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THE ECONOMIC SIGNIFICANCE OF COMPETITIVE BALANCE IN THE NATIONAL BASKETBALL ASSOCIATION: AN EMPIRICAL ANALYSIS OF THE DETERMINANTS OF LOCAL DEMAND

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Abstract

In the study of sports economics the notion of competitive balance is well known. This thesis seeks to expand upon this well known notion and use it as part of an empirical analysis of the determinants of local demand for NBA franchises. This paper starts by focusing on the traditional notion of competitive balance, with specific regard to the sport basketball and the National Basketball Association specifically. It then quantifies the degree of competitive balance in the NBA since 1990 using metrics similar to those used by Quirk and Fort in their 1992 book *Pay Dirt: The Business of Professional Team Sports*. An extensive amount of linear regression analysis is then conducted, first looking at all teams and then teams belonging to certain market types. The empirical results indicate that competitive balance is not a significant determinant of local demand. The results also indicate key differences in the determinants between low-income market teams and high-income market teams. I make two recommendations as to how the NBA could beneficially alter its business model based upon these regression results: abolishing guaranteed contracts and changing the 100/0 home/away gate split.

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Introduction

Sports franchises rake in billions of dollars in revenue annually, are part of the fabric of our society, and have a high degree of transparency in terms of their managerial decisions. These factors make the business of professional sports leagues prime for microeconomic analysis. In this thesis I will look specifically at the National Basketball Association, operating primarily in the USA with one team currently in Canada. The economics of this thesis reside mainly in my regression analysis of the determinants of local demand for NBA franchises.

This thesis will start by spending a considerable amount of time discussing the notion of competitive balance in sports leagues, with a focus on the NBA, and its theoretical relationship with the demand for sports. Then a number of different metrics will be presented that serve to quantify the amount of competitive balance in the NBA.

Regression analysis of the determinants of local demand will be the main focus of section two. I will first look at the determinants of local demand by considering all observations for teams from 1990 to 2007. I will then run regressions only for teams belonging to specific home-city market types. The market types that will be considered are: high-income, low-income, low-population, and high-population markets. The goal here is to determine if any differences exist in the local demand determinants according to market type.

Any sort of changes that can be recommended on the basis of this empirical analysis will be important for the NBA moving forward and are discussed at the end of this thesis. Hopefully the recommended changes to the NBA’s business model contained within this thesis are considered in the upcoming year as the league and the player's association works toward a new collective bargaining agreement.

The content of this thesis is laid out as follows. Chapter one will discuss competitive balance in general and with regard to basketball specifically. Chapter two presents the various metrics used to measure competitive balance in the NBA. Chapter three will present a brief summary of the NBA's current business structure. Chapter four will present and discuss linear regressions results concerning competitive balance and local demand, and chapter five will present and discuss similar regression results ran for different home-city market types. Chapter six will attempt to bring all the regression results together and discuss any implications they may have on the NBA's business structure moving forward.

Chapter 1: Competitive Balance and the NBA

What is Competitive Balance?

Imagine a twenty-team sports league in which the same team finishes with the highest amount of wins every year and this same team wins the championship every year. Would the other nineteen teams survive financially in the long-run? Would they have any semblance of a fan base? One could reasonably assume the answer to these questions to be no. One would also be reasonable in making the claim that the fan base of the dominant team would become bored and lose interest in the league. When fans pay to attend a game, or watch a game on television, they are doing so in large part due to the uncertainty of the outcome of that game. Miraculous finishes, victorious underdogs, and point spreads are primary reasons why fans have interest. If there were no uncertainty in a game's outcome, none of the aforementioned would exist. This leads to the reasonable assertion that the hypothetical league mentioned above would cease to exist in the long run.

Although the above example is one that is fictitious and unlikely (something we economists, if I may include myself as one, often employ), it stresses the importance of uncertainty and its relationship with fan interest. This all-important uncertainty is the foundation of competitive balance. Competitive balance is a general term used to gauge a league's uncertainty. A league that is deemed to have a high degree of uncertainty in its games would have a high degree of competitive balance. Correspondingly, a league that has a low degree of uncertainty in its matchups would have a low degree of competitive balance. In short, competitive balance and the level of uncertainty are positively correlated. Uncertainty and demand are also theorized to be positively correlated, so in this way measuring competitive balance is an important factor in approximating and anticipating demand. (Quirk & Fort 1992) It is important to note that there is no single, empirical metric for measuring competitive balance; measuring competitive balance with differing metrics is the focus of chapter 2.

Historical Relevance of Competitive Balance

Before I delve any deeper into my thesis, it would be prudent to present the reader with some historical evidence as to the relevance of competitive balance. For the sake of saving myself many painstaking hours of research, I will present a few historical case studies taken from Quirk and Fort's 1992 book entitled Pay Dirt: the Business of Professional Team Sports. Although these examples are just a paraphrasing of Quirk and Fort, they will show that competitive balance is not something we number geeks created to give us an excuse to study sports.

First, let us look at the case of the All American Football conference that existed during the late 1940's. It was a league that was dominated by the Cleveland Browns with one close rival, the San Francisco 49'ers. The Cleveland Browns won the championship every year that the league existed. They never lost more than two games during the league's four year existence. In 1946, the AAFC's first year, the Browns averaged 57,000 fans per home game, but by the 1949 season, the Browns averaged fewer than 30,000 fans despite no drop off in performance. Along with the dominance of the Browns and 49'ers, there existed teams that performed horribly. In 1946 the Miami Seahawks finished 3-11-0 and proceeded to drop out of the league. In 1947 the Baltimore Colts finished 2-11-1 and were so bad that the league allowed them to draft players from other teams! In 1948 the Brooklyn Dodgers finished 2-12-0, averaged less than 10,000 fans per home game, and were forced to merge with the New York Yankees (yes, this is football!). All the while the AAFC had to compete with the National Football League, and at the end of 1949 season the league could not survive and disbanded. Interestingly, the Cleveland Browns moved to the NFL and won three out of the next six championships.

Next, let us examine the famous 1927 New York Yankees baseball team, belonging to the American League. The Yankees had an astonishing lineup that featured Babe Ruth, Lou Gehrig, Bob Meusel, and Waite Hoyt. They went on to finish with a 110-44 record, a full nineteen games better than the second place Philadelphia Athletics. The Yankees aggregate home attendance went up from 1,027,000 in 1926 to 1,164,000 in 1927. The aggregate attendance for the rest of the American league fell from 4,913,000 to 4,613,000 because of the lack of uncertainty. This is what the theory of competitive balance is all about; demand for baseball outside of New York City fell because there was a low amount of competitive balance in the American League.

There are a myriad of other historical examples pertaining to both American and international sports leagues that offer further evidence of the validity of the theory of competitive balance. That being said, for the sake of brevity, I hope the two examples presented above present enough evidence for the reader to realize the importance of competitive balance and the validity of its relationship with the demand for sports. What you may have noticed is that neither of the historical examples presented pertained to the sport of basketball. That is because professional basketball has not existed as long as other sports leagues, and during the sport's professional infancy, it did not possess the same popularity of other sports. Hoping to have demonstrated the legitimacy of competitive balance, I will now move to a discussion of competitive balance and the sport of basketball specifically.

Competitive Balance in Basketball

Thus far, I have discussed competitive balance as though it should be equitably expected from all team sports. Surely, that may not be the case. Some sports may be easily dominated by a player with outlier-type talent, making high degrees of competitive balance unlikely. Others may require high levels of interdependence amongst teammates, engendering higher levels of competitive balance. The question this section attempts to answer is whether the sport basketball falls into the former or the latter categorization.

To get an expert opinion on the issue, I interviewed Peter Baggetta, Assistant Director of Rugby at Penn State University. Baggetta is obviously a rugby expert, but he is also a basketball expert. Baggetta has played the sport at the collegiate level, coached the sport at the high school and junior college level, and currently teaches basketball classes for the Kinesiology Department at Penn State. This makes Baggetta an excellent source for professional, comparative analysis of team sports.

When asked about the ability of one player to impact the outcome of a game in team sports, Baggetta said, “In all team sports there is always that special player…that has the ability to make his or her teammates much better. They play above everybody else, but by doing that, I believe, that they make the whole sport better.” He went on to discuss the Larry Bird/Magic Johnson, Michael Jordan, and Kobe Bryant/Lebron James eras to illustrate how in each successive era the standard at which basketball was played elevated because of those special players. When asked to compare the degree to which these special players can impact the outcome of the game in rugby compared to basketball, “The outcome of the game is probably more greatly determined in basketball [by these special players] because…you have less players on the court. But in rugby one great kicker could win you the game.” The fact that these players with outlier-type talent can greatly impact games and in turn lower the amount of competitive balance in basketball is important. In a basketball game, a dominant player could, theoretically, take up to 100 percent of his/her team shots, while in other sports this capacity is limited. Take baseball for example, a dominant hitter will only get to bat one out of every nine at bats, about eleven percent.

Another issue that has received discussion amongst basketball experts is the low supply of tall people and its impact upon competitive balance in the sport. In a 2007 *New York Times* article, David Berri, an economist at California State University- Bakersfield, put forward the theory that the small supply of very tall individuals contributes to the lack of competitive balance in basketball. According to Berri, the population from which basketball teams draw upon is quite small. He states:

> “The average American man is 5 feet 10 inches. The average N.B.A. player, though, is 6-7, and nearly a third are 6-10 or taller. This height requirement poses a significant problem for the league. Only 2 percent of adult men are taller than 6-3 and a tiny number are at least 6-10.” (Berri, 2007)

This small pool of talent results in an inequitable division of talent, as there are not enough talented, tall individuals to go around. Berri backs up this assertion by citing Stephen Gold, an evolutionary biologist, who said, “…when a population is relatively small, the difference between the very best and the average athlete will be quite large.” (Berri, 2007) This statement would indicate that the talent level amongst the small population of tall people would be quite skewed, with only a few very talented players.

Other basketball enthusiasts have argued against this line of thinking. Phil Birnbaum offered an argument against Berri iterated on his blog a year later in response to Berri's *New York Times* feature article (Birnbaum, 2007). Birnbaum's rebuttal has three main points: basketball players are not all tall, tall people are easily noticed, and tallness is evident early. Birnbaum states:

> "How many teenagers would have pursued an NBA career, but didn't know they would eventually be able to pass and shoot and read a defense extremely well? Probably lots. How many teenagers would have pursued an NBA career, but didn't know they would eventually be extremely tall? Probably very few… The fact that height is important in the NBA results in *more* competitive balance compared to other sports, not less." (Birnbaum, 2007)

Birnbaum does not offer much empirical evidence, as is evident by his use of the word probably twice in one quotation. However, assuming tall people are noticed early in life and are given opportunities to play competitive basketball, because of the advantage they offer a team, seems logical.

In my opinion, the argument that the small supply of tall people decreases competitive balance is the correct one. However, the extent to which this small supply hinders competitive balance may be shrinking as we have seen an increase in the supply of tall players from European Nations, specifically tall centers with shooting skills (Dirk Nowitzki, Mehmet Okur, Andrea Bargnani, and Zydrunas Ilgauskas to name a few). Berri's argument has much more empirical and expert support, whereas Birnbaum seems to put forth a highly subjective argument. The players Shawn Bradley, Manute Bol, Gheorghe Muresan, and Yao Ming surely provide evidence in support. These players were all over 7 feet tall, a very small population pool. They were all given extensive training from a relatively young age and ample opportunity to play in the NBA because of their height. However, Yao Ming was the only one that was able to dominate because he possessed some actual basketball talent, something that is rare amongst those of his height. *The fact that the sport of basketball draws so heavily upon a small population of tall individuals with a large, unequal distribution of basketball talent, in combination with the ability for one player to dominate a game, inherently makes the sport uncompetitive*.

<u>The NBA and Competitive Balance in the Modern Era</u>

In this chapter, I have established that competitive balance makes sense in theory and presented some historical examples from the 20's and 40's. I have also talked about the sport of basketball in general and how it might not be conducive to high levels of competitive balance. But what about the modern era (I will be referring to the modern era in the NBA as the last eighteen years of its existence, 1990-2008) of the National Basketball Association, is there any evidence that competitive balance holds any significance? I present some examples to conclude this chapter.

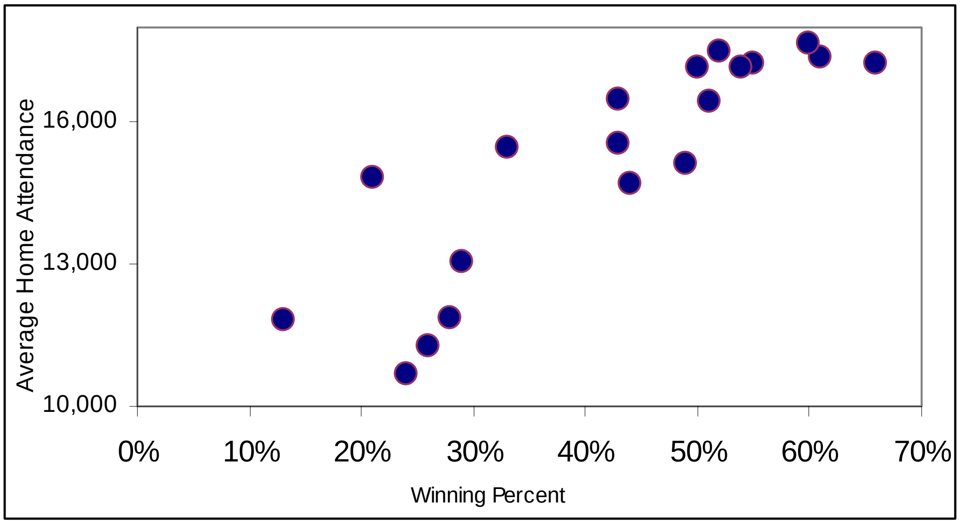
First, let us look at the Denver Nuggets franchise during the modern era, an example that will exemplify the typical relationship between attendance and winning percentage (refer to Table 1.1 below). All throughout the 1990's the Denver Nuggets were not exactly a stalwart franchise, as they finished with a winning percentage above .500 only once. The city of Denver did not give up on their team and attended more in seasons in which they had greater winning percentages, and they were noticeably absent during the years that the Nuggets had abysmal records. The Nuggets' winning percentage dropped considerably from .43 to .26 between the 1995-96 season and 1996-97 season; their average home attendance nose-dived as well from 16,474 to 11,254. During the 2003-04 season the Nuggets finished with a winning percentage above .500 for the first time in a decade, and the city responded by increasing their demand for the team dramatically to 17,506 per game. This was also the first season for the Denver Nuggets' new star player, Carmelo Anthony, so this may have also had a positive impact upon demand for the team. There are some other specific examples evident in the table and figure that follow this paragraph. We see that for the Denver Nuggets winning percentage and home attendance were, for the most part, positively correlated.

Table 1.1 : Denver Nuggets Winning Percentage and Average Home Attendance by Year

Year	*Regular Season Win %*	*Average Home Attendance*
2008-09	66%	17,223
2007-08	61%	17,364
2006-07	55%	17,230
2005-06	54%	17,137
2004-05	60%	17,657
2003-04	**52%**	**17,506**
2002-03	**21%**	**14,824**
2001-02	33%	15,460
2000-01	49%	15,105
1999-00	**43%**	**15,554**
1998-99	**28%**	**11,879**
1997-98	13%	11,800
1996-97	**26%**	**11,254**
1995-96	**43%**	**16,474**
1994-95	50%	17,171
1993-94	51%	16,433
1992-93	44%	14,719
1991-92	29%	13,032
1990-91	24%	10,685

Data Source: win % - www.basketball-reference.com
Attendance – www.apbr.org

Figure 1.1: Scatter Plot of Denver Nuggets Winning Percentage and Average Home Attendance by Year



Data Source: see Table 1.1

The Sacramento Kings provide a differing example, one that shows that the relationship between uncertainty (measured by win percentage) and demand may not be so cut and dry. The Kings moved from Kansas City to Sacramento, a city with no other professional sports teams (NFL, NHL, or MLB teams), in 1986. Like the Denver Nuggets, the Kings under-performed throughout the 1990's, not finishing with a win percentage above .500 until 1998. However, unlike the city of Denver, the city of Sacramento continued to maintain a high level of demand despite the poor performance. The Kings have played in ARCO arena since 1988, which has a maximum capacity of 17,317 (ARCOarena.com). Looking at Table 1.2, we see that the Kings averaged maximum capacity from the 1992-93 season to the 1996-97 season despite never finishing with a winning percentage above .500! This is likely due to the fact that the Kings were the only professional sports team in town and fans could not choose to attend a different team. The city had the same attendance during the 1999-00 to 2005-06 seasons, during which time the Kings never finished with a winning percentage *below*

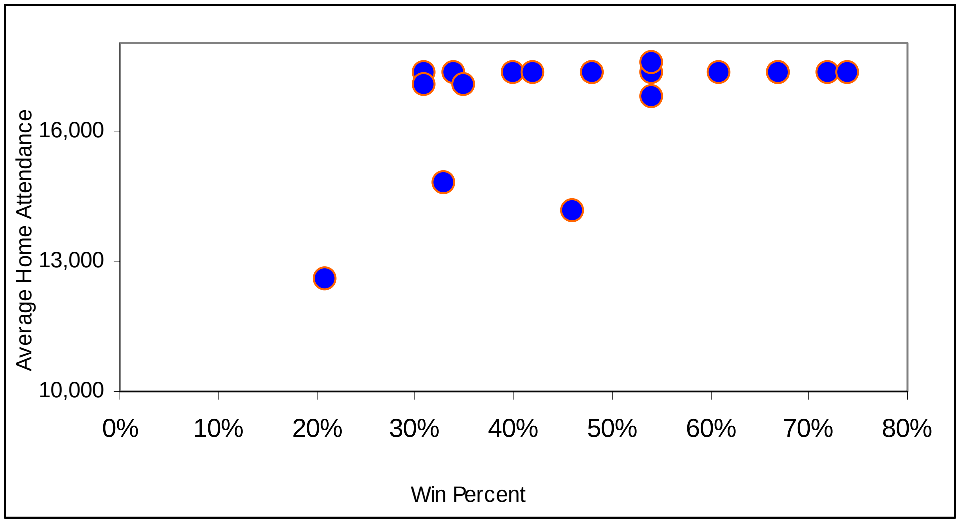
.500. There is a ceiling that is evident when looking at the scatter plot of winning percent and average home attendance; the kings likely had high levels of unsatiated demand during the early 2000's due to their small arena size. However, Sacramento's infatuation with the Kings may be drawing to a close as is evident when looking at the average home attendance during the last two years. Nonetheless, the maximum attendance numbers for the Kings during the 90's, when their winning percentage was low, shows that the theory of competitive balance and demand being positively correlated cannot be uniformly applied to all teams in the NBA.

Table 1.2: Sacramento Kings Winning Percentage and Average Home Attendance by Year

Year	*Regular Season Win %*	*Average Home Attendance*
2008-09	21%	12,571
2007-08	46%	14,150
2006-07	40%	17,317
2005-06	54%	17,317
2004-05	61%	17,317
2003-04	67%	17,317
2002-03	72%	17,317
2001-02	74%	17,317
2000-01	67%	17,317
1999-00	54%	17,562
1998-99	54%	16,750
1997-98	33%	14,767
1996-97	42%	17,317
1995-96	48%	17,317
1994-95	48%	17,317
1993-94	34%	17,317
1992-93	31%	17,317
1991-92	35%	17,014
1990-91	31%	17,014

Data Source: win % - www.basketball-reference.com
Attendance – www.apbr.org

Figure 1.2: Scatter Plot of Sacramento Kings Winning Percentage and Average Home Attendance by Year



Data Source: See Table 1.2

To show that the case of the Sacramento Kings is indeed an exception to the rule of competitive balance and not the rule itself, a simple linear regression is in order. Refer to Table 1.3 below, in which average home attendance per season for each team, during the modern era, was regressed upon the team's corresponding winning percentage for that year. This is an extremely simplistic model and does not take into account a myriad of other factors that may impact attendance, things such as an arena's capacity, America's economic performance, existence of other sports franchises within a city, and the presence of star players. The coefficient for regular season winning percentage is approximately equal to 6800, but despite the models' simplicity, it possesses a high t-value of about 10 and is indeed statistically significant. This indicates that regular season win percentage and home attendance are indeed positively correlated, which is in line with the reasoning derived in this chapter. The highly significant, large constant value in combination with the relatively low R-squared value tells us that there is a large degree of variation in home attendance due to factors outside the model. Taking these outside factors into account, as well as developing more intricate models to look at demand, will be the focus of section two.

Table 1.3: Linear Regression: Regular Season Winning Percentage (Independent Variable) & Average Home Attendance (Dependent Variable) <All NBA Teams from 1990-2008>

	Coefficient	*Standard Error*	*T- Value*	*P-Value*
Reg. Season Win %	68.195	6.7567	10.09	0.00
Constant	13468.6	354.14	38.03	0.00
$R^2 = .1577$ # of obs. = 546				

Data Source: win % - www.basketball-reference.com
Attendance – www.apbr.org

Chapter 2: Measuring Competitive Balance in the NBA

Having established the concept of competitive balance and its alleged importance in creating fan interest, the question now becomes how does one measure levels of competitive balance empirically? There is no simple answer to this question. Numerous articles have been published across different sports/labor economics journals that present different metrics for measuring competitive balance. In this thesis I will present metrics that are consistent with Quirk and Fort (1992). The metrics they employ are ideal for this thesis because they are straight-forward to calculate, easy to comprehend, and are commonplace in the study of competitive balance.

An observation one should make when looking at measures of competitive balance is whether the metric being used focuses on regular season winning percentages or the distribution of championships. The theory of competitive balance applies to the uncertainty of the outcome of all games; therefore, the outcome of championships should be equally uncertain as the outcome of regular season games. However, this is often not the case. The level of competitive balance obtained from looking at the distribution of championships can differ from the relative measure of competitive balance obtained when looking at the regular season winning percentage of the same league. This can be due to the fact that some teams may be built to succeed in winning championships at the cost of regular season winning percentage whereas other teams may be built to perform well in the regular season at the cost of winning championships. This thesis will look at measures of competitive balance pertaining to both regular and post-season performance. More emphasis will be placed on measurements of regular season competitive balance.

This is because regular season attendance, as the reader will see in chapter three, is the primary revenue source for NBA teams.

There are three metrics of competitive balance I will present in this chapter: ratio of actual and idealized standard deviations of win percentages, lifetime win percentages ranked by achievement measure, and titles per year amongst active teams. Two additional metrics concerning the range of regular season win percentages and excess tail frequencies can be found in the appendix. I will go into detail outlining how each measure of competitive balance is calculated and present the empirical results for each as applied to the NBA.

I am using the same methodology as Quirk and Fort (1992), applied to modern data, with a few minor changes. Where possible, I will present the reader with metrics from the National Hockey League for comparative purposes. The NHL is an appropriate sport for comparison because they play the same number of games in the regular season, each sport has five players on the court/ice at once (plus the goalie in hockey), and in both sports the home team keeps 100 percent of gate revenue (Quirk and Fort 1992).

Ratio of Actual and Idealized Standard Deviations

The next measure of competitive balance is the ratio of actual and idealized standard deviations of the winning percentages of the league. This is often called the "Noll-Scully" measure or metric of competitive balance, as it was first theorized by Noll (1988) and applied by Scully (1989). The basic concept is to compare the actual standard deviation of a league's regular season win percentages to those that would exist in an "ideal" league. By "ideal" league, we are referring to a league that has perfect competitive balance in that each team has an equal chance to win each game it plays. An ideal league would approximately follow the standard normal distribution with a mean winning percentage of .500 and a standard deviation of .5/squareroot(N), where N is the number of games playing by each team during that season.

The actual standard deviation of a league's winning percentage is calculated by taking the difference of each team's winning percentage at season's end and the league average. Then, by squaring each difference, summing them up, and dividing the summation by the number of teams in the league one obtains the league's variance of win percentage. Take the square root of this number and one has the standard deviation of win percentage for that year.

Calculating the ideal standard deviation of a league is quite simple. The ideal league has a winning percentage that is normally distributed with mean .5 and standard deviation equal to .5 divided by the square root of the number of games played by each team. When more games are played during a regular season it results in a lower ideal standard deviation for that league. In the NBA they play 82 games every season, so the ideal standard deviation of the league is equal to .50 divided by the square root of 82 which is approximately equal to .055.

By dividing the actual standard deviation by the ideal one, one obtains a measure of competitive balance. A high ratio for a league indicates deviation from perfect competitive balance, the higher the ratio the greater the deviation. The lowest the ratio can possibly be is one, in this instance the league exhibits the same standard deviation that would exist under perfect competition. See the results for the NBA below; ratios for years prior to 1990 are taken from Quirk and Fort (1992).

The most striking result from the output is just how uncompetitive the NBA was during the 1990's. In the 1980's the NBA was very uncompetitive with an average ratio of actual and ideal standard deviations equal to 2.730. It is extraordinary that the ratio rose even more in the 1990's, with an obscenely high value of 3.398 in 1996! This was because of the dominance of elite teams during the mid 90's, namely the Chicago Bulls, coupled with the existence of perennial bottom feeders, such as the expansion Vancouver Grizzlies (who never won more than 22 games the entire decade) and the Los Angeles Clippers. The ratio values seem to drop a little during the first part of the 2000's; however, this increase in competitive balance seems to have been short-lived, as we have witnessed another upsurge in the Noll-Scully ratio during the past two years. The sudden jump from a ratio of 2.355 in 2006 to the much higher ratio of 3.005 in 2007 is particularly interesting.

To put these gaudy figures into perspective let us compare the NBA to the NHL. The ratios of the NBA dwarf those of the NHL. Since 1990 the NHL never had a higher ratio than that of the NBA. The 1996 and 2007 years of observation are particularly telling. In the 1996-1997 season the NBA had a Noll-Scully ratio of 3.398 compared to a 1.382 value for the NHL. In the 2007-2008 season the NBA had a Noll-Scully ratio of 3.005 while the NHL had a ratio of 1.020, nearly perfectly balanced. These stark contrasts exist over a decade apart and show that the NBA has *very* low levels of competitive balance.

Table 2.1: Noll-Scully Metric - Actual/Ideal Standard Deviation of W/L %'s

Year	NBA Std Dev W/L%	Ideal Std Dev	NBA **Ratio: Actual/Ideal**	NHL **Ratio: Actual/Ideal**
1990	0.155	0.055	2.810	1.823
1991	0.156	0.055	2.834	1.676
1992	0.155	0.055	2.815	2.604
1993	0.174	0.055	3.150	1.838
1994	0.158	0.055	2.867	1.973
1995	0.168	0.055	3.048	2.052
1996	0.188	0.055	3.398	1.382
1997	0.186	0.055	3.371	1.709
1998	0.157	0.071	2.213	1.712
1999	0.158	0.055	2.865	1.758
2000	0.154	0.055	2.797	1.827
2001	0.136	0.055	2.456	1.551
2002	0.142	0.055	2.566	1.564
2003	0.134	0.055	2.422	1.606
2004	0.152	0.055	2.756	---
2005	0.134	0.055	2.427	1.610
2006	0.130	0.055	2.355	1.572
2007	0.166	0.055	3.005	1.020
2008	0.169	0.055	3.065	1.352
40's **	0.161	0.066	2.440	1.690
50's **	0.119	0.059	2.020	1.880
60's **	0.147	0.056	2.620	1.900
70's **	0.131	0.055	2.360	2.540
80's **	0.150	0.055	2.730	1.910
90's	0.166	0.055	2.940	1.853
00'-08'	0.146	0.055	2.650	1.513
Modern Day Average (90-08')	0.156	0.056	2.805	1.702
Total Average	0.146	0.057	2.537	1.898

Raw Data Source: www.basketball-reference.com ; www.hockey-reference.com
Methodology: Pay Dirt by Quirk and Fort (1992)
**Numbers for years prior to 1990 from Pay Dirt by Quirk and Fort (1992)

Lifetime W/L Percentages

When looking at the lifetime win percentages of teams in the NBA, we again turn to looking at the “ideal” league. We know that in the “ideal” league all teams will have lifetime winning percentages very close to .500. When looking at the actual lifetime win percentages of teams in the NBA this is obviously not the case. Teams like the Lakers have been historically dominant, whereas teams like the Clippers have been historical doormats. We can translate this observation empirically to obtain yet another measure of competitive balance.

To do this, one first calculates the sample standard deviation for each team over their tenure in the league. This is done by dividing .500 by the square root of the average number of games played each season during the team's tenure in the league. This gives us the population standard deviation. Dividing this number by the square root of the number of years the team has been in the league gives us the sample standard deviation for each team. Next, we divide the difference of .500 (the average winning percentage) and a team's actual win percentage by this sample standard deviation to figure out how many standard deviations a team's W/L percentage lies above or below the mean. By ranking this value from highest to lowest we obtain a sort of lifetime "achievement rank".

The results are not surprising given the lack of competitive balance in the NBA determined using the Noll-Scully metric. No comparative metrics for the NHL are presented here for sake of brevity. What these results do show is that the NBA has been uncompetitive throughout its entire history, and the uncompetitive nature of the league is nothing new. It is interesting to note that some historically dominant franchises, such as the Boston Celtics and Philadelphia 76ers, have underperformed in the modern era as compared to their historical dominance, while some teams, like the San Antonio Spurs, have performed exceptionally well over the past eighteen years despite their history of losing. However, Table 2.3 indicates that over the past eighteen years the league has seen not only an uncompetitive spread of win percentages, but the *same teams are winning* and the *same teams are losing.* This fact may have an impact upon fan interest in certain markets and perhaps on the aggregate level. I will discuss the implications of this phenomenon more in chapter six.

Table 2.2: 1990-2008 NBA W/L % Ranked by Achievement Measure

Team	Years in League	Lifetime W/L %	Standard Deviations above .500*
San Antonio Spurs	19	0.667368	13.1
Los Angeles Lakers	19	0.623737	9.7
Utah Jazz	19	0.623684	9.7
Phoenix Suns	19	0.614526	8.9
Houston Rockets	19	0.571737	5.6
Portland Trail Blazers	19	0.566474	5.2
Detroit Pistons	19	0.556895	4.4
Indiana Pacers	19	0.554632	4.3
Oklahoma City Thunder	19	0.550684	4.0
Chicago Bulls	19	0.531579	2.5
Orlando Magic	19	0.522579	1.8
New Orleans Hornets	19	0.518526	1.4
Miami Heat	19	0.514842	1.2
Cleveland Cavaliers	19	0.514789	1.2
New York Knickerbockers	19	0.514211	1.1
Boston Celtics	19	0.492421	-0.6
Dallas Mavericks	19	0.487263	-1.0
Sacramento Kings	19	0.479105	-1.6
Atlanta Hawks	19	0.467053	-2.6
New Jersey Nets	19	0.458474	-3.2
Philadelphia 76ers	19	0.447316	-4.1
Milwaukee Bucks	19	0.434421	-5.1
Minnesota Timberwolves	19	0.428158	-5.6
Toronto Raptors	14	0.415143	-5.7
Denver Nuggets	19	0.421737	-6.1
Golden State Warriors	19	0.415632	-6.6
Washington Wizards	19	0.393842	-8.3
Los Angeles Clippers	19	0.361789	-10.8
Memphis Grizzlies	14	0.3215	-11.9

*Assuming equal playing strengths (ACTIVE teams only with ten+ years of existence as of 2008)
Raw Data Source: www.basketball-reference.com
Methodology: Pay Dirt by Quirk and Fort (1992)

Table 2.2a: 1940-2008 NBA Lifetime W/L % Ranked by Achievement Measure

Team	Years in League	Lifetime W/L %	Standard Deviations above .500**
Los Angeles Lakers	61	0.618	16.4
Boston Celtics	63	0.594	13.2
San Antonio Spurs	42	0.579	9.2
Phoenix Suns	41	0.559	6.8
Philadelphia 76ers	60	0.535	4.8
Utah Jazz	35	0.543	4.6
Portland Trail Blazers	39	0.532	3.6
Milwaukee Bucks	41	0.524	2.8
Oklahoma City Thunder	42	0.518	2.1
Chicago Bulls	43	0.509	1.1
Houston Rockets	42	0.509	1.1
Indiana Pacers	42	0.507	0.8
Orlando Magic	20	0.506	0.5
Detroit Pistons	61	0.499	-0.1
New York Knickerbockers	63	0.498	-0.3
Dallas Mavericks	29	0.493	-0.7
New Orleans Hornets	21	0.491	-0.7
Denver Nuggets	42	0.492	-0.9
Atlanta Hawks	60	0.49	-1.4
Miami Heat	21	0.482	-1.5
Sacramento Kings	61	0.473	-3.7
Cleveland Cavaliers	39	0.462	-4.3
Golden State Warriors	63	0.461	-5.5
Washington Wizards	48	0.455	-5.6
Toronto Raptors	14	0.415	-5.7
New Jersey Nets	42	0.444	-6.5
Minnesota Timberwolves	20	0.416	-6.7
Memphis Grizzlies	14	0.326	-11.6
Los Angeles Clippers	39	0.362	-15.5

*Assuming equal playing strengths (ACTIVE teams only with ten+ years of existence as of 2008)
Raw Data Source: www.basketball-reference.com
Methodology: Pay Dirt by Quirk and Fort (1992)

Table 2.2b: Percent of NBA Teams with Lifetime Winning Percentages within Specified Standard Deviations*

	Percent of teams within:	Percent of teams:
	Two Standard Deviations	Outside Three Std Dev.'s
NBA -1946-2008	37.9%	55.2%
NBA 1990-2008	27.6%	65.5%

*Assuming equal playing strengths (ACTIVE teams only with ten+ years of existence as of 2008)
Raw Data Source: www.basketball-reference.com

Titles per Year amongst Active Teams

Thus far, only measures of competitive balance pertaining to regular season win percentages have been presented. It is important to calculate some measures of competitive balance that look at postseason performance as well. To do so, I will present the reader with the simple metric of championships per year amongst active teams. In the “ideal” league we expect a different team to win the championship every year. There are twenty-nine teams in the NBA, so we would expect each team to win a championship about one out of every 29 years of their tenure in the league. Therefore, in the long run, we would expect titles per year of existence for each sufficiently tenured team to be around .035. This is where the NBA deviates *greatly* from an ideally competitive league. See the results that follow.

The fact that the Lakers and the Celtics are atop this list should come as no surprise to even the casual NBA fan. From the days of Bill Russell winning six straight on the Celtics in the 60’s, to the days of Magic Johnson (Lakers) vs. Larry Bird (Celtics) in the 80’s, to the past two years when they have alternated hoisting championship trophies, these two teams have dominated the playoff and championship scene. These two teams have won almost half of all titles in NBA history! What is even more disturbing, and something the common fan may not realize, is that almost forty percent of active NBA teams have never won a championship! In fact, about 63 percent of the championships won, by active teams, have been won by a combined four teams! It is my opinion that these values show quite plainly how uncompetitive the NBA postseason has been; it is even more uncompetitive than the regular season. These results may have consequences on the level of demand for basketball in certain cities.

Table 2.3: NBA - Titles Won by Active Teams

Active Teams	Years of existence (10+)	Titles Won (total=67)	**Ideal Titles/Year**	**Titles/Year**
Boston Celtics	64	17	.035	0.27
Los Angeles Lakers	62	15	.035	0.24
Chicago Bulls	44	6	.035	0.14
San Antonio Spurs	43	4	.035	0.09
Indiana Pacers	43	3	.035	0.07
Philadelphia 76ers	61	3	.035	0.05
Detroit Pistons	62	3	.035	0.05
Golden State Warriors	64	3	.035	0.05
Houston Rockets	43	2	.035	0.05
New Jersey Nets	43	2	.035	0.05
Miami Heat	22	1	.035	0.05
New York Knickerbockers	64	2	.035	0.03
Portland Trail Blazers	40	1	.035	0.03
Milwaukee Bucks	42	1	.035	0.02
Oklahoma City Thunder	43	1	.035	0.02
Washington Wizards	49	1	.035	0.02
Atlanta Hawks	61	1	.035	0.02
Sacramento Kings	62	1	.035	0.02
Cleveland Cavaliers	40	0	.035	0.00
Dallas Mavericks	30	0	.035	0.00
Denver Nuggets	43	0	.035	0.00
Los Angeles Clippers	40	0	.035	0.00
Memphis Grizzlies	15	0	.035	0.00
Minnesota Timberwolves	21	0	.035	0.00
New Orleans Hornets	22	0	.035	0.00
Orlando Magic	21	0	.035	0.00
Phoenix Suns	42	0	.035	0.00
Toronto Raptors	15	0	.035	0.00
Utah Jazz	36	0	.035	0.00

Raw Data Source: www.basketball-reference.com
Methodology: Pay Dirt by Quirk and Fort (1991)

Summary of Results

All of the above metrics indicate that the NBA is an uncompetitive league, both historically and in the modern era. The uncompetitive nature of the NBA is evident when looking at regular season winning percentage and the distribution of championships. When the NBA is compared to other American sports leagues, such as the NHL, it has a lower amount of competitive balance. The Noll-Scully metrics calculated in this chapter will be used in regressions presented in subsequent chapters to see if they have an impact on demand. The uneven distribution of championships will become of particular importance in later chapters as well.

Chapter 3: The Business Structure of the NBA

The purpose of this chapter is to familiarize the reader with the basic business structure of the National Basketball Association. The business of the NBA is a complex and intricate topic that has enough substance to be the subject of a book. That being said, this chapter provides the reader with enough information to fully understand the discussions that will follow in later chapters concerning the implications of regression results. This chapter has three substantive sections: one outlining the collective bargaining agreement between the National Basketball Player's Association (NBPA) and the league, one which outlines the various ways in which NBA teams garner revenue, and another that summarizes the current business state of the NBA.

Collective Bargaining Agreement

The Bureau of Labor Statistics defines a collective bargaining agreement as, "[a] Method whereby representatives of employees (unions) and employers negotiate the conditions of employment, normally resulting in a written contract setting forth the wages, hours, and other conditions to be observed for a stipulated period (e.g., 3 years)." (U.S. B.L.S., 2008) The collective bargaining agreement (referred to as a CBA hereafter) between the NBA and the NBPA defines hundreds of different things, including the league's salary cap, structure for paying players, the draft, and rules regarding player trades. The current CBA was agreed upon in June 2005 and took effect during the 2005-2006 season. It will expire after the 2010-2011 season, unless extended to the 2011-2012 season by the league office by a December 15, 2010 deadline (Coon, 2010). I will go over the ways in which the current CBA defines: the salary cap, player contracts, and the escrow/luxury tax policy. The information herein, unless otherwise stated, is interpreted from a copy of the agreement posted on the NBPA's website.

The Salary Cap

The NBA has a soft salary cap. This means there is a set limit as to how much each team can pay its players, but there are certain exceptions that allow teams to exceed this limit. In addition, no team is permitted to have a total team payroll below 75 percent of the cap. The salary cap is re-set each year to a set percentage of the league's projected total basketball related income (BRI). In 2005-2006 season the percentage was 49.5 percent, in the remaining years of the CBA the percentage is set at 51 percent of the league's BRI. The league's salary cap has risen over time but it fell for the first time for the 2009-2010 season. With the Commissioner of the NBA, David Stern, predicting total losses of $400 million this season, it would be reasonable to conclude that the cap will decrease again next year (Mahoney, 2009).

Player Contracts

The CBA also places stipulations on player contracts. There are minimum and maximum amounts of money that a player can make each year based upon the number of years they have been in the league. The number of years a player has been in the league increases the minimum and maximum amount of money they can make annually, with rookies being subjected to a highly structured pay scale. An important aspect of player contracts, that will be discussed later, is the fact that contracts are guaranteed. Once a team signs a player to a contract, that team is obligated to pay that contract, in full, regardless of performance or injury. Because the risk of injury is so high in professional sports, the five most expensive contracts for each team are covered under a league-wide insurance policy that pays the team 80 percent of these players' base salary in the event of an injury (Coon, 2010).

Escrow System/ Luxury Tax

The current CBA employs an escrow system in an effort to ensure that the combined salaries of players never exceeded a specific percentage of the NBA's BRI. Since the end of the 2005-2006 season, this percentage has been set at 57 percent of BRI. This is different than the 51 percent of BRI that the salary cap is set at. Setting the escrow system at 57 percent of BRI means the league is ensuring that total player salaries never rise above 57 percent (teams can have salaries above the salary cap).

The system works by withholding a specified percentage of player salaries until the end of the season. This percentage started at 10 percent in the 2005-2006 season and has fallen to 8 percent for the 2009-2010 season. At the end of the season the league office tabulates the total BRI figure and compares it to the total value of player salaries and benefits. If the value of player salaries exceeds 57 percent of revenue, the owners keep enough of the escrow money to make up the difference and redistribute any remaining funds back to the players. If the value of player salaries does not exceed 57 percent of total league BRI than the entire fund is redistributed back to the players. If the 8-10 percent of withheld player salaries is not enough to cover the difference, the entire escrow account is distributed amongst the owners and additional money is withheld from player contracts the following year. The 2008-2009 season was the first time the entire escrow fund was withheld from the players and redistributed amongst the owners (Coon, 2010); this will most likely occur again this season (Badenhausen et al., 2009).

The CBA also defines a “tax” for teams that have total salaries over a specified threshold, commonly referred to as a luxury tax. Teams that have salaries above this threshold pay one dollar for each dollar they are over, so for example, if a team’s payroll is 5 million dollars over the luxury tax threshold they owe the league 5 million dollars in luxury tax. The threshold is determined each season by taking 61 percent of BRI, adjusting for benefits and previous projections, and dividing by the number of teams in the league. The luxury tax threshold is higher than the salary cap and only a few teams breaking this threshold each season. Interestingly, the Knicks have had to pay the most each season since 2005 and, in the 2006-2007 season, they paid more than six times the amount in luxury taxes than the next highest team (Coon, 2010). The luxury tax money that is collected by the league is re-distributed to each team that had a total salary under the tax threshold, with each of these teams receiving 1/30 (1/ # of teams) of the money. The excess money is kept by the league and is used for “league purposes”. This luxury tax acts as an instrument for revenue sharing amongst league teams, as it redistributes some money from high-spending teams to lower-spending ones.

<u>Sources of Revenue for NBA Teams</u>

Of particular importance when discussing the demand for basketball are the various ways in which NBA teams can garner revenue. The primary revenue stream for teams is gate receipts collected at home games, and the secondary revenue stream is national television broadcast deals; as of 2007, these two revenue streams combined for over half of the NBA’s total revenue (Forbes, 2007). Home attendance is of the utmost importance to teams because the NBA uses a 100/0 home/away gate split. This means that teams keep all the revenue from a game played in their home stadium and no revenue from games played on the road. This is not the case for all leagues; for example, the NFL operates using a 60/40 home/away split (Berri et al., 2004; Berri and Schmidt 2006)

This structure can result in positive externalities for home teams that host a team with a particularly popular player, Lebron James for example, because they capture all of the revenue associated with any increase in attendance. A few empirical studies have found that this externality does exist and it has a statistically significant relationship with demand. (Berri et al., 2004 ; Berri and Schmidt, 2006; Hausmann and Leonard, 1997) To quantify the phenomenon, Hausmann and Leonard determined that Michael Jordan generated over 50 million dollars in revenue for opposing teams over the course of his career.

The 100/0 gate split also results in an important dynamic between large and small market teams. Teams with large or rich markets, in theory, can charge higher prices for equal quality games. Market size is a critical component of team value and is the reason that either the Los Angeles Lakers of the New York Knicks have been the most valued franchise each year since 2002 (Forbes, 2009). As I will show later, teams in smaller markets face a tougher challenge to maintain profitability. This dynamic between large and small market teams will be covered in depth in chapters five and six.

There are other sources of revenue for teams including sponsorships, concessions, parking, and arena usage for privately owned arenas. Large, corporate sponsorships and brand management are important determinants of a team’s value (Forbes, 2009). The use of privately held arenas for non-basketball events is becoming more significant as teams like the L.A. Lakers have significantly increased their team value as a result of holding concerts, and other events, in their arena (Forbes, 2009). This is why stadium deals are so important in sports, and it can be the reason why a team like the Seattle Supersonics decides to leave town despite a quality market.

The Current State of the NBA

The current CBA between the NBA and the NBPA is set to expire at the end of the 2010-2011 season. The two parties have begun the negotiation process towards creating a new agreement, but reports from various media outlets indicate that an extension is far from being agreed upon. At the recent 2010 NBA All-Star Game David Stern predicted the NBA was going to lose over 400 million dollars this season and has lost millions in previous years; the NBA is no longer profitable (Mahoney, 2010). It seems that the NBA league office has all of the leverage in the negotiation process, as the owners have a financial incentive to not even have a season. There are a few things the owners would like to see changed under the terms of the new CBA.

The 57 percent amount of revenue that is given to players is too high in the eyes of David Stern, and he would like to see that number lowered under the new CBA. During *The BS Report with Bill Simmons,* an ESPN podcast, David Stern said, “We’re at a revenue percentage [of total revenue] right now with our players that is simply too high to power a sustainable business model” (Stern, 2010). The players will be likely to resist any effort to lower their allotted percentage of revenue.

No other possible changes to the current CBA have been definitively put forth by the NBA or the NBPA. Some possible changes to the guaranteed contract structure and/or the 100/0 home/away gate split may be in the league’s best interest. These possible changes, and the rationale behind them, will be the subject of the last chapter of this thesis. Next, I will present regression analysis of home attendance in order to determine an empirical foundation upon which to make suggestions regarding the new NBA CBA.

Chapter 4: Linear Regression Analysis of the Determinants of Local Demand

This is the first of two chapters presenting linear regression results of the determinants of local demand for NBA franchises. Local demand for an NBA franchise is defined, for the purposes of this thesis, as the total *home* attendance for a franchise during a season. Local demand does not take into account road attendance figures, local television ratings, or national television ratings. This chapter will have two substantive sections: first I will present and define all of the variables used in the regression, then I will present the results of the regression. The summary statistics for each variable are included in the appendix.

By running a simple OLS regression with local demand as the dependent variable and a number of independent variables I hope to determine which of these determinants has a statistically significant correlation with local demand. The independent variables used in this regression are: winning percent, winning percent during the previous season, playoff victories the previous season, time since last championship, level of competitive balance in the league (measured using the Noll-Scully metric), competitive balance during the previous season, per capita income of a team's home city, population, and a time dummy for the strike season. Each of these variables is defined in this first section of this chapter.

The winning percent and winning percent during the previous season variables are hypothesized to have positive correlations with local demand. Playoff victories and frequency of championship variables are also hypothesized to have positive a positive correlation coefficient. *A high Noll-Scully metric means low levels of competitive balance,* so the correlation coefficient for competitive balance in this regression is hypothesized to be negative in this model based upon the discussion contained within chapter one. One would assume that a large city would demand more basketball than a small city, so the population variable is hypothesized to have a positive correlation coefficient. One would also assume that a city that has a high per capita income would demand higher amounts of basketball, so the per capita income variable is hypothesized to have a positive correlation coefficient.

Regression Variables

Total Home Attendance – Dependent Variable

Aggregate home, regular season attendance per season, for each active NBA franchise, is used as the dependent variable for this regression. It is important to point out that this is different than the average home attendance figure used in the tables/figures presented in chapter one. I am using the total home attendance here because the coefficients in the regression will be easier to interpret and yearly variations in attendance will be larger in absolute value. Home attendance figures for the 1990-1991 season through the 2007-2008 season were considered, resulting in a maximum of 18 years of observation for any active franchise. A team must have been in its local market for two full seasons before being included in the regression. For example, the Charlotte Bobcats started playing games in Charlotte at the start of the 2004-2005 season, so their first year of observation included in the regression was the 2006-2007 season. This results in some teams not contributing a full 18 years of observations. There is some grey area here regarding the New Orleans Hornets. Because of Hurricane Katrina, they were forced to play some games in Oklahoma City during the 2005-2006 and 2006-2007 seasons. These years of observations will be excluded from the regression. The attendance figures were obtained through the Association for Professional Basketball Research website.

Win Percentage during Year i and Win Percentage during Year (i-1)

The first two independent variables in the regression model are win percentage during year i and during year (i-1). Each year of observation for which an active team is eligible is paired with the team's corresponding win percentage for that year and the win percentage during the prior year. This is the most direct way to measure a team's on-court regular season success. A higher win percentage is hypothesized to have a positive impact on total home attendance. Win percentage figures were obtained through basketball-reference.com.

Playoff Victories during Year (i-1)

The amount of playoff victories a team had during the previous season is included in the regression model. This variable is calculated by starting with a base of one if a team made the playoffs during the previous year and adding the amount of playoff victories during that previous year. The one is added to take account for the fact that some teams may get swept in the first round of the playoffs, in this case the playoff variable for next year of observation would equal one and not zero. Playoff victories were obtained through basketball-reference.com

Frequency of Championship Variable

The incidence of a championship victory by a team and the relative time between that victory and a year of observation is also included in the regression model. The calculation of this variable is more involved than the previous variables. If a team won a championship during the previous year the championship variable is equal to ten for that year of observation; it is equal to nine if a championship was won two years prior, eight if three years prior, seven if four years ago, etc.. If a team won the championship ten years ago the variable is equal to one, and it will be equal to zero the next year if the team does not win another championship. A new championship victory at any point in the countdown process resets the variable at ten, so for example, for a team that won the championship four years ago and also won it last year, the variable will equal ten and not seven.

The methodology behind the calculation of this variable is taken from a journal article by D. Berri and S. Brook (199) and subsequently applied in later empirical articles. In their regression model they calculated the championship variable as having values 0-20, which they found to be significant in predicting attendance. I made the decision that a variable taking a range of values from 0-10 would be more prudent, as a championship victory eighteen years ago will likely have little effect on ticket sales. A high value of the championship variable would be hypothesized to have a positive impact on ticket sales during a given year of observation. Data on championship victories was obtained through basketball-reference.com.

Competitive Balance during Year i and Year (i-1)

The Noll-Scully metric of competitive balance during each year of observation and the year prior is included in the regression model. This metric is identical for all teams for each year of observation, as it is a measure of the competitive balance of the entire league. The values for this variable were taken from chapter two, and an additional figure was calculated for the 1989 season in order to have a value for the competitive balance in year (i-1) variable for the 1990 year of observation. \

Population (measured in 100,000s) during Year i

The population of a team's home city during each year of observation is also taken into account. The US Census Bureau provides population estimates each year for metropolitan areas. The Canadian Census was the source for population estimates for Vancouver and Toronto. Some limitations using population estimates arose because only population estimates for incorporated areas are available for the 1990's. This resulted in incorporated places being used for population estimates for the 1990's and 2000's for the sake of consistency. Ideally, combined statistical areas data would have been used, so the population estimates would take into account people living outside of city limits. This is only a minor setback and should not markedly impact the regression results. I divided each of the population estimates by 100,000 in order for the correlation coefficient to be easily interpretable.

Per Capita Income during Year i

Estimates of per capita income for each home city during each year of observation are also included in the regression. The estimates were obtained through the Bureau of Economic Analysis website. Estimates were calculated for combined statistical areas, and serve to give a good depiction of a given city's purchasing power. A higher income per capita is hypothesized to have a positive impact on aggregate home attendance. When a city's residents earn more money, one would think their demand for basketball would rise, as they can afford to purchase luxury and entertainment goods.

The BEA does not provide income data for Canadian cities. The Canadian Census does not provide income per capita data; instead, they provide median income data. I was able to find income per capita data for Toronto for the 2005-2006 through the 2007-2008 seasons. All other years of observations for Toronto and the seasons the Grizzlies played in Vancouver were not included in the regression because no reputable income per capita estimates could be found. When the regression was run without the per capita income variable, with the Vancouver/Toronto observations, the output was not markedly different.

<u>1998 Dummy Variable</u>

A dummy variable was included for the 1998 years of observation because it was a strike-shortened year. Because there were fewer games played, the total home attendance numbers were systematically lower for all observations. The time dummy takes this into account. Time dummy variables for all years of observation were not included because they would take away any significance the competitive balance figures have on the model. This is because the competitive balance figures are identical for all teams during each year of observation.

<u>Discussion</u>

The below results have some striking implications. Competitive balance is insignificant and seems to have no impact on local demand. This is unexpected and suggests fans do not take into account the competitive balance of the entire league when making the decision to attend an NBA game. However, winning percentage is highly significant and positive which suggests that fans take into account the performance of their home team when making purchasing decisions. *Fans want to see their home team win, but they do not seem to care about the competitive balance of the league when making purchasing decisions*. Winning percentage is the most significant determinant of local demand in this model, outside of the 1998 dummy variable. This result follows the intuition of previous chapters, and it indicates that winning games is the best way for an NBA team to increase attendance.

Table 4.1: Regression Results; Dependent Variable- Total Home Attendance ; 1990-2007

Independent Variables	Coefficient	Standard Error	T-Stat	P-Value
Win Percentage - year i	2236.4 **	369.786	6.05	0.00
Win Percentage - year (i-1)	521.7	465.932	1.12	0.26
Playoff Wins - year (i-1)	1344.7	1536.2	0.88	0.38
Championships (0-10) variable	9214.8 **	1851.3	4.98	0.00
Competitive Balance - Year i	10668.9	17104.8	0.62	0.53
Competitive Balance - Year (i-1)	-5215.7	18242.5	-0.29	0.78
Population	90.4	223.2	0.41	0.69
Home City Per Capita Income	2.48 **	0.68	3.63	0.00
1998 Time Dummy (strike year)	-258977.3 **	25886.8	-10.00	0.00
Constant	441494.8	74551.3	5.92	0.00

N = 490

R^2 = 0.4419 ** - significance at the 5% level

F- Stat (9, 480) = 42.23

Data Sources: discussed in the body of this chapter; refer to appendix for a list of sources

The playoff wins variable was insignificant, but the championship variable was highly significant. This indicates that when it come to postseason performance, winning championships incites demand for years afterwards, while winning a few playoff games does not seem to generate demand the following year. The coefficient for population was not statistically significant. The size of a city has little impact on the amount of basketball a city demands. The per capita income of a city has a significant, positive relationship with local demand. A city with higher-earning inhabitants demands more basketball, all other things equal. This result is important because it means that local demand has a statistically significant determinant that has nothing to do with on-the-court performance. This result indicates that the city a team plays a significant role in determining demand. This result is reflected by home market being a significant determinant in the annual Forbes.com NBA team valuations.

Possible Variables to be added in the Future

There are a few variables that could be added in future research. The dependent variable, total home attendance, does not take into account sell-out games which results in unsatiated local demand. An independent variable taking into account sell-out games or manipulating the dependent variable in such a way to take this into account are both viable options. The racial composition of a city was found to be a significant variable in regression work done by Berri and Schmidt, with a high African-American population resulting in higher demand (Berri and Schmidt, 2006). This could be added in future work. They also found that the presence of popular All-Star players had a significant, positive relationship with road attendance; a variable taking into account the presence of All-Stars on a team's roster could be added.

Chapter 5: An Evaluation of the Determinants of Local Demand According to Market Type Using Linear Regression

In this chapter I will present linear regressions, with the same variables used in chapter four, which use observations from specific types of home cities. Four city categorizations will be used: low-income, high-income, high population, and low population. By running regressions for each type of home city I hope to determine any differences that may exist regarding the determinants of local demand. This chapter will be divided into two sections. I will first present and discuss figures containing the different coefficients for the three determinants of local demand determined in chapter five: winning percentage in year i, championships, and per capita income, and see how they differ across market categories. I will then present a discussion section; I will attempt to utilize chow tests, Wald tests, and the different coefficient values to arrive at some concrete, viable conclusions.

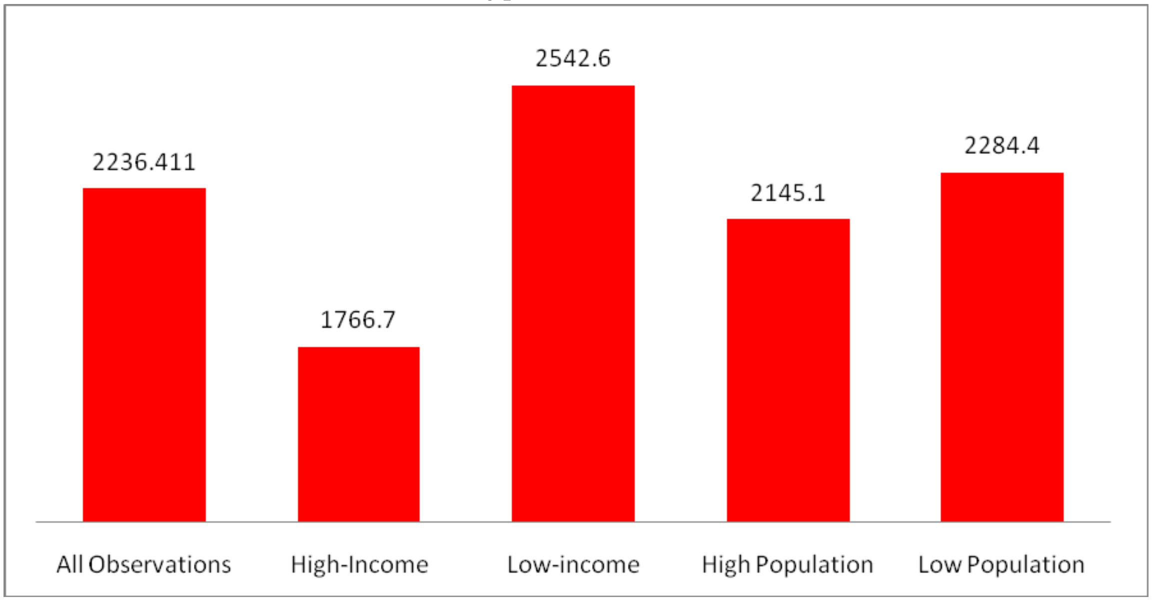
I will forgo discussing the specific regression output for each of the four categories for the sake of brevity. Tables outlining the summary statistics and regression results, as well as a brief summary of the results, for each of the four categories are contained in the appendix.

In order to determine how to classify each city, I calculated the average population estimate and the average per capita income estimate for each city from 1990-2007. The cities with the 15 highest averages in each category are classified as either high population or high-income cities, and the cities with the 15 lowest averages are classified as low-income or low population. A table with team categorizations is included in the appendix. The Oklahoma City Thunder were classified as the Seattle Supersonics because they did not move until 2008. The years the New Orleans Hornets played in Charlotte were classified the same way as the years of observation for the Charlotte Bobcats. Even though the Grizzlies did not move from Vancouver to Memphis until the 2001 season, Memphis was classified based on the average of its estimates from 1990 to 2007.

Winning Percentage in Year i

Looking at the various regression outputs, the most striking difference is the winning percentage coefficients. Refer to Figure 5.1 for a nice, visual depiction of the coefficient values across market types. The results suggest that the importance of winning games is not uniform across market categories. This difference is clearly seen when looking at high-income and low-income teams. High-income teams have a much lower coefficient for winning percentage when compared with that of all observations, low-income teams a much higher.

Figure 5.1: Coefficient of Winning Percent on Total Home Attendance by Market Type, 1990-2007



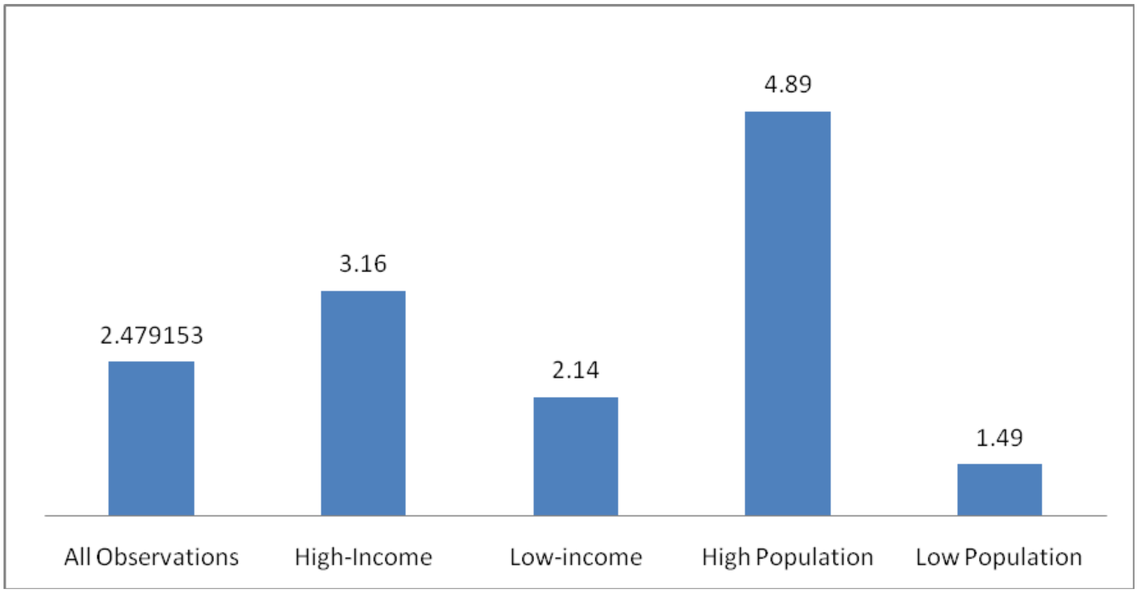
Refer to appendix for full regression output
Sources: same as in chapter 4

One could interpret these results as implying that teams in high-income markets can rely on the relative purchasing power of their market to generate demand, and they do not have to worry about winning games, to the extent that low-income market teams do, to generate local demand. A *great* example of this is the New York Knicks (New York City is classified as a high-income market). The Knicks have not posted a winning percentage above .500 since the 2000-2001 season, but their aggregate attendance figures have remained high, at an average of 780,000 per year over that time. I will utilize both a Chow test of the high-income market and low-income market regression and an F-test of an interaction variable containing income and win percentage in an attempt to elaborate on this point further in the discussion section of this chapter.

Income Per Capita

Figure 5.2 gives a visual depiction of the coefficient values for the per capita income variable. It is clear that per capita income is more important for high-income and large population teams and less important for low-income and small population teams. High-income markets are able to use the relatively high per capita income of those in their market to facilitate demand. Large population markets have a markedly high coefficient for per capita income. This could be due to a random fluctuation in the dataset; or it could be interpreted as further evidence that it is not just the amount of people in a market that matters, but it is the amount of people with discretionary income in that market that matters. It may be the case that in large population areas there are more individuals available, or these individuals are more likely, to choose the consumption of basketball games with discretionary income as income per capita rises.

Figure 5.2: Coefficient of Home City per Capita Income on Total Home



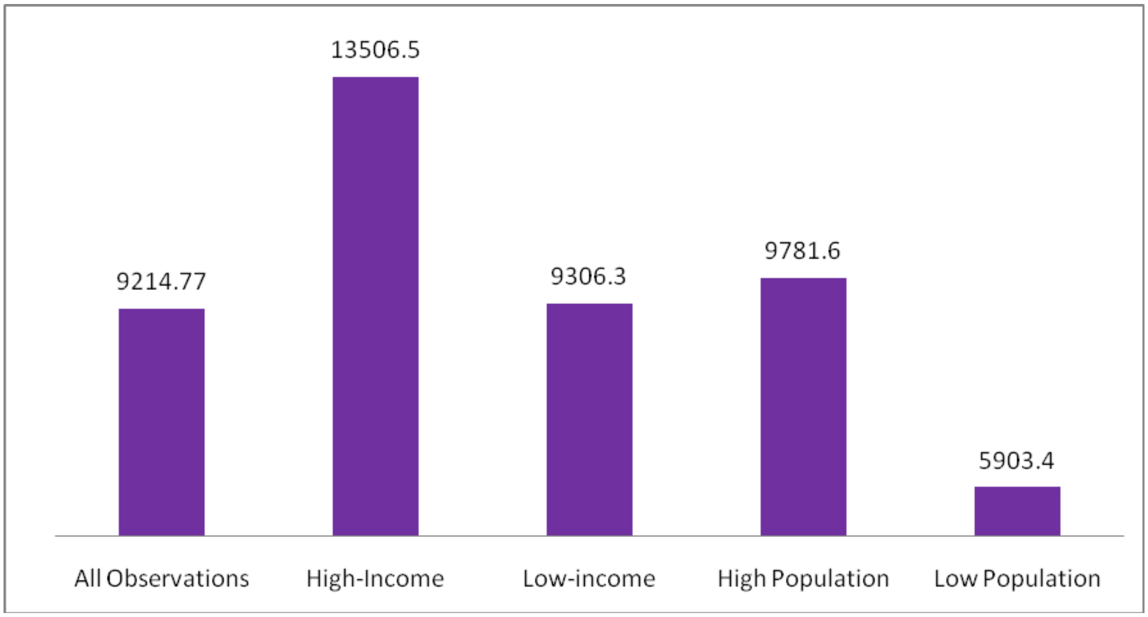
Attendance by Market Type, 1990-2007

Refer to appendix for full regression output
Sources: same as in chapter 4

Championship Variable

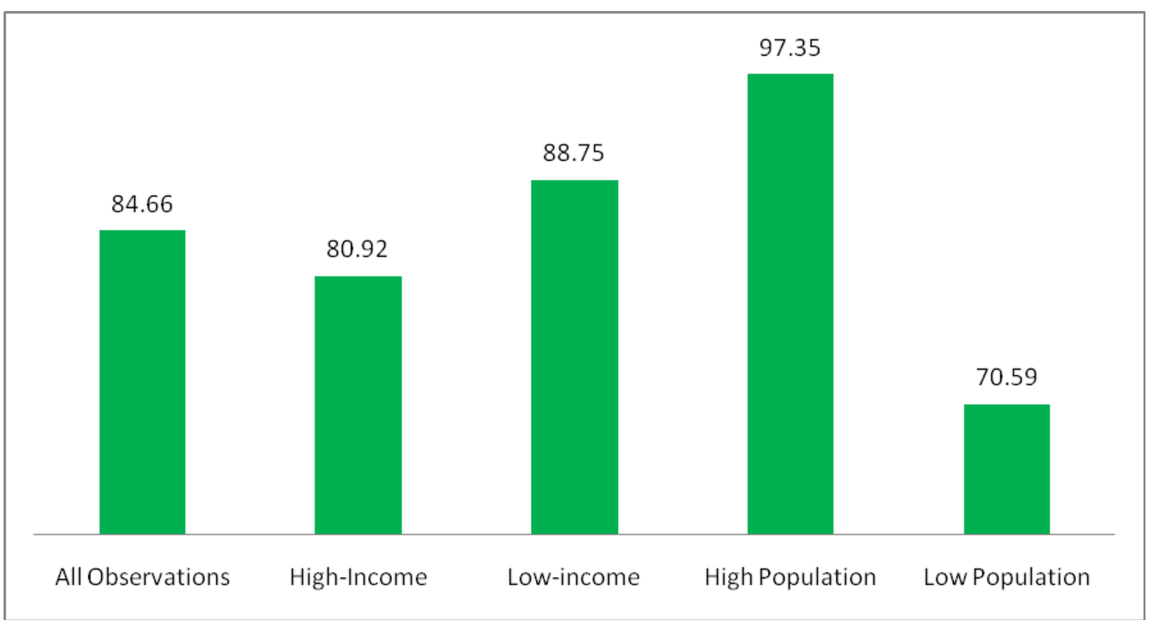
Figure 5.3 gives a visual depiction of the coefficient values for the championship variable formulated in chapter four. The championship variable is a very important determinant of local demand (small population is most likely insignificant because of a lack of observations). It has a large positive value that is highly significant across categories that have adequate observations. Keeping this result in mind, refer to Figure 5.4. From this we see that large population and high-income teams have many more non-zero observations than their respective counterparts. This leads me to believe that the importance of championships is likely to be fairly uniform across market types and the differences in the coefficients is most likely due to an uneven distribution of observations. This uneven distribution of observations is important in its own right (Although the distribution would be markedly different if Portland would have drafted Michael Jordan). If championships generate demand and championships are won mostly by high-income market teams, low-income markets are facing an uphill battle to maintain profitability.

Figure 5.3: Coefficient of Championship Variable on per Capita Income on Total Home Attendance by Market Type, 1990-2007



Refer to appendix for full regression output
Sources: same as in chapter 4

Figure 5.4: Percent Zero Observations of Championship Variable by Market Type, 1990-2007



Sources: same as in chapter 4

Discussion of Results

The regression output indicates a seemingly interesting relationship between high-income and low-income market teams. The computation of a Chow test statistic using the residuals from the two restricted regressions and the unrestricted regression indicate *there is a statistically significant difference between the two models* (refer to the appendix for the specifics of the Chow test). That is a good starting point, but the question now becomes: what is the key difference(s) between the two models and what is the implication(s) of this difference(s)?

It seems the most relevant difference between the two models lies in the different coefficients for winning percent and per capita income. High-income markets have a lower coefficient for win percentage and a higher coefficient for per capita income when compared with low-income market teams. This seems to suggest that, when compared with low-income market teams; *high-income market teams would experience a smaller increase in local demand from a rise in winning percentage during a given season and a smaller decrease in local demand from a drop in winning percentage when compared with low-income market teams*. A larger proportion of local attendance is determined by per capita income for high-income market teams than their low-income counterparts.

If we assume the variance in per capita income for a specific market from year to year to be less than a team's winning percentage, *the high-income teams may be able to rely on the relatively high per capita income of their market to decrease the variance in local demand they experience from year to year*. High-income teams have about the same mean of home attendance as low-income teams, but high-income teams have a significantly lower standard deviation of home attendance. (refer to appendix).

In an effort to provide further empirical support for the above assertions I calculated an interaction variable equal to win percentage multiplied by per capita income. I then ran the unrestricted regression (all observations regardless of market-type) with this interaction variable included amongst the independent variables. The goal was to calculate the partial derivative of attendance with respect to per capita income and win percent respectively; by doing so I hoped to quantify the differences in attendance resulting from equal wining percentages experienced by teams with different per capita income values. This regression is included in the appendix. The Wald test of win percent and the interaction variable was significant, indicating the coefficients are indeed different. However, the interaction variable had a very low T-statistic and contained zero within its 95 percent confidence interval. This led me to forgo the calculation of partial derivatives of attendance. The interaction variable's coefficient does not serve to disprove my above assertion, but it does not offer evidence in support. The model I have constructed cannot be used to calculate significant partial derivatives for attendance with respect to win percent and per capita income in the fashion I had intended.

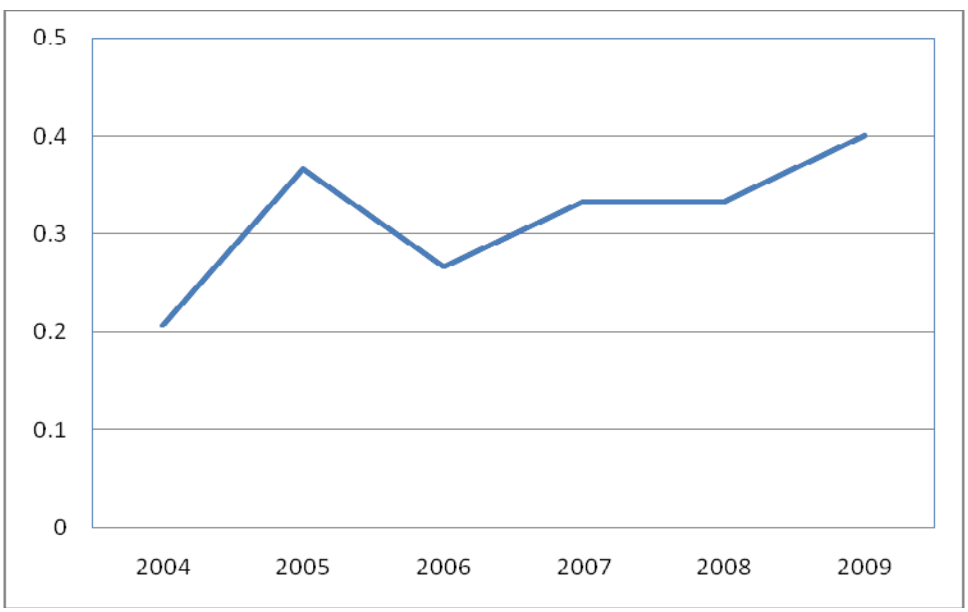
To summarize, the key implication of this chapter is low-income market teams have a larger incentive to have a high win percentage when compared with high-income market teams. High-income teams can rely on the relatively high purchasing power of their market to offset a low win percent year. This suggests that high-income teams would likely experience a smaller decrease in local demand during a particularly low win percentage year when compared with low-income teams. The statistical support of this assertion could be stronger, and should likely be the focus of any further research. The stark difference in coefficient values for winning percentage and per capita income between the two restricted regressions for high-income market and low-income market teams respectively, in combination with the significance of the Chow test statistic, offer the strongest evidence in support. The higher standard deviation, higher mean win percentage, and equal mean home attendance for low-income market teams compared to high-income market teams also offers support. A discussion of these results on the business structure of the NBA is the subject of the next chapter.

Chapter 6: Discussion of the Implications of the Empirical Results for the NBA

Business Structure of the NBA

The empirical work done thus far has entailed four important results: the NBA has low measures of competitive balance, competitive balance has an insignificant relationship with local demand, winning percentage is the most important determinant of local demand, and low-income market teams seem to a larger variance in local demand. The purpose of this chapter is to discuss the implications these results have on the current NBA business model. The main focus of the discussion will be ways in which the NBA can tweak its business model in such a way as to equalize the negative consequences associated with a losing season across market types. By doing so, the NBA can act to rectify the profitability inequities we have seen recently. The league cannot afford to do nothing, as there seem to be more and more teams operating at a financial loss. Refer to Figure 6.1. There are two aspects of the NBA's current business model I will suggest changes to: guaranteed contracts and the 100/0 home/away gate split.

Figure 6.1: Proportion of Teams Posting Operating Loss by Year; 2004-2009



Source: Forbes.com NBA Team Valuations

Guaranteed Contracts

Chapter one outlined some things about the sport of basketball that make it an inherently uncompetitive sport (short supply of tall people and ability of one start player to dominate), chapter two empirically showed the NBA was very uncompetitive, and, thankfully for the NBA, the regression work in chapters four and five indicated that this lack of competitive balance does not hinder local demand. However, the fact that the league is very uncompetitive means there will be teams with very low winning percentages and very high winning percentages each year. The regression results suggest that these low-win-percent teams would suffer low amounts of local demand, and presumably they would in turn experience a drop in revenue. The high winning percentage teams would experience an increase in local demand. If the same teams post a low winning percentage year after year they will find it difficult to remain profitable. The lifetime win percentage metric of measure competitive balance presented in chapter two (Table 2.2 & Table 2.2a) empirically shows that the same teams historically win and the same teams historically lose. This means the NBA should act to ensure that these very low winning percentage teams, which we know will inevitably exist every season because of the nature of competitive balance in the sport of basketball, are not the same teams every year.

An effective way to prevent teams from becoming continuously bad may be to eliminate the system of guaranteed contracts. With the system of guaranteed contracts teams are penalized for making poor contract decisions. If a team signs a player to a long-term contract and that player fails to perform, the team is forced to pay that player his full salary. However, high-income market teams, and teams with spend-hearty owners, are able to avoid the full repercussions of their poor decisions by signing additional players, forcing them to pay a luxury tax. These owners can afford to pay the luxury tax, whereas owners of low-income teams cannot. This system seems to disproportionately penalize low-income market teams, a common theme in the NBA.

The problem is compounded by the fact that general managers of teams can risk a team's long-term financial status in order to gamble on short-term on-the-court success, a moral hazard problem. Often times general managers will do this towards the end of their contracts in an effort to save their own job, similar to many moral hazard problems that arise in managerial compensation. Billy King of the 76ers signing Samuel Dalembert to a *58 million dollar, 6 year* contract and then promptly getting fired the next season is a good example. This contract has hindered the 76ers ability to sign players and build a solid team for years after the firing of Billy King (in my opinion). Bill Simmons of ESPN.com suggested in 2009 that Toronto Raptors' GM Bryan Colangelo was doing the same thing:

> "As I wrote in July, there's nothing more dangerous than a GM worried about his job who dumps the team's long-term interests to protect the short term. Everything Bryan Colangelo did this past summer screamed, "I need to keep my job!!!"" (Simmons, 2009)

It seems that he signed Hedo Turkoglu to an ill-advised 5 year, 53 million dollar contract in an attempt to engender short term success. If the deal does not work out, Colangelo gets fired and the Raptors have to pay out the contract.

The system of guaranteed contracts also presents some adverse selection issues. If a player signs a long-term deal, they do not have any financial incentive to put forth maximum effort. Some players may exert maximum effort because they possess an innate desire to be the best and win, while other players may slack off, not work hard, and coast through seasons just to collect their paychecks. A study by Berri and Krautmann found that 58 percent or 48 percent, depending upon the metric used, of the time NBA players experienced a drop in performance after signing a contract (Berri and Krautmann, 2006). Making contracts performance-contingent would presumably solve these adverse selection issues.

By eliminating the system of guaranteed contracts, the league is fixing an inefficient compensation system. The NBA must know it has a flawed system when it has cases such as: Jamal Tinsley getting paid 10.6 million dollars *not* to play by the Indiana Pacers over the next two seasons (Bill Simmons, 2010); the league's highest paid player in 2009-2010, Tracy McGrady, drastically underperforming; Stephan Marbury getting paid over 20 million dollars by the NY Knicks during the 2008-2009 season *not* to play; and the 76ers paying Elton Brand close to 15 million dollars this season to average 14 points and 6.5 rebounds. I could fill up the rest of this thesis with other egregious cases.

The system of guaranteed contracts is obviously flawed, and it prevents low-income market teams that sign bad contracts from competing in the long run. By abolishing the system in favor of one that allows teams to cut players who underperform, players are not receiving a lower percentage of total league revenue; instead, only players who perform to adequate standards are paid high salaries. This would not be unprecedented in the sports world was the NFL has non-guaranteed contracts. In a podcast interview with ESPN's Bill Simmons, the commissioner of the NBA, David Stern, said the following with regards to getting rid of guaranteed contracts:

> "I think it is realistic. Remember, if the league is guaranteeing that a certain amount of money will be paid to the players as a group, the absence of a guaranteed contract just means that it will be paid to players who are being deemed worthy of being on a roster." (Stern, 2010)

Therefore, I think it is safe to say that the league shares similar sentiments regarding guaranteed contracts, and I would be surprised if they were included as part of the new CBA.

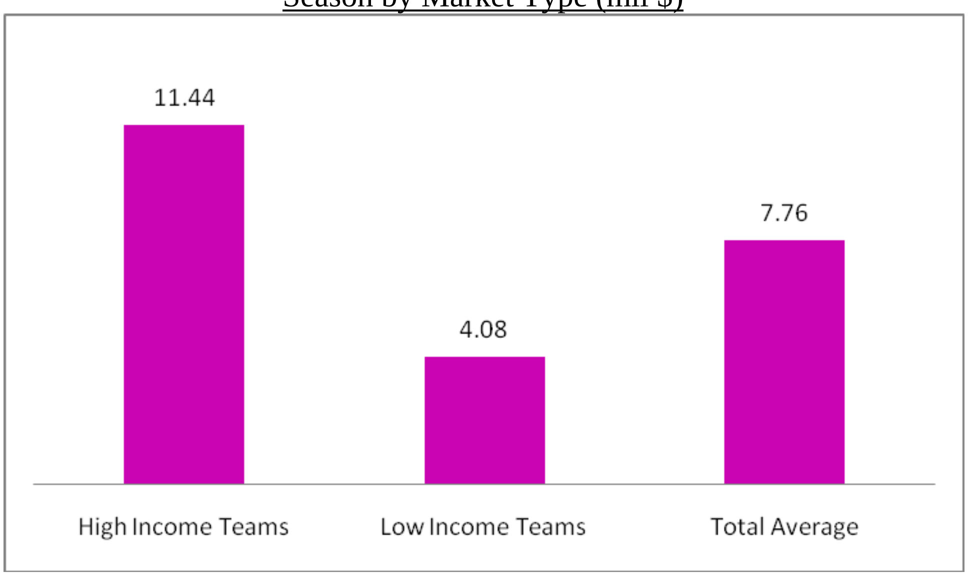
100/0 Home/Away Gate Split

The results of chapter five indicate that low-income market teams face a high variance in home attendance from year to year. This is in part due to their in ability to rely on the purchasing power of their market to facilitate demand during seasons in which their team is performing poorly. This suggests to me that low-income teams would experience a greater financial hit from a losing season than high-income teams experiencing a similar losing season. Even if this financial loss for a low-income team was equalized with large profits taken in during a subsequent winning season, in the long-run this high variance in local demand is detrimental to effective business forecasting; presumably, low-income team owners would have to take efforts to hedge against this inherent risk and may be prone to making conservative investments.

Changing the current 100/0 split to something along the lines of a 70/30 split could act to equalize the financial fallout associated with a losing season for all teams. If such a split were instituted, teams that operate in a low-income market would take in 30 percent of the gate receipt revenue associated with each of their road games. The 30 percent of home gate receipt revenue they lose in order to do so is likely to be less, especially in a low win year. Teams posting a highly successful year, regardless of market type, would likely experience a decrease in revenue under this new system.

The use of a 70/30 home/away gate split is an ambiguous figure and much empirical analysis would have to be conducted in order to determine an appropriate split, which is beyond the scope of this thesis. What is clear is that some sort of a split is necessary to ensure the long-run profitability of all teams. Refer to Figure 6.2 below; it shows just how bad the low-income teams performed financially this past season when compared with the high-income ones. The financial performance is measured using operating income. This is a metric that Forbes.com creates to determine the profits of various NBA teams from year to year; it can be negative (the operating income of low-income teams would have averaged .67 if the Los Angeles Lakers were not classified as belonging to a low-income market). If this trend continues, many teams may collapse financially. An increase in revenue sharing from other outlets, such as decreasing the luxury tax threshold, increasing the amount of the luxury tax, or by some other way, may also work. However, I believe that changing the home/away gate split would be the simplest and most effective route. Either way, it is clear that the home/away gate split is something that needs to be expanded upon empirically by future studies.

Figure 6.2: Average Operating Income of NBA Teams during the 2008-2009 Season by Market Type (mil $)



Source: Forbes.com NBA Team Valuations(Note: because of the addition of the Oklahoma City Thunder and the removal of the Seattle Supersonics for the 2008-2009 year, the Miami Heat were moved to the high-income category and OK City Thunder inserted in the low-income category)

Discussion

Reported by multiple media outlets, the meeting between NBA and NBPA officials at the 2010 NBA All-Star Game regarding the new CBA was quite contentious to say the least. David Stern and the league office seem to think that simply lowering the percentage of revenue given to players is an effective way to end the league's woes, a sentiment echoed in a quote referenced in chapter three (also reported by Mahoney, 2010). The NBPA is of the position that the league should institute higher amounts of revenue sharing in order to correct the NBA's recent financial woes (Mahoney, 2010). This argument by the NBPA is rather vague, and they have not publicly disclosed specific recommendations as to how to increase revenue sharing. Regarding this specific argument between the NBA and the NBPA, I would tend to agree with the NBPA, based upon the content of this thesis.

However, the owners hold all of the leverage to force some sort of change to the NBA's business model. Getting rid of guaranteed contracts in favor of performance-contingent ones is a concession on behalf of the players; their contracts may or may not be paid in full 100 percent of the time, and the poorly motivated (hidden type) players would have to exert maximum effort all of the time. Guaranteed contracts would help the owners maintain a good on the court product and minimize the financial ramifications associated with a bad contract decision. Instituting some gate split between home and away teams would help the struggling low-income market teams. Owners of low-income market teams should step up and be more vocal about their competitive disadvantages in order to get a gate split instituted. It will be inter esting to see how these events unfold over the next year and a half. With the complexities of the issues up for negotiation, it would not be surprising if the NBA and NBPA cannot come to terms and we witness a labor lockout.

Conclusion

This thesis has been concerned with the theory of competitive balance and its economic relevance for the National Basketball Association. The NBA is an uncompetitive league, more so than other sports leagues, when looking at regular season winning percentage or championship distribution. The theory of competitive balance would suggest that this lack of competitive balance hurts the local demand for the sport. Regression analysis conducted in this thesis suggests otherwise. Rather, winning percentage, championships, and home city per capita income seem to be the most important determinants of those that were considered, and competitive balance has a statistically insignificant relationship with local demand. Fans do not seem to care about the competitive balance of the league when making purchasing decisions; instead, the empirical results indicate they care most about the performance of their specific team during that season.

The regression analysis conducted with respect to home city market type raises some important issues. It seems that having a high winning percentage matters more for low-income market teams in terms of generating local demand; however, there still exists a large enough incentive for all teams to try to win games in any given year regardless of market type. Another key result of the comparative regression analysis was the high variance in local demand experienced by low-income teams because of their heavy reliance upon win percentage to generate demand. This indicates that low-income market teams have trouble maintaining local demand during down years when compared with their high-income market counterparts. This is likely due to the fact that high-income market teams reside in cities where fans can afford to spend large portions of their income on basketball games, i.e. a luxury good, and do not need to be incentivized to attend games via on-the-court performance.

These results have important implications regarding the NBA's business model. Some sort of a change is obviously needed, as the league is in dire financial straits. The two specific policy changes recommended in this thesis were abolishing the system of guaranteed contracts in favor of performance contingent ones and changing the 100/0 home/away gate split to implement revenue sharing. These policy changes would likely act to equalize the financial hit from a losing seasons for teams across market types and incur higher amounts of rollover at the bottom of the league.

The NBA is in the midst of ongoing negotiations with the NBPA to reach an agreement on a new collective bargaining agreement. The league wants to drop the percent of revenue allocated to players and the players think a higher degree of revenue sharing is the answer. The two suggestions recommended within this thesis force concessions on behalf of both parties and could serve as the pillar for an agreement. As a basketball fan, I have not seen this much talent on the NBA hardwood in my lifetime, and I hope that some sort of amicable agreement is reached. As an objective economist, I realize that billions of dollars are at stake and would not be surprised to witness a labor lockout.

Appendix

Chapter 2 Appendix

Range of W/L percentages

This is the simplest measure of competitive balance presented in this paper. It is simply the highest winning percentage in a given season minus the lowest winning percentage. The benefit of presenting this information lies in its simplicity; it is an easy metric to understand. However, the range does not give a good representation of the competitive balance of the entire *league*. Nonetheless, it is a good starting point. The ranges of the win and loss percentages of the NBA from 1990 to 2008 are presented below.

Table 2.1A: Range of W/L %'s

YEAR	NBA- RANGE	NHL- RANGE
1990	0.52	-
1991	0.63	-
1992	0.62	-
1993	0.61	-
1994	0.55	-
1995	0.70	-
1996	0.67	-
1997	0.62	-
1998 (NBA-50 games)	0.58	-
1999	0.63	-
2000	0.52	-
2001	0.49	-
2002	0.53	-
2003	0.49	-
2004	0.60	-
2005	0.52	-
2006	0.55	-
2007	0.62	-
2008	0.60	-
40's **	0.55	0.343
50's **	0.37	0.344
60's **	0.49	0.331
70's **	0.50	0.513
80's **	0.56	0.409
90's	0.61	-
00'-08'	0.55	-
Modern Day Average (90-08')	0.582	-
Total Average	0.518	-

Raw Data Source: www.basketball-reference.com
Methodology: Pay Dirt by Quirk and Fort (1992)
**Numbers for years prior to 1990 from Pay Dirt by Quirk and Fort (1992)

Excess Tail Frequencies

The ideal league described above follows the standard normal distribution. Elementary statistics tells us that about two-thirds of the ideal league would be within one standard deviation of the mean. It also tells us that about 4.6 percent of the ideal league will lie outside of two standard deviations from the mean and only .3 percent of the league will lie outside 3 standard deviations from the mean. Using this information, we have another way of comparing the actual distribution of win percentages to an ideal league in order to obtain a measure of competitive balance.

The league average of win percentages of any given year is about equal to .500. So taking the ideal standard deviation of the league, multiplying it by two, and adding it to .500 will give us an upper cut off point. Similarly, we can calculate a lower bound. By calculating the percentages of the league's teams that have win percentages above or below the cut-off points and comparing it to the ideal percentage of 4.6 we have a measure of competitive balance. We can do a similar calculation by calculating the three standard deviation cut-offs and seeing what percent of the league's W/L percentages lie outside of them. The results of these calculations are presented below.

Table 2.2A.: 1917-1990 Excess Tail Frequencies Compared to Standard Normal**

Deviation Totals- cutoffs in parentheses	Actual freq (%)	Idealized Freq (%)	Excess Frequency
NBA *- 2 Standard Deviation Totals* (under.388, over .611)	55.50%	4.60%	50.90%
NHL *- 2 Standard Deviation Totals* (under.374, over .626)	32.40 %	4.60%	28.3%
NBA *-3 Standard Deviation Totals* (under.332, over .667)	32.40%	.30%	32.10%
NHL *- 3 Standard Deviation Totals* (under.374, over .626)	13.1%	.30%	12.8%

**Source: Numbers taken directly from Pay Dirt by Quirk and Fort (1992)

Table 2.3A: 1990-2008 Modern Era Excess Tail Frequencies Compared to Standard Norma for the NBA Onlyl*

Deviation Totals- cutoffs in parentheses	Actual Freq (%)	Idealized Freq (%)	Excess Frequency
NBA *-2 Standard Deviation Totals* (under.388, over .611)	50.73%	4.60%	46.13%
NBA *-3 Standard Deviation Totals* (under.332, over .667)	35.40%	.30%	35.10%

Raw Data Source: www.basketball-reference.com
* Active teams as of 2008 with at least 10+ years in the league
Methodology: Pay Dirt by Quirk and Fort (1992)

The above values illustrate quite clearly just how uncompetitive the NBA has been. More than half of the league lies outside of the two standard deviation cutoffs, both over the total lifespan of professional basketball and modern day specifically. Even more striking is the fact that roughly two-thirds of the teams in the league lie outside of the three standard deviation cutoffs for both time periods presented. The historical values of the NHL compared to the NBA confirm that the NBA has very low amounts of competitive balance when using this metric.

Chapter 4 Appendix

Data Sources

Attendance- Association for Professional Basketball Research.

www.Apbr.org/attendance.html

Win Percent – www.Basketball-Reference.com

Playoff Wins- www.Basketball-Reference.com

Championships- www.Basketball-Reference.com

Competitive Balance Ratios- Chapter 2- Figure 2.2

Population- U.S. Census Bureau annual incorporated places population estimates

1990's: http://www.census.gov/popest/archives/1990s/SU-99-07.html

2000's: http://www.census.gov/popest/cities/SUB-EST2008-4.html

Toronto estimates ; Vancouver observations omitted (years in between calculated w/ uniform % increase) :

http://www40.statcan.gc.ca/l01/cst01/demo05a-eng.htm

http://geodepot.statcan.ca/Diss/Highlights/Page8/Table1_e.cfm

Per Capita Income- U.S. Bureau of Economic Analysis Estimates

http://www.bea.gov/regional/reis/default.cfm?selTable=CA1-3&section=2

Toronto estimates ; Vancouver observations omitted (years in between calculated w/ uniform % increase) :

http://www40.statcan.gc.ca/l01/cst01/labor51c-eng.htm

http://www.richmondhillonline.com/Business_Information/greater_toronto.asp#Per

http://www.omaccanada.ca/en/market/toronto/default.omac

Regression Summary Statistics

Summary Statistics - All Regression Observations

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable					
Attendance	490	675037.1	126296.1	256568.0	985722.0
Independent Variables					
Win Percentage - year i	490	0.51	0.15	0.13	0.88
Win Percentage - year (i-1)	490	0.51	0.15	0.13	0.88
Playoff Wins - year (i-1)	490	3.32	4.50	0.00	17.00
Championships 0-10	490	1.02	2.66	0.00	10.00
Competitive Balance - Year i	490	2.79	0.33	2.21	3.40
Competitive Balance - Year (i-1)	490	2.79	0.33	2.21	3.40
Populations	490	1536524	2004923	160076	8310212
Per Capita Income	490	31146.9	7924.8	16037.0	60983.0

Chapter 5 Appendix

Income and Population Categorizations

High-Income Teams	Low-Income Teams	High-Population	Low-Population
Boston Celtics	Atlanta Hawks	Charlotte Bobcats	Atlanta Hawks
Chicago Bulls	Charlotte Bobcats	Chicago Bulls	Boston Celtics
Dallas Mavericks	Cleveland Cavaliers	Dallas Mavericks	Cleveland Cavaliers
Denver Nuggets	Indiana Pacers	Detroit Pistons	Denver Nuggets
Detroit Pistons	L.A. Clippers	Houston Rockets	Golden-State Warriors
Golden-State Warriors	L.A. Lakers	Indiana Pacers	Milwaukee Bucks
Houston Rockets	Memphis Grizzlies	L.A. Clippers	Minnesota Timberwolves
Milwaukee Bucks	Miami Heat	L.A. Lakers	Miami Heat
Minnesota Timberwolves	New Orleans Hornets	Memphis Grizzlies	New Orleans Hornets
New Jersey Nets	(Charlotte Hornets)	N.J. Nets	(Charlotte Bobcats)
New York Knicks	Orlando Magic	N.Y. Knicks	Seattle Supersonics
Seattle Supersonics	Phoenix Suns	Philadelphia 76ers	Orlando Magic
Philadelphia 76ers	Portland Trailblazers	Phoenix Suns	Portland Trailblazer
Toronto Raptors	Sacramento Kings	San Antonio Spurs	Sacramento King
Washington Wizards	San Antonio Spurs	Toronto Raptors	Utah Jazz
	Utah Jazz		Washington Wizards

Regression Summary Statistics

Summary Statistics - Rich Market Regression Observations

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable					
Attendance	254	674947.9	121117.1	296965	983517.0
Independent Variables					
Win Percentage - year i	254	0.48	0.16	0.13	0.88
Win Percentage - year (i-1)	254	0.48	0.15	0.13	0.88
Playoff Wins - year (i-1)	254	2.94	4.43	0.00	17.00
Championships 0-10	254	1.17	2.75	0.00	10.00
Competitive Balance - Year i	254	2.79	0.33	2.21	3.40
Competitive Balance - Year (i-1)	254	2.79	0.33	2.21	3.40
Populations	254	1996288	2468032	353395	8310212
Per Capita Income	254	33980.1	8356.9	20350.0	60983.0

Summary Statistics - Poor Market Regression Observations

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable					
Attendance	236	675133.0	131901.7	256568	985722.0
Independent Variables					
Win Percentage - year i	236	0.54	0.15	0.16	0.82
Win Percentage - year (i-1)	236	0.54	0.15	0.16	0.82
Playoff Wins - year (i-1)	236	3.73	4.54	0.00	17.00
Championships 0-10	236	0.86	2.55	0.00	10.00
Competitive Balance - Year i	236	2.79	0.33	2.21	3.40
Competitive Balance - Year (i-1)	236	2.79	0.33	2.21	3.40
Populations	236	1041694	1154262	160076	3810426
Per Capita Income	236	28097.7	6122.2	16037.0	44295.0

**Note: The reason the max here is so high is because of an outlier observation for New Orleans during the 2007 year of observation. New Orleans' eighteen year average still categorizes them as a poor market team

Summary Statistics - Large Population Regression Observations

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable					
Attendance	226	691604.2	132218.6	256568	983517.0
Independent Variables					
Win Percentage - year i	226	0.53	0.16	0.13	0.88
Win Percentage - year (i-1)	226	0.53	0.16	0.13	0.88
Playoff Wins - year (i-1)	226	4.50	5.19	0.00	17.00
Championships 0-10	226	2.06	3.51	0.00	10.00
Competitive Balance - Year i	226	2.78	0.33	2.21	3.40
Competitive Balance - Year (i-1)	226	2.78	0.33	2.21	3.40
Populations	226	2814869	2381224	651530	8310212
Per Capita Income	226	30766.1	7340.2	16037.0	52855.0

Summary Statistics - Small Population Regression Observations

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable					
Attendance	264	660854.6	119430.9	296965.0	985722.0
Independent Variables					
Win Percentage - year i	264	0.49	0.15	0.13	0.81
Win Percentage - year (i-1)	264	0.49	0.14	0.13	0.78
Playoff Wins - year (i-1)	264	2.31	3.51	0.00	17.00
Championships 0-10	264	0.13	0.94	0.00	10.00
Competitive Balance - Year i	264	2.79	0.33	2.21	3.40
Competitive Balance - Year (i-1)	264	2.79	0.33	2.21	3.40
Populations	264	442184	128721	160076	628137
Per Capita Income	264	31472.9	8393.1	16608.0	60983.0

Regression Output

Data Sources: see chapter 4

Regression Results: High-Income Markets ; Dependent Variable- Total Home Attendance ; 1990-2007

Independent Variables	Coefficient	Standard Error	T- Stat	P- Value
Win Percentage - year i	1766.7	437.4	4.04	0
Win Percentage - year (i-1)	29505.4	54409.6	0.54	0.59
Playoff Wins - year (i-1)	2438.5	1928	1.26	0.21
Championships 0-10	13506.5	2250.2	6	0
Competitive Balance – Year i	-5570.2	20645.2	-0.27	0.79
Competitive Balance – Year (i-1)	-2141.2	22341	-0.1	0.92
Population	487.8	216	2.26	0.03
Home City Per Capita Income	3.16	0.8	3.96	0
1998 Time Dummy (strike year)	-266106	31102.5	-8.56	0
Constant	471799	93083.5	5.07	0
N = 254 R^2 = 0.5564 F- Stat (9, 480) = 34.01				

Regression Results: Low-Income Markets ; Dependent Variable- Total Home Attendance ; 1990-2007

Independent Variables	Coefficient	Standard Error	T- Stat	P- Value
Win Percentage - year i	2542.6	611.3	4.16	0
Win Percentage - year (i-1)	56587.3	77346.2	0.73	0.47
Playoff Wins - year (i-1)	-166	2349.2	-0.07	0.94
Championships 0-10	9306.3	3384.6	2.75	0.01
Competitive Balance – Year i	24903	27498.3	0.91	0.37
Competitive Balance – Year (i-1)	-9243.3	30024.5	-0.31	0.76

Population	-1825.2	662.5	-2.76	0.01
Home City Per Capita Income	2.14	1.47	1.46	0.15
1998 Time Dummy (strike year)	-255672	41584.5	-6.15	0
Constant	429737.4	128572.3	3.34	0
N = 236 R^2 = 0.3929 F- Stat (9, 480) = 16.25				

Regression Results: Large Population Markets ; Dependent Variable- Total Home Attendance ; 1990-2007

Independent Variables	Coefficient	Standard Error	T- Stat	P- Value
Win Percentage - year i	2145.1	500.6	4.29	0
Win Percentage - year (i-1)	158415.6	64879.7	2.44	0.02
Playoff Wins - year (i-1)	63.2	1967.2	0.03	0.97
Championships 0-10	9781.6	2052.8	4.77	0
Competitive Balance – Year i	11013.3	24264.2	0.45	0.65
Competitive Balance – Year (i-1)	5644.6	26784.9	0.21	0.83
Population	-16.5	296.2	-0.06	0.96
Home City Per Capita Income	4.89	1.17	4.17	0
1998 Time Dummy (strike year)	-252011	37084.3	-6.8	0
Constant	290531.1	114145.4	2.55	0.01
N = 226 R^2 = 0.5376 F- Stat (9, 480) = 27.9				

Regression Results: Small Population Markets ; Dependent Variable- Total Home Attendance ; 1990-2007

Independent Variables	Coefficient	Standard Error	T- Stat	P- Value
Win Percentage - year i	2284.4	548.1	4.17	0
Win Percentage - year (i-1)	-39370.4	65994.4	-0.6	0.55
Playoff Wins - year (i-1)	1648	2417.5	0.68	0.5
Championships 0-10	5903.4	6570.6	0.9	0.37
Competitive Balance – Year i	15670.1	23887	0.66	0.51
Competitive Balance – Year (i-1)	-3356.4	25219.7	-0.13	0.89
Population	-6077.3	5031.1	-1.21	0.23
Home City Per Capita Income	1.49	0.91	1.63	0.11
1998 Time Dummy (strike year)	-266709	35814.8	-7.45	0
Constant	524538.4	99399.6	5.28	0
N = 264 R^2 = 0.3671 F- Stat (9, 480) = 16.37				

Summary of Results

High-income Markets

The same variable coefficients were significant for high-income market teams that were significant when looking at all observations. These were winning percentage in year i, championships, and per capita income. The coefficient for population was significant. The coefficient of winning percentage in year i was about 20 percent lower. The coefficient of the championship variable rose by about a third. The coefficient for per capita income rose by about 20 percent. This suggests that winning percentage is less important in high-income markets, championships are more important, and per capita income is more important.

Low-income Markets

The same variable coefficients were significant for low-income market teams that were significant when looking at all observations except the coefficient for per capita income was only significant at the 15 percent level. Like high-income markets, the population coefficient was significant. The coefficient of winning percentage in year i rose about 14 percent. The coefficient of the championship variable was about the same, and the coefficient for per capita income dropped slightly. This suggests that winning percentage is more important in low-income markets, and there is essentially no difference in the impact of championships and per capita income.

High Population Markets

The same variable coefficients were significant for high population market teams that were significant when looking at all observations. Interestingly, the coefficient for winning percentage in year i-1 is significant for high population teams and not significant for any other regression done in this thesis. This is likely just a random fluctuation in the dataset. The coefficients for winning percentage in year i and championships are not markedly different. The coefficient for income per capita almost doubled. This indicates that per capita income has a larger positive relationship with local demand for high population teams when compared with all teams. \

Low Population Markets

The variable coefficient for winning percent in year i was significant for low population teams, but it was not distinctly different than the coefficient for all observations. The coefficient for championships was not significant. This is most likely due to a low amount of non zero observations for the championship variable. About 97 percent of the observations had a championship variable value of 0. Therefore, I would hesitant to make the assertion that championship victories do not have a positive impact on local demand for low population teams. The coefficient for income per capita was significant and fell by about 40 percent, meaning income per capita is less important for low population teams.

Chow Test
Methodology via: http://www.stata.com/support/faqs/stat/chow.html

Unrestricted residual = 4.35 x 10^14
High-income restricted residual = 1.64
Low-income restricted residual = 2.48
K = 10
N for high-income = 254
N for low-income = 236
Total N = 490

Chow test statistic = 2.623
F(10,470) =2.623
P-value = .04 (rounded to nearest hundredth)

Wald Test
Regression Results: All observations with Interaction Variable ; Dependent Variable- Total Home Attendance ; 1990-2007

Independent Variables	Coefficient	Standard Error	T-Stat	P-Value
Interaction Variable (win % * income)	0.025	0.037	0.68	0.50
Win Percentage - year i	1447.003	1212.652	1.19	0.233
Win Percentage - year (i-1)	562.5761	470.0057	1.2	0.232
Playoff Wins - year (i-1)	1306.687	1538.042	0.85	0.396
Championships 0-10	9242.29	1852.733	4.99	0
Competitive Balance – Year i	10788.25	17115.22	0.63	0.529
Competitive Balance – Year (i-1)	-4596.26	18275.07	-0.25	0.802
Population	93.47465	223.4097	0.42	0.676
Home City Per Capita Income	1.234463	1.944704	0.63	0.526
1998 Time Dummy (strike year)	-258893.7	25901.47	-10	0
Constant	476462	90447.59	5.27	0

N = 490
R^2 = 0.4425
F- Stat (9, 480) = 38.01

Result of Wald Test that interaction variable and winning percent both equal zero calculated via STATA

F(2, 479) = 18.5
Prob > F = 0

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Academic Vita

PATRICK JAMES KEMP

EDUCATION

The Pennsylvania State University – University Park Campus
Schreyer Honors College
Economics Departmental Honors Program
Major: Economics (B.S.)
Minor: Mathematics
Graduation Date: May 2010
Will graduate with the following Economics Major Modules:
- International, Development & Transition Economics
- Theory and Quantitative Methods

EXPERIENCE

Undergraduate Researcher: Penn State Economics Department; 5/09 to 12/09
- Worked in a professional research environment using STATA to complete a variety of statistical tasks. Worked as a team member and independently.
- *Responsibilities included*: calculating fertility rates for different subsets of population, running various linear/logistic regressions, creating summary statistic tables/charts, collaborating with others to meet project goals, creating summary reports/presentations, and writing instructional files

Undergraduate Grader: Penn State Economics Department; 10/09 to present
- Responsible for grading ECON 490- *Introduction to Econometrics* homework

RELEVANT COURSEWORK

MATH 415- *Intro to Mathematical Statistics*
MATH 416- *Stochastic Modeling*
ECON 483- *Economic Forecasting*
ECON 490- *Intro to Econometrics*