The Winless 22 of the NBA

An Econometric Investigation and Theory of Competitive Imbalance in the NBA

By James Tarlow

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Abstract

Since the 1979-1980 sporting season there have been 31 postseasons played in the National Football League (NFL), Major League Baseball (MLB), and the National Basketball Association (NBA). During this time there have been 15 different franchises to win the Superbowl, 18 franchises to win the World Series, but only 8 franchises to win the NBA Finals. That leaves 22 NBA teams, 73.3% of the league, that have competed during the past thirty one seasons with nothing to show for it but an empty trophy case. Perhaps more importantly, 24 of those 31 NBA championships have been won by just four different teams, making almost 80% of the past 31 NBA championships won by just 13% of the league.

Understood from the perspective of the average NBA fan who wants to see his or her perpetually losing team turn it around and win a championship, the NBA is competitively imbalanced. An econometric study of postseason success over this period in the NBA is presented to investigate how franchise personnel characteristics affect a franchise's success in the postseason. Through this econometric study of the NBA over this 30 year period, and the published work of others, I outline a theory of competitive imbalance in the NBA relative to championship distribution, and for the existence of the franchises which I will refer to as the winless 22.

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I. Introduction

Competitive balance is a central issue in sports economics and its multitude of metrics, applications, and implications are continually debated among sports economists. One of the few consensuses on the topic is that both extreme imbalance and extreme balance are inefficient in terms of maximizing consumer demand, or what is more commonly used in sports economics, fan interest. An extremely imbalanced contest in which the outcome is predetermined is uninteresting. Just consider how few fans are pleading for a rematch in football between Oregon and Portland State after Oregon strolled to a 69-0 victory. Fan interest lies in seeing Oregon play a team that would be competitive so as to provide the uncertainty of outcome that make sports interesting. Simon Rottenberg conceptually founded competitive balance in his 1956 seminal article by benignly writing about professional sports: "The nature of the industry is such that competitors must be of approximately equal 'size' if any are to be successful" (Rottenburg, 242). Previously, people in the business of sports had long known, without understanding, that fan interest lies in evenly matched competition (boxing has had weight classes since the 18th century). However, they had yet to conceptualize competitive balance and intentionally manipulate it in order to affect fan interest.

Contemporary competitive balance debates focus on determining what Rottenburg vaguely refers to as the approximately equal size of competitors, or more specifically, what level of competitive balance is most efficient, and which measure of competitive balance is most appropriate. Conceptually, competitive balance is the relationship between a sport and fan interest in that sport, through uncertainty of outcome. This conceptual foundation of relating the sport to the fan is why I am inclined to agree with Andrew Zimbalist and his position that the "metrics to which fans evince greatest sensitivity are the best ones" when

measuring competitive balance. What Zimbalist means by this is that if sports economists are trying to increase fan interest in a sport through competitive balance, then the best measures of competitive balance to use are the ones to which fans respond the most. This may not seem like a giant leap of logic, but what is important to take into account when considering this point is that many measures of competitive balance involve mathematical calculation that are not fan friendly. While contemporary fans are increasingly conscious of performance statistics of their preferred teams, they certainly are not aware of ratios of standard to idealized standard deviation, excess tail frequencies, or Gini coefficients, which are each a common measure of competitive balance. The importance of Zimbalist's point is that a *best* measure does not necessarily exist. The metrics of competitive balance should be a quantitative response to the qualitative nature of the sport's fan, rather than quantification simply for the sake of quantification. In other words, measures of competitive balance of a sport should relate directly to fan interest in that sport just as competitive balance is related to the fan conceptually.

With Zimbalist's attitude of competitive balance in mind, this paper can be understood as a quantitative response to the qualitative nature of the championship craving fans of 22 winless franchises in the NBA. The success of an NBA franchise is judged by the championships they have won. As the saying goes, nobody remembers who came in second. There is hardly an NBA player, coach, owner, or analyst that has not been quoted saying something along the lines of "it's all about winning a title." Fans are no different from the teams they worship; the prospect of winning is why they watch. When almost 80% of the league has not won a championship in thirty years, the interest of those fans must be waning. This econometric study is a quantitative response to the qualitative nature of the championship craving fan. Exploring what franchise characteristics are conducive to postseason success will lead to

reasons for why the winless 22 have failed to win a championship in the past thirty years and why the Lakers, Celtics, Bulls, and Spurs have won 24 times. Intuitively, this as an attempt to find out why the winners are winners and the losers are losers. What is it about the Lakers, Celtics, Bulls, and Spurs that made them champions 24 times in 31 years? What have these teams been doing so right, or everyone else been doing so wrong, that has brought them such success? Answers to these questions will shed light on the mechanisms by which the winless 22 have remained winless 31 times out of 31 seasons.

II. Motivating Questions

As a lifelong fan of the Portland Trailblazers, who are regrettably a member of the winless 22, the intent of this study was to gain some insight into what wins NBA championships in the hopes of being able to understand how 22 franchises have failed to win a title over such a long period. More specifically, I wanted to test expert, as well as my own, opinions of what produces postseason wins in the NBA. The questions I set out to answer were:

i.) Does having a higher payroll lead to winning in the postseason? Books such as *Moneyball* and franchises such as the New York Yankees have culturally created the urban legend that championships can be bought in professional sports, or at the very least influenced by an owner with deep pockets and a willingness to outspend the competition for talent. It would be useful to test payroll data over this period to see if there is any evidence of this in the NBA. Previous work in this area has not produced any evidence that championships can be bought in the NBA and I do not expect to find any evidence to suggest otherwise.

ii.) *Does a team's player NBA experience, postseason experience, or both improve a team's postseason success?* Every year there are a few teams that make the playoffs that are composed of players younger than average or less experienced than their opponent. Pregame analyses in such series invariably includes the hackneyed criticism that the younger team's lack of experience, either in the NBA or in the playoffs, will prevent them from winning the series or going far in the playoffs. In the event that the young team wins the series, this criticism is often forgotten as if it was never uttered and, among other things, they attribute the win to "young legs" or athleticism. This is surely just posturing by a supposed expert who does not want to admit being wrong, but such contradictory analysis is confusing and begs the question: What effect does experience actually have on postseason success? I expect to find that player NBA experience will be correlated with postseason success simply because rookies in the NBA do not perform as well as veterans. It takes players at least a few seasons to adjust to professional play. However, I do not expect to find that postseason experience helps a team to win in the postseason. Players in the NBA have played at the highest levels of competition for their age group their entire lives. They have likely been in high pressure situations their entire amateur careers because they were the stars of their high school and college teams. They reached the NBA because they have continually succeeded in high pressure circumstances and I do not see a reason why NBA pressure would be different to that of their past experiences. Controlling for player NBA experience, I expect to find no evidence that player postseason experience leads to postseason success.

iii.) How important is a coach's experience to winning in the postseason? A young or inexperienced coach gets the same criticisms from analysts that inexperienced players do. However, with a coach it is usually focused on postseason experience because of the strategic maneuvering required by the playoffs. In the postseason a coach's team faces the same

opponent up to seven times in a row, compared to the regular season where they face a new opponent each game. Coaches have compared the difference in strategy between the playoffs and the regular season to that of chess and checkers. Coaching in the playoffs may or may not be a skill acquired specifically through postseason coaching experience.

Also a common criticism of the NBA is the high firing rate of head coaches. A head coach in the NBA has very little job security; a poor performance in the regular season or a perceived underachievement in the playoffs often results in a head coach being promptly fired and replaced. This can be seen by the average coaching tenure in the NBA to be just over two years. Does a team's postseason performance improve if a coach is given a longer tenure?

iv.) *How important is team chemistry to winning in the postseason?* Basketball is not just a fast paced game, it is an extremely team oriented sport taking all five players on the court working together in order to win. The speed and teamwork that define the sport places a great deal of emphasis on each player's ability to make good decisions during play. The ability of a player to make good decisions during play is dependent upon his knowledge of each of his teammate's abilities, limitations, and tendencies. Through such knowledge of his teammates he is able to improve his decision making. For example, knowledge of his teammates allows a player to know where on the floor his teammates are most efficient scorers, where they are likely to get beat on the defensive end, when they are likely to backdoor their man and cut to the hoop for a layup, how high they can jump to receive a pass, where they like to receive a pass, etc. etc. Longtime teammates often only need eye contact to communicate during the game. The more information teammates have about each other, the better their ability to make decisions becomes. This type of team chemistry is intangible and is not recorded by any box score, but teammates acquire this information through

experience playing with each other. However, NBA players regularly change teams, reducing the time teammates have to develop this type of chemistry. Are teams that stick together, thereby improving their chemistry more successful in the postseason?

v.) *Do the answers to the previous four questions concerning postseason wins also apply to regular season wins?* One doesn't have to be a basketball expert to tell the difference between an NBA regular season game and a playoff game. Playoff games are played with a sense of urgency, speed, effort, and emotion with the knowledge that each game could end your championship hopes. In comparison, every team is guaranteed to play 82 regular season games which individually hold far less importance, are played with far less intensity, and in my personal opinion are played with far less teamwork. Do the same things that affect postseason wins apply to regular season wins?

III. Data

This econometric study uses data on all professional basketball teams in the NBA between the 1979-80 and 2008-09 seasons. These data contain non performance franchise variables, such as team experience levels, coach experience levels, and salary cap space.

Franchise aggregate player salaries are available from a variety of sources; my main sources are Rodney Fort and Patricia Bender who compiled data released by USA Today. However, data for aggregate player salary during 1989, 1986, and years prior to 1985 are unavailable and as a result of these missing data, any regression including a salary variable reduces the number of observations by about 30%.

All experience variables detailing the 804 NBA seasons played by thirty NBA franchises between 1979 and 2008 in this sample were hand collected from Basketballreference.com.

Variables referring to "players" are calculated from the five players receiving the most playing time in minutes during the regular season for a given team during a given season. Such variables are not calculated based on the entire roster or all players receiving an established baseline of playing time. The five players used to calculate such variables are also not determined by playoff minutes played. Also, all data are relevant only to seasons prior to a given season. For example, a coach's postseason winning percent for the 1991-92 season is calculated only from games coached previous to that season.

Player experience data is divided into two groups: NBA experience and postseason experience prior to a given season. **Player NBA experience** is defined as the average number of years played in the NBA per player while **player playoff experience** is defined as the average number of post season games played per player. Separating player experience into these two groups was done with the intent of isolating the effects of season and postseason experience by controlling for each of them. Furthermore, players on each team are not homogenous in experience level. There are teams composed mostly of players new to the league, teams composed of older veterans of the league, and teams composed of both. In order to control for this heterogeneity of player experience within each team I included the player experience variables: **variance of player NBA experience** and **variance of player playoff experience.**

Coaching experience data is also separated into NBA experience and postseason experience, however, also included as coaching experience variables are coach's winning percentage for postseason games, coach tenure, and a coach postseason dummy variable. **Coach NBA experience** is defined as years spent as a head coach in the NBA. **Coach postseason experience** is defined as number of postseason games coached. **Coach postseason win %** is defined as (postseason games won) / (post season games coached).

Coach tenure is defined as the number of years spent as the head coach of a given team. **Coach postseason dummy** is 1 if the coach has postseason coaching experience and is 0 if the coach does not have postseason coaching experience.

New players to a team are represented in these data as either a rookie or a veteran new to the team. **Rookies started** is defined as the number of players among the top five regular season minute getters for a given team and season who are in the first year of their NBA career. **New veterans** is defined as the number of players among the top five regular season minute getters for a given team and season who have at least one year of prior NBA experience.

Team chemistry, discussed earlier, is qualitative in nature. Data describing team chemistry in this study was quantified by a proxy variable that measures years of shared NBA experience between teammates. **Chemistry** is defined as the number of years players have been on their current team with one another. Therefore, each point in a team's chemistry rating represents one year of shared experience between two players on their current team. **Chemistry including coach** is defined identically to chemistry except this variable includes the coach's shared experience with players as well as between player experience. While chemistry is calculated between five players, chemistry including coach is calculated between five players and their coach. This variable is included because a coach familiar with his players would know how to utilize them better than a coach who is not, and a player familiar with a coach's offensive sets and defensive schemes can execute them more efficiently than a player who is not.

On the following page, Table 1 lists the variables previously defined and pairs them with their sample mean and standard deviations.

Table 1. Variables

Variable name	Mean(st. dev)
Player Experience	4.9 (1.91)
Player Experience Squared	27.69 (20.85)
Variance Player Experience	9.78 (7.53)
Player Postseason Experience	26.31 (23.13)
Variance Player Postseason Experience	692.26 (1085.97)
Player Postseason Experience Dummy	3.82 (1.41)
Salary Cap Space	8.955 Million (28.27 Million)
Chemistry	12.73 (10.15)
Chemistry Including Coach	18.46 (14.67)
Coach Experience	6.67 (6.46)
Coach Playoff Win %	0.44 (0.16)
Coach Playoff Experience	43.57 (53.99)
Coach Tenure	2.16 (2.86)
New Veterans	0.83 (.95)
Rookies Started	0.34 (.59)
Post Games Won	2.64 (4.11)
Season Wins	41 (12.72)

Notes: st. dev = standard deviation; NBA = National Basketball Association

IV. Estimation Results

Table 2 lists the estimation results for the three equations from which I derive my main analysis. All regressions use multiple least squares regression and includes a lagged dependent variable. Teams performing well the previous year are likely to perform well the

following year. Including a lagged dependent variable controls for this effect by holding the previous year's success constant. Regressions one and two are labeled postseason and season respectively for their dependent variable. Regression 1 estimates explanatory variables' effect on postseason wins while regression 2 estimates regular season wins. Regression 3 is a model of postseason wins restricted to teams with one or more postseason wins. The intent of the restricted model is to focus on the variation among playoff teams for a given season rather than all NBA teams.

Table 2.

Variable	(1)	(2)	(3)
Constant	-1.26(.96)	15.08(2.70)	.32(.87)
Player NBA Experience	.61(.34)*	1.95(.94)**	.85(.64)
Player NBA Experience Squared	-.07(.03)**	-.17(.08)**	-.08(.05)
Variance of Player NBA Experience	.01(.03)	-.16(.07)**	.06(.04)
Player Postseason Experience	.04(.02)***	.07(.04)**	.02(.02)
Variance of Player Postseason Experience	-.0003(.0002)	.0008(.0005)	-.0003(.0003)
Chemistry	.06(.02)**	.08(.06)	.06(.03)*
Chemistry Including Coach	-	-	-
Coach NBA Experience	-.08(.04)**	.05(.09)	-.11(.06)**
Coach Tenure	-.01(.05)	.17(.14)	-.07(.09)
Coach Postseason Experience	.008(.005)*	-.01(.01)	.01(.007)**
Coach Postseason Win %	2.08(.69)***	7.00(1.82)***	1.39(1.22)
Coach Postseason Dummy	-	-	-
New Veterans	.026(.19)	-.534(.51)	.21(.33)
Rookies Started	-.35(.3)	-1.32(.81)	-.62(.60)
Postseason Games Won Previous Year	.27(.05)***		.19(.07)***
Season Games Won Previous Year		.43(.04)***	
R^2	.35	.498	.24
Total Panel Observations	774	774	382

Notes: Dependent variable for regressions 1 and 3 is postseason games won. Dependent variable for regression 2 is season games won.
Numerical results reported for variables as: Regression Coefficient(Standard Error)

i. Does having a higher payroll lead to winning in the postseason?

Teams being capable of buying championships is a common criticism among uninformed NBA fans. Although there have been numerous studies done, none have found any correlation between player salary and postseason success. My sample found no evidence that previous work in this area has been incorrect. In attempting to answer this question I represented team salary in a variety of ways, none of which were found to be statistically significant when correlated against postseason wins. I first used salary data in its raw form, meaning team salary for a given season relative to nothing else. I also used salary "cap space" where a team's cap space was represented by the amount spent over/under the salary cap in effect during that year. Team salary was also represented relative to the average NBA team's payroll. Each of these representations of team salary was found to be statistically insignificant in all models. These data showed no evidence of team salary playing a role in postseason success. As a result of its lack of statistical significance, I considered it a confounding variable and removed it from my main analysis so it would not dilute the effects and/or significance of other variables by reducing the sample size.

Although no evidence was found from the data that was available, it is still possible that salary does play a role in winning championships in the NBA. The data on team salary that is available to the public is not complete. There are 8 years of salary data which are not available. Also, the data that is available is only a team total rather than a player by player distribution of salaries paid. If team salary does play a role in postseason success it is likely to involve the way a team allocates their payroll. While the salary cap in the NBA dissuades teams from overspending, it creates incentive for teams to be financially flexible. For example, it could be that paying a high percentage of team salary to a low percentage of its players is

correlated with winning in the postseason compared to distributing team salary more evenly. Such a variable would be represented by team variance of player salary. Over this period player salary has ranged from less than 100,000 to 33 million dollars per year and, among other factors, is regulated both by the market value of a player's talent level as well as the terms of the relevant Collective Bargaining Agreement for a given season. If the data were made available, it is possible the results could be statistically significant when regressed against postseason success.

ii. Does a team's player NBA experience, postseason experience, or both improve a team's postseason success?

Regression 1 of Table 2 estimates player NBA experience to have a quadratic correlation to postseason wins significant at the 10% level. This relationship is intuitive considering the skill of a basketball player initially rises, peaks at some point, and eventually falls over the course of his career. An NBA player begins as a rookie, develops into his prime as a veteran, and eventually declines with age until retirement. This model estimates that the effectiveness of a team follows the same pattern as that of its individual players. The estimated coefficients for player NBA experience and player NBA experience squared are .61 and -.07 respectively. Interpreting these estimates indicates an ideal average player NBA experience level for a team to be 4.33 seasons played per player. In other words, the model estimates that 4.33 seasons played per player is the level at which a team's effectiveness peaks just as an individual player would peak. The sample mean for this variable is 4.9 years per player. It appears that on average NBA franchises operate near this optimum level.

However, the question is whether being above or below this level would yield a large disparity in postseason wins. Holding the other explanatory variables constant, the optimum

level of 4.33 years per player is estimated to have an effect of 1.31 postseason games won from player NBA experience. A team below this optimum level by one standard deviation would estimate an effect of 1.06 postseason games won, a difference of about .25 postseason games. This effect could be considered large enough to support citing a lack of team experience as a weakness for a team, but being statistically significant at just the 10% level points to the ambiguity of this variable rather than the strength of it.

Player postseason experience on the other hand is significant at the 1% level and yields a coefficient of .04 providing initial evidence supporting the conclusion that postseason experience leads to winning in the postseason. A coefficient of .04 may seem small, but considering that the sample mean of player postseason experience is 26.31 postseason games played per player, the effect of this variable is 1.05 postseason games won. More importantly, the standard deviation of this variable is 23.13, meaning the variance between teams in postseason experience is large. This model estimates that teams one standard deviation below the mean (3.18 postseason games per player) can expect to win about 1.76 *fewer* postseason games than teams one standard deviation above the mean (49.44 games per player). 1.76 games is a massive effect and seems unreasonably high.

A closer look, through the lens of regression 3, reveals that player postseason experience becomes statistically insignificant when the sample is restricted to include only teams winning one or more postseason games for a given year. I interpret this as an indication that player postseason experience may get a team into the playoffs, thus providing the *opportunity* to win postseason games, while not increasing their *ability* to win postseason games. Player postseason experience implies an ability to be successful in the regular season by making the playoffs, but experience defined as postseason games played does not

necessarily mean they won any of those games. The coefficient in the first regression can just be seen as a byproduct of teams making the playoffs. Teams that have an opportunity to win postseason games will inevitably win more than those that do not. Restricting the sample supports the bigger picture that while player postseason experience may be correlated with entry into the playoffs, it is not a cause of winning once in the postseason. This conclusion is further supported considering regression 2, the model employing regular season wins as the dependent variable instead of postseason wins. Regression 2 estimates player postseason experience to be significant at the 5% level with its mean value correlated with 1.93 regular season wins. A player with post season experience is a player who has proven to be good enough to help a team gain entry into the playoffs, but not necessarily to win in the playoffs. These models show that teams with a high average of player postseason experience seem to be no different. Team average player postseason experience supports a team's ability to qualify for the post season, while not improving their ability to win in the postseason.

iii. How important is a head coach's past NBA and postseason experience to winning in the postseason?

Multiple measures of coaching experience are initially statistically significant when regressed against post season wins, however, not all can confidently be considered important to winning in the postseason.

Coach NBA experience is statistically significant at the 5% level when regressed against post season wins in both regression 1 and regression 2. The coefficient in regression 1 is -.08, surprisingly showing coaches NBA experience to be negatively correlated with postseason wins. This is surprising because experience is usually thought of as having a positive impact on performance. I interpret this negative correlation to be the result of controlling for coach's

postseason games coached. Postseason games coached are held constant by controlling for coach postseason experience in regression 1, and an increase in regular seasons coached would mean that a coach achieved less post season games per season. Considering the only way to increase postseason games coached per year is to win postseason games and advance in the playoffs, having less post season games coached per season means there were less post season wins per season. By controlling for coach postseason experience the coefficient becomes biased and yields a negative regression coefficient for coach NBA experience.

However, when the coach postseason dummy variable replaces coach postseason experience and coach postseason win % from regression 1, coach NBA experience becomes statistically insignificant rather than maintaining a statistically significant negative effect. This change is because postseason games played are no longer held constant while years coached varies. This is evidence that a coach's NBA regular season experience is not important to winning in the post season.

While the coach postseason dummy variable discredits the opinion that coach NBA experience is a significant contributor to winning in the post season, it reaffirms the significance of a coach's postseason experience. The coefficient for coach postseason dummy is estimated to be .67 and is significant at the 5% level. Intuitively, this means that a team who has a head coach with postseason experience is estimated to win .67 more postseason games than if the team were headed by a coach without postseason experience. Furthermore, regression 1 estimates the regression coefficient of coach postseason experience to be .014 postseason games won per postseason game coached. The sample mean being 43.57 postseason games coached yields .61 postseason games won due to coach postseason experience.

While regular season coaching experience does not seem to have much importance to post season success, there is evidence that having postseason coaching experience, as well as the amount of that experience, does contribute to winning in the post season. This makes sense considering the NBA is the only major basketball league in which playoffs are played in a series format where opponents play one another up to seven times in a row. The uniqueness of this tournament format to basketball would also make experience coaching within it unique, and therefore valuable.

iv. How important is team chemistry to winning in the postseason?

Chemistry was found to be statistically significant when regressed in a large or restricted sample. Regression 1 estimates a chemistry coefficient of .06 at 5% significance. For each year of shared experience between two teammates that team can expect to win .06 postseason games. Again, this effect may seem small, but the sample mean for team chemistry is 12.73 with a standard deviation of 10.75. The average team is estimated to win .738 postseason games due to their team chemistry. A team composed of players who have very little history of playing with one another, one standard deviation below the sample mean, would have a chemistry rating of approximately 2 and could estimate .12 postseason wins from this effect. However, the distribution of this variable is skewed to the right and it is not unusual for teams to have chemistry ratings well above 30. A team composed of longtime teammates who have 30 seasons of shared experience can expect to win 1.74 postseason games due to this effect, as opposed to the 0.12 postseason wins attributed to a team from a low chemistry level of 2.

Chemistry, as defined by the proxy variable used in this study, is subject to multicollinearity with two other variables. Multicollinearity is a potential problem in

econometric analysis when two or more explanatory variables are highly correlated between each other. In this case, chemistry is correlated with both New Veterans and Rookies Started. Chemistry has an approximate linear relationship with these two variables because introducing a new player to a roster, either a rookie or a new veteran, will by definition decrease that team's chemistry rating. When these two variables are included in the model, and therefore held constant, their linear relationship with chemistry confounds its effect because holding them constant limits the variation of chemistry. In the unrestricted model of regression 1 the sample size was large enough that multicollinearity did not pose a problem, but when the sample is restricted in regression 3 to just teams winning one or more postseason games multicollinearity becomes an issue. The coefficients on these two variables are statistically insignificant in regression 1 and when withheld from regression 3, chemistry has an estimated coefficient of .056 significant at the 5% level. Statistical significance, in the restricted model of postseason winners, provides extra evidence of chemistry's production of success in the postseason. Where player postseason experience proved to be unimportant, chemistry's importance remained unchanged.

More important than a team's chemistry rating during each season is the variable's potential to increase or decrease between seasons. A team that leaves their roster alone, allowing their players to gain another year of teammate experience, will see their chemistry score rise by 10 from the previous year. This increase would correlate with .58 more wins in the postseason than they had the previous season. Considering that essentially nothing has changed from the previous season, an increase of over one half of a game can be considered quite a major effect. However, more important than what a team is estimated to gain by leaving their team intact, is what they risk losing by breaking their team apart. Teams introducing new players to their rosters, that is, players without experience playing with their

new teammates, could lose far more than the 10 years of teammate experience gained by leaving it intact. The 1999 Utah Jazz for example, was a team that had stayed intact over the years and had a chemistry rating of 60. They won four playoff games that year, advancing to the conference semi-finals before losing. After their season of unfulfilled championship hopes, the Jazz replaced Jeff Hornacek and Howard Eisley with John Starks and Donyell Marshall who were acquired during the off-season. The addition of Starks and Marshall to the team dropped the Jazz's chemistry rating from 60 to 29. The model would estimate this drop, in terms of chemistry alone, to reduce their postseason wins by 1.8 games. The following season the Jazz managed to win just two playoff games and were ousted in the first round of the playoffs. While a team stands to improve their chemistry by 10 if they leave their roster unchanged, they have the potential to lose more than three times that amount by inserting just two new players into major roles. Team chemistry, while estimated to have a modest effect during each season, becomes far more relevant when considering roster changes between seasons.

Following each NBA season general managers across the league make roster decisions in response to the performance of their respective teams during the previous season. On average, the general manager of the NBA Champions preserves his team's roster, thereby increasing their chemistry for the following season, while most of the rest of the league mixes up their roster and reduces their team chemistry for the following season. In short, roster changes increase as postseason success decreases. NBA champions over this period, following their championship season, made a total of seven major roster changes. Seven roster changes following a championship year out of the 29-team sample is an average of .24 roster changes per championship team. Teams winning more than four postseason games but not winning the NBA championship average .63 roster changes per team, teams winning one to four postseason games average 1.01 roster changes, and teams getting swept in the first round or

not making the playoffs at all average 1.43 roster changes between each year. This inverse relationship between roster changes and the teams previous season performance is only natural. Losing teams are more inclined to try something new in order to win while winning teams would rather stick with their proven winners.

With respect to chemistry's correlation with postseason wins this means NBA champions increase their prospective postseason wins for the following season while most of their competitors decrease their prospective postseason wins for the following season. On average, NBA champions increase their chemistry score by 3.72 for the following season by preserving their roster. All other competitors show a slight tendency to decrease their chemistry by an average of .02. I consider this evidence of a contributing factor to the dynastic nature of the NBA as the current champions improve their next season expectations while their competitors decrease them, which widens a margin that already exists between the world champions and their competitors by .22 postseason wins.

There are several weaknesses to this variable that are worth mentioning. First, chemistry is a proxy to begin with. It in no way represents the way two or more players might naturally work well together on the court, which is the usual way that one thinks about team chemistry. The variable simply quantifies the number of years the five players receiving the most minutes during the regular season have played with one another. That being said, this proxy may not capture the entire effect that teammate experience actually has on postseason success or it may overestimate it. However, there is considerable evidence that it is important to winning in the postseason. Also a potential drawback to this variable was that it is regressed on postseason wins when the variable is calculated from regular season minutes played. It would have been more accurate to use postseason minutes played as the filter to

decide which five players would be used to calculate this variable. It was an oversight I made while gathering data. However, regular season distribution of minutes closely matches that of playoff minutes. Coaches put their best players on the floor as often as possible whether it is a regular season or a playoff game. What does go unrecognized by this variable are injuries that prevented players from playing in the playoffs, however, this is a minor inaccuracy considering the sample size of the 4,020 players included in the calculation of this variable and the rarity of such injuries.

v. Do the answers to the previous four questions concerning postseason wins also apply to regular season wins?

Just as regular season games in the NBA are played differently than postseason games, winning regular season games is correlated with different variables than winning in the postseason. Regression 1 estimates postseason wins to be significantly correlated with chemistry and coach postseason experience. Regression 2, employing regular season wins as its dependent variable, shows no such correlation.

Also, player NBA experience in the postseason was estimated in regression 2 to have a different peak performance level. While the maximum effect of player NBA experience on postseason wins is estimated to be 4.33 seasons played per player, the maximum effect on regular season wins is estimated to be 5.67 at the 5% significance level. This may be because the higher speed and intensity of the playoffs favors younger players compared to older players.

Regression 2 reports chemistry to be statistically insignificant when regressed against regular season wins. This may be due to the fact that the speed and intensity of regular season games are far less than postseason games, reducing the importance of decision

making. Furthermore, there is less ball movement and less team play on both the offensive and defensive ends of the floor during the regular season. A diminished importance of teamwork means chemistry becomes more of a subtlety or a nonfactor during the regular season.

V. A Theory of Competitive Imbalance

The following theory of competitive imbalance in the NBA, imbalance being understood as the skewed distribution of championships, is not exhaustive. There are undoubtedly many factors at play that have led to the winless 22 competing since 1979 without winning a championship trophy. I discuss several factors that are partially responsible for the lopsided championship distribution over this period. These factors include compensating differences between franchises, a high variance of player talent, and the effect the incentive to win has on the distribution of player talent within the league.

i. Compensating Differences Between Franchises

Marios Michaelides, in his paper, "A New Test of Compensating Differences: Evidence on the Importance of Unobserved Heterogeneity," unintentionally provides evidence that a salary capped league does not create a completely level playing field as franchises compete for talent. This reason is that franchises have naturally varied attributes between one another. Michaelides uses data on player performance, franchise nonpecuniary characteristics, and location amenities to forecast how much a given team would be estimated to pay a given player. His results show that while NBA franchises with favorable working conditions receive a discount on the salaries of their players, franchises located in a city with unfavorable working conditions pay a premium. Variables like crime rate, weather, urban population, and race are

found to be statistically significant in determining how much a team will be estimated to pay in salary to a prospective player. For example, Michaelides estimates that weather conditions, such as snowfall, rainfall, and temperature, in a franchise's location affect the wages paid to its players. He estimates that the Los Angeles Lakers would pay a player 8.1% less than the average NBA team would pay for the same player, while the Minnesota Timberwolves would pay 5.4% more. This means that if a hard salary cap was set at 50 million dollars per team, then the Lakers' 50 million dollars would be worth more to prospective players than the Timberwolves' 50 million dollars. Los Angeles would always be able to acquire better talent than Minnesota if these were the circumstances. However, these are not the only circumstances. While the Lakers reside in Los Angeles where the weather may be ideal, they also are in an overpopulated city with a high crime rate which work to their disadvantage. Michaelides paper provides evidence that the varied attributes among the cities of NBA franchises do play a role in the NBA's labor market.

The effect of compensating differences may seem unfair in some respects, but it really is no different than what we regularly encounter in sports. Criticizing California teams for being located in desirable places to be a professional basketball player is like chastising Lebron James for being a ridiculously gifted athlete. Los Angeles and Lebron James are not cheaters, they just found themselves to have a few better tools than their competitors did. The existence of compensating differences between franchises is not a problem in and of itself; however, it does contribute to the ability, or inability, of franchises to compete for championships.

ii. Relatively Scarce Talent

In his paper, "Short Supply of Tall People" David Berri shows that the advantage of height in the sport of basketball is a major reason for competitive imbalance in the NBA. By several measures, various professional soccer leagues across the world are rated as the most competitively balanced professional sports leagues. Berri argues that soccer's competitive balance is due to the fact that soccer is the world's most played sport and, therefore, draws on a larger population of potential athletes for its professional leagues than any other. Such a massive population of possible athletes reduces the variance of talent at the highest levels, thereby allowing soccer leagues to be composed of competitively balanced teams. Berri then argues that the advantage of height in basketball dramatically shrinks the population of eligible athletes to play in the NBA. The smaller population of athletes that the NBA draws on increases the variance of talent within the league. Essentially, Berri's argument is that the short supply of tall people in the world does not yield enough tall *and* talented players to field 30 competitively balanced basketball teams.

While I agree with Berri's argument for why the league is competitively imbalanced on a season by season basis, I would add that Berri's argument by itself does not begin to explain why the championship distribution should be so skewed over a thirty year period. Yes, with an increase in the variance of talent within the league the best team will become increasingly better than the worst team; however, over time the distribution of talent should fluctuate allowing a losing team to become a winning team. With the average NBA career lasting about five years per player, a championship caliber team would not persist long enough to explain the disparity in championships over a thirty year period. Furthermore, the NBA draft was designed so that the worst teams would receive the first choice of incoming players so that every year the best of future NBA players would join the worst teams. While the short supply of tall and talented basketball players in the world offers important background, Berri's theory

does not tell the whole story of competitive imbalance in the NBA because it does not explain why the talent distribution does not fluctuate evenly between teams.

Berri's description of the effect on the NBA of the short supply of tall people provides a vital context in which these data can be applied. A high level of variance of talent within the league would not produce a skewed distribution of championships over three decades as long as the distribution of talent within the league is allowed to fluctuate evenly between teams over time. That is to say, the lowest performing teams in the league in a given year (teams with the worst talent) will only remain low performers in the future if they are at a disadvantage in competing for future talent. The inverse relationship between roster changes and post season success provides evidence of this disproportionate fluctuation of talent. As evidenced earlier, championship teams average just .24 roster changes between seasons while teams not making the playoffs or getting swept in the first round average more than six times that amount at 1.43 roster changes per team between seasons. Winning franchises, franchises with the most talent in the league, are able to maintain their talent level while losing franchises make more and more changes to their rosters. It is as if winners keep their winners and continue to win, while the losers fight over scraps. As discussed earlier this pattern of behavior between teams is natural due to the incentive to win, however, it is magnified by the rules and regulations which define the NBA's soft salary cap.

iii. The NBA's soft salary cap, Bird exceptions, and competitive imbalance

I excluded performance variables (Points per game, Turnovers per game, etc.) from these data because basketball as a sport is competitively balanced. The 200-plus rules that define the game equally limit the actions of all players on the court, while at the same time defining where any advantage may be gained between teams (NBA.com). For example,

extending the three point line to a distance further from the basket did these two things. First, and most obviously, this rule change redefined the area on the court where a player can score a three point field goal and it did so equally across all players. Second, and less obviously, the rule change increased the value of high percentage three point shooters in the NBA. If few people can shoot effectively from longer range then having a player capable of doing so yields a competitive advantage for team. This is why mechanisms of competitive imbalance in the NBA would not be indicated by performance variables. Everyone on the court is subject to the same rules without exception, however, franchises, in competing for talent, do receive exceptions and do have advantages. Any advantage that these dominant franchises may have enjoyed has existed in the market for talent. With the variation of talent in the NBA to be large, as discussed earlier, a competitive advantage becomes inflated as the better talent becomes distanced from the worse talent. Over the past thirty years the Lakers, Celtics, Bulls, and Spurs were not just happen to be better at basketball than everyone else, they had an advantage in the NBA's labor market that allowed them to maintain their competitive advantage for an extended period.

Before any argument for existent competitive imbalance in the NBA is formed, the purpose of the NBA's soft salary cap and certain exceptions that make it a soft cap need to be explained. A salary cap is a limit on the aggregate salary each team can pay their players. The purpose of a salary cap is to create competitive balance between franchises by removing the advantage that teams with more resources would have in competing for talent by outspending their competitors. A hard salary cap does not allow the cap to be exceeded under any circumstances, while a soft salary cap is one that can be exceeded under certain predetermined circumstances (Coon). The purpose of a soft cap relative to a hard cap is to promote the ability for players to stay with their current teams. This is the explanation that is

routinely given in defense of the soft salary cap in the NBA; however, I will later argue that it does so unequally between teams. This usual defense for the existence of a soft salary cap is that players build families, relationships, and attachments to the cities they play in and vice versa. A soft cap allows his team to exceed the salary cap to offer him a contract competitive with offers from other teams, while under a hard cap that player may be forced to leave because his team did not have the cap space to offer him a large enough contract.

The NBA's Collective Bargaining Agreement (CBA) is a contract between the league and the Players Association defining the rules and regulations that they have to operate under. The NBA's CBA defines hundreds of procedures and rules that are necessary for the NBA to operate, including the exceptions by which a team may exceed the soft salary cap. There are ten such exceptions in the CBA, but only three of which I argue contribute to the dynastic nature of the NBA and the existence of the winless 22 (Coon 1999).

The three exceptions in the CBA that contribute to the winless 22 are the Larry Bird Exception, the Early Bird Exception, and the Non-Bird Exception. As a group, they are referred to as the Bird Exceptions. These are the exceptions that are used by a team to re-sign free agents currently on their own team rather than any free agent in the league. In other words, it allows teams to exceed the salary cap to re-sign their own players whose market value exceeds the team's cap space (Coon 1999). The purpose of these exceptions, as discussed earlier, are usually explained as a way to promote a player's ability to remain with a team that both he and the team wants him to be on. I argue that Bird Exceptions, understood from a team's perspective as a strategy to keeping a team intact, gives a competitive advantage to past NBA champions and are partially responsible for the lopsided championship distribution.

NBA franchises and NBA players have an extreme incentive to win and this incentive, overlooked in analyses of soft salary caps, makes the value of Bird Exceptions disproportionate between franchises. The incentive to win is often overlooked in sports economics research because most work in this field is done to test economic theory using sporting data as a natural experiment, rather than using sporting data for the sake of sports. However, player and franchise decisions are absolutely influenced in a major way by the incentive to win. Next to winning the league's Most Valuable Player award, there is nothing that will earn a player a spot in the NBA Hall of Fame faster than championship rings will. After all, NBA players represent the best basketball players in the world and they reached that level by way of a desire to win. That being said, considering a player's two major incentives to be contract size (money) and the likelihood of winning, there is not another situation in which player and franchise incentives are more aligned than after winning a championship. The Bird Exceptions allow a team to capitalize on that alignment of incentives by retaining their championship roster with contracts as much, or greater than their competitors are able to offer. When a team wins an NBA championship, its players want to stay and win some more and the GM wants to retain his players to win again. The Bird Exceptions of the CBA allow NBA general managers to be able to offer their championship players both the large contract and the prospect of winning that every player wants.

While every season brings one championship team's incentives into alignment, there are 29 other teams that lost whose player/GM incentives are less than aligned. The more frustrated a player gets when his team continues to lose year after year, the more they are likely to seek wins with another franchise and the more likely their franchise is to trade him. Players on losing franchises have a greater incentive to sign with new teams that have been winning, while losing GMs have incentive to sign new players they think could lead to winning.

On average, as a result of these incentives, championship teams are preserved for the following season while losing teams trade for players, draft new players, and sign new free agents. 66% of the teams not winning the NBA championship each year make roster changes during the offseason that gives new players major playing time. Those teams, relative to the previous season, average a reduction in chemistry rating of 3.55, whereas, as cited earlier, championship teams increase their chemistry rating by an average of 3.72. The total effect of these changes in chemistry is estimated by regression 1 to be .44 post season games. That means that following each season, the NBA champions widen their already substantial margin on two thirds of their competitors by almost half of a playoff game. This is one cause of the dynastic nature of the NBA that allows teams to win championships in bunches. It would be unimportant if teams started from the same place at the start of each new season, but the variation in talent between NBA teams is not equal and on average the champions are the ones gaining the most advantage between seasons. The bulls twice won championships back-to-back-to-back in the nineties, winning 6 titles in 8 seasons, the Lakers won three in a row from 2000-2002, and there have been four other instances of teams winning successive championships.

The incentive to win and Bird exceptions do not just preserve top performing teams; they also perpetuate the franchise's window of time during which they are attractive to potential free agents. Great players on losing teams who leave in search of a championship contender are going to want to play for a team proven to be a winner. Bird Exceptions allow a winning team to continue winning, giving them a larger window of opportunity to be attractive to star players on poor teams looking to change franchises. Just in the past six years this has happened with some of the greatest basketball players to ever play the game. Karl Malone and Gary Payton both left their perennially unsuccessful teams, members of the winless 22, to

play in Los Angeles where they then made it to the NBA finals. Kevin Garnett and Ray Allen, also leaving members of the winless 22, left to win a championship in Boston in 2008 and made another trip to the finals in 2010. Just a few months ago Lebron James, the two time MVP, and Chris Bosh, All Star and Olympic gold medalist, both left their respective winless 22 teams to join the Miami Heat, who were the 2006 NBA champions. Pau Gasol went from a floundering Memphis Grizzlies team, another winless 22 member, to play at Los Angeles where they have won NBA titles in 2009 and 2010. While everyone seems to notice that Bird Exceptions allow for teams to retain their best players, they have failed to realize that the incentive to win allows the best teams not just to retain the best teams, but that this then allows them to remain in a position to attract the best future great players as well. Although the winless 22 have what seems to be an advantage in the NBA draft, they have a short window of time in which to produce success in the playoffs and the deck is already stacked against them.

The common counter argument to this line of reasoning is that great players still have incentive to stay with their losing teams because those teams could also use Bird Exceptions to offer them a larger contract than they could find elsewhere. I would respond to this argument in three ways. First, Michaelides paper estimates that LA receives an 8% discount on the talent they pay for. Paired with LA's long history of winning in the NBA this evaporates the gap between what a losing team can offer their player by employing a Bird exception and what LA can offer them without one. The added benefit of this 8% discount on talent may be a reason why LA has won 11 out of the past 31 championships, although I can offer no empirical evidence for this. Second, Bird Rights to players are included in trades so if the player is acquired in a trade then the new team can renegotiate a maximum contract for their new player at any time despite the fact that they just acquired him. Such was the case with Pau

Gasol going to, and now staying with the Lakers until 2014. Pau had been with the Grizzlies for more than three seasons so when he was traded to the Lakers, so were his Bird Rights. Bird Rights in hand, the Lakers were then able to extend his contract and exceed the salary cap using a Bird Exception. Third, the Miami Heat highlights a tax advantage in that there is no state income tax in the state of Florida, so although before taxes James' and Bosh's previous teams could offer them larger contracts than Miami, the net salary becomes comparable to the point that their desire to win NBA championships sent them to Miami where they both signed 6 year contracts. Miami's championship in 2006 and Florida's lack of state income tax have helped to make it a pretty good time to be a Heat fan for the foreseeable future.

VI. Conclusion

Investigating the effects of franchise personnel decisions on postseason success led to evidence that player experience is not as important to winning in the post season as coaching experience is. Evidence of the effect of player NBA experience was inconclusive, while player postseason experience was found to improve a team's ability to make the playoffs while not improving their ability to win in the playoffs. However, regression results did provided evidence that postseason coaching experience improves a team's postseason success. Both having postseason coaching experience and the amount of postseason coaching experience is correlated with winning in the postseason. This study also confirmed previous work by not yielding any evidence that team salary plays a significant role in winning championships. And finally, regression analysis provided evidence that team chemistry, defined as years of collective teammate experience, does improve a team's postseason performance.

Patterns in the variation of chemistry between seasons in the NBA provides support for a theory of how almost 80% of championships over a 31 year period were won by just 13%

of the league. While NBA players are affected equally by the rules of basketball, NBA franchises are affected unequally by the rules of the CBA. A player who makes a game winning shot celebrates because he has won the game for his team, but that shot does not make him more likely to make the next one. His chances remain the same as before. The same goes for the player who misses the shot. Success does not beget success and failure does not beget failure. Franchises, however, by way of the disproportionate effect of Bird exceptions, are not forced to compete evenly between one another. Franchise success in one year improves the prospect of franchise success in the future. When winning causes player and franchise incentives to align, Bird exceptions allow the winning franchise to improve their chances for the following year by increasing chemistry as well as increasing their ability to attract talent in the future.

It is natural to think that any competitive imbalance is unfair, but this is not the way competitive balance works. Competitive imbalance is inherent in every sport. For a given contest to be interesting it is as Rottenburg said, "competitors must be of approximately equal size." The difference in the NBA is that the present size of competitors influences their future size. Making a shot in a basketball game does not improve your chances of making the next shot. Winning a championship should follow the same rule, but it does not. If the NBA wishes to see more teams competing for an NBA championship each year, and more franchises to win in the long run, then they will address the disproportionate effect that the CBA has between teams. This disproportionate effect is at least partially responsible for the empty trophy cases of the winless 22.

Additional research needs to be done in order to produce more information describing player movement in the NBA. Research in sports economics is both made possible and limited

by the availability of viable data. As discussed earlier, data that details player salary and team salary allocation could yield interesting conclusions, but this data is not available. However, there is research that can still be done. For example, a model that measures a player's likelihood to choose to change teams as a free agent relative to team performance, player performance, and endogenous franchise characteristics (city population, state tax rate, etc.) could provide more specific information as to the factors that motivate players to change teams. Similarly, a model that measures a franchise's likelihood to trade their players or to sign a free agent could provide more specific information as to the factors that motivate franchises to shuffle their rosters. This research would more accurately show what type of teams and which types of players are likely to choose to change rosters/teams. Such information would allow the NBA to be better educated about their labor market when formulating a CBA.

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