Contract Length's Effect on Premier League Player Effort

By:

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Abstract

In this paper I am investigating the relationship between player effort and the number of years since signing a new contract in the English Premier League. Tackles and aerial duels were used as measures of effort because they tend to be considered actions that carry a higher risk of injury, which players will engage in less often when comfortable with their contract. I compared a player's number of tackles or aerial duels per appearance in a season to their average across a five-year period. 92 players were considered in the sample and five years of data was collected for each player. The seasons collected for each player are the season prior to signing a new contract, the season in which a new contract began, and the three seasons post new contract signing. The results show that when using tackles as a measure of effort, player effort levels drop every season following a new contract signing.

Introduction

Soccer, or fútbol as it is referred to around the world, is a multi-billion-dollar, worldwide market, and is the most popular sport in the world. Despite being such a large sport, when compared to the major sporting markets in the United States such as the NFL, NBA, and MLB, soccer is often considered behind in the use of data analytics for the evaluation of players (Hummel & O'Neil, 2011; O'Neil, 2013; O'Neil & Deacle, 2019; White & Sheldon, 2014). The use of data analytics for evaluation of player performance gained traction thanks to Michael Lewis' "*Moneyball: The Art of Winning an Unfair Game."*

The "Moneyball" concept began in baseball when the Oakland A's used advanced data analytics to determine which players are the best value for their performance. In the time since the Oakland A's implemented this strategy, the term Moneyball has become a general term for the use of data analytics when evaluating player performance.

When watching an NFL, MLB, or NBA game in the United States, it is very common to hear commentators referencing a phenomenon known as the "contract year effect." The contract year effect says that players will outperform their capabilities in years when they are looking to sign a new contract and underperform once they sign a lucrative contract. I believe this phenomenon occurs because when players are looking to sign a new contract, they are going to give their maximum effort to get the largest contract possible, and then after they sign a contract, players feel more comfortable and effort declines as a result. While much research has been done relating the contract year phenomenon to player performance, not much research has been done on if the changes seen in player performance are the result of effort dropping due to a new contract being signed.

This paper looks to answer the question: Is player effort affected by number of years since last signing a contract? This paper looks to answer this question by analyzing player effort in the English Premier League specifically for players who signed new contracts between the 2015/16 and 2017/18 seasons. In order to test for effort, I used tackles and aerial duels as dependent variables in two separate regressions. I felt these were accurate measures of effort because these actions are typically associated with higher risk of injury, therefore players looking to give more effort would engage in these actions more often.

I came to a two-pronged hypothesis on what I expected the results to show: Player effort will increase in the season right before signing a new contract and decrease in the seasons following a new contract signing. Having conducted two OLS regressions I found evidence of the contract year phenomenon occurring in the Premier League. Results of the regressions show that when using tackles as a measure of effort, player effort declines increasingly for each year passed since signing a new contract.

Literature Review

While research on the contract year effect has been studied before, most of the research has been conducted with relation to the NFL, NBA, and MLB. Most studies regarding the contract year effect focus on the MLB, NBA, and NFL and focus on player performance with regards to contract years. There is little research focused on the contract year phenomenon in soccer, with more research focused on the valuation of soccer players. Studies done on the MLB, NBA, and NFL have found that the contract year effect does exist with regards to increased performance before signing and decreased performance after signing. Studies on player effort with regards to the contract year have been researched for the MLB; however, the research is mostly focused on player performance directly and not on player effort levels.

Studies from White and Sheldon (2013) and O'Neill (2013) focus primarily on determining if the contract year effect does exist with regards to performance. White and Sheldon (2013) conducted research on both the NBA and MLB, by collecting both scoring and non-scoring statistics over a three-year period for each player. The study looked at the year before signing a new contract, the year a new contract is signed in, and the year following. The research found that for the NBA, there is evidence of the contract year effect, with player performance increasing in years before signing a new contract, and a decrease in performance after a new contract is signed. These results were shown through an increase in scoring statistics specifically points scored and field goal percentage in the pre-contract year as well as through a decrease in offensive and defensive rebounds, steals and player efficiency rating in the year post contract signing. White and Sheldon (2013) also find evidence for the contract year effect with regards to MLB player performance, but these results were much less significant with only runs batted in having an increase in the contract year ($p=0.051$). However, the results for the MLB showed that in the post-contract year, four measures of offensive performance decrease.

O'Neill (2013) looked at the MLB between the years 2006 and 2011 when analyzing player performance with regards to contract year. O'Neill found that there is evidence of the contract year phenomenon occurring in the MLB but makes the point that this is only true for financial incentive among players not looking to retire at the end of a contract. Interestingly though, O'Neill does mention that players looking to retire still see an increase in performance and account this to players wanting to "go out on top."

Hummel and O'Neill (2013) and O'Neill and Deacle (2019) have both found evidence that MLB player effort is affected by contract years. Hummel and O'Neill (2013) created a dummy variable for contract year that was equal to one when the season was a contract signing year, and a zero when it is not. The authors also controlled for age, age^2, position, and whether the player retired following the season. The study also controlled for whether or not a player's team made the playoffs. This was controlled for because players in playoffs have increased motivation to give more effort even when not in a contract year. The authors then ran an OLS regression in which they used on base percentage plus slugging percentage as the dependent variable in order to examine if the contract year effect exists. The results of the regression show that there was reasonable evidence to believe player effort increases to boost performance during a contract year.

O'Neill and Deacle (2019) expand on this study to also observe the changes in effort levels in the seasons following new contract signings. O'Neill and Deacle followed O'Neill's (2013) previous works closely in terms of variables with the regression equations appearing almost identical. This study looked more in depth to the future and found that player effort increases in the final years of contracts when players are looking to sign another new contract. Conversely the results showed that player effort decreased in the first years of contracts lasting four to six years.

A common theme studied in research on soccer focuses on player performance with relation to player salary. Rodriguez (2019) studied the value drivers of soccer players in Europe and found six measures of statistics that appeared to predict player value. Rodriguez (2019) found that participation in the senior national team, age of the athlete, career goals scored,

player appearances and participation in the under 21 national team were all value drivers for players meaning that higher values were related with higher player value. Rodriguez (2019) also found that age^2 of the athlete has a negative effect on player value.

Weimar and Wicker (2014) looked to implement Moneyball theories such as using data analytics to evaluate players performance and effect on team success. The study gathered data from 2011 to 2014 for players in the German Bundesliga and created a sample consisting of 1,514 observations. This study set team performance as the dependent variable and represented this as a dummy variable for outcomes of each game, set equal to one if the team won the game, and set equal to zero if the game was lost. The study looks specifically at whether increased player effort, measured by distance covered by all players on a team and the average number of intensive runs of all players, is related to increased wins for teams. The results of the study show that when individual regressions were run for distance covered and the number of intensive runs, that both measures proved to be related with increased team wins. However, it is interesting that when running a regression that includes both effort measures, the total distance covered stat was found to be positively correlated with more wins, but average number of intensive runs was found to be negatively correlated with wins.

The results of these papers set the stage for the further research and analysis of the contract year phenomenon in soccer discussed in this paper.

Data and Methodology

My research aims to establish a relationship between the amount of effort that players in the English Premier League show, measured through aerial duels and tackles, relative to the number of years passed since they signed a contract. Aerial duels and tackles are being used as measures of effort due to the nature of these actions having higher risk of injury associated

with them, and the fact that they aren't necessarily considered a skill move as much as just a physical action taken. Values for tackles and aerial duels were calculated as the difference between a player's aerial duels or tackles (per appearance) in that respective season and the player's career average aerial duels or tackles (per appearance) over the other four seasons in the player's sample, this data was collected from premierleague.com. I chose to quantify tackles and aerial duels in this manner because it can be easily seen if players are putting forth different levels of effort. Negative values would relate to below career average effort and vice versa for positive values. Premierleague.com reports statistics on aerial duels won and aerial duels lost, since my research is not concerned with the success of aerial duels, these values were added together to determine the total number of aerial duels in a season. Both aerial duels and tackles were then divided by the number of appearances in that season, to account for seasons in which players may have played less games due to injury or other reasons.

Additionally, it is important to mention that playing full matches and entering games as a substitute are treated the same in this model. This is due to the assumption that players typically play a specific role on their team, whether that be a full match player or a substitute. Often these roles are unlikely to change throughout seasons. One of the most well-known examples of this is the player, Theo Walcott. Walcott has become known as a player who may regularly start games, but most of the time gets substituted off before playing the entire game. He even holds the record for most times substituted off in the Premier League (Milner, 2021). In my research I have come up with a two-pronged hypothesis: First, players will show more effort in seasons right before they sign a contract. And secondly, in the years following a contract being signed, player effort will decrease.

In gathering data for my research, I created a sample of players from the English premier league, who started a new contract between the 2015/2016 and 2017/18 seasons. I chose to look at this period because these are the most recent seasons which data for three years following a contract signing is available for. Players in the sample also must have competed in the Premier League the season prior to signing the contract and have remained in the Premier League for three seasons following the signing of a new contract. This is to ensure that statistics are only being collected from the Premier League, as statistics of other leagues may not be comparable. After coming up with the sample of players to look at, a total of 92 players between all three seasons met the requirements to be included in the research resulting in 460 total observations. When gathering statistics on tackles and aerial duels for these players, it was found that the Premier League only records aerial duel statistics for defenders and midfielders, not forwards. Meaning the sample for tackles is 92 players, but the sample for aerial duels is less. The sample consisted of 17 forwards, therefore when looking at aerial duels my sample will consist of 75 players rather than 92. This data was collected from spotrac.com which keeps a detailed list of Premier League player contract signings. It is important to mention that the most popular length for players to sign a new contract for is five years (“Are soccer,” 2021), because of this, some of the players in the sample re-signed a new contract before their previously signed contract expired. If this is the case, the player has two contracts being measured in the dataset.

The independent variable of interest being studied is years since contract signing. I made a dummy variable to account for each season; “year before” represents the season before which a new contract is signed, “year signed” represents the season in which a new

contract was signed at the start of, and “years after 1, 2, and 3” each representing the seasons one, two and three years following a new contract signing. The dropped group was the year prior to signing a new contract. By dropping the year prior to a new signing, I can easily interpret the results as the effect that more time since signing a contract has on effort.

Along with years since contract signing being used as independent variables, my study will also use control variables to account for other reasons that players may have for showing increased effort. The first control variable I will be using is team participation in European tournaments. I will be splitting this into two dummy variables, one for if the player’s team is participating in the Champions League, the highest level of European competition, and another for team participation in the Europa League, the second tier of European competition. Admittance into the Champions or Europa League is gained through placement in domestic league from the year prior, if a team in the Premier League places first through fourth, they are granted a spot in the Champions league, and if they place fifth or sixth, they are granted a spot in the Europa League. I believe that this is important to control for because the players on teams participating in these competitions are likely to put in more effort, as these tournaments are the most competitive in all of Europe. Players on teams not in the Champions or Europa Leagues were dropped from the regression.

I also created dummy variables to control for whether a player signs a new contract through a contract extension, through a transfer to a new team, or as a loan move to another team. I include this as a dummy variable because players signing a new contract through a transfer or loan may have additional reason to put out more effort, to prove they deserve a

spot on the team in the first season after signing, something that players signing contract extensions may not be as concerned about.

I also control for player position categorized as either forward, defender, or midfielder through dummy variables, with forwards being dropped from my regression using tackles. In the regression using aerial duels the group for defenders was dropped due to the absence of forwards in this sample. This was collected from premierleague.com, which reports player position as considered by the player's team. This is important to control for because when comparing tackle statistics between forwards and defenders, defenders will likely have a higher number due to the nature of the position. Therefore, one additional tackle for a forward could mean more effort is being exerted than one additional tackle for a defender or midfielder. I will also create control variables for age and age^2, which is important because player effort will most likely decrease as players get older and are less willing or able to put their body on the line and at risk of injury compared to young players. Young players may show lower effort levels due to the fact they may still be maturing and honing their skills and becoming accustomed to the higher level of play than they were participating in before. This results in an upside-down quadratic relationship between age and effort.

Another control variable being used in this study will be a dummy variable representing final standing for a player's team in the season. This is broken into three dummy variables: one for teams placing first through fourth, which is generally considered the title contention race, one representing teams considered to be in the mid-table, which is teams with a final standing between fifth and seventeenth, and one for teams placing eighteen through twenty, which is made up of teams who are relegated at the end of the season. I thought that this should be

controlled for because players on teams in title contention may have increased motivation as they are looking to compete for the League Title. Also, players on teams that finished in the relegation zone may have increased motivation due to trying to prevent relegation and the negative effects that may come with it. The dropped group will be the mid-table teams as it allows me to see if players in title or relegation contention are giving more effort compared to the other teams who may have less to fight for. This variable is not correlated with the variables measuring participation in the Champions or Europa, because participation in these leagues is based off of standing in the league in the season prior as opposed to the current season.

Finally, the last control variables in this study that I will be including are dummy variables relating to player loans and transfers/extensions. Players on loan and players who sign transfer contracts to new clubs may have increased motivation to give more effort because they may be looking to prove themselves to a new coach or fanbase, compared to players who sign contract extensions who probably already feel comfortable in their position with a team. Players who sign contract extensions during their contract will be dropped from the regression. After determining everything that I will control for the two equations for my regressions are as follows:

$$\begin{aligned}\boldsymbol{Tackles} = {} & \beta_0 + \beta_1(year\ signed) + \beta_2(year\ after\ 1) + \beta_3(year\ after\ 2) + \beta_4(year\ after\ 3) \\ & + \beta_5(participation\ CL) + \beta_6(Participation\ EL) + \beta_7(Defender) \\ & + \beta_8(Midfielder) + \beta_9(age) + \beta_{10}(age^2) + \beta_{11}(Title\ contention) \\ & + \beta_{12}(relegation\ contention) + \beta_{13}(Loan) + \beta_{14}(Transfer) + u_i\end{aligned}$$

$$\boldsymbol{Aerial\ Duels} = \beta_0 + \beta_1(year\ signed) + \beta_2(year\ after\ 1) + \beta_3(year\ after\ 2) + \beta_4(year\ after\ 3) + \beta_5(participation\ CL) + \beta_6(Participation\ EL) + \beta_7(Midfielder) + \beta_8(age) + \beta_9(age^2) + \beta_{10}(Title\ contention) + \beta_{11}(relegation\ contention) + \beta_{12}(Loan) + \beta_{13}(Transfer) + u_i$$

Results

To determine if length since last signing a contract has an effect on player effort, two separate standard OLS regressions were ran to test player effort level, with measures such as tackles attempted per game and aerial duels attempted per game as proxy variables for effort. When using tackles and aerial duels as dependent variables, both were measured as the difference between tackles (aerial duels) per game in the season being considered and the player's average tackles (aerial duels) per game across the other four years of data collected. Before running the regressions though I had to tested for both multicollinearity and heteroskedasticity. Multicollinearity was not found to be present, however heteroskedasticity was present so robust standard errors were used. ran my two regressions with results shown in table 1.1 below:

Table 1

Independent Variable	Tackles	Aerial Duels
Constant	-1.68 (1.43)	-3.44 (2.24)
Year signed	-0.17*** (0.066)	0.15 (0.15)
Year after1	-0.24*** (0.069)	0.25 (0.16)
Year after2	-0.28*** (0.079)	0.26 (0.19)
Year after 3	-0.34*** (0.099)	-0.21 (0.19)
Participation in Champions league	-0.072 (0.074)	0.19 (0.15)
Participation in Europa League	0.038 (0.075)	0.04 (0.17)

Defender	0.02 (0.055)	-
Midfielder	0.006 (0.06)	-0.01 (0.11)
Age	0.16 (0.11)	0.26 (0.17)
Age^2	-0.003 (0.001)	-0.004 (0.003)
Title Contention	-0.003 (0.073)	-0.32** (0.15)
Relegation Contention	-0.12 (0.11)	-0.11 (0.27)
Loan	0.068 (0.15)	0.19 (0.27)
Transfer	0.33 (0.083)	0.034 (0.19)
Number of Observations	460	375
R^2	0.082	0.041
F-stat	3.06***	0.27
Dependent Variables Tackles (aerial duels) are calculated as the difference between tackles (aerial duels) per game in one season and the player's averaged number of tackles (aerial duels) in the other four seasons.		

Note: Robust standard errors for independent variables are shown in parentheses. The symbols *, **, *** correspond to a 10%, 5%, and 1% level of significance.

The results show that the model using tackles as an indicator of effort was found to have explanatory power however, the model using aerial duels as an indicator of effort does not have explanatory power. Although the model for aerial duels does not have explanatory power it is still important to note this finding as it may be useful in future research.

When examining the results from the regression ran using tackles as the dependent variable there are some interesting conclusions to be observed. The variables measuring time since last contract signing were found to be significant at the 1% significance level. Relative to the year before signing a new contract, the coefficient for the year that a contract is signed in is -0.17. This signifies a decrease in tackles per game of 0.17 relative to the level in the season

prior to signing a new contract. This result signifies a drop in effort level, directly after signing a contract. When looking at the one year after the contract signing, the coefficient was -0.24, indicating a drop of 0.24 tackles per game relative to the year before signing a contract. The coefficients for years after 2 and 3, had coefficients of -0.28 and -0.34 respectively, indicating a drop of 0.28 tackles per game relative to the year before signing a contract, two years after signing and a drop of 0.34 tackles per game relative to the year before signing a contract, three years after singing a new contract.

When considering these results in comparison to my hypothesis in which I state that I expect player effort to increase in years right before signing a contract and effort to decrease in years following a contract signing, the results supported my hypothesis. The regression results found that players will show more effort the year right before signing a new contract, with continuously less effort being exerted in the three years following a new contract. The fact that effort appears to drop in the year that a new contract is signed demonstrates the idea of the "contract year phenomenon" which has been observed in other studies, specifically in Major League Baseball and the National Basketball League (O'Neill and Hummel, 2011; White and Sheldon, 2013). Unfortunately, many of the control variables were not found to be significant in the model. The addition of other control variables in the future could be beneficial to the study, as it may help increase the significance of the regressions.

These results are generally what I expected to see, because when a player signs a new contract, they are more secure in terms of income, meaning that even if they don't necessarily realize, players no longer must prove themselves as much as they may have before resulting in less effort being exerted, and players engaging in injury prone action less often. There were no

other variables in the model which were found to have any statistical significance therefore they cannot be used in analysis. This may be because variables measuring team success does not provide the additional motivation for team effort expected. Also, this may show that player effort is not affected by aging, and the effect of aging have more of an effect on player performance which shows through other statistics. Another potential issue of the study is the inability to observe the effects of final years of some contracts, as the most popular length for players to sign a contract for is five years ("Are soccer," 2021) some of the contracts in the sample will not reach the final years on the contract until after three years following the contract signing.

As mentioned before, the regression which used aerial duels as the independent variable measure of effort was found to not have explanatory power. This may be due to the control variables being used not accounting for other motivating factors affecting effort. Also, this may indicate that aerial duels are not an effective measure of estimating effort and is more of a skill-based action than predicted.

Conclusion

In conclusion, the regression I ran with tackles as the dependent variable was found to be statistically significant at the one percent level. The results of the regression agreed with my hypothesis. Player effort appears to be higher in seasons before signing a new contract and drops in the seasons following the signing of a new contract. This research sets up a lot of potential adaptions for the future. Looking to the future I would like to include more control variables to hopefully increase the significance of my regressions. I would also be interesting in obtaining statistics on distance ran per game for the Premier League. Unfortunately, at this

time the Premier League does not collect this statistic, however it may be collected as data analytics in soccer continue to evolve. It could also be interesting to look at the other major European soccer leagues and maybe compared the leagues to one another for analysis.

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Appendix

Table 2: Description and Source of Variables

Variable (Source)	Description	Mean	Standard Deviation	Minimum	Maximum	Observations
Year before contract signing (1)	Reported as a dummy variable, 1 representing the season before a new contract is signed.	0.27	0.44	0	1	460
Contract Signing Year (1)	Reported as a dummy variable, 1 representing the season in which a new contract was signed at the start of.	0.29	0.46	0	1	460
Year after signing 1 (1)	Reported as a dummy variable, 1 representing the seasons one year after a new contract is signed.	0.19	0.39	0	1	460
Year after signing 2 (1)	Reported as a dummy variable, 1 representing the season two years after a new contract is signed	0.12	0.33	0	1	460
Year after signing 3 (1)	Reported as a dummy variable, 1 representing the season three years after a new contract is signed.	0.11	0.31	0	1	460
Tackles (2)	Reported as the player's number of tackles per game minus the player's average tackles per game for other seasons in the sample.	$-1.96e^{-6}$	.51	-2.29	1.84	460
Aerial Duels (2)	Reported as the player's number of aerial duels per game minus the	0.27	1.02	-4.72	4.44	375

	player's average aerial duels per game for other seasons in the sample.					
Loan (1)	Reported as a dummy variable, 1 representing the player being on loan in the season.	0.03	0.18	0	1	460
Extension (1)	Reported as a dummy variable, 1 representing a new contract signing being an extension with the same team.	0.53	0.5	0	1	460
Transfer (1)	Reported as a dummy variable, 1 representing a new contract signing being a transfer move to a new team.	0.12	0.32	0	1	460
Participation in Champions League (3)	Reported as a dummy variable, 1 representing a player's team participating in the Champions League.	0.29	0.46	0	1	460
Participation in Europa League (3)	Reported as a dummy variable, 1 representing a player's team participating in the Europa League.	0.12	0.32	0	1	460
Defender (2)	Reported as a dummy variable, 1 representing the player's position being classified as a defender.	0.46	0.5	0	1	460
Midfielder (2)	Reported as a dummy variable, 1 representing the player's position being classified as a midfielder.	0.36	0.48	0	1	460

Forward (2)	Reported as a dummy variable, 1 representing the player's position being classified as a forward.	0.18	0.39	0	1	460
Age (2)	Player's age at the time of the season.	26.2	3.54	17	36	460
Age^2 (2)	Player's age squared at the time of the season.	698.8	185.36	289	1296	460
Title Contention (2)	Represented as a dummy variable, 1 representing a player's team finishing first through fourth in the season.	0.28	0.45	0	1	460
Mid-Table (2)	Represented as a dummy variable, 1 representing a player's team finishing fifth through seventeenth in the season.	0.67	0.47	0	1	460
Relegation Contention (2)	Represented as a dummy variable, 1 representing a player's team finishing eighteenth through twentieth in the season.	0.05	0.21	0	1	460

(1) sportrac.com (2) Premierleague.com (3) footballdatabase.com