Facility Age and Ownership in Major American Team Sports Leagues: The Effect on Team Franchise Values

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This paper examines the franchise values of American professional sports teams in the NBA, the NFL, and the NHL. It is argued that team franchise values depend on the ownership status of the facility in which the team plays. If a team owns its playing facility, it capitalizes the value of the facility in the team franchise value, driving the latter higher. If a team plays in a facility owned by another entity, the franchise value should be lower. The empirical evidence suggests that the franchise values of NFL and NHL teams are higher for teams that own their playing facilities. No such effect is found for NBA teams.

1. Introduction

The 1991 to 2004 period was active for designers and builders of sports facilities. According to Table 1, three of the twenty-eight National Football League (NFL) teams that existed in 1991[1] played in stadiums ten years old or younger. Nine of twenty-seven National Basketball Association (NBA) teams and two of twenty-one National Hockey League (NHL) played in arenas aged ten years or less. Contrast those numbers with 2004 where seventeen of twenty-nine NBA teams, twenty-two of the thirty NHL teams, and sixteen of thirty-two 32 NFL teams played in such facilities. The average age of an NBA arena was 18.5 years in 1991, but only 11.4 years old in 2004. The average age of an NHL arena was 30.3 years in 1991 and 11.9 years in 2004. The average age of an NFL stadium was 26.1years in 1991 and 19.3 years in 2004.

Sports teams often claim they need new facilities to help them remain competitive. The evidence on this, however, is spotty. For example, see Quinn et al (2003) who find that MLB teams that play in new facilities have higher win percentages, but who do not find a relationship between facility age and team quality in other sports.

What is more certain is a new facility's effect on attendance. Clapp and Hakes (2005) argue that new facilities tend to generate fan interest per-se, a so-called "honeymoon effect". Quirk and Fort (1992) find that new facilities lead to higher attendance levels for up to 5 years after opening, while Kahane and Shmanske (1997) find that the novelty of new facilities wears off after three years. Hamilton and Kahn (1997) find that the Baltimore Orioles saw a significant increase in demand after the opening of Oriole Park at Camden Yards.

Not surprisingly, the attendance increases leads to improved revenues for teams that move into new facilities. Depken (2006) finds that Major League Baseball (MLB) teams that moved into new facilities realized higher gate revenues and higher stadium revenues (e.g. through concessions and parking) but realized no significant effect on media revenues. The latter finding is understandable since a new facility's novelty effects are virtually impossible to experience via broadcast media.

There is also evidence that moving to a new stadium increases the value of franchises. Alexander and Kern (2004) show that the franchise values of NBA, NHL, and MLB teams reported by *Financial World* magazine and *Forbes* increase when teams move into new facilities. Miller (2007) shows that MLB teams realize a ceteris paribus increase in franchise values when they move into new facilities. Humphreys and Mondello (2008), however, find no significant evidence that facility ages affect sales prices in the four major American sports leagues.

So it is understandable why teams want to move into new facilities. Playing in a new facility increases attendance and some types of revenues ceteris paribus. It is also understandable why teams seek public funding: public funding lowers the cost of construction, land acquisition, and infrastructure paid out-of-pocket by teams. A source of controversy, public subsidies continue to be sought by teams and given at various levels of government.

Miller (2007) argues that when a facility is built with public funds, it is generally owned by a public authority. But when a team builds its facility without public construction subsidies, it owns the facility and its value is capitalized into the overall value of the franchise. He finds empirical evidence for this for MLB teams. Humphreys

and Mondello (2008) also find evidence that teams in the four major sports in the US that own their facilities have higher franchise sales prices.

Why, if private ownership drives franchise values higher, do so many teams seek public funding for facilities and, effectively, transfer ownership to public bodies? Miller (2007) argues that if the cost of constructing a new facility exceeds the incremental value that ceteris paribus private ownership provides, then teams will seek public assistance for construction and, in exchange, rationally give up ownership status. He shows that this is indeed the case for MLB teams.

In this paper I use Miller's model of franchise values to empirically examine the franchise values for the other three major sports leagues in the US: the NHL, the NBA, and the NFL. Specifically, I further explore the determinants of values of franchises in these leagues and I explore the relationship between facility age and franchise values. I also explore the relationship between the ownership status of the facility and the franchise value. This paper thus gives a deeper understanding of the role that various factors play in determining franchise values and it provides a deeper understanding of the motives of sports team owners. The paper adds to the literature on sports franchise values, to the literature on the honeymoon effect, and to the public finance literature on the relationship between government and sports. The rest of the paper is organized as follows: section 2 describes the empirical model and the data used in the analysis, section 3 presents the empirical results and discusses the findings, and section 4 concludes.

2. The Empirical Model and the Data

If franchise owners and all potential buyers are profit-maximizers and assuming perfect foresight and common discount rates, the value of a sports franchise will be equal to the present value of future profits. Consequently, franchise values will be functions of the determinants of team profitability and the ownership status of the facility. This suggests an empirical model of the form

$$F_{ti} = X_{ti}\beta + \varepsilon_{ti}. \quad (1)$$

F_{ti} is the logarithm of the real franchise value of team i in year t, X_{it} is a matrix of independent variables that impact the team's value, including variables that control for the age and ownership status of the facility. β is a vector of parameters to be estimated. ε_{it} is a vector of random error terms.

The X_{it} matrix includes variables that control for team profitability, including the logarithms of SMSA real per-capita income and population in each team's home metropolitan area, both of which control for revenue potential and team payroll costs.

I include team winning percentage in the current year and in the previous year in the regressions for the NBA and the NFL. I include team points standings in the current season and the previous season for NHL teams. Because fans prefer winning, I expect the coefficient on these quality measures to be positive.

I also include facility age in the models. Facility age is defined as the difference between the season in which it first opened and the time period of the observation. For example, a team playing in 2005 in a facility opened in 1972 will have a twenty-three year old facility. If a facility's age is defined as zero, then the team is playing its first season in a new facility.

As noted above in the discussion of honeymoon effects, a new facility presents a novelty that draws people simply to experience it. But this novelty should diminish over time. Older facilities, on the other hand, may present a historical value to fans, and fans may attend games to experience historical stadiums. Therefore, I include facility age in linear and quadratic form.

I also control for fan loyalty by using the number of seasons the team has been in the current city. The interested reader is directed to Depken (2000) who examines fan loyalty in MLB and (2001) in the NFL. This variable is included linearly and quadratically.

I include an ownership dummy equal to one for teams playing in facilities owned by their team plus an interaction term between private ownership and the age of the facility.

The data for the analysis are drawn from American NBA, NHL, and NFL teams. SMSA population and per-capita income data was obtained from the Bureau of Economic Analysis' Regional Economic Information System (REIS). When the sample data were gathered, REIS contained data up to and including 2005. Consequently, the data cover the period from 1991 to 2005 for NBA and NFL teams and from 1991-2004 for NHL teams[2].

Franchise value data were generated by *Financial World* and *Forbes* during this period and were obtained from Rod Fort's website (www.rodneyfort.com). No franchise values were available for NHL or NBA teams in 1998, so those years were dropped from the analysis. In addition, no franchise values were reported for expansion teams.

It is important to note that the franchise values used here are estimates and not actual transaction prices. To estimate franchise values, *Forbes* and, earlier, *Financial World*, send surveys to teams regarding their revenues and costs. The results from these attempts to gauge profits are then used to estimate values.

Fort (2006) and Vine (2004) both find that actual transaction prices are, on average, larger than estimated values. One explanation for the differential is that buyers may be motivated by things other than the profits of sports franchises, such as consumption utility or the profitability of other business activities somehow connected to the ownership of a sports franchise. Fort (2006) and Vine (2004) also note that team ownership may generate an ego boost to owners. To the extent that ownership provides some measure of satisfaction in addition to that generated by profits, then a rational buyer would willingly and rationally value a franchise in excess of its profits.

Another reason for the differential is that sports teams, in responding to the surveys, intentionally understate their true profitability for public relations purposes. A third explanation is that the winner's curse drives sales prices above expected profits. To the extent that sports teams do not intentionally misrepresent their revenues and costs on average, the franchise value estimates are reasonable attempts at gauging future profitability.

Team win percent data for the NBA and the NFL and points data for the NHL were also obtained from Rod Fort's website. Each team's ownership status for its facility was obtained from Wikipedia.com entries, Ballparks.com entries, several online press articles, and team corporate web sites. In cases where team ownership and facility ownership fall under different corporations that are subsidiaries of the same parent

company, the facility was considered to be owned by the team. For example, Atlanta Spirit, LLC owns Philips Arena in Atlanta, the Atlanta Hawks of the NBA, and the Atlanta Thrashers of the NHL. Because Atlanta Spirit owns both teams and the facility in which they play, both the Hawks and the Thrashers are assumed to play in their own arena.

Lastly, since the data used in the analysis is panel, there are two sources of randomness in the error term ε_{it}: one between teams and one over time. Consequently I use estimation techniques to control for the two sources of error. Hausman tests rejected the equivalence of fixed and random effects, so fixed effects estimation was used since it yields consistent parameter estimates. In addition, Wooldridge tests showed the presence of autocorrelation in every model. So each model was assumed to have an AR(1) error process.

3. Empirical Results

Table 2 gives the means of the variables used in the regressions and table 3 reports the results of the regressions. Standard errors are listed below each estimated coefficient. Models 1 and 2 are for the NBA, models 3 and 4 are for the NFL, and models 5 and 6 are for the NHL. Models 1, 3, and 5 control for team ownership of the facility via a dummy variable equal to one if the team owns its facility. Models 2, 4 and 6 utilize an interaction term between the age of the facility and the private ownership dummy quadratically.

Table 3 reports the within, between, and overall R-squared for each model. The R-square which corresponds to the proportion of explained variance in fixed effects panel models is the within R-squared. For both of the NBA models, the within R-squared values are approximately 0.68, so over two-thirds of the variation of franchise values is explained by the variation of the independent variables in the regressions. The NHL models explain less variation, with within R-squared of 0.50 in model 5 and 0.48 in model 6. The NFL models have comparatively low within R-squares, suggesting that the models explain between 21.7% to 28% of the variation of Forbes franchise values.

Note that in comparison to the NBA and NHL models, the team quality measures do not significantly explain variations in franchise values. While it is possible that team quality does not explain the variation in franchise values, it is also possible that other measures of team quality, such as playoff appearances, Super Bowl appearances, or a longer-term measure of success are better at explaining variation in franchise values.

Another explanation for the comparatively low within R-squares in the NFL models is that the NFL's national television contract has been the primary driver of team revenues over the years. In contrast, both the NBA and the NHL are more driven by local revenue streams. My NFL models may not adequately control for variation in national revenues while my NBA and NHL models include reasonable controls for variation in local revenues.

Within leagues, the coefficient on the logarithm of per-capita income changes little between models. All coefficients are positive and significant, suggesting that teams in higher per-capita income cities have higher franchise values, all else equal. In the NBA, a 1% increase in per-capita income increases franchise values by approximately

0.35%-0.36%, suggesting relatively insensitive changes in franchise vales driven by changes in per-capita incomes. NFL franchise values, conversely, are more sensitive to changes in real per-capita incomes: a 1% increase in local area per-capita income increases franchise values higher by approximately 1%. NHL franchise values exhibit weak sensitivity to changes in per-capita income, slightly more compared to the NBA regressions but less than in the NFL regressions..

Franchise values are relatively unresponsive to changes in the logarithm of population in every model. Because the three leagues studied in this analysis maintain franchises in the largest cities, save for the Green Bay Packers of the NFL, there is little variation between the populations of cities. In addition, the largest cities tend to sport more franchises in each league, yielding a smaller range of population-per-sports team values. This further mitigates population effects on franchise values.

Current season win percent does not significantly affect the franchise values of NBA or NFL teams. However, previous season win percent drives the franchise value of NBA teams higher. According to both models 1 and 2, if the average team wins 10% more of its games, its franchise values increases by approximately 1.8% in the following season. NFL teams' franchise values are statistically unaffected by changes in lagged win percent. As noted above, this may be due to the way revenue is generated and shared in the NFL. During the study period, the bulk of team revenue was generated via the NFL's national television contract, revenue that was shared equally among the teams. Local gate revenue is split between the home and visiting teams, with the home team keeping 60% of the gate receipts[3]. This equitable revenue sharing system smoothes out variations in revenues across teams and may lessen the impact of team quality on

franchise values. Another potential reason for this finding is that other measures of team quality are important in explaining variations in franchise values.

Current season point standings do not significantly affect the franchise values of NHL teams. Lagged points, however, has a positive and significant impact on NHL franchise values. According to models 5 and 6, a one-point increase drives next year's franchise value higher by nearly 0.21%. Vine (2004) finds evidence that the *Forbes* franchise values are multiples of revenues. Fort (2006) also argues that the *Forbes* values generally are a simple multiple of revenues (by a factor of between 3 to 5.5). When Forbes presents the revenues and values of sports teams, the franchise values are estimated for one season but the revenues reported are from the previous season. If franchise values are simple multiples of revenues, then it is understandable why current season win percent does not affect the *Forbes* values.

The linear term on city tenure is insignificant in every regression, but its quadratic term has a positive and significant effect on the franchise values of NBA teams and a negative and significant effect on NHL teams, but no significant effect on NFL teams. The results suggest that the longer an NBA team resides in a city, the more valuable it becomes, suggesting a dominance of fan loyalty over honeymoon effects. However, the value of NHL teams does not increase with tenure, suggesting a dominance of honeymoon effects over fan loyalty. The lack of relationship between city tenure and NFL values may also reflect the equitable revenue sharing system in the NFL. Honeymoon or loyalty effects that would normally arise in team revenues are spread throughout the league via revenue sharing.

Recall that the age of the facility appears in regressions 1, 3, and 5 linearly and quadratically, but with no interactions. It appears with a linear and a quadratic interaction with the private ownership dummy in models 2, 4, and 6. There is no significant evidence that either the age of the facility or its ownership status effects NBA franchise values.

But this is not the case with the NFL regressions. The linear terms on facility age are negative and significant in both regressions and the quadratic terms are positive and significant in both regressions. Moreover, the estimated coefficients are robust to the adding of the interaction terms. The estimated parameters of the linear and quadratic interaction terms are both positive and significant.

The estimates suggest that the age of NHL facilities does not significantly affect NHL franchise values. However, the evidence suggests that if an NHL team owns its facility its franchise value is 20.5% higher ceteris paribus. So while facility age does not appear to be a determinant of NHL franchise values, facility ownership status does matter[4].

In 2005, the average real franchise value of an NHL team that did not own its facility was $160.5 million. Controlling for other effects, the empirical results suggest that this average team would see a jump in its value to $193.4 million if it owned its facility, an incremental increase of $32.9 million. Since new hockey arenas cost significantly more than $32.9 million to construct, it is straightforward to see why a hockey team would not want to pay to construct its own facility.

The effect of a one-unit change in facility age on NFL franchise values is more complex. To interpret this effect, rewrite equation 1 in terms of the variables that contain facility age as follows:

$$F_{ti} = X'_{ti}\,\beta' + \beta_1 AGE_{ti} + \beta_2 AGE_{ti}^2 + \beta_3 AGE_{ti} D_{ti} + \beta_4 \left(AGE_{ti} D_{ti}\right)^2 + \varepsilon_{it}\,. \qquad (2)$$

AGE_{ti} is the age of team i's facility in year t, D_{ti} is a dummy variable equal to one if team i played in its own facility in year t, X'_{ti} is a vector of all other variables contained in the X_{ti} matrix in equation (1), $\beta_1 - \beta_4$ are parameters to be estimated, β' is a vector of the other parameters to be estimated, and ε_{it} is the error term defined in equation (1).

Models 1, 3, and 5 are estimated by omitting the interaction terms. Therefore, the proportional effect of a one-unit change in facility age on franchise values in those models is given by $\beta_1 + 2\beta_2 AGE_{it}$.

Models 2, 4, and 6 are estimated by including the interaction terms. Therefore, the proportional effect of a one-unit change in facility age is given by $\beta_1 + 2\beta_2 AGE_{it}$ if a team does not own its own stadium ($D_{ti} = 0$) and by $\left(\beta_1 + \beta_3\right) + 2\left(\beta_2 + \beta_4\right) AGE_{it}$ if it does own its own stadium ($D_{ti} = 1$).

Figure 1 presents the proportional effect of a 1-year change in an NFL team's facility, all else equal, using model (4). The figure suggests that if the stadium is brand new (0 years old), a one-year change in the age of the stadium causes the team's franchise value to fall by 0.53% if it does not own its own stadium and to increase by over 12.7% if it does own its stadium. However, the rate of growth is much higher for teams playing in their own facilities vs. teams playing in facilities they do not own. But as the facility ages, the growth rate of franchise values increases, regardless of ownership

status. If the facility is 20 years old, a one-year change in age drives the franchise value down by 0.18% if the team does not own the facility. But if the team owns its facility, the franchise value increases by over 20%.

How do the present results described above compare with those found in other studies? Humphreys and Mondello (2008) find that sales prices are positively and significantly related to local metropolitan area populations. Alexander and Kern (2004) find a positive and significant relationship between franchise values and population for the NBA and the NHL, but not for the NFL. My results suggest no relationship between population and team franchise values

Alexander and Kern (2004) find no relationship between per-capita income and franchise values for the NBA, the NHL, and the NFL. I find a positive relationship between franchise values and per-capita income in all three leagues.

Humphreys and Mondello find no relationship between 5-year team win percent and sales values. Miller (2007) finds a positive relationship between team quality and franchise values. In the present paper, I find a positive and significant relationship between one-year lagged team win percent and franchise values for NBA teams and one-year lagged points for NHL team values.

Humphreys and Mondello (2007) find that franchise age is positively and significantly related to sales prices. Alexander and Kern (2004) find no relationship between franchise values and whether a team is an expansion team. They explain this by noting there may be collinearity between their expansion dummy and their dummy that controls for facility age: newer teams tend to play in newer stadiums. I find a positive and significant relationship between a team's tenure in a city and its franchise value.

Humphreys and Mondello (2008) find no relationship between facility age and sales price. Alexander and Kern (2004) find that NBA and NHL teams that play in new facilities have higher franchise values. Miller (2007) finds that franchise values fall as facilities get older. I find a negative and significant relationship between facility age and franchise values in the NFL, an effect that lessens as time goes by.

Humphreys and Mondello (2008) estimate that teams that own their playing facilities have higher sales prices. Miller (2007) finds that MLB teams that own their facilities have higher franchise values. The present results suggest that franchise values are higher for NFL teams and NHL teams that own their playing facility while the franchise values of NBA teams are not impacted by facility ownership status. Thus the evidence on franchise values suggests that a facility's value is capitalized in the value of the franchise in MLB, the NHL, and the NFL. A policy implication of this finding is that by giving a team a stadium via public subsidization, policy makers create a privately-realized gain.

Lastly, I examine the factors that are correlated with team ownership of a facility. Table 4 reports panel probit and logistic analysis of a binary variable equal to 1 if a team plays in its own facility and 0 otherwise. The explanatory variables in these models include metropolitan area population and per-capita income. I also include a multi-team dummy equal to 1 if at least one team from the four major professional sports played in the facility during the sample period. I also include the age of the facility, its original real construction cost, the proportion of this cost that was covered by public financing (referred to below as the "public proportion"), and the age of the team. Construction cost and public financing information were gleaned by examining Wikipedia and

Ballparks.com entries on the facilities. All models assumed the existence of random effects.

According to the results, both NBA models have similar results in terms of parameter significance. The coefficients on real per-capita income are negative and slightly significant. This suggests that the larger a metropolitan area's income, the less likely its NBA team is to own its facility. A similar thing can be said about the multi-team facility dummy. If more than one team plays in an NBA facility, the lower the likelihood it owns its facility.

The coefficients on facility age and public proportion are both negative and highly significant. The models thus suggest that older facilities are less likely to be owned by their NBA teams. They also suggest that the higher the public proportion, the less likely the facility is to be owned by its NBA team.

The coefficients on the age of the team are positive and highly significant suggesting that older NBA teams are more likely to own their facilities. All other coefficient estimates are insignificant.

According to the NFL estimates, population, facility age, and public proportion are negative and highly significant. Teams that play in large metro areas are less likely to own their facilities, older facilities are less likely to be owned by their NFL teams, and the higher the public proportion, the less likely an NFL team owns its playing facility. Similar to the NBA findings, older NFL teams are more likely to own their facilities. All other coefficients are insignificant in the NFL regressions.

Now consider the NHL models. The results suggest that older facilities are less likely to be owned by their NHL teams and older teams are more likely to own their

facilities. Note that the parameter on team age is only slightly significant in the logistic NHL regression.

Unlike the NBA and NFL regressions, the coefficient on the real construction cost is positive and significant in both NHL regressions, suggesting that more expensive facilities are more likely to be owned by its NHL team. Similarly, the coefficient on the multi-team dummy is positive and significant in both models. Thus, multi-team facilities are more likely to be owned by the NHL team that plays there.

The coefficient on the public proportion variable is negative in both regressions, but significant in only the logistic regression. Thus there is weak evidence that the higher the proportion of public funding used in construction, the less likely the facility's NHL team is to own it.

An interesting future research project would be to examine treatment effects model of franchise values and/or sales prices. However, such an analysis is beyond the scope of the present paper. I now move to the concluding section.

4. Conclusion

This paper examines the determinants of American team franchise values with special attention given to facility age and ownership status in the NBA, NFL, and NHL. This paper therefore, extends the work of Miller (2007) who examined these factors for Major League Baseball teams. It thus gives a deeper understanding of the role of various factors in determining franchise values and it provides a deeper understanding of the motives of sports team owners. Assuming teams and any potential buyers are profit-

maximizers, the value of a sports franchise is its expected future profitability. I found that local area per-capita income is positively-related to franchise values, but not local population. Lagged team quality matters in franchise values in the NBA and the NHL, but not in the NFL. In addition, the team's tenure in its home city is positively associated with franchise values in the NBA, but negatively associated with franchise values in the NHL.

I argued that teams that play in their own facilities will realize higher franchise values because they can capitalize the value of the facility into that of the team. Miller (2007) found evidence for this capitalization in MLB and the present empirical results find evidence of this for NHL and NFL teams but not for NBA teams. Furthermore, the results suggest that the impact that facility age has on NFL franchise values is interacted with the age of the facility.

In terms of policy implications, policy-makers should realize that at least in the NFL, the NHL and, according to Miller (2007), MLB, if a team owns its own stadium, it will be able to privately capitalize the value of the facility in its franchise value. Policy makers need to appreciate how the values of franchises are impacted by the ownership status of facilities in order to be as well-informed as possible when deciding whether or not to retain ownership of a facility built with public funds.

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[1] The NFL regular season and its playoffs overlap calendar years. In this analysis, I refer to an NFL season as the calendar year in which the regular season began. The NBA and the NHL regular seasons overlap calendar years. Throughout the analysis, I refer to the calendar year in which the regular season ended as the "year" or "season" for these two leagues. For example, the 1994-95 regular season is referred to as the 1995 season.

[2] The 2004-05 NHL season was cancelled as the result of a lockout.

[3] NFL luxury suite revenue is not shared.

[4] Humphreys and Mondello (2008) find that facility age did not impact franchise sale prices. In their empirical model, they examined MLB, NFL, NHL, and NBA franchise sales and controlled for league

differences by dummying out the NFL, NHL, and the NBA. The results here for the NFL, NBA, and NHL combined with Miller (2007) for MLB suggest that facility age does impact franchise values, but only in the NFL and MLB.

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Table 1

Stadium Opening Information

NBA

1991			2004		
Franchise	***Year Stadium Opened***	***Age of Stadium***	***Franchise***	***Year Stadium Opened***	***Age of Stadium***
Atlanta Hawks	1973	18	Atlanta Hawks	2000	4
Boston Celtics	1928	63	Boston Celtics	1996	8
Chicago Bulls	1930	61	Chicago Bulls	1995	9
Cleveland Cavaliers	1975	16	Cleveland Cavaliers	1995	9
Dallas Mavericks	1981	10	Dallas Mavericks	2002	2
Denver Nuggets	1976	15	Denver Nuggets	2000	4
Detroit Pistons	1989	2	Detroit Pistons	1989	15
Golden State Warriors	1967	24	Golden State Warriors	1967	37
Houston Rockets	1976	15	Houston Rockets	2004	0
Indiapolis Pacers	1975	16	Indiapolis Pacers	2000	4
Los Angeles Clippers	1960	31	Los Angeles Clippers	2000	4
Los Angeles Lakers	1968	23	Los Angeles Lakers	2000	4
Miami Heat	1989	2	Memphis Grizzlies*	1992	12
Milwaukee Bucks	1989	2	Miami Heat	2000	4
Minnesota Timberwolves	1991	0	Milwaukee Bucks	1989	15
New Jersey Nets	1982	9	Minnesota Timberwolves	1991	13
Charlotte Hornets	1989	2	New Jersey Nets	1982	22
New York Knicks	1969	22	New Orleans Hornets	1999	5
Orlando Magic	1990	1	New York Knicks	1969	35
Philadelphia 76ers	1968	23	Orlando Magic	1990	14
Phoenix Suns	1966	25	Philadelphia 76ers	1997	7
Portland Trail Blazers	1961	30	Phoenix Suns	1993	11
Sacramento Kings	1989	2	Portland Trail Blazers	1996	8
San Antonio Spurs	1969	22	Sacramento Kings	1989	15
Seattle SuperSonics	1963	28	San Antonio Spurs	2003	1
Utah Jazz	1970	21	Seattle SuperSonics	1963	41
Washington Bullets	1974	17	Toronto Raptors*	2000	4
			Utah Jazz	1992	12
			Washington Wizards	1998	6
Average		***18.5***			***11.2***
Average Excluding Expansion Teams					***11.4***
**New Team Since 1991*					

Table 1 continued

NFL

1991			2004		
Franchise	***Year Stadium Opened***	***Age of Stadium***	***Franchise***	***Year Stadium Opened***	***Age of Stadium***
Phoenix Cardinals	1958	33	Arizona Cardinals	1958	46
Atlanta Falcons	1966	25	Atlanta Falcons	1992	12
Buffalo Bills	1973	18	Baltimore Ravens*	1998	6
Chicago Bears	1924	67	Buffalo Bills	1973	31
Cincinnati Bengals	1970	21	Carolina Panthers*	1996	8
Cleveland Browns	1931	60	Chicago Bears	1924	80
Dallas Cowboys	1971	20	Cincinnati Bengals	2000	4
Denver Broncos	1948	43	Cleveland Browns	1999	5
Detroit Lions	1975	16	Dallas Cowboys	1971	33
Green Bay Packers	1957	34	Denver Broncos	2001	3
Indianapolis	1984	7	Detroit Lions	2002	2
Kansas City Chiefs	1972	19	Green Bay Packers	1957	47
Miami Dolphins	1987	4	Houston Texans*	2002	2
Minnesota Vikings	1982	9	Indianapolis	1984	20
New England Patriots	1971	20	Jacksonville Jaguars*	1995	9
New Orleans Saints	1975	16	Kansas City Chiefs	1972	32
New York Giants	1976	15	Miami Dolphins	1987	17
New York Jets	1976	15	Minnesota Vikings	1982	22
Los Angeles Raiders	1923	68	New England Patriots	2002	2
Philadelphia Eagles	1971	20	New Orleans Saints	1975	29
Pittsburgh Steelers	1970	21	New York Giants	1976	28
San Diego Chargers	1967	24	New York Jets	1976	28
Seattle Seahawks	1976	15	Oakland Raiders	1966	38
San Francisco 49ers	1960	31	Philadelphia Eagles	2003	1
Los Angeles Rams	1960	31	Pittsburgh Steelers	2001	3
Tampa Bay Buccaneers	1967	24	San Diego Chargers	1967	37
Houston Oilers	1965	26	Seattle Seahawks	2002	2
Washington Redskins	1961	30	San Francisco 49ers	1960	44
			St Louis Rams	1995	9
			Tampa Bay Buccaneers	1998	6
			Tennessee Titans	1999	5
			Washington Redskins	1997	7
Average		***26.1***			***19.3***
Average Excluding Expansion Teams					***21.2***
**New Team Since 1991*					

Table 1 continued

NHL

1991			2004		
Franchise	***Year Stadium Opened***	***Age of Stadium***	***Franchise***	***Year Stadium Opened***	***Age of Stadium***
Boston Bruins	1928	63	Mighty Ducks of Anaheim*	1994	10
Buffalo Sabres	1941	50	Atlanta Thrashers*	2000	4
Calgary Flames	1983	8	Boston Bruins	1996	8
Hartford Whalers	1976	15	Buffalo Sabres	1997	7
Chicago Blackhawks	1930	61	Calgary Flames	1983	21
Quebec Nordiques	1951	40	Carolina Hurricanes	2000	4
Minnesota North Stars	1967	24	Columbus Blue Jackets*	1983	21
Detroit Red Wings	1980	11	Chicago Blackhawks	1995	9
Edmonton Oilers	1975	16	Colorado Avalanche	2000	4
Los Angeles Kings	1966	25	Dallas Stars	2002	2
Montreal Canadiens	1925	66	Detroit Red Wings	1980	24
New Jersey Devils	1982	9	Edmonton Oilers	1975	29
New York Islanders	1973	18	Florida Panthers*	1999	5
New York Rangers	1969	22	Los Angeles Kings	2000	4
Philadelphia Flyers	1968	23	Minnesota Wild*	2001	3
Winnipeg Jets	1956	35	Montreal Canadiens	1997	7
Pittsburgh Penguins	1962	29	Nashville Predators*	1997	7
St Louis Blues	1968	23	New Jersey Devils	1982	22
Toronto Maple Leafs	1932	59	New York Islanders	1973	31
Vancouver Canucks	1969	22	New York Rangers	1969	35
Washington Capitals	1974	17	Ottawa Senators*	1996	8
			Philadelphia Flyers	1997	7
			Phoenix Coyotes	2004	0
			Pittsburgh Penguins	1962	42
			San Jose Sharks*	1994	10
			St Louis Blues	1995	9
			Tampa Bay Lightning*	1997	7
			Toronto Maple Leafs	2000	4
			Vancouver Canucks	1996	8
			Washington Capitals	1998	6
Average		***30.3***			***11.9***
Average Excluding Expansion Teams					***13.5***
**New Team Since 1991*					

Table 2

Summary Statistics

	NBA		NFL		NHL	
Variable	***Mean***	***Std. Dev.***	***Mean***	***Std. Dev.***	***Mean***	***Std. Dev.***
Facility Age	14.13	13.15	23.21	17.39	16.39	15.52
Years in City	26.22	12.80	37.36	22.59	27.59	24.70
Team Win Percent	0.50	0.16	0.50	0.19	-	-
Lagged Team Win Percent	0.50	0.16	0.50	0.19	-	-
Points	-	-	-	-	82.76	18.32
Lagged Points	-	-	-	-	81.76	18.58
SMSA Population	4,977,110	4,676,094	4,320,850	4,242,717	6,577,973	5,734,012
Real Franchise Value ($Mil)	$206.33	$96.05	$448.10	$256.04	$143.58	$66.76
SMSA Real Per-capita Income	$38,543.68	$5,921.65	$38,913.59	$6,024.44	$40,080.62	$5,733.45
Number of Observations	382		447		251	

Table 3
Fixed Effect AR1 Coefficient Estimates

	NBA		NFL		NHL	
Model	1	2	3	4	5	6
Log of Real Per Capita Income	0.351**	0.355**	1.005***	0.99***	0.416*	0.507**
	0.137	*0.137*	*0.121*	*0.115*	*0.242*	*0.245*
Log of Population	0.013	0.0096	-0.019	-0.028	0.239	0.202
	0.096	*0.096*	*0.065*	*0.062*	*0.177*	*0.181*
Win Percent	0.011	0.007	-0.026	-0.019		
	0.057	*0.057*	*0.037*	*0.036*		
Lagged Win Percent	0.186***	0.188***	0.052	0.053		
	0.061	*0.061*	*0.038*	*0.037*		
Points					0.0002	0.0003
					0.0005	*0.0005*
Lagged Points					0.002***	0.002***
					0.0005	*0.0005*
Facility Age	-0.001	-0.0007	-0.005**	-0.005**	-0.0005	-0.001
	0.002	*0.0027*	*0.002*	*0.002*	*0.003*	*0.004*
Facility Age Squared	-0.00001	0.0000008	0.00009**	0.00009***	0.00005	0.00002
	0.00005	*0.00005*	*0.00004*	*0.00003*	*0.00006*	*0.00006*
Tenure in City	-0.002	-0.002	-0.004	-0.002	0.011	0.013
	0.0101	*0.0101*	*0.005*	*0.005*	*0.008*	*0.008*
Tenure in City Squared	0.0011***	0.0011***	0.00006	0.00003	-0.0004*	-0.0005**
	0.00017	*0.00017*	*0.00007*	*0.00007*	*0.0002*	*0.0002*
Team Owns Facility Dummy	-0.070		-0.091		0.205**	
	0.057		*0.117*		*0.101*	
Facility Age - Team Ownership Interaction		0.003		0.133***		-0.006
		0.011		*0.045*		*0.019*
Facility Age - Team Ownership Interaction Squared		-0.0002		0.002*		0.0003
		0.0004		*0.001*		*0.0007*
Intercept	0.527***	0.508***	-3.482***	-3.815***	-2.594***	-2.806***
	0.061	*0.061*	*0.119*	*0.115*	*0.072*	*0.0736*
rho_ar	0.74	0.74	0.896	0.893	0.898	0.904
sigma_u	0.65	0.651	0.249	1.565	0.613	0.706
sigma_e	0.119	0.119	0.14	0.135	0.117	0.119
rho_fov	0.967	0.967	0.7598	0.993	0.965	0.973
n	354	354	415	415	227	227
RSq: Within	0.68	0.68	0.22	0.28	0.50	0.48
Between	0.26	0.27	0.02	0.001	0.22	0.32
Overall	0.26	0.27	0.25	0.008	0.07	0.11
Breusch-Pagan Test for Random Effects	83.69***	85.38***	220.24***	220.72***	42.08***	50.98***
Hausman Test	266.66***	311.15***	117.98***	55.41***	154.13***	67***
Wooldridge Test for Autocorrelation	129.736***	137.319***	336.827***	344.064***	71.374***	73.076***

***Coefficient is significant at the 1% level or less

**Coefficient is significant at most at the 5% level but more than the 1% level

*Coefficient is significant at most at the 10% level but more than the 5% level

Table 4
Analysis of Facility Ownership Determinants

	NBA Facilities 1991 - 2005		NFL Facilities 1991 - 2005		NHL Facilities 1991 - 2004	
	Panel Probit	**Panel Logit**	**Panel Probit**	**Panel Logit**	**Panel Probit**	**Panel Logit**
Population	0.0000001	0.0000002	-0.000002***	-0.000002***	-0.0000002	-0.0000003
	0.0000001	*0.0000002*	*0.0000007*	*0.0000009*	*0.0000002*	*0.0000002*
Real Per-capita Income	-0.0001*	-0.0002*	0.000007	-0.00001	0.00001	-0.00004
	0.00008	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0002*
Facility Age	-0.066***	-0.116***	-0.136**	-0.193**	-0.0975**	-0.141**
	0.017	*0.03*	*0.059*	*0.079*	*0.042*	*0.056*
Age of Team	0.138***	0.267***	0.137**	0.176**	0.054	0.078*
	0.037	*0.058*	*0.063*	*0.074*	*0.033*	*0.042*
Real Construction Cost	0.0000000005	-0.0000000001	0.0000000007	0.000000002	0.000000009*	0.00000002**
	0.000000002	*0.000000003*	*0.000000003*	*0.000000004*	*0.000000005*	*0.000000007*
Public Proportion of Construction Funding	-3.675***	-6.269***	-10.887***	-14.921***	-2.993	-4.515*
	1.03	*1.583*	*4.241*	*4.856*	*2.0107*	*2.438*
Multiteam Facility	-1.648	-3.095	2.079	2.751	2.535*	3.846**
	1.202	*1.727*	*2.195*	*2.618*	*1.531*	*1.943*
Intercept	2.11	2.704	3.115	5.259	-3.316	-3.368
	2.591	*3.75*	*4.757*	*6.248*	*4.0329*	*5.623*
n	365	365	447	447	245	245
Likelihood Ratio Test	71.22***	62.85***	128.87***	121.41***	97.72 ***	89.20***
Wald Chi-2	56.34***	48.73***	11.78	15.11**	26.29***	27.99***

***Coefficient is significant at the 1% level or less

**Coefficient is significant at most at the 5% level but more than the 1% level

*Coefficient is significant at most at the 10% level but more than the 5% level

Figure 1
Proportional Effects of a One-year Change in Facility Age - NFL