THE TRANSFER OF TALENT: HOW TO PREDICT SUCCESS IN THE NBA

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THE TRANSFER OF TALENT: HOW TO PREDICT SUCCESS IN THE NBA

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Abstract

The purpose of this paper is to estimate the significant predictors of future success of NCAA college players in the NBA, and to determine whether or not there is a specific variable that separates future great NBA players from mediocre players using college statistics. This study focuses on the transfer of talent measured by the efficiency rating of a player.

KEYWORDS: (NBA, Efficiency Rating, NCAA)

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CHAPTER I

INTRODUCTION

The purpose of this paper is to estimate the significant predictors of future success of NCAA (National College Athletics Association) college players in the NBA (National Basketball Association), and to determine whether or not there is a specific variable that separates future great NBA players from mediocre players using college statistics. This study attempts to discover the reasons why some players are overvalued during the NBA draft. Even Michael Jordan, voted one of the top 50 players of all time,[1] the winner of six NBA championships, and a five time NBA MVP (Most Valuable Player), was the overall third selection in the 1984 draft.[2] The best players should get picked first, that's the way the draft is set up to work. The best talent is distributed to teams based on their success from the previous season.[3] In other words, the worst performing team from the prior year gets to pick first. However, the first 14 picks are decided by a lottery. The 14 worst performing teams from the previous season participate in a weighted lottery[4]. The lottery

[1] On October 19, 1996 NBA Commissioner David Stern announced the 50 greatest players of all time. A blue-ribbon panel of media, former players and coaches, current and formal general managers and team executives selected the list of players. Found at www.nba.com.

[2] NBA & ABA Basketball Statistics & History, Copyright 2000-2012, Sports Reference LLC. Found at http://www.basketball-reference.com.

[3] J. A. Hausman and G.K. Leodard, "Superstars in the National Basketball Association: Economic Value and Policy" *Journal Of Labor Economics*, (1997): 586-624.

[4] NBA, Copyright 2012 NBA Media Ventures, LLC. Found at www.nba.com.

process determines the first three picks of the draft. The rest of the first-round draft order is in reverse order of the win-loss record for the remaining teams. In the article *NBA Draft Lottery Probability*, Florke and Ecker explain the procedure for the actual lottery.

"The technical procedure for implementing the actual lottery drawing involves 14 Ping-Pong balls, numbered 1 through 14, placed in a drum and four balls are drawn. When these four balls are drawn out of the 14 total balls, without regard to their order of selection, 1,001 combinations are possible (14 C4 =1001). Prior to the lottery drawing, teams are assigned combinations based on their order of finish (their initial draft position) during the regular season [1]. For example, Dallas was assigned 50 of the possible combinations. The Board of Governors reduced the total number of combinations to an even 1000 by disregarding one of the combinations that was not assigned to a team. Table 2 illustrates the chances assigned to each team and the associated probabilities of receiving the top pick."[5]

Based on this system the probability of the worst team getting to select first in the draft is .250. The probability of the second worst team getting the first pick is .199. The probability decreases down to the 14th worst performing team from the previous season. They have .005 chance of receiving the first selection in the NBA draft. In 2003, the Detroit Pistons were lucky enough to receive the third pick in a draft that contained a lot of future talent. During the draft the Detroit Pistons made, possibly, the worst draft decision in franchise history. They drafted a seven-foot international player from Novi Sad, Serbia. He is in his 9th season with a career average of six points per game. To say the least, he has underperformed as a number two draft pick. For some unknown reason

[5] Chad R. Florke and Mark D. Ecker, "NBA Draft Lottery Probabilities" *American Journal of Undergraduate Research,* Vol. 2, no. 3 (2003): 20.

the Detroit Pistons drafted Darko Milicic[6] over current NBA stars like Carmelo Anthony[7], Chris Bosh[8], and Dwayne Wade[9]. In fact, one could argue that with Dwayne Wade's 2006 NBA Finals performance[10] and win that he has been the most successful of the previously mentioned players and yet he was the last of them to get drafted. It's possible that Detroit felt that Milicic's height would provide them with a great player. That wasn't the first time height was overvalued. The first selection in the 1984 draft was a seven foot Sam Bowie over 6'6'' Michael Jordan. Bowie's professional performance was nowhere near that of one of the greatest players in NBA history, Michael Jordan. Height isn't everything, but it has influenced huge decisions that cost teams a lot of potential success. This is one example of how a variable impacts others to have high expectations for a player. Is it possible for teams to avoid overvalued players? This paper researches other factors that can have an impact on the transfer of talent from college to the NBA.

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[6] Darko Milicic was the number two draft pick in 2003 from Serbia. He has played 8 years in the NBA for 6 different teams. He averages 18.5 minutes and 6 pointes per game during his entire career. Found at www.nba.com.

[7] Carmelo Anthony was the number three pick in the 2003 draft. He is a five time NBA All-Star, and won a gold medal with the USA Olympic team in 2008. He averages 25.6 minutes and 24.7 points per game in his career. Found at www.nba.com.

[8] Chris Bosh was the number four pick in the 2003 NBA draft. He is a six time NBA All-Star. Throughout his career he has averaged 19.9 points and 9.2 rebounds per game. In 2011 he competed for the NBA championship with the Miami Heat. Found at www.nba.com.

[9] Dwayne Wade was the number five pick in 2003. He has played his whole career for the Miami Heat in 2006 they won an NBA Championship Title and Dwayne Wade was named NBA Final MVP. He is an 8 time NBA All-Star has career averages of 25.3 points and 6.3 assists per game. Found at www.nba.com.

[10] Dwayne Wade averaged 34.7 points per game, 7.8 rebounds per game, and 3.8 assists per game. He was named the NBA Finals MVP. His performance in the 2006 NBA Final is the top amongst all players to ever compete in and NBA championship. Found at www.nba.com

Every year employers are looking for new and young talent. They want the next big thing, a new discovery that will place them ahead of the competition. With several prospects to look through, employers need a way to determine who the best is. In the world of sports it's easy to evaluate a player's productivity and performance by looking at their statistics. The statistics of a player's performance (points, rebounds, assists, blocks & steals) can reveal a lot about their ability to play. Statistics show what a player accomplished, or what they didn't accomplish, during the time they were competing. According to some, "(statistics) allow us to see what our eyes cannot follow."[11] When watching a game or competition it is impossible to keep track of everything the players are doing. That's why statistics are so important. They allow teams and players to evaluate performance numerically and determine who the best performing player is.

The most important thing to know about statistics is that they only tell you how well a player played in their previous games, they don't account for games in the future. However, they do provide teams and coaches with a good idea of who will play well and, over several seasons coaches can determine which players are consistent in their performances. "Consistency can be measured by how the variation in this year's performance can be explained by what a player did last year."[12] To use an example from David J. Berri (2010), 22% of the variation in a batter's batting average is explained by the hitter's batting average the previous season. In football 26% of the variation in a quarterback's rushing yards per attempt is explained by what he rushed during the

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[11] David J. Berri, Martin B. Shmidt and Stacey L. Brook, *The Wages of Wins: Taking Measure of the Many Myths in Modern Sports* (California: Stanford Business Books, 2007), 2.

[12] David J. Berri and Martin B. Schmidt, *Stumbling on Wins: Two Economists Expose the Pitfalls on the Road to Victory in Professional Sports* (New Jersey: Pearson Education, Inc., 2010), 33-39.

previous season. The sport whose variations are explained the most by previous seasons is basketball. Total rebounds per minute are 90% explained by what a player did the previous season. Field goal percentage has the lowest percent of variation explanation, and it is still over double (47%) the explanation of a batter's batting average. Although statistics don't tell everything about a player, they do provide people with numbers to analyze when it comes to selecting and possibly predicting the best.

Team owners and coaches are not the only people who want to know who the best is. Companies want to endorse the best player with the most talent, but to endorse the best player they have to know who the best player is. In June of 2003, LeBron James signed a 90 million dollar deal with Nike before he was a proven commodity.[13] He had just graduated high school a few months prior to being offered Nike's second biggest deal in the brand's history, second to Tiger Woods. He had absolutely no college experience, and $90 million is a lot of money to invest in an 18-year-old kid, without a professional or college résumé. James could have easily gotten hurt, had a career ending injury, or like we've seen before, underperformed. Why was Nike so confident in an 18-year-old? Wouldn't they have more confidence in signing an endorsement deal with a player that had already played at least a year in the NBA, and had proven his ability to play? Luckily for Nike, LeBron James has performed as well as any other NBA player and is on his way to being a future NBA Hall of Famer. If Nike signed him just because he was the number one draft pick, they were betting a lot of money on his potential success. In 2007, Greg Oden was the number one draft pick. He didn't get any big endorsement

[13] John Fizel, Chris R. McNeil, and Timothy Smaby, "Athlete Endorsement Contracts: The Impact of Conventional Stars. *International Advances In Economic Research,* Vol. 12, no. 2 (2008): 247-256.

deals, and that's probably a good thing, at least for endorsers. Over a period of 5 years he's only played 82 games. A regular NBA season consists of 82 games. Teams and companies invest a lot of money in people they think will be the next big star to help them win games, sell products, and make money. It's a risky investment since not everyone is a superstar, and players that can perform at the highest level are limited.

Employers and fans are interested in finding the next big thing. They want to find talent as early as possible. When talent is detected it is like finding the golden ticket, but just because someone is good now doesn't necessarily mean they will be good in the future.

> "Sports teams are in pursuit of the next Michael Jordan, movie studios pursue the next Titanic and music producers seek the next Beatles. Yet player after player, movie after movie and singer after singer fail to meet expectations. In the pursuit of superstars, there are many false positives. We identify this problem as the dilemma of choosing talent."[14]

Many analysts have successfully predicted draft orders. It is clear they know whom people will think is good, but what they continue to fail to do is predict the future success and productivity of players in professional sports. They don't know who will actually be good. Draft order should theoretically be the best players being picked first and then a steady decline in skill level as the draft progresses. However, that rarely happens due to the incapability of team owners and coaches to distinguish between NBA potential and college success. At the end of the 2010-2011 NBA season the average draft pick number of the top 20 scoring leaders was 8.55. This means that the best scorers are not always number one draft picks. The statistics being used to decide which players should be

[14] Peter A. Groothius and J. R. Hil and Timothy Perri. The Dilemma of Choosing Talent: Michael Jordans Are Hard to Find. *Applied Economics* (November 2009): 3193-3198.

drafted first are not the same statistics that are capable of predicting future success in professional sports. In this study there will be an investigation of several college statistics and other variables that will tell us if decision-makers are capable of predicting NBA success based on college variables and statistics.

This study ran a regression for NBA efficiency using nine variables that could be determined through their college career. The majority of previous studies use college statistics such as, points per game and rebounds per game, to predict future performance in the NBA. Rather than comparing college statistics with NBA statistics, this study analyzes efficiency at the college and professional level. The college efficiency of a player will predict their NBA efficiency. Efficiency is measured using a formula developed by the NBA that will later be explained in Chapter III. College efficiency will be accompanied by eight other variables. The level of competition a player faced will be measured by the conference they played in. A player's success in college will also be measured by how many years their team was named regular season champions, and how many times they won the conference tournament at the end of the year. Success will also be measure by number of NCAA Final Four appearances and National Titles. To put more focus on the individual player, the affect of a player receiving the James Naismith Award and NCAA Tournament MVP will be factored into the regression. The final variable that will be used in this study is the number of years a player competes for in college. This variable will be used to test whether or not more college experience is better for a player. All of these variables will be further discussed and explained in Chapter III. Chapter II will examine several studies that took place prior to this one, and the results that were concluded by the authors. In the fourth chapter the results of the

regression will be analyzed, and the reasoning behind the results will be discussed. The final chapter will conclude the research that was completed by this thesis.

CHAPTER II

THEORY

The purpose of this chapter is to explore previous papers and research completed on the transfer of talent from college to professional sports. There are a total of five sections that will discuss the papers reviewed. Each section will discuss different studies that are relatable to each other, and to the research of this paper. The sections will focus on the variables that were used and the results that the studies concluded. Most of the variables will be similar to the ones used in each study. The variables will also relate to the ones that were chosen for this paper. The previous studies focus on data collected in the National Football League (NFL), the National Basketball Association (NBA), and from NCAA (National Collegiate Athletics Association) Division I college basketball. The first section will provide an introduction and explanation for the reasoning behind the purpose of this research. The following three sections will discuss previous research relating to the topic being studied. The final section will provide a brief conclusion of the steps that will be taken to differentiate this study from the ones that pre-existed.

2.1 Literature Introduction

It's never easy to make the right decision. It's even harder to know what the right decision is. A lot is on the line for companies and teams looking for the next big star to represent their products and franchise. They want successful players, players who score

big and win games; players that people want to watch and cheer for. Great players have fans, and popularity is the key determinant of an athlete's endorsement power to consumers.[1] Over the years, athletes have had a huge presence in advertising. The Nike and Michael Jordan combination is unforgettable, creating the phrases, "like Mike" and "it's got to be the shoes." Nike took the basketball shoe market to a whole new level. They set the stage in 1984 when they signed Michael Jordan.[2] Two years after signing Jordan, Nike topped $1 billion dollars for the first time.[3] To say the least, signing Michael Jordan as their star athlete endorser was the best thing Nike could have done. Now, Nike runs most of their advertising through celebrity endorsements. However, did Nike just get lucky? What attracted them to MJ? After all, no one knew Jordan was going to turn out to be such a successful professional athlete, especially those who passed on him during the NBA draft (Michael Jordan was the third pick in the 1984 NBA draft). It's true he had a successful college career, ending it with the game winning shot at the buzzer to win the NCAA National Title, but as we have seen, college success does not always transfer over to the professional level. Could Nike have predicted his success? Was Nike assuming that Jordan's success in college would transfer to the NBA? Although a company will never be able to predict an athlete's off court behavior, i.e.

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[1] Yupin Yang, Mengze Shim and Avi Goldfarb, "Estimating the Value of Brand Alliances in Professional Team Sports." *Marketing Science*, Vol. 28, no. 6 (November):1095-1111.

[2] NIKE, Inc. The official corporate website for Nike and its affiliate brands, Copyright 2011. Found at http://nikeinc.com.

[3] Korky Vann. "Nike." *About.com Shoes*. Web. 20 Feb. 2012. <http://shoes.about.com/od/athleticshoes/a/nike.htm>.

Tiger Woods or Kobe Bryant[4], there may be a way to predict their future success as a professional athlete.

There seems to be two options when looking to sign a professional athlete as an endorser. A company can sign an athlete with a lot of hype[5] and popularity, or they can wait until an athlete has proven their ability to perform. The latter may cost more money, since many companies may be bidding for athletes that have proven themselves successful and popular. In June of 2003, LeBron James signed a $90 million dollar pact with Nike prior to playing one regular season game.[6] He was straight out of high school, without any NCAA experience. Then there are players like Blake Griffin. Griffin sat out his rookie season due to injury. When he returned the following season he was crowned rookie of the year. That same year, he was seen in commercials varying from Kia to Subway. Both James and Griffin were overall number one draft picks in the NBA. Yet, one was signed before he ever played a NBA game (James) and the other was signed after a breakout rookie season (Griffin). Even with two successful seasons at Oklahoma on his side, Griffin had to prove himself at a professional level. Why LeBron? Several high school athletes had been entering the draft before him, and several had flopped and were unsuccessful in the NBA. There are several factors that can effect a company's decision to sign an athlete endorsement, but the bottom line is, if they don't perform and win, people won't like them and businesses won't profit.

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[4] Tiger Woods was found guilty of cheating on his wife and lost several endorsement deals. Kobe Bryant was charged with raping a young women and also lost several endorsement deals.

[5] The expectations for a player to perform well.

[6] John Fizel, Chris R. McNeil amd Timothy Smaby, "Athlete Endorsement Contracts: The Impact of Conventional Stars." *International Advances In Economic Research*, Vol. 14, no. 2 (2008) 247-256.

The most profitable athletes are the superstars, the franchise players. Many marketing agencies believe that, "there has been an excessive saturation of athletes associated with signature products.[7]" They are arguing that nobody really knows which athlete is endorsing which company anymore. The focus on superstar endorsers has been lost. Fizel, McNeil, and Smaby did a market study on the impact of conventional stars in 2008. They wanted to know if the market would respond positively to conventional star endorsements suggesting that such contracts add on to the bottom line of the firm, or will the market respond negatively reflecting the expectations of a diminished bottom line due to the ever increasing market saturation of athlete endorsements? They came to the conclusion that, the more athletes in the market the less profit. Instead of signing every conventional star, companies should be focused on the, "superstars." The big names like LeBron James and Kobe Bryant, the faces of not only their team, but of the entire NBA. Companies need to recognize the big names and they need to do so before anyone else. How can they distinguish a superstar from just a star? Even team managers and franchise owners have difficulty doing that.

It seems that very rarely players who receive the most significant endorsements are drafted outside of the top ten draft picks of their class. This suggests that companies are associating higher draft picks with future success. It's easy to assume that the best go first, but in several situations that has not always been the case. Several studies have been done related to analyzing draft position and future success in professional sports.

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[7] Howard Burch, Vice President of Marketing for Fila America

2.2 Catching a Draft: On the Process of Selecting Quarterbacks in the National Football League Amateur Draft

This study focused on NFL quarterbacks found that many factors related to a quarterback's draft position are unrelated to future NFL performance.[8] High draft picks are not guaranteed. Berri and Simmons (2011) focused on the difficulties of evaluating athletes in the uncertain environment of professional sports. Their analysis revealed that there was a relationship between a quarterback's college performance and when he was drafted. However, their research also showed that the relationship between production and draft position was, "quite weak." They realized that quarterbacks taken higher do not appear to perform any better. The research concluded that NFL decision-makers are impressed by physical factors such as, height, weight, and speed. They also concluded that there isn't any evidence that these physical features make a difference in a quarterback's NFL performance. NFL decision-makers are picking who they believe will be the best based on college statistics, but what they don't realize is, not all great college players turn out to be NFL Hall of Famers. Somewhere along the line there are factors that separate a great NFL quarterback and a mediocre second-string quarterback. The first aren't always best.

If the first draft picks aren't guaranteed superstars then who is? Which picks present the greatest value to a team? Some researchers believe that the first draft picks actually hold the least value. More research into the NFL draft showed that players drafted towards the top of the second round offer more per dollar value to teams than

[8] David J. Berri and Rob Simmons, "Catching a Draft: On the Process of Selecting Quarterbacks in the National Football League Amateur Draft." *Journal Of Productivity Analysis*, (February 2011): 37-49.

players drafted in the top of the first round.[9] When a team uses an early draft pick to select a player they are implicitly forecasting that this player will do well. Some teams will even trade as many as three draft picks in order to get the number one pick. However, success in the NFL has been notoriously difficult to predict. They found that players selected in the final picks of the first round on average produce more surplus for their team than the first pick, and cost one quarter of the price. How overvalued is the right to choose first? Over their first five years, players drafted in the first round spend about as many seasons out of the league (8%) or not starting a single game (8%) as in the pro bowl (9%). There are several psychological factors that suggest teams may overvalue the "right to choose." Some teams will overestimate the extent to which other teams covet a player, and therefore overestimate the importance of trading-up to acquire a particular player. In this cycle teams get pushed towards overvaluing early picks. They found that it's true performance declines steadily throughout the draft. However, performance does not decline steeply enough to be consistent with the very high values of top picks. They concluded that the first pick has an expected surplus lower than any pick in the second round. Some teams have argued that signing a high draft pick could be for reasons that stretch beyond on-field performance. In the article they discussed Michael Vick. He might help sell tickets and team paraphernalia in a way his performance statistics do not reflect, but there are few players who are able to bring in fans without successful team performance. Bottom line is, winning brings in fans and money. To win, a team needs good players, and not all predicted stars deliver. The right to pick first

[9] Cade Massey and Richard Thaler, "The loser's curse: overconfidence vs. market efficiency in the national football league draft." *National Bureau of Economic Research* (2010).

in the draft is only a benefit if the team trades it away. Sense you have to have a losing season to receive a lottery pick in the draft, the first pick has become, the loser's curse.

2.3 The Dilemma of Choosing Talent

The last thing a team or company wants to encounter is regret from decisions made under uncertainty. It is a classic case that appears throughout bidding situations. This is the dilemma of the winner's curse; the winner of the auction will be the bidder who overvalued the amenity.[10] It exists in competitive bidding situations.[11] "In the pursuit of superstars, there are many false positives. We identify this problem as the dilemma of choosing talent. To measure player performance Groothuis, Hill, and Perri (2009) use the *efficiency formuIa* as used by the NBA to rate players.

FIGURE 2.1

EFFICIENCY RATING

(points + rebounds + assists + steals + blocks)-[(field goals attempted – field goals made) + (free throws attempted – free throws made) + turnovers)]

This measurement is used by the NBA to provide a measure of quality that is based upon performance in all aspects of the game. They concluded that the dilemma of choosing talent shows that there are more false positive signals that exist than correct decisions. For the NBA there is much uncertainty in selecting talent.

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[10] Peter A. Groothuis, James R. Hill, and Timothy J. Perri, "The Dilemma of Choosing Talent: Michael Jordans Are Hard to Find." *Applied Economics*, (November 2009).

[11] L. M. Pepall and D. J. Richards, "Reach for the Stars: A Strategic Bidding Game" *Economica*, 68, (2001): 489-504.

2.4 Predictability of College Statistics on Professional Success in the NBA

Kahn and Sherer focused on the NBA draft and were unsuccessful in finding a statistical relationship between draft position and a player's college statistics.[12] However, some have found that points scored are a significant determinant of draft position, but they do not account for professional scoring.[13] Scoring is the most dominant factor in predicting draft position. One paper even claimed that, "scoring totals is the primary factor players should focus on."[14] Berri, Brook, and Fenn (2010) also discussed other factors they felt were important to predicting draft order. The first factor is player performance in college. Players who are expected to perfrom well in the NBA also performed well at the college level. The height of a player was another factor they believed would have impact. They looked at the 1984 draft for example. The first selection was a seven foot Sam Bowie over 6'6'' Michael Jordan. Bowie's professional performance was nowhere near that of the greatest player, Michael Jordan. Height might effect draft position, but it is insignificant in predicting NBA success. Berri, Brook, and Fenn also predicted that younger players are taken first. Their reasoning behind this was that few players who are predicted to be taken higher in a draft would postpone their earnings to continue their unpaid college career. If he's that good he will declare for the

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[12] L. M. Kahn and P.D. Sherer, "Racial Differences in Professional Basketball Players' Compensation" Vol. 6, no. 1 (1988): 40-61

[13] Dennis Coates and Babatunde Oguntimein, "The Length and Success of NBA Careers: Does College Production Predict Professional Outcomes?" *Int. J Sport Finance* Vol. 5, no. 1 (2010): 4-26

[14] David J. Berri, Stacey L. Brook, and Aju J. Fenn. "From College to the Pros: Predicting the NBA Amateur Player Draft" *Journal Of Productivity Analysis*, Vol. 35, no. 1 (February 2011): 25-35.

NBA draft. Peter Goothius, James Hill and Timothy Perri (2007) also suggest the same thing about early entry. They argued that teams would choose players who have less college experience if they can maximize the downside risk and capitalize on the upside potential.[15] Another factor Berri, Brook, and Fenn wanted to look at was competition quality. What conference did a player compete in? Top conference was defined as any school in the Mountain West, Western Athletic Conference, Atlantic 10, Atlantic Coast Conference, Big Ten, Big 12, Big East, Conference USA, Pacific 10, and Southeastern Conference. They also mentioned efficiency. "Efficiency in utilizing shot attempts would also be an indicator of a player's worth to a basketball team."[16] If two players are averaging the same amount of points per game then how do you decide which one is better? One could argue that the player who takes the least amount of shots is more efficient and therefore a better player. Efficiency in scoring may be more important then the actual amount of points a player scores. The final factor they took into consideration was whether or not a player competed in the NCAA Final Four and if they won the NCAA championship. However, like previous research, the results still showed that draft position is not a very good predictor of future performance. They found that less then 5% of a player's career is explained by what number they were drafted. As was true in the NFL, draft position in the NBA has proven itself an insignificant predictor of future success in the National Basketball Association.

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[15] Peter A. Groothuis, James R. Hill, amd Timothy J. Perri, "Early Entry in the NBA Draft: The Influence of Unraveling, Human Capital, and Option Value" *Journal Of Sports Economics* Vol. 8, no. 3 (June 2007):223-243.

[16] David J. Berri, Stacey L. Brook, and Aju J. Fenn. "From College to the Pros: Predicting the NBA Amateur Player Draft" *Journal Of Productivity Analysis*, Vol. 35, no. 1 (February 2011): 25-35.

Maybe success should be defined differently. One article focused on the length and success of NBA careers. Their analysis evaluated the role of college productivity on draft position and the relationship between professional career productivity, measured by individual performance statistics and as productivity indexes, with professional career productivity measured similarly with the length of the career.[17] In other words, success was measured based on the length of a player's career. If they are successful teams will keep signing new deals, allowing player's to remain in the league. One of the variables they looked at that differed from previous research was the conference of the player. They split the conferences up into big conferences and small conferences, which varied from the conference split of Berri, Brooke, and Fenn (2010). Big conferences were defined as equal to 1 for any college in the Big 10, Southwest, Big East, the Southeast, Metro, Atlantic Coast, Pac-10, and Big 8. The research concluded that some types of NBA production over an entire career could be predicted fairly well based on a player's college production. They also stated that the results are equally clear that not all types of NBA production are predictable from college statistics. In terms of big conferences versus small conferences, the research indicated that the correlation between professional productivity is different for players from big conferences. Individual stats (points per minute, rebounds per minute, blocks per minute, and turnover percentage) are all larger in the NBA for a given level of the respective variable achieved in a big conference school than in a small conference school. Players from big conference schools were performing better in certain individual statistics than players emerging from small conferences.

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[17] Dennis Coates and Babatunde Oguntimein, "The Length and Success of NBA Careers: Does College Production Predict Professional Outcomes?" *International Journal Of Sport Finance*, Vol. 5, no. 1 (February 2010): 4-26.

However, when it came to free throw percentage, assists per minute, and steals per minute the same relationship existed for big and small conferences. In conclusion,[18] they finalized their answer saying, "Specific types of college productivity are significant determinants of draft position and generally significant predictors of NBA level production. However, there remains a great deal of variation in draft position and production as a professional that is unexplained by college productivity." So far the same fact has held true, college performance predicts draft position, but is very insignificant in predicting future performance at the professional playing level.

2.5 Literature Conclusion

The most profitable athlete endorsements are with athletes who are popular and successful in their sport, arguably the best at their sport. If companies want to continue to make a profit with athlete endorsements they need to focus on signing superstars and franchise players. It is obvious that the better a player is, the more fans they will accumulate, therefore increasing their popularity and fan interest. If one could predict the success of an athlete they would be able to locate the next star player. Many of the reviewed studies have already proven that college statistics do not predict future success in professional sports. However, college stats combined with other statistics such as the conference a player competed in and whether or not that player received any significant awards, may provide another perspective to the idea of predicting success. Its easy to predict what players people think are good, but it is much more difficult to predict the players who will have the most success. In the sports world there are many things that are unpredictable; which team will win each game, who will score the most, which

[18] Ibid.

players will suffer injuries, etc. Endorsement contractors sometimes gamble on the future success of a player. Nevertheless, there is high-risk in each situation. The following chapters of this paper will discuss which factors are believed to be the most important when predicting a player's success.

CHAPTER III

DATA

In order to develop a reliable method of predicting the transfer of success from the college level to the professional level this study will focus on a different way of measuring success. The research will focus on the success of a player during their rookie contract years in the NBA. A rookie contract lasts four years, but is only guaranteed for three years.[1] The data collected will focus on the first three years of a player's rookie contract. These years are the most important since their performance will decide whether or not they re-sign a new contract or get an extension on their current contract. All of the statistics will be collected from an online database, www.sports-reference.com. Sports reference is a combination of sites for professional sports. The site has statistics for all past and present NBA players and every player who has ever played for an NCAA D1 college basketball team. Statistics will be collected for all first round draft picks starting in 1999 and ending in 2008. High school and international players, who did not attend an NCAA college, will be excluded due to the fact that there is not any college statistics to compare to their professional career. The following figure lists the variables that will be researched and their abbreviations.

[1] NBA Rumors and Basketball News, Copyright 2012, Hoopsworld. Found at http://www.hoopsworld.com.

FIGURE 3.1

LIST OF VARIABLES

Variable	Abbreviation
NBA Efficiency Rating	REFF
College Efficiency Rating	CREFF
Conference	CONF
Regular Season Champion	REGSEA
Conference Tournament Champion	TOURNC
Final Four	FINAL4
NCAA National Title	TITLE
NCAA Tournament MVP	TOURNMVP
Naismith Award	NAISMITH
Years	YEARS

To measure success the efficiency rating practiced by the NBA will be used. Coaches in the NBA use the efficiency rating to evaluate a player's game performance. It is a composite of basic basketball statistics. The equation consists of points, rebounds, assists, steals, blocks, field goals, free throws, and turnovers. The equation can be positive or negative depending on how well, or how badly a player performed. The equation is as follows:

((Points + Rebounds + Assists + Steals + Blocks) - ((Field Goal Attempts - Field Goals Made) + (Free Throw Attempts – Free Throws Made) + Turnovers))[2]

This equation is typically used to measure performance of a game, but for research it will be used to measure efficiency of the player's first three-year averages of these statistics. The same equation will also be used to measure the efficiency of a player's college career statistics. Again, these will be the career averages of their college performances. The college efficiency of a player's career should have a positive correlation with their NBA efficiency. If a player can perform efficiently at the highest college level then they will be able to perform efficiently at the next level, the NBA.

The next variable to look at is conference. In division one college basketball there are 32 conferences.[3] Some are more competitive than others. There's an old saying that states, "You have to play the best to get better." If a player is playing in one of the stronger conferences then they will be facing better competition. In theory their skills should develop more than if they were playing in a smaller, less competitive conference. Based on a previous study the conferences were split into big and small conferences. The study found that there was a significant difference between the productivity of a player who played in a big conference and a player who played in a small conference.[4] The following figure lists the big conferences according to the authors of the previous study.

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[2] NBA, Copyright 2012 NBA Media Ventures, LLC. Found at www.nba.com.

[3] ESPN: The Worldwide Leader in Sports, Copyright 2012, ESPN Internet Ventures. Found at http://sports.espn.go.com.

[4] Dennis Coates and Babtunde Oguntimein, "The length and success of NBA careers: does college production predict professional outcomes?" *Int. J Sport Finance*, Vol. 5, no.1 (2010): 4-26

FIGURE 3.2

BIG CONFERENCES

Big Conference
Big 10
Southwest
Big East
Southeast
Metro[5]
Atlantic Coast
Pac-10
Big 8[6]

Big conferences will be defined equal to 1 for any college that competes in the qualifying big conferences. Due to the strength of competition in big conferences, there should be a positive correlation between professional efficiency and conference a player competed in.

It's not enough just to play in a big conference. How well was that player able to compete? Every year there is a regular season champion for each conference. This is the team that had the best record within their conference. In other words, it's the team that performed the best and won the most against all the teams in their conference. After the regular season every conference has a conference tournament. A lot is at stake for some teams in their conference tournaments. If a team is not already ranked amongst the top teams in the country then they must win their conference tournament in order to receive a

[5] In 1995 the Metro conference merged with the Great Midwest Conference and formed Conference USA.

[6] In 1994 Texas, Texas A&M, Baylor and Texas left the Southwest Conference to join the Big 8 conference, which then renamed themselves the Big 12.

bid to the NCAA National Tournament. If a player is playing on a team that can win the regular season in their conference, their conference tournament, or both, then they may have an advantage over those who placed lower in the conferences. It takes great players to provide the necessary tools for a team to win in competitive situations such as those in the big conferences. For example, this year there are five teams[7] in the Big 10 conference that are ranked within the top 15 teams in the country.[8] If a player is playing against the top teams in the country on a regular basis then they will inevitably get better, and develop the skills to perform at the next level. The ability to succeed in a tough, competitive conference will have a positive effect on a player's ability to perform well in the NBA. The more regular season championships they win and the more conference tournaments they win will increase the efficiency rating of their rookie years.

The next variables that are predicted to have an effect on a player's ability to perform in the NBA are related to the NCAA National Tournament. Every year the top 64 teams in the nation compete in the NCAA tournament for a chance to win the National Title. The tournament is single-elimination. In other words, once a team looses they are done, they are out of the tournament and their season is over. There are four regions containing 16 teams each. The first four rounds of the tournament produce the final four. The final four consists of the winning team from each region. Making it to the final four is a great achievement for any team. The following figure shows the break down of the tournament for 2011.

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[7] As of March 9, 2012: Ohio St. (#7), Michigan State (#8), Wisconsin (#12), Michigan (#13), and Indiana (#15). Found at http://sports.espn.go.com.

[8] ESPN: The Worldwide Leader in Sports, Copyright 2012, ESPN Internet Ventures. Found at http://sports.espn.go.com

FIGURE 3.3

NCAA TOURNAMNET BRACKET

SOURCE: NCAA Basketball Tournament Brackets, Copyright 2005-20012 Team Rankings, LLC. Found at http://www.tournamentrankings.com/ncaa-tournament.

The data will keep track of every final four appearance made by the team during the length of a player's college career at that school. Although the final four is one of the greatest accomplishments in college basketball, it's not the final step in the, "Big Dance."[9]

When a team is competing in the final four they are playing for a chance to be a contender in the National Championship. The second variable relating to the NCAA National Tournament will be how many championships did a team win while a player

[9] The NCAA National Tournament is often referred to as the Big Dance by fans and analysts.

was on the team. This will give some insight into the question of, was the player a contributing factor on a championship team? Not only, can they compete on the biggest stage in college basketball, but also can they win, and not just win, but win it all and become the number one team in the country. The final variable related to the NCAA National Tournament will be the tournament's most valuable player (MVP). At the end of the tournament each year a player is chosen by the Associated Press (AP) and given the title of NCAA Tournament MVP. The AP is a news agency that is known for their weekly sports polls and year-end awards that was established in 1846 and is based in New York City.[10] Usually the tournament MVP is on the team that won the championship.[11] The last time a player received the MVP award and wasn't on the winning team was in 1983.[12] If you measure the best team in the country as being the team that wins the NCAA National Tournament then in theory, the MVP goes to the best player on the best college team in the country. Although not every tournament MVP goes on to become a superstar, the majority of them go on to play in the NBA. Earvin Johnson[13] (1979) and Patrick Ewing[14] (1984) are just a few players who have received

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[10] Associated Press, Copyright 2012, Associated Press. Found at http://www.ap.org.

[11] NBA Rumors and Basketball News, Copyright 2012, Hoopsworld. Found at http://www.hoopsworld.com

[12] In 1983, Hakeem Olajuwon played for Houston. In the championship game they lost by 2 points to North Carolina State.

[13] Earvin "Magic" Johnson played 13 years for the Los Angelos Lakers. He won five championships and was a 12- time All Star. Argued by many as one of the greates players to have ever played in the NBA. www.nba.com

[14]Patrick Ewing was rookie of the year in 1985 and was an 11-time All Star player. He has been voted one of the top 50 players in NBA history. www.nba.com

the MVP award and have gone on to have successful NBA careers.[15] If a player can lead his team to the championship game and win, then he should be able to compete successfully in the NBA. No player has ever been a repeat receiver of the tournament MVP award. This variable will be defined with the number 1 if the player was a recipient of the MVP award.

The most prestigious award in college basketball is the Naismith trophy. The trophy is named in honor of Dr. James Naismith, the founder of the game of basketball.[16] The trophy is awarded annually to the best college player of the year. The Atlanta Tipoff Club's board of directors vote and select the winners of the trophy each year. The board is comprised of leading basketball journalists, coaches, and administrators from around the country.[17] Unlike other national awards, fans contribute 25 percent of the final vote.[18] The data collected will show how many times a player received the Naismith Trophy. If a player was voted to receive the award then it will have a positive effect on their professional success.

The final variable that will be looked at is the number of years played in college. After the 2005-2006 NBA season the commissioner passed a rule that would not allow players to be drafted immediately after high school. The rule stated that players could only enter the draft a year after they had graduated high school, as long as they were 19

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[15] "Where Are They Now? Current Whereabouts Of Each Final Four," *College Football, College Basketball, NCAA,* (Jan. 2010).

[16] Naismith Awards, Copyright 2012. Found at www.naismithawards.com.

[17] Ibid.

[18] Ibid.

years old at the end of the calendar year of the draft.[19] Therefore, a large majority of players play at least one year of college, before entering the draft. It seems very rare that players actually play out their full eligibility in college, which consists of four years. The more experience a player gains at the college level, the better their chances of success at the NBA level of competition.

A regression will be used to test the nine variables against a player's NBA efficiency. The following figure summarizes all the variables and their predicted effect on NBA success.

[19] Dan Hilton," Should High School Players Wait a Year Before Going Pro?" *One-on-One Debate,* (July 2008).

FIGURE 3.4

SUMMARY OF VARIABLES

Variable	Abbreviation	Summary	Predicted Outcome
NBA Efficiency Rating (Y)	REFF	Average efficiency rating of the first three years of a player's NBA career.	Y-VARIABLE
College Efficiency Rating	CREFF	Average Efficiency Rating throughout college career.	+
Conference	CONF	What conference did a player compete in? Big conferences will be defined with 1.	+
Regular Season Champion	REGSEA	Every conference has a regular season champion.	+
Conference Tournament Champion	TOURNC	Did their team win their conference's tournament?	+
Final Four	FINAL4	How many Final Fours did they appear in?	+
NCAA National Title	TITLE	How many National Titles did they win?	+
NCAA MVP	TOURNMVP	Were they voted MVP of the National Tournament?	+
Naismith Award	NAISMITH	How many Naismith Awards did they receive?	+
Years	YEARS	How many years did they play college basketball?	+

The variable that is predict to have the most significance on predicting a player's NBA efficiency rating is the college career efficiency rating. The ability of a player to be efficient in college will transfer to his professional career. In the next chapter the results of the study will be revealed, and the outcomes discussed.

CHAPTER IV

RESULTS

The results of this study proved that individual, statistical, success in the NBA can be related to college success. Berri, Brook, and Fenn (2010) concluded in their study that college statistics do not predict professional success. However, the college efficiency rating, which is a combination of an athlete's college statistics was the most significant variable in this study's regression. The result showed that college experience and individual performance of a player plays a role in determining productivity in the NBA.

Combined with all the other variables this study was in search of a way to predict future success in the NBA, and to determine if talent could be found prior to its success. Regression analysis was used to determine which college factors had the most significant impact on player salaries. The variable predicted as being the most significant was college efficiency rating. The original hypothesis of this study was that college productivity, measured by the efficiency rating, would translate over to NBA productivity. Figure 4.1 displays the results and the significance of each variable found in the regression analysis. Three regressions were examined to ensure that the variables were significant. Figure 4.2 displays the final regression equation.

FIGURE 4.1

REGRESSION RESULTS[1]

Variable	Regression 1	Regression 2	Regression 3
CREFF	.5400457* *.0887441*	.5411565* *.0882377*	.5357439* *.086833*
CONF	.3930453 *.8147019*	.385244 *.8111524*	.2705822 *.7947926*
REGSEA	.0975715 *.443011*	.0901512 *.4393406*	
TOURNC	.0293413 *.566371*	.0401578 *.560684*	
FINAL 4	-.7442503 *.8733963*	-.756059 *.8679376*	
TITLE	-2.006915*** *1.626854*	-1.990666*** *1.475119*	-2.480242* *1.113187*
TOURNMVP	.2141557 *1.626854*		
NAISMITH	.2141557 *1.564159*	.1964232 *1.556148*	
YEARS	-.666059** *.3377315*	-.6682399* *.3366104*	-.7092228* *.2996805*

[1] Table 4.1 significant at 5%*, significant at 10%**, significant at 15%***

FIGURE 4.2

REGRESSION EQUATION

NBA Efficiency =

1.36399 + 0.5400457 CREFF + 0.3930453 CONF + 0.0975715 REGSEA + 0.0293413 TOURNC – 0.07442503 FINAL4 – 2.006915 TITLE – 0.2524089 TOURNMVP + 0.2141557 NAISMITH – 0.666059 YEARS

As figure 4.1 indicates, a player's college career efficiency rating proves to be the most significant determinant of a player's NBA efficiency rating. According to the model a point increase in college efficiency provides a 0.5400457 increase in NBA efficiency. It makes sense that the increase in NBA efficiency is less then one because the players are facing tougher competition. They are competing against better players. In other words becoming a better player at one level doesn't make you an equally better player at the next level.

Years in college proved to be a significant variable in determining NBA efficiency in a negative manner. Every year a player spends in a college leads to a -0.666059 decrease in NBA efficiency. However, we must not forget that a future NBA star player will rarely, if ever, compete for four years in college. There are a very few number of players who, if expected to be picked during the first round of the NBA draft, would postpone their earnings to continue playing, unpaid, at a college or university. Also, better players are drafted earlier and therefore play less years. Figure 4.3 shows the average efficiency-rating breakdown of payers depending on the number of years they competed in college. The data includes the statistics collected for players up to the 2005 draft (first round draft picks from 1999-2005). This was the last year players were

allowed to enter the NBA draft immediately after high school. Only these years were considered because after the 2005 draft there is no way of distinguishing between the players that would not have gone to college for one year had they not been required to by the NBA, and the players that would have gone to college for one year whether or not a high school rule existed.

FIGURE 4.3

AVERAGE EFFICIENCY RATING PER YEAR

Years Played in College	Average NBA Efficiency Rating
0	9.94
1	10.12
2	9.85
3	10.17
4	7.75

On average, players who enter the NBA after two years of college have a lower NBA efficiency than players who leave after their third year. There is only a 0.18-point difference between players who didn't compete in college and players who competed for only one year. Previously in chapter III it had been predicted that the more years a player competes in college the better his NBA efficiency rating would be. The theory behind this was that more experience would produce a better player. However, it was not taken into consideration that if a player is capable of playing at the next level, the NBA, then they would essentially be playing better competition and be gaining better experience.

The third significant factor in this regression was whether or not a player had played on a team that won the NCAA National Title. Winning a National title proved to have a negative affect of -2.006915, making it the largest per point effect on a player's NBA efficiency rating. This means that for every NCAA National Title a player participates in, their NBA efficiency rating decreases slightly more than 2 points. The result of this variable came across as the most surprising. This could be interpreted as meaning that great teams win championships, not great players. A team of good players can easily beat a team with one great player surrounded by mediocre players. In 2010, the Duke Blue Devils won the NCAA National Title. From that team, only two players went on to play in the NBA. Nolan Smith was chosen 21st in the 2011 NBA draft and Lance Thomas played in the NBA D-League[2] before he was eventually signed to the New Orleans Hornets. Playing on a National Title winning team does not always mean that every player was great; it means the team, as a unit, was great. On a championship team there might be one or two players that succeed at the NBA level and become great professional players. The rest of the team members will either become mediocre players in the NBA, or not play at all after college. Playing in the NCAA Final Four was also found to be negative. However, it was not significant in this regression. The same theory behind the negative effect of winning the National Title could be applied to the outcome of competing in the NCAA Final Four.

All other variables were found to be insignificant. In Coates' (20120) research he concluded that, in terms of big conferences versus small conferences the research indicated that the correlation between professional productivity is different for players

[2] The NBA D-League is a development league for players who may have a future in the NBA, but aren't quite ready for it. It is like a minor league baseball team for the NBA.

from big conferences.[3] In this study conference was found to be insignificant. Coates found that individual stat (points per minute, rebounds, per minute, blocks per minutes, and turnover percentage) are all larger in the NBA for a given level of the respective variable achieved in a big conference school than in a small conference school.[4] The efficiency rating is calculated based on these statistics. It would have made sense for conference to affect a player's efficiency rating in the NBA. Coates research was focused on the length of NBA careers whereas the data for this study was based on the first three years of a player's career. Focusing on the first three years doesn't allow player's statistics to develop as much as they would over the entire length of their career. From 1999 to 2008, 85% of first round draft picks were from a big college. Only 32 players participated in small college competition. It is possible that there was not a large enough sample of small schools to compare to the large sample of big colleges in the data sample.

To conclude, the only variables that presented themselves as being significant factors in determining a player's NBA efficiency rating are college efficiency rating, the number of years a player competed in college, and whether or not a player won the NCAA National Title. Therefore, based on these results, a basketball player is more likely to be efficient in the NBA if they can perform efficiently in college.

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[3] Big conferences were classified as any school in the Big 10, Southwest, Big East, Metro, Atlantic Coast, Pac-10, and Big 8. Figure 3.2

[4] Dennis Coates and Babatunde Oguntimein, "The Length and Success of NBA Careers: Does College Production Predict Professional Outcomes?" *International Journal Of Sport Finance,* Vol. 5, no. 1 (February 2010):4-26.

CHAPTER V

CONCLUSION

The goal of this study was to determine if a basketball player's college statistics provided predictable variables for success in the NBA; success being measured by a player's NBA efficiency rating of their first three years in the NBA. This study was motivated by the idea that not all athletes that are predicted to succeed actually do. Some player's sign endorsement deals before they play a single NBA game while other players must establish themselves as great NBA players before they are offered a multi-million dollar contract. A recent example would be LeBron James and Blake Griffin. In 2003, Nike offered LeBron James a 90 million dollar contract. James was 18 years old and had just graduated high school. James went on to be the number one overall pick in the 2003 NBA draft. In 2009, the number one overall draft pick was Blake Griffin. Nike only offered him a 2-year deal worth $400,000 a year[1]. It wasn't until the end of Blake Griffin's rookie year that he began bringing in the large endorsement deals. Now in his second NBA season, he makes 6.5 million dollars in endorsement deals. One analyst believes that Blake Griffin is now worth, at least 2 million dollars a year for Nike. Nike got away with underpaying Griffin for two years. These may be the kind of deals companies want. This study was aimed at finding a way to determine which players would perform well during their beginning years in the NBA. Although the data

[1] Larry Brown Sports, Copyright 2011. Found at http://larrybrownsports.com.

indicates that many of the variables are insignificant in determining NBA efficiency, the results showed that college efficiency and NBA efficiency are very relatable. However, the fact still remains that predicting success based on college statistics in sports is, at this time, a difficult task.

Chapter I of this study introduces the importance of statistics and the issues that occur when trying to choose the best player. There are several factors that teams owners and endorsement companies can look at to choose who they think will perform successfully. All the variables that were present in the regression are briefly introduced. Chapter I also explains the procedure of the NBA lottery draft, and the process that is taken to give the worst teams the best chance of receiving the best players.

Chapter II discusses studies that related to this thesis. Articles in this chapter analyze the difficulty of using college statistics to predict future success at the professional level in the NBA as well as in the NFL. Some of the articles focus on longevity while others focus on the transfer of talent from college to the pros. Only one of the articles uses the efficiency rating that was developed by the NBA to analyze the length of a player's professional career. None of the articles use the efficiency rating to predict the future success of college players in the National Basketball League.

Chapter III describes, in great detail, each of the nine independent variables. The chapter explains how the variables are collected and the theory behind the use of these variables. The chapter also includes the predictions that were made for each variable. Included in Chapter III is a standard regression model with NBA efficiency as the dependent variable and the nine other variables as the independent variables.

Chapter IV reveals the results of the regression and analyzes the outcomes. College efficiency, years played in college, and winning a NCAA National Title were found to be significant factors in predicting NBA efficiency.

The number of years a player competed at the collegiate level proved to be significant with a negative effect on a player's NBA efficiency rating. This should not be interpreted as meaning the longer a player stays in college the worse they become. When it comes to this variable there is a very important aspect to remember, most college players with the ability to play at the professional level will leave college rather than stay another year. It would be interesting to know which players attend college knowing they will enter the draft after one year. In other words, which players attend college only because the NBA forces them to be at least one year removed from high school before they can enter the NBA draft? Number of years a player competes for at the collegiate level doesn't directly affect a player's NBA efficiency rating. These results prove that better players leave college earlier.

Wining a NCAA National Title was the variable that had the largest coefficient in the regression model. It was one of the two significant variables that had a negative effect on a player's efficiency rating (the other being years). Interpreting this outcome was rather difficult. Two things must be considered. Most championship teams consist of several good players rather than just one great player. The other thing to consider is that not all great players win a championship. Wining a National Title turned out to not be a good measurement of a player's ability to play at the professional level. This variable measures a team's ability to succeed, not an individual player's chance of success. The results of this variable could also mean that players who win

championships are prematurely drafted and therefor do not perform as well as people predict them to.

There are different aspects that could have been analyzed in order to improve this study. There could have been more variables used in data to improve this model. Athletic ability could have been measured by including statistics such as: a player's speed and vertical jump[2]. Using statistics that are tested during the NBA combine would have been interesting to include in this model. The reason these factors weren't included was because the availability of the data was inconsistent and could not be found for every player. Another factor that could improve this model would be to include the length of the player's career. This study only looked at the first three years of a player's NBA career. The theory behind this was that if a player doesn't perform over these first years then they would not be resigned. Therefore adding a longer length of years may bring more insight to this thesis.

It would also be interesting to study the affect of college injuries on a player's ability to compete in the NBA. The more injuries a player suffers in college, the more injury prone he is. When a player is injury prone, they become unreliable. It is hard to predict when they will breakdown next. It would be interesting to factor in the number of games a player misses in college due to injury.

The conclusion showed what studies previous to this one found that using college statistics to predict future professional success has yet to be perfected. Further research could provide team owners and endorsement companies with a better understanding of which factors are associated with predicting NBA success.

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[2] How high a player can jump.

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