The Value of College

Drafted High School Baseball Players

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This article investigates the decision of high school athletes to pursue college educations or play professional sports immediately after high school. Using salary, draft, and playing data for Major League Baseball, along with minor league playing data, the authors estimate the lifetime earnings of drafted high school baseball players. The results show that players drafted in higher rounds with more ability should enter professional baseball, but players drafted in lower rounds have higher expected earnings if they attend college. The authors also find that in 2003, players' decisions were highly correlated with the difference in expected lifetime earnings.

Keywords: *Major League Baseball; education*

In 1965, Major League Baseball (MLB) started the amateur draft. Currently, the draft works by having teams select college juniors and seniors, junior college players, high school players, and others who are nearly 21 but not playing professional baseball (Rausch, 2002). Teams select players in the reverse order of the previous year's standings, with the first pick alternating between the American League and the National League. The purpose of this study is to analyze the decisions of drafted high school athletes whether to enter college or immediately pursue professional baseball careers.

Over time, there have been several changes in the structure of the draft, which was renamed the First Year Player Draft in 1998. MLB had June and January phases for the draft as well as a separate draft for American Legion players late in the summer. The American Legion draft was dropped after 1966, and the January phase of the draft was dropped in 1987. The June and January phases of the draft used to

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each have a secondary phase to redraft previously drafted but unsigned players. This secondary phase of the draft was eliminated in 1987. That same year, teams were awarded compensation picks for not being able to sign first-round draft picks and for losing players to free agency. Compensation depends primarily on the quality of the player lost (Madden, 2001). Originally, there was no limit to the number of rounds in a draft. The draft would continue until each team passed on selecting. However, in 1998, the draft was limited to 50 rounds (Rausch, 2002).

When a player is drafted, the drafting team has exclusive negotiating rights with the player. If the player does not sign a contract with the team that drafts him, he cannot sign with any other MLB team until he is redrafted or until he makes it through an entire draft without being chosen. Players who are eligible for the draft but do not get selected become free agents and can sign with any team.

High school players who are drafted must decide between entering college and entering the minor leagues. If they play baseball professionally right after high school, they lose eligibility to play college baseball. However, many players feel that their best chance to play major league baseball is to enter the professional ranks right after high school. Also, extremely attractive signing bonuses lure athletes to turn professional as early as possible. For example, in 2003, the Tampa Bay Devil Rays gave Delmon Young a $3.7 million signing bonus. Although many people argue that these athletes should go to college in case they do not have successful athletic careers, the risk for injury in college may give players an incentive to play professional baseball sooner. Players who do not play professional baseball right out of high school have the chance to get college educations and increase their expected nonbaseball earnings. They also have a chance to be redrafted if they play well in college. Therefore, going to college does not rule out the possibility of a major league baseball career.

The objective of this article is to analyze the decision high school baseball players who are drafted to play professional baseball face. This question is whether to play professional baseball or to attend college. A player is forced to make this decision without knowing what his future earnings will be. However, a player should have some expectation of future earnings on the basis of his draft status and how much education he plans on receiving. This article shows how a player can maximize his expected lifetime earnings solely on the basis of information known at the time of the decision.

PREVIOUS WORK

One issue that must be dealt with when using earnings estimates is a selection problem (Willis & Rosen, 1979). High school players who enter professional baseball, on average, have more baseball ability than players who choose to enter college. One aspect that makes this analysis interesting is that we can control for baseball ability by using a player's draft round. Although draft round is not a perfect representation of baseball ability, it does act as a good proxy for that ability.

However, there is still an academic ability bias. Our results could be biased, because players with lower nonbaseball natural ability have a larger incentive to play professional baseball.

There is an extensive economics literature on the returns to schooling. To estimate an individual's nonbaseball yearly earnings, schooling and work experience need to be taken into account. For estimates of returns to schooling, we use the results of previous literature that uses Mincer's (1974) model. Mincer estimates returns to education and the effects of work experience. For estimates, we rely on the results of Krueger and Lindahl (2001), Heckman and Klenow (1997), Card (1999), and several other researchers. Kreuger and Lindahl note that estimates on the effect of the log of earnings range from 0.05 to 0.15 for each year of school. Heckman and Klenow state, "Across individuals within a country, each additional year of schooling is associated with roughly 10% higher wages" (p. 4). These estimates are consistent with the results of Card and most of the other literature on the returns to education. On the basis of these results, this article uses an estimate of 0.10. This implies that an additional year of schooling increases an individual's nonbaseball earnings by 10%.

To get estimates for the returns to work experience, we also rely on empirical results from the education literature that estimate the log of earnings. Most researchers estimate both linear and quadratic terms for work experience. Mincer's (1974) model defines work experience as the number of years an individual has worked since completing school. Light (2001) estimates that the linear estimate is between 0.06 and 0.90, whereas Molitor and Leigh (2005) estimate it to be close to 0.06. Light estimates that the square of returns to work experience is between –0.002 and –0.003. In this article, we use a linear estimate of 0.06 and a square estimate of –0.0025.

Spurr (2000) studies the demand side of the baseball draft and tests for any inefficiencies. Many argue that even today, there are many inefficiencies in the baseball draft because certain types of players are drafted too high or too low. Using an early data set, Spurr finds that teams are not statistically different in finding baseball talent. However, teams have moved away from drafting mostly high school players to drafting many collegiate players (see Figure 1). This may be due to collegiate athletes proving their baseball ability against better talent.

Many economists have estimated baseball salaries (Scully, 1974). To explain baseball salaries, economists have analyzed the minor leagues as training costs (Krautmann, Gustafson, & Hadley, 2000). Other factors include revenue sharing (Fort & Quirk, 1996) and ethnicity (Cymrot, 1985). However, to our knowledge, no one has used these salary and return to education estimates to analyze the decision a drafted high school player should make.

MODEL

To analyze the decision a drafted high school player faces, we consider the expected discounted present value of lifetime earnings (Freeman, 1975). The

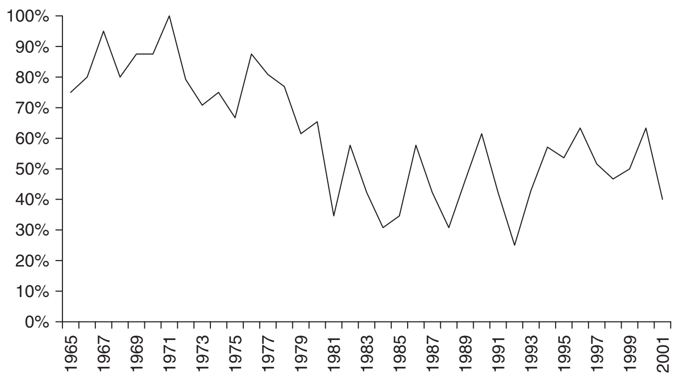

Figure 1: Percentage of First-Round Draft Picks Who Are in High School

expected discounted present value of lifetime earnings of a drafted player who enters professional baseball immediately after high school is given by

$$EXPECTED\ EARNINGS = BNS + \int_0^{t_1} MLSL\ e^{-rt}dt + \int_{t_1}^{t_2} MLBSL\ e^{-rt}dt + \int_{t_2}^{t_3} NBSL\ e^{\beta_{W1}(t-t_2)+\beta_{W2}(t-t_2)^2-rt}dt, \quad (1)$$

where *BNS* is the signing bonus the player receives for signing a contract with a major league team, t_1 is the end of his minor league career, *MLSL* is his minor league salary, r is the discount rate (which we assume to be 5%), t_2 is the end of his major league career (and the start of his nonbaseball career), *MLBSL* is his major league baseball salary, t_3 is the end of his nonbaseball career, *NBSL* is his nonbaseball starting salary without a college education, and β_{W1} and β_{W2} represent the linear and quadratic returns to work experience described earlier (0.06 and –0.0025 respectively). If a player never makes it to the major leagues, $t_1 = t_2$, denoting no time spent in the major leagues.

We consider the alternative to playing professional baseball to be going to college. In this scenario, a player may still play professional baseball by being redrafted in a future year (thus, the future signing bonus must be discounted). If the player goes to college, the lifetime expected earnings would be given by

$$EXPECTED\ EARNINGS = BNS\ e^{-rt_c} + \int_0^{t_1} MLSL\ e^{-rt}dt + \int_{t_1}^{t_2} MLBSL\ e^{-rt}dt + \int_{t_2}^{t_3} NBSL\ e^{\beta_C t_C+\beta_{W1}(t-t_2)+\beta_{W2}(t-t_2)^2-rt}dt, \quad (2)$$

where t_C is the time he spent at college, β_C represents the yearly increase in wages from a college education described earlier (assumed to be 0.10), and all other variables are the same as in equation 1. Assuming that the athlete is risk neutral, if the expected earnings are higher if he plays professional baseball right out of high school, he should play professional baseball. Alternatively, if the expected earnings are higher if he goes to college, he should go to college. We make the assumption that if the player plays professionally right away, he will not enter college after his baseball career is over.[1]

DATA

To get the data on the expected length of a career, we examine players who were drafted by MLB in the regular phase of the June draft between 1965 and 1980. This gives a sample of 7,800 high school baseball players. Although these data may seem dated, more recent data would not allow us to observe a player's entire career. In addition to the year and the phase in which a player was drafted, seven other variables are observed for each of the 7,800 observations. The first variable is the round in which a player was drafted. This variable is used as a control for the baseball ability of the player.[2] The second variable is the position of the player. Some players played more than one position, but the primary position of the player is used. The third and fourth variables are the number of years the player played in the minor leagues and the first year he played in the minor leagues, which was obtained from Old Time Data Company. It is interesting to note that the average minor league career length for players who went immediately into professional baseball was 4.38 years, and for players who did not immediately enter professional baseball, it is 1.70. The fifth variable is an indicator variable denoting if a player is from the South. This variable is included because of the differences in the labor market in the South. The sixth variable is the number of years the player played in the major leagues. The average major league career length for players who went immediately into professional baseball is 1.46 years, and for players who did not immediately enter professional baseball, it is 0.60. We make the assumption that expected career length for minor and major league players has not changed for current players. Nine hundred ninety-two of the players in the sample played major league baseball. The final variable is the team that drafted the player.

More recent information is used for financial data. Recent information is needed for the financial data because the article is looking at the decision that currently drafted players face (these players can expect different earnings from those of historical players). Data from 2003 are used for all financial data. The average 2003 major league baseball salary, excluding pensions, is used for an estimate of expected earnings in major league baseball. It is assumed that the player earns this average salary. Although this salary would depend on experience, as well as other variables, a value of $2.3 million (the average major league baseball salary

TABLE 1: Descriptive Statistics

Variable	M	SD	*Minimum*	*Maximum*
Years played in the major leagues	0.933	3.140	0	27
Years played in the minor leagues	2.737	3.191	0	22
Round drafted in	19.099	13.619	1	90
Catcher	0.105	0.307	0	1
Infielder	0.260	0.439	0	1
Outfielder	0.172	0.377	0	1
Year drafted	7.646	4.386	1	16
Before rule change	0.117	0.322	0	1
Played high school baseball in the South	0.254	0.435	0	1

in 2003) was used to calculate earnings from major league baseball.[3] Because real major league baseball salaries have dramatically increased over the past 40 years, the player's actual salary was not used.

To estimate nonbaseball earnings, this article uses information from the U.S. Census Bureau. The mean earnings for working 18- to 24-year-olds with terminal high school degrees were $17,411 in 2003. This is interpreted as the earnings that an "average" high school graduate would earn if he or she took a job right out of high school and is used for nonbaseball earnings (with no experience or college education). Table 1 presents descriptive statistics. Note that the variance in the number of years played in major league baseball is large.

EMPIRICAL SPECIFICATION

First, we estimate the signing bonus. Each observation is assigned a signing bonus variable equal to the average 2003 signing bonus for the round in which the player was drafted. Figure 2 shows the average signing bonuses for each round for both college draftees and high school draftees. Although the variance for signing bonuses is high in the first round, our estimation is for an average first-round draft pick. If the player signed with the major league team, the estimated signing bonus is equal to the average 2003 signing bonus of a high school player[4] in that round (the supplemental round was excluded). For example, if a player was drafted in the first round and signed right away, then for that observation, $BNS =$ $1,877,083, which is the average first-round signing bonus for a high school player. However, if the player did not sign right away, he could be redrafted and earn a signing bonus at some point in the future. We estimate the expected value of the future signing bonus of the subset of the sample who do not play baseball out of high school with a two-stage Heckman procedure. The two-stage Heckman procedure is used because many values of the dependent variable are zero if either players were not redrafted or the average signing bonus in 2003 for that round was zero. Therefore, the dependent variable is censored because negative signing bonuses are not possible. The first stage of the Heckman procedure estimates the probability of a noncensored dependent variable using a probit model. The probit model yields an inverse Mill's ratio. The second stage uses ordinary least squares with the inverse Mill's ratio as an explanatory variable. Both the probit model and second stage of the Heckman procedure have the following functional form:

$$\begin{aligned} BNS = \beta_0 + \beta_1 RND + \beta_2 RND^2 + \beta_3 CTCH + \beta_4 INF \\ + \beta_5 OUT + \beta_6 YR + \beta_7 RULE + \beta_8 STH + \varepsilon, \end{aligned} \quad (3)$$

where *BNS* represents an indicator variable equaling 1 if the player would receive a signing bonus in the future and in the second stage equaling the amount of the depreciated signing bonus the player would expect to receive later from being redrafted. The dependent variable was assigned a positive value only if the player was redrafted and signed with an MLB team. If the player was redrafted and signed with an MLB team, the value of the bonus is defined to be equal to the average 2003 depreciated signing bonus of a college player in that round. Otherwise, if the player was never redrafted or did not sign when he was redrafted, a value of 0 was assigned. All other variables are not restricted to 2003 data. *RND* represents the round in which a player was drafted out of high school. *CTCH*, *INF*, and *OUT* are position indicator variables representing if the player was a catcher, infielder, or outfielder (pitcher is omitted for dependency). *YR* is a time variable (1965 = 1, 1966 = 2, . . . , 1980 = 16) that should correct for any trends in the draft. These trends could be caused by factors such as the influx of foreign-born players who are not subject to the draft. There are many factors that may change the supply of talent in major league baseball. It is also possible that the increase in salaries have influenced playing career lengths, which may be partly captured by the trend variable.

RULE is an indicator variable representing 1965 and 1966. During this time, college freshman could be drafted. In 1967, MLB changed the rules of the draft, and MLB teams were no longer allowed to draft freshman or sophomores in college. *STH* is an indicator variable equaling 1 if the player is from the South. Results from these regressions are presented in Table 2.

Next, we estimate the expected length of the minor league career, or t_1 for the case of players who signed with their teams and $t_1 - t_C$ for players who went to college, using the following specification:

$$\begin{aligned} MLYRS = \beta_0 + \beta_1 RND + \beta_2 RND^2 + \beta_3 CTCH + \beta_4 INF \\ + \beta_5 OUT + \beta_6 YR + \beta_7 RULE + \beta_8 STH + \varepsilon. \end{aligned} \quad (4)$$

Two analyses were done, one with players who signed with their respective teams and one with players who did not sign with their teams. This specification is estimated using ordinary least squares for players who entered into professional baseball right after high school. All of the values of the dependent variable are nonzero

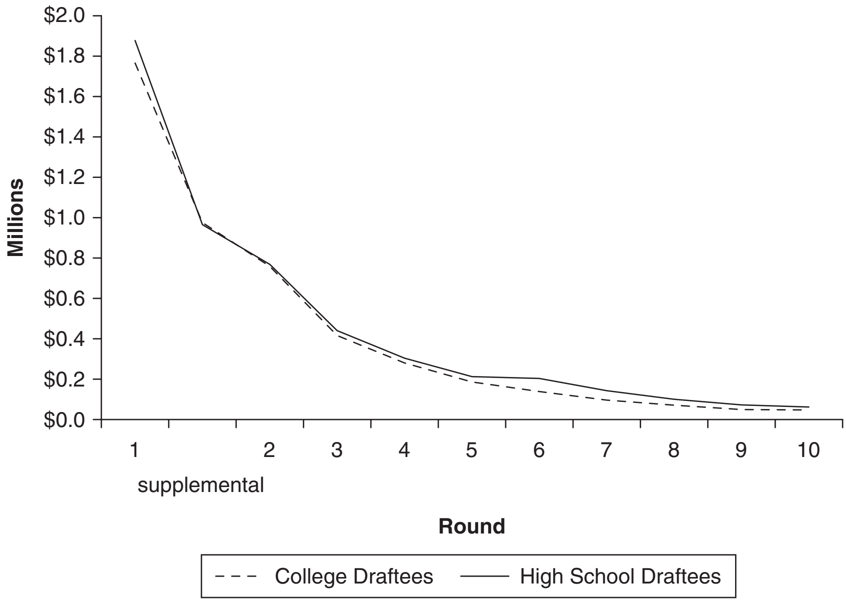

Figure 2: 2003 Average Signing Bonus by Round (Rounds 1 to 10)

and positive in this case. However, this is not the case with players who did not enter professional baseball right after high school. Therefore, this specification is estimated using a two-stage Heckman procedure for the sample of unsigned players.

Finally, we estimate the expected number of years played in the major leagues, or $t_2 - t_1$, with the following specification:

$$MLBYEARS = \beta_0 + \beta_1 RND + \beta_2 RND^2 + \beta_3 CTCH + \beta_4 INF + \beta_5 OUT + \beta_6 YR + \beta_7 RULE + \beta_8 STH + \varepsilon. \quad (5)$$

Again, the regression analyses are split into two samples. Because a majority of players in both samples never played in the major leagues, the two-stage Heckman procedure is used for both samples.

Team fixed effects were tested for each estimation. If fixed effects were found to be significant in the probit model, it was used in the second stage of the Heckman procedure. The standard errors were clustered[5] by each team-year. Once the estimations of equations 3, 4, and 5 were completed, the estimations were then imputed into equations 1 and 2. A discount rate of 5% is used, and a value of 40 is used for t_3.

To estimate average minor league salaries, we used information from Minor League Baseball's official Web site (http://www.milb.com). Although we do not

TABLE 2: Estimation of Future Signing Bonuses (in thousands of dollars) for Drafted High School Baseball Players Who Did Not Directly Enter Professional Baseball

Two-Stage Heckman Model		
Explanatory Variable	*Probit Estimation*	*Second-Stage Estimation*
Constant	–0.6784** (0.0820)	526.896 (6,222.788)
Round	–0.0286** (0.0042)	–24.769 (107.171)
Round^2	0.0003** (0.0001)	0.259 (0.977)
Catcher	–0.1719* (0.0826)	–81.341 (665.612)
Infielder	0.0927 (0.0538)	–0.084 (353.776)
Outfielder	–0.1023 (0.0621)	3.676 (390.392)
Year	0.0283** (0.0059)	–2.559 (107.665)
Rule[a]	0.2706** (0.0878)	44.938 (1,030.656)
South	–0.1528** (0.0532)	7.389 (584.719)
Inverse Mill's ratio		314.620 (4,866.216)
Log-likelihood	–2,188.82	
R^2		.0399
Sample size	4,790	864

NOTE: Clustered standard errors are in parentheses.
a. This represents an indicator variable equaling 1 for the years 1965 and 1966.
*Statistically significant at the 5% level. **Statistically significant at the 1% level.

know minor league salaries for 2003, 2004 salaries are available. Minor league baseball players are paid at least $850 per month while playing in Class A (short season), at least $1,050 per month while playing in Class A (full season), at least $1,500 per month while playing in Class AA, and at least $2,150 per month while playing in Class AAA. On the basis of this, we assume that the average minor league player gets paid $1,387.50 per month. Because many of these players get other jobs during the off-season, we assume that the yearly pay for minor league baseball players is equal to $16,650 ($1,387.50 per month for 12 months).

Lifetime expected earnings are then calculated for both players who entered professional baseball and players that did not. *BNS*, *MLYRS*, and *MLBGAMES* are estimated at the means. *RND* was estimated at each point, through 50 rounds. The years between being drafted in high school and signing a contract were also estimated at the means. Obviously, if the player entered professional baseball out of high school, this value was zero. If the player did not enter professional baseball, t_C was estimated to be the average years (3.352) of college baseball eligibility for players who did not enter professional baseball.

RESULTS

The results of the estimations are presented in Tables 2, 3, and 4. The regressions of expected future signing bonuses are essentially estimating the redraft of the player. Fixed effects are not significant in this model, which is not surprising,

TABLE 3: Estimation of Years in the Minor Leagues for Drafted High School Baseball Players

	Estimation of Players Immediately Entered Professional Baseball	*Two-Stage Heckman Estimation of Players Who Did Not Immediately Enter Professional Baseball*	
Explanatory Variable	*OLS Estimation*	*Probit Estimation*	*Second-Stage Estimation*
Constant	6.6873** (0.3573)	0.3062** (0.0829)	-0.7310 (4.0942)
Round	–0.2223** (0.0160)	–0.0371** (0.0039)	–0.2274 (0.1565)
Round^2	0.0031** (0.0004)	0.0004** (0.0001)	0.0024 (0.0014)
Catcher	–0.5047** (0.1778)	–0.0613 (0.0625)	–1.1146** (0.3230)
Infielder	–0.1617 (0.1405)	0.1114* (0.0478)	0.4204 (0.4919)
Outfielder	–0.3517* (0.1597)	–0.0758 (0.0492)	–0.3321 (0.3816)
Year	0.0545** (0.0160)	0.0174** (0.0058)	0.1691* (0.0787)
Rule	0.5275** (0.1989)	0.2695** (0.0738)	2.0708 (1.1879)
South	–0.2932* (0.1217)	–0.1933** (0.0443)	–0.8273 (0.8643)
Baltimore Orioles	–0.7972* (0.3501)		
Boston Red Sox	–0.0453 (0.4108)		
California Angels	–0.0387 (0.4619)		
Chicago Cubs	–0.7163 (0.4291)		
Chicago White Sox	–0.2283 (0.4037)		
Cincinnati Reds	–0.8974** (0.3415)		
Cleveland Indians	–0.8565* (0.3809)		
Detroit Tigers	–0.4980 (0.4825)		
Houston Astros	–0.7968* (0.3618)		
Oakland Athletics	–0.1416 (0.3939)		
Kansas City Royals	–1.2662** (0.3944)		
Los Angeles Dodgers	–0.1363 (0.3803)		
Milwaukee Brewers	–0.7680 (0.4834)		
Minnesota Twins	–0.8424* (0.3640)		
Montreal Expos	–0.5479 (0.5144)		
New York Mets	–0.4787 (0.4453)		
New York Yankees	–0.4023 (0.3482)		
Philadelphia Phillies	–0.7206 (0.4034)		
Pittsburgh Pirates	–1.0580** (0.3655)		
San Diego Padres	–0.8291 (0.5816)		
San Francisco Giants	0.3897 (0.4111)		
Seattle Mariners	0.2220 (0.5888)		
St. Louis Cardinals	–0.7793* (0.3552)		
Texas Rangers	0.2067 (0.3823)		
Toronto Blue Jays	–1.3394 (0.7291)		
Inverse Mill's ratio			7.4515 (6.6544)
Log-likelihood		–3161.43	
R^2	.1765		.0303
Sample size	3,010	4,790	2,094

NOTE: Clustered standard errors are in parentheses.
*Statistically significant at the 5% level. **Statistically significant at the 1% level.

TABLE 4: Estimation of Years in the Major Leagues for Drafted High School Baseball Players

	Two-Stage Heckman Estimation of Players Who Immediately Entered Professional Baseball		*Two-Stage Heckman Estimation of Players Who Did Not Immediately Enter Professional Baseball*	
Explanatory Variable	*Probit Estimation*	*Second-Stage Estimation*	*Probit Estimation*	*Second-Stage Estimation*
Constant	0.1698 (0.1362)	–4.6610 (7.6622)	–0.9556** (0.1024)	–26.6633 (70.4316)
Round	–0.1023** (0.0070)	–1.5077 (0.9230)	–0.0425** (0.0059)	–0.8179 (1.6308)
Round^2	0.0014** (0.0001)	0.0205 (0.0125)	0.0005** (0.0001)	0.0089 (0.0179)
Catcher	–0.0835 (0.0926)	0.3143 (0.9711)	–0.4179** (0.1070)	–7.6685 (16.5088)
Infielder	0.0898 (0.0748)	3.1074** (1.0456)	–0.0320 (0.0691)	0.8961 (1.4487)
Outfielder	0.0055 (0.0852)	1.5658* (0.6820)	–0.0027 (0.0698)	0.6066 (0.7326)
Year	–0.0002 (0.0078)	–0.0886 (0.0715)	0.0283** (0.0065)	0.5871 (1.0982)
Rule	0.1813 (0.1145)	2.1150 (1.6648)	0.3350** (0.0844)	5.2722 (12.9165)
South	–0.0711 (0.0675)	–1.2616 (0.9163)	–0.0808 (0.0599)	–1.4489 (3.2188)
Baltimore Orioles	–0.3049* (0.1501)	–3.4973 (3.0023)		
Boston Red Sox	0.0108 (0.1694)	2.1735 (1.3870)		
California Angels	–0.0439 (0.1928)	0.7752 (1.3204)		
Chicago Cubs	–0.7203** (0.2276)	–10.8712 (6.4995)		
Chicago White Sox	–0.3032 (0.1668)	–3.3194 (3.2548)		
Cincinnati Reds	–0.3625* (0.1468)	–2.9016 (3.3779)		
Cleveland Indians	–0.6855** (0.1845)	–5.9056 (6.3288)		
Detroit Tigers	–0.2363 (0.1802)	–2.6490 (2.6438)		
Houston Astros	–0.4588** (0.1531)	–6.7009 (4.1674)		
Oakland Athletics	–0.1814 (0.2052)	–1.0908 (2.2372)		
Kansas City Royals	–0.4850* (0.1894)	–5.5483 (4.3445)		
Los Angeles Dodgers	–0.1421 (0.1457)	0.2422 (2.2387)		
Milwaukee Brewers	–0.2185 (0.2302)	–1.9481 (2.4817)		
Minnesota Twins	–0.4758** (0.1809)	–4.4132 (4.7863)		
Montreal Expos	–0.2024 (0.1722)	0.0080 (2.4937)		
New York Mets	–0.2054 (0.1570)	–2.1041 (2.4171)		
New York Yankees	–0.2040 (0.1633)	–3.3019 (2.1294)		
Philadelphia Phillies	–0.4401** (0.1520)	–4.4384 (4.1038)		
Pittsburgh Pirates	–0.4498** (0.1641)	–2.9657 (4.1265)		
San Diego Padres	–0.3397 (0.1835)	–5.5669 (3.1922)		
San Francisco Giants	0.1561 (0.1446)	2.2824 (1.5488)		
Seattle Mariners	–0.3071 (0.2285)	–0.8816 (3.6771)		
St. Louis Cardinals	–0.4243** (0.1564)	–2.1230 (4.2918)		
Texas Rangers	–0.0655 (0.1635)	–0.2202 (1.2198)		

	Two-Stage Heckman Estimation of Players Who Immediately Entered Professional Baseball		*Two-Stage Heckman Estimation of Players Who Did Not Immediately Enter Professional Baseball*	
Explanatory Variable	*Probit Estimation*	*Second-Stage Estimation*	*Probit Estimation*	*Second-Stage Estimation*
Toronto Blue Jays	–0.3534 (0.2267)	–4.4880 (3.6682)		
Inverse Mill's ratio		18.0489 (11.7030)		22.0870 (47.1646)
Log-likelihood	1,257.20		1,375.78	
R^2		.0770		.0317
Sample size	3,010	561	4,790	431

NOTE: Clustered standard errors are in parentheses.
*Statistically significant at the 5% level. **Statistically significant at the 1% level.

because the team that drafts a player should have no effect on his expected draft round if he does not enter professional baseball right after high school. The results show that if players are drafted in the early rounds, they have a higher probability of being redrafted and receiving signing bonuses, but there is no evidence that any of the variables affect the size of those bonuses. The results also show that players from the South are less likely to earn future signing bonuses. Although it may be difficult to interpret this finding, it may indicate monopsony power over players with lower expected wages out of baseball. The low R^2 value for the second-stage estimation shows that it is difficult to explain the magnitude of the future signing bonus, which may be due to the reduced sample size.

Table 3 gives the estimation of minor league career length. Minor league career length does depend on the team that drafts a player if he enters professional baseball. However, it does not affect minor league career length if the player does not enter professional baseball right after high school. Also, interestingly, catchers have shorter minor league careers, and minor league career lengths are growing over time for both samples of players. However, these results are difficult to interpret because a short minor league career could mean a short professional career or less training for the major leagues.

Table 4 shows the estimation of years played in major league baseball. Again, fixed effects are significant for the first sample of players but not the second sample. Also, there is again little significance in any of the variables in the second-stage regressions, with the exception of some position variables. This could be due to a small sample size, or it may imply that given that a player has reached the major leagues, his ability has little to do with his earlier perceived talent level. The results also show that the probability of making the major leagues is increasing over time for players who do not immediately sign after high school. However, there is a negative but not significant trend for players who do sign after high school.

TABLE 5: Expected Discounted Lifetime Earnings and Probabilities of Playing Major League Baseball for Drafted High School (HS) Players

	Expected Earnings ($)			*Probability of Playing Major League Baseball*			*Percentage of 2003 Drafted HS Players*
Who Round Drafted	*Enter Pro Baseball After HS*	*Enter College After HS*	*Expected Change in Earnings*	*Enter Pro Baseball After HS*	*Enter College After HS*	*Change in Probability*	*Entered Pro Baseball*
1	7,365,815	3,534,440	3,831,376	0.414	0.207	0.207	100
2	5,898,239	3,350,435	2,547,804	0.377	0.195	0.181	100
3	5,067,313	3,178,247	1,889,067	0.341	0.184	0.157	73
4	4,529,152	3,017,228	1,511,924	0.308	0.174	0.134	100
5	3,998,894	2,866,770	1,132,124	0.277	0.165	0.112	91
6	3,577,632	2,726,279	851,353	0.249	0.155	0.093	90
7	3,241,231	2,595,149	646,082	0.223	0.147	0.076	100
8	2,926,192	2,472,839	453,353	0.199	0.139	0.060	78
9	2,651,748	2,358,789	292,959	0.178	0.131	0.047	100
10	2,422,976	2,252,507	170,469	0.159	0.124	0.034	67
11	2,187,153	2,153,492	33,661	0.142	0.118	0.024	60
12	1,993,882	2,061,282	–67,400	0.127	0.112	0.015	60
13	1,827,447	1,975,437	–147,990	0.113	0.106	0.007	50
14	1,688,160	1,895,553	–207,393	0.101	0.101	0.001	29
15	1,566,486	1,821,231	–254,745	0.091	0.096	–0.005	29
16	1,443,049	1,752,114	–309,066	0.081	0.091	–0.010	83
17	1,343,043	1,687,850	–344,807	0.073	0.087	–0.013	55
18	1,254,616	1,628,127	–373,511	0.066	0.083	–0.016	38
19	1,176,507	1,572,635	–396,128	0.060	0.079	–0.019	29
20	1,107,580	1,521,104	–413,524	0.054	0.075	–0.021	8
21	1,050,056	1,473,263	–423,207	0.050	0.072	–0.023	25
22	993,323.1	1,428,879	–435,556	0.045	0.069	–0.024	20
23	955,513.2	1,387,718	–432,205	0.042	0.066	–0.025	14
24	905,046.8	1,349,588	–444,541	0.039	0.064	–0.025	20
25	868,938	1,314,269	–445,331	0.036	0.061	–0.026	0
26	837,433.7	1,281,607	–444,174	0.033	0.059	–0.026	33
27	810,061.6	1,251,421	–441,359	0.031	0.057	–0.026	0
28	786,412	1,223,565	–437,152	0.030	0.055	–0.026	9
29	766,132.4	1,197,898	–431,766	0.028	0.054	–0.025	29
30	754,678.2	1,174,284	–419,606	0.027	0.052	–0.025	11
31	734,537.9	1,152,612	–418,074	0.026	0.051	–0.025	0
32	722,749.4	1,132,773	–410,023	0.025	0.049	–0.024	0
33	713,396.1	1,114,667	–401,271	0.024	0.048	–0.024	0
34	706,327.7	1,098,198	–391,870	0.024	0.047	–0.023	0
35	701,454.2	1,083,290	–381,836	0.023	0.046	–0.023	9
36	698,697.7	1,069,870	–371,172	0.023	0.045	–0.022	0
37	698,024.3	1,057,872	–359,847	0.023	0.044	–0.021	0
38	699,409.9	1,047,235	–347,825	0.023	0.044	–0.020	0
39	869,554.2	1,037,901	–168,347	0.024	0.043	–0.020	6

	Expected Earnings ($)			*Probability of Playing Major League Baseball*			
Round Drafted	*Enter Pro Baseball After HS*	*Enter College After HS*	*Expected Change in Earnings*	*Enter Pro Baseball After HS*	*Enter College After HS*	*Change in Probability*	*Percentage of 2003 Drafted HS Players Who Entered Pro Baseball*
40	708,498.8	1,029,838	–321,340	0.024	0.043	–0.019	0
41	716,331.4	1,022,992	–306,660	0.025	0.042	–0.018	5
42	726,483.9	1,017,335	–290,851	0.025	0.042	–0.017	14
43	739,116.3	1,012,833	–273,716	0.026	0.042	–0.015	6
44	754,404.6	1,009,478	–255,073	0.028	0.042	–0.014	9
45	772,577.8	1,007,237	–234,660	0.029	0.042	–0.013	7
46	793,887.1	1,006,116	–212,229	0.031	0.042	–0.011	0
47	818,658.6	1,006,091	–187,432	0.033	0.042	–0.009	0
48	847,249	1,007,169	–159,920	0.035	0.042	–0.007	0
49	880,079.1	1,009,347	–129,268	0.037	0.042	–0.005	8
50	917,632.7	1,012,649	–95,016.4	0.040	0.043	–0.002	0

Table 5 shows the lifetime expected earnings for players who are drafted from high school and what percentage of 2003 high school drafted players entered professional baseball in 2003. As expected, players drafted in early rounds would be better off entering professional baseball, but players drafted in later rounds would be better off going to college. For players drafted out of high school, it is profitable to play minor league baseball if they are drafted in the 11th round or better. For example, high school players drafted in the first round of the June draft in the regular phase have a lifetime expected earnings of $7,365,815 if they play professional baseball immediately after high school but a lifetime expected earnings of $3,091,409 if they forgo the draft. Therefore, it costs them $4,534,440 to not immediately play professional baseball. Table 5 also shows the probability of making the major leagues when players enter professional baseball or go to college. These estimates come from the probit regressions in Table 4. It is interesting that in later rounds, players actually have a higher probability of making the major leagues if they go to college. Only in Rounds 12, 13, and 14 would a player be possibly making a choice between maximizing his earnings and maximizing his chances of playing in major league baseball. Table 5 also shows that when players are expected to lose income if they play professional baseball, a majority of them do not choose to play professional baseball. Also, if players are expected to lose income if they go to college, they will likely play professional baseball immediately after high school. However, given the probabilities of making the major leagues, it could be that players enter college to maximize their playing potential and not earnings potential.

CONCLUSIONS

We find that players who are drafted in the early rounds of the 1st-year player draft will maximize their earnings if they play professional baseball immediately after they are drafted. Conversely, if the players are drafted in the lower rounds, they will maximize their expected lifetime earnings by going to college.

Also, the decision to play professional baseball is not purely financial for many players. Numerous factors influence the decision to enter professional baseball or go to college. Many drafted high school baseball players have a utility function that is almost strictly based on their baseball careers. However, the results show that even if the players are maximizing the probability of making the major leagues, they should still enter professional baseball right out of high school only if they are drafted in the early rounds.

NOTES

1. Although it is certainly possible to enter college after professional baseball (or during baseball off-seasons), which is sometimes paid for by MLB teams, we assume that players will not go to college given the lower, although rising, rate of postsecondary education among older adults. In 1970, 18- to 24-year-olds represented 69.1% of higher education enrollment, and by 1993, this number had dropped to 54.9%. However, 18- to 24-year-olds still represented 60% of all undergraduate students in 1993 (U.S. Department of Education, 1995).

2. Although overall draft position is a more detailed variable, it did not predict the dependent variables as well as the draft round. One possible reason is that players are not always drafted in order of ability but by the needs of teams. Overall draft position does not indicate how many players a team drafted ahead of each player. Using draft round also helps correct for the expansion of teams. In 1965, there were 20 teams, and in 1985, there were 26. Each variable was tested in the model, and draft round was found to be more significant.

3. In dealing with baseball salaries, for the first 6 years of a player's career, he should earn less than the league average. According to Burger and Walters (2005), it is reasonable to assume that players should earn the major league minimum salary during their first 2 years in the majors (when they are not arbitration eligible). During Years 3 to 6, players are eligible for arbitration and will earn (on average) 37.5%, 55%, 76.3%, and 80% of their marginal revenue products, respectively. However, when estimating time spent in major league baseball, no player is estimated to spend up to 6 years playing major league baseball. Therefore, the average salary is used.

4. Typically, signing bonuses for high school players are higher than those for college players drafted in the same rounds.

5. All standard errors were clustered by team-year to help correct for any correlation pattern within teams over time (Bertrand, Duflo, & Mullainathan, 2004). The covariance matrix for the linear estimations were given by $V = \left(\frac{n-1}{n-k}\right)\left(\frac{G}{G-1}\right)(X'X)^{-1}\left(\sum_{i=1}^{G} X_i' e_i e_i' X_i\right)(X'X)^{-1}$ where $X = n \times k$, there are G groups (team-years), and i denotes the observations for one group. The covariance matrix for the nonlinear or probit estimations were given by $V = \left(\frac{G}{G-1}\right)\left(\frac{-\partial^2 \ln L}{\partial \beta^2}\right)^{-1}\left(\sum_{i=1}^{G} \frac{\partial \ln L_i}{\partial \beta}\frac{\partial \ln L_i}{\partial \beta}\right)\left(\frac{-\partial^2 \ln L}{\partial \beta^2}\right)^{-1}$.

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