Compensation Discrimination in the NFL:
An Analysis of Career Earnings

by

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ABSTRACT: Using NFL data from 2000 to 2008, we test for compensation discrimination on career earnings in the NFL. We use both the traditional dummy variable technique applied to Ordinary Least Squares regression as well as quantile regression analysis to measure the effect of race on earnings. We focus on six positional groups: defensive backs, defensive linemen, linebackers, running backs, tight ends and wide receivers. Our analysis finds that a player's performance determines career earnings and not their race. Perhaps, using a Becker-like argument, market competition for the best players in a competitive environment to achieve a winning team has overcome personal prejudice.

1. Introduction

Labor economists have found professional sports to be a productive area in which to conduct empirical studies to test for various forms of labor market discrimination. With the abundance of readily available measures of employee productivity and salary information, researchers discovered a virtual laboratory to conduct experiments (Kahn 2000). Empirical measures of pay discrimination represent most of the research in this field.

For instance, Scully (1974) found significant pay discrimination against black Major League baseball players using 1968-69 data. Hill and Spellman (1984) did not find evidence of pay discrimination against minority MLB players using 1976-1977 data, nor have most researchers since. In the NBA, Kahn and Sherer (1988) found substantial pay discrimination against black players in a league that was dominated (75%) by black athletes. More recent research, however, (Bodvarsson and Brastow (1999), Hill (2004), and Groothuis and Hill (2013)) has failed to find salary discrimination in the NBA using data from 1990 onward.

Overall, few studies have examined pay discrimination in the NFL (Burnett and Van Scyoc 2013, Keefer 2013, Gius and Johnson, 2000, Kahn 1992, Mogull 1981). While Keefer (2013), Kahn (1992) and Mogull (1981) all find white players were paid a wage premium, Gius and Johnson (2000) found black players were paid a premium of about ten percent. Keefer's (2013) study that focused only on one position found that white NFL linebackers had a pay premium of about ten percent while Burnett and Van Scyoc using rookie data did not find any pay premium for linebackers or offensive lineman.

Hoang and Rascher (1999) developed a model to explore the concept of racially-based retention barriers in the NBA. They found evidence that, performance being equal, there was "exit discrimination" in the NBA. They demonstrate that exit discrimination can lead to a potential greater loss of income for the group discriminated against. Groothuis and Hill (2004)

failed to confirm Hoang and Rascher's results using data from the 1990s. Jiobu (1988) found evidence that race decreased career length, ceteris paribus, for black players using Major League Baseball data from 1971-1985. Again, Groothuis and Hill (2008) failed to find exit discrimination in MLB using more recent data from 1990-2004. Ducking, Groothuis and Hill (2013) found no evidence of exit discrimination in the NFL using the same data set used in this analysis.

Therefore the use of career earnings to test for compensation discrimination seems appropriate and follows the approach used by Groothuis and Hill (2013) to test for earnings discrimination in the NBA. In addition, we use career earnings because the unique structure of compensation in the NFL that includes signing bonuses makes actual annual earnings difficult to measure and because most NFL careers are short; therefore our data provides a representative sample.

2. Data

We use NFL data on defensive backs, defensive linemen, linebackers, running backs, tight ends, and wide receivers all of whom both started and ended their careers between the 2000 to 2008 seasons. We create two samples using these six positions: a sample for defensive positions and a sample for offensive positions. We chose these six positional groups for two reasons: performance statistics that can be used to measure their productivity are readily available and there are multiple players that play these positions for each team during the course of a football game. The first reason is important because the availability of performance statistics allows us to control for a player's productivity. The second reason is important because choosing positions in which there is typically only one player playing in a game will result in an extremely small sample size. Quarterbacks, punters, and kickers are excluded because typically only one player

plays these positions during the course of a football season. We exclude offensive linemen because of a lack of performance measures to control for productivity.

Productivity and demographic information are used as control variables in this analysis. We obtain data on player performance and demographic information from the NFL official website (www.nfl.com/players). Some players are not included in the sample for the following reasons: 1) their career started before the year 2000 or had not ended by 2008; 2) they played for more than one team in a season; 3) they have a missing or skipped season from the NFL's official website[1].

In both the offensive and defensive models we include average games played per season for each player's career. This variable is expected to have a positive impact on career earnings. We also include draft number and body mass index (BMI) as measured during the first season the player enters professional football[2]. BMI is expected to have a positive impact on career earnings while an increase in draft number is expected to have a negative impact on career earnings. Positional dummy variables are included in both the defensive and offensive regressions to account for potential earnings differentials by position[3].

Defensive player productivity is measured by the average number of tackles, sacks, passes defended, interceptions, and forced fumbles per season over their career. These performance variables are expected to have a positive impact on career earnings because they measure the impact of the player's ability to help his team stop their opponent from scoring.

[1] Players are excluded from the sample if a season is missing or skipped in the USA Today's NFL salary database (content.usatoday.com/sportsdata/football/nfl/salaries/team) or if their salary is not available in this database.
[2] All undrafted players are assigned a draft number that is one digit higher than the last player taken in the draft.
[3] Separate equations were also run for each position using the natural log of career earnings regressed against the basic variables discussed above. Five of the six results showed no significance for the white dummy variable, In the regression for wide receivers the coefficient for the white dummy variable was negative and significant at the 1% level.

An offensive player's productivity is also measured by the average of performance measured per season over their careers. The performance measures include average touches, yards, touchdowns, fumbles, and fumbles lost per season. Average touches per season is expected to have an ambiguous impact on career earnings because holding yards (and other measures) constant; an additional touch is simply another opportunity for an injury or it might control for increased performance. Yards and touchdowns are expected to have a positive impact on career earnings because they measure the impact of the player's ability to help the team score points; fumbles and fumbles lost are expected to have a negative impact on career earnings because they represent either an opportunity for the opposing team to gain possession, or an actual loss of possession.

3. Results

In table 1 we report the means of the variables as a whole and for the non-white and white subsets of players[4]. The means show that there are differences between whites and non-whites but not in one direction. For instance white defensive players are selected earlier in the draft on average while white offensive players are selected later on average. White defensive players have more tackles while non-white defensive players have more passes defended. The offensive player's data shows similar patterns. The defensive sample is composed of 23.04% defensive linemen, 32.61% linebackers, and 44.35% defensive backs. The offensive sample is composed of 16.10% tight ends, 41.95% running backs, and 41.95% wide receivers.

In tables 2 and 3 we report the career earnings regressions. The dependent variable for both offensive and defensive positions is the natural log of wages. The results in both tables show that productivity increases wages but there is no wage premium for being a white player.

[4] 98.5% percent of the non-white offensive players and 97% of the defensive players are black and the remainder are Pacific Islanders.

For instance, the OLS regression, reported in column one table two shows that all performance measures have positive and statistically significant coefficients except career interceptions and career fumbles forced that were both statistically insignificant. In addition we find that draft number is negative and significant and BMI is positive and significant. The linebacker and defensive back variables are positive and significant indicating that these positions have higher career earnings than defensive linemen. In table 3 we find similar OLS results for the offensive positions with yards per season and games played per season increasing career earnings. The number of touches per season, ceteris paribus, decreasing earnings may be capturing the increased probability of injury. In all specifications and for every quantile level in our analysis, we do not find a wage premium for white players using the natural log of career earnings as the dependent variable. In addition, not only are all coefficients not statistically significant but the magnitude of the coefficients are either quite small and many times negative suggesting that even if the results were statistically significant there is no economic significance.

6. Conclusion

Proclamations of racial discrimination always elicit notoriety. Findings of no discrimination do not procure the same response. Therefore, it is important that any positive findings of racial inequality be particularly robust. In our analysis on career earnings in the NFL, we find that player productivity determines wages and there is no wage premium for being white. Past research had suggested that discrimination by majority, white fans led owners in sports to pay white players a premium. Our results suggest that team owners in the pursuit of championships pay players based on their ability regardless of race. This is an affirmation of Becker's theoretical implications of market competition overcoming discrimination.

Table 1: Means of Variables			
Defensive Players			
	Overall	White	Nonwhite
Total Career Earnings	$3,349,876	$3,413,033	$3,340,037
Draft Selection Number	172.9739	166.7742	173.9397
Body Mass Index	30.3944	31.2526	30.2607
Dummy Variable for White Players	0.1348		
Career Games Played per Season	9.2864	9.3608	9.2748
Career Tackles per Season	18.3592	20.2503	18.0646
Career Sacks per Season	0.3662	0.4330	0.3558
Career Passes Defended per Season	1.0136	0.5345	1.0882
Career Interceptions per Season	0.2451	0.1360	0.2622
Career Fumbles Forced per Season	0.2394	0.1401	0.2549
Dummy Variable for Defensive Backs	0.4435	0.2258	0.4774
Dummy Variable for Defensive Linemen	0.2304	0.2903	0.2211
Dummy variable for Linebackers	0.3261	0.4839	0.3015
Number of Observations	230	31	199
Offensive Players			
	Overall	White	Nonwhite
Total Career Earnings	$2,827,853	$2,343,644	$2,924,129
Draft Selection number	189.4049	213.7059	184.5731
Body Mass Index	28.9749	29.5732	28.8559
Dummy Variable for White Players	0.1659		
Career Games Played per Season	8.0042	6.8916	8.2254
Career Touches per Season	22.3118	8.8000	24.9983
Career Total Yards per Season	139.1287	87.7709	149.3402
Career Touchdowns per Season	0.8659	0.5586	0.9270
Career Fumbles per Season	0.4438	0.1486	0.5025
Career Fumbles Lost per Season	0.2541	0.0779	0.2892
Dummy Variable for Running Backs	0.4195	0.1471	0.4737
Dummy Variable for Tight Ends	0.1610	0.5588	0.0819
Dummy Variable for Wide Receivers	0.4195	0.2941	0.4444
Number of Observations	205	34	171

Table 2: Natural Log of Career Earnings Regressions for Defensive Players: 2000-2008						
VARIABLES	OLS	Quantile Regressions				
		10%	25%	50%	75%	90%
Draft Selection Number	-0.0058***	-0.0077***	-0.0075***	-0.0065***	-0.0056***	-0.0060***
	(0.000791)	(0.00170)	(0.000854)	(0.000785)	(0.00116)	(0.00127)
Body Mass Index	0.0775***	0.0101	0.0894**	0.0394	0.0774**	0.0514
	(0.0295)	(0.0857)	(0.0366)	(0.0289)	(0.0367)	(0.0370)
Dummy Variable for White Players	0.117	0.0772	0.143	-0.00546	0.335	0.265
	(0.173)	(0.460)	(0.210)	(0.173)	(0.243)	(0.286)
Dummy Variable for Defensive Backs	0.610*	0.608	0.616	0.119	0.321	-0.0660
	(0.312)	(0.916)	(0.402)	(0.307)	(0.393)	(0.400)
Dummy Variable for Linebackers	0.400*	0.817	0.215	-0.0835	0.0457	-0.242
	(0.237)	(0.661)	(0.298)	(0.233)	(0.284)	(0.269)
Career Games Played per Season	0.0812***	0.106**	0.0387**	0.0476***	0.0623***	0.107***
	(0.0153)	(0.0415)	(0.0196)	(0.0150)	(0.0187)	(0.0215)
Career Tackles per Season	0.0142**	0.000346	0.0198***	0.0211***	0.0225***	0.0197**
	(0.00605)	(0.0131)	(0.00705)	(0.00594)	(0.00781)	(0.00790)
Career Sacks per Season	0.370***	0.556***	0.299**	0.210*	0.277**	0.338**
	(0.113)	(0.181)	(0.142)	(0.111)	(0.132)	(0.139)
Career Passes Defended per Season	0.203***	0.211***	0.183**	0.219***	0.176**	0.202**
	(0.0644)	(0.0772)	(0.0813)	(0.0624)	(0.0699)	(0.0856)
Career Interceptions per Season	-0.0892	0.174	-0.154	-0.184	-0.0842	-0.312**
	(0.183)	(0.184)	(0.222)	(0.180)	(0.199)	(0.158)
Career Fumbles Forced per Season	0.205	-0.0282	-0.000691	0.107	0.358	0.108
	(0.220)	(0.379)	(0.277)	(0.219)	(0.267)	(0.305)
Constant	10.80***	11.80***	10.83***	12.81***	11.56***	12.79***
	(1.090)	(3.230)	(1.349)	(1.070)	(1.368)	(1.354)
Observations	230	230	230	230	230	230
R-squared	0.722					

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

Table 3: Natural Log of Career Earnings Regressions for Offensive Players: 2000-2008						
VARIABLES	OLS	Quantile Regressions				
		10%	25%	50%	75%	90%
Draft Selection Number	-0.0074***	-0.010***	-0.0083***	-0.0073***	-0.0058***	-0.0047*
	(0.00103)	(0.00230)	(0.00102)	(0.000855)	(0.00140)	(0.00238)
Body mass Index	0.0584	0.0500	0.0917*	0.0635*	0.0388	0.167***
	(0.0449)	(0.102)	(0.0551)	(0.0368)	(0.0483)	(0.0583)
Dummy Variable for White Players	-0.225	-0.662	-0.398	-0.286	-0.0212	0.362
	(0.220)	(0.612)	(0.244)	(0.182)	(0.262)	(0.382)
Dummy Variable for Running Backs	0.0655	0.654	-0.0832	-0.215	-0.165	-0.894***
	(0.265)	(0.527)	(0.295)	(0.218)	(0.305)	(0.313)
Dummy Variable for Tight Ends	0.254	1.250*	0.270	0.255	0.368	-0.937**
	(0.303)	(0.678)	(0.341)	(0.254)	(0.331)	(0.423)
Career Games Played per Season	0.0837***	0.0844*	0.0422**	0.0622***	0.0760***	0.0949***
	(0.0165)	(0.0465)	(0.0188)	(0.0138)	(0.0180)	(0.0204)
Career Touches per Season	-0.0193***	-0.0284***	-0.0169***	-0.0115***	-0.0138**	-0.0147**
	(0.00515)	(0.0102)	(0.00632)	(0.00430)	(0.00571)	(0.00621)
Career Yards per Season	0.0047***	0.0055**	0.0040***	0.0030***	0.0049***	0.0044***
	(0.00114)	(0.00239)	(0.00121)	(0.000964)	(0.00135)	(0.00178)
Career Touchdowns per Season	0.141	0.103	0.177	0.172*	0.112	0.0737
	(0.119)	(0.248)	(0.118)	(0.101)	(0.138)	(0.231)
Career Fumbles per Season	0.315	0.465	0.0800	0.370*	0.741**	0.395
	(0.262)	(0.505)	(0.293)	(0.223)	(0.310)	(0.440)
Career Fumbles Lost per Season	-0.272	-0.425	-0.118	-0.422	-0.817*	-0.373
	(0.391)	(0.994)	(0.488)	(0.330)	(0.458)	(0.662)
Constant	12.23***	11.58***	11.54***	12.50***	12.99***	10.01***
	(1.231)	(2.752)	(1.493)	(1.002)	(1.354)	(1.943)
Observations	205	205	205	205	205	205
R-squared	0.652					

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