if a club builds or renovates a stadium it leads to 15-20 per cent bigger attendance. Arenas of Farjestad, HV 71 and Linkoping were renovated in early 2000s and attendance increased significantly. Moreover, a majority of Swedish ice hockey stadiaums still have standing places: just AIK and Frolunda Indians have fully seated accommodation. It can be expected that further improvement of viewing comfort will also lead to higher number of fans attending a game though a deeper analysis is definitely required.

It has been discussed in previous chapters that football games can become a substitute that is why it is highly important to avoid situations when football and hockey games are scheduled in the same time. Usually it happens when hockey games are re-arranged due to various circumstances; nevertheless clubs should try to avoid it. Moreover, ice hockey clubs may seek for a deeper cooperation with football colleagues and provide specially designated programs (discounts, special offers etc.) in order to convince fans to attend both games as it can be beneficial for both sides.

Except for clear implications for clubs, results of the present research can be valuable for Swedish Elitserien as a league. Authors believe that the league should pay more attention to game scheduling. According to their observations traditional days for ice hockey games are Tuesday, Thursday and Saturday. In the same time, analysis shows that clubs can attract more fans on Friday comparing to other weekdays. Consequently, the league can consider changing timetable and schedule more games on these days. Fixtures should avoid clashing with football and other popular local sports (for instance, bandy or innebandy). Moreover, it can be recommended to arrange more matches during Christmas holidays as it has one of the most significant impact on attendance. Bigger brakes between two home games attract more fans so it is reasonable to avoid situations when a team has to play several consecutive matches at home during a short period of time.

Furthermore, considerable attention should be paid to even scheduling. League should avoid any disparities and provide the same (or at least similar) opportunities to each club. Jackey, Kennely and Mitchell (2008) proved that asymmetric scheduling might
lead to a sufficient variation in clubs’ revenues. According to them more favorable scheduling might result in revenues difference up to 31 per cent ceteris paribus.

5.3. Contributions

As it has already been mentioned there is a lack of studies that investigate attendance problems in European hockey. Similar researches were done in Czech Republic and Finland but to authors knowledge no one examined ice hockey attendance in Sweden though Swedish Elitserien is one of the strongest leagues in the world. As a result the present research can become a starting point of attendance related studies in Sweden.

Ice hockey violence has always been one of the most controversial topics among North American researchers. Their studies show that fights do not attract fans in American leagues anymore (Coates & Humphreys, 2011; Paul & Chatt, 2011; Paul & Weinbach, 2011). Besides this Lahvicka (2010) proposed that violence is not important for European ice hockey fans. Despite this, it has been found that fights have a strongly positive impact on attendance in Swedish Elitserien and clubs can consider it as one of the tools to increase the number of spectators.

5.4. Further research

The present research has several limitations which were mentioned in previous chapters. Some of them provide additional insights how the current paper can be improved.

Firstly, a stronger cooperation with Elitserien or SICO (Sveriges Ishockeyspelares Centralorganisation) can help to improve the research by including several variables. In the present study authors had to introduce variables that could capture effect of star players though this indicator is not that obvious. Roster quality can be better estimated if clubs budgets or payrolls are disclosed. This would help to evaluate how strong each team is and how much Swedish ice hockey fans are attracted by star players. Furthermore, additional research can be conducted in order to estimate if there is any relationship between signing expensive players and team’s performance and success.

Secondly, a tight contact with ice hockey clubs can allow receiving detailed information about the number of sold tickets. According to previous studies, fans that purchase season tickets and those who buy single game tickets might be influenced by different factors. Moreover, the whole dataset can be divided into several models according to the types of tickets fans purchase. This can help to outline new trends and develop additional solutions for clubs how game attendance can be increased. Furthermore, information about the number of away team fans can help to understand travel behavior of Swedish ice hockey fans and can be continued with sociological studies to reveal factors that influence them to attend away games.

Thirdly, a similar approach can be used to analyze other areas of club’s matchday activities, for instance, arena catering. This can help to figure out which determinants affect gameday spending and as a result clubs’ and arenas’ managers can modify range of food and prices. Moreover, they can try to adapt various North American practices (promotions, special offers etc.) as American clubs are extremely successful in providing arena catering.

Finally, a bigger number of seasons can be included in the model which can help to achieve better results though this will take considerably more time as some data can
hardly be found. Besides this, a separate research can be concluded for Allsvenskan (the second tier of Swedish ice hockey championship) to reveal the factors that determine attendance of less popular and less successful clubs.
6. Conclusions

The purpose of this study was to identify factors that influence attendance of ice hockey games in Swedish Elitserien. Present research has shown that demand for ice hockey games in Elitserien has many similarities with other professional hockey leagues though several distinctions still exist.

Every team fixed effect is significant and shows how big supporters’ base of each club is. These coefficients show that Frolunda Indians, Djurgarden and Linkoping are the most popular clubs in Elitserien which is not surprising as they represent three biggest cities that have a team in Elitserien. In the same time, the second team from Stockholm, AIK, has one of the smallest coefficients in the league. Moreover, as far as Djurgarden relegated from Elitserien and will play in Allsvenskan (the second tier league) next season it can be expected that average attendance of the whole league will fall. Season fixed effects are negative though coefficient for season 2011/2012 is insignificant. This means that ice hockey games have become less popular among Swedish people.

Probably the most interesting result is a positive price elasticity coefficient as it contradicts to economic theory. The most reasonable interpretation of this paradox is that the most popular Swedish clubs set higher entry prices but still manage to sell tickets. Furthermore, it might mean that Swedish fans decision to purchase a ticket is not influenced by ticket prices and as a result clubs can slightly increase them without attendance drop.

Factors that refer to match quality showed mixed results. Swedish fans do not pay attention to home team results and league progress since the start of the season but value success in recent games and high-scoring performance. Nevertheless, if a home team failed to reach playoff attendance decreases significantly. Last champions and playoff participants do not bring additional spectators to arenas but constant improvement during latest seasons attracts fans both at home and on road. Newly promoted teams enjoy higher attendance in their first season but next year this effect disappears. Signing players with international experience does not influence fans to attend more games at home but these star players attract spectators in other cities. Rivalry has a strong positive impact on attendance and games between AIK and Djurgarden had 123 per cent higher attendance ceteris paribus. Surprisingly, fights have a positive effect on the number of spectators. Recent studies in North America showed that fans are not attracted by violence anymore while European researchers did not take it into account due to cultural differences.

The last group of factors showed results that stay in line with previous studies. First home games of the season are more popular among fans as they do not have an opportunity to watch their team since previous season. Games that are held on Friday, Saturday and especially Christmas holidays attract bigger audience than weekday matches. Besides this, the number of spectators tend to increase in February and March when championship is coming to its final stage. The most important games of the regular season are played in February and March as they decide which teams are qualified for playoff. Football turned out to be a substitute for ice hockey games as it decreases attendance if both matches are played in the same time.
List of references


Appendix 1

Average regular season match attendance per team and arenas’ capacities, seasons 2008/2009-2011/2012
## Appendix 2

### Complete estimation results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
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<th>Standardized Coefficients</th>
<th>Sig. (p-value)</th>
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Appendix 3

Descriptive statistic for variables

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