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Race and the Evaluation of Signal Callers in the National Football League

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Abstract: Until recently, the position of quarterback in the National Football League (NFL) was not an option for black athletes. Today many teams employ black quarterbacks, a development that might suggest race is no longer relevant when it comes to the evaluation of signal callers in the NFL. To examine this contention, this paper explores the relationship between player salary, performance, and race at the quarterback position over the period 1995 to 2006. We find that blacks and whites play this position differently. Specifically, black quarterbacks are more likely to run with the football. This skill, though, is not compensated in the market. Consequently, there is evidence that blacks face an uncompensated entry barrier in this particular occupation.

The story of Jackie Robinson illustrates that discrimination was once an issue in professional sports. Is it still a problem today? Although numerous studies have been offered examining discrimination in professional team sports like baseball and basketball, there is little a priori evidence that discrimination remains a problem in these sports. Consequently, it is not surprising that much of the recent research on the topic offers very mixed results with respect to the subject of discrimination. Depending upon the issue examined and the methodology employed, studies have found evidence of discrimination against blacks[1], discrimination against whites[2], or no discrimination at all.[3]

The story of professional football is different. Specifically, black quarterbacks have historically been a relatively rare occurrence in the National Football League (NFL). The first was Willie Thrower, who threw eight passes for the Chicago Bears on October 18, 1953. These were the only eight passes Thrower ever attempted.[4] It was not until 1968 that Marlin Briscoe became the first starting black quarterback, leading the Denver Broncos of the American Football League.[5]

In the 1970s the black starting quarterback came to the NFL. The first was James Harris, who was drafted by the Buffalo Bills of the AFL in 1969. In 1970 the NFL and AFL merged. Consequently, when Harris attempted 103 passes for the Bills in 1971 he became the first black quarterback to received "significant" playing time – where significant is defined as attempting at least 100 passes in a single season -- in the history of the NFL.[6] Harris was cut from the Bills after the 1971 season and did not play professional football in 1972. But in 1973 he joined the Los Angeles Rams, performing well enough for the Rams to be named to the Pro Bowl in 1974. Over a ten year career that began with the Buffalo Bills of the American Football League in 1969, and ending with the San Diego Chargers in 1979, Harris appeared in 83 games.

Unlike Jackie Robinson in baseball, though, Harris did not open the floodgates for black quarterbacks. In the entire decade of the 1970s, only eight times did a black quarterback attempt 100 passes for an NFL team in one season. Harris did this four times. Joe Gilliam, the first black quarterback to be named a team's starter at the onset of a season, did this in 1974. Dave

Mays, in a back-up role, attempted 121 passes for the Cleveland Browns in 1977. And Doug Williams, a first round draft choice for the Tampa Bay Buccaneers in 1978, attempted more than 100 passes in both 1978 and 1979.

Williams played five seasons for Tampa Bay, leading the team to the NFC championship game in 1979. From 1983 to 1985, though, Williams did not take a snap at quarterback. In 1987, due to an injury to the Washington's starting quarterback, Williams was named the starter for the Redskins[7] towards the end of the campaign.[8] As starter, Williams led the Redskins to the Super Bowl title in 1988, becoming the first black quarterback to start for a team in the NFL's biggest game. Despite the success of Williams, the quarterback position in the NFL continued to be primarily a position for white players only in the 1980s. After Williams, only Vince Evans, Warren Moon, Randall Cunningham, and Rodney Peete received significant playing time at the quarterback position in this decade.

By the end of the 1993 season, only eight black quarterbacks had ever received significant playing time in the NFL. When we look at Table One – which list all 28 black quarterbacks to ever attempt 100 passes in a single season (as of the end of the 2006 campaign) – we see that in mid-1990s blacks began to make substantial progress at this position. In 1994, Jeff Blake became the starting quarterback for the Cincinnati Bengals. The next season, Blake, Moon, Evans, Cunningham, and Peete all attempted at least 100 passes. This marked, as Table Two indicates, the first time that more than three black quarterbacks received significant playing time in the same season.

Continuing with Table Two we see that from 1996 to 2000 the number of black quarterbacks attempting at least 100 passes in a single season rose from five to eleven. The mark of eleven was again matched in 2001, 2003, and 2006, but never exceeded.

So relative to the 1970s and 1980s, blacks appeared to have more opportunities. Still, it appears the participation of blacks have not changed much since 2000. Plus, even with an increase in the number of black quarterbacks, this position is still dominated by whites. From 2000 to 2006 there were 251 instances where a quarterback attempted 100 passes in a single season. Of these, 68 were offered by black quarterbacks, or 27% of the population. When one

notes that 65% of the NFL is black,[9] it is easy to conclude that progress still remains in the effort to integrate the quarterback position.

The number of blacks participating at this position certainly suggests the possibility of discrimination. To further address this subject, we will focus our attention on two issues. First we wish to evaluate the performance of black and white quarterbacks on the field of play. Are there differences in the average performances of each population? Beyond on-field productivity is the larger issue of worker compensation. The employment data suggests that blacks are still under-represented at the quarterback position. Are there similar disparities in the wages paid to members of each population?

1. Comparing on-field performance

Goff, McCormick, and Tollison (2002) investigated the integration of Major League Baseball in the 1950s and 1960s. One issue these authors examined was the relative performance of black and white baseball players. Via a comparison of slugging percentages, evidence was presented suggesting that the typical black baseball player outperformed his white counterpart in the first decades of integration. Do we see the same pattern in the NFL?

To address this issue one must have a measure of player performance. Player performance data exists in abundance in the sports of baseball and basketball, two sports that have been frequently investigated by economists interested in the issue of racial discrimination. Like these two sports, a number of metrics exist to evaluate the productivity of an NFL quarterback.

The plethora of metrics, though, presents a problem. Which measure should one employ? Studies of baseball tend to follow the lead of Gerald Scully (1974) and utilize an index on performance[10] like slugging percentage.[11] The advantage of this metric is that it is commonly cited and simple to understand, although its connection to runs scored and wins is relatively weak.[12]

For quarterbacks, the most commonly cited statistic is the NFL's quarterback rating measure. But as the following equation reveals, it is hardly a simple or intuitive metric.[13]

$$\left(\frac{\frac{COMP}{PASSATT} - 0.3}{0.2} + \frac{\frac{PASSYDS}{PASSATT} - 3}{4} + \frac{\frac{PASSTD}{PASSATT}}{0.05} + \frac{0.095 - \frac{INT}{PASSATT}}{0.04} \right) \cdot \frac{100}{6}$$

Where COMP = Completions PASSYDS = Yards passing
PASSTD = Touchdown passes thrown INT = Interceptions thrown
PASSATT = Passing attempts

Beyond a lack of intuition, one should note that the quarterback rating may be biased against black quarterbacks. To understand this contention, one should note that the quarterback rating system is actually only a measure of a signal caller's passing ability. Only four statistics, completions, yards, touchdowns, and interceptions are employed, with each evaluated per passing attempt. Contributions made with the quarterback's legs are not considered.

We collected data on 309 quarterbacks who attempted at least 100 passes in one regular season from 1971-2006. Given that quarterbacks appeared in multiple seasons, our sample initially includes 1470 distinct observations. To address differences in rushing ability, we first calculated the number of Plays where the quarterback participated. Specifically, according to the NFL's definition of Plays, we aggregated passing attempts, rushing attempts, and sacks. We then examined the percentage of Plays that were rushing attempts. Our 28 black quarterbacks offered 145 season observations. In this sample 11.3% of the time the black quarterbacks ran with the ball. In contrast, white quarterbacks only ran with the ball on 6.7% of their Plays.

When we turn to rushing attempts and yard per game we see a similar story. The average white quarterback from 1971 to 2006 ran with the ball twice per game, gaining an average of 7.3 yards. When we look at our sample of black quarterbacks we see that 84.1% exceeded the white average with respect to rushing attempts per game while 80.7% exceeded the white average for rushing yards per contest. Overall, the average black quarterback ran with the ball 3.8 times per contest and gained 19.4 rushing yards.

To put this in perspective, consider the case of Warren Moon in 1997. At the advanced age of 41, Moon ran 17 times out 575 Plays, for a rate of 3%. In 1998, a young 22 year old white quarterback Peyton Manning, only ran 15 times in 612 plays, for a frequency of 2.5%. Manning was not alone. Of the white quarterbacks examined, 11% did not run as often as an old Warren

Moon in 1997. Only one black quarterback, Doug Williams in the last year he played in the NFL, failed to run as often as Moon. Such results highlight a key difference in the performances of blacks and whites at the quarterback position. White quarterbacks can often play without their legs. A similar opportunity does not often exist for black quarterbacks.

Given the formulation of the quarterback rating, a key offering of black quarterbacks is ignored. Consequently to assess the impact of this difference, we employed a measure of performance detailed in Berri, Schmidt, and Brook (2006) and Berri (2007). These works detailed models of both points scored and points surrendered in the NFL.[14] Such models were used to derive the value in terms of net points, of passing yards, rushing yards, passing attempts, rushing attempts, sacks, interceptions, and fumbles lost. The value of each factor is reported in Table Three.

The values can be used to measure by Net Points and QB Score. Net Points simply involves multiplying the values in Table Three by each quarterback's production of each statistic. QB Score is a simpler measure, calculated as follows:

QB Score = All Yards – 3*All Plays – 30*All Turnovers

Where All yards = Passing yards + Rushing yards – Yards lost from sacks
All Plays = Passing attempts + Rushing attempts + Sacks
All Turnovers = Interceptions + Fumbles lost

The simpler measure is derived from normalizing the value of plays and turnovers around one yard. For example, as seen in Table Three, each play is worth about 3 yards. As noted in Berri (2007), the correlation between QB Score per play and Net Points per play is 0.98.

With measures in hand, we offer Table Four, where we present our evaluation of the average performance of black and white quarterbacks. This table begins by looking at this position prior to the leap in participation seen in the mid-1990s. Specifically we compare the average performance of black quarterbacks from 1971 to 1993 to what we saw on average from whites playing this position.

From 1971 to 1993 the average black quarterback was better with respect to the NFL's quarterback rating, which again only considers what a signal caller does with his arm. When we incorporate the quarterback's ability to run, the difference becomes even greater. Black

quarterbacks in the earlier time period created more points both per play and per game. And not surprisingly given our result with respect to points, blacks also have a higher QB Score and QB Score per play.

When we look at more recent years we see that both black and white quarterbacks improved. With respect to the NFL's QB Rating, though, whites are now slightly ahead of blacks. But again, this metric ignores what a quarterback does with his legs. When the rushing game is added, we again see that blacks are more productive than whites. A t-test of equality of mean values of rush yards earned by white and black quarterbacks comprehensively rejects with *p* value of 0.000.

2. Modelling Race and Compensation in the NFL

We are not the first to examine racial discrimination in the NFL. The first studies were offered by Mogull (1973, 1981). More recently Kahn (1992) and Gius and Johnson (2000) offered studies with somewhat contradictory results. Specifically, in a study of worker compensation for the 1989 season, Kahn (1992) reports a wage premium for white players. In contrast, in a study of wages paid in the 1995 season, Gius and Johnson (2000) present evidence that minority players are paid more than whites. More recently, a working paper by Doran and Doran confirm the work of Gius and Johnson with respect to every position but quarterback. In a study spanning data from 1994 to 2003, Doran and Doran report a premium paid to minorities at every position except that of the signal caller, where whites are reportedly paid additional wages for similar performances.

To understand these results, it is useful to review the standard approach to uncovering the existence of salary or wage discrimination. The simplest method proceeds by estimation of coefficients on a dummy variable to distinguish race. This assumes that the impacts of productivity measures on salary do not vary by race. If significant and negative, the race dummy represents a downward intercept shift in salary for the racial group in question. In a more sophisticated approach, researchers examine the relationship between pay and productivity, seeking to uncover differences in this relationship due to race by means of slope dummy

variables. If one finds that statistically significant racial differences exist, the researcher concludes that evidence of discrimination has been uncovered. All other factors that may influence salary must be accounted for in the salary model. If not, the estimation and interpretation of racial differences is problematic.

We begin our discussion with our dependent variable, salary. We want to compare determinants of quarterback salary for players that are some distance apart in time, as our sample period covers 1995 through to 2006. For salary data in standard occupations, deflating nominal salary by a consumer price index is sufficient for this. But salaries in the NFL have considerably outstripped consumer price inflation, fuelled by lucrative broadcast contracts. Consequently we deflate salaries by the average NFL wage, taken is season averages from large samples of NFL players shown in files on Rod Fort's sports business web site, www.rodneyfort.com/SportsBusiness.

Table Five shows some descriptive salary statistics. Total salary includes base salary and bonuses related to signing and performance.[15] Unlike other sports, only the signing bonus is guaranteed in the NFL. Hence NFL players who do not perform can see their salary in the future reduced or eliminated. Consequently, although a player may have signed his current contract sometime in the past, current pay is tied quite closely to very recent past performance. Players who do not perform according to expectations can expect teams to either force the player to sign a new contract for less money or be cut from the team.

An examination of the distribution of salaries for blacks and whites reveals that little disparity exists in the compensation of each population at the median or below. But at the 75th and 90th percentiles, it seems that white quarterbacks earn more than black quarterbacks. Consistent with this, the salary distribution for black quarterbacks is less compressed and has less skewness and kurtosis compared to the distribution for white quarterbacks. The potential for discrimination is apparent in that black quarterbacks do not appear to generate the very high rewards in the upper right hand tail of the salary distribution. Of course, it could simply be that the best black quarterbacks are not as able as the best white quarterbacks. Multivariate regression

is needed if we are to reveal genuine disparities by race, controlling for player productivity and other influences.

The specification of our multivariate regression depends upon our measure of worker productivity. In section 3 below, we offer results from estimation with four sets of productivity measures. For now, we summarise our measures by the vector ***PERFORMANCE*** and note that this can be a single measure (e.g. quarterback rating) or a group of measures. We would note that current season measures of productivity always generated insignificant coefficients, either singly or in groups. Prior season productivity measures do appear to influence player salary.[16]

This finding emphasizes the importance of recent performance in a pre-determined multi-period salary bargaining. However, we experimented with career-based cumulative measures of productivity and could find no systematic influence from these. We would note that performance by NFL signal callers is surrounded by much statistical noise reflecting both player injuries, as well as the stochastic element in the performance of team-mates on which the quarterback's performance will depend. The regular season itself is short with just 16 games. So variations in form and bad luck on critical plays will play a larger role in performance measurement than it would in a sport like baseball, where 'true' performance can be revealed over a 162 game season.

Beyond our measure of performance we consider a collection of additional regressors.[17] These regressors can be divided into three groupings: player characteristics, team characteristics, and race.

Additional Player Characteristics

As is standard in Mincer-type sports salary regressions, the first we note is a measure of experience. This will be total years of experience in the League including the current season (*EXP*). The predicted concave relationship between productivity and experience is captured by a squared term (*EXPSQ*). Years of experience, though, does not distinguish between time as a starter and time on the bench. We would expect starters – who would be involved in more plays than a back-up -- to demand additional pay. To capture the impact of being a starter, we also include as an independent variable a quarterback's *CAREER PASS ATTEMPTS*. [18]

Quantity of play is not the entire story. Perceptions of quality are also important. Prior literature on NFL salaries has stressed the role of draft status as a predictor of salary (Kahn, 1992). The best college football players are drafted into NFL franchises in seven rounds. Ceteris paribus, a quarterback drafted in the first round is predicted to have more ability than a round six draftee. This is partly self-fulfilling since teams devote considerable coaching resources to ensure that their 1st round draft picks are nurtured into genuine on-field talent.[19] Kahn (1992) used the reciprocal of draft round. But we experimented with dummy variables for each round and found significant coefficients for the first two rounds only. Hence, we include *DRAFT ROUND 1* and *DRAFT ROUND 2* as our measures of draft status. We assume that the impact of draft status only holds if the player remains with the team that drafts him; once the player is traded, the impact of draft status is lost. If the player does stay with his drafting team, then the impact of draft status remains for the duration of tenure with that club.

NFL players are broadly eligible for free agency after four seasons of experience. After three years, players have restricted free agent status in which teams holding the player's contract are allowed to make offers that at least match those available on the free agent market. Experimentation revealed that the impact of veteran or free agent status does not depend on whether we use three or four years as the qualifying period. Hence, we denote players with at least three years NFL experience by a coding of one in the dummy variable, *VETERAN*.

A feature of our data is that quarterbacks that are traded seem to receive lower salaries. Some players experience a salary reduction on joining a new team followed by enhanced salary in later years. This suggests that free agent trades are seen as risky by acquiring teams and that they need to be convinced of a new quarterback's ability before committing to a large contract. We capture the effect of player trades on salary by the dummy variable *CHANGE TEAM*. This takes a value of one for the season immediately after the player is traded.[20]

The final player characteristic we consider is another measure of perception of reputation. Each year NFL fans, players, and coaches nominate a set of players to appear in the Pro Bowl. This is an indicator of fan and peer esteem and can be thought of as a reputation attribute. We use *PROBOWL* to indicate a player who has appeared in this special game, with a

value of one starting from season after the first appearance and continuing as one throughout the rest of the player's career. Hence, we hypothesise that once gained, Pro Bowl reputation persists even if the player does not subsequently receive nomination.

Team Characteristics

Beyond characteristics unique to the player, we also consider some characteristics of the team employing the player. The team's market size is proxied using log population of the local SMSA (*LNSMSA*).[21] We have reason to expect population and salary to have a fairly weak link Team revenues in the NFL are shared to a greater extent than in other pro sports. The broadcast contract is negotiated centrally by the NFL, with equal shares of sales of broadcast rights. Gate revenues are shared between teams with the away team receiving 40 percent of revenues from ticket sales. Merchandise sales are organized centrally with revenues equally shared amongst teams. With these features of revenue distribution firmly in place, we do not expect the impact of local market size to be important.

Although marginal revenue might not vary much from team to team, the marginal productivity of a quarterback depends upon the quality of his teammates. A quarterback needs a strong offensive line to protect him from an aggressive defense and give him sufficient time to throw the ball. He also needs good receivers to catch his passes.

The role of team complementarity in pro sports is an under-researched topic in sports economics (Borland, 2006). For the National Hockey League, Idson and Kahane (2000) captured complementarity of team-mate performance as total team performance measure minus the magnitude of a particular player's contribution. Significant impacts of team-mate productivity on player salary were found.

In the NFL, such a direct approach is not possible for two reasons. First, performance measures are not available for the offensive line. Additionally, it is difficult to separate the production of wide receivers from the production of quarterbacks. Do yards gained in a pass player 'belong' to quarterback or wide receiver? Both are responsible for a successful play.

Rather than artificially attribute team performance measures to groups of players, we take as a proxy for the ability of team-mates to be the total salary of a particular unit on a given

team led by a quarterback. We introduce *OFFENSE SALARY* as the total salary of all the 'skill' position players on the team. These are wide receivers, tight ends and running backs. The ability of a set of skill position players is assumed to be correlated with *OFFENSE SALARY*. If more able skill position players raise quarterback performance, and hence salary, the coefficient on *OFFENSE SALARY* is expected to be significant and positive.

We should note that NFL franchises have to adhere to a league-wide salary cap, or a maximum payroll set as a proportion of team designated gross revenues. If a team spends more on its skill position players, it may decide to pay less to quarterbacks, given their ability. The 'thin' market for NFL quarterbacks, with just 32 pro teams, might lead to reductions in quarterback salaries which are realizable, given monopsony power. If so, the coefficient on *OFFENSE SALARY* will be significant and negative.[22]

Race and the Model

Our final variable is of course the focus of our study. Player race is indicated by the variable *BLACK* determined by visual inspection of player photographs. In our sample, all quarterbacks were unambiguously either white or black. As noted above, the use of an intercept dummy to explore race- based disparities in salary is limited since it necessarily assumes that returns to player attributes are equivalent for each sub-group. A more sophisticated approach is to explore interaction terms between *BLACK* and the ***PERFORMANCE*** vector.

Equation (2) reports the specific salary model we will estimate.

$$\begin{aligned} \ln SAL = {} & b_0 + b_1 * PERFORMANCE + b_2 * EXP + b_3 * SQEXP + b_4 * CAREER\ PASS\ ATTEMPTS + b_5 * DRAFT\ ROUND\ 1 + \\ & b_6 * DRAFT\ ROUND\ 2 + b_7 * VETERAN + b_8 * CHANGE\ TEAM + b_9 * PRO\ BOWL + \\ & b_{10} * OFFENSE\ SALARY + b_{11} * LNSMSA + b_{12} * BLACK + \mathbf{b_{13} * PERFORMANCE + b_{14} * BLACK * PERFORMANCE + e_t} \end{aligned} \quad (2)$$

3. Empirical Findings

Salaries of players in professional sports are typically more highly skewed than in other occupations (see e.g. Hamilton (1997) for NBA and Lucifora and Simmons (2003) for Italian soccer). Interestingly, the kernel density for black quarterbacks is less skewed than for white quarterbacks in our sample. Summary measures of skewness and kurtosis in Table Five show considerable differences. With a kurtosis value in excess of three, the white salary distribution

displays excess kurtosis and is leptokurtic. These properties are incompatible with a normal distribution. The white salary distribution might be influenced by some outlier observations for one player, Peyton Manning who received a much larger salary than his peers. But even when Peyton Manning is removed from the sample the differences in skewness remain.

Given the skewness in our data we follow the lead of Hamilton (1997) and Leeds and Kowalewski (2001) and explore these distributional differences below using quantile regressions (Koenker, 2005). At the median, quantile regression minimises the sum of absolute differences from the fitted regression line. A particular advantage of this estimation method is that we can assess impacts of covariates at different points of the salary distribution, not just the median. This is particularly relevant when our descriptive statistics in Table Five seem to be pointing towards salary differences between black and white quarterbacks at the 75th and 90th percentiles.

Before turning to our findings with respect to race and player productivity, it is useful to note our results with respect to our other regressors. We find that salary is positively impacted by draft positions 1 and 2, veteran status, pro bowl appearance during a career, career pass attempts and offense salary. Other offense players appear to generate significant complementarities with quarterback productivity. Players who change teams experience salary reduction, *ceteris paribus*. In addition, salary increases initially with experience, but declines as expected as a player reaches the end of his career. The turning point on experience is in the range of seven to ten years, implying age levels of 28 to 32. Population, as we expected, is not found to be a significant predictor of salary.

What of quarterback performance and race? We consider four sets of performance variables. In Table Six, we use the quarterback rating from the previous season. For the 25th percentile and above, this has a significant impact on salary. Also, for quantiles at median and above the interaction term *BLACK*QB RATING* has a negative and significant coefficient. This must be qualified by the positive coefficient on the intercept term *BLACK* at median and 75th percentile. At these quantiles, the quarterback ratings at which black players are estimated to suffer a salary reduction for extra rating, compared to white quarterbacks are 75 and 66, respectively, which would be viewed as at best mediocre performances within the industry.

Inspection of the distribution of players reveals that the majority of black quarterbacks in the neighbourhood of median and 75th percentile salaries exceed these performance levels.

However, the pseudo R^2 values in Table Six are rather low and it is not necessarily the case that front offices of NFL franchise negotiate player salaries with quarterback rating as an important performance indicator. An alternative, simpler quarterback performance metric the aforementioned QB Score.

Compared to the quarterback rating, QB Score weights pass yards differently and includes running attempts. In Table Seven, we replace quarterback rating by QB Score and find that the fit of the model improves substantially, at all estimated quantiles. The QB score has a significant impact on salary at all estimated quantiles. The *BLACK*QB SCORE* interaction term has a significant, negative impact on salary inside the tails of the distribution, at 25th,50th and 75th percentiles. Since the *BLACK* intercept term has an insignificant coefficient at all quantiles, we conclude that an increased QB Score is associated with salary reduction for black players compared to whites, inside the tails of the salary distribution. [23]

In section 1 above, we highlighted the fact that black quarterbacks tend to run with the ball more than their white counterparts. Is this difference in performance reflected in estimated quarterback salary? To investigate this question, we need to decompose the broad measures of quarterback rating or QB Score into their components. In Table Eight, we disaggregate performance into five measures: *PASS YARDS*, *TOUCHDOWNS PER ATTEMPT*, *COMPLETIONS PER ATTEMPT*, *INTERCEPTIONS PER ATTEMPT* and *RUSH YARDS*.[24] Of these, we predict positive coefficients on all variables with the exception of *INTERCEPTIONS PER ATTEMPT,* for which we expect a negative coefficient. When a quarterback's pass is intercepted it both deprives his team of a scoring opportunity and sets the opposition up with an opportunity to score points.

We also interact *BLACK* with *PASS YARDS* and *RUSH YARDS*. [25]The results in Table Eight show significant impacts of *PASS YARDS* at all estimated quantiles. The coefficient on *TOUCHDOWNS PER ATTEMPT* is, perhaps surprisingly, only significantly positive at the 75th percentile. The coefficient on *COMPLETIONS PER ATTEMPT* is insignificant at all quantiles

while the coefficient on *INTERCEPTIONS PER ATTEMPT* is only negative and significant at the 90th percentile. This suggests that the very best quarterbacks do suffer a salary penalty for the interceptions that they create. The only performance measure that has systematically significant coefficients across the salary distribution is *PASS YARDS*. Our results suggest that pass yards achieved are the most fundamental performance measure by which NFL quarterbacks are rewarded.

In Table Eight, we find that the marginal salary returns to additional rushing yards is not significantly different from zero for all quarterbacks, black and white, at all estimated quantiles. Note that the coefficient on *RUSH YARDS* remains insignificant when the interaction term with *BLACK* is removed. These results imply that black quarterbacks are not rewarded for their distinctively greater rushing contributions, a result suggestive of salary discrimination against black quarterbacks. The lack of significance on coefficients of *RUSH YARDS* further suggests that the improved fit of the model in Table Seven, with QB Score replacing quarterback rating, is not due to the inclusion of rushing yards in the QB Score measure but is more likely indicative of inappropriate (for salary determination) weighting of pass yards in the quarterback rating formula.

Our evidence of salary discrimination is reinforced by the significant, negative coefficient on *BLACK*PASS YARDS* at 50th, 75th and 90th percentiles, in Table Eight. Black quarterbacks at median salary or above suffer reduced salary compared to white quarterbacks with similar characteristics, with the size of salary penalty rising with the number of pass yards. The *BLACK* intercept dummy has an insignificant coefficient at all estimated quantiles, so there is no offset to performance-related salary disadvantage to black players.

Table Nine presents results from estimation of a parsimonious model with the generally insignificant terms *TOUCHDOWNS PER ATTEMPT*, *COMPLETIONS PER ATTEMPT*, *INTERCEPTIONS PER ATTEMPT* all removed. As before, the coefficients on *RUSH YARDS* and *BLACK*RUSH YARDS* are insignificant at all estimated quantiles. Hence, the parsimonious model sustains the finding of discrimination against black players for their particular running skills.

Also in Table Nine, the coefficient on *BLACK*PASS YARDS* is negative and significant at the five per cent level at the median and 75th percentile. This coefficient is marginally significant at the 25th percentile (p value = 0.055). Again, in some region of the salary distribution, black players suffer a salary disadvantage that rises as performance levels, assessed by pass yards, increase.

4. Concluding Observations

What have we learned about quarterbacks and race? The argument that the NFL is truly color-blind is bolstered somewhat our examination of performance and our initial study of compensation. Although there does exist differences in style between black and white signal callers, in more recent years the difference in overall production has narrowed. Furthermore, average salaries are quite similar.

Of course, the NFL does have a history of discriminating against black quarterbacks. Even today, although black quarterbacks are not uncommon, the number of blacks at this position is far below the numbers we observe at other positions. The story with respect to compensation is also not entirely positive. Using a quantile regression approach, we see evidence that neither white nor black quarterbacks receive additional reward for extra rush yards achieved. Since black players appear to be more adept at rushing than white quarterbacks, this suggests a lack of reward for an additional skill that black quarterbacks bring to their teams.

We also find that black players receive less compensation than white counterparts for additional passing contributions on the field, in some range of the salary distribution. The significant, negative coefficients on pass yards achieved by black quarterbacks is further evidence of discrimination in compensation.

So the scorecard suggests progress has been made. It is also suggested, though, that more progress remains to be made with respect to racial equity among signal callers in the NFL.

Table One
Black Quarterbacks Who have Attempted at least 100 passes in a single NFL season in league history

Black Quarterbacks	Years with 100 passes Attempted	Years
James Harris	5	1971, 1974-77
Joe Gilliam	1	1974
Dave Mays	1	1977
Doug WIlliams	7	1978-82, 1987-88
Vince Evans	4	1980-81, 1983, 1995
Warren Moon	15	1984-98
Randall Cunningham	14	1986-90, 1992-95, 97-01
Rodney Peete	10	1989-93, 95-98, 2002
Jeff Blake	9	1994-2000, 2002-03
Steve McNair	11	1996-06
Tony Banks	7	1996-01, 2003
Kordell Stewart	7	1997-03
Charlie Batch	4	1998-01
Donovan McNabb	8	1999-06
Ray Lucas	2	1999, 2002
Akili Smith	2	1999-00
Shaun King	2	1999-00
Daunte Culpepper	7	2000-06
Aaron Brooks	7	2000-06
Michael Vick	6	2001-06
Anthony Wright	3	2001, 2003, 2005
Quincy Carter	3	2001-03
Byron Leftwich	4	2003-06
David Garrard	2	2005-06
Jason Campbell	1	2006
Tarvaris Jackson	1	2006
Seneca Wallace	1	2006
Vince Young	1	2006

Table Two
Percentage of NFL Quarterbacks who are Black: 1971-2006
Minimum 100 passes attempted in a season

Year	Black Quarterbacks	All Quarterbacks	Percent Black
1971	1	35	3%
1972	0	31	0%
1973	0	36	0%
1974	2	38	5%
1975	1	33	3%
1976	1	36	3%
1977	2	36	6%
1978	1	33	3%
1979	1	33	3%
1980	2	36	6%
1981	2	40	5%
1982	1	30	3%
1983	1	38	3%
1984	1	41	2%
1985	1	43	2%
1986	2	41	5%
1987	3	41	7%
1988	3	44	7%
1989	3	37	8%
1990	3	37	8%
1991	2	38	5%
1992	3	42	7%
1993	3	44	7%
1994	3	43	7%
1995	5	39	13%
1996	5	43	12%
1997	7	41	17%
1998	8	42	19%
1999	10	42	24%
2000	11	35	31%
2001	11	31	35%
2002	10	37	27%
2003	11	36	31%
2004	6	37	16%
2005	8	39	21%
2006	11	36	31%
Totals	**145**	**1,364**	**11%**

Table Three
Value in Net Points of
Various Performance Statistics Tabulated for NFL Quarterbacks

Variable	Net Points
Yards (Passing or Rushing)	0.080
Plays (Passing Attempts, Rushing Attempts, Sacks)	-0.214
Interceptions	-2.745
Fumbles Lost	-2.899

Table Four
Comparing the Average Performance of Black and White Quarterbacks
1971-2006

Sample	Black QBs 1971-93	White QBs 1971-93	Black QBs 1994-06	White QBs 1994-06
N	39	824	106	501
Completion Percentage	54.8%	55.4%	57.6%	58.8%
Passing Yards per Passing Attempt	7.07	6.95	6.77	6.81
Touchdown Passes per Passing Attempt	4.18%	4.17%	4.01%	4.03%
Interceptions per Attempt	3.79%	4.23%	3.02%	3.17%
Quarterback Rating	**75.32**	**73.46**	**79.08**	**79.67**
Passing Yards per Game	195.7	168.2	189.9	193.5
Rushing Yards per Game	17.6	7.5	20.1	7.0
Yards lost from Sacks per Game	16.5	14.9	13.4	12.6
Plays per Game	33.3	28.1	34.2	32.5
Yards gained per Game	196.8	160.8	196.6	188.0
Fumbles Lost per Game	--	--	0.28	0.24
Interceptions per Game	1.05	1.02	0.85	0.90
Net Points per Game	**4.9**	**3.4**	**6.0**	**5.5**
QB Score per game	**57.2**	**39.7**	**60.3**	**56.4**
Yards per Play	5.90	5.73	5.75	5.78
Fumbles Lost per Play	--	--	0.8%	0.7%
Net Points per Play	**0.146**	**0.120**	**0.175**	**0.170**
QB Score per Play	**1.715**	**1.415**	**1.762**	**1.735**

Note: Data from 1971-93 does not include fumbles lost. So Net Points and QB Score were each calculated without fumbles lost in the earlier time period.
From 1994-06, average black QB Score play, without fumbles, would be 2.005.
From 1994-06, average white QB Score per play, without fumbles, would be 1.953

Table Five
Descriptive Statistics for Real Salary

Deflated by NFL average Wage, 2000 base year	White N = 435	Black N = 95
Mean	2,615,553	2.536,037
Standard deviation	2,284,601	1,930,611
10th percentile	413,224	471,033
25th percentile	793,444	819,596
Median	1,762,497	1,898,695
75th percentile	4,110,626	3,938,629
90th percentile	6,046,535	5.463,845
Skewness	1.072	0.716
Kurtosis	3.382	2.494

Table Six
Quantile Regressions of Log Real Salary: With Quarterback Rating

	Quantile				
Variable	**0.1**	**0.25**	**0.5**	**0.75**	**0.9**
EXP	0.120	0.133	0.172	0.080	0.131
	(1.42)	(2.85)	(2.46)	(1.23)	(2.63)
SQEXP	-0.008	-0.010	-0.013	-0.008	-0.011
	(1.81)	(3.09)	(3.73)	(2.28)	(3.81)
DRAFT ROUND 1	1.028	1.033	0.959	0.721	0.694
	(4.92)	(7.49)	(9.10)	(5.62)	(5.30)
DRAFT ROUND 2	0.929	0.758	0.569	0.710	0.621
	(5.01)	(3.55)	(2.11)	(3.75)	(3.73)
VETERAN	0.527	0.609	0.561	0.387	0.193
	(2.82)	(3.30)	(2.61)	(2.27)	(1.64)
CHANGE TEAM	-0.617	-0.635	-0.642	-0.579	-0.605
	(3.55)	(5.91)	(7.20)	(5.11)	(5.03)
PROBOWL	0.358	0.444	0.363	0.331	0.197
	(2.11)	(3.60)	(3.65)	(3.60)	(2.27)
LNSMSA	0.042	-0.031	-0.027	-0.023	-0.027
	(0.58)	(0.62)	(0.63)	(0.34)	(0.65)
OFFENSE	0.198	0.419	0.499	0.357	0.454
SALARY	(1.01)	(3.08)	(2.90)	(2.12)	(2.80)
BLACK	-0.376	0.558	1.727	1.406	1.027
	(0.60)	(0.91)	(2.79)	(2.50)	(1.49)
CAREER PASS	0.219	0.214	0.272	0.253	0.255
ATTEMPTS	(3.72)	(3.51)	(5.47)	(6.43)	(3.74)
QB RATING	0.0036	0.0076	0.0128	0.0131	0.0114
	(1.17)	(2.45)	(4.40)	(4.33)	(3.18)
*BLACK*QB*	0.0038	-0.0089	-0.0230	-0.0214	-0.0178
RATING	(0.53)	(1.34)	(3.19)	(3.11)	(2.01)
Pseudo R^2	0.35	0.38	0.39	0.35	0.30
N	530	530	530	530	530

Note: In Tables Four through Seven dependent variable is log real salary for quarterbacks with positive pass attempts in previous season; sample period 1995-2006; salary is deflated by average NFL salary. Standard errors are bootstrapped with 200 replications.

Table Seven
Quantile Regressions of Log Real Salary: With Quarterback Score

	Quantile				
Variable	**0.1**	**0.25**	**0.5**	**0.75**	**0.9**
EXP	0.028	0.138	0.192	0.140	0.153
	(0.34)	(2.36)	(2.65)	(2.07)	(2.46)
SQEXP	-0.003	-0.008	-0.012	-0.011	-0.010
	(0.61)	(2.63)	(3.19)	(2.67)	(3.17)
DRAFT ROUND 1	0.700	0.974	0.969	0.777	0.602
	(3.33)	(7.66)	(8.13)	(5.60)	(4.07)
DRAFT ROUND 2	0.797	0.783	0.697	0.697	0.632
	(4.47)	(5.92)	(3.66)	(3.63)	(3.98)
VETERAN	0.648	0.567	0.518	0.249	0.143
	(3.60)	(3.48)	(2.65)	(1.40)	(0.90)
CHANGE TEAM	-0.560	-0.580	-0.461	-0.405	-0.377
	(3.37)	(4.70)	(3.67)	(3.49)	(2.38)
PROBOWL	0.211	0.291	0.339	0.239	0.088
	(1.25)	(2.90)	(3.69)	(2.58)	(0.82)
LNSMSA	0.012	0.028	-0.019	0.003	0.010
	(0.17)	(0.57)	(0.46)	(0.10)	(0.26)
OFFENSE	0.239	0.292	0.461	0.310	0.291
SALARY	(1.37)	(2.15)	(2.77)	(1.83)	(1.72)
BLACK	0.135	0.123	0.332	0.093	0.265
	(0.87)	(0.96)	(1.52)	(0.59)	(1.44)
CAREER PASS	0.135	0.127	0.156	0.213	0.200
ATTEMPTS	(3.70)	(2.94)	(3.47)	(4.72)	(3.31)
QB SCORE	0.591	0.609	0.622	0.565	0.327
	(4.67)	(6.00)	(7.76)	(5.90)	(2.74)
*BLACK*QB SCORE*	-0.326	-0.332	-0.565	-0.406	-0.110
	(1.79)	(2.48)	(3.12)	(2.77)	(0.58)
Pseudo R^2	0.40	0.43	0.43	0.37	0.30
N	530	530	530	530	530

Table Eight
Quantile Regressions of Log Real Salary: With Full Performance Measures

	Quantile				
Variable	**0.1**	**0.25**	**0.5**	**0.75**	**0.9**
EXP	0.103	0.161	0.193	0.139	0.137
	(1.32)	(2.95)	(2.75)	(2.30)	(1.81)
SQEXP	-0.007	-0.010	-0.011	-0.010	-0.010
	(1.55)	(3.09)	(2.97)	(2.78)	(2.49)
DRAFT ROUND 1	0.609	0.850	0.871	0.691	0.456
	(2.85)	(7.40)	(7.45)	(5.59)	(3.39)
DRAFT ROUND 2	0.651	0.665	0.643	0.507	0.369
	(3.18)	(3.55)	(4.38)	(3.35)	(2.02)
VETERAN	0.441	0.504	0.424	0.284	0.112
	(2.60)	(3.43)	(2.34)	(1.97)	(0.74)
CHANGE TEAM	-0.654	-0.538	-0.390	-0.447	-0.326
	(4.35)	(6.20)	(3.14)	(4.68)	(2.08)
PROBOWL	0.254	0.298	0.189	0.100	0.249
	(1.51)	(3.24)	(1.87)	(1.10)	(1.49)
LNSMSA	0.032	0.016	-0.009	0.008	0.003
	(0.43)	(0.29)	(0.21)	(0.27)	(0.03)
OFFENSE	0.218	0.396	0.369	0.422	0.035
SALARY	(1.18)	(3.06)	(2.40)	(2.88)	(0.66)
BLACK	0.045	0.136	0.293	0.214	-0.099
	(0.24)	(0.74)	(1.34)	(1.34)	(0.43)
CAREER PASS	0.120	0.106	0.144	0.197	0.228
ATTEMPTS	(3.23)	(3.21)	(2.91)	(4.40)	(3.12)
PASS YARDS	0.287	0.273	0.317	0.267	0.147
	(4.97)	(6.97)	(7.17)	(7.40)	(2.63)
*BLACK*PASS*	-0.026	-0.128	-0.259	-0.228	-0.171
YARDS	(0.18)	(1.59)	(3.60)	(3.60)	(2.31)
TOUCHDOWNS	-0.027	-0.072	-0.491	0.881	0.989
PER ATTEMPT	(0.06)	(0.15)	(1.13)	(2.09)	(1.36)
COMPLETIONS	0.346	-0.040	-0.005	-0.083	0.364
PER ATTEMPT	(1.64)	(0.17)	(0.02)	(0.23)	(0.53)
INTERCEPTIONS	-2.225	-1.827	-0.167	-1.412	-3.735
PER ATTEMPT	(0.83)	(0.95)	(0.11)	(1.46)	(2.46)
RUSH YARDS	0.026	0.062	0.040	0.016	0.061
	(0.34)	(1.22)	(0.69)	(0.31)	(0.95)
*BLACK*RUSH*	-0.326	-0.010	0.025	0.064	0.051
YARDS	(1.79)	(0.14)	(0.38)	(1.16)	(0.78)
Pseudo R^2	0.42	0.46	0.45	0.40	0.33
N	530	530	530	530	530

Table Nine
Quantile Regressions of Log Real Salary: With Pass and Rush Yards

	Quantile				
Variable	**0.1**	**0.25**	**0.5**	**0.75**	**0.9**
EXP	0.086	0.165	0.198	0.149	0.141
	(0.90)	(2.76)	(2.78)	(2.35)	(1.91)
SQEXP	-0.007	-0.010	-0.012	-0.010	-0.011
	(1.18)	(2.88)	(3.11)	(2.75)	(2.65)
DRAFT ROUND 1	0.578	0.829	0.854	0.638	0.456
	(3.08)	(7.33)	(6.98)	(5.16)	(3.25)
DRAFT ROUND 2	0.571	0.613	0.674	0.508	0.329
	(2.96)	(3.45)	(4.24)	(2.97)	(1.87)
VETERAN	0.558	0.498	0.396	0.279	0.128
	(3.14)	(3.50)	(2.14)	(1.67)	(0.77)
CHANGE TEAM	-0.664	-0.529	-0.358	-0.412	-0.337
	(4.31)	(5.96)	(2.90)	(4.23)	(1.93)
PROBOWL	0.201	0.309	0.176	0.105	-0.008
	(1.14)	(3.49)	(1.73)	(1.10)	(0.06)
LNSMSA	0.000	0.018	0.003	0.013	0.036
	(0.00)	(0.42)	(0.06)	(0.42)	(0.62)
OFFENSE	0.261	0.427	0.361	0.461	0.310
SALARY	(1.59)	(2.97)	(2.42)	(3.54)	(1.68)
BLACK	0.062	0.187	0.286	0.270	-0.177
	(0.36)	(1.22)	(1.21)	(1.76)	(0.69)
CAREER PASS	0.136	0.102	0.146	0.193	0.247
ATTEMPTS	(3.32)	(3.17)	(2.97)	(3.97)	(2.92)
PASS YARDS	0.297	0.285	0.313	0.291	0.160
	(5.05)	(6.62)	(6.79)	(7.60)	(2.62)
*BLACK*PASS*	-0.076	-0.148	-0.238	-0.250	-0.139
YARDS	(0.55)	(1.93)	(2.90)	(4.21)	(1.63)
RUSH YARDS	0.019	0.056	0.045	0.028	0.056
	(0.26)	(1.09)	(0.72)	(0.54)	(0.90)
*BLACK*RUSH*	-0.019	-0.001	0.012	0.047	0.051
YARDS	(0.13)	(0.02)	(0.17)	(0.75)	(0.74)
Pseudo R^2	0.42	0.45	0.45	0.40	0.31
N	530	530	530	530	530

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End Notes

[1] For a review of the literature examining this issue prior to 1990's see Kahn (1991). More recent studies of racial discrimination in professional baseball have found that discrimination against blacks exists in the market for baseball cards [Andersen and La Croix (1991) and Fort and Gill (2000)], the hiring of NBA players [Hoang and Rascher (1999)], and the pay to players in the upper tier of the NBA's income discrimination [Hamilton (1997)]. Evidence of customer discrimination against blacks was offered by Kanazawa and Funk (2001), Burdekin, Hossfeld, and Smith (2005), and Berri and Schmidt (2005).

[2] Hanssen and Andersen (1999) presented evidence that although blacks were discriminated against in the voting for baseball's mid-season All-Star game in the 1970s, in the 1990s it is whites who suffer from discrimination. This finding is echoed in basketball by McCormick and Tollison (2001), who find that black players are favored in the allocation of playing time.

[3] With respect to NBA salaries, Jenkins (1996), Dey (1997), Gius and Johnson (1998), Bodvarsson and Brastow (1998, 1999), and Eschker, Perez, and Siegler (2004) offer little evidence of discrimination. More recently, Berri, Schmidt, and Brook (2004) failed to find evidence of customer discrimination in an examination of gate revenue in the NBA.

[4] The story of Willie Thrower is reviewed in Finder (2002).

[5] Although Briscoe finished second in the voting for the AFL's rookie of the year, he was cut from the team before the start of the 1969 season. Briscoe did enjoy a career as an NFL wide receiver, but he never played quarterback again. (Associated Press: February 22, 2005)

[6] The restriction of the sample to quarterbacks with 100 pass attempts follows from the work of Leeds and Kowalewski (2001).

[7] It is interesting to note that a team that contributed to the efforts to integrate the quarterback position in the NFL utilizes a racial epithet as its name.

[8] Career data for Marlin Briscoe, James Harris, Joe Gilliam, and Doug Williams can be found at http://www.pro-football-reference.com/

[9] See Leeds and Von Allmen (2005).

[10] As noted by Jenkins (1996), both the works of Quirk and Fort (1997) and Scully (1995) suggest that the utilization of an index, rather than using a multitude of separate statistics, provides a more accurate measurement of an individual player's productivity.

[11] Slugging percentage was the primary measure of productivity employed in thirteen studies published from 1974 to 2002. In addition to the Goff et. al. (2002), slugging percentage was employed by Scully (1974), Sommers and Quinton (1982), Raimondo (1983), Bruggink and Rose (1990), Hill (1985), Durland and Sommers (1991), Sommers (1993), Krautmann and Oppenheimer (1994), Krautmann (1999), Krautmann, Gustafson, and Hadley (2000), Maxcy, Fort, and Krautmann (2002), Krautmann and Oppenheimer (2002). Sommers (1993) also employed a player's batting average while Krautmann, Gustafson, and Hadley (2000) added a hitter's runs-batted-in. Slugging percentage has not been the only measure of productivity chosen. Medoff (1976), Hill and Spellman (1983), and MacDonald and Reynolds (1994) measured a hitter's productivity with runs scored. Such a choice ignores the impact a player's hitting has upon the scoring of teammates. Sommers (1990) utilized a player's batting average, or simply hits divided by at-bats. Batting average ignores the quality of a player's hits and is generally considered inferior to slugging average. Finally, Zimbalist (1992a, 1992b) utilized slugging percentage with a player's on-base percentage in the construction of a summary statistic he labeled PROD. PROD is better known today as OPS.

[12] Utilizing team baseball data from 1995 to 2004, one can explain 81% of the variation in a team's runs scored with a team's slugging percentage. In contrast, a measure like OPS – which is on-base percentage plus slugging percentage – can explain 90% of runs scored. Asher Blass (1992) employed a linear weights model, which consists of regressing the number of runs a team scored in the regular season on each teams accumulation of singles, doubles, triples, non-intentional walks, hit batsmen, stolen bases, sacrifice flies, the summation of double plays and caught stealing, and outs. This model, when estimated with data from 1995 to 2004, explains 94%. Given both OPS and the linear weights model, it is surprising researchers still employ slugging percentage as the measure of a hitter's output.

[13] ESPN.com, as well as other web sites, reports the equation for the NFL's quarterback's rating.

[14] Two models were detailed in Berri, Schmidt, and Brook (2006) and Berri (2007). The first regressed the points scored by a team's offense on factors associated with acquisition of the ball, the ability to advance the ball across the field of play, the ability to maintain possession of the ball, and the team's ability to convert scoring opportunities into points. A second model was estimated connecting the same factors for the opponent to the number of points allowed by a team's defense. From these two models we learn the impact passing yards, rushing yards, passing attempts, rushing attempts, sacks, interceptions, and fumbles lost have on offensive points scored and defensive points allowed.

[15] The salary we employ for the each player refers to the sum total of actual base salary, signing bonus and performance-related bonuses as posted by USA Today. Within this measure the signing bonus is treated as pro-rated across the duration of the contract. Finally, salaries are converted into real values at 1994 prices.

[16] Use of prior season productivity measures has the effect of reducing the sample size available for regression analysis from 607, as reported in the descriptive statistics in Table Four, to 530.

[17] A similar set of control variables appears in Simmons and Berri (2008).

[18] Alternative measures of on-field experience include career total plays, starts or games. The career pass attempts measure has the advantage of capturing a quarterback's primary on-field function. Substitution of these alternative measures of experience does not affect the results reported below. When career pass attempts is included the R^2 value is slightly higher than when any of the alternative experience measures is used.

[19] The best quarterbacks are not necessarily round one draft picks as the current example of New England's Patriots quarterback, Tom Brady (round six) testifies. Brady led the Patriots to three Super Bowl titles in 2001, 2003, and 2004.

[20] Most trades occur in the off-season.

[21] We initially supplemented the population measure with the proportion of African-Americans in the SMSA population (*BLACKPOP*) as a proxy measure to capture possible customer discrimination (see both Bodvarsson and Partridge, 2001; Hamilton, 1997). However, this did not deliver significant coefficients in any of our estimations and was dropped from the analysis. A problem with this measure is that it does not vary through time. Our SMSA population measure is time-varying.

[22] On a similar basis, we could use *OFFENSIVE LINE SALARY* as a measure of offensive line ability. But in preliminary analysis, the coefficient on this measure was not significant and we exclude it from the reported estimates.

[23] Very similar results were found when we replaced QB Score by Net Points. The results with Net Points included are not reported to save space but are available from the authors on request.

[24] Inclusion of a further adverse characteristic, fumbles lost per play, results in an insignificant coefficient at all quantiles.

[25] We also interacted *BLACK* with *TOUCHDOWNS PER ATTEMPT*, *COMPLETIONS PER ATTEMPT* and *INTERCEPTIONS PER ATTEMPT* but these terms delivered insignificant coefficients at all estimated quantiles nd are omitted from the results in Table Eight.