The Returns to Elite College Athletic Programs

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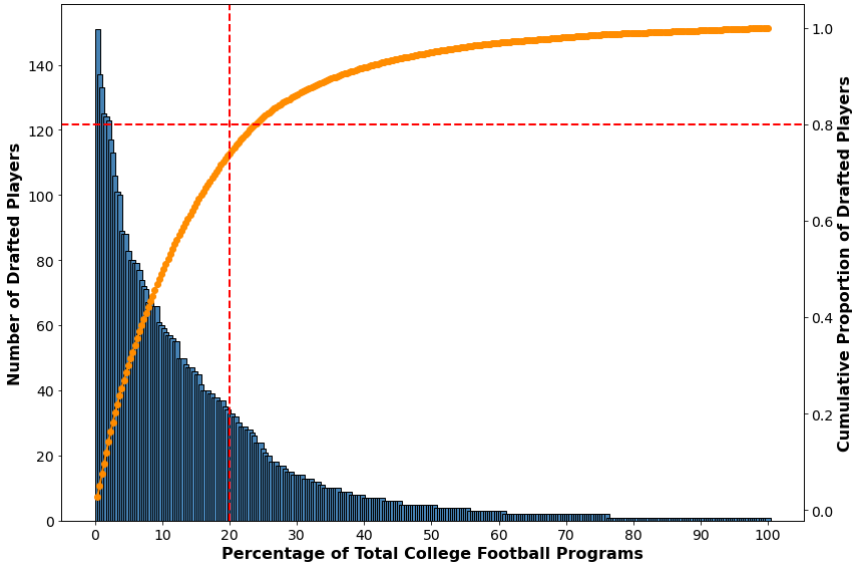

Number of Drafted Players
Cumulative Proportion of Drafted Players
Percentage of Total College Football Programs
0
20
40
60
80
100
120
140
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
50
60
70
80
90
100

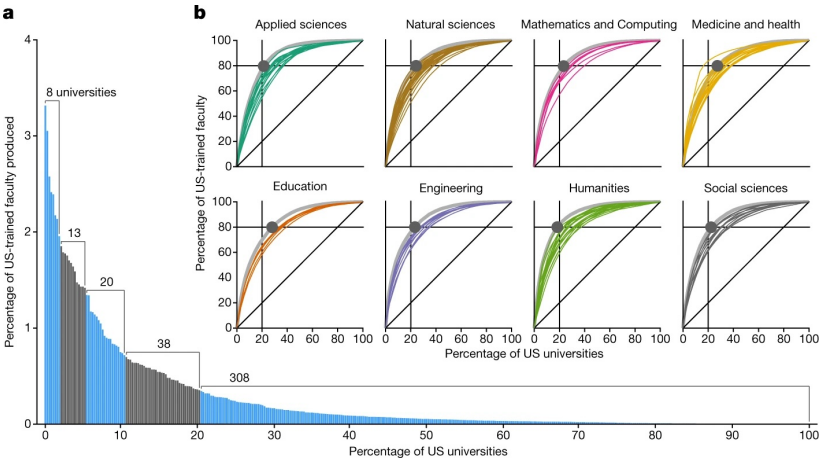


Figure: Wapman, K.H., Zhang, S., Clauset, A. et al. Quantifying hierarchy and dynamics in US faculty hiring and retention. Nature, 120–127 (2022).

What are the returns to participation in elite college sports programs?

Measure impact of elite sports programs on career trajectory of highly recruited student athletes

Summary:

- Assemble a large panel data set following student athletes from high school, college, and professional careers
- Exploit variation in offersets to apply a matching empirical strategy addressing selection
- Provide selection corrected estimates of private returns to education

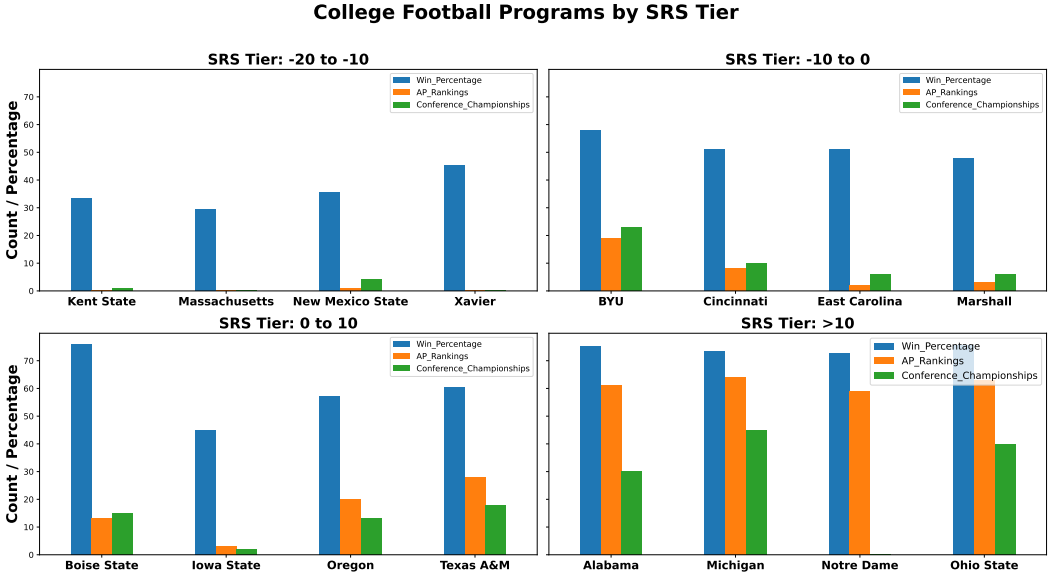
- Limited Consensus on Economic Returns to Elite Programs:
  - Dale and Kruger (2002): Returns indistinguishable from zero, measured by earnings 20 years after graduation (self-reported earnings) (QJE)
  - Dale and Kruger (2011): Returns indistinguishable from zero, earnings measured with tax records 5 - 30 years after graduation (JHR)
  - Chen, Grove, & Hussey (2012): Reported substantial returns to selective MBA programs, measured by self-reported hourly earnings 1-7 years after graduation (Economic Letters)
  - Ge et. al, (2020): Controlling for selection eliminates the positive relationship between college selectivity and earnings for men but not for women.
  - Mountjoy & Hickman (2021): "A fleeting selectivity earnings premium fades to zero after a few years in the labor market."
  - Chetty, Deming, & Friedman (2023): "Attending an Ivy-Plus college instead of the average selective public institution increases chances of reaching top 1% of earnings distribution by 60%"

College Team Quality: Simple Rating System (SRS) Massey (1997)

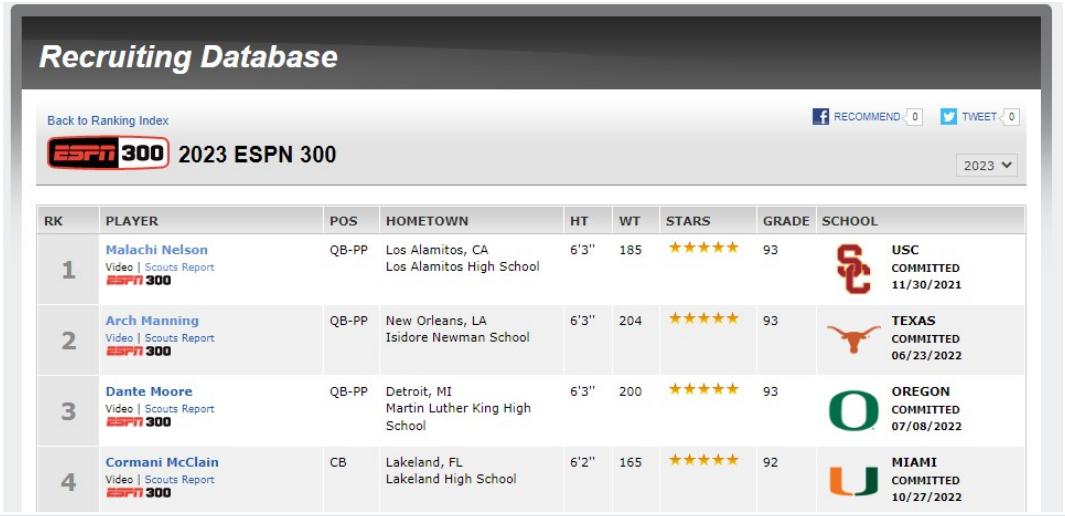
Average Margin of Victory $\times$ Strength of Schedule

$$Ax = b$$

- x - Simple Rating System measure
- b: Average margin of victory: (Points scored) - (points allowed)
- A - Strength of Schedule (SOS)
  - SOS: $\frac{2\times(OpponWin\%)+1\times(Oppo.oppo.win\%)}{3}$
- Reported by NCAA, & every major sports analytics website
- Generalizes to many sports / teams
- Variations used to seed bowl games & March madness tournament


College Football Programs by SRS Tier
SRS Tier: -20 to -10
SRS Tier: -10 to 0
SRS Tier: 0 to 10
SRS Tier: >10
Count / Percentage
Win_Percentage
AP_Rankings
Conference_Championships
Kent State
Massachusetts
New Mexico State
Xavier
BYU
Cincinnati
East Carolina
Marshall
Boise State
Iowa State
Oregon
Texas A&M
Alabama
Michigan
Notre Dame
Ohio State

Largest sports network in US (ESPN) created national ranking HS players in 2006



Recruiting Database

Back to Ranking Index

RECOMMEND 0 TWEET 0

ESPN 300 2023 ESPN 300

2023

RK	PLAYER	POS	HOMETOWN	HT	WT	STARS	GRADE	SCHOOL
1	Malachi Nelson Video | Scouts Report ESPN 300	QB-PP	Los Alamitos, CA Los Alamitos High School	6'3''	185	★★★★★	93	USC COMMITTED 11/30/2021
2	Arch Manning Video | Scouts Report ESPN 300	QB-PP	New Orleans, LA Isidore Newman School	6'3''	204	★★★★★	93	TEXAS COMMITTED 06/23/2022
3	Dante Moore Video | Scouts Report ESPN 300	QB-PP	Detroit, MI Martin Luther King High School	6'3''	200	★★★★★	93	OREGON COMMITTED 07/08/2022
4	Cormani McClain Video | Scouts Report ESPN 300	CB	Lakeland, FL Lakeland High School	6'2''	165	★★★★★	92	MIAMI COMMITTED 10/27/2022

High School Career: ESPN.com

- $\approx$ 25,000 high school football athletes ranked top 1% of graduating class by ESPN professional scouts
- Observe every scholarship offer extended and where athlete plays college football

Collegiate Career

- Sports-reference.com
  - Player & Team performance measures
  - NFL Combine & NFL Draft Outcomes
  - College Program Quality Measures
- Equity in Athletics Disclosure Act (EADA) 2000 - 2021
  - College Program Quality Measures
  - College Program Athletic Department Financial Data
- Massey Sports Rankings: MasseyRatings.com
  - College Program Quality Measures

Professional Career: Spotrac.com

- Salary contract info each year professional career
- Professional player & Team performance
- Team performance measures

Naive Returns Model: coefficient of interest β_1, returns to participation

$$y_{ij} = \beta_0 + \beta_1 Q_j + \beta_2^{'} X_{1i} + \beta_3^{'} X_{2i} + \epsilon_{ij} \tag{1}$$

- Individual i, College Team j
- y_{ij}: Labor market outcomes: job placement (drafted), rank/round of being drafted, career length
- Q_j: College Sports Program Quality: Program (SRS)
- X_{1i} : Athlete Observable Characteristics, (height, weight), analyst score/rankings, position
- X_{2i} : **Unobservable athlete characteristics: team work, coachability, git**
- ϵ_{ij} : Error Term

Matched Applicant Model: Dale & Krueger (2002)

$$y_{ijg} = \beta_0 + \beta_1 Q_j + \beta_2^{'} X_{1i} + \sum_{1}^{m} \gamma_g Group_{ig} + \epsilon_{ijg} \tag{2}$$

- Individual i, College Team j, Matching Group g
- y_{ijg}: Labor market outcomes: job placement (drafted), rank/round of being drafted, career length
- Q_j: College Sports Program Quality (Simple Rating System)
- X_{1i} : Athlete Observable Characteristics, (height, weight), analyst score/rankings, state, position
- $Group_{ig}$: Match offer-set group indicator variables
- ϵ_{ijg} : Error Term

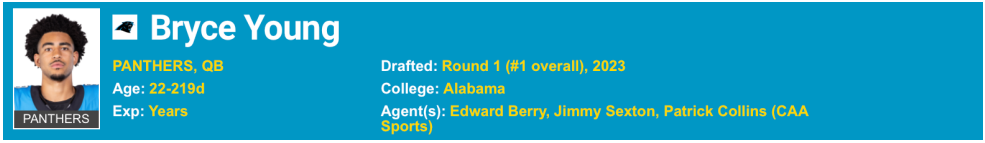
Self-Revelation Model: Dale & Krueger (2002)

$$y_{ijg} = \beta_0 + \beta_1 Q_j + \beta_2^{'} X_{1i} + \beta_3^{'} X_{2ijg} + \epsilon_{ijg} \tag{3}$$

- Individual i, College Team j, Scholarship Offer set g
- y_{ijg}: Labor market outcomes: job placement (drafted), rank/round of being drafted, career length
- Q_j: College Sports Program Quality (Simple Rating System)
- X_{1i} : Athlete Observable Characteristics, (height, weight), analyst score/rankings, state, position
- X_{2ijg} : **Average Quality of Offer-set & Total Number Scholarship Offers**
- ϵ_{ij} : Error Term

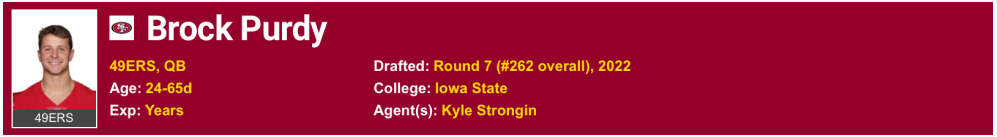
Identifying Assumption: Athletes enrollment decision random conditional on offerset

Name	Offers	Offerset Valuation
Brock Purdy	Alabama, Iowa State, Kansas, Boise State, UC Davis, UCF, UNLV, N. Arizona	0.569
Bryce Young	Alabama, Arizona St, Utah, Georgia, Hawaii, San Jose St, UAB, USC, $\cdots$	0.581



College: **Alabama**

1st Year Earnings: $25,353,688



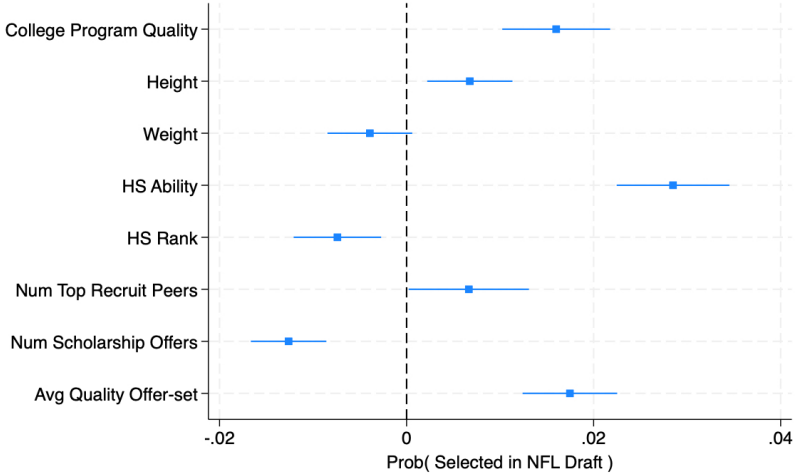
College: **Iowa State**

1st Year Earnings: $1,030,346

	(1) Basic Model	(2) Matched Applicant 1	(3) Matched Applicant 2	(4) Self-Revelation Model
College Quality (SRS)	0.043***	0.018***	0.016***	0.018***
	(0.00)	(0.00)	(0.00)	(0.00)
Athlete Controls		✓	✓	✓
Scholarship Offer-set Controls				✓
Mean Drafted	0.06	0.06	0.06	0.06
R^2	0.027	0.051	0.100	0.045
N	20,298	20,331	20,289	20,298
# Groups	-	32	1,011	-

Standard errors in parentheses

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



Alternative Quality Measures

	(1) Draft Pick	(2) Draft Round	(3) 1st Year Earnings
College Quality (SRS)	-6.846***	-0.176***	119,417
	(3.31)	(0.09)	(150,693)
Athlete Controls	✓	✓	✓
Scholarship Offer-set Controls	✓	✓	✓
Mean Outcome	125	4.11	3.09 (Millions)
R^2	0.104	0.016	0.083
N	1,488	1,488	1,550

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Returns Conditional on Drafted in NFL

Measures of Career Length

- Games played
- Games Started
- Number years in the league

Measures of Career Earnings

- Annual Earnings
- Total Career Earnings
- 1st Year Earnings

Measures of Career Productivity

- Approximate Value
- Career Productivity
- 1st Year Productivity

Employment Share

$$\text{Employment Share} = \frac{\text{Number of Employed Players}}{\text{Total Number of Players}}$$

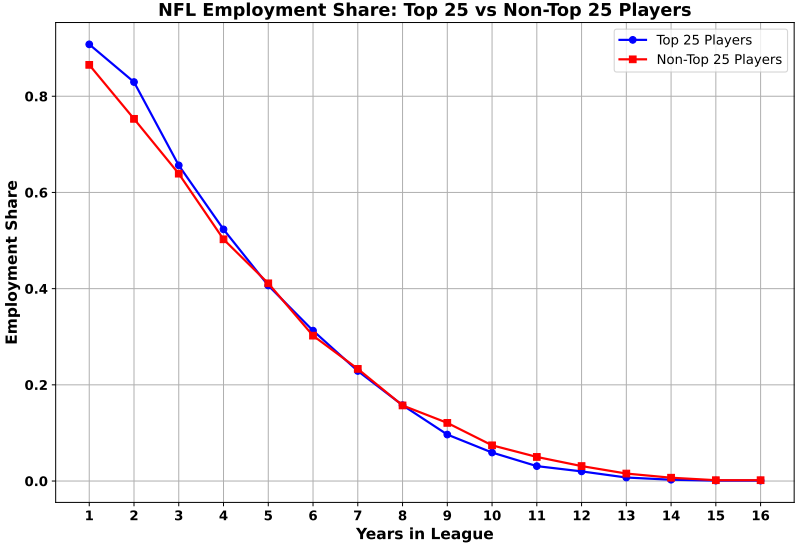
$$\text{Employment Share}_{\text{group}}(t) = \frac{\sum_{i=1}^{N} \text{Employment Status}_{i,t}}{N}$$

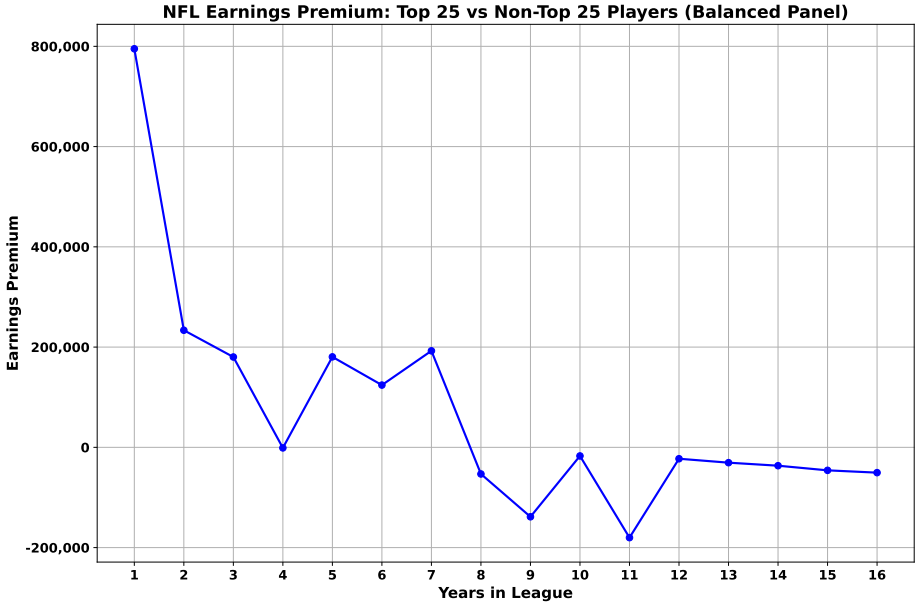
Earnings

$$g \in \{\text{Top 25}, \text{Non-Top 25}\}$$

$$\text{Average Earnings}_g(t) = \frac{1}{N_g} \sum_{i=1}^{N_g} \text{Earnings}_{i,t}$$

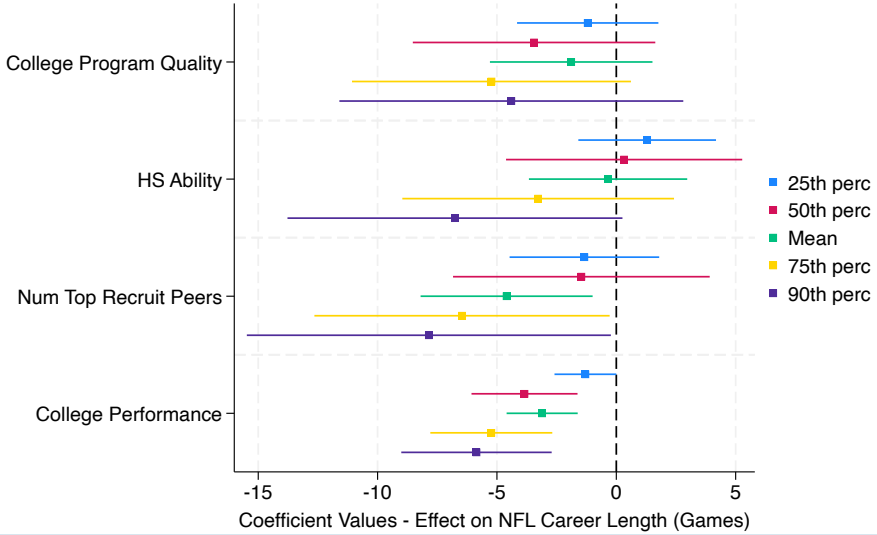
$$\text{Earnings Premium}(t) = \text{Average Earnings}_{\text{Top 25}}(t) - \text{Average Earnings}_{\text{Non-Top 25}}(t)$$

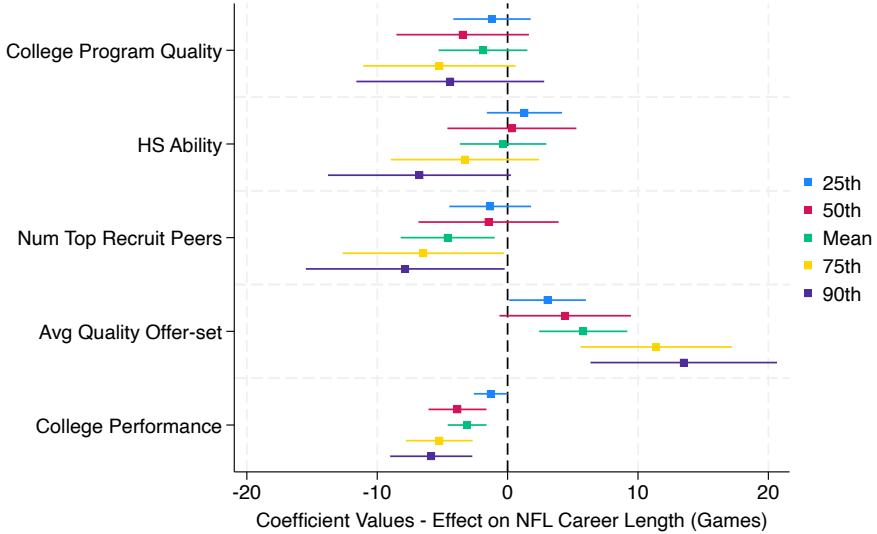

NFL Employment Share: Top 25 vs Non-Top 25 Players
Top 25 Players
Non-Top 25 Players
Employment Share
0.0
0.2
0.4
0.6
0.8
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Years in League

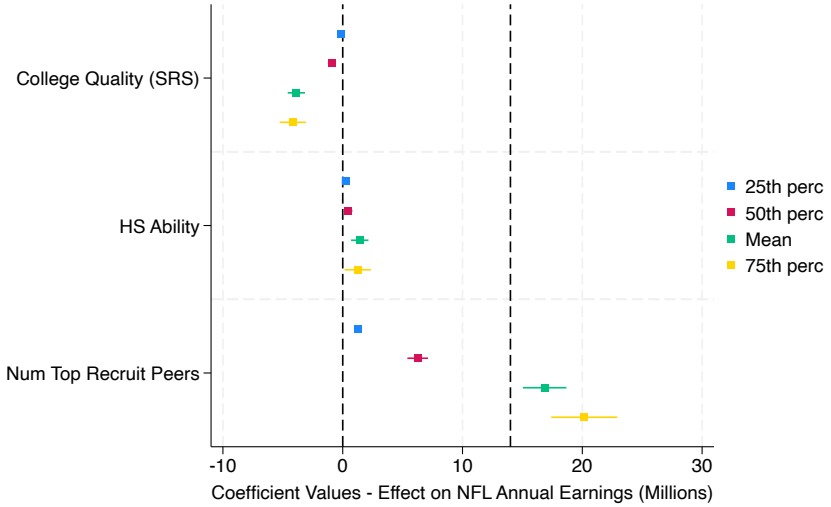

NFL Earnings Premium: Top 25 vs Non-Top 25 Players (Balanced Panel)
Earnings Premium
800,000
600,000
400,000
200,000
0
-200,000
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Years in League

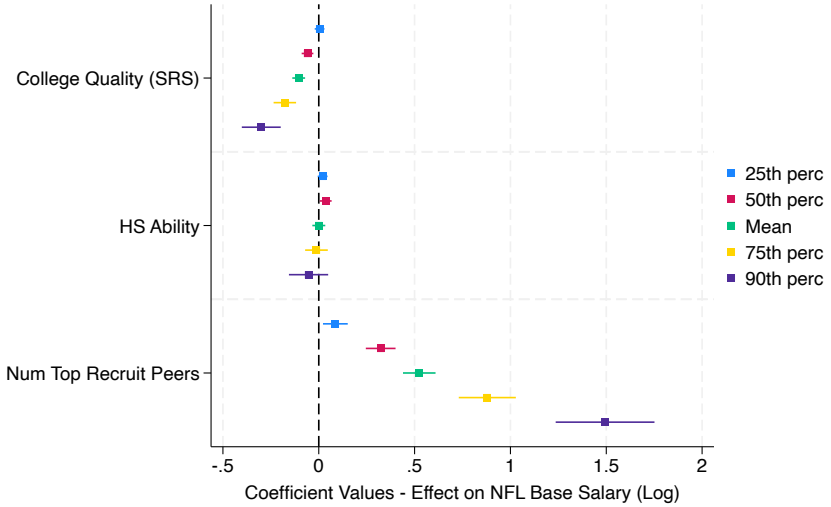
	(1) NFL Games	(2) Seasons as Starter	(3) Years in League
College Quality (SRS)	-0.838	0.108	-0.122
	(1.72)	(0.11)	(0.12)
Athlete Controls	✓	✓	✓
Scholarship Offer-set Controls	✓	✓	✓
Mean Outcome	48.87	1.76	3.35
R^2	0.007	0.005	0.0045
N	1,389	1,389	1,389

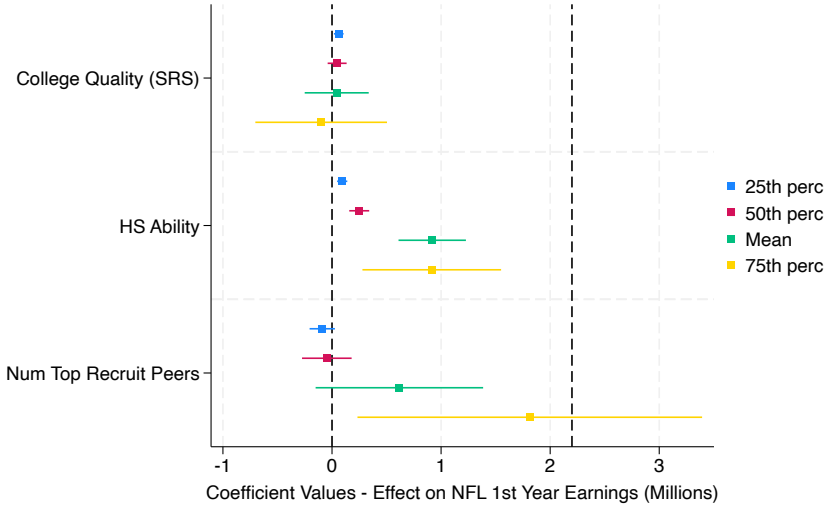
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$


College Program Quality
HS Ability
Num Top Recruit Peers
College Performance
25th perc
50th perc
Mean
75th perc
90th perc
-15
-10
-5
0
5
Coefficient Values - Effect on NFL Career Length (Games)


College Program Quality
HS Ability
Num Top Recruit Peers
Avg Quality Offer-set
College Performance
25th
50th
Mean
75th
90th
-20
-10
0
10
20
Coefficient Values - Effect on NFL Career Length (Games)

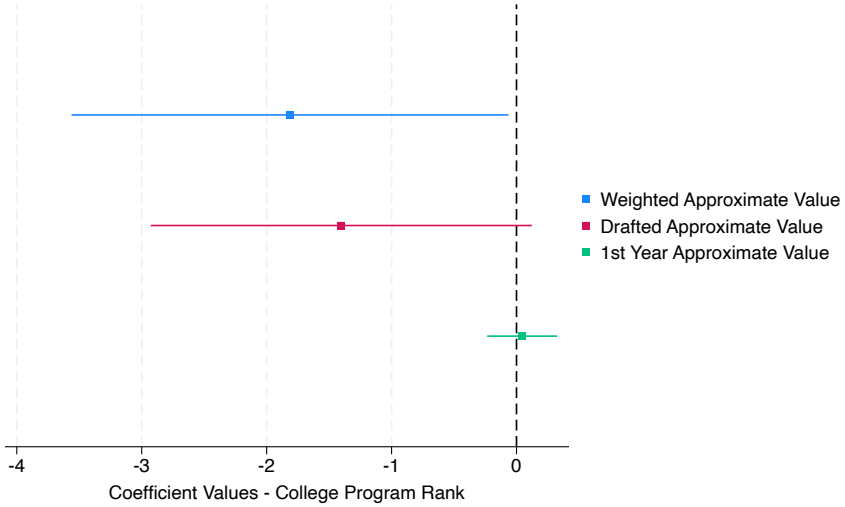

College Quality (SRS)
HS Ability
Num Top Recruit Peers
25th perc
50th perc
Mean
75th perc
-10
0
10
20
30
Coefficient Values - Effect on NFL Annual Earnings (Millions)

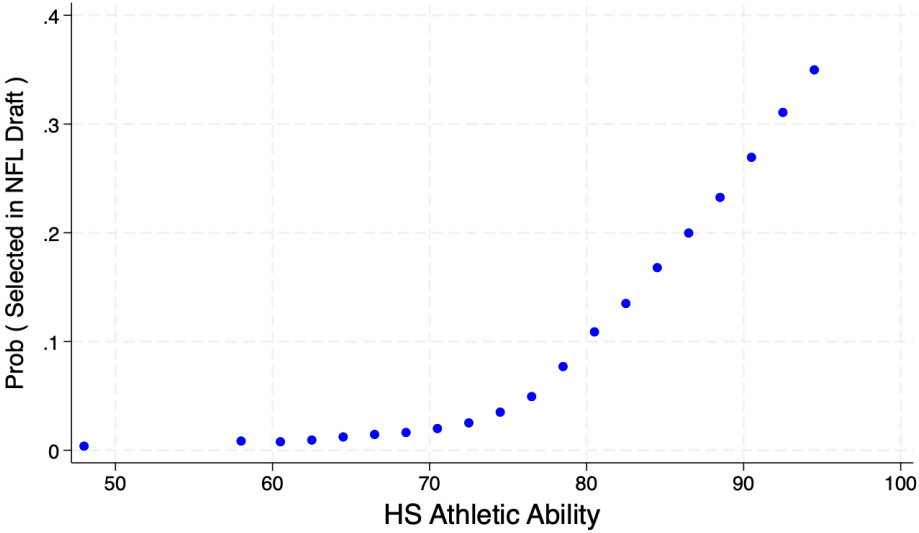

College Quality (SRS)
HS Ability
Num Top Recruit Peers
25th perc
50th perc
Mean
75th perc
90th perc
-.5
0
.5
1
1.5
2
Coefficient Values - Effect on NFL Base Salary (Log)


College Quality (SRS)
HS Ability
Num Top Recruit Peers
25th perc
50th perc
Mean
75th perc
-1
0
1
2
3
Coefficient Values - Effect on NFL 1st Year Earnings (Millions)

	(1) Weighted AV	(2) Drafted AV	(3) 1st Year AV
College Quality (SRS)	-1.61	-1.28	0.03
	(0.90)	(0.79)	(0.14)
Athlete Controls	✓	✓	✓
Scholarship Offer-set Controls	✓	✓	✓
Mean Outcome	16.08	12.99	3.02
Std Outcome	18.06	15.75	2.87
R^2	0.043	0.034	0.023
N	1,217	1,217	1,217

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$


Weighted Approximate Value
Drafted Approximate Value
1st Year Approximate Value
-4
-3
-2
-1
0
Coefficient Values - College Program Rank


Prob (Selected in NFL Draft)
.4
.3
.2
.1
0
50
60
70
80
90
100
HS Athletic Ability

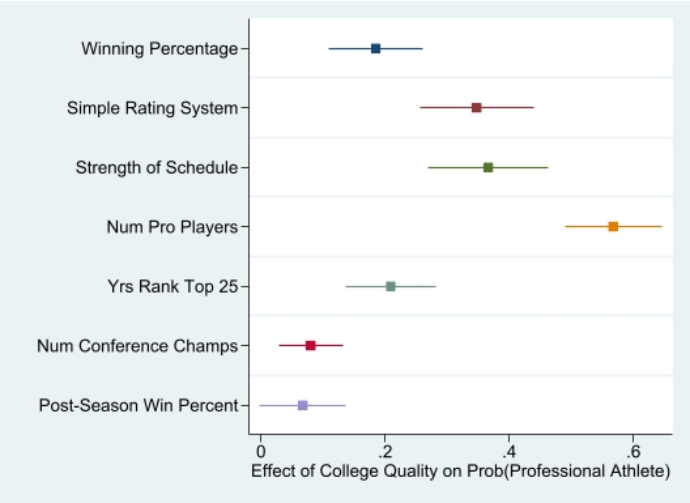
- Majority of benefit of elite schools is better job placement
- College Program Rank, HS Ability, & College Performance limited impact as on professional athlete outcomes
- Peer effects & Offerset evaluation impact career length & earnings
- Results consistent with Hendericks et. al (2003), Kitchens (2014)

Thank You!

	(1) Self Revelation	(2) Match Model 1	(3) Match Model 2	(4) Match Model 3	(5) Match Model 4	(6) Match Model 5
College Quality (SRS)	0.018***	0.018***	0.017***	0.016***	0.018***	0.014***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Athlete Controls	✓	✓	✓	✓	✓	✓
Scholarship Offer-set Controls	✓					
R^2	0.045	0.051	0.092	0.100	0.183	0.194
N	20,298	20,331	20,256	20,289	18,589	16,075
Groups	-	32	908	1,011	4,127	6,575

Standard errors in parentheses

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



Main Presentation

	(1) NFL Draft Pick Number (1-250)	(2) NFL Draft Pick Number (1-250)	(3) NFL Draft Pick Number (1-250)
College Team Quality	-104.61***	-66.48***	-61.33***
	(19.27)	(20.84)	(22.01)
HS Recruit Grade		-2.55***	-2.34***
		(0.63)	(0.64)
HS Recruit Ranking		-0.06	-0.09
		(0.11)	(0.11)
Number Scholarship Offers			-0.33**
			(0.16)
Player Controls (Height, Weight, Position)	✓	✓	✓
Scholarship Offer Set			✓
Observations	1,927	1,927	1,910
R-Squared	0.03	0.05	0.05

	(1) NFL Draft Round (1-7)	(2) NFL Draft Round (1-7)	(3) NFL Draft Round (1-7)
College Team Quality	-2.84***	-1.79***	-1.67***
	(0.52)	(0.57)	(0.60)
HS Recruit Grade		-0.07***	-0.07***
		(0.02)	(0.02)
HS Recruit Ranking		-0.00	-0.00
		(0.00)	(0.00)
Number Scholarship Offers			-0.01*
			(0.00)
Player Controls (Height, Weight, Position)	✓	✓	✓
Scholarship Offer Set			✓
Observations	1,927	1,927	1,910
R-Squared	0.04	0.05	0.06

	(1) NFL Career Games	(2) NFL Career Games	(3) NFL Career Games
College Team Quality	-15.94	-19.14	-25.36**
	(10.81)	(11.68)	(12.30)
HS Recruit Grade		-0.90**	-0.74**
		(0.35)	(0.36)
HS Recruit Ranking		-0.17***	-0.13**
		(0.06)	(0.06)
Number Scholarship Offers			-0.31***
			(0.09)
Player Controls (Height, Weight, Position)	✓	✓	✓
Scholarship Offer Set			✓
Observations	1,782	1,782	1,767
R-Squared	0.02	0.03	0.04