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Are Sunk Costs Irrelevant?

Evidence from Playing Time in the National Basketball Association

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I. Introduction

"Sunk costs are irrelevant," is one of the most commonly recited mantras of any price theory class. Still, no matter what diagrams we draw or calculus we show, our students seldom believe this claim – and for good reason. Political and corporate leaders alike make frequent appeals to sunk costs as a justification for future policies. Economic experiments (e.g., Khan, Salter, and Sharp, 2000) have also found a "commitment effect." The greater the initial expenditure on a project, the more that subjects were willing to spend to see the project through to completion. The relevance – the central importance – of fixed costs is thus one of the key elements of behavioral economics, dating back to seminal work by Thaler (1980) and Tversky and Kahneman.

Most of the evidence regarding the (ir-)relevance of sunk costs stems from anecdotes or from artificial experiments. We provide a real-world test of the commitment effect by estimating the impact of draft position on playing time in the NBA. Regardless of whether a team maximizes wins or profits, it will generally try to give the greatest playing time to its most productive players. (For an interesting take on why a rational team might not want to play its best players, see Taylor and Trogdon, 2002.) However, one constantly hears sports commentators explain that a team is committed to a given player because it had used such a high draft choice, spent so much money, or traded so many players to obtain him, a classic application of the commitment effect.

If teams feel such commitment, then they should give first-round draft picks more playing time than they give to players selected in later rounds or signed as undrafted free agents even after one accounts for the players' performance. The abundance of data on performance and playing time in the National Basketball Association allows us to perform just such a test.

Our study builds on two earlier studies of playing time in the NBA by Staw and Hoang (1995) and Camerer and Weber (1999). In addition to using a better data set, we use a more appropriate technique – regression discontinuity – to test for the impact of draft position on playing time. We also acknowledge possible impact of race on playing time by testing for whether teams feel less committed to African American players than to other players.[1]

The next section of this paper briefly reviews the literature on sunk costs, with particular attention to the work by Staw and Hoang (1995) and Camerer and Weber (1999). The third section explains the relevance of regression discontinuity, presents the empirical model and describes the data. The fourth section discusses the results, and the fifth section concludes.

II. The Behavioral Economics of Sunk Costs

The importance of sunk costs has been a major point of conflict between economics and psychology. Standard neoclassical theory claims that, because sunk costs affect neither marginal benefit nor marginal cost, agents have no reason to take these costs into account when making a decision. However, Thaler (1980) and Tversky and Kahneman (1981) cite studies from psychology dating back to the 1950s that show that subjects take previous expenditures of money or effort into account when making current decisions.

A recent paper by McAfee, Mialon, and Mialon (2010) tries to place the apparently irrational attachment to fixed costs in a neoclassical setting. They claim that people account for fixed costs for three economically rational reasons. First, fixed costs might provide

[1] See Kahn and Scherer (1988), Hamilton (1997), and Bodvarsson and Brastow (1999) for discussions of the impact of race on salary in the NBA. Kanazawa and Funk (2001) provide an interesting treatment of race and playing time in the NBA.

information. If a project has unknown returns, high start-up costs might be a signal that future expenditures could bring a high future income.

In addition, sunk costs could have reputational effects. McAfee et al. cite two such effects. First, disparate agents sometimes make investments, the value of which investment depend on the overall level of investment. In such a case, an individual who pre-commits to finishing what he starts might encourage others to invest as well, thereby generating an efficient overall level of investment. Second, sunk costs might have political effects, as public or private decision makers might want to conceal poor decisions by continuing to invest in projects on which they have already spent large sums.

Finally, McAfee et al. note that large sunk costs might lead to state dependence. As sunk costs grow, the resources at the decision maker's disposal fall. With fewer resources available, the agent could find himself committed to an action that he would have abandoned if he had more resources at his disposal.

Given the controversy over sunk costs and its centrality to the neoclassical-behavioral economics debate, there is very little rigorous empirical analysis of the role played by sunk costs. One of the few such tests comes from Staw and Hoang (1995). They used data for players drafted in the first two rounds of the NBA draft for 1980-1986.[2] They then ran four sets of regressions, corresponding to players with two, three, four, and five years of experience. They regressed playing time per game on performance variables, a set of control variables, and the player's draft position.

Because they felt that the performance variables might be collinear, Staw and Hoang used factor analysis to create three indices for performance: scoring, toughness, and quickness. They

[2] At that point, the draft lasted seven rounds. In 1988, the draft was reduced to three rounds, and in 1989 it fell to the present two rounds.

also include a dummy variable indicating whether the player was a guard and a dummy variable for indicating whether the player was injured. Because they felt that teams would be less committed to players whom they had not drafted, they included a dummy variable that denoted players who had been traded. Draft position is given by the order of the player in the draft. Thus, the first player selected takes a value of one, the second player takes a value of two, and so on.

Staw and Hong find that draft position has a negative and significant impact on playing time. Hence, a player with a smaller draft number (a more valuable draft position) has more playing time. Moreover, they find that the impact of draft position on playing time falls in successive regressions, corresponding to greater playing time from almost 23 minutes to almost 14 minutes. Given that a game lasts only 48 minutes, this says that draft position has a huge impact. All else equal, moving up two positions in the draft increases playing time from zero to almost an entire game. Because Staw and Hoang do not provide standard errors or t-statistics, we cannot tell whether the coefficients are significantly different from one another.

Staw and Hoang provide and reject three rational motives for their findings. They propose that a team might be stuck with high draft choices due to the rigidities imposed the NBA's salary cap. They reject this proposal because they claim that teams can always waive (i.e., release) unproductive players. They also note that teams might be reluctant to trade high draft choices who are popular among fans. They dismiss this possibility because they claim that fans are notoriously fickle. Finally, they note that teams could gain information from a player's draft position. Subsequent regressions, however, indicated that draft position was a poor predictor of later performance, so Staw and Hoang reject this possibility as well.

Camerer and Weber (1999) build on Staw and Hoang in several ways. Most importantly, in addition to accounting for the specific draft number, they test for greater commitment to first-round picks by including a dummy variable for whether a player was a first-round choice. They also unbundle the performance measures that Staw and Hoang combined into three indices, use the cost of player cards as a proxy for player popularity, and – in the final set of regressions – replace these observed measures of performance with predicted measures. These predictions are based on regressions of future performance on previous performance and a player's draft position.

Camerer and Weber use data from the 1986-1991 drafts, which encompass a varying number of rounds. Their results are sensitive to the variables that they include. In general, they find that the impact of draft position is similar to that found by Staw and Hoang for the first three years of a player's career, with an improvement of one in draft position increasing playing time by over 20 minutes. The impact in years four and five is less in all specifications, in some cases significantly so. In the specification that uses predicted performance, draft position does not have a statistically significant impact in years four and five after increasing playing time by almost 30 minutes in year three. In all cases, the dummy indicating a first-round selection is negative, showing that first-round choices receive less playing time (holding the precise draft position constant).

III. Empirical Model and Data

This model builds on the models of Staw and Hoang (1995) and Camerer and Weber (1999) in several ways. Most importantly, it provides a new application of the regression discontinuity technique. Regression discontinuity (RD) recognizes that small changes in an explanatory can have an unusually large impact when that explanatory variable crosses a threshold value. (See Angrist and Pischke, 2008, for a detailed discussion of RD.) Because of the winner-take-all nature of elections, RD studies have largely focused on politics (Lee, 2008) and union recognition (DiNardo and Lee, 2004).

We use RD to analyze the NBA draft to capture two different forms of potential commitment. First, since the 1995 collective bargaining agreement, a team experiences a much greater financial commitment to the 30th player selected – the last player chosen in the first round – than it does to the 31st player selected – the first player chosen in the second round. First round draft picks now receive a three-year guaranteed contract with payment according to a fixed salary scale. Second-round draft picks receive no such guarantee. The greater financial obligation to the first 30 picks could lead teams to give more playing time to one of these players than the player deserves to justify the greater expense.

A second source of a commitment effect could come with one of the first 14 picks in the draft, who constitute the so-called "lottery picks." The NBA established the lottery in 1985 to prevent teams from intentionally losing games late in the season so as to secure the best position in the subsequent amateur draft. Rather than proceeding in reverse order of finish, the first fourteen picks of the first round are determined by a random process that gives the team with the worst record a 25 percent chance of receiving the top pick of the draft, and the 14th worst team a 0.5 percent chance of receiving the top pick. Only the first three picks are determined by lottery.

The financial commitment to a lottery pick is greater than to a non-lottery pick, as the player is located higher on the NBA's rookie salary scale. However, the difference between a lottery-pick and non-lottery pick's pay is marginal and not a difference in kind, as is the case for first-round draft picks and other rookies. If there is a difference between lottery picks and other first round choices, it would be a psychic commitment rather than a financial commitment. Lottery picks receive much more publicity, and fans are likely to place much greater expectations on them than on other choices.

At first glance, Camerer and Weber (1999) appear to use a RD framework by including both draft position and a dummy variable for the round in which a player is selected. In their model, however, draft position enters only linearly, and one of the key insights of RD is that non-linearities in the impact of continuous variable could mistakenly be attributed to the indicator variable. (Angrist and Pischke, 2008, p. 253-54) The appropriate empirical framework for RD estimation of draft and playing time is thus:

$$T_{it} = \beta_0 + \beta_1 d_i + \beta_2 d_i^2 + \cdots + \beta_k d_i^k + \gamma' Z_{it} + \delta_1 D_{1i} + \delta_L D_{Li} + \varepsilon_{it} \qquad (1)$$

Where T_{it} is the playing time of player *i* in season *t*, d_i is player *i's* draft position, Z_{it} is a vector of control variables, and D_{ji} are dummy variables indicating whether a player was selected in the first round (*j=1; d_i<31*) or in the draft lottery (*j=L; d_i,15*). $$

The most important set of control variables pertains to measures of a player's productivity. Eventually, we will use several measures of performance. In this draft, we use only the player's contribution to his team's wins, as described in Berri et al. (2006). Because a player with more playing time will contribute more to wins than an identical player with less playing time, we normalize this measure of performance to the player's contribution to wins per 48 minutes. Since players at some positions might systematically accumulate more playing time than others, we include dummy variables indicating a player's primary position.

To capture the continuous impact of draft order, we include the player's draft position, ranging from 1 to 60. To capture the possible discontinuity, we included two dummy variables. The first captures the round in which a player was selected. The second indicates whether the player was a lottery selection.

Many players in our sample recorded no minutes and no contributions to wins because they were no longer on an NBA roster. To account for possible selection bias, we ran both a pooled OLS regression and a regression that included a Heckman correction for selection bias.

Our data set includes all players who were drafted by NBA teams between 1995 and 2005. It contains performance data for the first five years of the players' careers. Players who were not on an NBA roster during the relevant time period (because they make a team's roster or because they refused to sign an NBA contract and, for example, played in Europe instead) had their performance data coded as zero. Performance data come from the basketball-reference.com website (http://www.basketball-reference.com).

The data show clear differences between players who were drafted in the first and second rounds and between lottery picks and other first-round picks. Table I shows that our sample includes 679 second-round picks, 1385 first-round picks, and 721 lottery picks who played positive minutes for an NBA team during the sample period. First-round picks played over 650 more minutes than second-round picks over the course of a season, while lottery picks played over 300 more minutes than the average first-round pick. However, the differences in playing time might be due to the players' performances. Table II shows that First-round picks contributed almost ten times the number of wins per 48 minutes on average than did second-round picks but only three-fourths the number of wins that lottery picks contributed. All differences are statistically significant at the one-percent level.

IV. Results

Results of the regressions appear in Table III. (Table IV contains the results of the supporting probit equation but is not discussed here.) Both the OLS regression and the corrected regression are strongly significant and return largely similar results.

Both regressions showed that minutes differed systematically for certain positions. Using point guards as the default, we found that power forwards and centers logged fewer minutes, while small forwards were statistically indistinguishable from point guards. The only difference came for shooting guards, who were indistinguishable in the OLS equation but played fewer minutes in the corrected equation.

As expected, performance had a large impact on playing time. A player who contributed one additional win per 48 minutes would receive over 1950 more minutes in the OLS specification and almost 1700 more minutes in the Heckman specification. While this difference is not large, it is statistically significant.

Regressions not shown here revealed that the appropriate power of the continuous measure of draft position differed across the two specification. Hence, we use a third-order series for the OLS and a fifth-order series for the Heckman correction. The alternating signs were as expected.

Finally the indicator variables told roughly the same story in both regressions. The dummy variable indicating whether a player was a first-round draft pick was statistically insignificant in both specifications. The dummy variable indicating whether a player was a lottery pick was also statistically insignificant, though the coefficient was close to significant in the OLS equation. The insignificant results indicate that teams do not feel a greater commitment to either first-round picks or lottery picks because of the greater financial and emotional investment in them.

It is possible that teams do not feel the same commitment to a high draft choice if the player was not selected by them. To account for this differential commitment, we included a dummy variable that indicated whether the player was with a different team than the one that drafted him. The coefficient for this variable was statistically insignificant at any reasonable level, so regressions including this variable are not shown here.

V. Conclusion and Further Research

We find no evidence of a commitment effect by NBA teams. Instead, our results suggest strongly that teams allocate playing time largely according to a player's performance. Hence, our study supports the conclusion by neo-classical economists that sunk costs do not matter.

Our results differ from both Staw and Hoang (1995) and the Camerer and Weber (1999). This could be for several reasons. The first could be our modeling of performance, a factor that we shall examine in future specifications. While we believe our measure of performance to be superior to those used by the previous studies, we shall use a variety of performance measures as a robustness check.

Another source of difference could be the fact that the previous studies stratify their regressions by years of experience. Again, we shall account for the possibility that the impact of draft position changes over time in future studies. In addition, we will include a factor not considered by previous papers - the impact of race – in future versions of the paper. If, as some previous papers suggest, race plays a role in the allocation of playing time, it is possible that it also affects the degree of commitment a team feels to a first-round or a lottery pick. We hope that, by including these added checks, we can come to a clearer understanding of the role of sunk costs in decision making in the NBA and elsewhere.

One final addition by this paper is our accounting for the impact of race. If there is racial discrimination in the NBA, then it is possible that teams feel less committed to Black players than to white players. If this is the case, then the impact of being a first-round draft choice would be less for Black players than it is for white players.

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Table I: Number of Non-zero Observations	
Draft status	Number of Players
Second Round	679
First Round	1385
Lottery Pick	721

Table II: Mean Minutes played and Wins Generated by Draft Status	
Variable	*Mean*
Minutes played by all drafted players	1326.337
Minutes played by 2^{nd} round picks	885.648
Minutes played by 1^{st} round picks	1541.905
Minutes played by lottery picks	1847.981
Wins generated per 48 minutes overall	0.039
Wins generated per 48 minutes by 2^{nd} round picks	0.005
Wins generated per 48 minutes by 1^{st} round picks	0.056
Wins generated per 48 minutes by lottery picks	0.074

Table III: Determinants of Playing Time in the NBA		
Variable	OLS	Heckman Correction
Shooting Guard	3.194 (0.07)	-231.477*** (4.74)
Power Forward	-219.116*** (4.78)	-451.088*** (9.34)
Center	-341.458*** (7.68)	-582.957*** (12.42)
Wins Generated per 48 Minutes	1945.732*** (19.07)	1678.100*** (16.86)
Draft Position	-117.619*** (9.56)	-172.955*** (4.12)
Draft Position Squared	3.030*** (5.63)	10.821** (2.16)
Draft Position Cubed	-0.027*** (4.24)	-0.389* (1.73)
Draft Position to the Fourth Power	N/A	0.007* (1.65)
Draft Position to the Fifth Power	N/A	$-4.75(10)^{-5*}$ (1.66)
First Round Pick	27.215 (0.29)	-28.284 (0.28)
Lottery Pick	-121.214 (1.53)	-13.235 (0.13)
Constant	2588.087*** (16.12)	2809.008*** (16.16)
Heckman λ	N/A	-509.221 (16.79)
Adjusted R^2	0.3752	N/A
Wald χ^2	N/A	1093.45
Number of Observations	2064	2987