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Tournament Incentives, League Policy, and NBA Team Performance Revisited

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Abstract

Taylor and Trogdon found evidence of shirking under some, but not all, draft lottery systems used in three different National Basketball Association (NBA) seasons. The authors use data from all NBA games played from 1977 to 2007 and a fixed effects model to control for unobservable team and season heterogeneity to extend this research. The authors find that NBA teams were more likely to intentionally lose games at the end of the regular season during the seasons where the incentives to finish last were the largest.

Keywords

tanking, NBA, tournament theory

Introduction

Agents respond to economic incentives. In the office, on professional golf tours, and in the National Basketball Association (NBA), effort put forth by employees, professional athletes, and professional sports teams depends on the economic incentives given to them. Lazear and Rosen (1981) developed a model in which organizations

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compensate agents based on relative performance, rather than on marginal revenue product as neoclassical economics predicts. The rank-order incentive structure at the heart of this model, called tournament theory, explains why chief executive officers (CEOs) earn hundreds of times more than rank and file factory workers and why the winner of a professional golf tournament cashes a check worth twice the amount won by the second place finisher. Frick (2003) points out that tournament theory applies to both individual and team sports because the theory explains both compensation and effort put forth in contests. Preston and Syzmanski (2003) show that, in the context of sport, multiple incentives can affect athletic performance and these incentives do not necessarily increase the effort put forth to win a contest. The dual incentive problem identified by Preston and Syzmanski (2003) turns tournament theory on its head: in some instances, incentives can lead athletes or sports teams to try to lose contests rather than to win them. These incentives create a "tournament within a tournament" where some teams expend effort to win games and other teams in the same league expend effort to lose games.

We examine a specific case where incentives exist for a sports team to put forth effort to lose: the reverse-order amateur entry draft in the NBA. The NBA made a number of changes to the format of its entry draft over the past 20 years, in part because of real or perceived "tanking"—intentionally trying to lose basketball games at the end of the regular season to get a higher pick in the next entry draft—by teams at the bottom of the standings. These changes in entry draft format can be interpreted as natural experiments in the context of tournament theory as the exogenously change the incentives provided to NBA teams. Taylor and Trogdon (2002) analyzed the outcomes of NBA games under three different draft formats and concluded that NBA teams were more likely to lose when the incentives created by the amateur entry draft rewarded losing. We extend the analysis by Taylor and Trogdon (2002) to a fourth entry draft format, fully document the payoffs to teams that "win" the rights to the first pick in the NBA entry draft, and reanalyze the data from the other three periods using a different econometric approach.

This article contributes to a small, growing literature in sports economics, which looks for evidence of the dual incentive problem in sports leagues identified by Preston and Syzmanski (2003). Taylor and Trogdon (2002) were the first to identify a case where teams face an incentive to lose games and act on this incentive. Other articles in this literature include Balsdon, Fong, and Thayer (2007), who found evidence that National Collegiate Athletic Association (NCAA) men's basketball teams perform poorly in conference championship play to improve seeding in the NCAA tournament, and Borland, Chicu, and MacDonald (2009) who found no evidence of losing on purpose in the Australian Football League, though this might be due to insufficiently large benefits of being the worst team in that league. Because the tournament in this case involves losing games instead of winning, this behavior resembles shirking, a frequently analyzed phenomenon in labor economics. In addition, intentionally losing games can be viewed as an undesirable outcome in a sports league. In this sense, this article relates to a broader class of research on detecting corruption in sports. Past research in economics has provided clever empirical strategies for detecting corruption among Sumo wrestlers (Duggan & Levitt, 2002), Olympic judges (Zitzewitz, 2006), and evidence of biases on the part of sports officials (Parsons, Sulaeman, Yates, & Hamermesh, 2007; Price & Wolfers, 2007; Price, Remer, & Stone, 2009). On a brighter note, it appears that this type of research can bring about changes that reduce the opportunity for corruption (Dietl, Lang, & Werner, 2009).

Entry Drafts in Sports Leagues as Contests

Following Taylor and Trogdon (2002), we assume that the presence of an entry draft in a sports league creates a dual incentive problem in the league and generates a contest in which teams at the bottom of the standings compete to get the first pick in the entry draft by intentionally losing games at the end of the season. Under tournament theory, rank-ordering and the presence of a nonlinear increasing prize structure induce participants to put forth maximum effort to win the contest; tournament theory predicts that small increases in effort can generate large increases in payoffs. For the NBA entry draft to induce teams to behave in a way consistent with tournament theory, the payoffs in this contest must conform to this key feature; if the payoffs are not increasing and nonlinear, the predictions of tournament theory do not apply to the behavior of NBA teams at the bottom of the standings at the end of the regular season. Because the format of the NBA entry draft included uncertainty about which team would be awarded the first pick in the draft, the payoffs in this contest are composed of two parts: the probability of getting a given pick in the draft and the benefit that the pick produces. Nonlinearities in this payoff structure arise either because the probability of getting the next highest pick in the draft increases or the marginal benefit of the next highest pick in the draft increases.

Amateur entry drafts allocate new players coming into a league from amateur sports leagues like the NCAA, or even from interscholastic sports leagues, to specific teams in North American professional sports leagues. Except in certain specific cases, every new player coming into a North American professional sports league must first pass through an amateur entry draft. Amateur entry drafts provide professional sports teams with monopsony power in labor markets because they assign the rights to new players to a single team.

Leagues frequently claim that entry drafts promote competitive balance because they allocate the best incoming talent in each season to the worst teams. In the case of the NBA's reverse-entry amateur entry draft, the league cited competitive balance as an important factor when changing the format of the entry draft on several occasions. However, Quinn (2008) recently surveyed the literature on competitive balance and entry drafts and found no evidence of a relationship between entry drafts and competitive balance. Rottenberg's (1956) invariance hypothesis suggests that the most productive players will eventually play for the teams that value them the highest, regardless of the initial allocation of players. In any event, we focus on the incentives generated by entry drafts, not their affect on competitive balance.

The NBA began play in 1946. The first NBA entry draft took place after the conclusion of the NBA season. Although the first NBA entry draft awarded the first pick to the team with the worst record, it also allowed teams to select players based on territorial considerations, so that teams could select college players from their region to help teams in this new league build their fan bases. Starting in 1966, the NBA adopted a draft format resembling a standard reverse-entry draft. A standard reverse-entry draft consists of a number of "rounds," numbered 1 through T. Each round contains N "picks" where N is the number of teams in the league. The team with the worst record gets the first draft pick in each round. The team with the first draft pick can select any player who is eligible for the entry draft in that year. The team with the second worst record gets the second pick in each round and can select any remaining eligible player; the team with the third worst record gets the third pick and can select any remaining eligible player, and so on.

The NBA was composed of two conferences in 1966. In the 1966 NBA entry draft, a coin flip determined which of the two teams with the worst record in each conference would get the first draft pick. The loser of the coin toss received the second pick in the draft. This coin toss introduced uncertainty about which team would get the first pick in the entry draft, and set the stage for future format changes. The third, and all subsequent picks, were awarded in the standard reverse order of finish. Under this entry draft format, only the two worst teams in the league had a chance to get the first pick in the draft.

Following the 1984-1985 season, the NBA changed the format of the entry draft. Under the playoff structure at that time, seven teams would not advance to the postseason. Under the new format, envelopes with the name of each of these seven teams would be placed in a tumbler and shuffled. The first team drawn was awarded the first pick in the next entry draft, the second team drawn was awarded the second pick, and so on. Each team eliminated from the playoffs had an equal probability of getting any of the first seven picks in the next draft. The uncertainty introduced by the lottery reduced the marginal benefit from finishing one position lower in the standings to 0, so eliminated teams had no incentive to engage in a tournament theory-type contest for higher draft picks. Taylor and Trogdon (2002) found that teams eliminated from the postseason were no less likely to lose games at the end of the 1984-1985 regular season than teams who had not been eliminated, controlling for quality of opponent and other factors. This result suggests that teams eliminated from the postseason were not competing in a contest to get higher draft picks.

The equal probability lottery format introduced after the 1984-1985 season met with resistance from the start. Critics claimed that it generated unfair outcomes and failed to distribute new talent to the teams that needed it the most. For example, the Golden State Warriors finished the 1984-1985 season with the worst record in the NBA. Under the previous format, the Warriors would have received either the first or second pick in the next entry draft. Instead, the Warriors' envelope was the last one drawn, giving them the seventh pick in the next draft, just one pick before the playoff teams.

Following the 1989-1990 season, the NBA changed the format to a weighted lottery. Each of the 11 teams that did not make the playoffs was assigned a set of numbers between 1 and 66. The quantity of numbers that each team received decreased linearly with win–loss percentage—the worst team was assigned 11 numbers, the second worst team 10 numbers, and so on. The 66 numbered balls were inserted into a tumbler and mixed. The balls were then removed one at a time. This lottery mechanism assigned only the first three picks of the NBA draft. After three draws, the next draft picks were assigned in reverse order of win–loss record. If the worst team did not receive the first, second, or third pick, then it would automatically receive the fourth choice. This format change returned the nonlinearity to the payoffs in a contest for higher picks in the entry draft. A team's probability of getting the first pick in the entry draft increased with each lower position in the final standings, and the marginal effect was increasing. Taylor and Trogdon (2002) estimated that teams eliminated from playoff contention at the end of the 1989-1990 regular season were 19% less likely to win any game played, conditional on the quality of the opponent and other factors. Again, these results suggest that, in response to the change in the entry draft format that led to a nonlinear payoff structure, teams eliminated from the playoffs once again competed in a contest to get higher picks in the entry draft.

The draft lottery following the 1992-1993 season produced an extremely unlikely outcome. The Orlando Magic finished the season with 41 wins and 41 losses but did not make the playoffs. This record was as good as two teams from the other conference that made the playoffs that year, and the same record as the Indiana Pacers, a team in the same conference that made the playoffs based on a tiebreaking procedure. The Magic won the draft lottery that year and were awarded the first pick in the next entry draft, despite having only a 1-in-66 (1.5%) chance of winning; it was the second consecutive year that the Magic won the draft lottery. NBA Commissioner David Stern stated at the end of the lottery that league would consider several proposals to change the draft lottery. Stern said:

> "The suggestions that seem to be most prominent at the present time is some sense that a team shouldn't be allowed to win it two years in a row, which would suggest some rule that pushes last year's winner down … and the other thing that has been suggested is an even heavier weighting, which would make what happened this year highly unlikely, but not statistically impossible" (*The Toronto Star*, 1993).

The league voted to accept the idea of increasing the weights. The number of balls in the tumbler was reduced from 66 to 14, and each team received a certain allotment of combinations of four numbers ranging from 1 to 14. The first team whose combination of numbers (without respect to the order in which the numbers were drawn) was selected received the first pick, and so on. The combinatorics of this lottery format are complex.

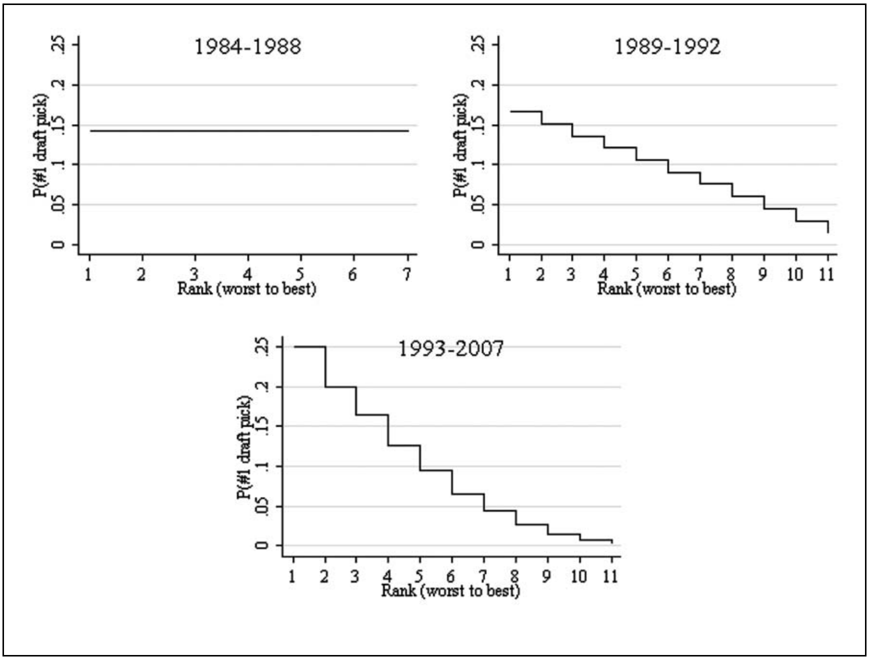

Figure 1. Probability of getting the number one pick by end-of-season ranking.

Figure 1 shows the unconditional probabilities of a team that did not make the playoffs getting the first pick in the entry draft. Clearly, the change in the lottery draft format in 1993 made the payoffs in the contest for higher draft picks even more nonlinear. Note that although the unconditional marginal probability of finishing one position lower in the standings appears to be constant, the lottery applied to only the first three draft picks under this format. The conditional marginal probabilities for finishing with the fourth through 11th worst record would be smaller, leading to a nonlinear marginal probability.

Since the initial decision to change from a traditional reverse-order draft format, the purpose of the draft has been debated by league members and the media. The debate focuses on the conflicting goals of deterring tanking and preserving competitive balance. The introduction of uncertainty about the awarding of the first overall pick in the draft led some to question the fairness of a team like the Orlando Magic in 1993, who almost qualified for the postseason, receiving the number one pick. Soebbing and Mason (2009) discuss the conflict within the league regarding the different draft formats and describe how the commissioner balanced tanking (or the perception of tanking) and league-wide competitive balance with various stakeholders.

Table 1. Wins Produced by Draft Pick

	First Pick	Second Pick	Third Pick
Average wins produced	44.9	25.9	34.7
Percentage above average	66.7%	48.2%	66.7%
Percentage superstar	33.3%	7.4%	22.2%

The Benefits From NBA Draft Picks

For NBA teams to compete in a contest for high-draft picks in the entry draft, gaining the rights to a higher draft pick must produce large enough benefits to induce teams to compete in the contest. Benefits from higher draft picks in the entry draft take several forms. Higher draft picks could perform better on the court than lower draft picks, leading to more wins and larger revenues. The first pick in the draft might be more likely to be a "superstar" caliber player. Because the focus of the NBA draft lottery is the first pick in the entry draft, we concentrate on the first few picks in the draft.

How productive are the top picks in the NBA entry draft? Berri's (2008) wins produced measure of productivity converts basketball performance statistics to wins. Table 1 summarizes the average productivity of the first three picks in the draft over the period 1977-2003 over the first 5 years of their career, or over their entire career for players that played less than 5 years, in terms of wins produced. The average number one pick in the NBA draft produced almost 45 wins over his first 5 seasons, whereas the second pick and third pick produced 28 and 33.3 wins, respectively. The second pick was no better than the third, in terms of wins produced. The *t* tests indicate that the average number of wins produced by first picks is larger than the average number of wins produced by either second or third picks and no difference between the average wins produced by second and third picks.

We also considered the likelihood a team would acquire an above average player or a superstar with the first three picks in the draft. An average team wins 0.500 of its games, and an average NBA player will produce 0.100 wins per 48 min of playing time (WP48). Of the 27 number one picks examined, 66.7% performed above this average level over the first 5 years; less than half of the number 2 picks exceeded this level of production. When we move to superstar status—players who surpassed the 0.200 WP48 mark—33.3% of number one picks performed at or above this level. Only two number two picks in this period in our data set reached this performance level. Perhaps surprisingly, the average number three pick in the draft generated, on average, more wins produced than the second pick (although not nearly as much as the first pick). This underscores the nonlinear nature of the benefits of getting the first pick in the draft relative to the second or third pick.

The first pick does not just produce more wins. He also has a greater impact on gate revenue. To illustrate this point, we estimate a simple reduced form model of

Table 2. Summary Statistics, Revenue Data 1992-2008

Variable	Mean	*SD*	Maximum Value	Minimum Value
Real gate revenue	28,202,797	10,241,843	71,813,813	10,664,388
Regular season wins	41.00	12.85	72.00	11.00
All-star votes received	1,034,051	1,053,601	5,597,842	0
Stadium capacity	18,917	1,848	25,356	12,888
Dummy variable, team at capacity	0.22	0.41	1.00	0.00
Dummy variable, expansion team	0.01	0.12	1.00	0.00
Dummy variable, age of stadium	0.17	0.38	1.00	0.00
Championships won, weighted	7.27	17.13	99.00	0.00
Dummy variable, first pick in draft	0.03	0.18	1.00	0.00
Dummy variable, second pick in draft	0.03	0.18	1.00	0.00

the determination of gate revenue in the NBA. This model relates gate revenue to regular season wins, regular season wins in the previous season, a team's star power as measured by the number of all-star votes players on that team received, championships won in the past, stadium capacity, whether the team sold out all of its home games, whether the team is an expansion team, and whether the team's stadium is less than 3 years old. In addition to these factors, we included dummy variables for teams that were awarded the first three picks in the draft. Formally, the model is

$$\begin{aligned} \mathrm{GATE_{it}} &= \mathrm{d1_i} + \mathrm{d2_t} + \mathrm{a2} * \mathrm{WINS_{it}} + \mathrm{a3} * \mathrm{WINS_{it-1}} + \mathrm{a4} * \mathrm{STARS_{it}} \\ &+ \mathrm{a5} * \mathrm{SCAP_{it}} + \mathrm{a6} * \mathrm{DCAP_{it}} + \mathrm{a7} * \mathrm{DEXP_{it}} + \mathrm{a8} * \mathrm{DNEW_{it}} + \mathrm{a6} * \mathrm{WCHM_{it}} \\ &+ \mathrm{a7} * \mathrm{DFT1_{it}} + \mathrm{a8} * \mathrm{DFT2_{it}} + \mathrm{a8} * \mathrm{DFT1_{it-1}} + \mathrm{e_{it}}. \end{aligned} \tag{1}$$

We estimate this gate revenue regression using data from the 1992-1993 through 2007-2008 seasons. Table 2 contains summary statistics for all the variables in this model. We exclude the 1998-1999 season because of the strike that resulted in the cancellation of 928 games. The model was estimated in log–log form to allow for nonlinearities in the relationships between the explanatory variables and gate revenues. It also included team- and year-specific dummy variables. Additionally, to control for any autocorrelation, an AR(1) term was included in the composite error term.

The results are reported in Table 3. Gate revenue is increased by both wins and star power. Of the two, though, wins are far more important. To illustrate, Kevin Garnett led the NBA in all-star votes in 2008, receiving 2,399,148. All of these votes were worth less than $300,000. In contrast, the 17.9 wins produced by Garnett that season was worth $3.5 million. Being awarded the first or second pick in the draft did have an impact on gate revenue, even when controlling for the number of wins.

Table 3. Regression Results, Gate Revenue Model

Variable	Coefficient	Standard Error	t statistic
Regular season wins	.099	0.026	3.72
Lagged regular season wins	.138	0.035	3.85
All-star votes received	.003	0.001	2.38
Stadium capacity	.879	0.075	11.6
Dummy variable, team at capacity	.045	0.018	2.52
Dummy variable, expansion team	.111	0.022	4.36
Dummy variable, age of stadium	.054	0.009	6.81
Championships won, weighted	.002	0.001	3.94
Dummy variable, first pick in draft	.051	0.016	3.14
Dummy variable, second pick in draft	.048	0.013	3.81
Dummy variable, third pick in draft	−.005	0.015	−0.31
Dummy variable, first pick in draft, lagged	.029	0.009	3.25
Dummy variable, second pick in draft, lagged	.006	0.014	0.42
Dummy variable, third pick in draft, lagged	−.017	0.013	−1.44
R^2	.91		
Adjusted R^2	.88		
N	315		

These additional revenues probably come from the advertising effect of the number one pick on gate attendance, licensed merchandise sales, advertising revenues, and concessions. Getting the first pick in the draft in the previous year also had a positive impact on gate revenue, holding wins constant.

Table 4 summarizes the total financial impact of having the first pick in the draft on gate revenues over the period 1992-2007. On average, the first pick will produce 7.2 wins in his first season. These wins are worth $1.4 million or about half the impact of just having the first pick has on gate revenue. Although the third pick tends to be slightly more productive than the second pick, the third pick has no independent impact on gate revenue, so the overall value is less than $1 million. These results clearly indicate that having the very first pick is worth substantially more than the either the second or third pick. The impact of the number one pick on gate revenue and wins is larger than the impact of the second or third picks; this nonlinear payoff structure is consistent with tournament theory and explains why teams would participate in a tournament to secure the top selection in the NBA draft.

One potential concern, though, is that the costs of tanking (intentionally losing games) could offset the potential benefits of securing the number one draft pick; as teams lose games they lose revenue. For the 2007-2008 season, the value of each additional win was $197,304, calculated at the sample means. As shown in Table 4, the estimated value of the number one pick is $4,432,599. Given these numbers, a team would have to lose more than 22 games for the value of the number one pick to be completely offset by the cost of losing.

Table 4. The Total Value of the Top Three Draft Picks, 1992-2007

	First Pick in Draft	Second Pick in Draft	Third Pick in Draft
Average wins produced	7.2	3.3	4.7
Value of wins	$1,426,313	$644,221	$917,522
Value of draft position	$2,816,072	$1,615,512	$0
Total Value	$4,242,386	$2,259,733	$917,522

The Probability of Getting the First Pick

The draft lottery formats put in place after the 1983-1984 season introduced uncertainty into the awarding of the first pick in the entry draft. This uncertainty requires teams to make probabilistic assessments of the return to winning a contest for the first pick in the entry draft. To illustrate the probabilistic nature of the incentives under each lottery regime, we calculate the probability of a team getting a particular draft pick based on their ranking at the end of the season. The probability of any team winning the first pick in any season depends on the format of the lottery used. For the 1966-1983 seasons, a coin toss decided the first pick, the worst team in each conference had a 50% chance of receiving the first and second picks, whereas the other teams had a 0% chance. For the 1984-1988 seasons, the probability that team $i \in S$ receives the nth pick, where S is the set of teams that have been eliminated from the playoffs, is

$$P(i\text{th team wins the } n\text{th pick}) = \frac{1}{S}.$$

For the seasons from 1988 to the present, the probabilities of winning the first, second, and third picks are given by

$$P(i\text{th team wins the 1st pick}) = \frac{c_i}{T},$$

$$P(i\text{th team wins the 2nd pick}) = \sum_{j \in S/\{i\}} \frac{c_j c_i}{T(T - c_j)},$$

and

$$P(i\text{th team wins the 3rd pick}) = \sum_{j \in S/\{i\}} \sum_{k \in S/\{i\}} \frac{c_j c_k c_i}{T(T - c_j)(T - c_j - c_k)},$$

where c_i is the number of chances that team i has been allotted, and $T = \sum_{i \in S} c_i$ is the total number of chances in the lottery in that year ($T = 66$ from 1989 to 2002, and $T = 1{,}000$ from 2003 to the present). The derivation of these last three equations makes use of previous results in Penrice (1995) and Florke and Ecker (2003). Figure 1 shows the probability that a team gets the first pick in the entry draft by rank. The key feature on this figure is the marginal effect on the probability of getting the first pick from moving up one place in the contest for the first pick. In the 1984-1988 period, the marginal effect is 0; teams had no incentive to compete for the first pick in the draft under this draft lottery format. In the 1989-1992 period, the marginal effect is roughly constant. As we documented above, the return generated by the first three picks are nonlinear, but the marginal probability is constant under this draft lottery format. The changes made in the draft lottery format after 1992 lead to a nonlinear marginal effect of moving up in the standings in this contest. When combined with the nonlinear benefit generated by higher draft picks, this change in probability increased the nonlinearity of the total expected reward from winning the contest for the first pick in the entry draft. The draft lottery format in place after 1992 generates the strongest incentives in the context of tournament theory.

Cost Savings

The NBA instituted a rookie "salary scale" in 1995, which fixed the salary that players drafted in the first round of the entry draft would be paid for the first 4 years of their career. Prior to 1995, teams had to negotiate with players over the salary they would be paid. The first pick in the 1994 entry draft, Glenn Robinson, threatened to hold out and not sign a contract unless he was paid $100 million over the life of his first contract. He ultimately signed a 10-year contract worth $68.15 million. The salary scale awarded the number one pick the highest salary, a fraction of Robinson's salary; the number two pick a slightly lower salary, and so on. A rookie salary scale has been in effect since 1995. The NBA collective bargaining agreement specifies the scale. In 2009-2010, the number one draft pick will earn $4.15 million in year one, $4.46 million in year two, and $4.77 million in year three. The number two draft pick will earn $3.71 million in year one, $3.99 million in year two, and $4.27 million in year three.

The introduction of a rookie salary scale provided teams with an additional incentive to compete for the first pick in the entry draft. Not only would the team with the first pick in the draft have the rights to a player that would, on average, generate more wins than any other pick in the draft; under the rookie salary scale that team would not have to negotiate with the player drafted, and would pay him a specific salary over the first 4 years of his career.

The first pick in the entry draft generates significant benefits for the team awarded this pick. The benefits from later picks in the draft decline nonlinearly. Taken together, these factors conform to the assumptions of tournament theory and suggest that NBA teams might be induced to compete in a contest for the first pick in the entry draft. The competition would involve losing games at the end of the season to finish lower in the standings and increase the probability of winning the rights to the first pick in the entry draft. We next look for evidence that such a competition actually took place in the NBA.

Empirical Analysis

We use an empirical approach similar to that of Taylor and Trogdon (2002) to determine if NBA teams intentionally lost games at the end of the regular season as part of a contest to win the first pick in the entry draft. We estimate a logit model of the probability that a given team wins a game and include as controls whether the team is the home team as well as team, season, and opponent fixed effects. We also include controls for the team's win percentage up to that point and whether they have clinched a spot in the playoffs (as well as similar information about the opponent). Our main variables of interest are a set of interactions between an indicator of whether the team has been mathematically eliminated from the playoffs and each of the seasons as well as similar interactions for whether the opponent has been eliminated from playoff contention.

We implicitly assume that teams with a nonzero chance of qualifying for the playoffs will not participate in the contest for the first pick in the entry draft. Following Taylor and Trogdon (2002), a negative and significant parameter estimates on the elimination variable provides evidence that the team was trying to lose the game to improve its chances of winning the draft lottery.

Our main variables of interest are all interaction terms between our elimination variable and indicators for each year. Ai and Norton (2003) point out that the interpretation of interaction terms in nonlinear models can often be misleading. To address this concern, we also present all of our results using a linear probability model. In addition, because we have two observations for each game, we cluster all of our standard errors at the game level.

Data

We use data from all NBA regular season games played during the 1977-1978 through 2007-2008 seasons.[1] For each game played, we know the date, home team, visiting team, and score of each team. We use this information to construct each team's win percentage at each point in the season. These data are augmented with information about the lottery rules in place in each season. Using the daily standings and the number of games remaining, we identify the point in the season when teams were eliminated from the playoffs in each season. Our game-level data include 63,680 team-game observations. Of these, 4.1% of the observations involve a team that has been eliminated from playoff contention and 7.4% involve teams that have clinched a spot in the playoffs. There were a small number of games (0.2%) during this period, which were played at neutral sites that we left out of our analysis.

Results and Discussion

Table 5 provides the effects of home team, win percentage, and clinching a playoff spot on the likelihood of wining the game. We drop the 1998 season due to a strike that resulted in the cancellation of 928 games and the all-star game. The franchise

Table 5. Team Characteristics Associated With Winning the Game

	Logit Regression		Linear Probability Model	
Variable	Marginal Effect	*p* Value	Coefficient	*p* Value
Home team	0.288	.00	.255	.00
Win percentage	0.006	.00	.005	.00
Clinched Playoff	0.038	.00	.033	.00
R^2	0.1334		.1690	
Observations	63,680		63,680	

and season-specific effect parameters are not reported, but are available from the corresponding author on request. These results conform to expectations. Home teams are almost 29% more likely to win a game, holding relative team strengths constant. The higher the winning percentage of the team going into the game, the more likely is that team to win; the higher the winning percentage of the opposing team going into the game, the more likely is the team to lose.

Table 6 contains parameter estimates, *p* values and marginal effects for the indicator variables for teams that had been eliminated from the playoffs. The results in Table 6 are from the same regressions as in Table 5. Each row represents the effect of being eliminated from the playoffs interacted with an indicator variable for each season. We report the effect of being eliminated separately by season to account for year-to-year variation in the value of getting the top draft pick. This variation results form changes in the expected quality of the players being drafted the next year as well as rules governing rookie salaries and contract lengths. The lines on this table delimit the four different draft formats in place in the NBA since 1977. The seasons when the parameter estimates are significant have been shown in bold for ease of interpretation. Note that the marginal effects, when significant, are quite large ranging from 9.5% to 21.7%.

The NBA changed the method of allocating draft picks in response to perceptions that teams were intentionally losing games under the original reverse-order draft format. Taylor and Trogdon (2002) reported evidence of tanking in the 1983-1984 season. However, our results provide some evidence of tanking during the first period of our sample (1977-1983). Our results indicate that teams appeared to lose games after being eliminated from the playoffs only in 1979 and 1981 (and possibly 1983). Our model includes franchise-specific fixed effects, whereas Taylor and Trogdon (2002) estimated a random effects model. Because the decision to participate in a contest to win the first pick in the entry draft is made by the franchise, we believe that controlling for unobservable franchise-level heterogeneity is important in this setting. In addition, because the parameter estimates of interest are random variables, some of these parameter estimates will be significant even if no tanking takes place. Therefore, we interpret the result that teams appeared to be tanking in

Table 6. Estimates of Interaction Between Elimination and Each Season

	Logit Regression		Linear Probability Model	
Season	Marginal Effect	*p* Value	Coefficient	*p* Value
1977	−0.001	.99	.004	.97
1978	−0.083	.47	−.091	.49
1979*	−0.217	.00	−.295	.00
1980	−0.069	.29	−.078	.37
1981*	−0.131	.02	−.184	.03
1982	−0.078	.16	−.117	.18
1983	−0.136	.07	−.166	.12
1984	−0.101	.12	−.129	.17
1985	0.036	.72	.048	.71
1986	−0.064	.24	−.088	.27
1987*	−0.118	.02	−.175	.04
1988	0.014	.77	.024	.69
1989*	−0.141	.00	−.215	.00
1990	0.066	.19	.085	.14
1991*	−0.095	.05	−.125	.07
1992	−0.079	.11	−.107	.14
1993*	−0.156	.00	−.225	.00
1994	−0.059	.21	−.079	.26
1995*	−0.104	.02	−.141	.04
1996*	−0.128	.00	−.191	.00
1997*	−0.135	.00	−.211	.00
1999*	−0.120	.01	−.166	.01
2000*	−0.126	.00	−.154	.00
2001	−0.031	.56	−.030	.66
2002	−0.061	.17	−.067	.24
2003	−0.073	.23	−.082	.30
2004*	−0.116	.01	−.149	.02
2005	−0.062	.24	−.064	.34
2006	−0.105	.10	−.126	.13
2007	−0.047	.24	−.063	.26

Notes: This is a continuation of the results from Table 5. The regression also includes season, team, and opponent fixed effects. The level of significance is shown in the P-Value column on Table 6. The stars identify parameters significant at the 2% level or better. This should be obvious from the P-values reported.

only two of the seven seasons in the first subsample as weak evidence of tanking. In addition, the marginal benefit from winning the first pick in the entry draft during this period was not strongly nonlinear. Tournament theory requires nonlinear rewards to induce agents to enter the tournament and try and win. The incentives may not have been strong enough during this period to induce teams to participate in a contest for the first pick in the draft, which is consistent with our results.

During 1984-1988, a random draft lottery was used. Under this format, teams have no incentive to intentionally lose games, because they could not affect the probability of winning the first pick in the entry draft. The marginal benefit a team realized by improving its standing in the contest for the first pick in the entry draft was 0, eliminating any incentive to compete for this prize. Taylor and Trogdon (2002) reported no evidence of tanking in 1984. Our results confirm their finding and suggest that tanking took place in only one season, 1987-1988, out of five in this subsample. This could be due to an adjustment in the NBA draft policy starting with the 1987 draft (1986-1987 season) that the lottery would only select the first three picks and not the entire order for the nonplayoff teams. Again, over many seasons, the estimated parameter on the elimination variables would be expected to be significant occasionally, no matter what underlying behavior occurred, because these parameters are random variables. Our results suggest that no tanking took place during this period.

A new draft format was put in place for the 1989-1990 season. Again, this system featured a lottery weighted in a way to give teams with worse records a larger chance of winning the first pick in the entry draft. This generated a nonlinear payoff structure and should have induced teams to participate in a contest to win the first pick in the entry draft. Some NBA team executives believed that this format was the best way to balance the deterrence of tanking and preserve competitive balance (Soebbing & Mason, 2009). In addition, Commissioner David Stern stated, "We wanted to insure that the teams that finish with the worst record will get a better crack at the top picks" (Goldpaper, 1989). Taylor and Trogdon (2002) found evidence that teams eliminated from the playoffs were more likely to lose games in the 1989-1990 season. Our results find evidence of this behavior in both 1989-1990 and 1991-1992. Teams eliminated from playoff contention resumed their competition for the first pick in the entry draft during this period.

After the 1992-1993 season, the NBA again changed the format of the draft lottery by adjusting the weights on the probabilities assigned to each position in the final standings. Recall that this format generates the strongest incentive for teams to compete in a contest for the first pick in the entry draft, because of the greater nonlinearity of the expected payoff from winning the contest. Our results indicate that teams eliminated from the playoffs were more likely to lose games at the end of the season in six of the first seven seasons under this draft lottery format, the strongest evidence of tanking in the sample period. Teams appear to have responded strongly to the new incentive structure, as predicted by tournament theory.

Interestingly, our results indicate that less tanking took place after the 2000-2001 season under the current draft lottery format; only the 2004-2005 season shows evidence of tanking. The NBA switched from a conference format to a divisional format in 2004-2005, which could affect the incentives to lose games at the end of the season as well as the timing of teams' elimination from playoff contention. This could reflect learning about the actual payoff from the contest for the first pick in the entry draft by NBA teams. Teams must make a decision to participate in the contest for the first pick in the entry draft based on the expected return to winning the competition. The actual return may differ from the expected return either because of the outcome of the lottery or because of the performance of the player actually drafted. Differences between the actual and expected return will only be revealed over time. The lack of evidence of tanking at the end of the sample period could reflect learning about the actual return to winning the contest. Alternatively, teams may not have competed for the first pick in the draft by losing games at the end of the regular season in the later part of the sample because the cost of participating in this contest increased. Fans, the media, and the NBA league office may not like this competition, because it requires teams to lose more games than they otherwise would have lost. The frequent tanking that took place in the 1989-2000 period could have made fans and the media more sensitive to tanking, and increased their distaste for this behavior, and thus increased the cost of tanking to the team.

Tournament theory explains the changes in tanking in the NBA over the sample period. Teams appear to have competed for the first pick in the entry draft by losing games at the end of the regular season, when the expected returns from winning this contest were sufficiently nonlinear and not competed when the expected returns were less nonlinear. Interestingly, we find relatively weak evidence of tanking prior to 1989, but the NBA changed the format of the entry draft to reduce the incentive to tank in 1984. Again, we explain the draft format change made by the NBA in the early 1980s as an attempt to head off perceived tanking by NBA teams. The changes in the draft lottery format made since then had the unintended consequence of increasing the incentive for teams to participate in this contest and led to more tanking than occurred prior to the format change.

Conclusions

Taylor and Trogdon (2002) found evidence of teams eliminated from playoff contention late in the regular season losing games unexpectedly under both the traditional reverse-order entry draft format used up until 1983 and under the weighted lottery entry draft format put in place prior to the 1989-1990 season. Taylor and Trogdon (2002) argued that this constitutes evidence that teams were competing in a contest to win the first pick in the next entry draft by finishing lower in the final standings and that both the traditional reverse-order entry draft format and the weighted lottery entry draft format generated incentives for teams to participate in this contest.

We argue that the traditional reverse-order entry draft format does not generate strong incentives to participate in this type of contest and develop evidence to support this assertion. Under the traditional reverse-order entry draft format, draft order was deterministic, and the marginal benefit to shirking, an increase of one position in the draft, was constant. The only increasing marginal benefit from finishing lower in the final standings came from the extra benefits generated from the first pick in the draft relative to the second and third picks. Tournament theory, as proposed by Lazear and Rosen (1981), features nonlinear incentives that generate increasing marginal benefits to effort. The relatively constant marginal benefit to finishing lower in the final standings under the traditional reverse-order entry draft format is not consistent with tournament theory; the marginal benefit from finishing lower in the final standings increases only under the two weighted lottery entry draft formats used by the NBA after the 1989-1990 season. We analyze the performance of NBA teams in each season from 1977 to 2008, which includes the three seasons examined by Taylor and Trogdon (2002), using a fixed effects logistic estimator that controls for unobservable team specific factors. We find strong evidence of shirking late in the season only under the weighted lottery entry draft formats in place after 1989, when the marginal benefit from finishing lower in the final standings was increasing.

Our results support the primary findings of Taylor and Trogdon (2002) that the weighted lottery entry draft formats used by the NBA in the 1990s created an incentive for teams to compete for the first pick in the entry draft by losing more teams that would be expected once they are. However, the evidence of shirking by Taylor and Trogdon (2002) under the traditional reverse-order amateur draft format originally used by the NBA is not entirely robust to the inclusion of team-specific fixed effects, and we find evidence of teams unexpectedly losing games after being eliminated from the playoffs in only a few seasons prior to 1989.

Why did the NBA change the draft format if teams were not shirking under the original reverse-order amateur entry draft format? Uncertainty of game outcome is a core product of sports leagues (Mason, 1999) and the integrity of this product must be protected. Media reports indicate that a *perception* of shirking existed under the original draft format, and this perception was enough to force the NBA to institute changes, even if shirking did not take place (Soebbing & Mason, 2009). Interestingly, the changes made by the NBA actually introduced and increased the incentive to shirk late in the season, an example of the unintended consequences of economic policy changes.

Like Taylor and Trogdon (2002), this study cannot account for the effect of injuries and strategic resting of key players in regular season games on the probability that a team wins a game. Injuries, especially to key players, can result in teams losing more than would be expected. NBA teams frequently rest important players late in the regular season to preserve their energy for the long postseason. In these cases, a common comment is if the game was a playoff or other high importance game, the player would be playing. Therefore, it is impossible to control for the effects of injuries and resting key players in this model. Future research might explore some of the specific ways that teams engage in this shirking behavior, in particular, whether star players are more likely to be "injured" that game or play fewer minutes.

Future research examining shirking in the NBA needs to focus on the effect of "losing to win" on other key stakeholders. For example, fans may object to this behavior and this effect could be reflected in gate attendance. In addition, betting markets may reflect shirking by NBA teams. Bettors can bet both on the spread of the game as well as the over/under total point market. If bettors believe that the spread is an accurate predictor of game outcomes, then future research should examine if the odds makers believed that teams were tanking late in the regular season.

Note

1. These data are available at basketballreference.com.

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