# EVALUATING NATIONAL BASKETBALL ASSOCIATION DRAFT PICKS

by

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# ABSTRACT

JOHN FARRELL. Evaluating National Basketball Association Draft Picks. (Under the direction of Dr. CRAIG A DEPKEN II)

In 2017, Forbes estimated the NBA made around $5.9 billion dollars in revenue the previous season, with each individual franchise worth an average of $1.36 billion; both figures were up from the year before. The ability to successfully draft players plays a crucial role in a franchise's ability to be successful by winning championships and increase the worth of the franchise, this fact is only magnified in the smaller markets. A small market is a franchise that is in a smaller metropolitan area, the Memphis Grizzles or the Indiana Pacers for example. This paper examines the value of the top-tier draft picks with respect to change in team wins the following three years, while controlling for changes in labor contracts. Results indicate that there is greater value in picks one through eight.

# ACKNOWLEDGMENTS

It is important to Acknowledge Dr. Craig Depken for helping me with this thesis. The data he provided me enabled me to complete this thesis. I would also like to thank him for his guidance and patience throughout this process.

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| NBA | National Basketball Association |
| MLB | Major League Baseball |
| TV | Television |
| CBA | Collective Bargaining Agreement |
| NBAPA | National Basketball Association Players Association |
| PER | Player Efficiency Rating |
| WS | Win Shares |
| ABA | American Basketball Association |
| GM | General Manager |
| fe | Fixed Effects |

# CHAPTER 1: INTRODUCTION

Once the playoffs in the National Basketball Association (NBA) are completed, most of the attention around the league will be on the upcoming NBA draft and the process that has been called "tanking." Tanking is a method by which an NBA franchise purposely loses to increase their odds of a higher pick in the next draft. The thought process is: if a franchise does this for several years in a row, the talent level and the salary situation of the team will be in the optimal state to possibly win a championship.

The most recent culprit is the Philadelphia 76er's, who are now a regular playoff team after their former General Manager, Sam Hinkie, committed the franchise to this "tanking" strategy during the summer of 2013. For the next three years Sam Hinkie acquired as many draft picks as possible and assembled a team that would lose more often than win. From the moves he made, the franchise acquired what appears to be two franchise players (players so talented that the franchise will be successful.) "Trust the process" has become a rallying cry for fans of the organization. Through this process, the 76er's have selected five times in the top ten picks of the draft. Before committing a firm to what appears to be at least a five-year process, the question of how valuable a top-tier draft pick is seems to be important.

If a franchise can successfully and accurately determine the worth of a draft pick, they would be positioned to make the best decision possible for the future success of the team. Not only would they know the impact of taking a player with the given pick, they would also be able to properly analyze possible trades with other teams and look to take advantage of their knowledge. Of course, this would help the team win more, which

should lead to more profit for the franchise, as the most successful teams on the court are often the ones valuated to be worth the most.

This age of advanced analytics became in vogue in the NBA about 36 years after Bill James started releasing his seminal *Baseball Abstracts* annual books. These continued analyses contradicted the current thinking of the day. Before this time, most of the analysis done in baseball was qualitative and used mostly intuition, with some basic statistics attached. Since then there has been a slow conversion to advanced mathematical approaches to player evaluation. Every team at the top of the MLB has implemented intensive advanced analytics. The same is now happening across the NBA. One of the most successful teams, the Houston Rockets, has one of the biggest advocates of this analytical approach as their General Manager, Daryl Morey.

The contract situation for rookies drafted is an ever-changing landscape. The first Collective Bargaining Agreement (CBA), a labor contract agreed to by the NBA and the NBA Players Association (NBAPA) that expires at a given date, likely to affect the results of this study was agreed to in 1983. It was a Memorandum of Understanding modifying the terms of the 1980 agreement. During this time period only 7 of the league's 23 teams made money the previous season. The average salary for players was $246,000, and the average team payroll was $2,952,000. The biggest change was that a salary cap was added. A salary cap limits the total amount a team can pay their players. Many professional athletic leagues use them as a parity measure, to make an even playing field for the larger wealthier teams and smaller less fortunate teams.

The next CBA controlled for is the deal struck in 1995. At this point the league was in a much different financial situation. Many think that Larry Bird, "Magic"

Johnson, and Michael Jordan were to thank for righting the ship in the 1980's and early 1990's. Because of this, the players wanted to be fairly compensated for driving the success of what was a failing league in the late 1970's and early 1980's. The recourse the player's decided to go with was a lockout. A lockout is when the NBAPA and NBA cannot come to terms on a new CBA and the players are "locked-out" which leads to the cancelation of the season. This CBA was very significant, not only did it end the lockout, it also added rookie scale contracts. The new rookie scale set standards for the amount of the contract's based on drafted position and set maximum contract length. The biggest impact this CBA had on the league, besides ending the lockout, was when young players signed their second deal, they were signing long term and massively valuable contracts. For example, Kevin Garnett was drafted by the Minnesota Timberwolves out of high school. Shortly after the draft he signed a three-year $5.4 million-dollar contract, a large sum for most high school graduates. During the final year of his rookie contract the Timberwolves signed him to a six-year, $126 million-dollar extension. Kevin Garnett was just 21 when he signed this unparalleled contract extension.

The period after the 1995 CBA was a tumultuous time for the league, which found that problems arose when they gave unprepared young men enormous amounts of wealth. The league saw talented players, rookies and veterans alike, drop out of the league after being given massive contracts. The third and last CBA this study controls for is the deal struck in 2005. In terms of the scope of this paper, this deal was a game changer. After this deal, all incoming players had to be one year removed from high school. This became known as the "one and done" rule, because most NBA prospects would go to a college for a year to play, then immediately declare for the NBA draft as

soon as their first collegiate season ended. The intuition behind this rule is that by delaying entry by a year, rookies would be better equipped to deal with their new life as a wealthy NBA player. The league still operates under the "one and done" rule, although there has been speculation that the rule will be amended in upcoming years. This 2005 CBA also shorten potential contract length and amounts as well as imposed a luxury tax for any team that exceeds the salary cap set by the current CBA.

Shortly after the NBA championship ends in mid-June, the NBA draft commences. There are two rounds with each round having a total of 30 picks. Teams are free to do as they wish with their awarded pick, they can keep the pick and select a rookie or trade the pick for what the market deems a fair value.

The premise of the draft sequence is a reverse-order draft. The team with the fewest games won of the 30 total teams, picks first; then the second worst picks second and so on. The situation is complicated by the "lottery" system for the first 14 picks. Currently, the worst three teams have the best odds to land the number one pick, with each team having a 14% chance. After that, the odds ascended in order from the fourth worst team to the fourteenth worst team. After pick fifteen and the entire second round the draft proceeds in a straightforward reverse-order. Generally, the worst teams pick higher than the better teams. However, the lottery system introduces randomness into the draft.

Some consider the draft a sort of "craps-shoot." As in the quality of player is completely random and that there is no skill involved in selection. While most would contend that it's not completely random, it is far from an efficient system as the "best" player rarely goes to the team with the first overall pick. Figure 1 is a graph of the

variance of wins by pick. The y-axis is the change in record and the x-axis is draft selection. Teams with picks in the top ten win more games the following year. There are only select ways an NBA team can improve itself: through free agency, the rookie draft, and their coaching staff. It would be difficult to parse out which of these factors plays the biggest role. Some of the improvement for teams in the top ten could also be chalked up to simply regressing back to the league mean for wins. To compensate for these effects, that is why we included net wins for the three years following the draft. With the highest picks showing such drastic improvement the following season, one would expect the lower picks to show a decrease in the number of wins, but this isn't the case. The change in record bounces back and forth around zero, seemingly random. This leads to the question, are their inefficiencies within the first round of the NBA draft? Particularly, how do teams that draft late in the first round continue their success the following season? Does the inherent talent of certain teams picking late in the draft matter more than what number pick they have?

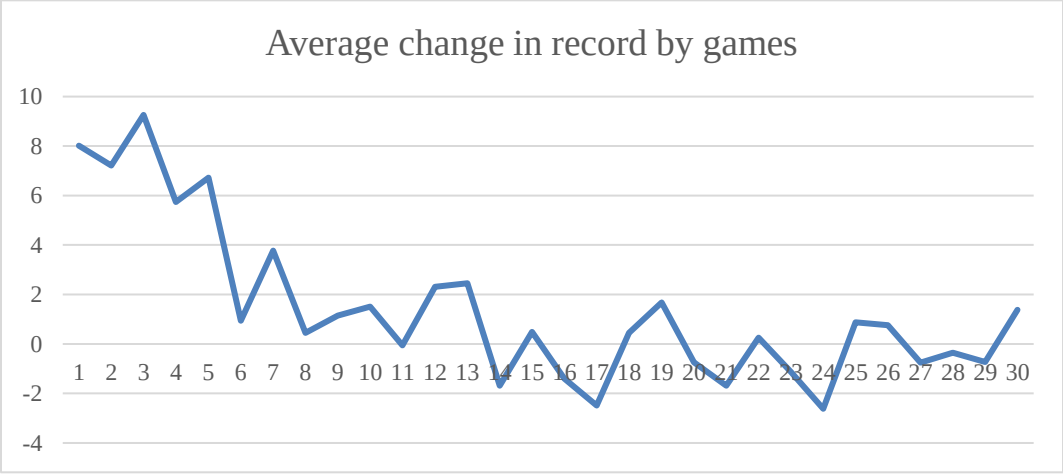


FIGURE 1: Average change in record by draft pick.

When looking for the draft picks where teams had the most success the following season, the first six don't surprise as we have shown the graph above, but it is interesting to note as shown in Table 1 below, that four of them occur in the second round. It follows that there would be picks in the early second round as most of these teams would also be teams in the early first round, but it does not ascend in the order in which one would expect it to. The most intriguing is the tenth highest increase in winning percentage at pick number 41. As mentioned before the second round is a strict reverse-order, which means that the team picking at 41 is not among the ten worst records. This could be that those teams are a player or two away from competing for a playoff spot and the drafted player was all they needed.

TABLE 1: The top ten biggest changes according to draft selection.

| Top Ten Biggest Improvement | | |
|---|---|---|
| Draft Selection | Percent Increase | Game Increase |
| 3 | 11.29% | 9.26 |
| 1 | 9.77% | 8.02 |
| 2 | 8.79% | 7.21 |
| 5 | 8.20% | 6.72 |
| 4 | 7.01% | 5.74 |
| 7 | 4.60% | 3.77 |
| 36 | 3.74% | 3.07 |
| 31 | 3.63% | 2.98 |
| 37 | 3.19% | 2.61 |
| 41 | 3.16% | 2.59 |

Beyond the benefit of adding talented players through the draft, there is financial incentive to have a successful selection. "Rookie deals," or the contract the players sign with the team that picked them are often very advantageous for the franchise. If one

franchise can acquire two or more talented rookies, they are at a competitive advantage versus the rest of the league because of the NBA salary cap and luxury tax.

# CHAPTER 2: PREVIOUS LITERATURE

Motomura, et al. (2016) do a broad analysis of a related subject, while their focus isn't just on the value of individual picks, they incorporate that while trying to answer the question of whether it pays to build through the draft in the National Basketball Association. The way they go about trying to answer the question has a similar base as this paper, however they expand the depth of data involved while contracting the time period included.

This contraction makes it easier for them to answer their paper's purpose, the timeframe they look at is from the 1994-95 season through the 2012-13 season. Choosing this period enables them to use the rookie pay scale that was introduced during the 1995 CBA, which standardizes how much a team pays each pick.

Their paper also looks beyond the first-year impact of the draft pick, up to the fourth year, which is the last year of the rookie contract during the period in which they studied. While I understand the selection of four years, the question remains how long after the draft a pick can have an effect. In the NBA players are often traded or simply cut. As each team can only carry 15 players at a time, teams need to make sure they optimize their roster. If the player is traded, the assumption is that the team received fair market compensation for that young player. This speaks to the "skill" of the front office or General Manager and not to the value of having that draft pick. If they had included the percentage of draft picks remaining on their original team that would help clear up this issue. They also control for when the franchise brings on a new coach or general manager. Also included in the paper are playoff wins, with playoff wins given greater weight than a regular season win. The conclusion of their analysis is that who is making

the selection matters more than the selection itself. They concluded that successful franchises win more and therefore draft later in the rounds, whereas bad or in-between teams draft early and fail to take advantage of the earlier picks.

There was also an undergraduate senior thesis by Watave (2016) that uses advanced statistics PER, player efficiency rating, and WS, win shares. The player efficiency rating is a statistic created by John Hollinger. This metric has been widely criticized as biased in favor of offensive skills and does not incorporate the defensive skills of players. A second criticism is that the metric gives unproportionable credit to players with lower minutes played or minutes played against the opponents' backups. "Win shares" comes from the book of the same name written by Bill James and Jim Henzler, *Win Shares.* It details how to evaluate a player's performance using sabermetrics, resulting in the metric "win share." This measure is more widely accepted than the PER statistic. The paper discounts these metrics using the rookie pay scale to find if there are optimal selections when cost is a constraint. Since this paper uses the rookie pay scale it only focuses on the NBA draft from 1995 and onward. Since Watave (2016) is built on statistics made by individuals and not just the facts, the question of biases arises. He suggests that there may be picks at the end of the draft that are efficient when considering the cost of those later picks. Seeing that the cost of a rookie selected with the first pick last year only accounted for 6.2% of the team's salary cap, how meaningful these results are is in question. This paper looks to push past the 1995 barrier and test the data going back into the 1970's.

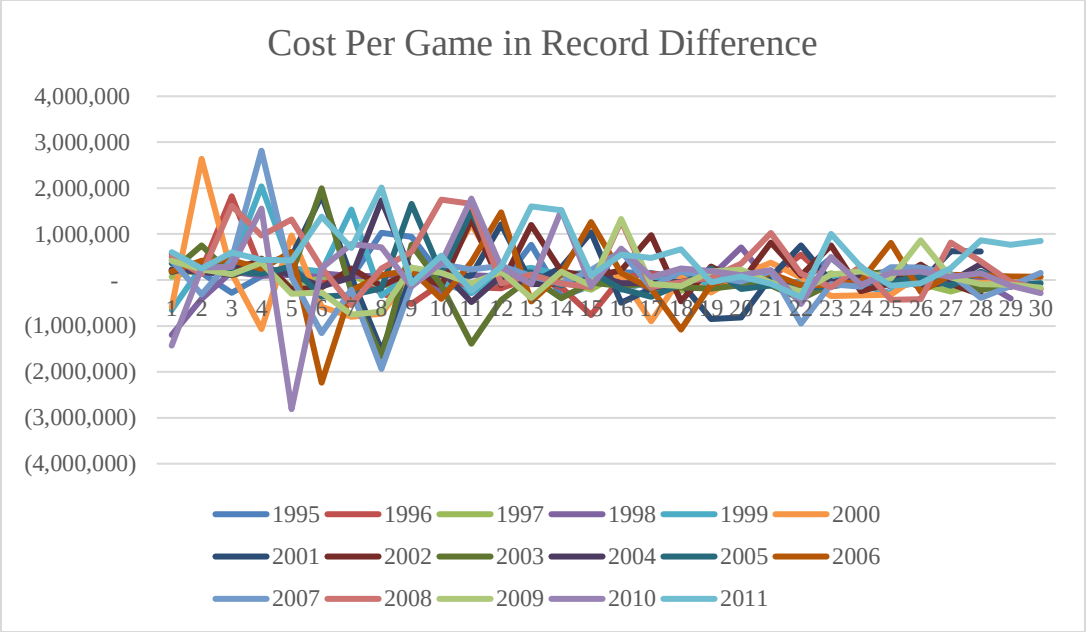


FIGURE 2: Cost per game in record difference.

Above is a graph that takes the rookie salary for the given year and position in the draft and divides it by the increase or decrease in number of games won the year after the draft. A quick metric of "cost" of change in win outcome. There are of course other inputs that affect a team's number of wins. This figure is a quick visual about how much noise there is around rookie salary and the next season's outcome.

# CHAPTER 3: DATA

The data used for this paper includes two different worksheets provided by Dr. Craig Depken. The first was data on the NBA draft and the second was data on NBA franchises. To be consistent, this paper will use data from after the NBA/ABA merger, in 1976, through the 2011 season. The draft data were aligned with the team data so that each draft selection was connected to the team's statistics for that season and the following three seasons. The dependent variable for this analysis will be the total number of net wins for the three years following the draft. The data are unbalanced as there were less teams in the league at the beginning of the sample period; the current number of teams is 30. While some teams have moved cities during the time period studied, in those cases the data follows the team to it's new destination, it is not declared a new team.

The one instance of confusion in the data was when the Charlotte Hornets moved to New Orleans. When the Hornets moved, they brought their players and General Manager with them, so for this study the original Charlotte Hornets data follows the team to New Orleans. When Charlotte got an expansion franchise, they are treated as a new team.

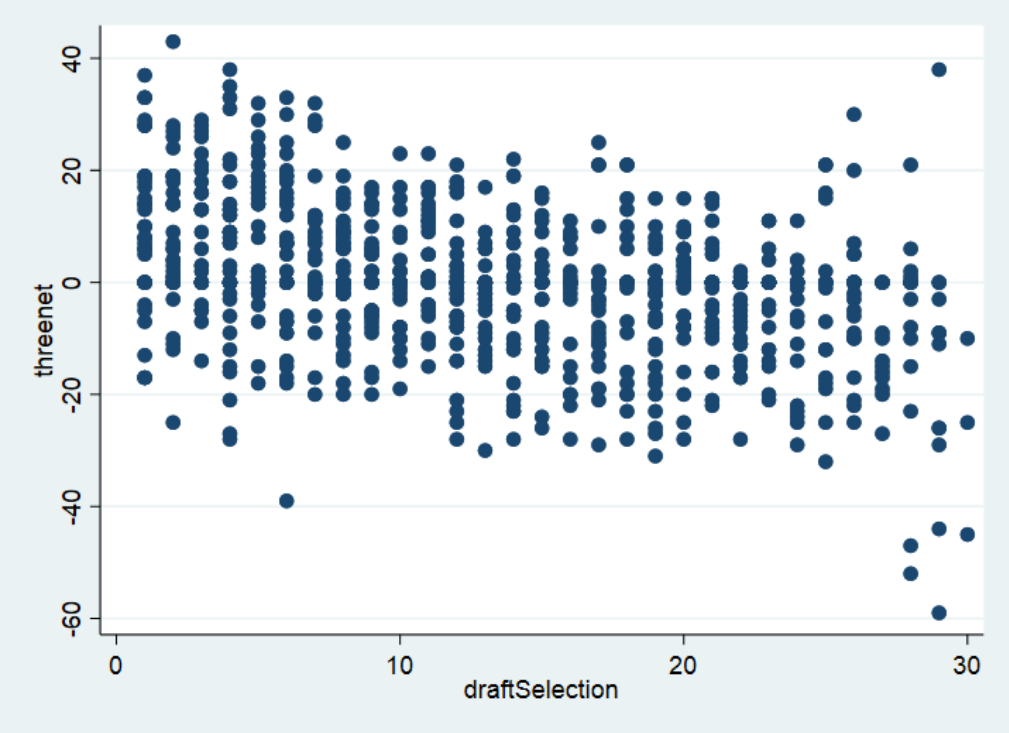


FIGURE 3 Net win change by draft pick.

Figure 3 is a scatter plot of the change in wins over the next three years, against first round draft picks. As can be seen there is a slight negative correlation as the draft moves from pick 1 to pick 30. How much of that relationship is from the effect of the newly drafted player and how much of that is from teams regressing back to the average?

The independent variables of interest are total picks for the next three years, as an aggregate and broken out by year. Picks one through ten were divided into five buckets, picks one and two as bucket one, picks three and four as bucket two, etc. Before 1989 the NBA draft included more than two rounds, so for those years only the top 60 selections were included in the study, since 60 is the total number of draft picks we have

currently. This paper also studies independent variables that are dummy variables for the first through tenth pick.

Dummy variables for whether the year was impacted by a lockout were added. It is important to include this since in those years the number of games is less than 82, the regular season amount since the 1966-67 season. Other dummy variables that were included are for when a new CBA would impact the draft. The CBA's used were the 1983, 1995, and 2005, as all three directly or indirectly would have affected the strategy and outcomes surrounding the draft.

The final variable included in the study was number of games won the three previous seasons. This is proxy for the franchise's inherit talent. There seems to be a regression back to the true mean for most teams, as there is a slightly negative correlation between the number of games won the previous three years and the net wins the following three. To incorporate the previous three years of wins the first two years for franchises was excluded. These include the first three years for the Dallas Mavericks, Miami Heat, Charlotte Hornets, Minnesota Timberwolves, Orlando Magic, Vancouver Grizzlies, and Toronto Raptors.

To find certain effects, a random number generator was used to selected ten of the twenty-one teams that were in the league in 1977. A dummy variable was used to indicate each of the selected markets.

Figure 4 below shows the three year net wins following the current draft versus the number of games won for the three years previous to the draft. It's clear from the negative correlation that there still exist a regression back to the mean when the previous three years and the following three years are considered.

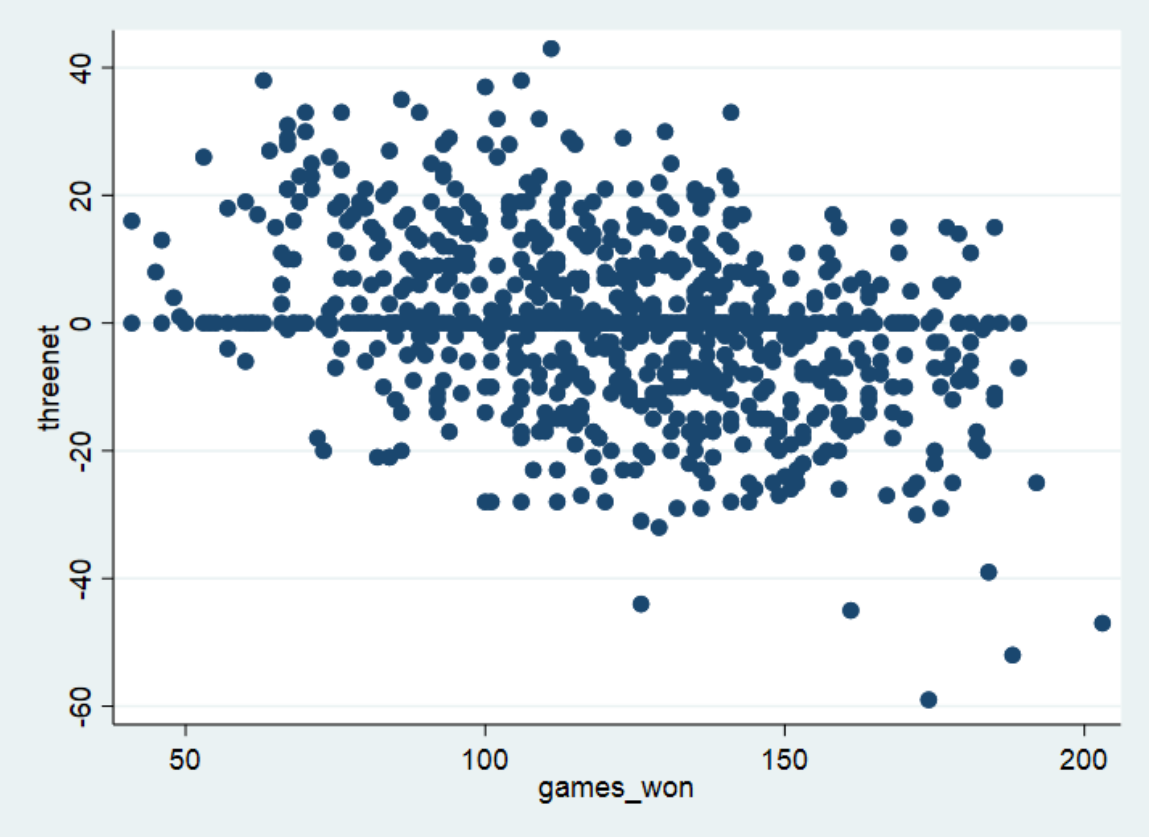


FIGURE 4: Net wins change by previous games won.

# CHAPTER 4: ECONOMETRIC METHOD

Since the data are a cross-section repeatedly sampled over time, it is considered panel data, which lends itself to a specific variety of techniques. With this study, we want to be able to control for fixed effects of the franchise's general manager or coach, seeing how the ability of the GM or coach are essentially unmeasurable, even with number of games won included, a fixed effects model would control for their influence on winning percentage change. The benefit of the fixed effects model is that the effects can be correlated with other right-hand side variables without jeopardizing consistency at the cost of a degrees of freedom sacrifice. The fixed effects estimator is also called the within estimator. With this estimator, you will have efficiency loss as it uses only within variation and the coefficient of any time-invariant regressor is not identified.

To make sure the fixed effects estimator was the appropriate avenue, the Hausman test was leveraged. The test statistic fails to meet the asymptotic assumptions. With this in mind, we use the default *xtreg* settings. To flush out specific fixed effects for franchises dummy variables were added.

For this study we will be using the first ten picks in the draft, the five different buckets, CBA dummies, lockout dummies, picks remaining in first and second round, number of games won the previous three years, and the number of picks the next three years as a total and broken out by year. The net wins for the following three years as the left-side variable.

Once the significant variables were identified, the *test* command in Stata was used to test to see if the coefficients were statistically different from each other.

# CHAPTER 5: RESULTS

Across all the models run, the quantitative results for the coefficient tied to the number of games won the previous three season stays negative and significant at the 1% level. This confirms the theory that teams regress back to the league mean for wins.

Of the ten franchise's incorporated only Golden State was significant across all models they were involved in at the 1% level. At the 5% level of significant Utah and Phoenix were significant for all models that involved them. Brooklyn came in significant at the 10% level for models one through six.

Looking at the models that included the picks in buckets, the first four remained significant at the 1% level in all models they were used. The magnitude and sign of the coefficients is what will be useful for front office decision making. Even when accounting for CBA's, Lockouts, future picks, and remaining picks that year it's clear that a pick in the first bucket will add between 8.5 and 9 wins over the next three years. The number of wins added increases for bucket two to between 9.4 and 9.7. Bucket three drops back to between 7.9 and 8.3, with bucket four being the smallest at 4.5 to 4.9 wins added.

When these coefficients were tested to see if they were different from each other bucket one was different from bucket four and five at the 10% and the 1% level. Bucket two was statistically different from bucket four and five at the 5% and 1% level. The last bucket to have a significantly different coefficient was bucket three compared to bucket five, at the 1% level.

For model's incorporating specific picks a similar narrative takes place. Even when controlling for all the same variables as we did for the buckets picks one through

five are significant at the 1% level. Pick six through eight maintained a significance at the 5% level for models seven and eight, then picks six and seven drop down to significant at the 10% level for model nine. The range for magnitude of the coefficients is similar to that of the buckets. The eighth pick adding between 4.6 and 5.1 wins the next three years and pick five added 11.2 to 11.5 wins.

Tests were also done on the model that comprised the data on individual draft picks. The pick one coefficient showed to be statistically different from five of the top ten picks. The effect of pick one was different than picks six, seven and eight at the 10% level and different than picks nine and ten at the 1% level. Pick two's effect was different than nine and ten at the 10% level. Pick three also showed significant difference from nine and ten, rather at the 5% level. Pick four proved to be statistically different than seven, nine, and ten at the 10%, 1%, and 5% level. Pick five also showed difference with five other picks, the coefficient being different than picks six, seven, and eight at the 5% level. Five showed difference from nine and ten at the 1% level.

TABLE 2: Results from models without picks broken out.

| Variable | (1) | (2) | (3) |
|---|---|---|---|
| games_won | -.1562*** | -.1714*** | -.1681*** |
| totpicks | 0.4071* | 0.4076* | |
| Boston | | 3.21 | 3.36 |
| Cleveland | | 0.39 | 0.48 |
| Denver | | 3.06 | 3.05 |
| Golden_State | | -6.5247*** | -6.6890*** |
| Indiana | | -1.9206 | -1.8480 |
| Brooklyn | | -4.0670* | -3.8120* |
| Seattle_OKC | | 1.67 | 1.51 |
| Philadelphia | | 2.09 | 2.07 |
| Phoenix | | 5.0559** | 4.9759** |
| Utah | | 3.6774* | 3.6849* |
| pickyr1 | | | .9049** |
| pickyr2 | | | -0.0003 |
| pickyr3 | | | 0.51 |
| _cons | 16.4803*** | 18.0847*** | 17.2500*** |
| Observations | 817 | 817 | 817 |
| R-squared | 0.2113 | 0.2117 | 0.2139 |

Note: *p<.10. **p<.05. ***p<.01.

TABLE 3: Results from models applying picks into buckets.

| Variable | (4) | (5) | (6) |
|---|---|---|---|
| games_won | -.1069*** | -.1076*** | -.1090*** |
| bone | 9.0540*** | 8.9848*** | 8.6398*** |
| btwo | 9.7717*** | 9.7092*** | 9.3848*** |
| bthree | 8.3330*** | 8.2653*** | 7.9915*** |
| bfour | 4.9008*** | 4.8566*** | 4.5974*** |
| bfive | 2.2255 | 2.2167 | 1.9883 |
| Boston | 2.8883 | 2.8634 | 2.8756 |
| Cleveland | 1.5314 | 1.5648 | 1.4982 |
| Denver | 3.4912 | 3.5042 | 3.4163 |
| Golden_State | -5.8654*** | -6.0161*** | -6.1140*** |
| Indiana | -1.0308 | -0.9314 | -1.0368 |
| Brooklyn | -3.5881* | -3.6100* | -3.6240* |
| Seattle_OKC | 1.0140 | 0.9815 | 0.9144 |
| Philadelphia | 2.1081 | 2.0081 | 1.9308 |
| Phoenix | 5.3409** | 5.3115** | 5.2400** |
| Utah | 4.5309** | 4.5545** | 4.5490** |
| pickyr1 | | 0.0765 | 0.2005 |
| pickyr2 | | -0.0798 | -0.0897 |
| pickyr3 | | 0.4864 | 0.4891 |
| rest_first | | | -0.3401 |
| rookie_cba | | | -0.3729 |
| Salarycap_cba | | | 0.7074 |
| contract_cba | | | -0.5208 |
| _cons | 9.9182*** | 9.1108*** | 9.3551*** |
| Observations | 817 | 817 | 817 |
| R-squared | 0.2831 | 0.2856 | 0.2857 |

Note: *p<.10. **p<.05. ***p<.01.

TABLE 4: Results from models using pick specific data.

| Varibale | (7) | (8) | (9) |
|---|---|---|---|
| games_won | -.1072*** | -.1080*** | -.1094*** |
| one | 10.3557*** | 10.2501*** | 9.8552*** |
| two | 7.8044*** | 7.7114*** | 7.2458*** |
| three | 9.4773*** | 9.3589*** | 8.9604*** |
| four | 9.9781*** | 9.9163*** | 9.4902*** |
| five | 11.4786*** | 11.5121*** | 11.2442*** |
| six | 5.0845** | 4.8341** | 4.4084* |
| seven | 4.7363** | 4.7470** | 4.3719* |
| eight | 5.1292** | 4.9757** | 4.6938** |
| nine | 1.8154 | 1.7110 | 1.3746 |
| ten | 2.3935 | 2.4057 | 2.1385 |
| Boston | 3.0428 | 3.0401 | 3.0727 |
| Cleveland | 1.5275 | 1.5792 | 1.5170 |
| Denver | 3.1040 | 3.1051 | 3.0104 |
| Golden_State | -6.1978*** | -6.3892*** | -6.5048*** |
| Indiana | -0.9389 | -0.8319 | -0.9449 |
| Brooklyn | -3.5330 | -3.5305 | -3.5242 |
| Seattle_OKC | 0.9826 | 0.9272 | 0.8524 |
| Philadelphia | 2.1537 | 2.0542 | 1.9632 |
| Phoenix | 5.4002** | 5.3588** | 5.2849** |
| Utah | 4.5768** | 4.5995** | 4.6050** |
| pickyr1 | | 0.1427 | 0.3052 |
| pickyr2 | | -0.1244 | -0.1359 |
| pickyr3 | | 0.5281 | 0.5344 |
| rest_first | | | -0.4555 |
| rookie_cba | | | -0.4267 |
| Salarycap_~a | | | 0.7061 |
| contract_cba | | | -0.5493 |
| _cons | 9.9765*** | 9.0571*** | 9.3563*** |
| Observations | 817 | 817 | 817 |
| R-squared | 0.2853 | 0.2881 | 0.2882 |

Note: *p<.10. **p<.05. ***p<.01.

# CHAPTER 6: AREAS FOR IMPROVEMENT

This study has room to become more robust, by coming up with ways to control for different aspects of the teams, whether that be where they play, effects of new coaches, and effects of new ownership.

Also, data on the actual players drafted might have a meaningful contribution to the paper, as some players drafted in the top five have short, non-productive careers, while others turn into very productive and contributing stars. This becomes tricky as the introduction of bias would be hard to evade.

Another opportunity for further study would be to integrate data on free agency activity for the teams in a given year. The level of this would cause problems as it has increased since 1977, but perhaps a percentage of previous total could null this problem.

# CHAPTER 7: CONCLUSION

The NBA rookie draft every spring is a great opportunity for teams to add depth and talent to their roster. As teams get smarter and integrate more advanced methods to seek competitive advantage, the margin for error shrinks. The results from this paper suggests that Sam Hinkie was shrewd to organize the purposeful tanking of the 76er's.

After controlling for CBA's, Lockouts, and various pick data it is clear that the top eight picks show a clear advantage to the rest of the draft. This result held when transforming the picks into buckets or using the specific pick data. While total picks, picks in specific years, and picks nine and ten showed little effect. These results would suggest that when NBA franchises are considering tanking or evaluating trades, they should value the top eight picks over all else.

# REFERENCES

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