What Drives the Price of Naming Rights? Quantifying the Relationship Between Naming Rights Prices and the Factors that Drive Them

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Abstract

This thesis examines the relationship between the prices of naming rights and the factors that drive them. Corporations engage in naming rights deals in order to increase revenue and exposure for their brand. Naming rights deals are a very lucrative type of sports sponsorship and can reach to the tens of millions annually, largely due to the unparalleled amount of exposure seen by the corporation. Past research has suggested that the prices of naming rights are positively driven by the potential target size of the audience, the building of a new facility, and that there has been a long-term price inflation of naming rights fees up until 2002. Using OLS regression, this thesis examines the effect that different facility characteristics have on both total fee and annual fee. One hundred sports facilities from Major League Baseball, the National Hockey League, the National Football League, the National Basketball Association, Minor League Baseball, Major League Soccer, and Division I College were observed. The findings in this thesis suggest that that total attendance has a positive and significant effect on both total and annual fees, facilities home to Major League Baseball, National Basketball Association, National Football League, and National Hockey League teams have higher premiums than Major League Soccer, Minor League Baseball, and collegiate facilities, and annual long-term price inflation has decreased since 2002.

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1 Introduction

Sponsorship has been described as "a mutually beneficial business arrangement between sponsor and sponsored to achieve defined objectives" (Head, 1981). The sponsorship of sports in general, whether it be a sporting event, a specific sports team, or a sports facility is one of the most popular and profitable types of sponsorship in the world (Abratt et al., 1987 and Crompton & Howard, 2003). The sponsorship of a sports facility, better known as naming rights, is of particular popularity and profitability. Naming rights deals for sports facilities are lucrative business agreements that play a vital role in corporate advertisement in the United States. Corporations purchase the rights to the put their names on sports facilities in order to reach a large audience that other marketing outlets such as television, radio, or newspaper advertisement are unable to reach.

The goal of my thesis is to answer the question: what is the quantitative relationship between naming rights prices of diverse sports entertainment facilities and the factors that drive these prices? Following methodology found in Gerrard et al. (2007), I broke down the component characteristics of sports facilities and determined which ones are most influential in driving the existing prices using OLS regression analysis. My results build on existing literature by expanding the types of facilities observed beyond the four main professional sports organizations by including Minor League Baseball (MiLB), Major League Soccer (MLS), and collegiate venues. I am also optimistic that my study has taken place far enough from the naming rights market boom so that I have not picked up any rapid growth effects and the naming rights market has had time to settle down.

This thesis finds that total attendance has a positive and significant effect on both total and annual fees, facilities home to Major League Baseball (MLB), National Basketball Association (NBA), National Football League (NFL), and National Hockey League (NHL) teams have higher premiums than MLS, MiLB, and collegiate facilities, and annual long-term price inflation has decreased since 2002.

2 Literature Review

Many authors (Head, 1981, Abratt et al., 1987, Blair & Haynes, 2008, Gerrard et al., 2007 and Crompton & Howard, 2003) have hailed naming rights as a type of sponsorship unparalleled to other types of promotion. There are two central reasons why corporations seek naming rights on sports facilities: exposure and increasing sales (Abratt et al., 1987, Crompton & Howard, 2003). The increasing sales aspect has been up for debate in a good amount of literature (Leeds et al, 2007, McCarthy & Irwin, 2000, and Blair & Haynes, 2009). From an exposure perspective, naming rights deals offer a "24/7" kind of brand exposure that is rarely met by promotional and sponsorship alternatives (Crompton & Howard, 2003). Another advantage of owning the naming rights to a facility is that this type of sponsorship has various multiplier effects. By owning the naming rights to a facility, the brand is not only seen on the stadium or arena itself but also reaches the masses through different media outlets like TV, radio, and websites. Corporations also have exposure throughout the stadium when included in what is usually a very complex naming rights contract. For example, in 1996, Corel Corporation agreed to a 10 year, 26 million Canadian dollar contract with the Ottawa Senators for the naming rights of the Senators' facility. In addition to facility entitlement, the firm received

premium seating, tickets to every event, and advertising throughout the venue from scoreboard signage to the Corel logo on cups, plates, and napkins at concession stands (Crompton & Howard 2003).

Although naming rights contracts currently tend to be complex and extend much further than the naming of the facility, this has not always been the case. When naming rights first came about, deals simply gave corporations the ability to name the stadium. The first known naming rights deal was signed in 1971 when Schaefer Brewing Company paid $150,000 to name the home of the New England Patriots of the NFL Schaefer Field. While there were a few other deals made in the next two decades, it was not until 1995 that the naming rights market really boomed. Between 1995 and 2002, fifty stadium naming rights deals were signed in professional sports and the average total value of these deals grew from $21.5 million in 1995 to $88.2 million in 2002 (Gerrard et al., 2007). In the eight years of this substantial market boom, the annual growth rate of annual price of stadium naming rights was 18.8 percent (Street & Smith, 2002). By 2002, 70 percent of professional sports facilities were corporately named (Mahoney & Howard, 2001). Some researchers (Crompton & Howard, 2003, Gerrard et al., 2007, and DeSchriver & Jensen, 2003) have speculated that the cause of this boom in the naming rights market had to do with the large number of new sports facilities that were built in the late 1990's through mid-2000's. Facilities with no previous name association are better for corporations who engage in these deals. Gerrard, Parent, & Slack (2007) found that corporations are willing to pay a considerable premium for such new facilities because there is a community aversion to renaming facilities with traditional or historic names (e.g. Fenway Park, Wrigley Field, or Lambeau Field).

If researchers have found that corporations will pay a significant premium for the naming rights of new facilities, what are other factors that drive the value of naming rights? Generally speaking, this is the question my work will aim to answer. There has been other work seeking to answer this question as well. DeSchriver and Jensen (2003) attempt to identify these determinants by developing a model of the naming rights market where the objective of the facility owner is to maximize revenue and the objective of the sponsor is to allocate its advertising budget efficiently. Like previous authors, they find that a new facility status adds a substantial amount to the cost of naming a facility, but they also find that, quite surprisingly, the price of a naming rights deal is independent of the number of games played at the facility, the median income of the area, the on-field success of the teams that play in the facility, whether the facility is publicly or privately owned, average attendance, and the cost of construction.

Ashley and O'Hara (2001) explore the potential benefits and downsides of engaging in naming rights deals and examine the "intangible nature" of such deals. The study finds that the market value approach is the most commonly used method for naming rights valuation and that "local sentiment" should be considered before engaging in a naming rights agreements, which directly relates to the new facility aspect discussed above.

Gerrard, Parent, and Slack (2007) provide a study that is most relevant to my thesis. Using the natural log of total value of the deal and the natural log of the annual fee of the deal as dependent variables and facility characteristics as independent variables, they find that this value is related to variables associated with the size of the potential target audiences. This includes the economic size of the facility's city, the capacity, the

success of the resident teams, the diversity of the facility usage, and whether or not the facility is new.

Even at the minor league level, attendance increases significantly when a new facility is built, further supporting the notion that new facilities are a sought after commodity, by corporation and fans alike. Gitter and Rhoads (2014) find that new stadiums add an additional 1.2 million fans at the Triple-A level, 400,000 at the Double A-level and high Single A level. A study carried out by the same authors (Gitter & Rhoads, 2010) finds a positive relationships between a minor league's winning percentage and attendance. It is characteristics like these, winning percentage and attendance, that might have a positive effect on the price of the naming rights deals.

The goal of my research is to investigate the quantitative relationship between naming rights prices of sports facilities and the factors that drive these prices. While my thesis builds on all of the previously mentioned literature, I follow Gerrard et al. (2007) most closely and use the same methodology to valuate sports entertainment facility naming rights. I build on the existing literature by not only including facilities for the MLB, the NFL, the NHL, and the NBA, but also including MLS, Minor League Baseball (MiLB), and Division I collegiate facilities. I am also confident that my results are more comprehensive than previous studies because there has been enough time between the current period and the growth of the naming rights market in the early 2000's to further understand changes in the market over time.

3 Methodology

3.1 Data Collection

There are 100 individual facilities being observed in this analysis. Of those 100, 19 host teams that play college sports (basketball or football), 16 host MiLB teams, 16 host MLB teams, 5 MLS teams, 23 NBA teams, 20 host NFL teams, and 9 host NHL teams.

Consistent with Gerrard at el. (2008), I needed to collect data on many different characteristics of sports facilities involved in the naming rights deals I am observing. Variables describing the terms of the deal and name, sponsor, and location of each facility came from the naming rights database created by Sports and Properties, Inc. [1]. For facilities that had the term (length of deal) and at least *TOTALFEE* or *ANNUALFEE* but missing the other, I was able to calculate the other using the term and either type of fee I had.

All of the sports leagues I am including in my study were included in this data set. Each league is a dummy variable. College facilities, both basketball and football, are classified as *COLLEGE* while all other facilities fall into each of their given leagues. If a facility is home to an NHL team, *L_NHL* is equal to "1" and if otherwise, *L_NHL* is equal to "0." This is the same for all leagues. However, if a facility is home to more than one team (there are 10 facilities that match this description), a "1" is present in both league dummies. For example, O.Co Coliseum is home to both the Oakland Raiders (NFL) and the Oakland Athletics (MLB) so *NFL* is equal to "1" and so is *L_MLB*.

In order to test for differences between the MLB, NBA, NHL, and NFL and the MLS, MiLB, and college, a dummy variable was created representing whether or not the

facility is home to a "big four" (MLB, NBA, NHL, and NFL) team. If a facility is home to a big four team, *BIGFOUR* is equal to "1" and otherwise, *BIGFOUR* is equal to "0." In order to measure the size of the premium for a big four team *and* a new facility, an interaction term between the two was added: *NEWBIGFOUR = (BIGFOUR)*(NEWFAC)*. Also using data from this data set, I needed to generate an interaction term that would measure the long-term inflation rate *after* the Gerrard et al. (2007) paper in order to test for Hypothesis 3. This was done by creating a dummy variable for all deals signed before 2002 (the latest year a deal was signed in Gerrard et al.). If the deal was signed in or before 2002, *YEARDUMMY* is equal to "1" and if the deal was signed after 2002, *YEARDUMMY* is equal to "0." In order to fully measure the long-term price inflation, an interaction term between *YEARDUMMY* and *YEAR* was created. This interaction term is defined as *YEARINTERACT*.

Two of the variables found in this data set will serve as the dependent variables in my two models: *LN_TOTALFEE* and *LN_ANNUALFEE*. In order to correct for skewedness seen in the *TOTALFEE* and *ANNUALFEE* data, the natural log is taken of both. *LN_TOTALFEE* is the natural log of the total amount of money that the sponsor will pay the facility owner for the naming rights over the determined term and is measured in hundred thousand dollars. *LN_ANNUALFEE* is the natural log of the annual amount of money that the sponsor will pay the owner of the facility measured in thousands of dollars.

I assembled a second data set from many different sources. Most of the data came from the Wikipedia pages of individual facilities [4], the Wikipedia pages of individual teams [2], and archives and box scores from university athletic pages [3]. These variables

consist of total attendance (*TOTALATT)*, average attendance (*AVGATT)* whether the

facility was new (*NEWFAC*), whether the team was new (*NEWTEAM*), whether the

facility was previously named (*PREVNAME)* the capacity of the facility the year before

the deal was signed *(PREVCAP*), *GAMES*, type ownership, whether it be public or

private (*PUBLIC)*, capacity of the facility (*CAPACITY)*, *AGE*, the percentage of capacity

filled on average (*PERCENTAVGATT*) and type of roof on the facility (*OPEN, CLOSED,*

or *RETRACTABLE*). The natural log was taken of *AGE* and *TOTALATT (LN_AGE* and

LN_TOTALATT) to correct for skewedness. Variables *PERCENTAVGATT, TOTALATT,*

PREVCAP, GAMES, and *AGE* were all taken from the year before the deal was signed

because this is the information the potential sponsor would have been using to determine

the facility's worth.

　　As mentioned, there were 10 facilities that host two teams from two different

sports (one facility hosts two teams from the same sport). In order to account for both

events, *GAMES* for this observation is the number of games played by both teams and

TOTALATT is the total attendance of each season of each team added together. To get

AVGATT for two sport facilities, I averaged *AVGATT* for both teams.

　　In order to get a quantitative measurement of some of my data, I had to create

dummy variables from the data collected on my own. *PUBLIC* allows me to determine

which facilities are publicly owned and which facilities are privately owned. "1" is given

if the facility is publicly owned and "0" is given if the facility is not publicly owned.

There were two cases where there was a combination of public and private ownership,

Miller Park and Petco Park (both MLB facilities). However, in both cases, the majority

share of the facility is publicly owned so I classified those facilities as having public ownership.

I also created a dummy variable for if a team was new. For example, the Columbus Blue Jackets were a new team the first year of their deal with Nationwide. If a team is new *NEWTEAM* is "1" and if not, *NEWTEAM* is "0."

In my data, there are three different kinds of roofs: open, closed and retractable. I made these separate dummy variables. For example, for *OPEN*, "1" means the facility has an open roof and "0" means it does not. This is the same for both *CLOSED* and *RETRACTABLE*.

Taking into account what Gerrard et al. (2007) and DeSchriver and Jensen (2003) suggest, I also control for whether or not the facility is new when the deal is signed. For example, when American Way purchased the naming rights for the NBA arena in Orlando, the facility was brand new, while when US Airways purchased the naming rights of the NBA arena in Phoenix, the facility was not new and had a former name. "1" means that the facility was new at the time the deal was signed and "0" means that the facility was not new at the time the deal was signed.

I was unable to find data with average attendance, total attendance, games, previous capacity, whether the team was new, and whether the facility was new for Minor League Baseball. Fortunately, I was able to obtain many of these missing variables from another source, Professor Seth Gitter [5], who passed along MiLB data, which included *AVG ATT, NEWFAC* and *GAMES*. From the information in this data set on average attendance and the number of games played, I was able to calculate *TOTALATT* by multiplying *AVGATT* by *GAMES*.

Finally, *POPULATION* and *PERSONALINC* were both obtained from the United States Bureau of Economic Analysis [6]. I decided to use personal income as a measurement of metropolitan statistical area wealth because it was the only data that went as far enough back in years as my naming rights data. This data was taken from the year before the deal was signed because, again, this would have been the information being used during negotiations.

There were a number of deals that I had to drop from the data set for various reasons. Deals were dropped because the terms of the deal were not fully disclosed, the facility had either been renamed, or the facility was not affiliated with any of the leagues I observed.

3.2 Model

In this analysis I follow Gerrard et al. (2007) to determine what drives the value of stadium naming rights. The point of this method is to valuate intangible assets, much like the value of a naming rights deal. Each characteristic of the value of a stadium (ownership, league, attendance, capacity, etc.) can be thought of as having a price so that the total price of stadium is the sum of the prices of each characteristic. By sampling the values of currently existing facility naming rights, I can statistically infer the hedonic (or implicit) prices of the individual characteristic.

Equation: $V_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \ldots + \beta_k X_{ki} + \varepsilon_i$, where:
- V_i = the market value of the ith asset
- $X_{1i} \ldots X_{ki}$ = the value-relevant attributes ($X_1, X_2 \ldots X_k$) of the ith asset
- $\beta_1 \ldots \beta_k$ = hedonic prices of each value-relevant asset attribute
- ε_i = other asset-specific factors

Two different models are used in this analysis. In Model 1, my dependent variable is *LN_TOTALFEE* and in Model 2, my dependent variable is *LN_ANNUALFEE*. While

controlling for length of deal in my "total fee" model might fix the difference between the

two, it is still important to investigate the differences between each specific year amount and

total amount in order to see the different effects each facility characteristic has on each type

of payment.

My specific equations:

Model 1:

$$LN\_TOTALFEE_i = \beta_0 + \beta_1(year)_i + \beta_2(term)_i + \beta_3(games)_i + \beta_4(percentavgatt)_i +$$
$$\beta_5(ln\_totalatt)_i + \beta_6(avgatt)_i + \beta_7(prevcap)_i + \beta_8(capacity)_i +$$
$$\beta_9(ln\_personalinc)_i + \beta_{10}(ln\_population)_i + \beta_{11}(public)_i + \beta_{12}(ln\_age)_i +$$
$$\beta_{13}(newfac)_i + \beta_{14}(newteam)_i + \beta_{15}(open)_i + \beta_{16}(retractable)_i +$$
$$\beta_{17}(l\_college)_i + \beta_{18}(l\_milb)_i + \beta_{18}(l\_mlb)_i + \beta_{19}(l\_mls)_i + \beta_{17}(l\_nba)_i + \beta_{20}(l\_nhl)_i + \varepsilon_i$$

Model 2:

$$LN\_ANNUALFEE_{it} = \beta_0 + \beta_1(year)_i + \beta_2(term)_i + \beta_3(games)_i + \beta_4(percentavgatt)_i +$$
$$\beta_5(ln\_totalatt)_i + \beta_6(avgatt)_i + \beta_7(prevcap)_i + \beta_8(capacity)_i +$$
$$\beta_9(ln\_personalinc)_i + \beta_{10}(ln\_population)_i + \beta_{11}(public)_i + \beta_{12}(ln\_age)_i +$$
$$\beta_{13}(newfac)_i + \beta_{14}(newteam)_i + \beta_{15}(open)_i + \beta_{16}(retractable)_i +$$
$$\beta_{17}(l\_college)_i + \beta_{18}(l\_milb)_i + \beta_{18}(l\_mlb)_i + \beta_{19}(l\_mls)_i + \beta_{17}(l\_nba)_i + \beta_{20}(l\_nhl)_i + \varepsilon_i$$

These are the two equations performed in column 1 in Tables I and II. For the second two

equations (results found in column 2 and 3), *BIGFOUR, NEWBIGFOUR, YEARDUMMY,*

and *YEARINTERACT* were added and the league variables were dropped (due to

collinearity).

3.3 Hypotheses

Hypothesis 1: The value of sports facility naming rights are positively related to

the potential target audience size as determined by the economic size of the facility's city,

capacity, success of team, and number of events.

While this is the main hypothesis tested in the Gerrard et al. (2007) paper, it will

be important to test this with my new data. The size of a facility's city, capacity, and

number of events varies drastically from previously tested leagues in Minor League

Baseball and collegiate sports. It will be important to see if this hypothesis still holds with

those types of facilities.

Hypothesis 2: There are larger premiums paid for the naming rights for new MLB,

NBA, NHL, or NFL facilities than new facilities in the MLS, MiLB, or college.

Due to the popularity of the four main sports and thus larger potential audiences

for events, I propose that the premiums paid for naming rights for new facilities are larger

than those paid for the MLS, MiLB, or college. If the facility is new, the corporation gets

a "bigger bang for its buck" if the facility is home to a team in the MLB, NBA, NHL, or

NFL. Again, this stems from the idea that the larger the potential audience in a given

venue, the higher the price will be. This was tested by looking at an interaction term

between new facilities (*NEWFAC)* and whether or not the facility is home to a big four

(*BIGFOUR)* team.

Hypothesis 3: The accelerated long-term price inflation found in Gerrard et al.

(2007) has decreased in recent years.

Gerrard et al. (2007) find that there was accelerated long-term price inflation for

naming rights deals and I propose that this price inflation has not necessarily decreased

but is not accelerating as rapidly as Gerrard et al.'s (2007) findings suggest. A

decelerated long-term price inflation would mean that the average annual fee has

decreased since 2002 (the most recent facility observed in Gerrard et al. (2007)'s study). I

expect this might be true due to the leveling off of the naming rights market and the

recession beginning in 2007. This was tested by looking at an interaction term between

YEARDUMMY and *YEARINTERACT*.

4 Data Analysis

The regression analysis results for Models 1 and 2 can be seen in Table I and Table II, respectively. Both models have a high goodness of fit, with coefficients of determination (R^2) between 82.75 percent and 84.15 percent for Model 1 and between 84.27 percent and 87 percent for Model 2. This tells us that both models explain more than eighty percent of the variation in the differences between facilities and the total/annual value of naming rights deals.

In relation to Hypothesis 1, the variables reflecting potential target audience size that seem to have any effect on *LN_TOTALFEE* are total attendance and number of games played. Looking at the coefficient on *LN_TOTALATT* in Table I, we can see that for a 1 percent increase in total attendance, total fee increases by 0.147 percent. To put this into context, we can use the means for total attendance and total fee, 820,864 and $6,441,000 respectively. If total attendance, starting at 820,864, increased by 8,208 attendees per year, total fee would increase by approximately $9,468.27. Number of games played also seems to have an effect on total fee. However, looking at the results, number of games played has a negative effect on total fee. For a single game increase, total fee decreases by 1.4 percent. This negative effect is most likely picked up because NFL deals are the most lucrative of any sport and only have 8 games, while MiLB deals tend to be much less expensive and they play upwards of 80 games per season.

The variables reflecting potential target audience size that have a significant effect on *LN_ANNUALFEE* are *PERCENTAVGATT,* and *LN_TOTALATT*. The coefficient on *PERCENTAVGATT* tells us that for a single point increase in percentage of capacity filled on average, annual fee increases by 153 percent. This means that if a facility is a

single percentage point closer to filling capacity, a measurement of overall attendance, annual fee more than doubles in size. The coefficient on *LN_TOTALATT* suggests that for a 1 percent increase, annual fee increases by 0.1 percent. Going back to using the means and putting things into perspective, if total attendance increases by 8,208, annual fee increases by approximately $3,017.65.

Finally, average attendance also has an impact on annual fee. Looking at Table II, we can also see that *AVGATT* has a significant coefficient. It tells us that for a single attendee increase in average attendance, annual fee actually decreases by 0.0000272 percent, which means that annual fee only decreases by $0.80. While it is unexpected that the direction of this effect is negative, after interpreting it, it is such a minimal change that it more or less has no effect.

While not all the variables reflecting potential target audience size were found to be significant, total attendance is significant in both models, which suggests that attendance, the strongest indicator of potential target audience size, is indeed a driving force behind the increase of stadium naming rights.

In order to analyze the results for Hypothesis 2, we must look at the second columns in both Table I and Table II. Hypothesis 2 suggests that there are larger premiums, both total and annual, paid for the naming rights for new MLB, NBA, NHL, or NFL facilities than new facilities in the MLS, MiLB, or college. The coefficient on *NEWBIGFOUR* was not significant. However, while not precisely consistent with the hypothesis, looking at the coefficient on *BIGFOUR*, which is significant, we can see that if a facility holds a big four team, total fee increases by a 177 percent and annual fee increases by 122 percent. More specifically, if a facility is home to a MLB, NFL, NBA,

or NHL team (or more than one), the total fee almost triples while annual fee slightly more than doubles. While it is clear that big four facilities do get higher premiums, there is no effect on fees found for big four *and* new stadiums.

In order to look at Hypothesis 3, we need to interpret the coefficient in column 3 in both models. The coefficient on *YEAR* is the annual growth of the deals for after 2002 and the coefficient on *YEAR* plus the coefficient on *YEARINTERACT* is the annual growth rate for before 2002, although the coefficient on *YEAR* was not statistically significant in either model. In light of this, I performed an F-test on both models to see if the sum of the year and year interaction coefficients were different from zero. The results of the F-test for total fee, found in Figure 1, show a p-value greater than 0.1 (albeit just barely) so we cannot reject the null hypothesis that the sum of the year and the year interaction coefficients are equal to zero. Figure 2 shows the results of the F-test for annual fee and because those results show a low p-value (<0.1), it implies that there has been a decrease of annual long-term price inflation.

There are also variables of significance worth discussing that are not related to my hypotheses. Inconsistent with Gerrard et al. (2007), *NEWFAC* is positive although not statistically significant. One variable that has not been tested in previous studies is *NEWTEAM*. According to this regression analysis, if a team is new, *LN_TOTALFEE* increases by 1,024 percent while *LN_ANNUALFEE* increases by 758 percent. This strongly suggests that having an element of having a brand new team in an area raises the price quite significantly. All facilities that were home to a new team at the time the naming rights deal was signed were also new facilities themselves, so this provides strong evidence that if the facility is home to a new team, the corporation gets a bigger bang for

its buck (a *much* bigger bang) if the facility is also home to a new team. Therefore, it seems as though having a new team is part of this high attraction to brand new sports entities (Gerrard et al, 2007; DeSchriver & Jensen, 2003).

5 Robustness

Robustness checks were done in order to test for structural validity. I tested for multicollinearity, heteroskedasticity, and created a residual plot in order to determine that OLS regression is appropriate for this dataset. Because the points in the residual plot are dispersed randomly, I determine that my methods were indeed appropriate. The residual plot can be found in Figures 3 and 4.

I tested for multicolliearity by looking at variance inflation factor (VIF) for each independent variable. The results to this test can be found in Figure 5. While the VIFs are well above 10 (the usual threshold) for *YEARDUMMY, YEARINTERACT, LN_PERSONALINC, LN_POPULATION, AVGATT, CAPACITY, PREVCAP*, and *BIGFOUR*, I assume this multicollinearity comes from the fact that my independent variables are all characteristics of each facility so it makes sense why some may be collinear with others. Fortunately, none of these variables were dropped due to collinearity by Stata, so I did not correct for multicollinearity.

Heteroskedasticity was tested by using the Breush-Pagan/Cook-Weisberg test with Stata and the results can be found in Figures 6 and 7. The p-value for both tests (*LN_TOTALFEE* and *LN_ANNUALFEE*) was greater than 0.1 meaning that we are unable to reject the null hypothesis that there is constant variance. Therefore, I can safely say that the data is structurally valid.

6 Conclusion

Based on the analysis performed above, the results provide evidence that supports parts of each of the described hypotheses. In terms of Hypothesis 1, I found that total attendance has a positive and significant effect on both total and annual fees while number of games played had a negative, but explainable, impact on total fee while percentage of capacity filled on average and average attendance have a positive and significant effect on annual fee. When looking at the effect that new big four facilities have on total and annual fees, I found no evidence that facilities home to new MLB, NBA, NFL, and NHL teams have higher premiums than new MLS, MiLB, and collegiate facilities. However, strong evidence supports the fact that big four facilities do get higher premiums, just not necessarily for new big four facilities. Finally, I found that annual long-term price inflation has decreased since 2002, the year of latest deal observed in Gerrard et al. (2007), although no evidence that total long-term price inflation has decreased.

One of the most surprising findings in this thesis is that new facilities were found to have no effect on either the total fee or annual fee, differing from the findings found in Gerrard et al. (2007) and DeSchriver and Jensen (2002). This previous finding, a positive and significant effect of new facilities, may have been picked up by the "new team effect" found in this thesis. The effect that a new team has on total and annual fees is quite large and since all new teams have new facilities, we can see how this may be the case.

From this analysis, it can be concluded that naming rights prices are indeed driven by a potential target audience size characteristic and although the annual long-term price

inflation rate has decreased, it is still positive which means the prices are only growing. Future research in this subject should take place in five to ten years down the road, where most naming rights deals have to do with existing facilities, because most of the new facilities found in this study were built in the mid-2000s. It is likely that there will be a new wave of facility building, but it is not likely to happen for some time.

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McCarthy, L., & Irwin, R. (2000). An examination of the rationale and motives for corporate purchase of stadia and arena naming rights. *Cyber-Journal of Sport Marketing*, *4(3)*.

Street and Smith (2002). By the numbers. *Sports Business Journal*, 37(4), 10-11.

8 Data Reference List

[1] Sports and Properties, Inc., received November 2013

[2] Data was collected from the Wikipedia pages of individual teams.

[3] Data was collected from individual archives and box scores from university athletic pages.

[4] Data was collected from the Wikipedia pages of individual facilities.

[5] Seth Gitter, Assistant Professor, Department of Economics, Towson University. Received April 2014.

[6] U.S. Bureau of Economic Analysis, "CA1-3 Personal Income Summary," http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=5#reqid=70&step=1&isuri=1 (accessed Feb 10, 2014).

9 Data Appendix

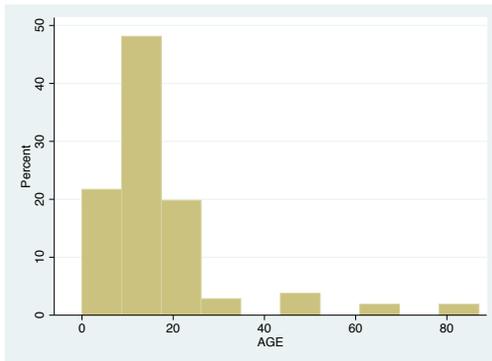**Variable name:** *AGE*
Data source: [4]
Missing observations: 0/106
Description and units: Age of the facility in years.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
age	106	16.90566	14.96187	0	87

Histogram:

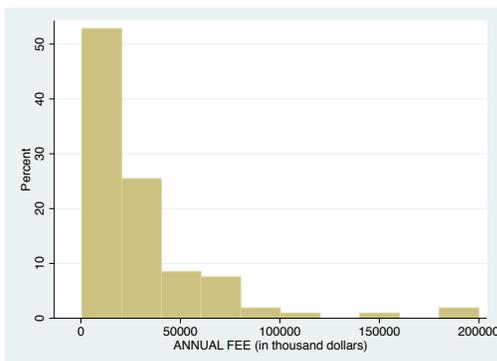**Variable name:** *ANNUALFEE*
Data source: [1]
Missing observations: 0/106
Description and units: Natural log of the annual fee the sponsor is paying the facility owner for naming rights in thousand dollars.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
annualfee	106	30176.46	35873.67	500	200000

Histogram:

Variable name: *AVGATT*
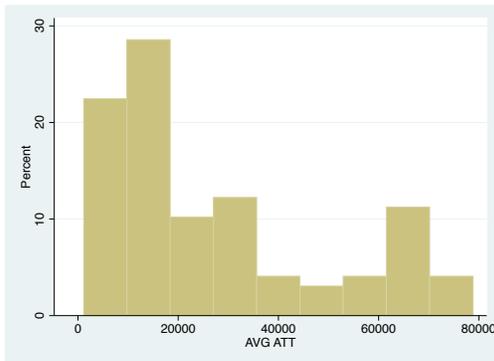**Data source:** [2] [3] [5]
Missing observations: 8/106
Variable description: Average attendance of games played at facility taken from the year before the deal was signed.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
avgatt	106	25361.36	22482.84	0	78808

Histogram:

Variable name: *BIGFOUR*
Data source: [1]
Missing observations: 0/106
Description: Defines whether or not the facility is home to a big four team.
Variable values and coding:

      0: facility is home to a big four team.
      1: facility is not home to a big four team.

Frequency distributions:

bigfour	Freq.	Percent
0	40	37.74
1	66	62.26
Total	106	100

Variable name: *CAPACITY*
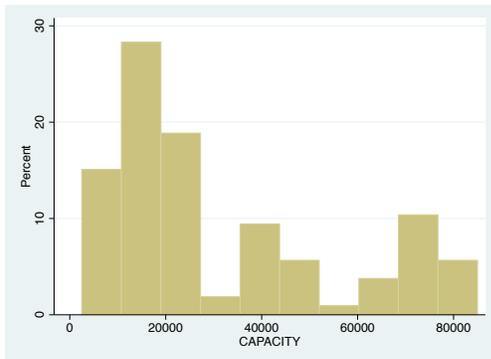**Data source:** [3] [4]
Missing observations: 0/106
Variable description: Total capacity of stadiums from the year the deal was signed. Includes standing room where applicable.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
capacity	106	31567.12	23513.9	2500	85000

Histogram:
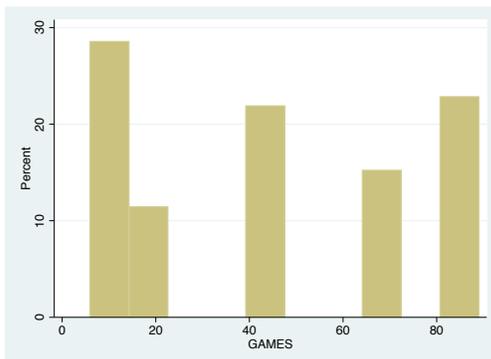

Variable name: *GAMES*
Data source: [2] [5]
Missing observations: 1/106
Variable description: Number of games played in each facility, each season. For MiLB, the number of games played included Seth Gitter's data set [5] were the total number of games played by the team during an entire season and not just at the facility. Professional sports teams, play half their games at home and half away, so I calculated the total number of games by dividing that number by two.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
games	105	42.84286	29.67527	6	89

Histogram:

Variable name: *LEAGUE*
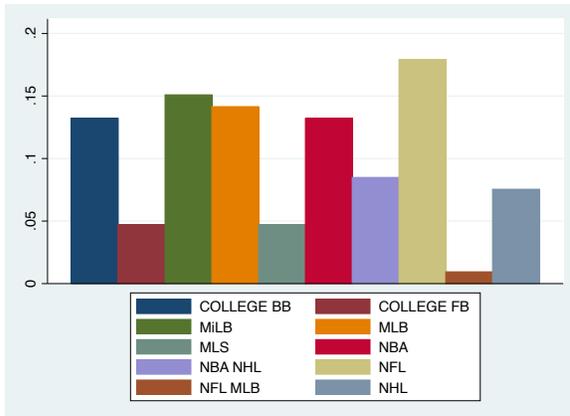**Data source:** [1]
Missing observations: 0/106
Variable description: The league of the sport that plays in the facility in the naming rights deal.
Frequency distribution:

LEAGUE	Freq.	Percent
COLLEGEBB	14	13.21
COLLEGEFB	5	4.72
MILB	16	15.09
MLB	15	14.15
MLS	5	4.72
NBA	14	13.21
NBA NHL	9	8.49
NFL	19	17.92
NFL MLB	1	0.94
NHL	8	7.55
Total	106	100

Bar graph:

Variable name: *LN_AGE*
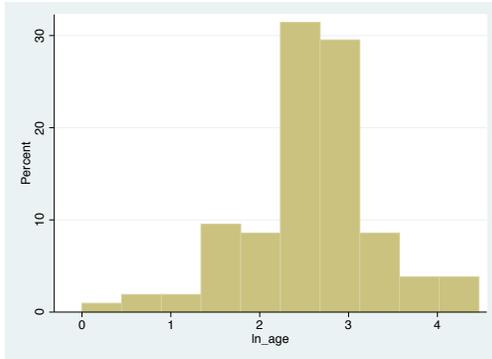**Data source:** [4]
Missing observations: 0/106
Description and units: Age of the facility in years.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_age	105	2.55905	0.7645564	0	4.465908

Histogram:

Variable name: *LN_ANNUALFEE*
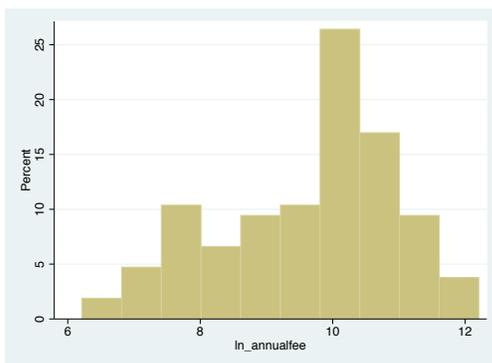**Data source:** [1]
Missing observations: 0/106
Description and units: The natural log of length of the naming rights deal, in years.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_annualfee	106	9.642949	1.31893	6.214608	12.20607

Histogram:

Variable name: *LN_PERSONALINC*
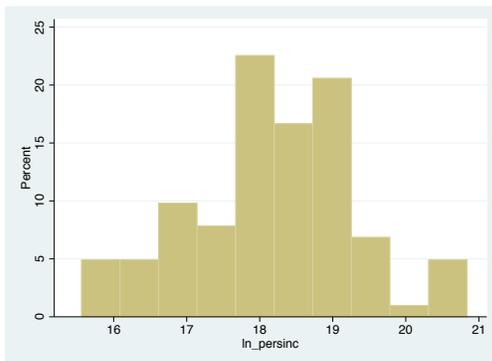**Data source:** [6]
Missing observations: 4/106
Description and units: The natural log of mean personal income by metropolitan statistical area taken from the year before the deal was signed, measured in dollars.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_personalinc	102	18.18132	1.153535	15.55873	20.83933

Histogram:

Variable name: *LN_POPULATION*
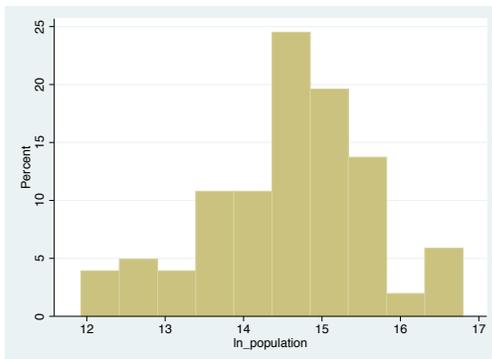**Data source:** [6]
Missing observations: 4/106
Description and units: Natural log of the total population by metropolitan statistical area taken from the year before the deal was signed.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_population	102	14.58431	1.054215	11.92941	16.79765

Histogram:

Variable name: *LN_TOTALATT*
Data source: [2] [3] [5]
Missing observations: 8/106
Description and units: The natural log of otal attendance of games played at facility taken from the year before the deal was signed.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_totalatt	106	12.19109	3.626879	0	15.21226

Histogram:
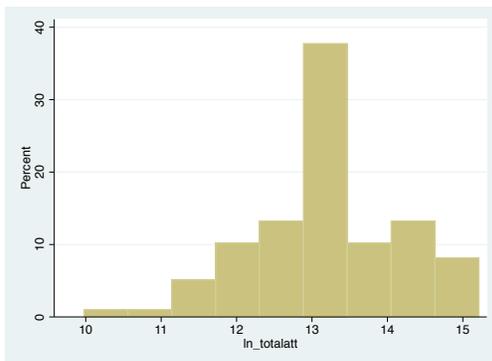
Variable name: *LN_TOTALFEE*
Data source: [1]
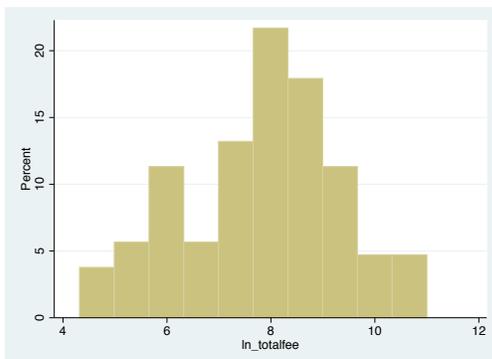**Missing observations:** 0/106
Description and units: Natural log of total fee the sponsor is paying the facility owner for naming rights deal measured in hundred thousands of dollars.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_totalfee	106	7.867019	1.505008	4.317488	11.0021

Histogram:

Variable name: *NEWBIGFOUR*
Data source: [1] [4]
Missing observations: 0/106
Description and units: Defines whether or not the team was new at the time the deal was signed and if the facility is home to a big four team.
Variable values and coding:
      0: facility is new and is home to a big four team
      1: facility is not new and is not home to a big four team
Frequency distributions:

newbigfour	Freq.	Percent
0	79	74.53
1	27	25.47
Total	106	100

Variable name: *NEWFAC*
Data source: [4]
Missing observations: 0/106
Description and units: Defines whether or not the facility was new when the deal was signed.
Variable values and coding:
      0: facility was not new when the deal was signed
      1: facility was new when the deal was signed
Frequency distributions:

NEW FACILITY	Freq.	Percent
0	65	61.32
1	41	38.68
Total	106	100

Variable name: *NEWTEAM*
Data source: [2]
Missing observations: 0/106
Description and units: Defines whether or not the team was new at the time the deal was signed.
Variable values and coding:
      0: tenant team was not new when the deal was signed
      1: tenant team was new when the deal was signed
Frequency distributions:

NEW TEAM	Freq.	Percent
0	101	95.28
1	5	4.72
Total	106	100

Variable name: *PERCENTAVGATT*
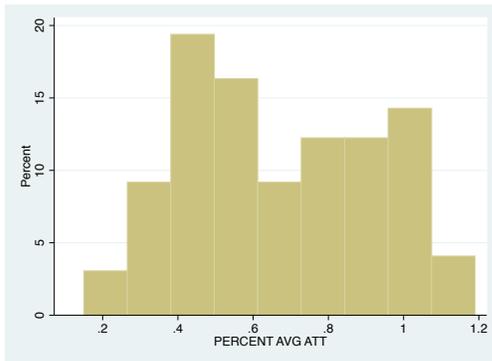**Data source:** [2] [3] [4] [5]
Missing observations: 8/106
Description and units: Percentage of average attendance from the year before the deal was signed. Calculated by dividing avgatt by prevcap.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
percentavg~t	106	0.6201597	0.3030333	0	1.19

Histogram:

Variable name: *PERSONALINC*
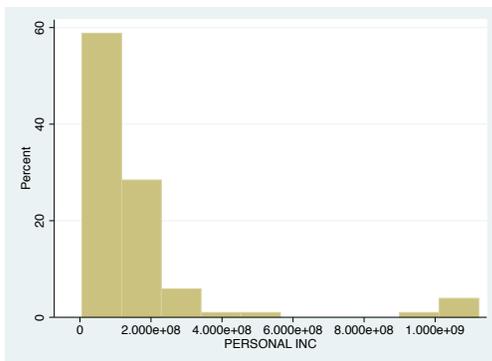**Data source:** [6]
Missing observations: 4/106
Description and units: Mean personal income for each metropolitan statistical area taken from the year before the deal was signed, measured in dollars.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
personalinc	102	1.51E+08	2.24E+08	5715689	1.12E+09

Histogram:

Variable name: *POPULATION*
Data source: [6]
Missing observations: 4/106
Description and units: Total population by metropolitan statistical area taken from the year before the deal was signed.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
population	102	3591832	4255727	151662	1.97E+07

Histogram:
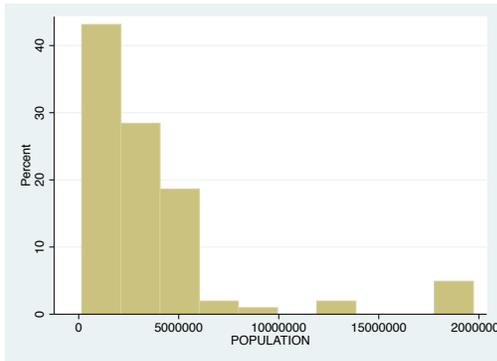
Variable name: *PREVCAP*
Data source: [4] [5]
Missing observations: 5/106
Variable description: Capacity of facility taken from the year before the deal was signed. If facility is new during the first active year of the deal, the capacity is taken from the previous facility the team played in.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
prevcap	106	30919.61	24827.35	0	85000

Histogram:

Variable name: *PUBLIC*
Data source: [4]
Missing observations: 0/106
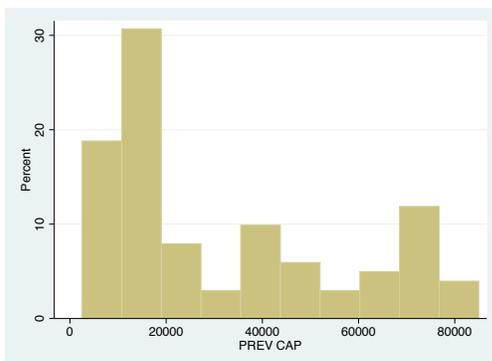**Description:** Defines type of ownership of facility the year the deal was signed.
Variable values and coding:
      0: facility is privately owned
      1: facility is publicly owned
Frequency distributions:

PUBLICLY OWNED	Freq.	Percent
0	21	19.81
1	85	80.19
Total	106	100

Variable name: *ROOF*
Data source: [4]
Missing observations: 0/106
Variable description: Type of roof on facility.
Frequency distribution:

ROOF	Freq.	Percent
CLOSED	48	45.28
OPEN	51	48.11
RETRACTABLE	7	6.6
Total	106	100

Bar graph:

Variable name: *TERM*
Data source: [1]
Missing observations: 0/106
Description and units: Length of the naming rights deal, in years.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
term	106	17.70755	6.667572	5	32

Histogram:
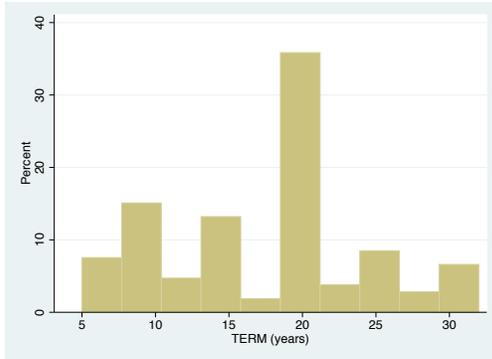
Variable name: *TOTALATT*
Data source: [2] [3] [5]
Missing observations: 8/106
Description and units: Total attendance of games played at facility taken from the year before the deal was signed.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
totalatt	98	820864.6	793220.9	21542	4042045

Histogram:
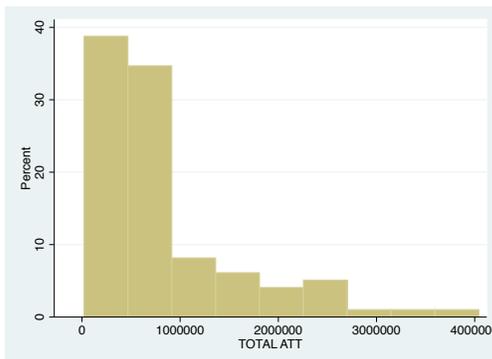
Variable name: *TOTALFEE*
Data source: [1]
Missing observations: 0/106
Description and units: Total fee the sponsor is paying the facility owner for naming rights deal measured in thousands of dollars.
Summary statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
totalfee	106	6441.915	9626.209	75	60000

Histogram:
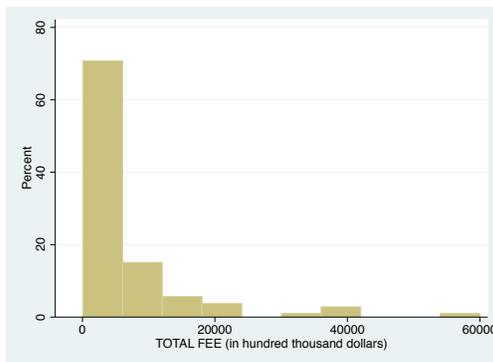
Variable name: *YEAR*
Data source: [1]
Variable description: The year the naming rights deal was signed.
Missing observations: 0/106
Frequency distributions:

YEAR	Freq.	Percent
1994	1	0.94
1995	1	0.94
1996	2	1.89
1997	2	1.89
1998	1	0.94
1999	11	10.38
2000	6	5.66
2001	2	1.89
2002	12	11.32
2003	7	6.6
2004	7	6.6
2005	7	6.6
2006	11	10.38
2007	4	3.77
2008	3	2.83
2009	6	5.66
2010	4	3.77
2011	10	9.43
2012	5	4.72
2013	4	3.77
Total	106	100

Histogram:
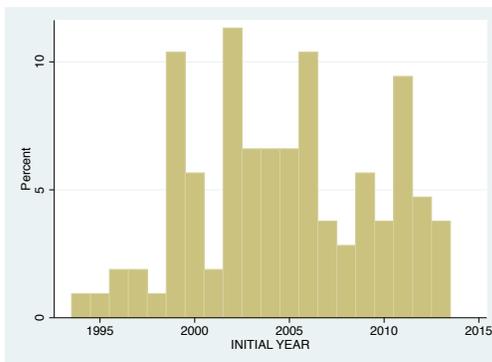
Variable name: *YEARDUMMY*
Data source: [4]
Missing observations: 0/106
Description: Determines which facility engaged in a naming rights deal prior to 2002 and which facilities engaged in a naming rights deal after 2002.
Variable values and coding:
    0: facility was named prior to 2002
    1: facility was named after 2002
Frequency distributions:

yeardummy	Freq.	Percent
0	68	64.15
1	38	35.85
Total	106	100

Variable name: *YEARINTERACT*
Data source: [4]
Missing observations: 0/106
Description: Interaction term used to determine which facilities were named after 2002 and which were named prior to 2002. Used to measure long-term inflation.
Variable values and coding:
    0: facility was named prior to 2002
    1: facility was named after 2002
Frequency distributions:

yearinteract	Freq.	Percent
0	68	64.15
1994	1	0.94
1995	1	0.94
1996	2	1.89
1997	2	1.89
1998	1	0.94
1999	11	10.38
2000	6	5.66
2001	2	1.89
2002	12	11.32
Total	106	100

10 Tables

TABLE I.

VARIABLES	(1) ln_totalfee	(2) ln_totalfee	(3) ln_totalfee
_cons	-99.28785 (64.82827)	-110.9032* (65.24959)	-70.30588 (78.61941)
year	0.0518267 (.0329125)	0.0562549** (.0331095)	0.0360857 (.0396662)
term	0.0859671*** (.0142005)	0.0893449*** (.0141568)	0.0928817*** (.0145511)
games	-0.0076684 (.0346712)	-0.0140833*** (.0048754)	-0.0129044*** (.0049679)
percentavgatt	1.076963 (.6972519)	0.8542979 (.6170155)	0.8645487 (.6191664)
ln_totalatt	0.1470499*** (.0587791)	0.1490226*** (.0542115)	0.1384555*** (.0548886)
avgatt	-0.0000177 (.0000192)	-0.00000786 (.0000164)	-0.00000616 (.0000164)
prevcap	0.00000378 (.0000118)	0.00000572 (.0000106)	0.00000448 (.0000107)
capacity	0.00000383 (.0000179)	-0.00000983 (.0000145)	-0.00000907 (.0000145)
ln_personalinc	-0.2748731 (.615693)	-0.2456355 (.6236753)	-0.2953164 (.6291867)
ln_population	0.399077 (.665029)	0.4443491 (.673776)	0.4984397 (.6807832)
public	-0.2198208 (.2178578)	-0.3455817* (.2006248)	-0.3688412** (.2034777)
ln_age	-0.1508017 (.1278822)	-0.0956768 (.130967)	-0.0731983 (.132279)

TABLE I. continued

VARIABLES	(1) ln_totalfee	(2) ln_totalfee	(3) ln_totalfee
newfac	-0.095782 (.2447159)	0.0364759 (.238133)	0.0887066 (.2427069)
newteam	2.422337*** (.8242047)	2.729853*** (.7652444)	2.617112*** (.7771305)
open	0.3158685 (.4195675)	0.1348279 (.3041825)	0.1121557 (.306468)
retractable	0.1993227 (.5257863)	0.1021562 (.4507009)	0.0168765 (.4564652)
l_college	-1.655381*** (.4765737)		
l_milb	-2.432685 (2.500076)		
l_mlb	-0.381853 (2.718196)		
l_mls	-1.015266 (.9103322)		
l_nba	0.183409 (1.314373)		
l_nhl	0.2966807 (1.338241)		
bigfour		2.018153*** (.3833668)	2.000645*** (.3845107)
newbigfour		-0.3078153 (.3839712)	-0.33524 (.3858181)
yearinteract			0.092893 (.0774737)
yeardummy			-186.0428 (155.0375)
Observations	100	100	100
R-squared	0.8415	0.8275	0.8313

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE II.

VARIABLES	(1) ln_annualfee	(2) ln_annualfee	(3) ln_annualfee
_cons	-84.8859* (50.96411)	-94.81561* (54.06474)	-32.23446 (64.09843)
year	0.0456817* (.0258738)	0.0493574** (.027434)	0.0182399 (.0323399)
term	0.0240818** (.0111636)	0.0287438** (.0117301)	0.0338954*** (.0118635)
games	0.0148683 (.0272564)	-0.0112805*** (.0040396)	-0.009859** (.0040503)
percentavgatt	1.532044*** (.5481378)	1.367474*** (.511249)	1.393884*** (.5048066)
ln_totalatt	0.1032121** (.0462086)	0.1059347** (.0449188)	0.0923175** (.0447507)
avgatt	-0.0000272* (.0000151)	-0.0000147 (.0000136)	-0.0000126 (.0000134)
prevcap	0.0000108 (0.00000931)	0.0000126 (-0.00001875)	0.0000114 (0.00000869)
capacity	0.00000796 (.0000141)	-0.00000775 (.000012)	-0.00000699 (.0000118)
ln_personalinc	-0.3258093 (.484021)	-0.2477552 (.5167671)	-0.287103 (.5129762)
ln_population	0.4943744 (.522806)	0.489368 (.5582797)	0.5290284 (.5550428)
public	0.0271552 (.1712668)	-0.1328137 (.1662345)	-0.1526059 (.1658954)
ln_age	-0.1639543* (.1005333)	-0.1233265 (.1085171)	-0.0945332 (.1078471)
newfac	-0.1030946 (.192381)	0.0932454 (.1973131)	0.1670301 (.197879)

TABLE II. continued

VARIABLES	(1) ln_annualfee	(2) ln_annualfee	(3) ln_annualfee
open	0.3381408 (.3298389)	0.0815855 (.2520406)	0.0426483 (.2498635)
retractable	0.1901867 (.4133418)	0.0164851 (.3734434)	-0.0987477 (.3721563)
l_college	-1.671775*** (.3746538)		
l_milb	-3.594543* (1.96541)		
l_mlb	-1.923199 (2.136883)		
l_mls	-1.117885 (.7156487)		
l_nba	-0.5162931 (1.033282)		
l_nhl	-0.2463904 (1.052045)		
bigfour		1.842444*** (.3181523)	1.825816*** (.3134917)
newbigfour		-0.1244347 (.3181523)	-0.1509052 (.3145576)
yearinteract			0.1058579** (.0631643)
yeardummy			-212.1157 (126.4021)
Observations	100	100	100
R-squared	0.8699	0.8427	0.851

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
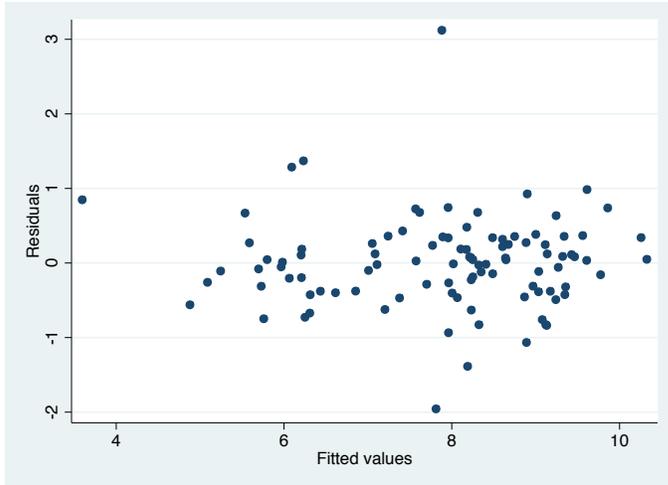
12 Figures

Figure 1: Residual Plot (ln_totalfee)

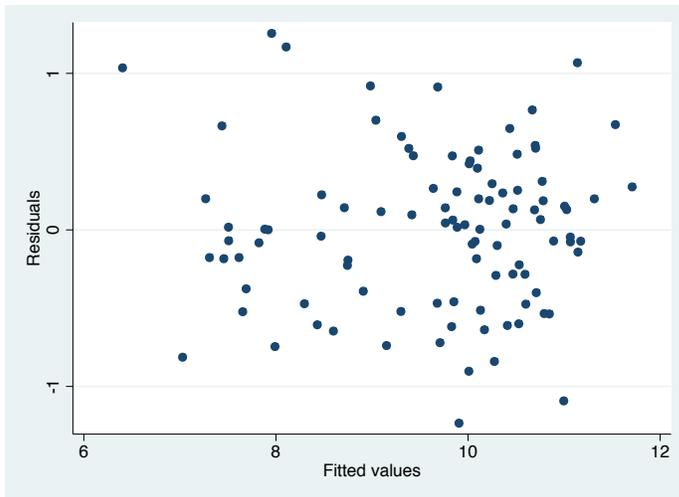Figure 2: Residual Plot (ln_annualfee)

Figure 3. F-test, ln_totalfee

test year+yearinteract==0

(1) year + yearinteract = 0

F(1, 79) = 2.59

Prob > F   = 0.1118

Figure 4. F-test, ln_annualfee

test year+yearinteract==0

(1) year + yearinteract = 0

F(1, 79) = 3.60

Prob > F   = 0.0613

Figure 5. Test for multicollinearity

Variable	VIF	1/VIF
yeardummy	1.14E+06	0.000001
yearinteract	1.14E+06	0.000001
ln_persona~c	106.27	0.00941
ln_populat~n	104.66	0.009555
avgatt	27.66	0.036157
capacity	24.37	0.041039
prevcap	14.58	0.068568
bigfour	11.17	0.089507
year	6.83	0.146356
ln_totalatt	6.76	0.147975
percentavg~t	6.71	0.149092
newbigfour	6.03	0.165707
open	4.94	0.20244
newteam	4.89	0.204641
games	4.51	0.22177
newfac	2.86	0.349675
retractable	2.86	0.349876
ln_age	2.21	0.451671
term	1.98	0.505551
public	1.34	0.744798
Mean VIF	113601.94	

Figure 6. Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance
Variables: fitted values of ln_totalfee
chi2(1)   =   0.39
Prob > chi2 = 0.5334

Figure 7. Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance
Variables: fitted values of ln_annualfee
chi2(1)   =   1.84
Prob > chi2 = 0.1753