

Football Recruiting Stars Draft

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1 Introduction

Over the past twenty years college football recruiting has modernized. Information on high school prospects are now easily accessible online for college coaches and the general public. Additionally, several private firms offer rankings of high school players based on their natural ability and potential to play professionally in the National Football League (NFL). I have collected data from one of these private firms, 247Sports, and have the rating of all prospects from 2002-2016 in their database. Each prospect has a continuous rating from 0 to 1 which then corresponds to a discrete star rating from two to five. Each discrete star rating has to a distinct cutoff on the continuous scale $[0,1]$. I merge prospects rating with a few potential outcomes of interest such as: NFL draft selection, All-American Selection, All-Conference Selection and number of Division I offers (forthcoming). I intend to exploit the distinct cutoffs in the star rating system by using a regression discontinuity design to test if stars matter when it comes to the probability of being drafted or an All-American or All-Conference selection.

Star ratings from 247Sports and other recruiting firms were a novel concept when introduced in the early 2000s. These star ratings were intended to provide actionable and salient information for interested parties, most notably college coaches in an effort to reduce search costs during the recruiting process. The economics literature (Jin and Sorensen 2006, Darden and McCarthy 2014) has shown that when star ratings are salient, it can guide consumers in their consumption choices. This study seeks to illustrate whether the introduction of the star recruiting system better informs the general public and coaching community of prospect quality and helps improve matching between players and schools. Likewise, this study intends to find whether or not stars disseminate quality information to theoretically improve market outcomes such as identifying those prospects most likely to find success during their collegiate career and potential play football in the NFL.

2 Evolution of College Football Recruiting

The first college football game was played in 1869 between Rutgers University and Princeton. Since that time, over eight hundred and ninety universities play college football across various divisions - most notably Division I. According to the NCAA over one million high athletes participate in high school football and roughly seventy four thousand continue on to play collegiate football. This number becomes even smaller when considering the allocation of players across Division I, II, and III schools. A survey of high school athletics participation found that approximately 2200 high school football players go on to play Division I collegiate football, the number of athletes for Division II and III are similar.

Currently football programs are divided in one of two subdivisions at the Division I level. The two subdivisions are the Football Bowl Subdivision (FBS) and Football Championship Subdivision (FCS). The FBS is considered to be the more

competitive of the two subdivisions and can issue up to 85 full scholarships to athletes in comparison to only 63 for FCS schools. There are 129 FBS football teams with 11 different conferences (including Independents) and those schools compete to have the ability to participate in a four-team playoff deciding the national champion. Within the FBS there are two distinct groups, the Power Five and Group of Five. Power Five schools are believed to have more designated areas of institutional autonomy than their Group of Five counterparts. The FCS has 125 football teams with 14 conferences. At the end of the season, 24 teams compete in a playoff to crown a national champion. So while FBS and FCS schools may compete against each other during the season, during postseason play only schools from the same subdivision will compete against one another.

Given the number of four-year institutions and finite prospect pool with the talent to compete at the FBS and FCS levels, there exists fierce competition among schools to find and identify the best players. Likewise, prospects are competing against one another for limited scholarships. Up until the early 2000s, there was no widely available formal ranking system of high school football players interested in competing at the collegiate level. Therefore coaching staffs from each institution were responsible for evaluating potential prospects from a talent and skill perspective and endured search costs in the process. Therefore depending on the number of available staff members involved in the recruiting process as well as available funds, the evaluation process of potential recruits varied across FBS and FCS school members. As long as there has been football scouts, efforts to reduce search costs have been sought after. However like so many other things, the dot com boom made more information about players easier to access for college coaches. Starting in the early 2000s private companies, who had no affiliation to colleges and universities, such as Rivals, ESPN, and 24/7Sports emerged as dominant players in the college scouting and ranking information aggregation space. As a result, statistical information on high school athletes became more accessible though the internet and search costs for college coaches were reduced. Indeed, it was now possible to collect statistical game performance as well as visual scouting material without having a staff member present at a high school game.

24/7Sports is a company that began offering college football player recruiting rankings in 2000 and employs a staff of more than 50 full time recruiting reporters and evaluators that rank and compile data on the nation's elite high school recruits. The company states the goal of their rankings is to accurately project college success with an "element of raw ability baked in." 24/7Sports believes the NFL Draft is the best measuring stick to quantitatively measure the level of success and ability players exhibit during their college careers. Additionally they make the distinction that the purpose of these rankings are not to project to the NFL and state what a player does over the course of his NFL career is of minimal interest. The company believes being drafted into the NFL is the most objective measure of a player's performance in college versus looking at All-Conference selections or statistics which in their opinion can be "corrupted" by level of competition, scheme limitations, uninformed opinions as well as any number of factors.

24/7Sports has a composite rating system for high school football players that assigns a numeric value for each prospect between 0 and 1. Ratings for each player are continuous and correspond to a star value. Therefore based on a prospect's numeric rating, each player falls into the category of being a five, four, three, or two star prospect. 24/7Sports provides an explanation of their rating system and defines the prospects in each category. Five stars is the highest rating a prospect can achieve and corresponds to the top 32 players nationally who are most likely to be drafted in the first round from each recruiting class. The next category of prospects are four stars. Four stars are believed to be capable of having college careers worthy of being drafted and usually fall in the range of 350 prospects. Three stars correspond to the bulk of college prospects that are found and encompass a wide range of ability levels, all of which can be considered as NFL players long term. Three

star prospects can be fall into one of three categories: high, mid, and low. High three star prospects are considered to have significant NFL upside and project to be impact college players. Mid three star prospects project to be Power Five starters or impact players at the Group of Five level. Low three stars are prospects projected to be contributors at the Power Five level and impact starters at the Group of Five level. Prospects who are FBS level players with very limited NFL potential are two stars.

The 24/7Sports composite rating system is a proprietary algorithm that compiles prospect rankings and ratings listed in the public domain by the major media recruiting services¹. Their composite rating converts average industry ranks and ratings into a linear composite index which is capped at 1.00. A rating of 1.00 indicates a consensus number one prospect across all major media services. These major media services receive an equal percentage in the composite ranking where the composite index equally weights this percentage among the services that participate in a ranking for any given prospect. Due to each recruiting service having their own philosophy on the number of "stars" allocated to each recruiting class, the composite rating assigns stars based on an approximate average distribution of stars from the industry.

3 Data Collection

Composite ratings for all prospects from 2002-2016 were collected from the 24/7Sports website. In addition to the composite ratings, the following attributes for each prospect were collected: the first college or university a prospect enrolled at, the conference in which the prospect competed, position, position group, height, weight, national rank, positional rank, and state rank. There are 21 positions listed in the data which are then put in nine distinct groups. These groups include: athlete, receiver, defensive back, defensive line, linebacker, offensive line, quarterback, running back, and special teams. Height measurements are listed in total inches and weight measurements are listed in pounds. National rank denotes where a prospect ranks within their respective recruiting class irrespective of position. Positional rank denotes where a prospect ranks when only considering their position within a given class. Lastly, state rank denotes where a prospect ranks based on their home state regardless of position. While 24/7Sports does offer composite separate ratings for junior college (JUCO) prospects, these prospects were not included in the sample. However, any prospect who initially enrolled in a four year institution and later transferred to another like institution is included in the data.

NFL draft selections from 2005 to 2021 were collected from the Pro-Football-Reference website. NFL rules state a player must participate in three years of college football in order to become eligible for the NFL Draft. 2005 denotes the first year a prospect from the 2002 recruiting class would be eligible to be drafted. For each drafted prospect the following attributes were collected: draft year, draft round, draft pick, position, age, and last college or university attended. In addition to draft selection, All-American and All-Conference awards were collected for ranked prospects from 2002 to 2021 from their respective conference websites.

Table 1 shows the distribution of ratings, height, weight, and outcomes of interest by star and for the entire sample. Outcomes of interest include NFL Draft, All-American, and All-Conference selections². Every prospect in the sample has a rating, however height and weight were not available via the 24/7Sports website for roughly 120-130 prospects. The average rating for all prospects in the sample was .814 and the average height and weight was 73.839 inches and 219.45 pounds,

¹Source: 24/7Sports

²All-Conference is broken out between Power 5 and Non-Power 5

respectively. 2,951 prospects in the sample were drafted and 737 earned All-American selections. There are 4,541 All-Conference selections with 2,684 (59.1%) coming from the Power 5 conferences and 1,857 (40.9%) coming from the Non-Power 5 conferences. On average, five star prospects are the tallest and heaviest. However, the average height difference between two, three, four and five stars are separated by less than one inch. Differences in average weight by prospect group are relatively larger in comparison to height. Five star prospects on average are about 1.96% heavier than four stars and 5.27% heavier than three stars. Table 1 also shows the ratings range for each star group. Most important to this study is the distinct cutoff for ratings differentiating prospects from different star groups. Based on the minimum and maximum value ratings for each star group, it is impossible for any prospect to fall into more than one star group. The distinct cutoffs remain constant for the entirety of the sample (2002-2016), meaning a four star prospect rated in 2002 would be rated as four star prospect for all subsequent years.

Table 2 shows the distribution of the stars throughout the sample based on the college or university they enrolled as well as the position group they were assigned as a prospect. There are a total of 39,855 rated prospects in the sample and 36,196 (90.9%) of those prospects enrolled at a college or university. The top half of table 2 shows the conference in which each prospect enrolled at. Conference USA and the Mid American Conference (MAC) had the lead all conferences in two star enrolled prospects and roughly accounted for a third of all two star prospects. Three star prospects represented the largest star category to enroll at a college or university in the sample at 46.9%. 64.6% of three star prospects chose to enroll at a Power-5 college or university. Four star prospects represent 10.6% of enrolled prospects. 30.3% of prospects who enrolled chose to play at a Southeastern Conference (SEC) university. The conference with the next highest share of enrolled four star prospects was the Pacific 10/12 conference at 15%. 90.6% of enrolled four star prospects chose to play at a Power 5 college or university. Five star prospects represent the smallest star rating of enrolled prospects in the sample at 1.39% and are usually capped at 32 prospects for each recruiting cycle. When explaining the fixed number of five star prospects, 24/7Sports states: five star prospects are *"The top 32 players in the country to mirror the 32 first round picks in the NFL Draft. These are 32 players that we believe are the most likely to be drafted in the first round from each recruiting class."* More than a third (37.4%) of enrolled five star prospects choose to play in the SEC, the conference with the next largest share of enrolled five star prospects was the Atlantic Coast Conference (ACC) at 17.3%.

The bottom half of Table 2 shows the distribution of prospects by star category as well as the distribution based on the position group they were assigned. Wide receivers (REC) were the most common prospects in the sample followed by offensive linemen (OL), defensive linemen (DL), and defensive backs (DB) respectively. The most common star rating and position group pairings are four star wide receivers, three star offensive linemen, and three star wide receivers. When considering only five star prospects, defensive linemen are the most common in the sample at 22.7%, wide receivers follow at 14.5%.

4 Methodology and Results

The empirical estimation strategy of this study can be separated into two parts. The first part estimates the marginal effect of a recruiting star on the probability of attaining certain athletic outcomes of interest as well as the probability of attending a R1 or R2 research institution. The second part of the empirical strategy estimates the marginal effect of a recruiting star on the probability of receiving a scholarship offer from a head football coach based on his tenure. For the first part of the

Table 1: Summary statistics

2 Star	Mean	Std. Dev.	Min	Max	Obs
Rating	.758	.026	.4278	.7967	17,489
Height	73.628	2.578	61	82	17,412
Weight	217.588	42.311	135	425	17,405
Offers	2.117	2.246	0	43	17,489
Drafted					508
All-American					88
All-Conference					1,376
P5 All-Conference					272
Non P5 All-Conference					1,104
3 Star					
Rating	.838	.024	.7968	.8899	17,951
Height	73.931	2.573	61	82	17,905
Weight	219.406	42.51	139	402	17,903
Drafted					1,310
All-American					310
All-Conference					2,109
P5 All-Conference					1,418
Non P5 All-Conference					691
4 Star					
Rating	.928	.028	.89	.9832	3,885
Height	74.283	2.496	61	81	3,884
Weight	226.543	44.057	141	380	3,884
Drafted					861
All-American					224
All-Conference					814
P5 All-Conference					756
Non P5 All-Conference					58
5 Star					
Rating	.991	.005	.9833	1	503
Height	74.436	2.5	61	80	503
Weight	230.964	44.849	160	355	503
Drafted					271
All-American					115
All-Conference					241
P5 All-Conference					237
Non P5 All-Conference					4
All					
Rating	.814	.063	.428	1	39,855
Height	73.839	2.576	61	82	39,731
Weight	219.45	42.698	135	425	39,722
Drafted					2,950
All-American					737
All-Conference					4,540
P5 All-Conference					2,683
Non P5 All-Conference					1,857

Table 2: Stars by Conference and Position Group

Conference	Two Star	Three Star	Four Star	Five Star	Total
ACC	520	2,440	582	87	3,629
Big 12	519	2,155	549	57	3,280
Big East	589	979	127	14	1,709
Big Ten	650	2,184	593	56	3,483
CUSA	2,267	1,210	24	2	3,503
D2	26	1	0	0	27
FCS	1,201	373	3	0	1,577
Ind	589	299	155	16	1,059
MAC	2,744	822	2	0	3,568
MW	1,554	979	30	2	2,565
PAC	450	1,947	607	80	3,084
SEC	392	2,266	1,168	188	4,014
Sun Belt	1,887	469	3	0	2,359
WAC	1,106	373	6	0	1,485
Total	14,832	17,001	3,860	503	36,196

Position Group	Two Star	Three Star	Four Star	Five Star	Total
ATH	1,093	1,327	240	20	2,860
DB	2,832	2,755	567	70	6,224
DL	2,646	2,810	697	114	6,267
LB	2,146	2,131	450	57	4,784
OL	2,934	2,840	594	54	6,422
QB	976	1,162	274	47	2,459
RB	1,463	1,654	378	68	3,563
REC	2,913	2,959	678	73	6,623
ST	512	310	7	0	829
Total	17,515	17,948	3,885	503	39,851

empirical analysis, I merged all the data sources from the previous section to create a cross section where each prospect is an observation. For every observation, physical characteristics as well as school enrollment are merged with selected outcomes of interest in this study. Selected outcomes of interest include: the number of college scholarship offers, NFL Draft Selection, All-American Selection, and All-Conference Selection. All-Conference selections are differentiated between Power Five and Non-Power Five. In addition to studying these four athletic outcomes, I also have collected data on the Carnegie classification of the school each prospect enrolled at and the graduation rate for the cohort in the year a prospect enrolled. I use a regression discontinuity design to exploit exogenous variation around the cutoff thresholds for different star ratings in order to estimate the marginal effect of a star on both athletic and academic outcomes. In general, the estimating equation is as follows:

$$y_i = \beta_0 + \beta_1 \tilde{x} + \beta_2(Star) + \beta_3 1(Star) * (\tilde{x}) + \epsilon \quad (1)$$

where y_i denotes selected outcomes. In the cases where the dependent variable denotes NFL draft selection or All-American and All-Conference selections, y_i is equal to 1 if a prospect is drafted or earns and All-American or All-Conference selection. $\tilde{x}$ is equal to $(x - c)$ and denotes the transformed running variable. x is equal to the prospect's continuous rating between 0 and 1 and c denotes the cutoff threshold for each discrete star rating. This study measures the marginal effect of a recruiting star around three distinct thresholds - .9833, .8899, and .7967. $Star$ is a indicator variable equal to 1 when a prospect's rating is greater than the cutoff (c) for a given threshold. β_2 estimates the effect of a marginal recruiting star on selected outcomes of interest. β_3 measures the interaction term between a prospects transformed rating and indicator if they are to the right of a given cutoff. The inclusion of this terms allows the slope of the regression line to vary before and after the cutoff. For each estimating equation, the sample is restricted to a small bandwidth around one of the three distinct thresholds. This will lead to greater variance in regression discontinuity estimates but will reduce misspecification bias.

Table 3 shows the results of equation 1 for each star rating threshold where the outcomes of interest are: college scholarship offers, NFL draft selection, All-American and All-Conference selection. Row 1 shows the marginal effect of being a five star recruit on the probability a prospect receives a college scholarship offer, is drafted into the NFL, or achieves All-American or All-Conference status. Being a five star recruit has no effect on the probability of receiving an additional offer or being selected for All-American or All-Conference status. However, the marginal effect of being a five star recruit has a negative effect on the probability of being drafted into the NFL. Row 2 and 3 show the marginal effect of being a four and three star on the same outcomes of interest, respectively. Similarly, there is no effect of a marginal recruiting star at either the four or three star threshold on the probability of receiving an additional scholarship offer, being drafted, or attaining All-American or All-Conference status. Results shown in table 3 are robust to the inclusion of prospect level characteristics such as height, weight, tenure of head coach, positional group, and school, coach, year fixed effects. Estimates are shown in the appendix.

For the second part of the empirical analysis, the data is transformed to create a school and coach pairing for each prospect given their recruiting class year. Instead of being a single observation, each prospect now has 127 observations, one for each school and coach pairing for that given year. For each coach/school pairing we observe whether or not a prospect was offered a college scholarship, we denote this variable as "offer" and it equal to 0 or 1. In addition to observing whether a coach offered a prospect a scholarship offer, we also denote the year of a head coach's tenure at the given school. The value for head coach tenure ranges from 0 to 45. In order to estimate the marginal effect of a marginal recruiting star on the probability of receiving a scholarship offer, we use the following regression equation:

Table 3: Regression Discontinuity Results for Athletic Outcomes

	(1) Offers	(2) Drafted	(3) All-American	(4) All-Conference
5 Star	0.564 (1.057)	-0.105* (0.059)	-0.065 (0.043)	-0.041 (0.060)
4 Star	-0.147 (0.313)	0.008 (0.015)	0.001 (0.008)	0.002 (0.016)
3 Star	-0.186 (0.121)	-0.007 (0.007)	-0.000 (0.003)	-0.009 (0.011)
<i>N</i>	1097	1097	1097	1097

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Regression Discontinuity Results for Academic Outcomes

	(1) Graduation Rate	(2) R1 Enrollment	(3) R2 Enrollment
5 Star	-0.005 (0.017)	0.003 (.045)	0.005 (.045)
4 Star	-0.003 (0.007)	-0.046** (0.018)	0.019 (0.017)
3 Star	0.016 (0.011)	0.041** (0.019)	-0.004 (0.019)
<i>N</i>	1082	11342	8680

Dependent variable graduation rate is logged. Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

$$offer = \alpha + \beta_1(\tilde{x}) + \beta_2 1(Star) + \beta_2 1(Star) * (\tilde{x}) + \epsilon \quad (2)$$

where *offer* is equal to 1 if the prospect received a recruiting offer. $\tilde{x}$ denotes the transformed running variable where $\tilde{x} = (x - c)$. x is a prospect's rating between 0 and 1 while c is the rating cutoff for a given discrete star threshold. *Star* is an indicator variable equal to 1 if the prospect's rating exceeds the cutoff value for a given threshold. As in the first part, we study the effect of a marginal recruiting star on the probability of receiving a scholarship offer desperately at three distinct thresholds. When estimating the effect of a marginal recruiting star at each threshold, the sample is restricted to a smaller bandwidth around the applicable threshold.

Table 5: Offer Probability at 5 Star Threshold

	(1)	(2)	(3)	(4)
Tenure	All	1-3	4-6	7+
5 Star	0.009*** (0.003)	0.009** (0.004)	0.014*** (0.005)	0.003 (0.006)
<i>N</i>	144,447	70,864	38,695	34,888

Offer is dependent variable. Tenure is expressed in years. Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5 shows the results of Equation 2 at the five star threshold. Estimates are broken out into four groups by head coach tenure: all, one to three years, four to six years, and greater or equal to seven years. When considering all coaches the marginal effect of being a five star recruit increases the probability of receiving a scholarship offer. This is also true for newer coaches who have only been in their position for three years or less. The largest change in probability of receiving a scholarship offer occurs when considering coaches who have been in their current position between four and six years. The average tenure of coaches in this restricted sample is five years. Finally, when considering coaches who have a tenure of at least seven years, there is no change in the probability of receiving an offer.

Table 6 shows the estimates from Equation 2 at the four star thresholds. Estimates are broken out by the aforementioned tenure groups. When considering the effect of the marginal recruiting star on the probability of receiving an offer, at the four star threshold, this effect is negative regardless of the tenure level of the head football coach. The largest decrease in expected probability of receiving an offer occurs at the four to six year tenure level. The expected decrease in probability of receiving an offer is the same amongst coaches whom have a tenure of three years or less and those who have a tenure of at least seven years. Table 7 shows the results from equation 2 at the three star threshold. Based on the results from table 7 there is no marginal effect from a recruiting star at the three star threshold on the probability of receiving an offer. These results are consistent regardless of the tenure level of the head coach.

When considering the estimates from Equation 2 from all three thresholds, the largest change in expected probability was largest at the five star threshold amongst head football coaches in the four to six tenure year level. The next largest increase in expected probability of receiving an offer was again at the five star threshold for coaches with a tenure level of three years or less. The expected change in probability of receiving at the five star threshold is positive and significant for all tenure level groups with the exception of those coaches with the highest tenure level. At the four star threshold, the expected change in probability is negative and significant for all coach tenure groups and largest amongst coaches with four to six years of tenure.

Table 6: Offer Probability at 4 Star Threshold

	(1)	(2)	(3)	(4)
Tenure	All	1-3	4-6	7+
4 Star	-0.004*** (0.001)	-0.003** (0.001)	-0.006*** (0.001)	-0.003* (0.002)
<i>N</i>	2,219,583	1,114,748	588,838	515,997

Offer is the dependent variable. Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Offer Probability at 3 Star Threshold

	(1)	(2)	(3)	(4)
Tenure	All	1-3	4-6	7+
3 Star	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
<i>N</i>	2,589,952	1,287,094	698,726	604,132

Offer is the dependent variable. Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Estimates at the four star threshold are smaller than those of the five star threshold. Results from Equation 2 suggest there is no effect on the probability of receiving an offer at the three star threshold. In the next section, we discuss the possible mechanisms for these results and offer further interpretation.

5 Discussion

Forthcoming

6 Conclusion

Forthcoming

7 Appendix

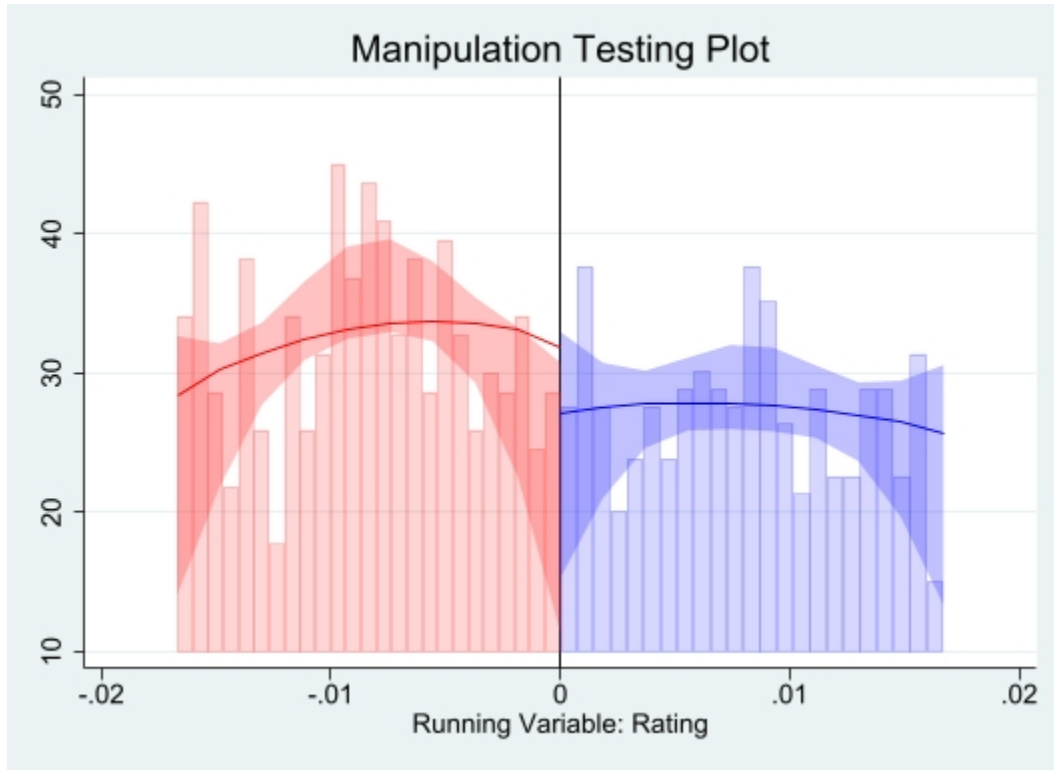


Figure 1: Density Test: Five Star Threshold

Table 8: Basic regression table

	(1) offers	(2) drafted	(3) aa	(4) ac
fivecut	14.222 (53.939)	15.324*** (4.297)	8.389*** (2.660)	16.496*** (4.062)
5 Star	0.185 (0.706)	-0.140** (0.061)	-0.089** (0.045)	-0.067 (0.061)
fiveinter	74.084 (72.182)	6.704 (6.226)	8.888* (4.755)	-5.025 (6.195)
_cons	-3.490 (8.466)	-1.385** (0.662)	0.258 (0.519)	0.209 (0.684)
<i>N</i>	1095	1095	1095	1095
Controls	Y	Y	Y	Y
School FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$