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Collegiate and Professional Careers of High School Athletes

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MacDonald Paul Mirabile
World Wildlife Fund

Mark David Witte
College of Charleston

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The authors examined approximately 1,000 high school quarterbacks that are recruited into collegiate athletics to determine what factors impact the player's decision to transfer to another school, change their position from quarterback, complete their eligibility (and presumably graduate), to be drafted into the National Football League and/or to make a professional roster at any level. Results suggest that minority student-athletes are more than twice as likely to change their position. Players that attend universities near their hometown see significant benefits, perhaps because of greater access to their hometown's social network. Attending a university closer to home decreases the likelihood that the player transfers to another school, increases the probability that the player stays a quarterback, increases the likelihood that the player completes their eligibility, increases the likelihood of being drafted into the National Football League and playing at any professional level.

S tudent-athletes face a difficult challenge balancing their academic careers with their potential goal of playing professionally. Kennedy and Dimick (1987) surveyed college football players and found that 45% expect to play professionally. Yet, according to the NCAA (2011), only 1.7% successfully transition beyond their college careers to become professional athletes. Which factors determine the path a student-athlete's career will take as he attempts to balance academics with a goal of graduation and football with the hopes of a potential professional career? Which factors cause student-athletes to transfer schools, change their playing position, complete their eligibility (and presumably graduate), or transition a successful college career to a professional one?

 To answer these questions, the authors examine a particular subset of student-athletes: the high school quarterback. Using the framework of organizational commitment theory (McGee & Ford, 1987; Turner & Chelladurai, 2005) the authors estimate a series of models to understand which factors affect the student-athlete's attachment to the organization – in this data represented by the student-athlete's commitment to his university and its football program. The characteristics of a successful high school quarterback can be drastically different from the

characteristics of a successful college or professional quarterback. The authors examine a variety of characteristics about the high school quarterback – his socio-economic background as well as characteristics about the college program that he ultimately attends. Many student-athletes may ultimately wish for a professional athletic career; according to Beamon and Bell (2002), 51% of college football players surveyed "strongly agree" with the statement "I expect to have a career in professional athletics." Yet, administrators, coaches, and parents may wish that the student-athletes complete their eligibility, graduate and become productive members of society.

As may be expected, high school quarterbacks who are highly rated by scouting services are more likely to remain a quarterback throughout their college career, complete their eligibility and be drafted into the NFL. Student-athletes that are recruited for multiple college sports (and are likely better natural athletes) are *more* likely to transfer schools but are *less* likely to change positions and complete their eligibility. Student-athletes that play multiple sports may be able to transition to professional sports in basketball or baseball instead of football. Major League Baseball, unlike the NFL and the National Basketball Association, regularly drafts players directly out of high school to play professionally.

Aside from the various physical characteristics of the student-athletes, socio-economic indicators play an important role. Shockingly, minority quarterbacks are more than twice as likely, relative to their White counterparts, to change their position from quarterback to another role during their college career. This finding is especially sensitive in college football given that in 2011 more than 85% of FBS head coaches were White (ESPN, 2011). When the student-athlete's hometown has a greater proportion of individuals with four-year college degrees, the student-athlete is more likely to complete their eligibility. This finding suggests that student-athletes with a more highly educated social network may display greater organization commitment to an academic program, which is consistent with existing models of organizational commitment theory. A 1% increase in the hometown's population with a four-year degree is associated with an 18% increase in the probability that the student-athlete completes his eligibility. Players who initially attend schools that are farther from their hometown are more likely to transfer schools and less likely to complete their eligibility, to change positions, to be drafted into the NFL or play professionally. An additional 100 miles of distance increases the probability that the player transfers schools by 4.5%, decreases the probability that the player completes their eligibility by 4%, decreases the probability that the player changes positions by 6%, decreases the probability that the player is drafted into the NFL by 6%, and decreases the probability of playing at any professional level by 4%. Student-athletes that attend schools closer to home receive large, positive benefits, perhaps because they have better access to their social network of friends, family and mentors.

Literature

The literature on the collegiate career of the student-athlete and the transition to the post-collegiate working environment is quite varied. Many have examined student-athletes' self-definitions and their expectations of their future careers. The transition from high school student-athlete to college and subsequent transition to either a professional sports career or non-sports career can be extremely complicated. Freeman (2009) examined the interaction between academic experience, social experience and athletic experience. The author noted the complex adjustments that student-athletes must make when first attending college.

As noted by Pendergrass, Hansen, Neuman, and Nutter (2003), many college football athletes expect to play professionally when they finish their college career. Though the NCAA (2011) found that only 2% of college athletes will transition to professional levels, Kennedy and Dimick (1987) report that 45% of surveyed football student-athletes expect to play professionally.

Clearly, as most student-athletes will never progress to professional athletics, the academic experience may be vital for future career transition. A variety of studies have examined student-athlete's organizational commitment to a given school. Maxwell (2011) interviewed student-athletes and found that close family connections and support from coaches are instrumental to academic achievement. James (2010) showed that past academic success in high school and on standardized tests is highly predictive of future academic success for a variety of student-athletes. Ridpath (2002) found that gender, ethnicity, and the sport played by the student-athlete significantly impact the probability of successful graduation. Sack, Park and Thiel (2011) surveyed much of the literature on the retention of student-athletes. The authors conducted their own research and found that football players are less likely to graduate when the academic selectivity at the school is high and when the football program is very successful. Eckles and Stradley (2012) found that a college student's organizational commitment and likelihood of graduation were highly dependent on the retention characteristics of the student's social network.

Beamon and Bell (2002) found evidence that parental behavior and academic probation/suspension impacts a student-athlete's expectations for a professional career. Houle (2011) surveyed college athletes and found that student-athletes with greater optimism about their post-athletic career decision-making are more likely to successfully transition to work after graduation. Cunningham (2003) examined student-athletes and found that African-American students are less likely than their White counterparts to perceive themselves as transitioning to coaching positions, a potential occupation for many student-athletes transitioning to non-athletic employment. Recently, Gill, and Brajer (2011) found that players who are drafted into the NFL often see their draft position fall if they have a low Wonderlic score; though the draft position of black players falls more than for their white counterparts based on the Wonderlic test results. The Wonderlic isa test developed to assess learning and problem-solving ability, commonly used by employers for a wide range of occupations.

Lally and Kerr (2005) interviewed student-athletes and found that individuals who invest more in their student development, at the cost of their athletic training, have an easier transition to non-athletic careers. Wylleman, Alfermann, and Lavallee (2004) suggested that institutions with better life skills programs which emphasize career transition will have more success with post-athletic professional life.

Sandstedt, Cox, Martens, Ward, Webber, and Ivey (2004) developed a survey methodology to examine post-collegiate career beliefs of student-athletes but do not specifically examine how those beliefs impact the transition. While Long and Caudill (1991) found that male, but not female, student-athletes attain a 4% higher salary premium compared to students who do not compete in intercollegiate sports.

While Mirabile (2005), Berry and Simmons (2011) and Gill and Brajer (2011) examined the determinants of draft order, we found only one other study of the determinants of *being drafted*. Mirabile (2004) found that college quarterbacks with higher quality teammates are themselves more likely to be drafted. However, the authors have found no statistical

examinations in the literature of the determinants of transferring schools, changing position or completing eligibility (and presumably graduating with a degree).

Data

The data for this study cover eight years 2000-2007 of high school quarterbacks who were evaluated by either Scout.com, Rivals.com or Prepstar.com as a student-athlete to play football at the collegiate level. The final year of the data is 2007 due to the fact that the outcomes are censored for all subsequent classes. There are 1,213 such student-athletes in this analysis. When available, data was collected on each student-athlete's height, weight, time in the 40-yard sprint, race, home town, high school, race, high school grade point average, standardized test scores, and "star" ranking from the athlete's Scouts.com, Rivals.com, and Prepstar.com player profile page. Additionally, the authors collected data on whether the student-athlete was a dual-sport athlete from Scouts.com, Rivals.com, and Prepstar.com, and a search of Major League Baseball's drafted players. The scouting services each employ regional recruiting specialists who cover the year-round visits, rumors and commitments of the top student-athletes in the country. These three primary sources were used to fill in information gaps from one another and build a more robust data set than could be created from any single source.

As one of the best expected predictors of success in college is how these recruiting services rate players, the authors will discuss briefly how the "star" rankings are assigned and how they are interpreted. Each player is graded based on a study of game film, live game study, and performances at scouting combines and camps. Both Scout.com and Rivals.com cover several hundred live games a year in their evaluation process. Likewise, they utilize the accurate and consistent measurements obtained at combines and camps to determine how players matchup against their peers. The game film and live game study form the basis of the evaluation of each player's skill set, which forms the core of the recruiting service's eventual ranking for the student-athlete. Points are also added or subtracted based on the player's height, weight, and speed. The recruiting services typically begin evaluating student-athletes during their junior year, though evaluations can change at any time. For the data used in this paper, the authors used the final recruit rankings from Scout.com – the same ones used to rank the entire incoming class in the spring. Scout.com was chosen instead of Rivals.com because Scout.com had graded more quarterbacks during the time period analyzed. Missing data on Scout.com players was supplemented with information from Rivals.com and Prepstar.com. As can be seen from the ranking scales in Table 1, the descriptive evaluations of the player quality are similar between both the Scout.com and Rivals.com recruiting services.

Table 1 - *Player rating guide*

Scout.com

Grading	Star Rating	Prospect Quality	Description
90-100	5 star	Rare prospect	Player can create mismatches and can have a major impact on the game as a true freshman.
80-89	4 star	Outstanding prospect	Player may be able to create some mismatches against most opponents and could potentially contribute as a true freshman.
70-79	3 star	Good prospect	Player does not dominate in every game, especially against

			quality competition. Could eventually become a starter.
60-69	2 star	Average prospect	This player is over-matched against the better players in the nation. Weaknesses will be exposed against tougher competition. Could develop into a solid contributor on the FBS level.
50-59	1 star	Prospect	Player has some redeeming qualities but is not projected to contribute at the FBS level.

Rivals.com

| Grading	Star Rating	Prospect Quality	Description
6.1+	5 star	Franchise Player	Considered one of the elite prospects in the country, generally among the nation's top 25 players overall; deemed to have excellent pro potential; high-major prospect
5.8 – 6.0	4 star	All-American Candidate	Considered one of the nation's top 300 prospects; deemed to have pro potential and ability to make an impact on college team
5.5-5.7	3 star	All-Region Selection	Considered among the region's top prospects and among the top 750 or so prospects in the country; high-to-mid-major prospect; deemed to have pro potential and ability to make an impact on college team
5.0-5.4	2 star	Division I prospect	Considered a mid-major prospect; deemed to have limited pro potential but definite Division I prospect; may be more of a role player
4.9	1 star	Sleeper	No Rivals.com expert knew much, if anything, about this player; a prospect that only a college coach really knew about

Which institution the student-athlete committed to enroll was determined from these sources and subsequently was overlaid with whether the student-athlete transferred schools by examining his playing record from NCAA.com. A transferred dummy variable was assigned to any junior college (JUCO) players that subsequently enrolled in a Division IA program (now called Football Bowl Subdivision-FBS) even though the student-athlete's NCAA.com statistical record would not reflect a transfer. The authors determined such JUCO transfers by examining each athlete's player profile website page created by each NCAA Division I program that he attended. The literature suggests that students who transfer into a four-year institution from junior college vary significantly from their traditional peers in educational outcomes. Ishitani and McKitrick (2010) found that many junior college transfers, even those not engaged in athletics, lag behind traditional students in a variety of involvement measurements. Harvey (2009) used survey data to identify many factors that make graduation more difficult for JUCO student-athlete transfers.

Data on the institution and coach's historical performance was collected from the College Football Data Warehouse. Using the student-athlete's hometown, his record was overlaid with socio-economic data from the Census Bureau for his community to control for differences in income, home values, and education. Finally, using data collected from GreatSchools.com, the authors controlled for the type of high school and the educational quality of the student-athlete's high school as captured by the community score.

Another important determinant, as shown in the results, is the distance between a student-athlete's hometown and college that he attends. Maxwell (2011) reported the large positive effects of having a strong personal network; conceivably, student-athletes that attend a university near their hometown will have more access to their network of family, friends and mentors in

their hometown. Figure 1 reports the county-by-county location of the hometown of the recruited quarterbacks. Note, that the distribution is not primarily determined by population density. While population density is high in the northeastern United States, there is a relative paucity of recruited quarterbacks from this area. Indeed, a great number of recruited quarterbacks are found in rural counties in the southeastern United States.

Figure 1 - *Quarterback Recruits by County*
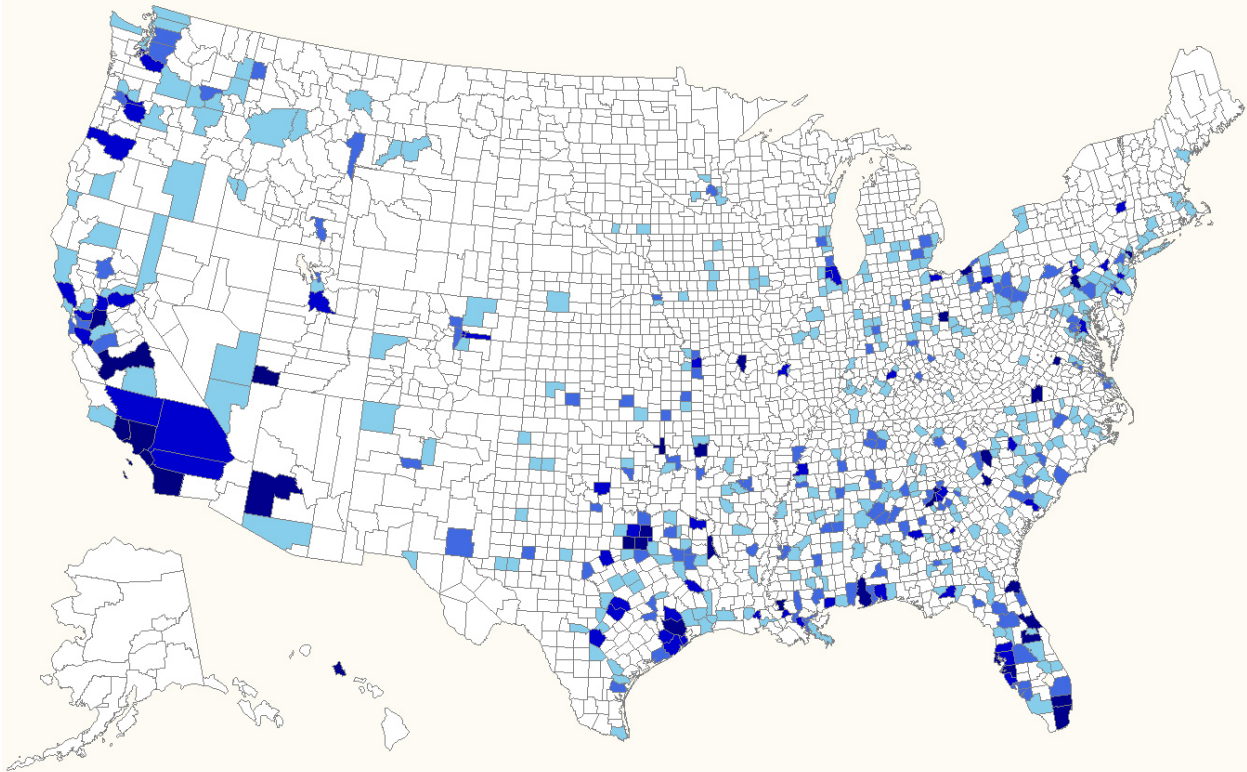
Note: Darker shades denote more quarterback recruits while counties in white have no quarterback recruits in this data set.

The purpose of this paper is not to evaluate how well or poorly recruiting services perform, but rather to take their player projections as one input in a series of models examining student-athlete outcomes. The evaluation of talent is an innately subjective process, and frequently professionals in different recruiting services disagree on how players are ranked. Even more frequently, college football coaches (who also regularly evaluate high school talent to recruit student-athletes that are good fits for their programs) disagree with these recruiting services. Ultimately, the college coaches who work with the student-athletes, developing or squandering their players' talents, have as much to do with many of the outcomes examined as do the student-athletes themselves.

Descriptive statistics for the outcomes and potential determinants are given in Table 2. As shown, 68.2% of these student-athletes complete their eligibility in college; this compares favorably with the approximately 60% 6-year graduation rate reported by Hess, Schneider, Kelly

and Carey (2009). Of the student-athletes in the dataset, 33.6% transfer schools, 22.9% elect to change positions, 9.7% are ultimately drafted into the National Football League (NFL), and 19.0% play at some professional level (the NFL, Canadian Football League or Arena Football League). For the top-ranked players, the opportunity to play in the NFL is significantly more likely. Of the 50 5-star players in this data set, 56% were drafted. Contrast this figure with just 16% of the 179 4-star players, 10% of the 283 3-star players, and 5% of the 706 2-star or 1-star players. Like their 2-star peers, many 1-star players abandon unfulfilling careers in high-level collegiate athletics in exchange for playing time against lower-tier competition.

Table 2 - *Descriptive Statistics*

	Obs.	Mean	Std. Dev.	Min.	Max.
Drafted in NFL	1212	0.097	0.297	0	1
Professional Roster	1213	0.190	0.393	0	1
Changed position from quarterback	1114	0.229	0.420	0	1
Transferred to another school	1213	0.336	0.472	0	1
Completed Eligibility	1166	0.682	0.466	0	1
Scouts Star Rating	1213	2.647	0.875	2	5
Player height	1213	74.566	1.666	69	79
Forty yard dash time	1182	4.691	0.146	4.29	5.28
Two (or more) sport athlete	1213	0.111	0.315	0	1
Player is a minority	1213	0.304	0.460	0	1
GreatSchools community rating of high school	1133	3.845	0.652	1	5
Player's high school is private	1213	0.154	0.361	0	1
Percent of population with college degree in player's hometown	1211	0.247	0.112	0.0475	0.8486
School's distance from players hometown (in hundreds of miles)	1051	4.435	5.539	0	49.28
Mean income in player's hometown	1211	45833	16079	20261	200001
Median home value in player's hometown	1211	141768	92625	36800	1000001
Number of years experience of head coach	1059	8.371	7.622	0	40
Team's winning percentage in previous year	978	0.547	0.218	0	1
Team's winning percentage in last five years	1058	0.524	0.163	0.115	0.908
Percent of team's offensive plays from passing	894	0.442	0.085	0.126	0.739

Minority (non-White) players comprise about 30% of the student-athletes in the data. In the 2011 college football season, 30% of the 121 starting quarterbacks in the Football Bowl Subdivision (formerly Division IA) were minorities. In the 2011 NFL season, there were four minority starting quarterbacks of the 32 teams, a rate of just 12.5%. The same reassignment of positions that occurs early in many high school quarterbacks' college careers (most frequently to the wide receiver or defensive back position) also occurs frequently in the transition to the NFL. Many quarterbacks whose exceptional speed and agility afforded them success in college are not given the opportunity to transition to a professional career as a quarterback. As the level of competition increases, student-athletes with exceptional speed and agility but marginal passing skills are reallocated to where their particular skill set is best utilized. Frequently, highly mobile college quarterbacks are transitioned to wide receivers or special teams return men, where coaches can make the most use of their athletic abilities.

In addition, the authors have included information about the player's physical characteristics such as height and speed (as measured by the 40-yard dash time of the player). The authors created a dummy variable to capture whether the student-athlete was offered collegiate scholarships in multiple sports, which may indicate that the player is a better natural athlete and may have competing athletics career paths from which to choose. Information about the student-athlete's high school and their hometown include the GreatSchool's community ranking of the quality of the student-athlete's high school and whether or not the high school is private or public. The authors also utilize the percentage of people in the student-athlete's hometown with a college degree, the hometown's median income, the hometown's median home price and the hometown's distance from the college that the student-athlete ultimately attends after high school. Also used in the model are variables capturing the college football program that the student-athlete attends, including the head coach's years of experience, the short-term (one-year) and medium-term (five-year) winning percentage of the team, and the percentage of the team's offensive plays that are passing plays.

Results

The authors examined the statistical probability of five separate outcomes. First, does the student-athlete transfer to another school? Second, does the player change positions from quarterback? Third, does the student-athlete complete their eligibility? Fourth, does the player get drafted in the NFL? And finally, does the player end up on a professional roster in the NFL, Canadian Football League, or Arena Football League? Arguably, only the fourth or fifth outcome may be viewed as the ideal outcome by student-athlete. Each spring many student-athletes leave college with remaining eligibility and without completing their degrees to become eligible for the NFL draft. The third outcome, which is more likely to be associated with finishing school, would be considered a successful outcome by school administrators and society. To find the determinants of these outcomes the authors utilize a marginal effects logistic regression using the variables listed in Table 1. *Because the authors are using a marginal effects logistic regression a coefficient equal to 1 denotes no statistical effect while significant deviations from 1 are important determinants; coefficients less than 1 suggest a negative effect, and coefficients more than 1 imply a positive effect.* This model was selected to determine not only what factors are statistically significant but also to estimate the size of the factor's marginal effect. By using the marginal effect logistic model the coefficient estimates are more robust as

the model can control for the various other factors that may impact the student-athlete's outcomes.

Logistic regressions of the first three outcomes are given in Table 3: transferring, changing positions and completing eligibility. In the first column the authors examine the determinants of the student-athlete transferring; the average transfer rate is 33.6% according to Table 2. As seen in the table, many of the potential determinants are statistically insignificant and the pseudo R-squared is quite low; in fact, only 4% of the variation in transferring can be predicted. Simply, the organizational commitment of the individual appears to be driven mostly by individual preferences and concerns which are not observed in this data set. Also, in preliminary analysis the authors included each student-athlete's high school grade point average (GPA) and standardized test scores on the scholastic aptitude test (SAT). However, both the high school GPA and SAT score were statistically insignificant in all regression formulations, and because GPA data was unavailable for roughly only half (and SAT scores for even less) of the student-athlete, the inclusion of these two variables dramatically reduced the number of observations available to study.

Table 3 - *Collegiate Career Determinants*

	Transferred to another school	Changed position from quarterback	Completed Eligibility
Scouts Star Rating	1.091	0.589**	1.579**
	(0.102)	(0.076)	(0.185)
Player height	0.982	1.104	1.063
	(0.054)	(0.076)	(0.066)
Forty yard dash time	1.534	0.004**	1.061
	(0.962)	(0.004)	(0.768)
Two (or more) sport athlete	1.950**	0.400**	0.324**
	(0.469)	(0.147)	(0.091)
Player is a minority	0.616**	2.250**	0.866
	(0.119)	(0.493)	(0.182)
GreatSchools community rating of high school	1.108	1.028	1.062
	(0.140)	(0.159)	(0.150)
Player's high school is private	0.681*	0.665	1.098
	(0.150)	(0.194)	(0.281)
Percent of population with college degree in player's hometown	0.387	0.646	18.593**
	(0.446)	(0.973)	(26.277)
School's distance from players hometown (in hundreds of miles)	1.045**	0.937**	0.960**
	(0.016)	(0.023)	(0.020)
Mean income in player's hometown (thousands)	0.996	1.008	1.007
	(0.008)	(0.011)	(0.011)
Median home value in player's hometown (thousands)	1.002*	0.998	0.999
	(0.001)	(0.002)	(0.002)
Number of years experience of head coach	0.993	1.011	0.997
	(0.011)	(0.013)	(0.012)
Team's winning percentage in previous year	0.466	1.976	0.535
	(0.215)	(1.125)	(0.280)
Team's winning percentage in last five years	2.323	0.320	1.033
	(1.429)	(0.248)	(0.727)

Percent of team's offensive plays from passing	1.146 *(1.137)*	35.781** *(45.384)*	7.899* *(9.267)*
Pseudo R-squared	0.0393	0.1633	0.0712
Observations	767	732	741

Note: Marginal effects logistic regressions with standard errors of the log odds in parenthesis. Coefficients equal to one have no marginal effect. Marginal effects are determined from the mean of each dependent variable. Because these are marginal effects logit regressions, significance is not simply determined by dividing a coefficient by its standard error. Instead we have denoted significant marginal effects at the 10% and 5% level by * and ** respectively.

However, the model does reveal two statistically significant determinants of the transferring outcome that are discussed in detail below. Two-sport athletes and non-minority athletes are more likely to transfer to a different school. Two-sport athletes are almost twice as likely as their counterparts to transfer schools. The high transfer rate of two-sport athletes may result from the player's desire to find a better mix of playing time at another institution in their various sports. Likewise, two-sport athletes may have an expanded skill creating more opportunities to transfer. Perhaps the most interesting relationship is the increased transfer rate for student-athletes who initially attend schools farther from their hometown. Each 100 miles of distance increases the student-athlete's probability of transferring by 4.5%. There are two potential reasons why distance from the student-athlete's hometown may be important. One, student-athletes who lack close, convenient access to their home network of family and friends may not succeed according to their expectations and choose to transfer to another institution; this is consistent with the results found in Maxwell (2011). Thus, the organizational commitment of the student athlete would depend on the student-athlete's access to their social network. Two, student-athletes who have chosen to attend a distant institution may simply be more willing to make great life changes, in which case transferring later may merely be further evidence of the individual's willingness to make important life changes.   In the second column of Table 3 the authors analyze whether the player changes position.   In high school, if the quarterback is one of best athletes on the team, such athletes commonly play both defense and offense. Though such situations may limit his development as a traditional quarterback, they may also extend his post-high school playing career, allowing him to compete at another position. The collegiate quarterback typically has one of the more difficult jobs on the field. In addition to being a physically demanding job, many important game-changing decisions must be made by the quarterback. Not surprisingly, more highly-rated players by the scouting services are less likely to change positions. One additional star in ranking decreases the probability of changing positions by 41%. Faster players, those with lower 40-yard dash times, are significantly more likely to change positions. Conversely, two-sport players are about 60% less likely to change positions. Surprisingly, minority quarterbacks are more than twice as likely to change positions as their counterparts, a finding which aligns with the result in Cunningham (2003) that minority players exhibit different expectations; the results herein suggest different outcomes also. Day and McDonald (2010) found racial disparity in college football head coaches was partially driven by less diverse social networks of minority assistant coaches. It may be that minority student-athletes lack a racially diverse social network (as do the vast majority of college students as reported in Mayer and Puller, 2008), thus, hampering their prospects of being promoted to the top of the quarterback depth chart. The school's distance from the player's hometown is also important. An additional 100 miles of distance reduces the likelihood that the player changes

position by roughly 6%; again, suggesting that a lack of social network access decreases the player's promotion prospects as a quarterback.

In the third column of Table 3 the authors examine what makes student-athletes more likely to complete their eligibility. For a student-athlete to complete their eligibility as defined in this data, he would have been a member of the football team (or teams if he transferred) for at least four years. Players often use more than four years to complete their eligibility if they are "redshirted" or are granted a medical waiver for being injured. A one star increase in the player's ranking increases the probability of completing eligibility by roughly 58%. Not surprisingly, two-sport athletes are 68% less likely to complete their eligibility, perhaps because they pursue other professional careers like baseball which has many routes to professional athletics. Student-athletes who attend a school farther away from their hometown are less likely to complete their eligibility as each 100 miles decreases the probability by 4%, additional evidence that greater access to a social network appears to increase the student-athlete's organizational commitment. The marginal effect for the educational attainment of the student-athlete's hometown is also quite large; a 1% increase in the rate of college completion in the student-athlete's hometown increases the student-athlete's probability of completing their eligibility by 18%. This parallels the results found in Eckles and Stradley (2012) which found that a student's organizational commitment is best predicted by the organizational commitment of the student's social network. The eligibility model likely suffers from missing variable bias due to lack of reliable data on the academic preparation of each quarterback, an issue discussed in more detail in the paper's Limitations section.

The position change and completing eligibility models both also reveal a statistically significant positive relationship between the percent of team's offensive plays from passing and these outcomes. The authors theorize that players with marginal passing skills may be quick to self-identify their chances of playing quarterback or another position. On teams where the quarterback's passing production accounts for a larger portion of the team's total offense, such marginal quarterbacks are more likely to transfer. The authors also theorize that as the percent of team's offensive plays from passing increases, the prestige of remaining a quarterback at that program also increases and the student-athlete would be more likely to complete their eligibility. In Table 4 the authors examine the determinants of being drafted into the NFL. In the first regression specification the authors construct a model using only the same determinants used for the initial three outcomes. In the second model specification, the prior three outcomes are each included as an explanatory variable. The authors follow the same methodology when examining whether the student-athlete can be found on a professional roster (either the NFL, Canadian Football League or Arena Football League). Because unobserved player-specific characteristics and personality all impact whether the player transfers schools, changes position or finishes their eligibility, the authors can use these three outcomes to control for the relevant individual-specific characteristics that would otherwise be lost in the analysis. For this reason, we focus the discussion on the results of the second, more complete specification.

Table 4 - *Professional Career Determinants*

	Drafted in NFL	Drafted in NFL	Professional Roster	Professional Roster
Transferred to another school		0.199**		0.350**
		(0.070)		*(0.080)*
Changed position from quarterback		0.752		0.710
		(0.263)		*(0.181)*
Completed Eligibility		2.440**		4.077**
		(0.982)		*(1.296)*
Scouts Star Rating	2.045**	1.886**	2.102**	1.970**
	(0.285)	*(0.279)*	*(0.228)*	*(0.230)*
Player height	1.386**	1.397**	1.224**	1.230**
	(0.131)	*(0.138)*	*(0.084)*	*(0.090)*
Forty yard dash time	1.736	1.451	0.373	0.241
	(1.738)	*(1.618)*	*(0.287)*	*(0.209)*
Two (or more) sport athlete	1.125	1.608	0.704	1.102
	(0.419)	*(0.667)*	*(0.219)*	*(0.395)*
Player is a minority	1.187	1.122	1.167	1.156
	(0.380)	*(0.392)*	*(0.270)*	*(0.292)*
GreatSchools community rating of high school	1.322	1.325	1.018	0.992
	(0.269)	*(0.289)*	*(0.156)*	*(0.165)*
Player's high school is private	1.070	0.958	0.827	0.715
	(0.386)	*(0.358)*	*(0.232)*	*(0.209)*
Percent of population with college degree in player's hometown	0.057	0.031	0.242	0.105
	(0.113)	*(0.063)*	*(0.348)*	*(0.156)*
School's distance from players hometown (in hundreds of miles)	0.921**	0.937**	0.964*	0.961*
	(0.030)	*(0.028)*	*(0.021)*	*(0.021)*
Mean income in player's hometown (thousands)	1.025	1.022	1.015*	1.015
	(0.014)	*(0.015)*	*(0.010)*	*(0.010)*
Median home value in player's hometown (thousands)	0.998*	0.999	1.000	1.000
	(0.002)	*(0.002)*	*(0.002)*	*(0.002)*
Number of years experience of head coach	0.992	0.985	1.004	1.000
	(0.017)	*(0.017)*	*(0.013)*	*(0.013)*
Team's winning percentage in previous year	3.554*	3.257*	2.664*	2.909*
	(2.716)	*(2.628)*	*(1.505)*	*(1.722)*
Team's winning percentage in last five years	2.044	3.452	1.123	1.545
	(2.090)	*(3.738)*	*(0.838)*	*(1.220)*
Percent of team's offensive plays from passing	0.653	0.587	2.486	2.362
	(1.136)	*(1.096)*	*(3.116)*	*(3.248)*
Pseudo R-squared	0.1588	0.2210	0.1277	0.1865
Observations	766	705	767	706

Note: Marginal effects logistic regressions with standard errors of the log odds in parenthesis. Coefficients equal to one have no marginal effect. Marginal effects are determined from the mean of each dependent variable. Because these are marginal effects logit regressions significance is not simply determined by dividing a coefficient by its standard error. Instead we have denoted significant marginal effects at the 10% and 5% level by * and ** respectively.

Players who transfer schools are about 80% less likely to be drafted into the NFL. As shown in Table 3, much of the variation in transferring schools was driven by unobserved individual characteristics of the student-athlete; those same characteristics may make the player much less likely to be drafted into the NFL. Or players who transfer to another school are unable

to earn playing time at their original school because of competition from teammates; potentially inadvertently signaling lower quality abilities. However, a player who has little chance of starting his senior year may find his chances of playing professionally are best served by transferring schools and starting in a lower level of competition. Additionally, players who complete their eligibility are more than twice as likely to be drafted into the NFL, as the additional years of training in college football may be highly valued by professional teams. Collegiate athletes are eligible for the NFL draft after being out of high school for three years, which equates to completing their junior or redshirt sophomore seasons. Players who complete their eligibility may have had a great deal of playing time and are thus, better professional prospects.

Taller players are more likely to be drafted. Again, because taller players can more easily see over linemen, the taller players may be more highly sought after by NFL teams. Not surprisingly, players with more stars in their recruit ranking are also more likely to secure transition into the NFL. Controlling for all other differences, five-star players are more than 6 times more likely to be drafted into the NFL relative to 1-star and 2-star players. Lastly, the authors find that student-athletes that attend schools that are farther away from their hometown are less likely to be drafted. An additional 100 miles of distance decreases their probability of being drafted by approximately 6%. While Maxwell (2011) found that close family connections improve the student-athletes' academic success, it may also be true that closer access to family connections also improves a player's collegiate success on the football field and transition to the NFL. Additionally, if the player joins a winning team after high school then they are more likely to be drafted; an increase in the winning percentage by 8% (roughly one more win in a year) increases the player's probability of being drafted by 18%.

Interestingly, results for the professional roster outcome are very similar to those of the NFL draft outcome. However, many of the statistically significant marginal effects are smaller. Player height, whether the player transfers to a new school, the college's distance from the players hometown and the winning percentage of the team are all important determinants, but the size of their effect is muted relative to the NFL draft outcome. Conversely, the scout's star rating is a slightly larger determinant of making a professional roster relative to being drafted in the NFL. Considered together, these findings should provide some hope for student-athletes seeking professional football careers whose physical limitations may have kept them from the NFL. Completing eligibility is a hugely important to being on a professional roster; student-athletes that complete their eligibility are 307% more likely relative to their peers to have the opportunity to play professionally.

Limitations of the study

The authors would have preferred to include more information on the high school quarterback's grades and standardized tests. Such variables could control not only for how well a high school quarterback could transition to a collegiate playbook, but also more interestingly how well-prepared he is for the academic rigors of college. There are two problems with any attempts to include measures of grades and standardized scores, however. First, such measures are not generally available – less than half of the quarterbacks in this study had either. Second, such measures are always self-reported and do not come from either the student-athlete's high school, a testing agency, or potential college. As such, there may exist a self-serving bias in any measures of GPA or SAT available.

Another potential limitation of the study is that the measurement of the outcomes is based on individual research for each of the observations in the data set. To the extent that a student-athlete transferred to a non-NCAA institution to continue his collegiate football career or transferred to another college and did not pursue observable football activities, then the student-athlete's act of transferring would not be captured in this data set. This particular type of transfer would also negatively affect whether or not the student-athlete completed his eligibility in this dataset. Likewise, student-athletes on occasion see their collegiate careers end prematurely due to injury. Such observations have been dropped from the final data set.

Conclusion

This paper adds to the literature by examining student-athlete careers using a large set of data. In addition to finding relevant determinants, the authors have also estimated the size of the effects on various collegiate and professional outcomes. Both physical characteristics and socio-economic factors impact the collegiate and professional path of high school quarterbacks. Faster student-athletes and minority student-athletes are much more likely to change their position from quarterback, most likely to wide receiver or defensive back. Student-athletes whose hometown has a more educated population are themselves more likely to complete their eligibility and presumably graduate. Social networks may be very important as student-athletes who attend colleges farther from their hometown are more likely to transfer and less likely to finish their eligibility or to be drafted into the NFL. Given that completing eligibility and playing professionally may be considered goals of both administrators and players, the authors are confident in suggesting that high school student-athletes try to stay closer to home when choosing a college, though the authors recognize that the decision of where to attend college for many student-athletes is heavily impacted by where the student-athlete is offered a scholarship.

The authors can only predict 4% of the variation in the decision to transfer schools, 16% of the changing position outcome, 7% of the completed eligibility outcome and 22% of the NFL draft outcome. Although seemingly low, these prediction rates are impressive given that they contain no information about how the student-athlete fared in college. Clearly, unobserved individual characteristics play an enormous role in the career path of student-athletes, and there will always be exceptions to the general results that the authors report. Future primary research may be able to observe individual characteristics which may play a role in determining a student-athlete's collegiate and professional career path.

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