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Johnny Ducking
North Carolina AT&T State University

Peter A. Groothuis
Appalachian State University

James Richard Hill
Central Michigan University

Department of Economics
Appalachian State University
Boone, NC 28608
Phone: (828) 262-2148
Fax: (828) 262-6105
www.business.appstate.edu/economics

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An Analysis of Linebackers, Defensive Linemen, and Defensive Backs in the National Football League

by

Johnny Ducking
Assistant Professor of Economics
Department of Economics
North Carolina A&T State University
Greensboro NC
jcduckin@ncat.edu
Telephone: 336-285-3355
Fax: 336-256-2055

Peter A. Groothuis
Professor of Economics
Department of Economics
Appalachian State University
Boone, NC 28607
groothuispa@appstate.edu
Telephone: 828-263-0818
Fax: 828-262.6105

and

James Richard Hill
Professor of Economics
Department of Economics
Central Michigan University
Mt Pleasant, MI 48858
hill1jr@cmich.edu
Telephone: (989)774-3706
Fax: 989-774-2040

Abstract: Previous studies have analyzed compensation discrimination in the National Football League with mixed results. We examine the market for defensive players: defensive linemen, linebackers, and defensive backs and find some evidence of discrimination against black linebackers. We do not find any evidence of discrimination against black defensive linemen and defensive backs. Our results provide some support for the hypothesis that employers, employees, or customers discriminate against black linebackers due to prejudice against black players who have to make decisions that play a major role in the success of the entire defense.

Keywords: National Football League, discrimination, compensation, quantile regression

The demands of a modern defense now include having leaders on the defense who can be an extension of the defensive coordinator's mind.

Ian Boyd, SB Nation

I. Introduction

In the National Football League (NFL) linebackers are often the players on the defensive side of the football who make decisions that play a major role in the success of the entire defense. Becker (1957) suggests that any team with employers, employees, or customers that are biased against black linebackers making important decisions that impact the team's defensive performance has an incentive to discriminate against black linebackers. Evidence of discrimination against Black players of all three defensive positions would suggest that there is rampant discrimination in the NFL against Black defensive players. Evidence of discrimination that indicates that only Black linebackers are discriminated against would suggest that teams only discriminate against the Black players who make decisions that play a significant role in the outcome of the game.

Several studies have examined the effect of race in the NFL with some studies finding evidence of discrimination against Blacks (Berri & Simmons, 2009; Keefer, 2013; Scully, 1973; Volz, 2015) and other studies finding little to no evidence of discrimination against Blacks (Burnett & Van Scyoc, 2013, 2015a, 2015b; Ducking, Groothuis, & Hill, 2014, 2015; Gius & Johnson; 2000; Kahn, 1991, 1992; Mogull, 1973, 1981). Recently, Keefer (2013) finds white linebackers were paid a premium while Burnett and Van Scyoc (2015b) find no white premium for either rookie linebackers or rookie offensive linemen. Burnett and Van Scyoc (2013, 2015a) examine the positions of wide receiver and tight end and find no evidence of discrimination against Blacks. Ducking, Groothuis, and Hill (2014) examine career earnings for all NFL

positions except for quarterbacks, kickers, and punters and find no evidence of discrimination against Blacks. Ducking, Groothuis, and Hill (2015) test for exit discrimination in the NFL and find that Blacks do not have shorter careers than whites when controlling for productivity. Volz (2015) finds that Black quarterbacks are approximately two times as likely to be benched compared to other quarterbacks.

Keefer's (2013) findings of racial discrimination against Blacks in the NFL labor market for linebackers provide evidence of discrimination that motivates a further inquiry into discrimination against defensive players in the NFL. We seek to test the validity of Keefer's evidence of discrimination against Black linebackers. We also test whether there is evidence of discrimination against Black defensive linemen and defensive backs or if discrimination against Blacks only exists at the linebacker position. In section two we discuss our data, in section three we report our results, and in section four we conclude.

II. Data

We use NFL data on linebackers, defensive linemen, and defensive backs from 2001 to 2008. We chose these three positional groups because performance statistics are available and can be used to control for productivity. In addition to the productivity variables we also control for player characteristics such as draft number and body mass index (BMI) in our analysis. We obtain data on player performance and BMI information from the NFL player database (2009). The salary information used in this study is the salary cap value. We obtain data on salary cap value from the USA Today NFL salary database. Some players are not included in the sample for the following reasons: 1) their career started before the year 2000; 2) they played for more than one team in a season; 3) they have a missing season in the NFL player database or the USA Today NFL salary database.

In our model, defensive player productivity is measured by games played per season, tackles, sacks, passes defended, and interceptions. Tackles are defined as the total number of times a player tackles an opponent during a season. Sacks are defined as the total number of times a player tackles the opposing quarterback behind the line of scrimmage during a season. Passes defended and interceptions measure the total number of times a player breaks up a pass or catches a pass thrown by the opposing quarterback. Games played per season, tackles, sacks, passes defended, and interceptions are expected to have a positive impact on salary.

The linebacker sample contains 651 player years and Blacks represent 79% of the sample, the defensive lineman sample contains 708 player years and Blacks represent 81.4% of the sample, and the defensive back sample contains 926 player years and Blacks represent 92.5% of the sample. We report the means of the defensive players by position and race in table 1. We find that on average, non-Black linebackers and defensive linemen have slightly higher tackles, sacks, and interceptions compared to their Black counterparts. Black defensive backs have more tackles, interceptions and passes defended than their non-Black counterparts.

III. Results

Like Keefer (2013) and Burnett and Van Scyoc (2013 and 2015) we use ordinary least squares (OLS) and quantile regression analysis with a dummy variable for race to measure the effect of race on wages throughout the salary distribution. We also apply the Oaxaca Blinder decomposition technique developed by Oaxaca (1973) and Blinder (1973) to our OLS results. In tables 2, 3, and 4 we use the dummy variable technique to measure racial discrimination for defensive players and report the OLS and quantile regression results for linebackers, defensive linemen, and defensive backs. The quantile regression results are reported for the 0.10, 0.25,

0.50, 0.75, and 0.90 quantiles. The dependent variable used in each model is the natural log of the player's salary cap value.

In table 2, the coefficient on non-Black for the linebacker sample is positive and significant using OLS and the 0.25, 0.50, and 0.90 quantile regressions showing that non-Black players are paid a premium. The OLS and quantile regression coefficients on non-Black are transformed into percentage changes using $100*(\exp(\beta_{Non\text{-}Black})-1)$. The OLS coefficient of 0.105 indicates that on average, holding all of the other explanatory variables constant, a non-Black linebacker earns 11.1% more than a Black linebacker. The 0.25 quantile regression coefficient of 0.0540 indicates that a non-Black linebacker in the 0.25 quantile earns 5.5% more than a Black linebacker. The 0.50 quantile regression coefficient of 0.0906 indicates that a non-Black linebacker in the 0.50 quantile earns 9.5% more than a Black linebacker. The 0.90 quantile regression coefficient of 0.179 indicates that a non-Black linebacker in the 0.90 quantile earns 19.6% more than a Black linebacker. These results provide evidence of discrimination against Black linebackers in the NFL.

In table 3, the OLS and 0.25 quantile coefficients on non-Black for the defensive lineman sample are negative and significant showing that Black defensive linemen are paid a premium. The OLS coefficient of -0.121 indicates that a non-Black defensive lineman earns 11.4% less than a Black defensive back. The 0.25 quantile regression coefficient of -0.0688 indicates that a non-Black defensive back in the 0.25 quantile earns 6.6% less than a Black defensive lineman. These results provide evidence of discrimination against non-Black defensive linemen counter to the results on linebackers.

In table 4, the quantile regression coefficients on non-Black for the defensive backs sample are negative and significant for the 0.10 and 0.90 quantiles providing evidence of

discrimination against non-Black defensive backs. These results are also counter to the results on linebackers. The 0.10 quantile regression coefficient of -0.120 indicates that a non-Black defensive back in the 0.10 quantile earns 11.3% less than a Black defensive back. The 0.90 quantile regression coefficient of -0.164 indicates that a non-Black defensive back in the 0.90 quantile earns 15.1% less than a Black defensive back. We also find that the coefficient on draft number is significant for OLS and all quantile regressions for each defensive position.

In table 5, we report the results from the Oaxaca Blinder decomposition technique to measure racial discrimination. Prediction 1 is the predicted natural log of salary cap for Blacks and prediction 2 is the predicted natural log of salary cap for non-Blacks. We find that for the linebacker sample the endowment and the coefficient effect are significant. The endowment effect indicates that Black linebackers earn 15% less than non-Black linebackers due to differences in explanatory variables. The coefficient effect indicates that Black linebackers earn 10.7% less than non-Black linebackers due to differences in returns to the explanatory variables. This result provides further evidence of discrimination against Black linebackers in the NFL.

In the defensive lineman sample, we find that the coefficient effect is significant indicating that Black defensive linemen earn 13.5% more than non-Black defensive linemen due to differences in returns to the explanatory variables. This result provides further evidence of discrimination against non-Black defensive linemen in the NFL. In the defensive backs sample we find the endowment effect is significant and the coefficient effect is not significant. This endowment effect indicates that Black defensive backs earn 24.2% more than non-Black defensive backs due to differences in the explanatory variables.

IV. Conclusion

Using OLS and quantile regression analysis for linebackers, defensive linemen, and defensive backs in the NFL we find evidence of discrimination. The discrimination is not solely against Blacks or non-Blacks. We find evidence of discrimination against Black linebackers and evidence of discrimination against non-Black defensive linemen and defensive backs. Unlike Ajilore (2014), our findings are similar to previous studies of sports markets that find some evidence of reverse discrimination (Gius & Johnson, 2000; Groothuis and Hill, 2013; Yang & Lin, 2010). Our results suggest that racial discrimination is more nuanced than just discrimination against one group in general. Our results show that for defensive backs and defensive lineman there is no racial discrimination against Blacks and in fact Black players are paid a premium. Yet for linebackers we find that racial discrimination against Blacks exists. Linebackers are often referred to as the quarterback of the defense (Boyd, 2014). This is because they have to make decisions that impact all of the players on the defense. Our results lend support to the hypothesis that employers, employees, or customers discriminate against the Black players who are the major decision makers on the football field. This type of discrimination is consistent with the result of Volz (2014) that indicates Black quarterbacks are more likely to be benched.

The discrimination against non-Black defensive linemen and defensive backs could be due to the perception of athleticism of non-Blacks compared to Blacks. We then use the Oaxaca and Blinder technique and the results confirm that there is discrimination against Black linebackers and non-Black defensive linemen. These results along with the results of Volz (2015) and Keefer (2013) provide evidence of discrimination against Black players who make major decisions in the NFL.

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Table 1: Descriptive Statistics						
VARIABLES	Means					
	Linebackers		Defensive Linemen		Defensive Backs	
	Non-Black	Black	Non-Black	Black	Non-Black	Black
Ln cap value	13.80	13.57	13.76	13.77	13.36	13.60
	(0.0795)	(0.039))	(0.09)	(0.042)	(0.0911)	(0.0306)
Draft Selection number	93.25	123.97	111.29	119.45	134.49	114.49
	(6.624)	(3.779)	(7.529)	(3.685)	(10.690)	(2.9603)
Body Mass Index	30.99	30.98	34.92	36.72	27.76	27.39
	(0.105)	(0.056)	(0.311)	(0.139)	(0.156)	(0.0462)
Experience	3.11	3.11	3.39	3.21	2.81	2.92
	(0.161)	(0.087)	(0.182)	(0.085)	(0.202)	(0.0624)
Experience Squared	13.20	13.56	15.88	14.49	10.67	11.87
	(1.302)	(0.716)	(1.572)	(0.714)	(1.424)	(0.487)
Gamesplayed	12.40	13.47	13.17	12.97	12.81	13.10
	(0.428)	(0.182)	(0.401)	(0.186)	(0.490)	(0.1458)
Tackles	55.66	53.98	33.67	29.07	33.16	44.15
	(3.466)	(1.820)	(1.97)	(0.756)	(3.489)	(0.9912)
Sacks	1.38	1.17	2.98	2.63	0.46	0.29
	(0.206)	(0.091)	(0.316)	(0.12)	(0.116)	(0.0221)
Passesdefended	2.03	2.01	1.47	1.48	2.17	5.25
	(0.218)	(0.105)	(0.171)	(0.073)	(0.369)	(0.1715)
Interceptions	0.61	0.44	0.13	0.09	0.59	1.49
	(0.084)	(0.038)	(0.033)	(0.013)	(0.144)	(0.0609)
Observations	137	514	132	576	69	857

	Table 2: Regressions of Natural Log of Cap value for Linebackers					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	OLS	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
Non-Black	0.105**	0.0280	0.0540**	0.0906***	0.0829	0.179**
	(0.0473)	(0.0344)	(0.0272)	(0.0333)	(0.0563)	(0.0784)
Draft number	-0.00343***	-0.00368***	-0.00335***	-0.00296***	-0.00343***	-0.00395***
	(0.000251)	(0.000177)	(0.000129)	(0.000179)	(0.000347)	(0.000524)
BMI	0.0284*	0.0129	0.00574	0.00964	0.0383**	0.0366
	(0.0152)	(0.0123)	(0.00923)	(0.0107)	(0.0176)	(0.0228)
Tenure	0.255***	0.137***	0.135***	0.182***	0.271***	0.342***
	(0.0381)	(0.0262)	(0.0225)	(0.0270)	(0.0453)	(0.0676)
Tenuresq	-0.000438	0.000785	0.0102***	0.0123***	0.00396	-0.00317
	(0.00458)	(0.00293)	(0.00280)	(0.00326)	(0.00511)	(0.00747)
Gamesplayed	-0.000751	0.0257***	0.000360	-0.000513	-0.0118*	-0.0168
	(0.00542)	(0.00449)	(0.00321)	(0.00381)	(0.00680)	(0.0105)
Tackles	0.00369***	0.000348	0.000817*	0.00284***	0.00392***	0.00600***
	(0.000787)	(0.000592)	(0.000457)	(0.000557)	(0.000960)	(0.00142)
Sacks	0.0353***	0.0205***	0.0336***	0.0476***	0.0173	0.0450***
	(0.0100)	(0.00642)	(0.00472)	(0.00718)	(0.0115)	(0.0157)
Passes defended	0.0203	0.00457	0.0144*	-0.00431	0.0428***	0.0384
	(0.0124)	(0.0102)	(0.00752)	(0.00879)	(0.0162)	(0.0253)
Interceptions	0.0148	0.0345**	0.0258*	0.0391**	0.0115	0.0210
	(0.0266)	(0.0172)	(0.0144)	(0.0182)	(0.0325)	(0.0536)
Constant	12.16***	12.35***	12.94***	12.75***	12.05***	12.27***
	(0.486)	(0.395)	(0.295)	(0.345)	(0.577)	(0.775)
R^2(pseudo)	0.719	0.436	0.473	0.523	0.552	0.561
Observations	651	651	651	651	651	651

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 --year dummies included

	Table 3: Regressions of Natural Log of Cap value for Defensive Linemen					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	OLS	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
Non-Black	-0.121**	-0.0587	-0.0688*	-0.0400	-0.0433	-0.122
	(0.0562)	(0.0382)	(0.0393)	(0.0500)	(0.0805)	(0.120)
Draft number	-0.00396***	-0.00361***	-0.00379***	-0.00401***	-0.00436***	-0.00463***
	(0.000265)	(0.000143)	(0.000157)	(0.000235)	(0.000444)	(0.000710)
BMI	0.00473	0.00406	0.00950*	0.00721	0.00929	-0.0106
	(0.00699)	(0.00477)	(0.00488)	(0.00620)	(0.00938)	(0.0139)
Tenure	0.389***	0.229***	0.256***	0.319***	0.380***	0.505***
	(0.0424)	(0.0296)	(0.0309)	(0.0373)	(0.0599)	(0.0966)
Tenuresq	-0.0152***	-0.00475	-0.00132	-0.00447	-0.0129**	-0.0280***
	(0.00494)	(0.00335)	(0.00378)	(0.00433)	(0.00654)	(0.0100)
Gamesplayed	0.00197	0.0247***	0.00509	-0.00404	-0.00190	-0.00194
	(0.00634)	(0.00488)	(0.00454)	(0.00561)	(0.00906)	(0.0131)
Tackles	0.00630***	0.000607	0.00151	0.00561***	0.00706***	0.00866***
	(0.00184)	(0.00152)	(0.00132)	(0.00164)	(0.00259)	(0.00330)
Sacks	0.0369***	0.00985	0.0230***	0.0271***	0.0533***	0.0431**
	(0.00947)	(0.00671)	(0.00642)	(0.00842)	(0.0136)	(0.0206)
Passes defended	0.0146	0.00355	0.0122	0.0173	0.0161	0.0193
	(0.0144)	(0.0119)	(0.0102)	(0.0127)	(0.0218)	(0.0362)
Interceptions	0.0615	0.0727*	0.0720	0.0383	0.0465	0.181
	(0.0690)	(0.0412)	(0.0450)	(0.0611)	(0.102)	(0.143)
Constant	12.81***	12.43***	12.55***	12.84***	13.02***	13.96***
	(0.277)	(0.194)	(0.195)	(0.245)	(0.371)	(0.519)
R^2(pseudo)	0.701	0.458	0.488	0.526	0.495	0.440
Observations	708	708	708	708	708	708

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 --year dummies included

	Table 4: Regressions of Natural Log of Cap value for Defensive Backs					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	OLS	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
Non-Black	-0.0134	-0.120***	-0.0321	-0.000772	0.0545	-0.164*
	(0.0646)	(0.0426)	(0.0341)	(0.0575)	(0.0724)	(0.0913)
Draft number	-0.00412***	-0.00364***	-0.00350***	-0.00340***	-0.00423***	-0.00509***
	(0.000208)	(0.000121)	(9.38e-05)	(0.000186)	(0.000278)	(0.000407)
BMI	0.0333**	0.0166**	0.0110	0.00427	0.00955	0.0346*
	(0.0131)	(0.00809)	(0.00676)	(0.0116)	(0.0155)	(0.0200)
Tenure	0.288***	0.243***	0.179***	0.189***	0.244***	0.348***
	(0.0351)	(0.0235)	(0.0197)	(0.0311)	(0.0410)	(0.0514)
Tenuresq	-0.00630	-0.0131***	0.00446*	0.0103***	0.00610	-0.00975*
	(0.00448)	(0.00292)	(0.00260)	(0.00396)	(0.00495)	(0.00573)
Gamesplayed	0.00415	0.0287***	0.00937***	0.00377	-0.00117	-0.0147*
	(0.00494)	(0.00332)	(0.00280)	(0.00437)	(0.00576)	(0.00782)
Tackles	0.00109	-0.000127	-0.000690	0.000517	0.00173	0.00390**
	(0.000927)	(0.000613)	(0.000494)	(0.000824)	(0.00106)	(0.00152)
Sacks	-0.0117	-0.0215	-0.0115	-0.0165	0.0118	0.0702*
	(0.0271)	(0.0195)	(0.0143)	(0.0242)	(0.0303)	(0.0364)
Passes defended	0.0291***	0.00666*	0.0156***	0.0245***	0.0409***	0.0426***
	(0.00488)	(0.00371)	(0.00250)	(0.00436)	(0.00569)	(0.00796)
Interceptions	0.0246**	-0.000122	0.00557	0.0329***	0.0160	-0.0180
	(0.0121)	(0.00988)	(0.00638)	(0.0107)	(0.0135)	(0.0186)
Constant	12.15***	12.12***	12.67***	12.93***	13.03***	12.83***
	(0.367)	(0.233)	(0.190)	(0.326)	(0.440)	(0.549)
R^2(pseudo)	0.684	0.442	0.458	0.484	0.504	0.477
Observations	926	926	926	926	926	926

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 --year dummies included

Table 5: Oaxaca Blinder Decomposition Results

Dependent Variable = ln(salary cap value), From Black Perspective

	Linebackers		Defensive Linemen		Defensive Backs	
VARIABLES	Differential	Decomposition	Differential	Decomposition	Differential	Decomposition
Prediction_1	13.57***		13.77***		13.60***	
	(0 .0389)		(0.0421)		(0.0307)	
Prediction_2	13.80***		13.76***		13.36***	
	(0.0810)		(0.0920)		(0.0931)	
Difference	-0.2283**		0.014		0.243**	
	(0.0898)		(0.1011)		(0.0981)	
Endowments		-0.1621**		-0.1341		0.2168**
		(0.0806)		(0.0922)		(0.1081)
Coefficients		-0.1131**		0.1267**		0.0100
		(0.0541)		(0.0609)		(0.0609)
Interaction		0.0469		0.0212		0.0162
		(0.0375)		(0.0479)		(0.0774)
Observations	651	651	728	728	926	926

*Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1*