# The Age-Position Effect in the NFL Free-Agent Labor Market


University of California, Santa Barbara

Department of Economics

Author: Bunsee Patel

Advisor: Professor Javier Birchenall

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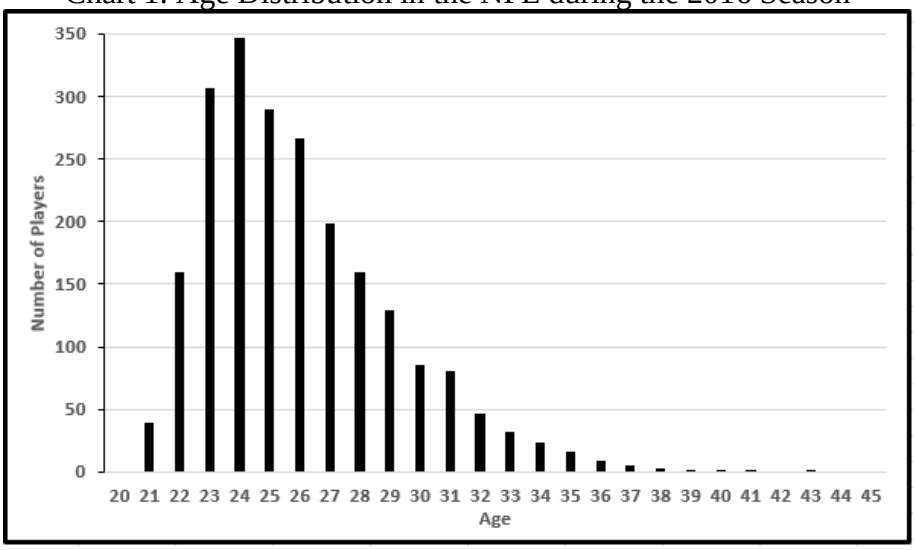
**Abstract**

The National Football League (NFL) is a unique economic environment for athletes and teams that fails to conform to typical labor-wage markets. Athletes in the National Football League have extremely short careers due to the physically demanding nature of football, creating a unique trajectory of earnings. Varying importance of positions and different career lengths as a result of disproportionate amount of contact leads to a difference in pay amongst position groups, despite apparent differences in skill. This paper examines the factors that go into determining contract length and amount (primary focus on age and position), as well as the discrepancy of earnings between position groups.

**Background/Introduction**

The National Football League (NFL) has a unique labor market that enables players to negotiate their wage with the teams that they seek to play for. As a result, several factors beyond the generic supply and demand of labor go into effect when player contracts are determined. In typical labor markets, age equates to experience and leads to higher wages and increased leadership roles. However, career trajectories in the NFL resemble a bell curve. Value for a player's service is high as a rookie and it increases as they develop their skills and improve as a player. Eventually, players reach their "prime" or peak skill level, where their value also peaks. After their prime, the player continues to age and eventually loses athletic ability, lowering their skill level and thus their value to their team. Despite extensive experience and knowledge, an old NFL player will eventually begin to earn less money compared to their peers due to a diminished level of athleticism. As seen in Chart 1, the NFL population is skewed towards younger players.

Chart 1: Age Distribution in the NFL during the 2016 Season




Before diving deeper, it is fundamental to understand the role of the Collective Bargaining Agreement (CBA) and salary cap on how contracts are written and offered. The NFL

Collective Bargaining Agreement is a labor agreement between the NFL Players Association and the league's team owners that sets labor standards regarding the distribution of revenues and various benefits across the league. One crucial element that arises from the CBA is the salary cap, which is a tool that establishes parity between the 32 NFL teams. The NFL salary cap is determined by a combination of factors each year that ultimately determines the maximum amount any given team is permitted to spend on its roster of players. All teams are required to comply with the salary cap and incur large penalties if they fail to do so. This measure prevents richer team owners from securing the best talent by offering more money for available players. Additionally, the salary cap limits the earnings of athletes, since teams do not want to spend over the cap. As a result, teams and players negotiate contracts that benefit both parties.

One unique element of player contracts is that they often extend beyond one year, which further complicates the negotiation process. In traditional workforces, employees have an annual salary that is negotiated and altered after every year. In the NFL however, contracts can be set for several years in advance, which is often a point of conflict in negotiations. Due to the violent nature of the sport, players often seek longer term contracts to hedge the risk of suffering a career-ending injury. On the other hand, teams prefer shorter deals in order to maintain salary cap flexibility. Typically, better players are able to leverage their skill and availability to secure longer contracts, whereas unproven players typically receive shorter deals as an opportunity to prove their worth.

The franchise tag is a common tool used by teams who fail to reach a long-term agreement for their top talent. The franchise tag allows the team to retain an unrestricted free agent for one year if certain conditions are met. The franchise tag is a guaranteed contract for one year equal to the average of the top 5 salaries across the league at the player's position. The

franchise tag allows the team to maintain flexibility while giving the player top pay. However, players often get dissatisfied due to the short contract length and the team's ability to use the tag as many times as they would like, leading to contract holdouts and protests.

Players are able to negotiate salaries at any time of the year, even if they are currently on a prior contract. Players under contract will negotiate for extensions or raises, while players who not under contract, known as free agents, will negotiate for a brand-new contract. The league operates from August to February, with a draft for college players occurring in the spring. Free agency typically begins in the summer, during which most players sign new contracts. While free agents can sign at any time of the year, there is a flurry of activity once the season ends, as it is tougher to incorporate a new player to a team mid-season.

The main areas of focus in this paper are the determinants of the earnings for NFL players, more specifically the effects of age and position on the salary free agents receive. An important distinction to be aware of is that this paper will only look into players signing contracts during free-agency periods, and not players signing extensions with their current teams. Thus, the sample does not include and resemble the entire NFL population. In order to isolate the effects of age and position on earnings, there must be an adequate control for the other major factors that go into determining salary figures, including skill, character and past success (winning games). With proper control for those variables, the interaction between age and position can be examined to determine any evidence of pay discrimination between positions. If a significant relation is discovered, players seeking to earn more in their careers and sustain longer careers may lean towards playing particular positions. Additionally, it can serve as the basis for leveling the pay between positions so that players who sustain more contact and have shorter careers can be fairly compensated for the additional harm they sustain from the sport.

**Related Literature**

There is a plethora of academic discussion on earnings within the context of sports. Existing literature has long established that performance metrics and statistics in sports is a relatively pure measure of productivity. Given the vast literature pertaining the NFL labor market, this paper will build off of existing models and take a different approach in handling productivity and skill element.

Johnny Ducking, Peter Groothuis, and James Hill's study (2014) on compensation discrimination looks into the issue of racial discrimination in a sample of NFL football players. This paper utilizes an OLS estimation that regresses log earnings on a variety of controls including performance stats in order to isolate the effect of race on earnings. This paper helped establish certain elements of the model used in this paper, such as the incorporation of performance statistics in the model. Ultimately, the researchers were unable to discover an effect of race on earnings and concluded that player performance trumps race in determining earnings, which allows for the elimination of race in the model in this paper.

Kevin McIntyre (2017) also explores factors that go into determining wages in the NFL. In his work, McIntyre concludes that while position-specific skills are an important consideration in earnings, durability and experience are more prominent factors determining career earnings. This paper establishes that the position of an NFL players is a significant factor along with experience, which validates their placement in the model in this paper. There is no incorporation of an interaction term between the two however, and there is no exploration of the effect of age or experience on earnings between different positions, which is the angle of this paper.

Michael Kremer's O-Ring Theory (1993) has a broader application to this paper. One crucial conclusion from Kremer's work is the idea that wage and productivity differentials

between rich and poor countries are large, which in this case applies to “rich” and “poor” teams. This indicates that more successful teams are able to generate more productivity from their players. Additionally, this applies to teams that spend more where they can outside of the salary cap, such as more money for better coaches and facilities. Kremer proves that workers performing the same task earn higher wages in a high-skill firm than a low-skill firm. This concept relates in this context in the sense that players can have similar skill levels as their peers but will be rewarded more for being on a winning team. Richard Borghesi (2008) sheds light on salary cap allocation strategies. The key insight from this paper is that ultimately teams that disperse their salary more evenly across players perform better than those that take a superstar approach, in which the team allocates a disproportionate amount for fewer, more talented players. The presence of the superstar causes more harm, even if their play justifies the contract they receive.

While most of the works outlined have taken different approaches to building an effective model for predicting wages, all of them utilize performance statistics as a means to control for productivity. However, the models do not capture skill which can be done with the incorporation of analytics, which are now more readily available than in the past. Additionally, while there is work that examines the role and significance of position and age on earnings, there is no current work looking at how the effect of age on earnings varies across position group, which is the main intent of this paper.

**Empirical Strategy**

In order to isolate the combined effect of age and position group, the model used to measure earnings must properly control for factors that go into determining player salaries. The most prominent factors that affect earnings are player skill, performance, character, and the

position they play. When determining a period to focus on, any season after 2011 makes the most sense, as the most recent iteration of the CBA was enacted in 2011. In order to overcome the likely nonlinear nature of the age variable, age groups will be included as dummy variables in the regression. The position played by the athlete will also be treated as a dummy as well, which will then interact with the dummy variables for age.

In order to avoid issues with the regressions, players with the same name are dropped form the sample, as well as any inconsistencies between player names. The contracts in focus will all be those signed during free agency periods. Lastly, rookie contracts are not part of the sample either, as their wages are mostly standardized and capped by the CBA. Rookies also are new to the league, and have no statistics measured yet.

Regressions will be run using annual earnings and contract length as dependent variables, as these are the key measures of contracts in the NFL. Preliminary regressions will be run to determine the relationship position and age have on the dependent variables individually. Next, control variables will be tested for effectiveness. The final regression should resemble the following model:

$$\text{Average Contract Years} = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1\text{Age} + \boldsymbol{\beta}_2\text{Position} + \boldsymbol{\beta}_3\text{PFF Grade} + \boldsymbol{\beta}_4\text{Arrests} + \boldsymbol{\beta}_5\text{Team Wins} + \boldsymbol{\beta}_6\text{Age*Position}$$

The variables for PFF grades, arrests and team wins are lagged by one year, as the contracts are signed before the season begins. That means that at the time of the signing, information regarding these variables need to be from the year prior. Since position and age are both dummy variables, the special teams position group and the youngest age group (20 to 25) are dropped to avoid multicollinearity. Special Teams players are largely insignificant and are the lowest paid position group, so having the lowest earning group and the youngest age group as the constant makes interpretation simpler.

Ultimately, the objective is to find a significant causal effect on the interaction terms between age and position by conducting an F-test with all of the interaction terms. This would indicate that age does disproportionately affect player earnings depending on the position they play. Additional regressions can be run to discover additional trends, such as the effect of these factors on contract length instead of earnings. If the F-test fails to be significant, then there would be no evidence of an additional effect of age due to position.

**Data Description**

The key dependent variables in the model will be the contract data collected from Spotrac, a site dedicated towards the collection and presentation of professional athlete compensation. The data collected covers contracts signed during free agency periods between 2013 and 2018. Each observation contains data on the total size of the contract, the average annual payout, age at the time of the signing, and the position of the players. Annual player salary and contract length in years serve as the two key dependent variables, as they are two critical components of contracts that can be compared. Longer contracts provide more stability and financial security that is coveted in a sport with relatively short career spans and potential for long term health issues.

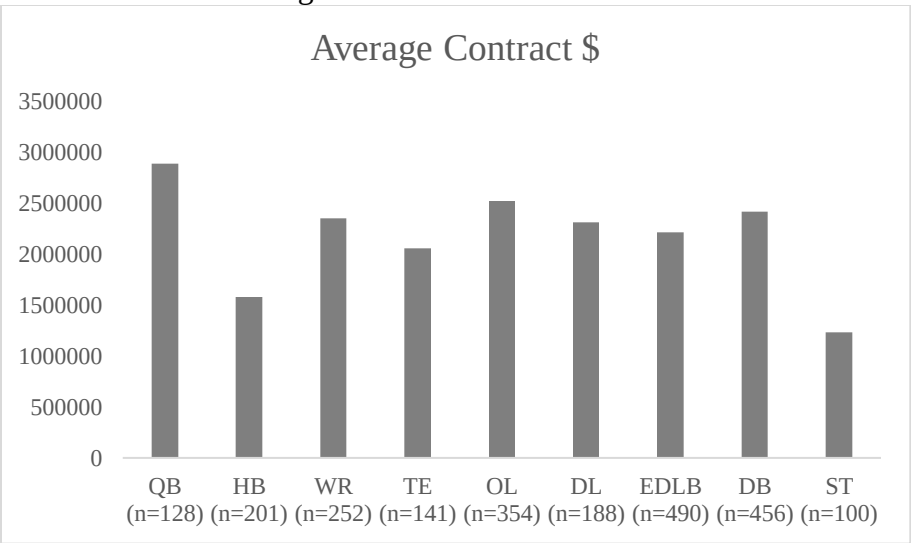
Table 1: Summary of Data

| Observations (n) | Average Annual Contract $ | Average Length | Average Total $ |
|---|---|---|---|
| 2,310 | $2,253,329 | 1.68 Years | $5,719,627 |

As we can see in Table 1, there are 2,310 contracts signed during the free-agency periods between 2013 and 2018. These contracts have a short contract length of under 2 years on average, largely due to the frequency of smaller contracts being signed. Contract extensions tends to be much longer, however this sample only covers free-agent contracts. These 2.310 contracts will serve as the sample size for regressions without lagged variables. When lagged

variables are introduced, the data will cover 2014 to 2018 to account for the variables from the previous year.

Chart 2: Average Contract Amount Between Positions




Looking at the distribution of contracts in the sample in Chart 2, it can be seen how the positions differ in average amount of money in their contracts signed. This chart reflects the relative importance and value of the positions, which can be attributed to a variety of factors from scarcity to health to durability and dependability.

Player skill grades and performance statistics were collected from Pro Football Focus (PFF), which is an independent sports analytics site that grades player performance. Analytics allow for a more accurate assessment of player skill than performance metrics, and they allow for comparison between different position groups due to the consistent 100-point scale. The average player grade in this data set is roughly 63. Skill is a critical factor in contract negotiations, and simply using performance stats would downplay the talent of a player. For example, a low skill quarterback who simply throws the ball more can collect more passing yards than an extremely talented quarterback who is utilized less. The recent prominence of advanced analytics can control for skill effectively. PFF grades are becoming widely accepted as a strong gauge of skill

and performance, and now several NFL teams have analytics departments that utilize advanced metrics in influencing roster building decisions as well. While PFF's grading scale is slightly subjective, it is evenly applied across every player, making it an effective point of comparison. Every player's PFF grade and relevant performance stats have been collected for 2013 to 2018 seasons and will be incorporated in the model.

In order to measure character, arrest data collected from USA Today's NFL player arrest tracker will be incorporated into the model as well. The number of legal infractions sheds insight on a player's character and availability, as multiple run-ins with the law can lead to suspensions. NFL teams have notoriously looked passed legal troubles, however repeated and significant infractions of the law still hold merit and is an important factor to control for in the regressions. In this paper, I will simply be using the frequency of arrests. However, this could be a potential shortcoming as severity is not factored. Some players may have multiple misdemeanors, which would likely be less of a negative effect on earnings than one significant felony. While that may be the case, a very small portion of the sample has a legal record, so the frequency should be enough to flag the few players that have had run-ins with the law. Also, arrests outside of the time frame of 2013-2018 will be omitted, so there is not a comprehensive description of every player's legal history (for example, some players could have been arrested in high school or college, and that would not be reflected in this sample).

**Results:**

Regression 1: Average Annual Earnings/Average Annual Earnings = $\boldsymbol{\beta}_0 + \boldsymbol{\beta}_1$QB + $\boldsymbol{\beta}_2$HB + $\boldsymbol{\beta}_3$WR + $\boldsymbol{\beta}_4$TE + $\boldsymbol{\beta}_5$OL + $\boldsymbol{\beta}_6$DL + $\boldsymbol{\beta}_7$EDLB + $\boldsymbol{\beta}_8$ DB+ $\boldsymbol{\beta}_9$ PFF+ $\boldsymbol{\beta}_{10}$ Wins+ $\boldsymbol{\beta}_{11}$ Arrests

Table 2: Dependent Variable: Annual Earnings ($)

| Variable name | (1) | (2) | (3) |
|---|---|---|---|
| Quarterback | 1,699,585*** | 54,437.29 | 1,963,762** |
| | (416,379.9) | (503,023.1) | (578,380.8) |

| | | | |
|---|---|---|---|
| Half Backs | 342102.4** | -1,798,187*** | 116,206.2 |
| | (120,169.2) | (302,479.7) | (221,318.9) |
| Wide Receiver | 1,119,078*** | -945,393** | 1,010,232*** |
| | (182,419.4) | (302,479.7) | (271,371.4) |
| Tight End | 823999.1*** | -1,018,473** | 706,230.2** |
| | (183,375.4) | (311,506.9) | (280,230.8) |
| Offensive Line | 1,286,171*** | 29,735.96 | 209,842 |
| | (165,689) | (300,462.2) | (275,908.8) |
| Defensive Line | 1,079,481*** | -1,495,400*** | 921,340** |
| | (198,194.6) | (343,565.2) | (290,480) |
| Edge/Linebackers | 976,422.5*** | -1,579,706*** | 855,046.9*** |
| | (126,629.8) | (301,136.6) | (233,193.9) |
| Defensive Backs | 1,183,078*** | -1,389,377*** | 1,058,647*** |
| | (138,707.1) | (306,583.4) | (239,208.4) |
| Cons_ | 1,234,031*** | 899,991.4** | 1,533,628*** |
| | (73,926.55) | (273,614.1) | (194,336.8) |
| PFF Grades (1-Year Lag) | | 38,567.23*** | |
| | | (3,017.3) | |
| Team Wins (1-Year Lag) | | 94,342.72*** | |
| | | (21,506.15) | |
| # of Arrests (1-Year Lag) | | | 183,325.3 |
| | | | (465,580.3) |
| Observations | 2,307 | 1,506 | 1,506 |
| R-squared | 0.0201 | 0.1328 | 0.0251 |

Standard errors in parentheses; *** p<0.01, **p<.05, *p<0.1

The first column in Table 2 helps establish the differences in pay between position groups in the NFL are statistically significant. This has been established before, as different positions have different levels of importance and varying degrees of contact, which can affect career longevity disproportionately. It can be seen that half-backs, tight-ends, and edge rushers/linebackers all have coefficient magnitudes under $1 million, whereas quarterbacks and defensive backs exceed this threshold. This directly falls in line with the amount of contact each of these positions deal with. The only major exception is the offensive line (OL), which deals

with a lot of on-field contact. However, this position group is seen to be highly valuable and scarce, indicating that perhaps performance outweighs the heightened risk of injury.

Adding controls for player skill and success of their team for the prior year diminished the significance of certain positions, as seen in column (2) in Table 2. Both of these controls are extremely significant, as seen in every regression run hereafter. Players get rewarded with higher pay for being good at their jobs and for having past success as members of successful teams. Arrests from the prior year is insignificant in the regression, which can be attributed to a variety of factors. First, the data set fails to take into account players who fail to receiver contracts after having a legal run-in. Thus, the observations in this regression only include those who were able to secure a contract, indicating that they must have other favorable traits that outweigh their character, such as high skill. Second, there is no measure of severity of arrest, so the variable is not equal for every player.

Table 3: Dependent Variable: Contract Length (Years)

| Variable name | (1) | (2) | (3) |
|---|---|---|---|
| Quarterback | -.124 | -.940897*** | -.3068784 |
| | (.106545) | (.2262198) | (.2148028) |
| Half Backs | -.0026866 | -.8125092*** | .1670289 |
| | (.1117511) | (.2267712) | (.217741) |
| Wide Receiver | .1346032 | -.679177** | -.0231879 |
| | (.11583) | (.2253563) | (.220755) |
| Tight End | .1834043 | -.5533401** | .022312 |
| | (.1276981) | (.2304602) | (.2284532) |
| Offensive Line | .3187571** | -.4119532* | -.3626936* |
| | (.1153878) | (.2246831) | (.2185555) |
| Defensive Line | .1355319 | -.8590215*** | -.0423691 |
| | (.1232647) | (.2366861) | (.226207) |
| Edge/Linebackers | .1293878 | -.8603904*** | -.0392405 |
| | (.1017775) | (.2244624) | (.2108206) |
| Defensive Backs | .1771053* | -.8233313*** | .0039606 |
| | (.1049519) | (.2240809) | (.2132684) |

| | | | |
|---|---|---|---|
| Cons_ | 1.54*** | 1.426796*** | 1.724461*** |
| | (.090087) | (.2193413) | (.204323) |
| PFF Grades (1-Year Lag) | | .0132237*** | |
| | | (.0011173) | |
| Team Wins (1-Year Lag) | | .0401856*** | |
| | | (.0086661) | |
| # of Arrests (1-Year Lag) | | | -.1579168 |
| | | | (.1505238) |
| Observations | 2,307 | 1,506 | 1,506 |
| R-squared | 0.0094 | 0.096 | 0.011 |

Standard errors in parentheses; *** p<0.01, **p<.05, *p<0.1

In the regressions in Table 3, the dependent variable is now set to contract years instead of annual earnings. Here, position groups are not very significant as determinants of contract length, as seen in column (1). However, player skill and team wins are once again strong controls, indicating that they are highly valued in both determining the value and length of free agent contracts. This falls in line with the expected logic of NFL teams, as they would be more likely to offer longer contracts to those who are better and have a history of winning. It would not be logical to offer a long contract to an unproven player.

Regression 2: Average Annual Earnings/Average Annual Earnings = $\boldsymbol{\beta}_0$ + $\boldsymbol{\beta}_1$Age26to29 + $\boldsymbol{\beta}_2$Age30to35 + $\boldsymbol{\beta}_3$Age36to46 + $\boldsymbol{\beta}_4$PFF+ $\boldsymbol{\beta}_5$Wins+ $\boldsymbol{\beta}_6$ Arrests

Table 4: Dependent Variable: Contract Length (Years)

| Variable name | (1) | (2) | (3) |
|---|---|---|---|
| Ages 26 to 29 | .3498861*** | .2935308** | .2311423** |
| | (.0733089) | (.1067546) | (.1097983) |
| Ages 30 to 35 | .0531919 | .1129804 | .0363401 |
| | (.0735951) | (.1083409) | (.1114095) |
| Ages 36 to 46 | -.2030387** | -.2307401 | -.2496525* |
| | (.0997947) | (.1565763) | (.1360333) |
| Constant (Ages 20 to 25) | 1.453039*** | .5874357*** | 1.500386*** |
| | (.0656263) | (.1299347) | (.1036976) |
| PFF Grades (1-Year Lag) | | .0104036*** | |
| | | (.0009286) | |
| Team Wins (1-Year Lag) | | .0397672*** | |

| | | | |
|---|---|---|---|
| | | (.0086118) | |
| # of Arrests (1-Year Lag) | | | -.1341699 (.1527995) |
| Observations | 2,307 | 1,506 | 1,506 |
| R-squared | 0.0207 | 0.0916 | 0.0111 |

Standard errors in parentheses; *** p<0.01, **p<.05, *p<0.1

The regressions in Table 4 uncover information regarding the relation between the contract length and the age of the player at the time of the signing. Here, there seems to be an opposite effect compared to the regressions in Table 3. The age groups of 26 to 29 (which is an age range typically seen as a player's prime) and 36 to 46 are significant, indicating that being younger or older relative to the players in free agency is significant. Looking at the coefficients, it can be seen that being in the younger age group adds roughly .4 years to the estimated contract length on average, whereas being in the older group leads to a drop in expected contract length by .2 years on average. Once again, the controls for player skill and team performance are significant, however only the younger age group remains significant.

Table 5: Dependent Variable: Annual Earnings ($)

| Variable name | (1) | (2) | (3) |
|---|---|---|---|
| Ages 26 to 29 | 757,322.6*** | 351,985.6 | 164,804.8 |
| | (217,410) | (343,965.7) | (357,494.4) |
| Ages 30 to 35 | 643,240.4** | 548,228 | 317,841.1 |
| | (229,637.4) | (360,444.8) | (372,726) |
| Ages 36 to 46 | 943,434* | 1,410,697 | 1,309,270 |
| | (566,192.1) | (991,694.4) | (1,024,467) |
| Constant (Ages 20 to 25) | 1,585,058*** | -240,790.6 | 2,179,101 |
| | (207,331.5) | (371,359.4) | (348,919.3) |
| PFF Grades (1-Year Lag) | | 30,287.53*** | |
| | | (2,359.358) | |
| Team Wins (1-Year Lag) | | 86,184.84*** | |
| | | (21,642.19) | |
| # of Arrests (1-Year Lag) | | | 2,855.964 |
| | | | (482,360.6) |
| Observations | 2,307 | 1,506 | 1,506 |

| | | | |
|---|---|---|---|
| R-squared | 0.0064 | 0.1029 | 0.0039 |

Standard errors in parentheses; *** p<0.01, **p<.05, *p<0.1

Looking at earnings, age initially appears to be a significant determinant, however the coefficients indicate that players in the older group get paid better. This once again is not completely representative, as the data does not account for players that retire or do not receive another contract offer for age-related reasons. Thus, this premium is most likely due to the skill of the players, as they are being offered contracts despite their age due to other factors, such as their experience or leadership. Controlling for skill and team performance from the prior year strips the age group variables of their significance.

As seen in each of the regressions, the controls for player skill and past team success are extremely significant and are instrumental factors in determining contracts in free agency. The number of arrests however is not an appropriate control for this model, since it fails to take into effect the players that fail to receive contracts due to arrests. Additionally, arrests are not widespread, so there are not enough observations for it be to a strong control. Hence, arrests are not used as a control in the next stage of regressions.

Regression 3: Average Contract Years/Average Annual Earnings = $\boldsymbol{\beta}_0 + \boldsymbol{\beta}_1$Age + $\boldsymbol{\beta}_2$Position + $\boldsymbol{\beta}_3$PFF Grade + $\boldsymbol{\beta}_4$Arrests + $\boldsymbol{\beta}_5$Team Wins + $\boldsymbol{\beta}_6$Age*Position

The main regressions once again have annual salary and average contract length as dependent variables. Right hand variables include age, position, the interactions between age and position groups, team wins, and player skill. With this regression, there is no discernable trend in the coefficient terms for the interaction terms across age, as seen in Charts 3 and 4 (found at the end of the document). We can see an additional age penalty in tight ends, defensive linemen and defensive backs, as the interaction term for the oldest position group indicates a drop in both

contract length and amount. However, these coefficients are almost all insignificant, so the evidence is not convincing.

Quarterbacks appear to be an outlier position group, as the coefficients are large negative figures. This is due to the strong significance of the player playing the quarterback position. A quarterback in the youngest age group is an extremely valuable player, as they play a premium position and have many years left to give to the sport. Hence, each interaction term with the quarterback variable and an older position group leads to a sharp drop in predicted earnings and contract length. Quarterbacks as a whole however are a unique position within football given its relative importance and the protection of the position.

Both F-tests for the regressions (results below Charts 3 and 4) indicate that the interaction terms are jointly significant, which provides strong evidence that age and position work differently based on the combination of the two for a particular player. This confirms the initial hypothesis that age affects position groups differently, however it does not provide insight on whether it is harmful or not. There is no strong evidence for discrimination based on a combination of these factors.

**Conclusion:**

NFL contracts are measured by the amount of money and the length of the contract, and it can be seen that different factors affect different elements of the contracts. With annual pay, there appears to be a position premium for position groups more involved in the passing offense. In this study, Quarterbacks, Wide Receivers and Offensive Linemen had the highest coefficients for predicted salary (Table 2, column 1), which falls in line with the current iteration of the NFL league. Passing is become a prominent strategy and emphasis for winning games, and these position groups are vital for a strong passing attack. Teams are willing to pay larger amounts of

money to secure the top talent to bolster their passing game. On the other hand, age becomes a prominent factor when it comes to contract length. This again falls in line with conventional free agency logic, as teams are willing to give more guaranteed years of employment when players are younger and have more shelf life. Older players present a higher risk for injury, so it makes sense that they receive shorter contracts in comparison.

Looking at the combined effect of age and position, there seems to be an additional age penalty for certain groups, including tight-ends, defensive linemen, and defensive backs, however it is statistically insignificant. The fact that there weren't any observations of running backs for the oldest position group shows how careers are shorter at the position. However, the interaction between age and the running back position failed to uncover any age penalty in the 30 to 35 age group, which is surprising. While the interaction terms are not strongly significant on their own for the most part, the interaction terms are jointly significant. This provides support that position groups do get impacted by age differently. These differences may lie again with how teams weigh and value the importance of the position and the age of player.

Ultimately, age matters for contract length and position matters when determining pay. This falls in line with past research and well known free-agency strategies. The interaction terms fail to paint a picture for an additional age penalty on certain position groups. This fails to support my initial hypothesis, which is that positions that face more contact (such as running backs and linebackers) would get penalized more for being old at their respective positions. While age and position are jointly significant, there is no distinguishable relation between the two across positions to indicate any discrimination or additional pay disparity.

Looking ahead, there is much more research that can be done to shed more light into the contract negotiation scene in the NFL. With ample time, there is vast amounts of data that can be

incorporated to create a more robust model to examine the factors that go into determining contracts. For example, injury history, arrest type and more performance measures can all be incorporated to enhance predicative power. Additionally, this study is limited to contracts signed in free agency. Not every contract is signed during this time period, and this sample excludes the top talents in the sport who are often extended before getting the chance to hit the open market. It is very possible to create a larger a more comprehensive sample across a longer window of time. The sample can contain information on every player, every contract signed, and a full background of every player. Background info that could be used includes draft position, medical history and playoff success. With a more robust data, there is great potential to uncover more insights regarding negotiations in the NFL.

Chart 3:

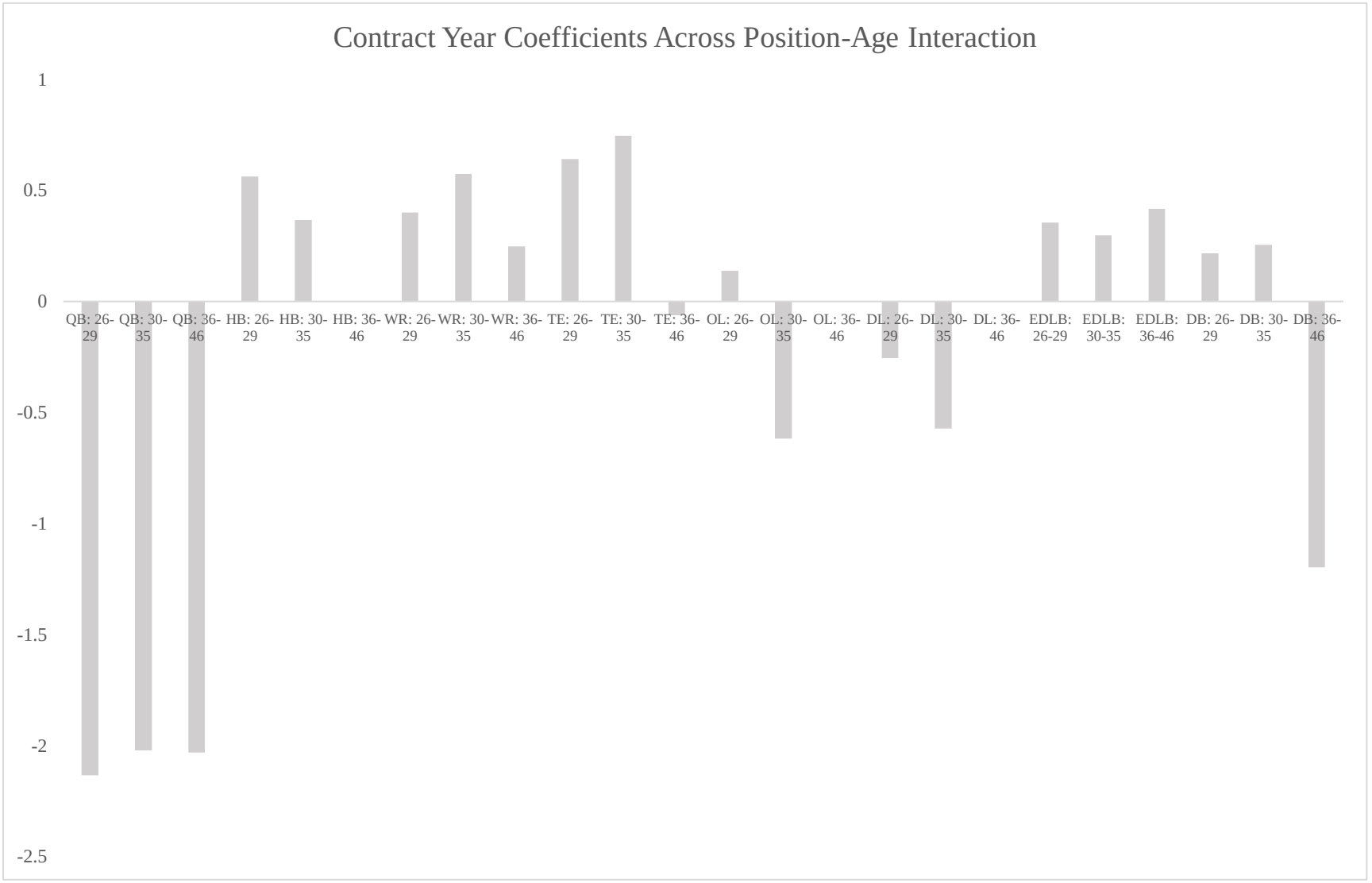
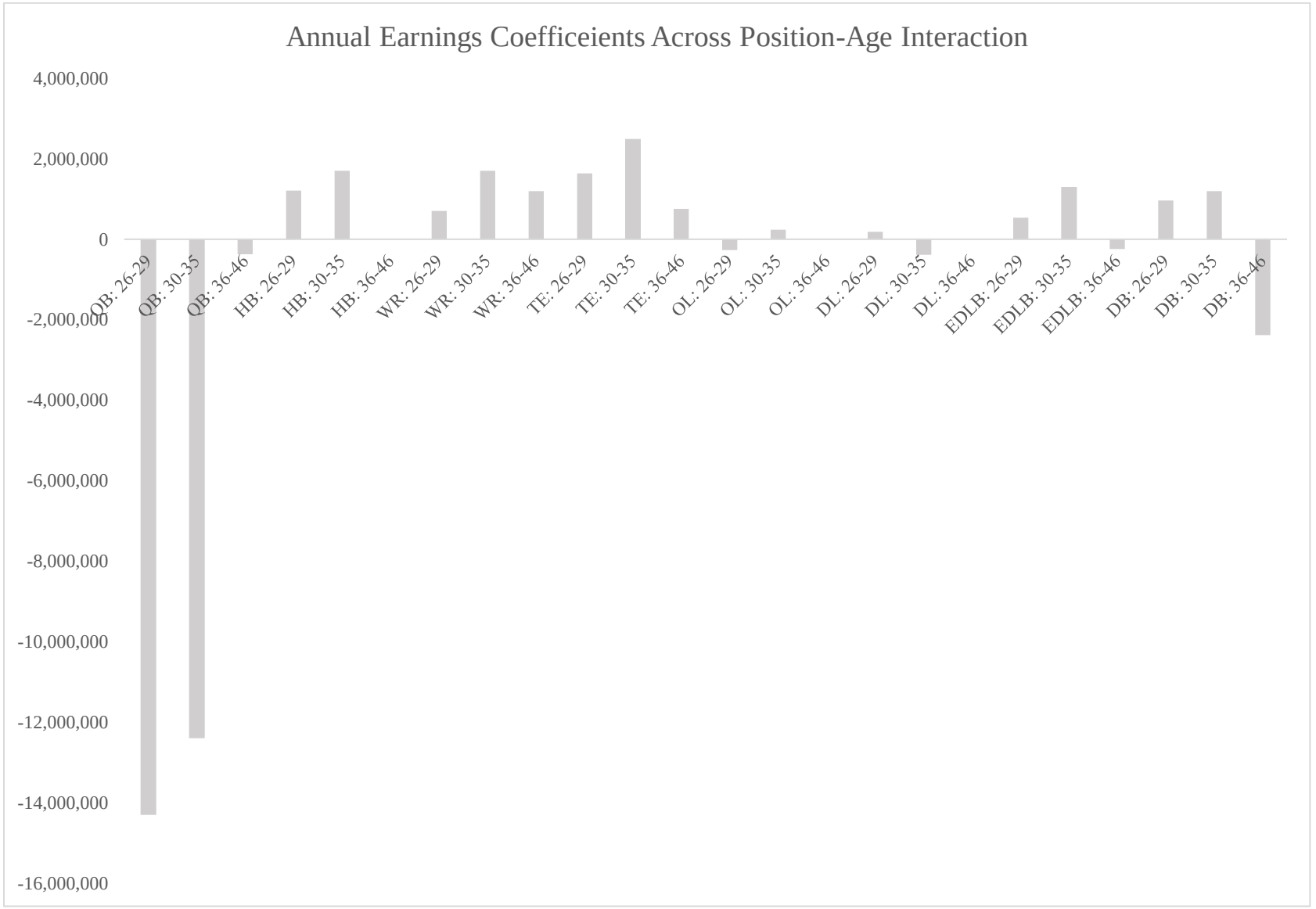

Contract Year Coefficients Across Position-Age Interaction
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
QB: 26-29
QB: 30-35
QB: 36-46
HB: 26-29
HB: 30-35
HB: 36-46
WR: 26-29
WR: 30-35
WR: 36-46
TE: 26-29
TE: 30-35
TE: 36-46
OL: 26-29
OL: 30-35
OL: 36-46
DL: 26-29
DL: 30-35
DL: 36-46
EDLB: 26-29
EDLB: 30-35
EDLB: 36-46
DB: 26-29
DB: 30-35
DB: 36-46

Chart 4:


Annual Earnings Coefficeients Across Position-Age Interaction
4,000,000
2,000,000
0
-2,000,000
-4,000,000
-6,000,000
-8,000,000
-10,000,000
-12,000,000
-14,000,000
-16,000,000
QB: 26-29
QB: 30-35
QB: 36-46
HB: 26-29
HB: 30-35
HB: 36-46
WR: 26-29
WR: 30-35
WR: 36-46
TE: 26-29
TE: 30-35
TE: 36-46
OL: 26-29
OL: 30-35
OL: 36-46
DL: 26-29
DL: 30-35
DL: 36-46
EDLB: 26-29
EDLB: 30-35
EDLB: 36-46
DB: 26-29
DB: 30-35
DB: 36-46

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