To Tank or Not to Tank? Evidence from the NBA

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Abstract

High draft picks are a coveted commodity in the NBA. Teams are often accused of losing intentionally ("tanking") in order to increase their odds of receiving a favorable pick in the league's draft lottery. This paper answers two questions related to tanking in the NBA: (1) What is the value of receiving the first draft pick?, and (2) Do teams lose intentionally to secure higher draft positions? We answer the first question by controlling for the probability of winning the lottery in a linear regression framework. The estimates indicate that winning the draft lottery increases attendance by 5 percentage points during the five year period following the draft. Receiving the first pick is also associated with a small increase in win percentage, though this effect is less precisely estimated. To answer the second question, we analyze games played by non-playoff teams near the end of the season. Using a fixed-effects methodology that compares games in which a team can potentially change its lottery odds to games in which these odds are fixed, we find strong evidence of tanking. Playoff-eliminated teams are 14 percentage points more likely to lose a game when doing so increases their chances in the draft lottery.

1 Introduction

In the National Basketball Association (NBA), the selection order in the annual amateur draft is determined via lottery. Weaker teams receive more weight in the lottery, but all non-playoff teams have at least some chance to receive the first overall pick. Draft picks are a coveted commodity in NBA front offices, and NBA teams are sometimes accused of "tanking" (that is, intentionally losing games) late in the season in order to increase their chances in the lottery. In an April 2007 article titled "Tanks for Nothing, NBA," ESPN's Bill Simmons chronicles a late-season game between the Milwaukee Bucks and the Boston Celtics, and argues that both teams were "desperate…to blow the game for lottery position." The resulting game was a "stink bomb" in which "every paying customer lost" [1].

This paper explores two questions related to tanking in the NBA. First, we ask whether receiving a high draft pick actually has economic and competitive value. Despite the perceived benefits of a favorable lottery position, there is substantial uncertainty associated with the performance of top amateur prospects. Table 1 summarizes the careers of the players selected with the first overall pick in the NBA drafts held from 1985 to 2010 (see Appendix 1 for all tables). Some first picks, like Tim Duncan and Shaquille O'Neal, became superstars and won multiple league championships; others, like Michael Olowokandi and Kwame Brown, failed to qualify for a single NBA all-star team. Since the NBA's rookie salary scale requires teams to make significant financial commitments to high draft picks regardless of their performance, the true value of owning a high draft pick is theoretically unclear.

We estimate the value of receiving a top pick by controlling for the probability of winning the lottery in a linear regression framework. Since bad teams are more likely to win the lottery, simple comparisons of subsequent outcomes for winners and losers do not capture a true causal effect. After holding the probability of assignment constant, however, the lottery outcome is random, and comparisons of winners and losers are unbiased. We use this methodology to estimate the effect of receiving the first pick on attendance and win percentage. The results indicate that receiving the first pick leads to an attendance increase of 5 percent in the five years following the lottery. The estimates for win percentage are less precise, but they suggest that winning the lottery causes a small increase in on-court success in the short term.

Our second question is whether teams recognize these benefits and tank to increase their odds of receiving a high draft pick. To answer this question, we focus on the performance of non-playoff teams near the end of the season. We use a fixed-effects methodology that compares games in which a team's lottery odds are already determined to games in which these odds would be improved by a loss. The results show that teams tank severely in order to improve their draft prospects. Non-playoff teams are 14 percentage points more likely to lose when doing so can improve their draft position, a result that is highly statistically significant. This effect appears to be stronger in more recent years of the data, perhaps reflecting an increase in knowledge about the value of high draft picks.

In a related study, Price et al. [2] study tanking in the NBA. They argue that receiving a high draft pick increases gate revenue, and that teams tank to improve draft position. Our paper improves and extends their study in several important ways. First, their analysis of the value of the first pick does not account for unobservable differences between lottery winners and losers, and is therefore contaminated by selection bias. We solve this problem by explicitly adjusting for the probability of winning the lottery, thus eliminating this bias. Second, their methodology for identifying tanking is based on comparisons between playoff and non-playoff teams; there may be underlying differences in team quality that drive the results of such comparisons. We use a richer methodology that holds team quality fixed by comparing games in which the incentive to tank is turned on or off for a given non-playoff team in a particular season. Our approach isolates the tanking incentive and yields uniquely credible evidence of tanking in the NBA.

2 The Value of the First Pick

We begin our empirical analysis by estimating the economic and competitive effects of receiving the first pick in the NBA draft. This analysis is complicated by the potential for selection bias: Since teams with poor records receive disproportionate weight in the lottery's selection mechanism, lottery winners are likely to continue to perform poorly relative to lottery losers in future seasons regardless of whether they win the lottery. However, a useful feature of the NBA lottery context is that the weight determining each team's probability of winning can be directly calculated. In the language of Rosenbaum and Rubin [3], the propensity score (probability of winning) is known; holding this probability constant, the lottery is purely random. We utilize this insight by controlling directly for a flexible function of the probability of winning in a linear regression framework.

Specifically, our estimating equation for analyzing the value of the first pick is

$$Y_i = \alpha + \beta First_i + \gamma_1 P_i + \gamma_2 P_i^2 + \epsilon_i \tag{1}$$

where Y_i is an outcome of interest for lottery team *i* (for example, attendance or win percentage in a subsequent year), $First_i$ is an indicator variable for receiving the first pick, and P_i is the probability that team *i* is assigned the first pick. Our coefficient of interest is β, which captures the causal effect of winning the first pick. We estimate equation (1) using data on participants in the 25 NBA draft lotteries held from 1985 to 2009, excluding teams that traded their picks prior to the lottery drawing (see Appendix 2 for a list of data sources). Outcomes are taken from the 1986 to 2010 NBA seasons. Following Florke and Ecker [4], P_i is calculated using standard rules of probability along with a historical database of NBA lottery rules. We use heteroskedasticity-robust standard errors and cluster them at the franchise level due to the potential for correlation in ϵ_i within a franchise over time.

Before discussing our results, we perform a simple balance check to verify that controlling for P_i eliminates observable differences between lottery winners and losers. Table 2 displays the relationship between pre-lottery team characteristics and receipt of the first pick. Column (1) shows coefficients from regressions of a variety of team attributes on a dummy for winning the lottery. While assignment of the first pick is not significantly related to previous attendance, points per game, or all-star appearances, it is strongly negatively correlated with the previous season's win percentage and scoring differential. Teams that win the first pick have average win percentages 6 points lower than other lottery teams, and score 1.7 fewer points per game relative to their opponents. This means that regressions using a simple dummy variable for winning the lottery will give biased estimates; lottery winners are systematically different than lottery losers, due to the weighting in the lottery odds.

Column (2) of Table 2 illustrates that controlling for the probability of winning the lottery successfully adjusts for these differences between winners and losers. The reported coefficients are estimates of β from equation (1) using each pre-lottery characteristic as the dependent variable. Notably, the coefficients on the first pick dummy in the equations for win percentage and scoring differential are no longer statistically significant, and the estimates are close to zero. The first pick coefficients in the regressions for other team characteristics remain insignificant. Holding the probability of winning the lottery constant is sufficient to erase differences between lottery winners and losers. Our empirical strategy will therefore eliminate team quality biases and provide plausible estimates of the causal effect of winning the lottery.

We now turn to our causal estimates. Table 3 reports OLS estimates of β from equation (1) using the natural log of attendance and win percentage as dependent variables. Column (1) shows results for attendance for years 1 through 5 after the lottery, as well as total log attendance over these years. The estimates show attendance gains close to 6 percent in most years following a lottery win, and these results are significant at the 10-percent level or lower in years 2 through 5. Column (3) adds controls for the characteristics in Table 2, as well as year dummies; adding these controls increases the precision of the estimates without substantially affecting their magnitude. This specification suggests that winning the first pick causes attendance gains of 5 to 6 percent in years 1 through 5 as well as in total over the five years after the lottery. The maximum effect, a 6 to 7 percent increase, occurs in the 4th year. With baseline team characteristics included, all of the results are statistically significant at the 5 percent level. Winning the draft lottery appears to substantially increase attendance in the short term.

Columns (3) and (4) of Table 3 repeat the analysis with team win percentage as the dependent variable. The results show that winning the draft lottery weakly increases subsequent win percentage, with the gain peaking at 8 to 9 percent in the 4th year after the lottery. The 4th-year estimates are highly statistically significant. Though the estimates for some years are imprecise, all of them are positive. These results are consistent with the hypothesis that winning the lottery leads to small increases in win percentage over the next few years. Estimates beyond year five (not reported) are not reliable since the sample size shrinks significantly as teams are followed for additional years.

3 Do NBA Teams Tank?

The results in Table 3 show that winning a high draft pick yields economic and competitive benefits. Do teams tank to increase their chances of receiving these benefits? To answer this question, we analyze the relationship between game outcomes and the incentive to tank for teams eliminated from the playoffs from 1968 to 2009. The estimating equation in this context is

$$W_{isg} = \kappa_{is} + \lambda_g + \theta Change_{isg} + \eta_{isg} \quad (2)$$

where W_{isg} is a dummy variable that is one if non-playoff team *i* wins game *g* in season *s*, λ_g is a set of fixed effects for the number of games remaining in the season, and κ_{is} is a full set of team-by-season fixed effects. The key right-hand side variable, $Change_{isg}$, is a dummy variable that is one if team *i* could potentially change its lottery odds between game g and the end of the season. In other words, team *i* is not locked in to its final rank; it could potentially pass or be passed by another team. Thus, in games where $Change_{isg}$ is one, team *i* has an incentive to tank for draft position. The game fixed effects control for changes in eliminated teams' performance over the course of a season that aren't due to tanking (it's likely that all playoff eliminated teams put in less effort as the season winds down, regardless of their tanking incentive). The team-season effects control for team quality in a particular season for a given team. The coefficient of interest, θ, captures the effect of having an incentive to tank on team performance. With team-by-season fixed effects included, θ measures differences in win percentage across games where the incentive to tank differs for a given playoff-eliminated team. We restrict the analysis to home teams to avoid double-counting games. Standard errors for equation (2) are clustered at the team-season level.

Our results demonstrate that teams respond strongly to tanking incentives. Table 4 reports estimates of θ from equation (2) for three time periods. Column (1) uses all regular season games in which the home team is already eliminated from the playoffs. The estimate of θ for the full sample shows that the tanking incentive reduces the probability of winning by a statistically significant 14 percentage points. This effect is substantial; the average win probability for playoff-eliminated teams in our sample is only 0.41. Column (2) restricts the sample to games in which the road team has not been eliminated from the playoffs. In these games, we expect the difference in team tanking incentives to be largest: the home team has already been eliminated from playoff contention and may be able to improve its draft position by losing, while the road team may still make the playoffs if it wins. Indeed, the estimate in the first row of column (2) is an even larger negative 16 percentage points, though it is slightly less precise than the estimate for the full sample due to the reduction in sample size.

The bottom rows of Table 4 repeat the analysis for two additional time periods. Prior to 1984, there was no draft lottery; teams simply picked in reverse order of their final ranking in the previous season. In theory this system should have produced a very large incentive to tank, as teams that moved down in the rankings could improve their draft positions for certain. We omit the period from 1985 to 1989, as all non-playoff teams shared the same lottery odds in these years, so playoff-eliminated teams had no incentive to tank. After 1989, a weighted lottery system was introduced that placed more weight on weaker teams. Interestingly, while all of the estimates are negative, the estimates are larger in magnitude after 1989 despite the weaker incentive to tank. One potential explanation for this result is that players, coaches, and executives have gained an increased understanding of the lottery process and the benefits of tanking over time.

4 Conclusions

High picks in the NBA draft are perceived to benefit teams both competitively and financially. As a result, lottery-eligible teams have an incentive to tank at the end of the season in order to improve their chances of getting a high pick. This paper provides two new pieces of evidence on tanking in the NBA. First, holding the probability of winning the lottery constant to eliminate selection bias, we show that landing the first pick in the draft lottery significantly increases attendance by 5 to 6 percent over each of the subsequent five years. Winning the lottery also increases win percentage in the short run, with the impact peaking at 8 to 9 percent in the 4th year following the lottery. Second, we have uncovered new evidence that commentators and fans are right to blame teams for tanking: teams take the rational response and tank hard to improve their odds of receiving these benefits. After being eliminated from the playoffs, teams are much less likely to win if their final rank in the standings is in doubt. Specifically, the incentive to tank reduces the probability of winning a game by a statistically significant 14 percentage points.

References

[1] W. J. Simmons, "Tanks for Nothing, NBA," ESPN The Magazine, April 2007.
[2] J. Price, B.P. Soebbing, D. Berri, and B.R. Humphreys, "Tournament Incentives, League Policy, and NBA Team Performance Revisited, " Journal of Sports Economics, vol. 11, no. 2, pp. 117-135, 2010.
[3] P. R. Rosenbaum and D.B. Rubin, "The Central Role of the Propensity Score in Observational Studies of Causal Effects," Biometrika, vol. 70, pp. 41-55, 1983.
[4] C. R. Florke and M.D. Ecker, "NBA Draft Lottery Probabilities," American Journal of Undergraduate Research, vol. 2, no. 3, pp. 19-29, 2003.

Appendix 1: Tables

Table 1: First Picks in the NBA Draft, 1985-2010

Lottery year	First Pick	Selecting team	Tenure with selecting team	All-star appearances	NBA championships
(1)	(2)	(3)	(4)	(5)	(6)
1985	Patrick Ewing	New York Knicks	15	11	0
1986	Brad Daugherty	Cleveland Cavaliers	8	5	0
1987	David Robinson	San Antonio Spurs	16	10	2
1988	Danny Manning	Los Angeles Clippers	5	2	0
1989	Pervis Ellison	Sacramento Kings	1	0	0
1990	Derrick Coleman	New Jersey Nets	5	1	0
1991	Larry Johnson	Charlotte Hornets	5	2	0
1992	Shaquille O'Neal	Orlando Magic	4	15	4
1993	Chris Webber	Orlando Magic	0	5	0
1994	Glenn Robinson	Milwaukee Bucks	8	2	1
1995	Joe Smith	Golden State Warriors	2	0	0
1996	Allen Iverson	Philadelphia 76ers	10	11	0
1997	Tim Duncan	San Antonio Spurs	14	13	4
1998	Michael Olowokandi	Los Angeles Clippers	5	0	0
1999	Elton Brand	Chicago Bulls	2	2	0
2000	Kenyon Martin	New Jersey Nets	4	1	0
2001	Kwame Brown	Washington Wizards	4	0	0
2002	Yao Ming	Houston Rockets	8	8	0
2003	LeBron James	Cleveland Cavaliers	7	7	0
2004	Dwight Howard	Orlando Magic	7	5	0
2005	Andrew Bogut	Milwaukee Bucks	6	0	0
2006	Andrea Bargnani	Toronto Raptors	5	0	0
2007	Greg Oden	Portland Trailblazers	4	0	0
2008	Derrick Rose	Chicago Bulls	3	2	0
2009	Blake Griffin	Los Angeles Clippers	2	1	0
2010	John Wall	Washington Wizards	1	0	0

Notes: This table lists players selected with the first pick in the NBA draft from 1985-2010. Columns (4)-(6) list initial tenure with the selecting team, all-star appearances, and NBA championships won through the 2010-2011 NBA season.

Table 2: Covariate Balance for First Overall Pick

	No controls	Controls for probability of winning lottery
	(1)	(2)
Log attendance	-0.048	0.007
	(0.049)	(0.039)
Win percentage	-0.060***	-0.006
	(0.015)	(0.009)
Scoring differential	-1.660***	-0.115
	(0.567)	(0.378)
Points per game	-0.687	-0.769
	(0.883)	(0.939)
Number of all-stars	0.033	0.122
	(0.111)	(0.111)
p-value from F-test	0.001	0.599
Sample size (N)	234	234

Notes: This table shows coefficients from regressions of the pre-lottery variable in each row on a dummy for winning the draft lottery. Column (2) controls for a quadratic in the probability of winning the lottery. Heteroskedasticity-robust standard errors, clustered at the franchise level, are in parentheses. F-tests are for the hypothesis that receiving the first pick is unrelated to any of the displayed characteristics.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Effects of Winning the Draft Lottery on Attendance and Win Percentage

		Dep. var: Log attendance		Dep. var: Win percentage	
		Probability of winning lottery	Probability and covariates	Probability of winning lottery	Probability and covariates
Time period		(1)	(2)	(3)	(4)
After 1 year		0.058	0.057**	0.026	0.029
		(0.038)	(0.027)	(0.028)	(0.027)
	N	234	234	234	234
After 2 years		0.059*	0.062**	0.023	0.023
		(0.032)	(0.025)	(0.034)	(0.036)
	N	221	221	221	221
After 3 years		0.048*	0.060**	0.032	0.034
		(0.028)	(0.027)	(0.039)	(0.039)
	N	207	207	207	207
After 4 years		0.060**	0.073**	0.080**	0.091***
		(0.027)	(0.029)	(0.032)	(0.032)
	N	195	195	195	195
After 5 years		0.057*	0.066**	0.042	0.048*
		(0.032)	(0.032)	(0.032)	(0.026)
	N	182	182	182	182
Total, next 5 years		0.047*	0.057**	0.040	0.042
		(0.025)	(0.023)	(0.029)	(0.027)
	N	182	182	182	182

Notes: This table shows regressions of subsequent log attendance and win percentage on a dummy for winning the NBA draft lottery. Columns (1) and (3) control for a quadratic in the probability of winning the lottery, and columns (2) and (4) add the team characteristics from Table 1 as well as year dummies. Heteroskedasticity-robust standard errors, clustered at the franchise level, are in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Tanking Among Playoff-Eliminated NBA Teams

	Dep. var: Home team won	
	Games with home team eliminated	Games with home team eliminated, road team not eliminated
Time period	(1)	(2)
All	-0.140**	-0.157*
	(0.062)	(0.081)
N	1783	1320
Before 1985	-0.059	-0.117
	(0.097)	(0.132)
N	591	426
After 1989	-0.185**	-0.190*
	(0.083)	(0.107)
N	1062	789

Notes: This table reports coefficients from regressing a dummy for the home team winning on a dummy equal to one if the home team can feasibly change position in the draft or odds in the lottery (up or down) before the end of the season. The sample is restricted to games where the home team has been eliminated from playoff contention. Column (1) shows results for all games with a playoff-eliminated home team over the stated period; column (2) restricts the sample to games where the visiting team has not been eliminated. All regressions include dummies for games remaining in the season and home team-by-season fixed effects. Standard errors are clustered at the team-season level.

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix 2: Data Sources

Data on team records and characteristics is available at:
http://basketballreference.com/stats_download.htm

Attendance information is available at:
http://www.apbr.org/attendance.html
http://espn.go.com/nba/attendance

NBA lottery rules are available at:
http://www.nba.com/history/lottery_probabilities.html