Valuation Problems in the Presence of Imperfect Information: The Case of the NFL

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Section I: Introduction

One of the main issues in finance is determining how to value an asset; how can one determine the present discounted value of an asset when its future performance is unknown? Investors can look at past trends in earnings per share or the price to earnings ratio to get some idea of how a stock is trending, but this information is at best a murky signal as to the stock's future performance. The labor economics literature looks at a similar problem that is present in employment decisions. When hiring, firms must estimate a potential employee's expected marginal revenue product before deciding to hire them. But in this instance, the available information signals are less reliable. Employers do not have full information about the employee, so they must make decisions based on inferior and imprecise market signals as to a candidate's quality.

These problems are both very much present in the NFL Draft. Given a limited number of draft picks from which to select players, teams must estimate a player's present discounted value or expected future productivity and choose the one they believe will give them the best return. However, the problem that teams face in this valuation process is that the information they have on players is very noisy; college performance does not necessarily translate to NFL success, as has been demonstrated in a number of individual cases. Given this uncertainty, teams must ask themselves which characteristics or traits best predict a player's future performance.

Other papers have previously explored this question by looking at specifically at skill position players; they analyzed which college statistics or NFL Combine measurements translate to NFL performance. In particular, these papers focused on which traits influenced games started, games played, or other counting statistics for those positions. My paper differs from the others in the football literature by using player earnings and plays as a measure of player performance in the NFL.

The benefits of doing this are largely two-fold: Firstly, it allows me to analyze other positions for which performance statistics are not readily available or reliable. Specifically, I am able to study offensive linemen as well as defensive players, which as of yet have not been studied. Secondly, player salaries and plays should also be a more reliable measure for player performance than other statistics that have been previously used, such as games started or games played.

Ultimately, I found that there are few reliable indicators of future performance for offensive players. Offensive linemen and defensive players benefit from being All-Americans, and stronger offensive and defensive linemen appear to be more successful in the NFL. Overall, however, teams are working with very poor information.

Section II: Background

At the end of April every year, the National Football League holds the annual NFL Draft, in which all thirty-two teams are given opportunities to select new players who have been out of high school for at least three years. The league established the draft in the 1930s to help the league's future success by ensuring that all teams had an equal opportunity at obtaining new talent. There are two-hundred and fifty-six selections assigned to teams every year — each team is assigned one pick in each of the seven rounds, and the league also assigns thirty-two selections to teams who lost more players in free agency than they added. Teams are free to trade draft selections for other selections or for current players, meaning the draft occurs in a Coasian-esque framework.

The draft order is determined by each team's win-loss record in the previous season and whether or not the team made the playoffs; teams that did not reach the playoffs choose in reverse order of their records, and teams that made the playoffs are placed in the order in which they were eliminated from the playoffs. That is, the Super Bowl champion team picks thirty-second in each round. This order is meant to help ensure parity in the league by allowing the worst teams to choose first, giving them a higher chance of selecting the best players.

Each team has a college scouting department that evaluates college players who will be eligible for future drafts in order to help the team select the best players. However, teams do not have perfect information about how a player will perform after making the transition to the NFL, given that a player's performance can be influenced by factors such as coaching, work ethic, or the other players on the team. As a result, teams rely on a myriad of different qualitative and quantitative measures of player performance. In addition to analyzing player's statistics, teams send scouts to attend different college football games throughout the season in order to see how well they carry out their assignments and to see what coaches have to say about their players. The College Bowl games are often well-attended by scouts because they get to see how well players perform against the best competition at the college level.

One of the biggest scouting events of the year is the NFL Scouting Combine. At the end of February of every year, the NFL invites around three hundred prospects to Lucas Oil Stadium in Indianapolis where they perform in drills[1] and conduct interviews with teams. How the players perform in the drills can and does affect where they are ultimately selected on draft day.

The NFL sets a hard salary cap every year based upon terms agreed to in the NFL's collective bargaining agreement; adjusted spending on players' salaries and benefits must be at

[1] The drills include the 40-yard dash, the bench press (repetitions at 225 pounds), the vertical jump, broad jump, 3-cone drill, 20-yard shuttle, 60-yard shuttle, and other position-specific drills.

least equal to forty-seven percent of the league's adjusted revenues. As a result, when building team rosters, teams must determine how much of their cap space they want to spend on any given player. Thus, player contracts are a sort of zero-sum game; money spent by a team on one player necessarily means less money to spend on other players. Players' salaries are essentially rank ordered, meaning that player earnings are directly comparable to one another.

Section III: Literature Review

There are several different strands of literature discussing the NFL Draft and predicting player performance in sports, though the NFL literature is relatively sparse.

Some papers have studied the way teams behave given the information problems inherent in the NFL Draft. Keefer (2016) finds evidence that teams employ rank-based groupings in contract negotiations with drafted players. Using a regression discontinuity design, the paper finds that there is a significant decrease in compensation for players picked at the start of the second and third rounds compared to those taken at the end of the round prior, even though the players selected 31^{st} and 32^{nd} in a round should be approximately similar to those drafted 33^{rd} or 34^{th}, for instance. Hersch and Pelkowski (2016) suggest that NFL teams do not trade up enough, finding that picks generate more value to teams that trade up for them than to the team that the pick was assigned to. Hendricks et al (2003) examine the draft from a labor economics point of view, analyzing statistical discrimination and option value in the draft market. They find evidence to suggest that teams oversample players from small schools due to their option value; they are more willing to take a chance on these relatively unknown players near the end of the draft in the hope that they outperform their draft position.

While there have not yet been any papers that have used earnings as a proxy for performance in American football, this relationship has been explored with respect to European soccer. Franck and Nüesch (2012), for example, find that statistics like goals and assists are highly positively correlated with players' market values. Frick (2013) finds that an OLS model using player performance metrics such as goals, statistics, games played, tenure, and captaincy explains about 60% of the observed variance in player salaries.

Most of the literature regarding predicting player performance in the NFL explores the effects that certain attributes or statistics have on when players are drafted or how they perform in the NFL, usually for specific positions. Kitchens (2015) looks at the impact of the school a player attended on where they are drafted. They find that players from larger football programs are more likely to be drafted earlier, but do not have better careers on average. This suggests that teams are doing a poor job at interpreting the college signal. Berri and Simmons (2011) look at quarterbacks and find that while performance indicators are a good predictor of draft position, draft position was not significantly related to NFL performance. Wolfson et al (2011) similarly explore quarterbacks. Mulholland and Jensen (2014) analyze predictors of tight end success in the NFL and find that few of the predictors of draft position were also predictors of later player success, suggesting that teams were focusing on the wrong signals. They did, however, determine that going to a BCS school was one of the predictors that teams got right; BCS players are generally drafted earlier and then go onto have career success. Fenn and Berri (2018) look specifically at wide receivers and find that a player's 40-yard dash time and media exposure correlated with both player performance and when players are drafted, suggesting that teams are interpreting that signal correctly. However, on the contrary, Treme and Allen (2009) find that while teams do indeed use 40-yard dash times in selecting players, that it actually does not significantly affect player performance.

Other papers look specifically at Wonderlic test scores to determine if this intelligence measure is a significant factor in players' future performance. Mirabile (2005) finds no evidence of evidence of an effect, while Gill and Brajer (2012) and Pitts and Evans (2018) do find a significant positive effect. Pitts and Evans also find that despite this positive effect, teams are not actually incorporating it into their drafting decisions, suggesting a possible inefficiency in their drafting strategies. Gill and Brajer also explore whether or not teams interpret Wonderlic scores differently for players of different races but find no statistical evidence to suggest that they do.

The paper that is closest to mine is Pitts and Evans (2019), who use a regression analysis explore the effect of many different variables on player success and draft position for a few different offensive positions. They find that while teams correctly use many variables when selecting players, teams tend to misjudge the importance of injuries and are generally unable to judge a player's expected performance when he has teammates who are also going to the NFL.

Section IV: Methodology

The primary method of analysis for this paper is a linear regression model of the following form: $Y_P = \beta 0 + \beta 1*Combine + \beta 2*PositionalStats_P + \beta 3*Power5 + \beta 4*AllAmerican + \varepsilon$.

Y_P is one of two dependent variables— the natural logarithm of adjusted player earnings for players of position P or the natural logarithm of the career total number of offensive and defensive plays a player was on the field for (snap counts). Combine is a vector of NFL Combine measurements and statistics that includes height, hand size, and arm length in inches, 40-yard dash times, 3-cone drill times, bench press repetitions, and broad jump and vertical jump distances in inches. $PositionalStats_P$ is a vector of the appropriate positional statistics for position P during a player's last year in college, including statistics such as passing yards, receiving touchdowns, and rushing yards per attempt. Power5 is an indicator variable that indicates if the player in question attended a school in one of the Power 5 conferences — the ACC, Big Ten, Big 12, Pac-12, and SEC — and AllAmerican is an indicator for whether a player was named a consensus All-American at least once during their college career.

In addition to the dependent variables mentioned earlier, I also look at the difference in a player's earnings and snap counts relative to the earnings and snap counts of the average player chosen in the NFL draft at the pick with which the player was taken. I do this in order to see if there are certain characteristics that predict a player being better than expected.

I split my sample into six position groups: quarterback, running back, wide receiver, offensive line, defensive linemen and linebackers/defensive front, and defensive backs. I perform each regression separately for each position group.

It should be noted that this is the first paper in the American football literature that uses player earnings as a proxy for player productivity. I believe that player earnings may prove to be a more useful proxy for a few reasons. Many of the dependent variables used by other papers — such as games played, games started, other positional stats, first-year stats, and first-year salary —each have potential limitations. Measures like games played or games started are imperfect because they only tell us whether a player played in a game or was on the field for the first play; they do not reflect how much a player actually impacted the game. Special teams-only players are active almost every single week, but it can be argued that they have less importance to a team than other players. In addition, many early draft picks end up playing in more games because teams feel a need to justify the early selection, even though the player may not be contributing anything. Teams tend to give these early draft selections a longer probationary period than for most other players. The idea that many teams appear to share is that if a player was good enough to be an early draft selection, then they can turn into a great player with the right team. As a result, games played and games started are skewed to favor special teams players and early round draft picks. Traditional positional statistics, such as passing yards or receiving yards, are often considered to be context dependent. The argument is that a player's coach, the type of scheme they play in, and the talent around them are significant factors in player performance, and thus these traditional statistics are not necessarily a pure reflection of a player's talent. In addition, first-year salary is a limited measure of player performance because it is almost solely a function of draft position and thus does not reflect NFL performance.

Player earnings may prove to be a more useful metric because it reflects both how long a player played and how productive they were during those years; players with higher career earnings are likely to have had productive careers. There is some evidence to suggest that this is the case; a simple correlation tests yields a .64 correlation coefficient between number of Pro Bowl awards a player received and their earnings.

In order to adjust for salary inflation caused by the yearly increase in the NFL's salary cap, I am adjusting player earnings to "2018 NFL cap dollars" by employing the following formula:

$$2018\ NFL\ Cap\ Dollars = \sum_{i=1}^{n} \frac{Year\ i\ earnings * 2018\ Cap}{Year\ i\ Cap}$$

Where a will be the player's first year of earnings, and n will be the last year in which the player drew a salary.

In addition to player earnings, I also use career snap counts as a dependent variable. This may also prove to be a more useful metric for similar reasons as player earnings — it goes beyond games started or games played and indicates how much a player was involved in any given game. I specifically look at the number of offensive and/or defensive plays each player was involved in, ignoring special teams plays.

Section V: Data

Spotrac.com tracks all of the current publicly available information on NFL contracts and keep listings of player earnings, and I use this data for the purposes of my study. I have also collected players' college statistics, NFL Combine statistics, All-American award winners, and the college they attended from Sports-Reference.com.

My sample size varies by specification and varies from 19 to 377, with smaller sizes for my earnings models because of the sparsity of the data.

I present summary statistics in Table 1.

Section VI. Analysis

My results are shown below in Tables 2-13. Overall, it appears that college statistics and NFL Combine measurables are ultimately poor predictors of players' earnings and snap counts in the NFL.

Only one of the terms in the quarterback regressions (Tables 2 and 3) is statistically significant, with each model having an R^2 term of around 0.1 to 0.17. This suggests that college statistics and Combine measurements are actually very poor predictors of quarterback performance in the NFL. Among other things, these findings run contrary to the conventional wisdom in the NFL that height is important for quarterbacks. Shorter quarterbacks are generally seen as less desirable prospects. However, the height term here is not significant, suggesting that the conventional wisdom does not appear to hold in today's NFL. This may be due in part to the success of shorter quarterbacks such as Russell Wilson or Drew Brees. Interestingly enough, none of the passing statistics are statistically significant either, with the Power 5 and All-

American indicators also lacking significance. Interestingly, rushing yards per attempt is a statistically significant predictor of a quarterback playing more snaps than expected given his draft position. I do not have specific evidence to suggest why this is, but it is possible that coaches are more willing to sub in an efficient rushing quarterback if their starter gets hurt because they can game plan around their rushing abilities instead of their likely sub-par passing skills. Overall, it appears that measurables do not reliably predict quarterback success in the NFL. It may be the case that certain intangible qualities such as work ethic or leadership are better predictors.

Most of the terms in the running back regressions are also not significant, with the adjusted R^2 values again being pretty low (see Tables 4 and 5). It is worth noting that my earnings results are subject to a very small sample size. None of the traditional college rushing receiving statistics or Combine measurements are statistically significant. In recent years, we have seen teams employ a “running back by committee” approach in which they use several different running backs with different strengths instead of a “workhorse” type of player. We have seen several productive young running backs — such as David Johnson and Todd Gurley — experience a steep fall in production due to a combination of injuries, wear and tear, and age. As a result, teams have been utilizing many late-round draft picks at running back, many of whom have proven to be reliable contributors. So, it is possible that none of these terms are statistically significant because the transition from college to the NFL is relatively easy for most running backs.

The model for wide receivers (Tables 6 and 7) is actually somewhat more reliable, with R^2 terms ranging between about 0.09 and .43. We also have two significant terms here. One additional receiving touchdown during a receiver’s last year in college is associated with playing

1% more snaps in the NFL. This may be because the skillset required to score touchdowns is a better reflection of a receiver's ability. Touchdowns are generally scored in the red zone — near the other team's end zone — where there is less space for receivers to get open. Thus, they have to rely on their hands and their ability to find open space. These are two skills which would appear to better transfer to the NFL than things like speed, as there is very little difference in athleticism between professional players. In addition, a player being an All-American in college is associated with them playing about 1,434 more snaps over the course of their career; which is equal to about 2 seasons of being a full-time starting wide receiver at the NFL level. It is interesting to note that while All-Americans do appear to out-perform their draft position, they are not necessarily more successful players overall.

The offensive line models (Tables 8 and 9) do not fit well, having very low R^2 values, but we do get two significant coefficients. Each additional bench press repetition at the Combine results in a player playing about 4% more snaps in the NFL. This may be because offensive linemen need to be stronger in the NFL in order to block defensive linemen that routinely weigh around 20-30 pounds more than defensive linemen in college. In addition, being an All-American appears to result in a player seeing a 33% increase in career earnings. Being an All-American might be a reliable signal because it represents a player having good technique. It is generally agreed upon that offensive linemen coming into the NFL from college football today lack good technique. And with practice time being limited, it is harder for coaches to try to develop young offensive linemen. Being an All-American in college might mean that a player has developed better technique through more playing time or better habits and is thus one of the more "NFL-ready" offensive linemen.

Just as with offensive linemen, the bench press is a statistically significant predictor of playtime for defensive linemen and linebackers (Tables 10 and 11). Arm length is also a significant term. This may be because it is better for defensive linemen to be able to stay further away from offensive linemen while blocking so that they can disengage their block and run after the quarterback or the ballcarrier during a play. There also appear to be significant playtime returns to being an All-American, which could again suggest better technique. Linebackers in particular are often responsible for being the leaders of the defense and calling plays, so being an All-American may indicate that the player has the requisite football IQ to be successful as a defensive leader at the next level.

Defensive backs (Tables 12 and 13) also see a return on being an All-American, both in terms of snaps played in general as well as snaps played above expected. Again, this could be an indicator of a player having solid technique that they are able to pair with their athleticism in order to defend the better wide receivers.

Overall, it appears that college statistics and NFL Combine measurements are very poor predictors of a player's future performance in the NFL. Despite this, being an All-American does seem to generally result in a player seeing more playtime. Given that many All-Americans are selected early, however, teams are essentially throwing darts at the board in the later rounds of the NFL Draft.

Section VII. Conclusion

In short, I have analyzed which college statistics and NFL Combine measurables best predict future player success in the NFL, as measured by player earnings. Sabermetrics was invented for baseball by teams so that they could better predict players' future performance and identify market inefficiencies, but similar analysis in the context of American football has been limited, given the very team-oriented nature of the sport; individual statistics and performance are thought to be very dependent upon a player's teammates and coaches. This study adds to the literature by proposing a new proxy for player performance: player earnings. In doing so, I was able to test for defensive positions and offensive linemen. Ultimately, I found that there are few reliable indicators of future performance for most players. Offensive skill position players, particular running backs and quarterbacks, seem to be extremely hard to predict. For the positions with fewer available statistics, being an All-American in college seems to yield returns at the next level. Overall, it seems that the use of general statistics provides little value in predicting how a player will perform in the NFL. It may be that play-by-play data or more advanced metrics are needed, or that the traditional scouting methods of watching film and interviewing players are actually more reliable. In the end, though, it would appear that NFL teams face an extremely difficult task in selecting new players every year and are unlikely to be able to consistently yield a good draft class using college statistics as they currently are.

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Table 1: Summary Statistics

	Mean	Standard Deviation	Count
Earnings	7.01e+07	5.35e+07	791
Snaps	1237.111	1630.297	4340
Height (in.)	73.73034	2.634462	6984
Hand Size (in.)	9.566895	.6084737	5871
Arm Length (in.)	32.33708	1.476817	5863
40-Yard Dash (sec.)	4.81055	.3227457	6507
Bench Press Reps	20.8035	6.434747	4738
Vertical Jump (in.)	32.60128	4.273606	5622
Broad Jump (in.)	113.312	9.725137	5507
3-Cone (sec.)	7.342198	.4543001	4372
Completion %	58.70346	5.94845	1329
Passing Yards	2373.354	860.6163	1329
Passing Yards/Attempt	7.290444	1.107909	1329
Passing TD	16.87961	8.74689	1329
Interceptions	9.358916	3.79241	1329
Rushing Yards/Attempt (QB)	1.082844	2.599463	1329
Rushing Yards (RB)	419.5249	449.2516	6694
Rushing Yards/Attempt (RB)	4.571776	4.047886	5885
Rushing TD (RB)	4.11697	4.904244	6694
Receiving Yards/Catch (RB)	8.71691	5.401964	2803
Receiving TD (RB)	.5922171	.973394	3058
Receiving Yards/Catch (WR)	12.68368	3.302037	5422
Receiving TD (WR)	3.635559	3.198006	5422

Table 2: Quarterbacks

	Quarterbacks	
	ln(Earnings)	ln(Snaps)
Height (in.)	-0.0198	0.227
	(0.855)	(0.130)
Hand Size (in.)	-0.404	-0.0860
	(0.236)	(0.844)
Arm Length (in.)	-0.0457	-0.313
	(0.771)	(0.230)
40-Yard Dash (sec.)	-0.179	-1.250
	(0.846)	(0.397)
Completion %	0.0583	0.0714
	(0.133)	(0.196)
Passing Yards	-0.000547	0.000399
	(0.162)	(0.403)
Passing Yards/Attempt	0.0388	-0.359
	(0.835)	(0.159)
Passing TD	0.0237	0.00234
	(0.479)	(0.956)
Interceptions	0.0530	-0.0468
	(0.321)	(0.483)
Rushing Yards/Attempt (QB)	-0.00447	0.120
	(0.951)	(0.181)
Power 5	0.306	0.887
	(0.380)	(0.067)
All-American	-0.480	0.620
	(0.256)	(0.434)
Constant	22.45*	2.728
	(0.012)	(0.802)
N	52	100

R^2	0.173	0.148

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Quarterbacks — Above Expected

	Quarterbacks Difference	
	Earnings($)	Snaps
Height (in.)	-1552222.8	89.72
	(0.923)	(0.689)
Hand Size (in.)	-49282106.4	-210.1
	(0.288)	(0.719)
Arm Length (in.)	-15574590.2	-288.1
	(0.523)	(0.441)
40-Yard Dash (sec.)	-1897001.3	2048.4
	(0.989)	(0.298)
Completion %	5730085.1	92.48
	(0.309)	(0.226)
Passing Yards	-12799.7	-0.286
	(0.813)	(0.664)
Passing Yards/Attempt	-5337126.7	-153.6
	(0.828)	(0.643)
Passing TD	-1011151.4	23.45
	(0.819)	(0.687)
Interceptions	1135438.8	44.98
	(0.876)	(0.624)
Rushing Yards/Attempt (QB)	-2007165.5	253.7*
	(0.832)	(0.039)
Power 5	43348317.3	450.7
	(0.339)	(0.519)
All-American	-36729983.3	-271.4
	(0.522)	(0.791)

Constant	820828516.9	-10666.3
	(0.483)	(0.485)
N	47	90
R^2	0.138	0.098

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Running Backs

	Running Backs	
	ln(Earnings)	ln(Snaps)
40-Yard Dash (sec.)	-6.341	0.0293
	(0.053)	(0.985)
3-Cone (sec.)	1.729	-1.523
	(0.073)	(0.051)
Rushing Yards	0.00112	0.000330
	(0.303)	(0.606)
Rushing Yards/Attempt	-0.312	0.199
	(0.160)	(0.304)
Rushing TD	-0.0331	0.0108
	(0.707)	(0.819)
Receiving Yards/Catch (RB)	0.0823	-0.00500
	(0.430)	(0.933)
Receiving TD (RB)	-0.0780	0.0313
	(0.623)	(0.792)
Power 5	1.328	0.0174
	(0.154)	(0.966)
All-American	0.0934	0.0289
	(0.877)	(0.962)
Constant	32.79	14.78
	(0.055)	(0.101)
N	16	128
R^2	0.710	0.078

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Running Backs — Above Expected

	Running Backs Difference	
	Earnings	Snaps
40-Yard Dash (sec.)	-269510020.5	1657.1
	(0.153)	(0.094)
3-Cone (sec.)	22930639.1	-185.3
	(0.596)	(0.654)
Rushing Yards	1113.9	0.277
	(0.987)	(0.403)
Rushing Yards/Attempt	-6773162.4	40.12
	(0.542)	(0.699)
Rushing TD	-655164.9	-21.26
	(0.912)	(0.377)
Receiving Yards/Catch (RB)	-2386162.6	-13.24
	(0.797)	(0.668)
Receiving TD (RB)	5413077.5	105.5
	(0.497)	(0.093)
Power 5	17768817.0	-49.19
	(0.698)	(0.820)
All-American	-39215808.2	50.94
	(0.306)	(0.867)
Constant	1.10402e+09	-6500.3
	(0.241)	(0.214)
N	12	111
R^2	0.872	0.068

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Wide Receivers

Wide Receivers		
	ln(Earnings)	ln(Snaps)
Height (in.)	-0.0872	-0.0368
	(0.369)	(0.711)
Hand Size (in.)	0.392	0.171
	(0.218)	(0.587)
Arm Length (in.)	0.148	0.0434
	(0.290)	(0.807)
40-Yard Dash (sec.)	0.786	-1.317
	(0.540)	(0.474)
Vertical Jump (in.)	-0.0559	0.0220
	(0.247)	(0.673)
3-Cone (sec.)	-0.00700	0.00341
	(0.990)	(0.997)
Receiving Yards/Catch	0.0630	0.0200
	(0.216)	(0.700)
Receiving TD	0.0178	0.0999^{**}
	(0.521)	(0.009)
Power 5	-0.423	0.356
	(0.210)	(0.291)
All-American	-0.0602	0.481
	(0.860)	(0.401)
Constant	13.41	9.660
	(0.085)	(0.335)
N	29	172
R^2	0.432	0.087

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Wide Receivers — Above Expected

Wide Receivers Difference		
	Earnings	Snaps
Height (in.)	-5741509.9	44.97

	(0.481)	(0.597)
Hand Size (in.)	25534187.7	-31.61
	(0.278)	(0.900)
Arm Length (in.)	8331747.6	107.9
	(0.419)	(0.459)
40-Yard Dash (sec.)	76927296.9	979.4
	(0.459)	(0.544)
Vertical Jump (in.)	-1702506.4	18.10
	(0.629)	(0.683)
3-Cone (sec.)	-21837783.2	145.0
	(0.630)	(0.839)
Receiving Yards/Catch	2065631.0	-62.58
	(0.538)	(0.153)
Receiving TD	182841.9	44.59
	(0.930)	(0.175)
Power 5	-10924935.5	251.7
	(0.672)	(0.418)
All-American	-7551270.1	1434.4^{**}
	(0.732)	(0.002)
Constant	-248086108.5	-12163.1
	(0.606)	(0.163)
N	26	136
R^2	0.232	0.133

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.00$

Table 8: Offensive Line

Offensive Line		
	ln(Earnings)	ln(Snaps)
Height (in.)	0.0421	0.0653
	(0.384)	(0.387)
Arm Length (in.)	0.0278	0.0452
	(0.590)	(0.637)

Bench Press Reps	-0.00600	0.0434*
	(0.636)	(0.029)
Power 5	-0.0900	0.0141
	(0.569)	(0.951)
All-American	0.326*	0.569
	(0.019)	(0.105)
Constant	13.75***	-0.850
	(0.000)	(0.876)
N	83	341
R^2	0.097	0.027

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Offensive Line — Above Expected

	Offensive Line Difference	
	Earnings	Snaps
Height (in.)	2741364.8	52.57
	(0.345)	(0.572)
Arm Length (in.)	1436427.5	50.35
	(0.650)	(0.659)
Bench Press Reps	136377.3	33.82
	(0.860)	(0.146)
Power 5	-6332560.6	37.68
	(0.535)	(0.891)
All-American	16361857.5	-260.3
	(0.055)	(0.507)
Constant	-258706992.4	-6590.0
	(0.177)	(0.315)
N	73	307
R^2	0.087	0.009

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Defensive Front

	Defensive Front	
	ln(Earnings)	ln(Snaps)
Height (in.)	-0.00273	-0.0177
	(0.952)	(0.761)
Arm Length (in.)	0.0643	0.185*
	(0.297)	(0.029)
40-Yard Dash (sec.)	-0.998	0.328
	(0.070)	(0.640)
Bench Press Reps	-0.00483	0.0343*
	(0.681)	(0.042)
Broad Jump (in.)	-0.0163	0.0163
	(0.168)	(0.340)
3-Cone (sec.)	0.252	0.178
	(0.364)	(0.645)
Power 5	-0.307	0.140
	(0.098)	(0.473)
All-American	-0.0205	1.083**
	(0.898)	(0.001)
Constant	21.01***	-4.140
	(0.000)	(0.461)
N	95	426
R^2	0.087	0.053

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Defensive Front — Above Expected

	Defensive Front Difference	
	Earnings	Snaps
Height (in.)	119788.6	-46.38
	(0.963)	(0.407)
Arm Length (in.)	2652783.5	113.0
	(0.450)	(0.163)

40-Yard Dash	-38325886.7	-61.86
	(0.236)	(0.926)
Bench Press Reps	-771502.3	15.10
	(0.263)	(0.345)
Broad Jump (in.)	-699683.6	-16.91
	(0.304)	(0.292)
3-Cone (sec.)	15665511.6	-398.6
	(0.369)	(0.272)
Power 5	-11363886.4	-1.541
	(0.308)	(0.993)
All-American	-1688595.7	479.8
	(0.856)	(0.117)
Constant	85919344.4	4523.8
	(0.736)	(0.401)
N	89	378
R^2	0.067	0.018

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12: Defensive Backs

Defensive Backs Difference

	Earnings	Snaps
Height (in.)	4000111.3	13.82
	(0.296)	(0.883)
Arm Length (in.)	-7643187.9	55.93
	(0.126)	(0.667)
40-Yard Dash (sec.)	5358479.1	1288.3
	(0.930)	(0.331)
Vertical Jump (in.)	-1001453.7	-3.697
	(0.597)	(0.938)
3-Cone (sec.)	-31469999.2	-809.1
	(0.201)	(0.165)
Power 5	-15256890.9	-185.6
	(0.159)	(0.470)

All-American	13417861.7	1461.5**
	(0.249)	(0.002)
Constant	185498233.0	-2646.7
	(0.552)	(0.764)
N	48	242
R^2	0.123	0.054

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: Defensive Backs — Above Expected

Defensive Backs Difference		
	Earnings	Snaps
Height (in.)	4000111.3	13.82
	(0.296)	(0.883)
Arm Length (in.)	-7643187.9	55.93
	(0.126)	(0.667)
40-Yard Dash (sec).	5358479.1	1288.3
	(0.930)	(0.331)
Vertical Jump (in.)	-1001453.7	-3.697
	(0.597)	(0.938)
3-Cone (sec.)	-31469999.2	-809.1
	(0.201)	(0.165)
Power 5	-15256890.9	-185.6
	(0.159)	(0.470)
All-American	13417861.7	1461.5**
	(0.249)	(0.002)
Constant	185498233.0	-2646.7
	(0.552)	(0.764)
N	48	242
R^2	0.123	0.054

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$