Does the NBA Encourage Early Entry?

Griffin T. Tormey[*]

Professor Marjorie B. McElroy, Faculty Advisor

Professor Kent P. Kimbrough, Honors Workshop Instructor

Honors Thesis submitted in partial fulfillment of the requirements for graduation with distinction in Economics in Trinity College of Duke University.

Duke University
Durham, North Carolina
2009

[*] The author can be reached at griffin.tormey@gmail.com, and welcomes all questions and/or comments. He will be working as an analyst for Goldman Sachs in their Sales and Trading division, starting in the summer of 2009.

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Acknowledgements

I would first like to thank Professor Marjorie B. McElroy, my faculty advisor, for all of her help and support. Her comments and suggestions were critical to this research project, especially in its final stages. Professor Kent Kimbrough, the leader of my Honors Thesis workshop, also deserves much praise. He, along with my classmates, was very influential in this study's transformation from a general idea to what it eventually became. He and my classmates endured and critiqued many versions of this paper, and their comments were important in its progression. I am also extremely grateful for Ken Catanella's (Consultant for the National Basketball Association) advice, perspective, and suggestions for data sources. It really helped to have the opinion of an industry expert. Finally, I owe many thanks to my family. They were always excited to learn about the latest change in this study, and I would not have had the luxury to pursue this independent research experience if I was not at Duke. Thank you for everything!

Abstract

Over the last decade, the number of underclassmen selected in the first round of the NBA Draft has dramatically increased. Even when controlling for performance in college, underclassmen are paid significantly more than college seniors. What is going on here? Isn't experience a good thing? Groothuis, Hill, and Perri (2007) were the first to argue that the rookie pay scale introduced in 1995 is responsible for the shift in behavior. They use Lazear's (1998) option value theory as a means of explaining this action. His theory is the result of applying the financial principle of option value to labor economics. As the estimate of a worker's future production becomes more volatile, his option value increases. In the NBA Draft, early entrants have more option value than college seniors because less information is available about them, and they are less developed. The rookie pay scale sets compensation limits that lower the relative price of rookies. With less money at risk for the same upside potential, teams have an incentive to choose early entrants. This study empirically proves that option value is significant in determining draft order after 1995, and that along with the new rookie compensation structure, it explains the unraveling in the NBA labor market.

Introduction

Finding quality workers is vital to the future success of any organization. For this reason, companies invest a considerable amount of time and money in their quest for the most qualified talent. The search should produce information that enables firms to employ high ability workers, while ideally avoiding ones with low ability. However, these recruitment efforts occasionally cause labor markets without much structure to unravel. Unraveling is the economic term used to describe the labor market situation that arises when firms extend employment offers to applicants before an established clearing time, like graduation. The need to secure the best applicants before competitors can push hire dates months, sometimes years, before the employment start date. The recent spike in early entry into the National Basketball Association (NBA) is a good example of a labor market unraveling. Through the NBA Draft, teams are now selecting new players with less experience. This paper seeks to discover the reason for the increase in early entry.

The key question is: what is driving this rapid unraveling? It is possible that new training methods and increased specialization have improved player development before college. Players would then be closer to their true athletic potential at younger ages, and more ready to play at the professional level. This might explain some of the change, but not the abruptness with which it took place. An exogenous change in the structure of rookie contracts may provide a better explanation for the swift change. In 1995, the NBA updated its Collective Bargaining Agreement (CBA). This update included the introduction of a rookie salary cap, called the rookie pay scale. By decreasing investment, the pay scale inadvertently created incentives for teams to take more risks when drafting new players.

Players entering the NBA Draft before completing four years of college are known as early entrants. Drafting these players is risky because there is less information available about them than college seniors. This lack of information, normally regarded as unfortunate, can also be a boon for teams. If they can't accurately estimate a player's future production, there is a chance that he will be better than expected. The financial principle of option value is at work here. Volatility gives these early entrants option value (Lazear, 1998, p. 1).

In this paper, draft decisions are modeled from a team perspective. By including measures of performance, athleticism, and experience, it is possible to evaluate the relative importance of each one on first year salary. Before further exploring why the 1995 modification to the CBA affected draft outcomes, more background on the NBA labor market is necessary.

The CBA governs the NBA labor market. Specifically, it is the contract between the league commissioner, all thirty NBA teams, and the NBA Player's Association that determines the rules for contracts, trades, the salary cap, the NBA draft, and other related items. A new agreement is negotiated about every five years.

The NBA Draft is the annual process by which teams acquire the rights to new players entering the league. Win-loss records from the previous season determine the order of the draft. This provision is in place to ensure that the best new talent goes to where it is needed most: the worst teams. However, a lottery is held to determine the first thirteen picks. It is assembled in such a way that the worst team has the best chances, but is not guaranteed, of getting the first pick. The lottery is intended to discourage teams from losing on purpose in order to secure the number one pick.

The NBA Draft's role in talent distribution is important. It allows every team in the league a chance to remain competitive. Historically, the CBA has included other rules with the same aim. In 1983, the salary cap was introduced. A salary cap prevents the team with the most money from outbidding other teams for the services of the best players. The NBA has a soft cap, which means there are exceptions that allow a team's payroll to exceed the cap. The exceptions are in place to help teams resign their best players to new contracts. The NBA Draft also gives teams the exclusive right to negotiate with their selections for one year (2008, Coon). This setup allows a small market team that makes smart draft decisions an opportunity to secure and keep the rights of the best players in the league. These provisions imply that evaluating players eligible for the draft is a critical component for long term team success.

The rookie pay scale was one of the principal changes to come from the version of the CBA negotiated in 1995. It was instituted for three major reasons. First, rookies had begun to drag out negotiations until they got the contract they wanted. Although they could not threaten to play for other teams, they could withhold their services. The rookie pay scale eliminates this problem. The scale suggests a salary for each selection, and teams are given the freedom to pay between 80% and 120% of this amount. Most teams pay 120% of this amount because in absolute terms it is not much more money. Negotiations are now minimal compared to the time before the pay scale. Second, the 1983 salary cap had begun to create inequities in rookie salaries. For example, say the team with the third pick in the draft was at the salary cap, and the team with the fourth pick had a considerable amount of room under the cap. Under the old system, the third pick in the draft could have only been paid the league minimum, while the fourth pick in the draft could have been paid much more. The new system allows teams to pay the full value of rookie contracts even if they are over the salary cap. Finally, veterans had begun to complain about the high salaries of rookies. For example, David Robinson was paid $1,046,000 in 1987 as a rookie. This was $250,000 more than anyone else on his team. In 1994, Glenn Robinson held out for a ten year, $68 million contract as a rookie. The rookie pay scale was intended to function as a rent transfer to older players in the league. The scale was successful in accomplishing this goal. Presently, veterans receive a larger percentage of the payroll.

Figure 1 presented below displays first year salary plotted against draft number for the years 1994 and 1995 (the years immediately before and after the introduction of the rookie pay scale, respectively). This chart shows that the change made to the CBA not only lowered salaries, but also aligned first year compensation more closely with draft number.

Figure 1. First year Salary vs Draft Number

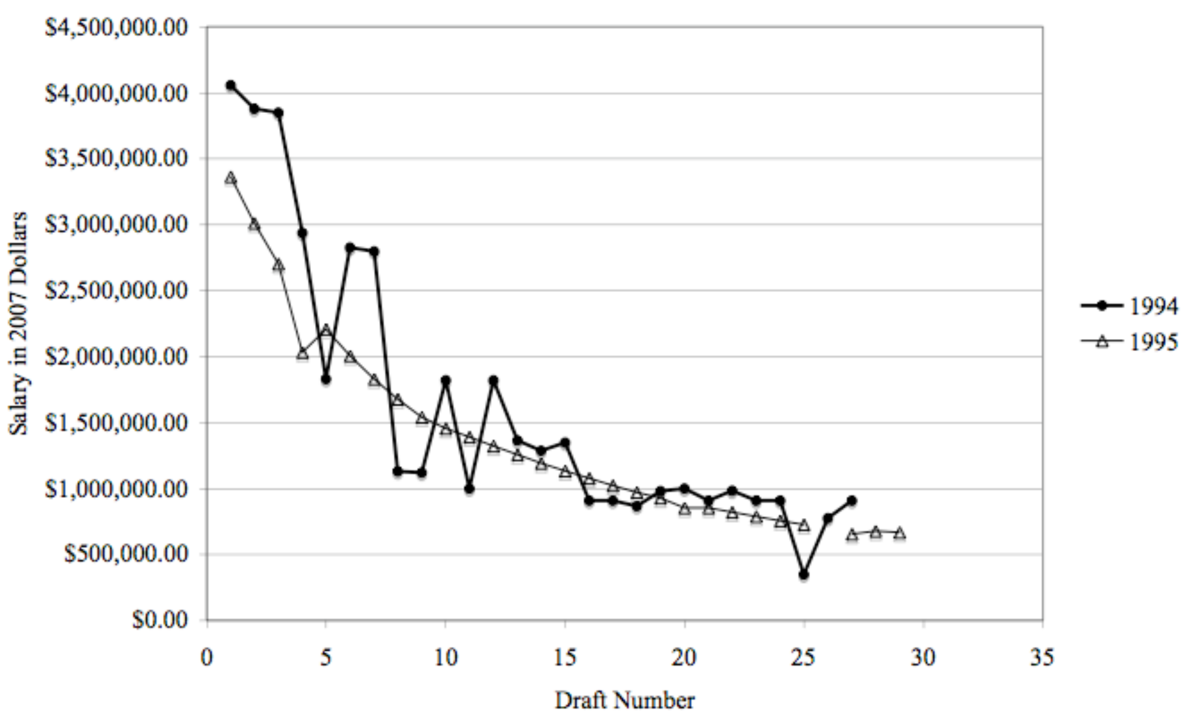
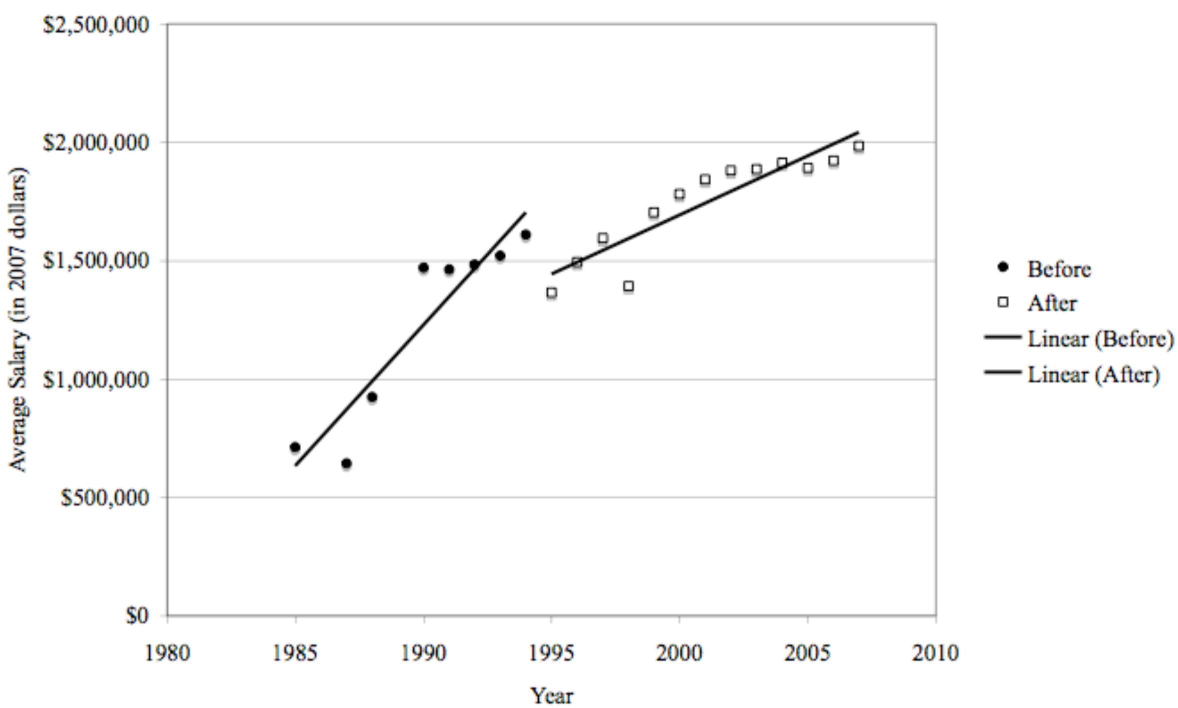


Figure 2 presented below shows the other effect of the pay scale. Although inflation-adjusted salaries for rookies have continued to rise, they are now rising at a slower, predetermined pace. In fact, immediately after the change the average salary decreased. First year compensation is no longer subject to erratic contractual negotiations.

Figure 2. Average Salary of First Round Pick Over Time



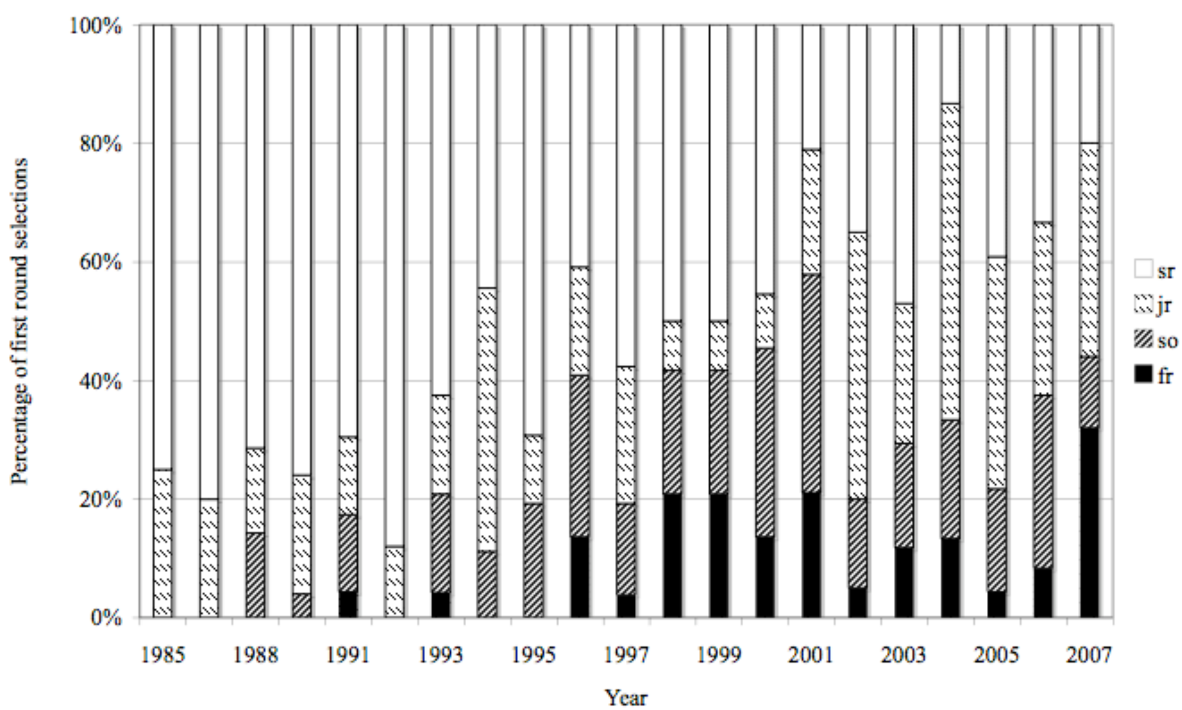
In addition to the pay scale introduced in 1995, automatic team option years were added in 1998. In 1995, the rookie scale contracts were set up so that teams had to pay three guaranteed years[1]. In 1998, the contracts were changed to include an additional one-year team option. The team option is the right, but not the obligation, to continue the previous contract under the same terms for a fourth year[2]. In 2005, the contracts were changed yet

[1] Contracts were only guaranteed for players selected in the first round.
[2] Groothuis, Hill, Perri (2007) tested to see if rookies were, on average, paid less than their market value while under rookie scale contracts. They conclude that rookies are underpaid during their third and fourth year (p. 235).

again to include only two guaranteed years followed by two consecutive one-year team options.

The rookie pay scale and option years have changed the way teams approach the NBA Draft. Although the scale has been successful at fixing all three of the problems that precipitated its creation, it has had one unintended effect. Since 1995, the number of players drafted who have not completed four years of college (the historic clearing time) has markedly increased. Figure 3 presented below shows how the composition of first round draft picks has changed over time. There is a bar for each year, and each bar is divided up proportionally by the number of freshmen, sophomores, juniors, and seniors selected that year.

Figure 3. Composition of Draft Picks by Year



Players attempting to maximize their lifetime earnings now face a different set of circumstances due to the pay scale. They must suffer three to four years of possibly being paid less than their marginal value product. This leaves less time over which they can capitalize on their ability. Players who choose to enter the NBA Draft early do so in order to maximize the length of their post rookie scale contract careers. This is the economic incentive for early entry that players face (Groothuis, Hill, Perri, 2007, p. 229).

While considering the decision from the player's point of view is important, this study focuses exclusively on unraveling from a team's perspective. What incentives exist for signing unproven players to guaranteed contracts? Lazear's (1998) option value theory offers an explanation. This theory supposes there are two types of workers. One type is risky. Their signal, or prospect of future productivity, is more volatile. They could be stars or they could be ineffective. The second type of worker is secure. The estimate of his future production has less variance. This theory postulates that at a given wage, risky workers will be preferred to secure ones, assuming they both have the same expected value of future production (p. 2). Obviously, workers with great ability and security will be preferred to both. These workers have a higher expected value and lower variance of future production. In our situation, wages have been fixed by the pay scale. In pursuit of the best players, teams have to make a decision between a pool of secure players (college seniors) and a pool of risky players (early entrants). Since rookie salaries are now a smaller investment by the team, the total risk of choosing an early entrant has been lowered. In other words, the price of the same upside potential is lower. The penalty for picking a lemon has decreased.

When considering how to prove if option value really does matters to NBA teams on draft day, I started by exploring what information factors into a team's decision to draft a player. Ideally, teams would be able to look into the future to see a player's production over his entire career. This would ensure the most efficient draft outcome, because the best players would be selected first. However, since this is not possible, teams are forced to estimate future production. When evaluating players, teams consider things like height, weight, and performance measures such as points, rebounds, and assists. Teams also consider upside potential, or option value. Since there is no standardized measure of option value, I use years of college experience as a proxy. Roth and Xing (1992) point out in a paper on unraveling that “athletes are highly trained professionals whose talents are uncertain when they are young, and are revealed more fully as they grow older” (p. 31). Generally speaking, players with less experience have more option value because they are less developed. If Lazear’s (1998) option value theory holds in this environment, then for a given wage and expected value of future production, teams ought to prefer a player whose distribution of future productivity has a larger variance.

In order to test this hypothesis, I have data from 1985 through 2007. By regressing the natural log of first year salary on all of the quantifiable information that goes into choosing a player, we should be able to quantify the effect of college experience. The results should tell us whether option value has gained importance over time, and whether the rookie pay scale can explain the unraveling in the labor market.

Literature Review

The change in the National Basketball Association's (NBA) Collective Bargaining Agreement (CBA) in 1995 provides an opportunity to examine what drives the unraveling of a labor market in pursuit of the greatest talent. These results can hopefully be used to predict what might happen in other labor markets with similar structures. Roth and Xing (1994) provide the foundation for why unraveling occurs and the effect it has on the labor market. They conclude that unraveling happens due to an incentive for employers to act before competitors in order to secure the top talent (p. 3). Roth and Xing study entry-level jobs because their hiring normally takes place around a central clearing time. They claim unraveling can cause labor markets to eventually fail. As hiring decisions move further away from the start date, costs associated with timing problems, long-term commitments, and decreased flexibility all increase (p. 4). However, if a firm waits to hire they may miss out on the top talent. Roth and Xing conclude that some labor markets need regulation in order to protect employers from the temptation to "jump the gun". An established clearing time that no competitor could violate would significantly decrease the costs of hiring labor many months in advance.

Groothuis, Hill, and Perri (2007) were the first to study the unraveling of the NBA labor market. They assert that early entry into the NBA draft is a form of unraveling with a couple of differences. First, NBA teams are not allowed to offer new entrants contracts before the NBA draft. Regulation prohibits the violation of the central clearing time. Second, hiring new workers is not a bilateral process. If a team drafts a rookie, they have exclusive rights to negotiate with that player. No other team can interfere for one year. Therefore, rookies cannot lead teams into making competing bids for his services. Finally, although players are being drafted at younger ages, teams do not have to wait for their services. This minimizes some of the costs associated with unraveling. Nevertheless, drafting players before they complete four years of college is considered a form of unraveling because teams are 'jumping the gun' in order to secure the rights to the top talent (p. 224).

Groothuis, Hill, and Perri (2007) also examine the factors influencing this unraveling. They consider early entry from a player and team perspective. From a player's point of view, his lifetime earnings are now restricted by the rookie pay scale. There is an upper bound set to his compensation for the first three to four years of his career. Depending on the marginal ability four years in college adds, it may be in his best interest to enter the NBA early. The rookie pay scale awards an economic rent to veterans. Therefore, the more years a player can spend as a veteran (not under a rookie scale contract), the higher his lifetime earnings will be.

Lazear (1998) introduced option value theory to labor economics. He begins by recapping a fundamental financial principle: variance provides option value. The five principles of option value theory that are most relevant to my research are:

1. *Risky workers are preferred to safe ones at a given wage. Because the risky worker has option value, a firm is willing to pay more to hire a worker with upside potential.*
2. *Restrictions on firing workers can reduce the value of the risky worker relative to the safe one, but cannot reverse the preference for risky over safe.*

3. *As an extension, young workers are favored over old ones with the same expected value. Since less is known about young workers, they have more option value.*
4. *Still, information has value. Firms are willing to pay to learn about a worker's true productivity. This way, the firm can eliminate having to tolerate low productivity workers during a probation period in order to find the ones that it wants to retain.*
5. *The initial employer must have some ex-post advantage over other firms or the option value vanishes. Private information, which becomes available to the initial employer alone, or mobility costs of some kind, are examples of the kind of advantage needed to produce option value (p. 1-2).*

When studying early entry from a team's point of view, Groothuis, Hill, and Perri (2007) consider two competing explanations: the human capital model and Lazear's (1998) option value theory. The human capital model states that once players attain a certain skill level, they will enter the NBA (p. 229). Consequently, early entrants have reached that skill level earlier, and do not need as much time in college to develop their skills. The authors also apply Lazear's (1998) option value theory to the NBA Draft. The structure of the market provides teams with ex-post advantages over rookies. Draft rights restrict player mobility, the rookie pay scale restricts compensation, and after 1998, firing restrictions are lifted with the introduction of team option years. Underclassmen in this model are the risky players, and college seniors are the secure players. Lazear's option value theory predicts that teams will prefer the risky player to the secure one (p. 233).

Kevin Garnett and Kobe Bryant's influence on the unraveling is difficult to measure. Kevin Garnett was chosen by the Minnesota Timberwolves with the fifth pick in the 1995 draft. Kobe Bryant was chosen by the Charlotte Hornets (who later traded his draft rights to the Los Angeles Lakers) with the thirteenth pick in the 1996 draft. Both have been perennial all-stars, won NBA Championships, MVP awards, and are among the top paid players in the league. In addition to these similarities, neither of them attended college. They are tangible examples that early entrants can be very productive in the NBA. It is possible their success has made teams afraid of passing up on a potential superstar. There are a couple of institutional advantages to acquiring such a player early. First, the rookie pay scale allows teams to exploit an economic rent for profit because the top draft picks produce more than the league requires teams to pay them (Groothuis, Hill, Perri, 2007, p. 235). Second, the CBA has provisions designed to help the initial team hold onto a superstar. While Bryant and Garnett undoubtedly had an impact on the unraveling, it is only because they proved the right tail of the talent distribution is present. They are examples of option value becoming real value.

Hendricks, DeBrock, and Koenker (2003) conducted a study on the NFL Draft. Since the NFL does not allow entry before a player's college class finishes their junior year, unraveling has not been a significant problem. However, misinformation is still a problem. The authors use the theory of statistical discrimination and Lazear's (1998) option value theory to explain the rationale behind draft picks. By studying the composition of NFL draft selections, they found that players from more recognizable conferences and teams were preferred to players from obscure conferences and teams in earlier rounds, and vice versa in later rounds. Statistical discrimination proposes that, "groups may be at a disadvantage when the reliability of the test instrument used to predict their performance is less than the reliability of this instrument when it is used to predict a competing group's performance" (883). The competing groups are the best conferences and most visible programs. In the first round of the draft, statistical discrimination predicts that teams will prefer players from more established conferences and teams because they are more secure choices. In the later rounds, Hendricks, DeBrock, and Koenker (2003) suggest that option value theory takes over. At this point, it is unlikely that the players will ever make significant contributions to their teams (the expected values of their future productivity are low). However, players from obscure leagues become more attractive because of their option value. Teams will then favor these players over more secure players. In the early rounds, teams prefer players who are more certain because the option value of the risky players is not large enough. The option value that risky players possess is not very large because players cannot enter the draft until their college class has completed their junior year, thus giving teams much more time to observe the players.

My research attempts to empirically test if Lazear's (1998) option value theory and the change to the CBA can explain the unraveling in the NBA labor market. Groothuis, Hill, and Perri (2007) performed two tests related to the option value theory. First, they cited the fact that the number of early entry washouts went from 1 out of 31 between 1989 and 1994, to 6 out of 58 between 1995 and 1999 (p. 238). This fact shows that early entrants drafted from 1995 onward have a higher washout rate than early entrants drafted before 1995. Second, they test whether early entry is significant in determining all-star status. They run three different regressions and find mixed results on the significance of early entry. If unraveling occurs in pursuit of the most talented players, the authors claim that being an early entrant assumes more upside potential, and should be related to all-star status. This variable is statistically significant in the model without draft number. However, once draft number is included as a regressor, it loses its significance (p. 241).

While these are two good tests, they do not examine if the pay scale is the reason for the unraveling. First, the only distinction the authors have between players is whether or not they were early entrants. They do not control for ability with performance measures. Second, they do not account for different quantities of option value. Freshmen in the draft are different than veteran juniors forgoing their last year of eligibility. Finally, by regressing all-star status on measures of performance in the NBA and whether the player was an early entrant, they are really only proving that the right tail of the talent distribution is present. By showing that the washout rate is now higher for early entrants they are demonstrating that the left tail of the talent distribution in present. They do not test if option value is significant in determining draft order after the change to the CBA.

My research attempts to fill this gap in their study. Lazear (1998) states that employers will only pay for option value under certain conditions. The introduction of the rookie pay scale in 1995 created an environment where option value could precipitate an unraveling. By controlling for ability, I first intend to assess whether option value has become significant in determining first year compensation after the change. I also intend to test if the pay scale has changed the effect of option value. The results of these two analyses ought to reveal the extent to which the 1995 CBA is responsible for the unraveling of the NBA labor market.

Theoretical Framework

This paper attempts to determine if the 1995 change to the CBA created incentives for teams to select early entrants because of their option value. This theoretical framework was originally developed by Groothuis, Hill, and Perri (2007). It is most relevant for the years after 1998, when team option years were automatically added to all rookie contracts. Table 1 presented below lists and describes all the variables used in this framework.

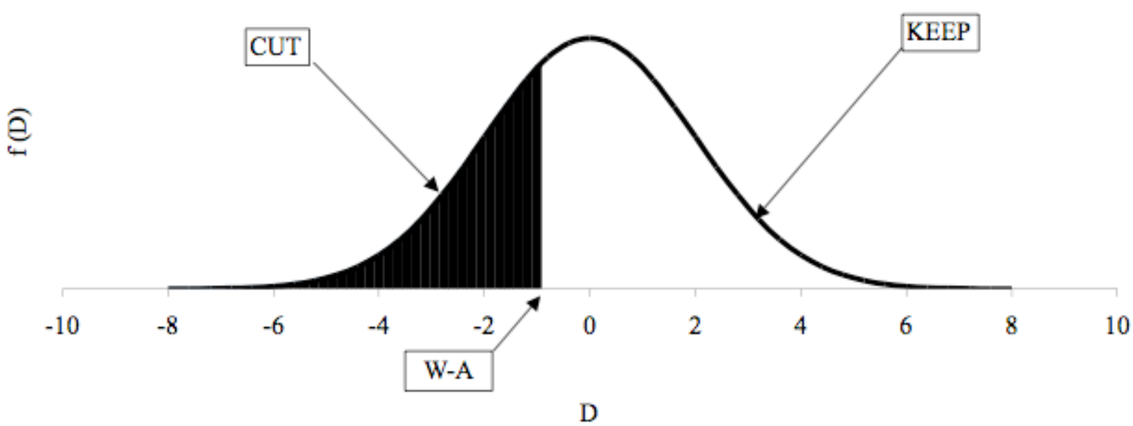
Table 1. Variables

Variable	Description
T	Length of Contract
bT	Guaranteed Period
Q	Production
A	Observed Factor of Production
D	Uncertain Factor of Production
π	Team Profit

Suppose there are two types of players in this labor market. One group of players is secure, and the other group is risky. Contracts have a length of time, T. However, teams have an advantage over players and have the option to terminate the contract after a time period bT, where $b < 1$. This allows teams to cut their losses if they make a hiring mistake. Exercising this option allows teams to profit from making a good selection. Future productivity for players is Q. Q is composed of two components, A and D. A can be thought of as ability and is known with absolute certainty to all teams before hiring takes place. D is some factor of future production unknown to teams (i.e. drive) before hiring takes place. Assume D is continuously distributed on $[D_{min}, D_{max}]$, has a probability density and cumulative density function of f(D) and F(D) respectively, and $E(D) = 0$. D is realized before bT so teams can make informed decisions about exercising the option. Finally, assume that teams have monopsony power so that E(Q) = W < [A + E(D)].

Although E(D) = 0, D ≠ 0 for all players. Since teams have the advantage to reevaluate their decision at time bT, teams will choose to cut players whose wage has been greater than their realized production. By this time, D has been realized, so we can say that players will be cut if W > (A + D). In other terms, players will be cut if D < (W – A). Figure 4 below presents this situation graphically.

Figure 4. Probability Density Function, f(D)



A team's profit is the difference between the production (Q) of its players, and the wages (W) it pays them. Given the setup of this labor market:

π = T {[Prob(cut)(E(D|cut)+A-W)b] + [Prob(keep)E(D|keep)+A-W]} **(1).**

Prob(cut) + Prob(keep) = 1

Prob(cut)(E(D|cut) + Prob(keep)E(D|keep) = E(D) = 0

For b=1: π = T {[Prob(cut)E(D|cut)+Prob(cut)(A-W)] + [Prob(keep)E(D|keep)+Prob(keep)(A-W)]}

π = T {[Prob(cut)E(D|cut) + Prob(keep)E(D|keep)] + [(Prob(cut)+Prob(keep))(A-W)]}

$\pi = T\ \{[E(D)] + [(1)(A\text{-}W)]\}$

$\pi = T\ (A\text{-}W)$

For b<1, and using the fact that, E(D|cut) <(W – A), [E(D|cut) + A – W] < 0:

$\partial\pi/\partial b < 0$ **(2).**

Equation two proves a key result of Lazear's model. As bT increases, teams lose power over players in the labor market because they are forced to make long-term commitments. Conversely, when bT decreases, teams gain power in the labor market. If the guaranteed period is shorter, teams lose less money in absolute terms from a poor selection. Risky workers provide the firm with greater profits because the structure of this labor market allows for the termination of unproductive workers before time T. This means that teams can cut their losses when they choose workers with a low value of D, and can exploit rent from workers with a high value of D by exercising the option.

When teams cannot terminate workers before time T, where b = 1, the only determinants according to this theory on team profits are wage, observed ability, and contract length. However, one of Lazear's (1998) principles is, "restrictions on firing workers can reduce the value of the risky worker relative to the safe one, but cannot reverse the preference for risky over safe" (p. 1). This means that the option year added in 1998 increased the value of risky players. However, from 1995 to 1998 there were still incentives to choose early entrants. Salary was fixed at a lower rate than in the past, which means the same option value was cheaper. Taking a risk became a different decision after the rookie scale was introduced. Teams had to pay less for the same upside potential.

The length of T determines the period over which teams can extract rent from a player. As this period increases, teams will make greater profits, and $\partial\pi/\partial T > 0$. This result is important when considering contract length, not salary or number of option years.

A peculiarity of the NBA labor market is Hausman and Leonard's (1997) 'superstar effect'. In the NBA, there are a limited number of roster spots, and only five players can be on the floor at once. The 'superstar effect' in this context presumes that because of the production function of basketball, teams are more likely to take a chance to find that one great player, rather than employ ten average players whose output would add up to this great player's output. This feature of the labor market suggests that the right tail of the distribution of D (uncertain talent) stretches out very far.

Another feature of the NBA labor market that is pertinent to this study is the advantage teams hold over the players they draft. As discussed earlier, the monoposony power takes the form of a salary restriction ($W < Q$), a mobility restriction, and option years ($b = 3/4$ after 1998, 1/2 after 2005). This theoretical framework suggests that the introduction of the rookie pay scale in 1995 created incentives for choosing riskier players. This theory predicts that this decreased risk, coupled with the termination period introduced in 1998, should have encouraged firms to take more chances when hiring new players.

Data

This paper's goal is to model a team's draft decision with every determinant of draft status that is available, standardized, and quantifiable. The shortcoming of the model is that it cannot include everything that determines draft position. All teams subjectively and objectively evaluate players. Subjective analyses are difficult to include because they differ across every scout and team, the information is not readily available, and it is most often not quantitative. Also, another key determinant at times is need. Although some positions are interchangeable, a team will always need a point guard for example. Teams may choose a talented player because his position fills a void on that team.

Before making draft decisions, NBA teams must first predict the future production of eligible players. They are then able to perform rough cost-benefit analyses on the available players. These analyses reveal which players will contribute to the most wins. More wins leads to more team revenue, and hence more profit. The aim of this study is to include performance measures that will accurately explain draft order. This study compares a large number of players over twenty years, and the data need to be available and standardized. This necessarily limits a lot of what can be included.

These limitations do not mean the NBA labor market is a bad environment to test Lazear's (1998) theory. Compared with other labor markets, many performance measures are readily available. College statistics like points, rebounds, assists, and games played are available. Personal information like height and weight are also available. Table 2 presented below lists all of the variables in this model.

Table 2. Description of variables

Variable	Descriptions
Draft Number	Equal to what number pick the player is drafted with
Natural Log of Salary	Natural Log of the player's first year salary in the NBA adjusted for inflation to 2007 dollars
FR	Equal to one if Freshman
SO	Equal to one if Sophomore
JR	Equal to one if Junior
CONF	Equal to one if Mid-Major*
BMI	[lbs/inches^2] * 703
GP	Games played during final year in college
FG%	Field Goal Percentage = (Field goals made / Field goals attempted)
PTS	Points per minute during final year in college
TRB	Rebounds per minute during final year in college
AST	Assists per minute during final year in college
STL	Steals per minute during final year in college
BLK	Blocks per minute during final year in college
TOV	Turnovers per minute during final year in college
PF	Personal Fouls per minute during final year in college
AFTER	Equal to one if drafted after 1994
BEFORE	Equal to one if drafted before 1995

* - Major Conferences: ACC, Big East, Big 10, Big 12, Conference USA, Pac-10, SEC
- All other conferences are considered to be mid-major

The variables FR, SO, and JR are the focus of the study. They are proxies for option value. Early entrants have undeveloped talents that give them option value. If college experience is significant in determining draft number and first year compensation, then option value does matter to teams. In other words, there is something besides performance during college that matters to NBA teams.

All of the performance measures were collected from the website <www.basketball-reference.com>. This website is run by Justin Kubato of Sports Reference, and has almost all of the information necessary for the analysis. It has a player's college stats, draft year and number, NBA stats by year, and other information such as height, weight, etc. The salary information was collected from the website < http://www.eskimo.com/~pbender>. This is Patricia Bender's personal site, and has information dating back to the 1980s. Bender's information has been used in multiple papers already, and I have checked Basketball Reference for accuracy as well. These data sources are reputable.

College statistics, by convention, are reported in per game format. I have chosen to convert these values to per minute format. Using per minute statistics more accurately measures a player's impact on a game. It is possible to compare his production to another player's, even if they did not play the same number of minutes for a variety of reasons (foul trouble, blowouts, etc).

The model also controls for the issue of injuries. The 'games played' variable captures two things. First, if a player played more games it means that his team had better performance in post-season tournaments. Since players drafted in the first round are normally stars on their respective college teams, this variable captures their ability to perform when it matters most. This undoubtedly is important to NBA teams. Second, the games played variable captures the effect of being injury prone. A player who missed games due to injury is likely to be penalized. Injury prone players inherently carry more risk (with no consequent increase in reward). Therefore, the games played variable ought to solve the issue of injuries.

In total, I have collected data for 474 players. 185 of these observations are from the years before the change to the CBA (1985-1994), and 289 of the observations are from the period after the first change to the structure of rookie compensation (1995-2007)[3]. Data availability only allowed me to include the years 1985, 1987-88, and 1990-94 in the time period before the change to the labor market. However, for these years I was able to include every observation drafted in the first round. With respect to the data from 1995 onwards, I had to exclude 93 observations that were high school or foreign entrants. Considering the scope of this paper, it was not feasible to standardize performance measures across different leagues. This means I only use 76% of all first-round draft picks after the change to the CBA.

Compared to college players, teams have less information available to them on high school and foreign entrants. This implies a sample selection bias in my data. In measuring if option value has an effect on draft selections, the players drafted with the least amount of information, and consequently the most option value, would be useful in this study. However, comparing only college players allows the model to include performance measures. Moreover, college players still comprise a majority of the players drafted each year by NBA teams, which means they are still the best group to study. Also, the segmented levels of college experience allow the model to test different quantities of option value.

This is an excellent opportunity to test Lazear's option value theory. Using performance in college and other explanatory variables allows the model to control for

[3] The 1995 NBA Draft was on June 28. However, the 1995 CBA was not officially ratified until September 15, 1995. This means that the rookie pay scale was put into effect retroactively for the rookie class of 1995. Nevertheless, I still consider this year to be after the change because it was universally anticipated that rookie compensation would be limited in some way (Chass, 1995, p. B15). Therefore, I assume this information influenced teams' draft decisions. This is why I include 1995 in the years after the change, even though the agreement was not technically passed until three months after the draft.

differences across players that influence draft order. These controls should allow the regression to isolate the effect of college experience on first year compensation.

Empirical Specification

This model seeks to test if the introduction of the rookie pay scale precipitated the unraveling of the NBA labor market. By including all the quantifiable information that a team would consider when choosing which player to draft, we can discover which statistics NBA teams view as important in predicting future production. One of these statistics is experience. College experience is the best quantifiable, available, and unbiased proxy for measuring option value. Freshmen entering the draft have the most option value (because less is known about them relative to other college entrants). Sophomores have more option value than juniors, and juniors have more option value than seniors. Every other independent variable is in place to control for differences across the population that might have otherwise influenced draft position.

<u>“Before” and “After” Regressions</u>

In order to compare the time periods before and after the rookie pay scale was passed, I have split the observations into two groups. The “before” group includes all observations before 1995. The “after” group includes all observations from 1995 until 2007. To highlight the differences between the time periods, I run the regressions separately for each group. I also run separate regressions within each group for two different dependent variables: draft number and salary. Salary is preferable to draft number for a couple of reasons. First, Lazear’s (1998) theory states that at lower wages firms are more likely to take chances because the punishment for a bad selection has been lowered (p. 1). Moreover, by using salary instead of draft number, the outcome variable captures the difference in dollar terms. Salary also more precisely measures the change between selections. It accounts for the fact that the change between the 1st and 5th picks is different than the change between the 25th and 30th picks.

The regressions for each group take the general form of:

$$\textit{Draft Number} \text{ or } \textit{Ln (Salary in 2007 dollars)} = \beta_0 + \beta_1 FR + \beta_2 SO + \beta_3 JR + \beta_4 CONF + \beta_5 BMI + \beta_6 GP + \beta_7 FG\% + \beta_8 PTS + \beta_9 TRB + \beta_{10} AST + \beta_{11} STL + \beta_{12} BLK + \beta_{13} TOV + \beta_{14} PF + \beta(\textit{Year Dummy Variables}) + e$$

Given that inflation-adjusted salaries have generally risen over the length of the study (see Figure 2, Introduction), year dummy variables were also included. Tables 3 and 4 present the regression results on the following pages.

Upon examining the results in Tables 3 and 4, a couple of things become apparent immediately. First, the R-squared values are higher for both groups when salary is the dependent variable. As expected, this proves that the salary model explains more of the variation in the data than draft number. For this reason, I will only refer to the salary regressions when interpreting the results, although the draft number model yields the same conclusions. Another important conclusion concerns the dummy variables for different levels of college experience. For the "before" group, the effect of college experience is vague. β_2, the coefficient on SO, is the only one of the three that is statistically significant (at the 10% level). Being a sophomore implies a 28.9% greater first year salary relative to college seniors. However, the coefficients on FR and JR (β_1 and β_3, respectively) are not statistically significant. In addition, the F-test result presented in Table 5 demonstrates that college experience is not jointly significant before 1995.

Table 3.

Dependent Variable: Draft Number

Data:	*1985-1994 (185 observations)* *"Before Group"*		*1995-2007 (289 observations)* *"After Group"*	
	Coefficient	Std. Error	Coefficient	Std. Error
FR	3.892735	4.981725	-9.963398***	1.4526100
SO	-4.914378**	1.91497	-7.017763***	1.1411380
JR	-1.774397	1.249234	-3.536644***	1.0970230
CONF	0.5212064	1.276452	0.7812209	1.2427690
BMI	0.6433315*	0.3306649	0.0361035	0.2493266
GP	-0.2984839**	0.1317374	-0.3050951***	0.1022961
FG%	10.37275	11.32593	-30.56262***	9.7596820
PTS	-32.25343***	5.084147	-32.67151***	5.1673700
TRB	-29.48634***	10.65246	-8.544083	7.9463650
AST	-76.38781***	17.20438	-69.71962***	15.1512100
STL	84.09743**	34.41475	27.84466	27.8877000
BLK	-76.6294***	19.15384	-63.16866***	17.4517800
TOV	60.67893*	35.9593	69.5445**	27.8803600
PF	17.70871	34.39049	70.98119***	25.4639700
constant	27.2856	9.316765	59.86842	8.1113
R^2	0.3761		0.3865	
Adj R2	0.2958		0.3257	
----Year Dummy Variables Included in both regressions----				

**** - significant at the 1% level*
*** - significant at the 5% level*
** - significant at the 10% level*

Table 4.

Dependent Variable: Natural Log of Salary (adjusted to 2007 dollars)

Data:	*1985-1994 (185 observations)* *"Before Group"*		*1995-2007 (289 observations)* *"After Group"*	
	Coefficient	Std. Error	Coefficient	Std. Error
FR	0.0517857	0.3998784	0.5903639***	0.0829730
SO	0.2894282*	0.1537129	0.4231729***	0.0651817
JR	0.0813069	0.1002749	0.197522***	0.0626619
CONF	-0.1536984	0.1024596	-0.0690355	0.0709869
BMI	-0.0415725	0.0265422	-0.0002584	0.0142415
GP	0.0248265**	0.0105744	0.0180305***	0.0058431
FG%	-0.9491242	0.9091218	1.751257***	0.5574728
PTS	2.142154***	0.4080998	1.986551***	0.2951601
TRB	2.251347***	0.8550629	0.6644912	0.4538961
AST	4.45335***	1.38098	4.241565***	0.8654368
STL	-4.204958	2.76244	-1.374874	1.5929450
BLK	6.411258***	1.537461	3.76922***	0.9968451
TOV	-2.679727	2.886419	-4.990613***	1.5925250
PF	-3.233793	2.760492	-4.186356***	1.4545020
constant	13.14656	0.7478481	11.66367	0.4633
R^2	0.5128		0.4446	
Adj R^2	0.45		0.3895	
----Year Dummy Variables Included in both regressions----				

**** - significant at the 1% level*
*** - significant at the 5% level*
** - significant at the 10% level*

Table 5. F-test results, "Before" group, Ln(adjsal)

Restriction 1	FR = 0	
Restriction 2	S0 = 0	F (3, 164) = 1.38
Restriction 3	JR = 0	Prob > F = 0.2498

College experience for the "after" group has a more definitive effect on first year compensation. Table 4 shows that $ß_{1,}$ $ß_{2,}$ and $ß_3$ (the coefficients on FR, SO, and JR, respectively) are all positive and statistically significant at the one percent level. Relative to college seniors, freshmen salaries were 59.0% higher. Sophomores made 42.3% more than seniors, and juniors made 19.8% more than seniors. Table 6 below presents the results of the F-test for whether $ß_{1,}$ $ß_{2,}$ and $ß_3$ are statistically different from one another.

Table 6. F-test results, "After" group, Ln(adjsal)

Restriction 1	FR-SO = 0	F (2, 262) = 11.11
Restriction 2	SO-JR = 0	Prob > F = 0.0000

Clearly, $ß_1$, $ß_2$, and $ß_3$ are not only individually significant, but also significantly different from one another. All of this suggests that teams reward early entrants with the most option value, and are willing to pay a statistically significant premium for increasing levels of this value. Option value definitely influenced team draft decisions from 1995 – 2007.

That being said, we should not conclude that option value is the only thing that matters. Many of the performance measures help explain first year salary as well. For example, the coefficients on PTS (points per minute), AST (assists per minute), and BLK (blocks per minute) are significant at the one percent level, and take the anticipated sign in all four regressions. Other performance measures are significant in these regressions as well. The only statistic that consistently takes the unexpected sign is steals per minute. However, it is only significant in one of the four regressions ("before" group, draft number)[4]. Overall, the results from Tables 3 and 4 confirm that, as expected, performance in college does influence draft order.

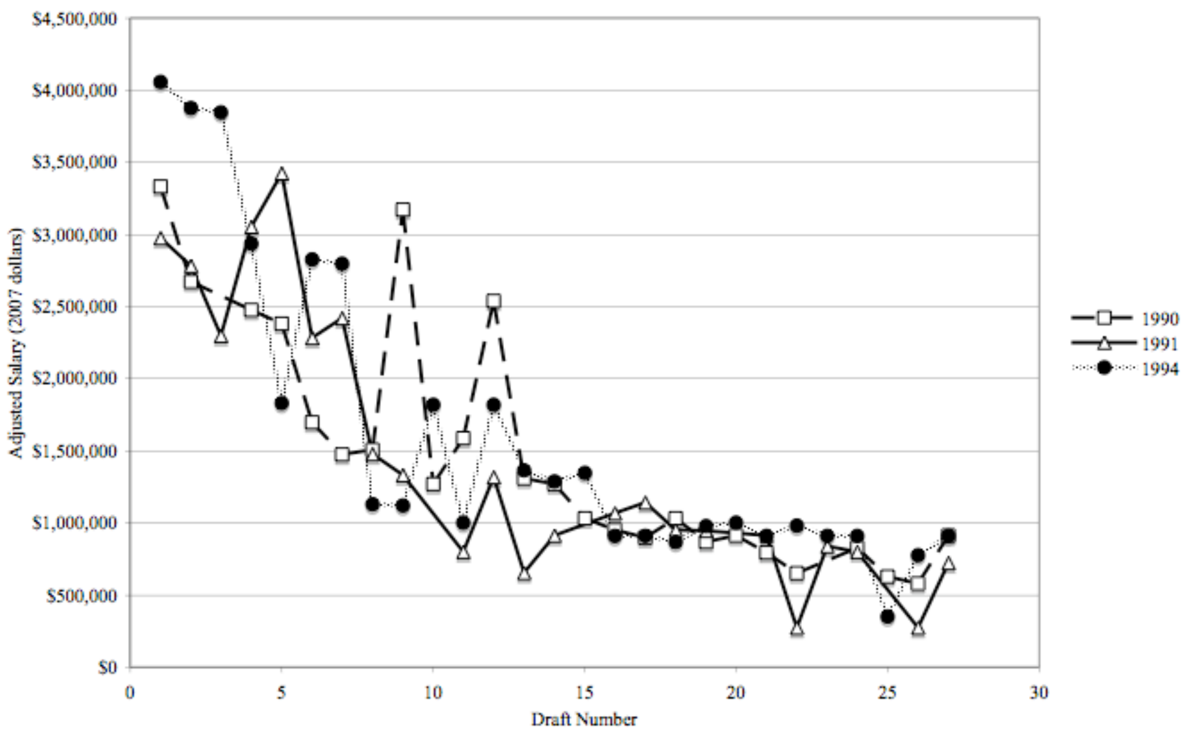
<u>Pooled Regression</u>

The final model I consider combines the separate regressions. Pooling the groups forces the coefficients on the independent variables to be the same. However, by using dummy variables to identify the different groups, it is possible to relax this restriction. I set BEFORE equal to one if the player was drafted before 1995, and AFTER equal to one if the player was drafted from 1995 – 2007. These two dummy variables are then interacted with every regressor. Including the interaction terms and excluding the original variables (i.e. include FR*BEFORE, FR*AFTER; exclude FR) exactly replicates the results from the separate regressions. This amounts to basically stacking the two separate regressions, without restricting any of the coefficients to equal one another. However, this replication is only exact if the separate regressions both have the same error variance.

[4] The only explanation I can think of as to why this would persist in all of the regressions is that while steals are intrinsically positive statistic in basketball, a player who averages a large number of steals may be a limited player. Perhaps he is good in college because he is great on defense. However, NBA teams are looking for players with more advanced skill sets. Players with high values of steals per minute may be lacking in more important offensive categories like points per minute. This is mostly speculation. However, I think it may explain why this one statistic consistently takes the unexpected sign.

There is reason to suspect that this may not be the case. Before the change to the CBA, rookie salaries were negotiated and not set by the league. These negotiations coupled with salary cap issues meant that first year salaries were less dependent on draft number. Figure 5 below shows salary plotted against draft number for a few selected years before the rookie pay scale was enacted.

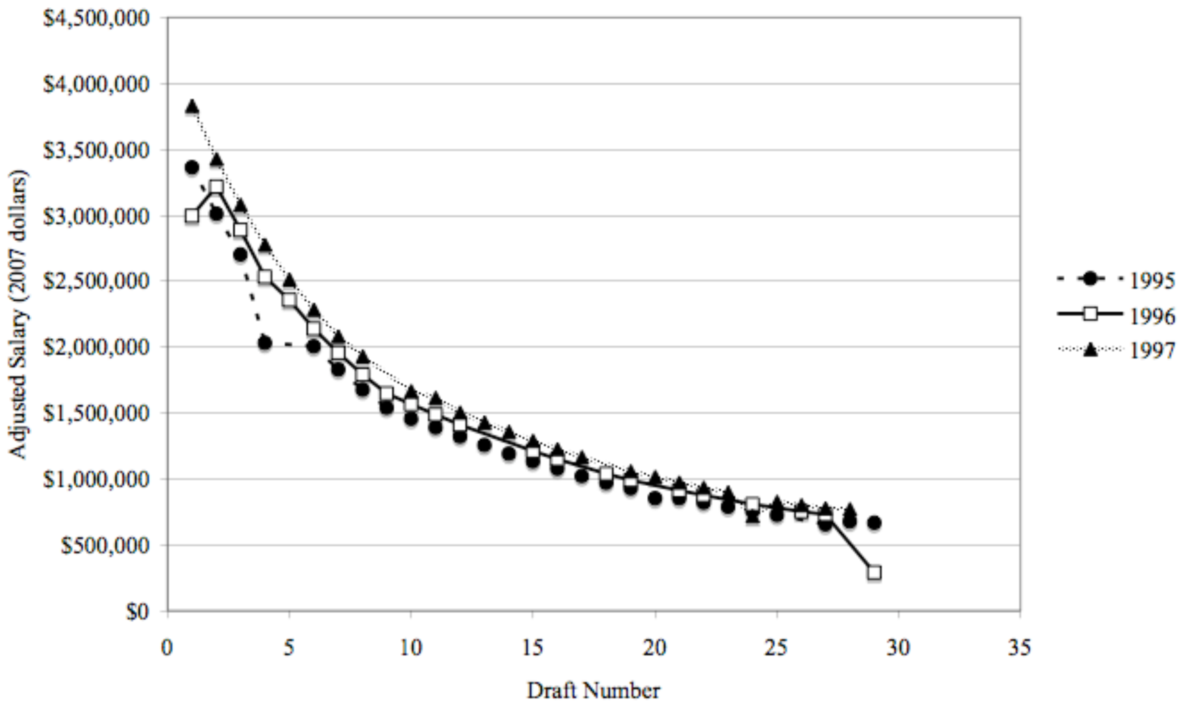
Figure 5. Adjusted Salary vs Draft Number



This chart shows that before the labor market change, first year salary was only loosely related to draft number.

However, from 1995 onwards, this relationship became more formulaic. Now, the pay scale requires that compensation fall as draft number increases. Figure 6 below shows salary against draft number for a few selected years after the change to the CBA.

Figure 6. Adjusted Salary vs Draft Number



The difference between Figures 5 and 6 is that compensation is more directly related to draft number after the pay scale was introduced. The absence of contract negotiations and salary cap issues provide reason to suspect that the error variance for the "before" group is larger than for the "after" group.

The differences in error variance need to be corrected before the regressions can be pooled. By multiplying every variable (including the error term) in the separate regressions by (1 / Root Mean Square Error), the variance of the error term goes to one in each regression[5]. This correction allows the pooled model to produce the correct estimates of the coefficients. The corrected variables are denoted with an "X" (i.e. FRX instead of FR). Finally, all of the corrected variables are interacted with BEFORE and AFTER, and then the

[5] Root Mean Square Error (RMSE) is the square root of MSE, and is equal to the standard error of the error term. Specifically, Var $(e_i/RMSE) = (1/MSE) * Var(e_i) = (1/MSE) * (MSE) = 1$

interactions are pooled into one regression. For "k" regressors, the pooled regression takes the form of:

$$Ln(Adjsal)X = \beta_1 BEFORE + \beta_2 AFTER + \beta_3 FRX*BEFORE + \beta_4 FRX*AFTER + \beta_5 SOX*BEFORE + \beta_6 SOX*AFTER + \ldots + \beta_k PTSX*AFTER + e$$

Table 7 presented below may look similar to Table 5. This is because the coefficient estimates are identical in both regressions. By constraining the variance of the error term equal to one, pooling simply replicates the separate regression results. Also, the regression is run without a constant, because the variables BEFORE and AFTER serve as the constants for both groups. The pooling regression allows us to empirically test whether the coefficients on two variables are equal (i.e. FRX1 = FRX2). Testing whether all the linear coefficients on two data sets are equal (i.e. FRX1=FRX2, SOX1=SOX2, etc.) is called a Chow test. Since this study is mainly concerned with college experience, a Chow test is not necessary. Table 8 presented below contains the F-test for the null hypothesis that the effect of college experience is the same for the before and after groups.

Table 7. Pooled Regression, MSE=1

Dependent Variable:	*Natural Log of Salary (Adjusted to 2007 dollars) X*			
	Coefficient	Std. Error	t - stat	P > |t|
BEFORE	23.88812***	1.456134	16.41	0.000
AFTER	30.13947***	1.197241	25.17	0.000
FRX1	0.0517853	0.3998784	0.13	0.897
FRX2	0.5903642***	0.082973	7.12	0.000
SOX1	0.290015*	0.1540245	1.88	0.060
SOX2	0.4238369***	0.065284	6.49	0.000
JRX1	0.0813071	0.1002749	0.81	0.418
JRX2	0.1975221***	0.0626619	3.15	0.002
CONFX1	-0.153698	0.1024596	-1.5	0.134
CONFX2	-0.0690359	0.0709869	-0.97	0.331
BMIX1	-0.0415725	0.0265422	-1.57	0.118
BMIX2	-0.0002584	0.0142415	-0.02	0.986
GPX1	0.0248265**	0.0105744	2.35	0.019
GPX2	0.0180305***	0.0058431	3.09	0.002
FGPX1	-0.949125	0.9091219	-1.04	0.297
FGPX2	1.751256***	0.5574729	3.14	0.002
PTSX1	2.142155***	0.4080998	5.25	0.000
PTSX2	1.986551***	0.29516	6.73	0.000
TRBX1	2.251345***	0.8550628	2.63	0.009
TRBX2	0.6644927	0.4538961	1.46	0.144
ASTX1	4.45335***	1.38098	3.22	0.001
ASTX2	4.241568***	0.8654367	4.9	0.000
STLX1	-4.204961	2.76244	-1.52	0.129
STLX2	-1.374863	1.592945	-0.86	0.389
BLKX1	6.411259***	1.537461	4.17	0.000
BLKX2	3.769226***	0.9968451	3.78	0.000
TOVX1	-2.679723	2.886419	-0.93	0.354
TOVX2	-4.990617***	1.592525	-3.13	0.002
PFX1	-3.233783	2.760493	-1.17	0.242
PFX2	-4.186357***	1.454502	-2.88	0.004
R^2	0.9992			
Adj R^2	0.9991			
---- Year Dummy Variables Included----				

**** - significant at the 1% level*
*** - significant at the 5% level*
** - significant at the 10% level*

Table 8. F-test results, pooled regression

Restriction 1	FRX1 - FRX2 = 0	F (1, 425) = 1.74 Prob > F = 0.1880
Restriction 1	SOX1 - SOX2 = 0	F (1, 425) = 0.64 Prob > F = 0.4242
Restriction 1	JRX1 - JRX2 = 0	F (1, 425) = 0.97 Prob > F = 0.3262
Restriction 1 Restriction 2 Restriction 3	FRX1 - FRX2 = 0 SOX1 - SOX2 = 0 JRX1 - JRX2 = 0	F (3, 425) = 0.96 Prob > F = 0.4128

The tests above show that the effect of college experience has not changed over time. The coefficients on FR, SO, and JR are a measure of option value. If they have not significantly changed, option value is the same for early entrants in the "before" and "after" groups. However, the rookie pay scale did change the importance of option value. The coefficients on FRX2, SOX2, and JRX2 are all positive, significant at the one level, and significantly different from one another at the one percent level (see Table 4).

While option value has become more important, we cannot reject the null hypothesis that early entrants after the change have the same amount of option value as those before the change. The only explanation is that after 1995 there were opportunities for teams to profit from the same inherent option value present in early entrants. The exogenous change in the structure of the labor market must be responsible for the abrupt unraveling of the NBA labor market.

Conclusion

In 1995, as part of the update to the Collective Bargaining Agreement (CBA), the National Basketball Association (NBA) introduced a limit to rookie compensation for the first time in league history. The limit is called the rookie pay scale. In 1998, the next version of the CBA added a fourth year team option to the standard three year guaranteed contract established in 1995. An option is the right, but not the obligation, to extend the terms of the previous contract an additional year. In 2005, the rookie contracts were changed so that teams had to pay for two guaranteed years, and received two consecutive single option years. Collectively, these changes to rookie compensation created incentives for teams to select risky players.

Since 1995, there has been a general trend toward the selection of college players with less experience. From 1985 – 1994, an average of 16.25 first round draft selections were college seniors. From 1995 – 2007, that number fell to 9.15. This shift toward choosing players before an established clearing time (the end of their senior year) is defined as unraveling in a labor market. This type of unraveling can lead to market failures or higher team profits, depending on the advantages teams hold over their players. Teams that choose more volatile players have larger downside risk. Teams that select more secure players have less risk. The tradeoff is that as players become more secure, they necessarily lose the option value, or upside potential, which can generate wins (revenue) for a team.

The combination of lower salaries and option years gave teams the necessary advantages over their draft selections. In this situation, there is potential for very large gains while maximum loss is capped at a smaller amount. Lazear's (1998) option value theory applies the financial principle of option value to the labor market. He states that, "risky workers are preferred to safe ones at a given wage. Because the risky worker has option value, a firm is willing to pay more to hire a worker with upside potential" (p. 1). Option value theory coupled with the rookie pay scale can explain the unraveling of the NBA labor market. In pursuit of the greatest profit and due in part to the structure of the labor market, teams have chosen to employ players at younger ages since they can capitalize on the option value while capping their downside risk.

The previous section shows the results of this study. They confirm that from 1995 onwards, something else is influencing first year compensation (and consequently draft number) besides performance during a player's last year in college. When assessing the importance of option value after rookie compensation was changed, we find that freshmen make 59.0% more money relative to college seniors. Sophomores make 42.4% more, and juniors make 19.8% more relative to seniors. However, when comparing underclassmen before and after the change, there are not many differences. For example, freshmen do not make significantly more money after the change than freshmen before the change. This means that the amount of option value associated with early entrants has not really changed, while its importance in determining first year salary has increased.

This study's scope does not extend outside of college players entering the NBA draft. With respect to this condition, the analysis is thorough. However, the implications and conclusions of this paper would be stronger if all draft selections could be analyzed. I was unable to include high school and foreign entrants in this model because there is no way to access or normalize their performance data. This makes it impossible to compare these players with college entrants. Future efforts could attempt to normalize their pre-NBA performance measures with college players, which would allow for their inclusion in the study.

Considering the equilibrium effects of the policy change would be another interesting starting point for future studies. Early entry into the NBA Draft is a two-step process. First, it requires a player to enter the draft. Later, a team must select him. This paper primarily considers how teams responded to different incentives resulting from a structural change. However, the new policy ought to have changed the incentives players face when deciding to enter the draft. A player's ability to reveal his upside potential inherent in his option value through better performance measures will affect his decision to enter the draft early. Team responses to the pay scale have changed the decision to enter the draft early. If the supply of early entrants is determined in part by the demand of the teams, the structural change likely increased the supply of early entrants. Incorporating this equilibrium effect into the model would add depth to the study.

Another weakness of this paper is that the model cannot take into account everything a team considers when making their draft decision. Subjective analyses of players by scouts cannot be included in this model, but nevertheless do influence a team's decision whether or not to draft a player. Also, teams may draft a player not because he is the best available, but because he fills a void on their team. The model does not control for team specific needs. It would be interesting to see if the conclusions would be the same for a model that includes some kind of team specific variable.

Despite some of the shortcomings of the model, it does include more than 15 variables aimed at describing salary. The size of the R-squared values indicates that it is successful in explaining about 50% of the variation in draft order and first year salary. The results suggest that NBA teams will pay for option value under some conditions. Players such as Kobe Bryant and Kevin Garnett served as tangible examples that option value can become real value, in the form of points, rebounds, assists, and wins. Their success most likely also encouraged many teams to draft early entrants. Conversely, there are also examples of option value never becoming real value. Consider Darko Milicic. He was drafted before (and paid more) than perennial all-stars Carmelo Anthony and Dwayne Wade. However, he has never averaged more than eight points per game. These examples show that option value can produce a gain or a loss for a team.

Economic analysis has always been an effective tool for predicting and uncovering unintended effects of policy change. Considering Lazear's (1998) theory and the structure of rookie compensation in the NBA, these results are not surprising. The surprising thing is the extent to which option value matters. Freshmen salaries were 59.0% higher relative to college seniors since the introduction of the rookie pay scale. The other surprise is that this large impact was an unintended side effect of the scale. Although it was meant to function as a rent transfer, it encourages early entry (from both the team and player perspective). In 2005, in an effort to control the number of high school entrants, the NBA imposed an age limit. Presently, a player cannot be drafted until his college class has completed at least their freshman year. The introduction of this age limit is an institutional effort to curb the unraveling. An extra year of school allows scouts another year to evaluate talent. The player will also undergo additional development during this year, and lose some option value. However, instead of having a large number of high school players in the draft, there are now a large number of college freshmen. Under the current arrangement, teams still have an incentive to choose these risky workers. The structure of rookie compensation in the NBA encourages early entry, and is the main source of the recent unraveling.

Appendix

Table 3-1.

Dependent Variable: Draft Number

Data:	*1985-1994 (185 observations)*			
	"Before Group"			
	Coefficient	Std. Error	t-stat	P > |t|
FR	3.892735	4.981725	0.78	0.436
SO	-4.914378**	1.91497	-2.57	0.011
JR	-1.774397	1.249234	-1.42	0.157
CONF	0.5212064	1.276452	0.41	0.684
BMI	0.6433315*	0.3306649	1.95	0.053
GP	-0.2984839**	0.1317374	-2.27	0.025
FG%	10.37275	11.32593	0.92	0.361
PTS	-32.25343***	5.084147	-6.34	0.000
TRB	-29.48634***	10.65246	-2.77	0.006
AST	-76.38781***	17.20438	-4.44	0.000
STL	84.09743**	34.41475	2.44	0.016
BLK	-76.6294***	19.15384	-4.00	0.000
TOV	60.67893*	35.9593	1.69	0.093
PF	17.70871	34.39049	0.51	0.607
constant	27.2856	9.316765	2.93	0.004
R^2	0.3761			
Adj R^2	0.2958			
----Year Dummy Variables Included----				

**** - significant at the 1% level*
*** - significant at the 5% level*
** - significant at the 10% level*

Table 3-2.

Dependent Variable: Draft Number

Data:	*1995-2007 (289 observations)*			
	"After Group"			
	Coefficient	Std. Error	t-stat	P > |t|
FR	-9.963398***	1.45261	-6.86	0.000
SO	-7.017763***	1.141138	-6.15	0.000
JR	-3.536644***	1.097023	-3.22	0.001
CONF	0.7812209	1.242769	0.63	0.530
BMI	0.0361035	0.2493266	0.14	0.885
GP	-0.3050951***	0.1022961	-2.98	0.003
FG%	-30.56262***	9.759682	-3.13	0.002
PTS	-32.67151***	5.16737	-6.32	0.000
TRB	-8.544083	7.946365	-1.08	0.283
AST	-69.71962***	15.15121	-4.60	0.000
STL	27.84466	27.8877	1.00	0.319
BLK	-63.16866***	17.45178	-3.62	0.000
TOV	69.5445**	27.88036	2.49	0.013
PF	70.98119***	25.46397	2.79	0.006
constant	59.86842	8.111348	7.38	0.000
R^2	0.3865			
Adj R^2	0.3257			
----Year Dummy Variables Included----				

**** - significant at the 1% level*
*** - significant at the 5% level*
** - significant at the 10% level*

Table 4-1.

Dependent Variable: Natural Log of Salary (adjusted to 2007 dollars)

Data:	*1985-1994 (185 observations)*			
	"Before Group"			
	Coefficient	Std. Error	t-stat	P > |t|
FR	0.0517857	0.3998784	0.13	0.897
SO	0.2894282*	0.1537129	1.88	0.061
JR	0.0813069	0.1002749	0.81	0.419
CONF	-0.1536984	0.1024596	-1.50	0.136
BMI	-0.0415725	0.0265422	-1.57	0.119
GP	0.0248265**	0.0105744	2.35	0.020
FG%	-0.9491242	0.9091218	-1.04	0.298
PTS	2.142154***	0.4080998	5.25	0.000
TRB	2.251347***	0.8550629	2.63	0.009
AST	4.45335***	1.38098	3.22	0.002
STL	-4.204958	2.76244	-1.52	0.130
BLK	6.411258***	1.537461	4.17	0.000
TOV	-2.679727	2.886419	-0.93	0.355
PF	-3.233793	2.760492	-1.17	0.243
constant	13.14656	0.7478481	17.58	0.000
R^2	0.5128			
Adj R^2	0.4500			
----Year Dummy Variables Included----				

**** - significant at the 1% level*
*** - significant at the 5% level*
** - significant at the 10% level*

Table 4-2.

Dependent Variable: Natural Log of Salary (adjusted to 2007 dollars)

Data:	*1995-2007 (289 observations)*			
	"After Group"			
	Coefficient	Std. Error	t-stat	P > |t|
FR	0.5903639***	0.082973	7.12	0.000
SO	0.4231729***	0.0651817	6.49	0.000
JR	0.197522***	0.0626619	3.15	0.002
CONF	-0.0690355	0.0709869	-0.97	0.332
BMI	-0.0002584	0.0142415	-0.02	0.986
GP	0.0180305***	0.0058431	3.09	0.002
FG%	1.751257***	0.5574728	3.14	0.002
PTS	1.986551***	0.2951601	6.73	0.000
TRB	0.6644912	0.4538961	1.46	0.144
AST	4.241565***	0.8654368	4.90	0.000
STL	-1.374874	1.592945	-0.86	0.389
BLK	3.76922***	0.9968451	3.78	0.000
TOV	-4.990613***	1.592525	-3.13	0.002
PF	-4.186356***	1.454502	-2.88	0.004
constant	11.66367	0.46332	25.17	0.000
R^2	0.4446			
Adj R^2	0.3895			
----Year Dummy Variables Included----				

**** - significant at the 1% level*
*** - significant at the 5% level*
** - significant at the 10% level*

References

Bender, P (2007). NBA salary data for 1985-2007. Retrieved December 2008, from http://www.eskimo.com/~pbender

Bollinger, C. R., & Hotchkiss, J. L. (2003). The upside potential of hiring risky workers: Evidence from the baseball industry. *Journal of Labor Economics*, *21*, 923-944. Retrieved October, 2008, from Econlit with Full Text database.

Chass, M. (1995, June 21). Deal or not, players get ready to dunk union. *The New York Times*. Retrieved October, 2008, from ProQuest database.

Coon, Larry. (2008). NBA salary cap FAQ. Retrieved October 2008, from http://www.cbafaq.com

Evans, T. (2009, April 5). After North Carolina, Hansbrough faces a skeptical N.B.A. *The New York Times*. Retrieved from http://www.nytimes.com

Fizel, J. (2006). *Handbook of sports economics research*. Armonk, NY: M.E. Sharpe, Inc.

Groothuis, P. A., Hill, J.R., & Perri, T.J. (2007). Early entry in the NBA Draft: The influence of unraveling, human capital, and option value. *Journal of Sports Economics, 8*, 223-243. Retrieved October, 2008, from Sage Journals database.

Hausman, J. A., & Leonard, G. K. Superstars in the National Basketball Association: Economic value and policy. *Journal of Labor Economics, 15*, 586-624. Retrieved October, 2008, from Econlit with Full Text database.

Hendricks, W., DeBrock, L., & Koenker, R. (2003). Uncertainty, hiring, and subsequent performance: The NFL Draft. *Journal of Labor Economics*, *21*. 857-886. Retrieved October, 2008, from Econlit with Full Text database.

Hill, J. R., & Groothuis, P. A. (2001). The new NBA collective bargaining agreement, the median voter model, and a Robin Hood rent redistribution. *Journal of Sports Economics*, *2*, 131-144. Retrieved October, 2008, from Sage Journals database.

Kubato, Justin (2007). Player college statistics from 1985-2007. Retrieved December 2008, from http://www.basketball-reference.com

Lazear, E. P. (1998). Hiring risky workers. In I. Ohashi, & T. Tachibanaki (Eds.), *Internal labour markets, incentives, and employment* (pp. 143-158). New York: St. Martins Press.

NBA Player's Association. (2005). Collective Bargaining Agreement. Retrieved October 2008, from http://www.nbpa.com/cba.php

Roth, A. E., & Xing, X. (1994). Jumping the gun: Imperfections and institutions related to the timing of market transactions. *The American Economic Review*, *84*, 992-1044. Retrieved October, 2008, from Econlit with Full Text database.