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The Impact of Transfer Spending in Expediting Improvement of On-Field Performance of English Premier League Clubs

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Thesis Summary

This thesis analyzes transfer spending and performance data from English Premier League football clubs participating in the 1992-2021 seasons of the English Premier League using regression analysis and Granger causality analysis. The analysis attempts to extend existing research that indicates a significant causal relationship between transfer spending and performance. I then speak to the sustainability of transfer spending necessary to improve performance over a specified length of time. Further discussion considers implications of Financial Fair Play regulations and explores relevant case studies of Blackburn Rovers, Manchester City, Chelsea, Leicester City, and Newcastle United.

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Introduction

Most fans of the National Football League (NFL), National Basketball Association (NBA), National Hockey League (NHL), and Major League Baseball (MLB) are familiar with the concept of a salary cap, or (in the case of the MLB) a luxury tax system, that governs how franchises may spend money to acquire or retain players. In a salary cap system, a league sets a dollar amount which serves as the limit each franchise can spend on player salaries in a given year. In a luxury tax system, a league does not set an absolute salary limit but instead to discourage spending in excess of the salary cap imposes a "tax" (i.e., a monetary penalty) on teams that breach a designated salary threshold. Both of these systems are designed to encourage competitive balance.

Because of this, it is only natural for American sports fans to take a look at the way the English Premier League (EPL) operates with no spending limit and scratch their heads. How is it fair when some teams are spending a great deal more than other teams to acquire the best players in the world? Many American sport fans question, "Why aren't more European football fans outraged at this unequal system?"

Fans familiar with the EPL system of transfer spending may wonder how sustained higher spending equates to football success. In addition, how quickly should on-the-pitch success follow? Conventional wisdom suggests that higher spending will lead to better performance, but how well does conventional wisdom hold true under deeper inspection? Stakeholders in European football including, but not limited to, owners, managers, and fans may be interested in the speed with which increased spending affects performance on the field.

After conducting a review of existing literature, this thesis investigates the relationship between transfer spending and performance by conducting regression analysis and Granger

causality analysis. Furthermore, this thesis then tackles other items associated with transfer spending such as the speed of its impact and how continuous the transfer spending must be. An in-depth regression analysis of changes in transfer spending and changes in final place in the standings should shed some light on how strong this relationship is. Meanwhile, Granger causality analysis provides empirical evidence on the direction of the relationship and how quickly increases in transfer spending lead to higher levels of on-field performance. Case studies of a few differently positioned clubs in the EPL, Blackburn Rovers, Manchester City, Chelsea, Leicester City, and Newcastle United illustrates some of the conclusions that are drawn from the data.

Literature Review

As this thesis explores the general connection between on field performance and the resulting financial ramifications for football clubs, there is perhaps nothing that is more relevant to consider than Financial Fair Play (FFP). FFP consists of two major provisions: the no overdue payables rule and the break-even rule (Plumley, Ramchandini, & Wilson, 2018).

Plumley et al. (2018) investigated whether FFP policies have been successful in achieving competitive balance. Club owners, media analysts, and fans have argued that FFP, rather than improving competitive balance, has conversely weakened competition in the "Big 5" domestic leagues in England, Germany, Spain, Italy, and France. In order to investigate this claim, recognized metrics of competition and dominance are analyzed in each league in the six seasons prior to the implementation of FFP (pre-FFP), and the six seasons following FFP (post-FFP). Statistical analysis supported claims that FFP has decreased competitive balance. In every league, decline in competitive balance is observed, with the decline statistically significant in

Germany, Spain, and France. The weakened competitive environment is most likely due to the break-even provision of the rule which requires that clubs do not spend more than they bring in via revenue. This has allowed the biggest clubs with the largest revenues to consistently spend more than smaller clubs while providing no avenue for smaller clubs to close that gap (Plumley et al., 2018).

By analyzing the correlation between ownership and performance in the UEFA Champions League in the time period before and after the implementation of FFP policies, Jaker and Gerretson (2021) attempt to understand this relationship. The FFP policies imposed restrictions on clubs by limiting spending to earnings in order to promote efficient, sustainable business models. Prior to FFP's implementation, ownership model played a very significant role in predicting success in the Champions League. Generally, private ownership suggests greater investment and thus higher spending on players. However, in the Post-FFP era the significant relationship between ownership structure and spending ceased to exist. This is probably due to FFP curtailing the spending of large privately owned clubs as well as increasing the relative spending power of large publicly owned clubs (Jaker and Gerretson, 2021). Nonetheless, with the consideration of the introduction of Financial Fair Play in the analysis of the Champions League and "big 5 European leagues", discussion can be shifted towards the financial performance of clubs.

A major indicator of financial health and performance of a publicly traded entity is its stock price. It so happens that 22 major European football clubs are publicly traded. In an analysis of the share prices of these clubs in comparison with traditional European securities, "football stocks" were decidedly in an asset class of their own (Prigge and Tegtmeier, 2020). This class differentiation was based on football stocks offering differing returns and thus, the

opportunity to diversify a portfolio to achieve more efficient risk-return combinations. However, institutional investors also consider the fact that football stocks offer weaker returns than traditional stocks, and because of this deem football stocks to be unattractive from a purely financial point of view. Instead, football stocks attract a unique kind of investor who cares about more than dividends and capital gains. This investor gains extra benefit from fan allegiance or entertainment (Prigge and Tegtmeier, 2020). This is known as an investor focus on a return on objective (ROO).

Another class of investors into European football clubs that must be considered is large funds acquiring a stake in a privately owned club. In recent years, there has a been a large movement of hedge funds and private equity investing cash into European football clubs in exchange for large chunks of ownership. The hesitancy of U.S. firms diving into the world of football thus far has been football clubs' historically "ugly business model" (Perez and Hellier, 2021). The high debt, inflated player salaries, and pressure from extremely passionate fans cause a lot of uncertainty in the industry. Yet, firms recognize the opportunity to benefit from such investments and are clawing their way in via a few targeted strategies: buying smaller clubs, investing in large, historical clubs in financial crisis, buying multiple teams in an effort to diversify, and investing in leagues as a whole rather than individual teams (Perez and Hellier, 2021). While this research does not directly answer the question of how increased transfer spending affects the financial health of a club, it provides a unique perspective on how a sample of European football clubs are viewed through the lens of individual and institutional investors.

In order to consider the growing investment strategy of buying multiple clubs, Multi Club Ownership (MCO) can be investigated for a potential competitive advantage it offers over Single Club Ownership (SCO). According to Dias (2021), MCO does offer an advantage with regards to

revenue capture, on-field performance, brand internationalization, and other operating efficiencies. Thus, it can be expected to grow in practice. Nonetheless, it most likely will never become prevalent in the football world given the extreme wealth required to own multiple clubs as well as possible barriers that could be imposed by football's international governing bodies – Federation Internationale de Football Association (FIFA) and Union of European Football Associations (UEFA) (Dias, 2021).

Manchester United Football Club (MUFC) provides a unique case study opportunity as one of the largest football clubs in Europe. Furthermore, it is a club that falls within the scope of this thesis as they play in the English Premier League. Interestingly, they have enjoyed spells as a publicly traded club as well as a privately owned club. Manchester United illustrates the emergence of transnational capitalism in the world of sports, and European football in particular (Velayutham &Velayutham, 2016). Sharp increases in foreign investment directly into Manchester United as well as other EPL clubs demonstrate the global appeal and financial opportunity of English football (Velayutham &Velayutham, 2016). Given that the financial performance of large English football clubs relies heavily on performance as an important revenue generator and spending on players as their largest expense, an analysis of the relationship between the two is essential.

Fortuitously, a substantial body of research exists on the question of whether larger payroll and higher transfer spending do in fact improve performance within European football's professional leagues. After investigating a representative sample of 39 football clubs in all of England's professional football leagues over 26 seasons from 1973-74 to 1998-99, Hall, Szymanski, and Zimbalist (2002) find a very strong correlation between payroll and final placing in the league standings, as evidenced by an R squared of 0.9439. This correlation proved to be

significantly stronger than the correlation in the MLB, the only other major professional sports league where owners have a comparable degree of financial freedom. Illustrated by an R squared of approximately 0.24, yearly spending in the MLB only accounts for about 24% of yearly winning percentages (Hall et al., 2002).

Jaker and Gerretson (2021) perform an adjacent analysis of investment in talented players, ownership structure, and club performance utilizing UEFA Champions League tournaments from 2006-2018 as their case study. Interestingly, they do not find a strong relationship between ownership type and performance. Privately owned clubs as well as publicly owned clubs and clubs "influenced by" the public did not perform significantly differently. However, Jaker and Gerretson (2021) did find that greater investment in players increases the probability of reaching later stages in the competition (Jaker, Gerretson, 2021). This finding corroborates the conclusions reached by Hall et al. (2002) that payroll plays a significant role in predicting on-field performance.

In a similar attempt to analyze team performance and financial capacity, research has been conducted across the five major European football leagues: English Premier League, French Ligue 1, Spanish La Liga, German Bundesliga, and Italian Serie A. The primary focus of this research was to determine how much a good start to the season matters to how the team would place at the end of the season. Lago-Penas and Sampaio (2015) stratify clubs into groups based on budget (High Range, Upper Mid-Range, Lower-Mid Range, and Low Range) and analyze three consecutive seasons from 2010-11 to 2012-13. From here, Lago-Penas and Sampaio (2015) determine a strong start to the season does have a statistically significant impact on the final placing of the Low and Lower-Mid Range Budget Clubs. Yet, it does not on the High Range Budget Clubs. Instead, the High Range Budget Clubs tend to place where their

financial capability suggests that they would, regardless of how well they began the season. This implies another instance of a strong causal relationship between higher spending on players and club performance.

As can be discerned from the body of research consisting of case analyses ranging from England to the five major European domestic leagues to the UEFA Champions League, a significant correlation between the size of a club's payroll and on-field performance is well documented. This thesis explores a nuance that previous literature on the subject has not addressed: How quickly does increasing transfer spending and payroll lead to winning? What kind of timetable can stakeholders in English Premier League clubs generally expect with regards to better performance based on the amount of investment in more talented players?

Analysis and Results

The research conducted by Hall et al. (2002) on the causality between team performance and payroll in Major League Baseball as well as in English football provides a solid framework to begin collecting and analyzing relevant data. As such, my first step in conducting empirical research is to replicate their process and statistical analysis with an updated dataset running from the 1992-93 to 2020-21 English Premier League seasons. One variation in my dataset is that it only includes the top flight of English soccer, the Premier League, as opposed to all levels as in the research conducted by Hall et al. (2002). More specifically, it includes teams which have competed for a minimum of three seasons in the top flight during the time period of 1992-2021.

The first step in analyzing the data is to take each season from the 1992-93 season to the 2020-2021 season and assign each club a rank between 1-20 corresponding to the place they finished the season. Next, I assign each club a rank between 1-20 in terms of how high their

transfer expenditures were in that year. Number one indicates the highest spending team while number 20 indicates the lowest spending team. Then, I run a simple linear regression to test if a relationship exists between the absolute rank in performance that season and the absolute rank in transfer spending. Interestingly, in 13 of the 29 seasons a statistically significant relationship (p-value < .05) exists between absolute rank in performance and absolute rank in transfer spending. The 2007-08 season was not quite significant but very close. Another observation to note is that more recent seasons appear more likely to have statistically significant relationships between the variables. From the 2005-06 season onwards, 10 out of 16 seasons were significant, or 62.5%. This compares to the seasons prior to 2005-06 in which only 3 out of 13 seasons, or 23.1%, were significantly related.

Table 1.

Year of Season	Regression Coefficient	P-Value of Regression	5 Year Rolling Average of Regression Coefficient
1992-93	0.2706	0.2188	#N/A
1993-94	0.2860	0.1799	#N/A
1994-95	0.5700	0.0114	#N/A
1995-96	0.3639	0.1147	#N/A
1996-97	0.0872	0.7146	0.3155
1997-98	0.2615	0.2660	0.3137
1998-99	0.2211	0.3490	0.3007
1999-00	0.4982	0.0387	0.2864
2000-01	0.1987	0.4071	0.2533
2001-02	0.6827	0.0009	0.3724
2002-03	0.3263	0.1603	0.3854
2003-04	0.2842	0.2246	0.3980
2004-05	0.2556	0.2767	0.3495
2005-06	0.6406	0.0023	0.4379
2006-07	0.2451	0.2976	0.3504
2007-08	0.4195	0.0655	0.3690
2008-09	0.5173	0.0195	0.4156

2009-10	0.5338	0.0153	0.4713
2010-11	0.5042	0.0233	0.4440
2011-12	0.3647	0.1110	0.4679
2012-13	0.4902	0.0282	0.4820
2013-14	0.6395	0.0012	0.5065
2014-15	0.6707	0.0012	0.5338
2015-16	0.0633	0.7918	0.4457
2016-17	0.6724	0.0026	0.5072
2017-18	0.6375	0.0096	0.5367
2018-19	0.1532	0.5098	0.4394
2019-20	0.2582	0.2675	0.3569
2020-21	0.6526	0.0018	0.4748

This table reports the results of a regression of absolute rank in performance against absolute rank in spending, separately for each season between 1992-1993 and 2020-2021. Statistically significant regression coefficients (p-value < 5%) are highlighted in green.

This investigation, while possibly proving helpful, does not account for the magnitude of the difference in transfer spending between each absolute rank in transfer spending. For example, the number one ranked team in spending may spend $300m (USD) while the number two team may only spend $150m and the number three ranked team spends $140m. In order to account for differences such as these, a relative spending measure must be utilized. Hall et al. (2002) applies a relative spending measure by calculating the average spending of each team in the league as a whole and then dividing the spending of each specific team by that season's league average. For instance, if a team spends $200m on transfer expenditures in a season but the league average is only $100m, they are assigned a relative spending measure of 2.0. If they spend $50m compared to the league average of $100m, they are assigned a relative spending measure of 0.5.

To proceed with this version of the analysis, I transformed each year of data by converting each team's spending to its relative spending measure. From there, I performed the same simple linear regression. The results from this analysis, utilizing a relative spending measure as opposed to the absolute rank in spending, differed slightly from the first analysis. This time, 15 of the 29 seasons showed a strong correlation (p-value < .05) between absolute rank in performance and the relative spending measure; this is a higher proportion than the 13 that showed this correlation in the previous analysis. It should be noted that the 2009-2010 season would have also shown a very strong correlation if it were not for the singular outlier of Manchester City who spent approximately five times the league average but only finished in 5th place. Because of the interesting divide of the 2005-2006 season present in the previous analysis, I compared the two time frames once again. The more recent time frame still exhibited a higher proportion of seasons in which a strong correlation was present, nine out of 16 compared to six out of 13 in the older time frame. Yet, this difference is less stark (56.25% compared to 62.50% in the first analysis).

Table 2.

Year of Season	Regression Coefficient	P-Value of Regression	5 Year Rolling Average of Regression Coefficient
1992-93	-2.3767	0.1696	#N/A
1993-94	-4.0359	0.0132	#N/A
1994-95	-5.8283	0.0123	#N/A
1995-96	-3.4833	0.0434	#N/A
1996-97	-1.4923	0.5363	-3.4433
1997-98	-2.5031	0.3033	-3.4686
1998-99	-0.3603	0.8303	-2.7334
1999-00	-3.8890	0.0144	-2.3456
2000-01	-3.5900	0.0881	-2.3669
2001-02	-5.4685	0.0054	-3.1622
2002-03	-2.3853	0.1180	-3.1386

2003-04	-1.4315	0.0604	-3.3528
2004-05	-1.9691	0.0289	-2.9689
2005-06	-4.5606	0.0011	-3.1630
2006-07	-2.4389	0.1462	-2.5571
2007-08	-4.1999	0.0588	-2.9200
2008-09	-1.8650	0.2132	-3.0067
2009-10	-2.2006	0.0991	-3.0530
2010-11	-2.4338	0.0139	-2.6277
2011-12	-3.9384	0.0073	-2.9276
2012-13	-4.6392	0.0084	-3.0154
2013-14	-4.4240	0.0053	-3.5272
2014-15	-4.8395	0.0005	-4.0550
2015-16	-2.1726	0.3285	-4.0028
2016-17	-6.3482	0.0032	-4.4847
2017-18	-5.7068	0.0003	-4.6982
2018-19	-3.5514	0.1069	-4.5237
2019-20	-2.8775	0.1510	-4.1313
2020-21	-5.0503	0.0033	-4.7068

This table reports the results of a regression of absolute rank in performance against Hall's relative measure of spending, separately for each season between 1992-1993 and 2020-2021. Statistically significant regression coefficients (p-value < 5%) are highlighted in green.

One item worth clarifying is the difference in signs on the regression coefficients between the first analysis and the second. In the first analysis, I compare absolute rank in performance with absolute rank in payroll. Intuitively, a "low" rank in performance such as 1st or 2nd place should coincide with a "low" rank in transfer spending such as 1st or 2nd and the same applies to a team with a "high" rank in performance and transfer spending. This creates an upward sloping trendline in the scatterplots of the data in each season, thus the positive regression coefficients. Meanwhile, in the second analysis, I compare absolute rank in performance with Hall's relative spending measure. Considering the way the relative spending

measure is calculated, the higher-ranking payrolls result in higher spending measures. The 1st ranked team in transfer spending might have a relative spending measure greater than 3.0 while the 20th ranked team in transfer spending likely has a relative spending measure barely above zero. Because of the way this works, clubs with "low" absolute ranks in performance are expected to coincide with clubs who have "high" relative spending measures. This creates a downward sloping trendline, thus the negative regression coefficients. This difference is illustrated by the corresponding scatterplots from the 2020-21 season (both of which were considered statistically significant):

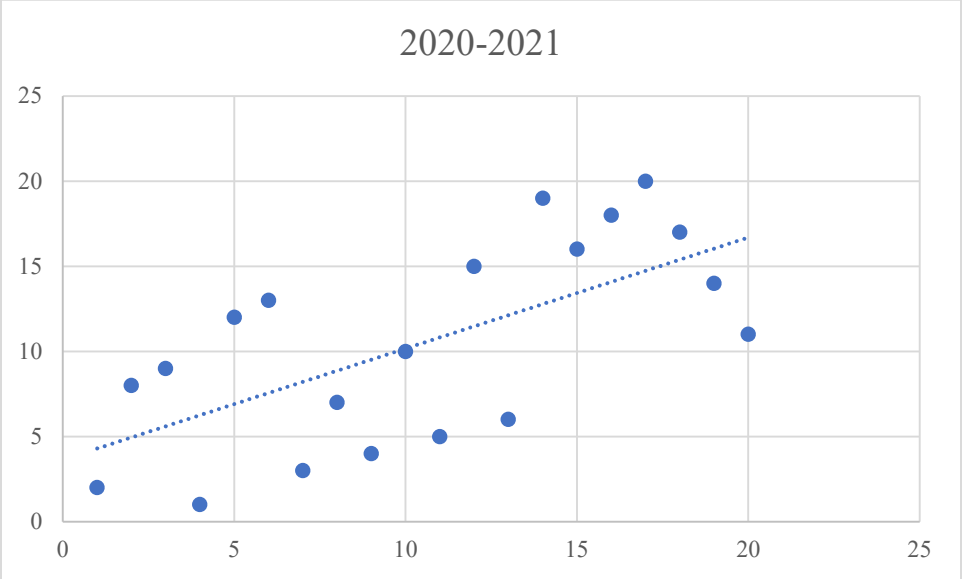

Figure 1. Regression analysis of absolute rank in performance with absolute rank in spending

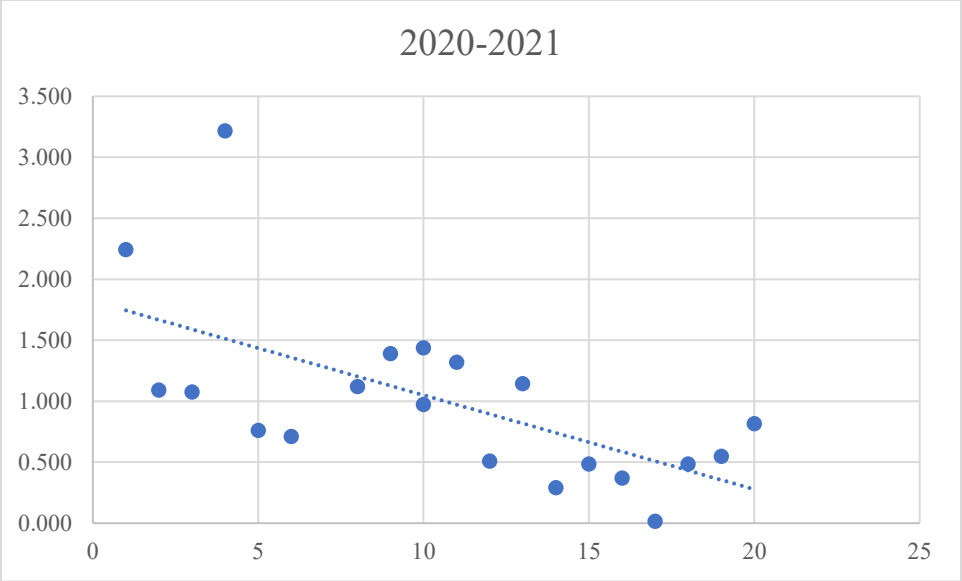

Figure 2. Regression analysis of absolute rank in performance with Hall relative spending measure

While the above data analysis served as a helpful starting point, there is not much power in conducting linear regression with datasets containing only 20 teams. In order to investigate the significance of the relationship between absolute rank in performance and absolute rank in transfer expenditures more fully, all of the years were combined into one large, pooled regression. This regression revealed a strong positive regression coefficient evidenced by a p value far below the threshold of 0.05 (4.028e-24). However, a limitation of this analysis is it assumes each observation is independent. This is unfortunately not a valid assumption given a particular team in one season is not independent of that same team in a prior season. Many players acquired in the transfer market in one season may persist into subsequent seasons.

The pooled regression was replicated to investigate the relationship between absolute rank in performance and Hall's relative spending measure. In this instance, an even stronger positive regression coefficient was revealed with a p-value once again well below 0.05 (4.907e-

28). This, consistent with the year-by-year simple regression analysis, illustrated a stronger relationship when utilizing Hall's relative spending measure than just the absolute rank in spending.

Something else I investigated was whether the pooled regression differed between time periods. Using the same split as was discussed in the year-by-year simple regression analysis (1992-2005 and 2005-2021), another pooled regression was conducted. Both time periods revealed a very strong relationship as they both had significant p-values. Yet, as was discovered in the simple regression analysis, the more recent time period illustrated a stronger relationship than the older time period. 1992-2005 had a p-value of 3.346e-08 compared to 2005-2021, which had a p-value of 2.051e-18. The same dynamic was observed in the pooled regression using Hall's relative spending measure. In that case, 1992-2005 had a p-value of 4.185e-10 while 2005-2021 had a p-value of 5.959e-21. Interestingly, in both pooled regression analyses, the aggregate analysis had a higher p-value than in either analysis split by time period.

In order to further investigate if there was a significant difference between these "supposedly" arbitrary time periods, I re-ran the pooled regression analysis with an added dummy variable to delineate between time periods. Essentially, every data point from 1992-2005 was assigned a 0 while every data point after 2005 was assigned a 1. The resultant regression output indicated no significant difference between the two time periods in either the analysis using absolute rank in spending or using Hall's relative spending measure (p-value of 0.754 and 0.566 respectively). This likely eliminates the need to continue to analyze these two differing time periods and instead allows focusing on the dataset as a whole or on a season-by-season basis.

While all the analyses to this point have certainly been helpful, they rely strongly on rank variable data: absolute rank in performance, absolute rank in spending, and Hall's relative spending measure. Staying true to methods used by Hall et al. (2002), it is useful to perform a log transformation on all of this data. By converting the rank variables to logarithmic variables, the data moves from uniform to normally distributed and symmetrical. This improves the statistical quality of the data as I continue to run more regression analysis. The transformation for absolute rank in performance becomes -log(absolute rank in performance/[21-absolute rank in performance]). The transformation for absolute rank in spending becomes -log(absolute rank in spending/[21-absolute rank in spending]). Finally, the transformation for Hall's relative spending measure is the -log(payroll/average payroll for the year). Especially for the relative spending measure variable, this log transformation effectively handles the skewness of the data which arises when a certain club spends far more than the rest of the league in a given season.

After improving the statistical quality of the data, I re-ran the simple regression analysis with the absolute rank in spending and the simple regression analysis with Hall's relative spending measure on a season-by-season basis. In the case of the analysis with the absolute rank in spending, results were very similar; however, one additional season (2007-2008) was found to have a higher regression coefficient and a p-value now below 0.05 when prior to the log transformation it was just above the threshold at 0.0588.

Table 3.

Year of Season	Regression Coefficient	P-Value of Regression	5 Year Rolling Average of Regression Coefficient
1992-93	0.2301	0.3028	#N/A
1993-94	0.3278	0.1207	#N/A

1994-95	0.4810	0.0234	#N/A
1995-96	0.2467	0.2944	#N/A
1996-97	0.1342	0.5726	0.2840
1997-98	0.2459	0.2901	0.2871
1998-99	0.1881	0.4271	0.2592
1999-00	0.5149	0.0428	0.2660
2000-01	0.2026	0.3789	0.2571
2001-02	0.6236	0.0033	0.3550
2002-03	0.3186	0.1709	0.3696
2003-04	0.3531	0.1267	0.4026
2004-05	0.3131	0.1789	0.3622
2005-06	0.6820	0.0009	0.4581
2006-07	0.2989	0.2004	0.3932
2007-08	0.4558	0.0434	0.4206
2008-09	0.4794	0.0325	0.4458
2009-10	0.4871	0.0294	0.4806
2010-11	0.4503	0.0433	0.4343
2011-12	0.3619	0.1146	0.4469
2012-13	0.4782	0.0330	0.4514
2013-14	0.5510	0.0049	0.4657
2014-15	0.5993	0.0052	0.4882
2015-16	0.0290	0.9048	0.4039
2016-17	0.6046	0.0078	0.4524
2017-18	0.6689	0.0093	0.4906
2018-19	0.1174	0.5961	0.4038
2019-20	0.2856	0.2196	0.3411
2020-21	0.6064	0.0046	0.4566

This table reports the results of a regression of the log transformation of absolute rank in performance against the log transformation of absolute rank in spending, separately for each season between 1992-1993 and 2020-2021. Statistically significant regression coefficients (p-value < 5%) are highlighted in green.

In the case of the analysis with Hall's relative spending measure, results were also fairly similar. The number of statistically significant seasons did drop from 15 to 13, however. The 1995-96, 2004-05, 2012-2013, and 2013-2014 flipped from significant to not significant

following the log transformation. Meanwhile, the 2003-04 and 2009-10 flipped from not significant to significant following the log transformation.

Table 4.

Year of Season	Regression Coefficient	P-Value of Regression	5 Year Rolling Average of Regression Coefficient
1992-93	-0.1522	0.6519	#N/A
1993-94	-1.0174	0.0095	#N/A
1994-95	-0.7906	0.0380	#N/A
1995-96	-0.1211	0.7221	#N/A
1996-97	-0.1201	0.8534	-0.4403
1997-98	-0.6739	0.2623	-0.5446
1998-99	-0.3717	0.4398	-0.4155
1999-00	-1.0323	0.0146	-0.4638
2000-01	-0.9894	0.1052	-0.6375
2001-02	-1.1489	0.0068	-0.8432
2002-03	-0.5218	0.1029	-0.8128
2003-04	-0.4615	0.0268	-0.8308
2004-05	-0.4438	0.1521	-0.7131
2005-06	-1.3089	0.0009	-0.7770
2006-07	-0.7432	0.1351	-0.6958
2007-08	-0.7935	0.1025	-0.7502
2008-09	-0.9545	0.0603	-0.8488
2009-10	-0.9923	0.0495	-0.9585
2010-11	-0.6324	0.0410	-0.8232
2011-12	-0.9592	0.0270	-0.8664
2012-13	-0.7923	0.0568	-0.8661
2013-14	-0.7213	0.0712	-0.8195
2014-15	-0.7342	0.0207	-0.7679
2015-16	-0.1865	0.7714	-0.6787
2016-17	-1.9327	0.0018	-0.8734
2017-18	-1.5653	0.0008	-1.0280
2018-19	-0.8945	0.1019	-1.0626
2019-20	-0.3333	0.3531	-0.9824
2020-21	-0.7010	0.0237	-1.0853

This table reports the results of a regression of the log transformation of absolute rank in performance against the log transformation of Hall's relative spending measure, separately for each season between 1992-1993 and 2020-2021. Statistically significant regression coefficients (p-value < 5%) are highlighted in green.

Keeping with the prior methodology, I then moved to the pooled regression as it constitutes a much stronger sample size than the individual seasons on their own. In both the absolute rank of spending and relative spending measure cases, rerunning the pooled regression with the logarithmic transformation of the data points netted similar results. Both outputs kept consistent with the outputs of the pooled regressions in that the results were very statistically significant as evidenced by their p-values. Interestingly though, in each case, the output was slightly less statistically significant. The P-values dropped from 4.03E-24 to 1.24E-22 in the absolute rank case and from 4.91E-28 to 1.60E-21 in the relative spending measure case. A marginal reduction, but a reduction, nonetheless.

The final form of statistical analysis I applied to my dataset is Granger causality. As is well known, correlation does not necessarily imply causation. Therefore, up until this point, I could not reliably draw conclusions that increases in spending directly cause improvements in performance and vice versa simply from the regression analysis showing correlation alone. Granger causality undertakes this challenge by utilizing time series data to assess whether one variable causes another based on a specified number of lags. The actual validity of this test is still open to debate; thus, for the purpose of this research, we will use the term "x granger-causes y" or "transfer spending granger-causes performance."

One important assumption of the Granger causality test is the time series data are stationary. In order to improve the stationarity of my data, I calculated the first difference of each variable and applied the granger test to that data instead of the original data. The increase in stationarity resulting from this differencing is illustrated by the graphs of Chelsea's transfer spending and performance (both absolute and relative) below:

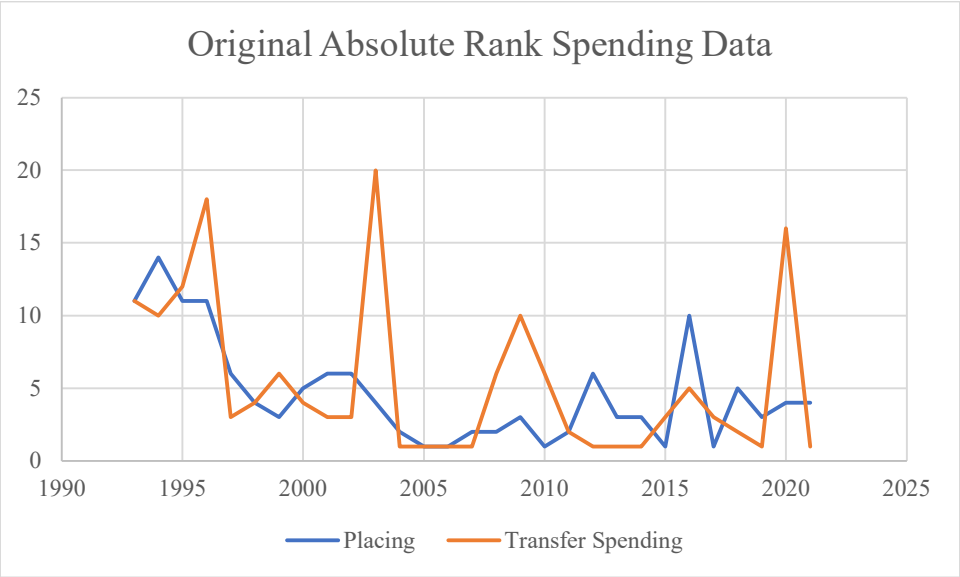

Figure 3.

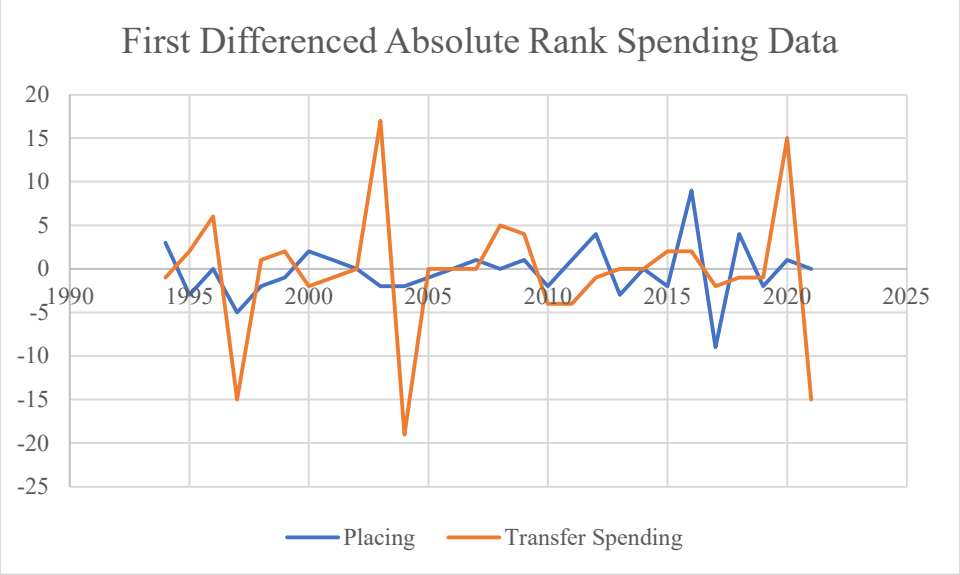

Figure 4.

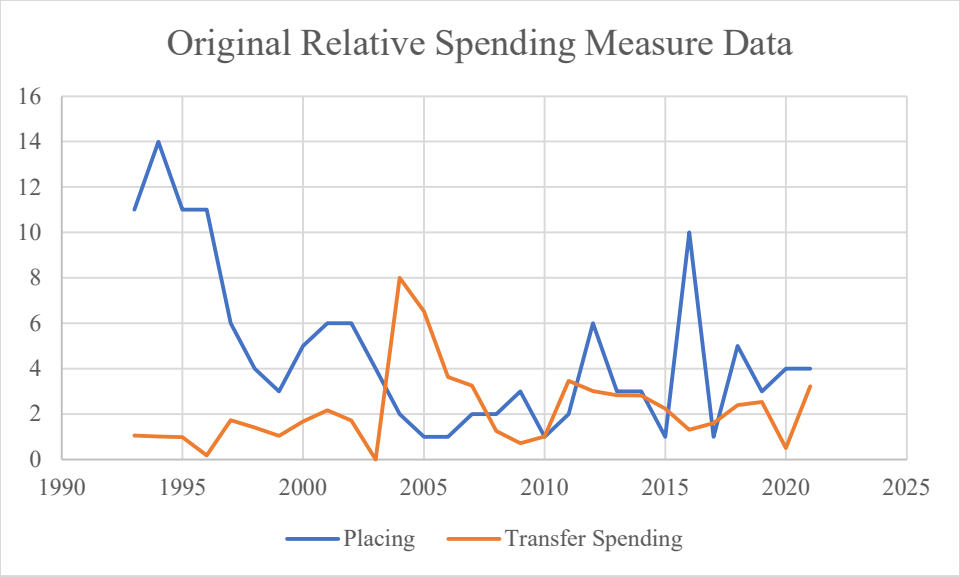

Figure 5.

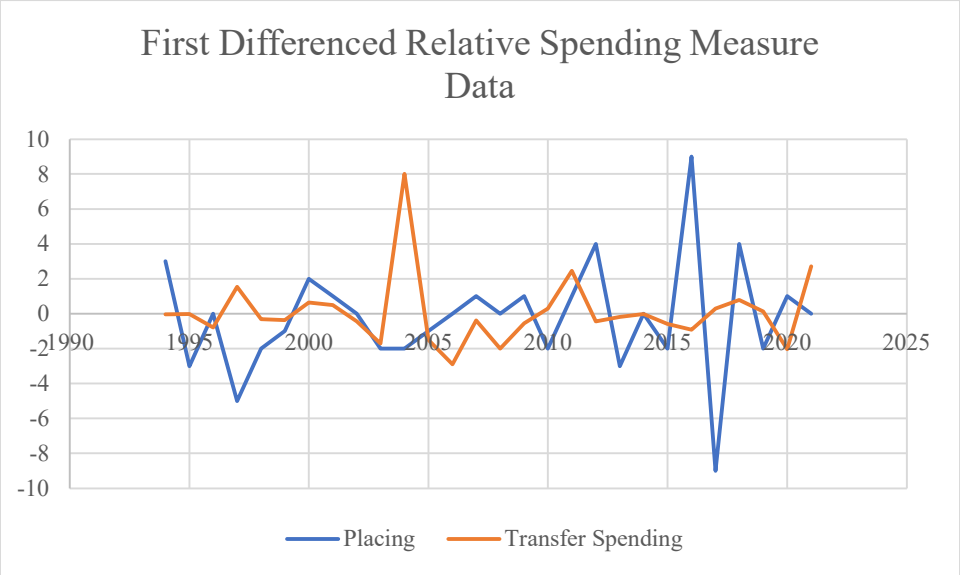

Figure 6.

In order to effectively apply Granger Causality analysis, I perform a multivariate regression analysis. In this multivariate regression analysis, the independent variable is the

current year's performance measured by absolute rank in the league table. The dependent variables are then one year lagged transfer spending, one year lagged performance, two year lagged transfer spending, two year lagged performance, and so on. In order to achieve this format, I translated the original list time-series data into columns and offset the columns by one year, two years, and so on to create the lag that Granger causality analysis calls for. Using multivariate regression analysis, I have complete control over each individual sample being analyzed. After cleaning the data samples by removing instances in which 1993 performance was lagging to 2021 spending of another team and the instances in which 2020 performance was lagging to 2007 spending, the multivariate regression was now ready to run.

The results turned out to be very intriguing. Transfer spending was found to Granger cause performance at a one-year lag and a two-year lag. However, it no longer Granger caused performance at a three-year lag. This is indicated in the table below by the highlighted cells in the one-year lag and two-year lag, but the lack of highlighting in the three-year lag. Note also, that the negative coefficients in the tables are a result of the first differenced data being used instead of the original data in order to improve stationarity as was discussed previously.

Table 5.

	Coefficients	*t-Stat*	*P-value*
Intercept	0.4034	2.0278	0.0433
1 Year Lagged Spending	-0.5371	-2.2876	0.0227
1 Year Lagged Performance	-0.5052	-9.3858	<0.001
2 Year Lagged Spending	-0.5217	-2.0806	0.0381
2 Year Lagged Performance	-0.2928	-5.3979	<0.001
3 Year Lagged Spending	0.0410	0.1756	0.8607
3 Year Lagged Performance	-0.1129	-2.4614	0.0143

In addition, after re-running the same multivariate regression but with the independent and dependent variables flipped, I found that performance did not Granger cause transfer spending at any specified lag time. This is indicated by the two highlighted cells showing p-values greater than 0.05.

Table 6.

	Coefficients	*t-Stat*	*P-value*
Intercept	-0.0221	-0.5562	0.5784
1 Year Lagged Performance	-0.0029	-0.3022	0.7627
1 Year Lagged Spending	-0.4410	-9.4720	<0.001
2 Year Lagged Performance	-0.0066	-0.7663	0.4439
2 Year Lagged Spending	-0.2569	-5.5565	<0.001

A final item worth noting is the statistically significant p-value outputs from the lagged performance in Table 5 and the lagged spending in Table 6. These outputs are purely a result of the way in which the multivariate regression analysis was structured in excel and do not contribute to the larger Granger causality analysis. Of course, when testing if transfer spending Granger causes performance, the output is going to show as performance causing performance. Similarly, when testing if performance Granger causes transfer spending, the output is going to show transfer spending causing transfer spending.

Discussion

Before diving into deeper discussion about the featured regression analysis and granger analysis above, I'd like to preface the debate with discussion of the transfer spending and budgeting framework that English Premier League clubs operate within compared to Major

League Soccer (MLS) and other American professional sports leagues. Prior to the introduction of Financial Fair Play (FFP) in the 2011-2012 season, there was no regulation or limit to how much clubs could choose to spend in acquiring players from other teams through the transfer market. Of course, most clubs were still cognizant of their financial standing as a business and still generally acted financially responsible. This absolute freedom in allowing each club to choose how much they want to spend may be a foreign concept to most Americans who are accustomed to the structured salary cap systems present in the NFL, NBA, and MLB. Under a strict salary cap, the league sets a limit and expects each team to construct their roster without exceeding the limit. For example, the 2022 NFL salary cap is set to be $208.2 Million USD per team. The MLB differs slightly in that instead of a hard cap, they utilize a luxury tax system in which very high taxes are levied on teams that exceed the $230 million USD limit to discourage further outrageous spending and promote competitive balance.

The MLS sits in a unique position as it juxtaposes competing in the internationally based soccer world while also exhibiting typical American sports league characteristics such as a player drafts and no relegation. Because of this position, they have implemented an incredibly complex system to regulate the acquisition and exchange of players (See Appendix A). The stark differences between how clubs in the EPL operate versus teams in the MLS versus other American sports franchises are precisely what sparked investigation into this relationship between player spending and performance. Based on these differences, I would hypothesize that a similar type of analysis performed on the MLS and other American sports leagues would not yield similar results.

A previously mentioned pertinent development is UEFA's implementation of Financial Fair Play (FFP) regulations. FFP was introduced in the 2011-2012 season as a response to a

number of clubs “overspending” and thereby threatening the long-term financial health of themselves. According to UEFA, fifty percent of clubs are operating at a loss and the goal is not to hurt clubs but instead help them operate responsibly in the marketplace (Paul, 2021). At its core, FFP limits clubs’ transfer spending to their gross revenue.

Many opponents of FFP have criticized its questionable legality and it being designed to protect the status quo. In effect, the large, wealthy, historically-successful clubs bring in more money than smaller clubs. Under FFP, they will always be allowed to spend more money on transfers than smaller clubs. My research does not suggest that the introduction of FFP rules has had a strong impact on the relationship between transfer spending and performance in the English Premier League. Prior to its introduction, eight out of 19 seasons, or 42.1% had a significant relationship; since its introduction, five out of 10 seasons, or only 50%, have had a significant relationship. Obviously, the sample size of each of these observations is far too limited to be able to draw any solid conclusions regarding the claim of FFP worsening the competitive balance. However, what limited data does exist would suggest that FFP may not have a powerful effect going forward. Nevertheless, UEFA has been rumored to have plans in effect to abolish FFP as we currently know it and transition to a salary cap and luxury system very similar to the one in effect in Major League Baseball (Paul, 2021). They are set to meet in April of 2022 to discuss this possibility further.

Now, after completing such comprehensive data analysis and briefly discussing the results of such analysis in the previous section, I believe it will be helpful to utilize this section of the thesis to complement the hard, quantitative results with some qualitative discussion and some additional implications of the research. First, it is important to mention and credit the research of Hall et al. (2002) for providing this manuscript’s theoretical framework involving

the analysis of the relationship between transfer spending and performance in professional English football. It is essential to note, however, that my paper applies to a larger, more recent set of data. This thesis' data set extends all the way to the 2020-2021 season as opposed to Hall et al. (2002), which concluded with the 1999-2000 season. Furthermore, Hall et al. (2002) takes a sweeping view on professional English football by looking at each tier from the Premier League down to the fifth division whereas I narrow the focus to the Premier League alone. This extension of the data set to the present, while simultaneously focusing the scope, provides for a novel contribution.

Hall et al. (2002) concluded that player spending did to statistically cause improved performance in English Soccer. My results confirmed that this finding extends through the 2021 season. Similarly, it supports that the relationship stands in the English Premier League by itself. Interestingly, every season on its own did not demonstrate transfer spending statistically causing performance. However, when pooled together, the data overwhelmingly showed that transfer spending did statistically cause improved performance. It should also be noted that a substantial number of stand-alone seasons did also demonstrate this relationship: 13 of 29 when utilizing the absolute rank in spending and 15 of 29 when utilizing Hall's relative spending measure.

Further contributing to the novelty of this thesis, I performed Granger causality analysis with various lag times in order to address the speed at which transfer spending improves performance. The results suggest a few intriguing things.

First off, past transfer spending did granger cause current performance. Interestingly, it did so at a one- and two-year lag, but not at a three-year lag. This indicates that a club could decide to make a large investment in acquiring players and expect improved results in the league table the following season. Furthermore, this would suggest that sustaining a high rate of transfer

spending for two years should also lead to improved performance in the league table. Where the causation drops off is at the three-year time period. Intuitively, this makes sense. Over a three-year period there can be significant roster turnover and many players who were acquired via transfer 3 years ago may not even be on the current roster leading to this lack of cause and effect. Thus, this illustrates a requirement for clubs to commit to a sustained, high level of transfer spending in order to continue to perform at the highest level. Clubs cannot rely on spending that occurred over two years ago to cause them to perform better.

Secondly, past performance did not granger cause current transfer spending. This is an interesting takeaway when you consider the revenue sharing structure of the English Premier League. The English Premier League divides television revenue to the clubs based on a formula of 50% divided evenly no matter what, 25% divided depending on the number of games shown on national broadcasts, and 25% based on the final position in the league table. This final portion is known as merit pay based on performance. It generally runs from approximately $2.6 Million USD for the 20th place team and increases by $2.6 Million USD for each place up to approximately $31.5 Million Dollars (Ghosh, 2022). It is also important to note that international television revenue is split 100% evenly between each club; international tv revenue accounts for the largest portion of the English Premier League's total revenue at approximately $1.3 billion USD per season (Ghosh, 2022). This discrepancy in revenue based on table results might cause some to believe that it would lead the teams who perform better to spend more. However, upon closer inspection, this does not turn out to be true at a statistically significant level. I conjecture that the reason for this may be that this difference in merit pay is not substantial when comparing the overall revenues for each club. For instance, in the 2019-2020 season the top

placing team Liverpool earned £153 Million while the 13th placed Newcastle United earned £120 Million and the 20th placed Norwich City still earned £96.5 Million (Ghosh, 2022).

Transfer spending does indeed statistically cause improved performance in the Premier League and sustained spending is necessary to maintain this improved performance level. Consequently, it is worthwhile to discuss a few prominent teams that have demonstrated this relationship. The first team that identified this relationship and famously put it into practice was Blackburn Rovers from 1993-1999. At this time, Blackburn Rovers were owned by Jack Walker who made it loud and clear that he did not care about the club in terms of a long-term financial investment, but instead only wanted to win the Premier League and would do so at any cost. So, in order to achieve this self-proclaimed goal, Jack Walker and Blackburn Rovers did indeed spend. From the Premier League's inception in 1993 to 1995, Blackburn Rovers posted absolute ranks in transfer spending of 1st, 1st, and 5th as well as relative spending measures of 3.562, 3.562, and 1.56. The incessant transfer spending paid off and Blackburn Rovers won the Premier League in the 1994-1995 season. Because of this ludicrous level of spending for a small club, Blackburn Rovers was unable to sustain the high transfer spending and subsequently posted absolute ranks in transfer spending of 5th, 20th, and 13th as well as relative spending measures of 1.609, 0, and 0.803 from 1996-1998. The decreased transfer spending, as predicted by the data analysis conducted in this thesis, resulted in a marked decrease in performance on the field. Blackburn Rovers ended up being relegated from the Premier League entirely in 1999. Blackburn is perhaps the best example of this relationship in practice as they exhibited both the highest and lowest ends of the spectrum of transfer spending throughout their time in the English Premier League.

Blackburn represents only one example among a few others that have followed the blueprint of incredible transfer spending to achieve football success. Prior to 2008 when Manchester City was famously acquired by Sheikh Mansour and the Abu Dhabi United Group for Development and Investment (ADUG), they were still regulars in the English Premier League but spent and performed at a fairly modest level. In the years that they were in the EPL (1993-1996 and 2001-2007), spent roughly 0.868x the amount of the rest of the league and their average rank in performance was 14. Essentially, they were just below the league average in both categories. From 2008 and onward, the new ownership group began to increase investment in the club and transfer spending substantially. From 2008-2021, the average relative spending measure has been nearly 2.67x higher than the rest of the league. Subsequently, their average rank in performance has skyrocketed up to approximately 3rd place. This transition illustrates a case in which transfer spending has successfully led to a marked increase in performance.

Chelsea illustrates an extremely similar case to Manchester City. Though they had been a historically better club than Manchester City prior to the famous 2003 acquisition by Roman Abramovich, a significant rise in transfer spending post-acquisition also equated to a rise in performance. Prior to 2003, Chelsea spent at a rate of approximately 1.293x the league average and maintained an average rank in performance of 7.7. This is slightly above average in each category. After Abramovich's acquisition, they spent at a rate of 2.65x the rest of the league and have ended up earning an average placing around 3rd place as well. The large amounts of spending have successfully positioned Chelsea among the English Premier League's elite.

Despite the well-documented cases of Blackburn, Manchester City, and Chelsea implementing high transfer spending strategies in order to achieve high performance, it is important to note that of course sport at its core is still full of random anomalies. As the famous

sports adage goes: “That’s why they play the game.” The conclusions gathered through this research result from aggregated, long-term data. The 2016 Leicester City English Premier League title run is perhaps the best example of one such anomaly and is largely regarded as the most remarkable single season in the English Premier League’s history. In the two years prior to that title win, Leicester City ranked 17th and 16th in transfer spending which was a rate of 0.05x and 0.37x the league average, respectively. Yet, they managed to achieve 1st place in the league with an incredibly cheap roster of players. In comparison, their squad cost just £72 Million which was 7x less than Manchester City’s squad which cost £415 Million that season.

A final case study worth discussion is that of Newcastle United as a good example of a middling English Premier League team. Newcastle United has been a regular of the EPL competing in 26 out of 29 seasons. They have spent above the league average in 14 out of those 26 seasons and below the league average in 12 of them. They have also enjoyed varying degrees of success, performing as high as 2nd place when they were spending at their peak in 1996 and 1997 and slipping as low as relegation in 2017 when spending over the previous seasons had been well below the league average. The lesson learned with Newcastle United is that a large number of Premier League clubs tend to hover in the middle tier of the league and that they are often only taken as far as their transfer spending will allow them. Just recently, however, Newcastle United was taken over by a consortium of investors, lead by PIF which is the sovereign wealth fund of Saudi Arabia. This group has announced plans to greatly increase investment in Newcastle United (Benge, 2021). My research would suggest that this increased investment, if directly tied to transfer spending, will lead to a significant increase in Newcastle United’s performance in the EPL over the next couple of seasons. This will be a fascinating development to keep an eye on.

Conclusion

Through the replication of Hall's methods for regression analysis and granger analysis on a modernized dataset, this thesis has determined that the conventional wisdom of increased transfer spending correlating to better performance on the soccer field holds true. Better yet, transfer spending Granger causes performance at a one-year and two-year lag. This indicates that stakeholders should expect to see results from their investment in players after only one or two years. It also suggests continuously sustained high transfer spending is necessary to maintain high levels of performance. High transfer spending in the short term cannot be expected to influence performance in the long term.

The exploration of the cases of Blackburn Rovers, Manchester City, and Chelsea nicely demonstrate the conclusions drawn from this data analysis in the real world. Simultaneously, the cases of 2016 Leicester City and Newcastle United acknowledge the non-absoluteness of the relationship between transfer spending and performance in a single season.

So, what about the competitive balance? European football stakeholders don't seem to care. Interestingly, UEFA's Financial Fair Play regulations make no mention of increasing fairness; they maintain that their purpose is to preserve the financial well-being of the clubs. It has long been assumed that the wealthiest clubs will achieve the greatest football success, and this is something that will presumably continue to reign true.

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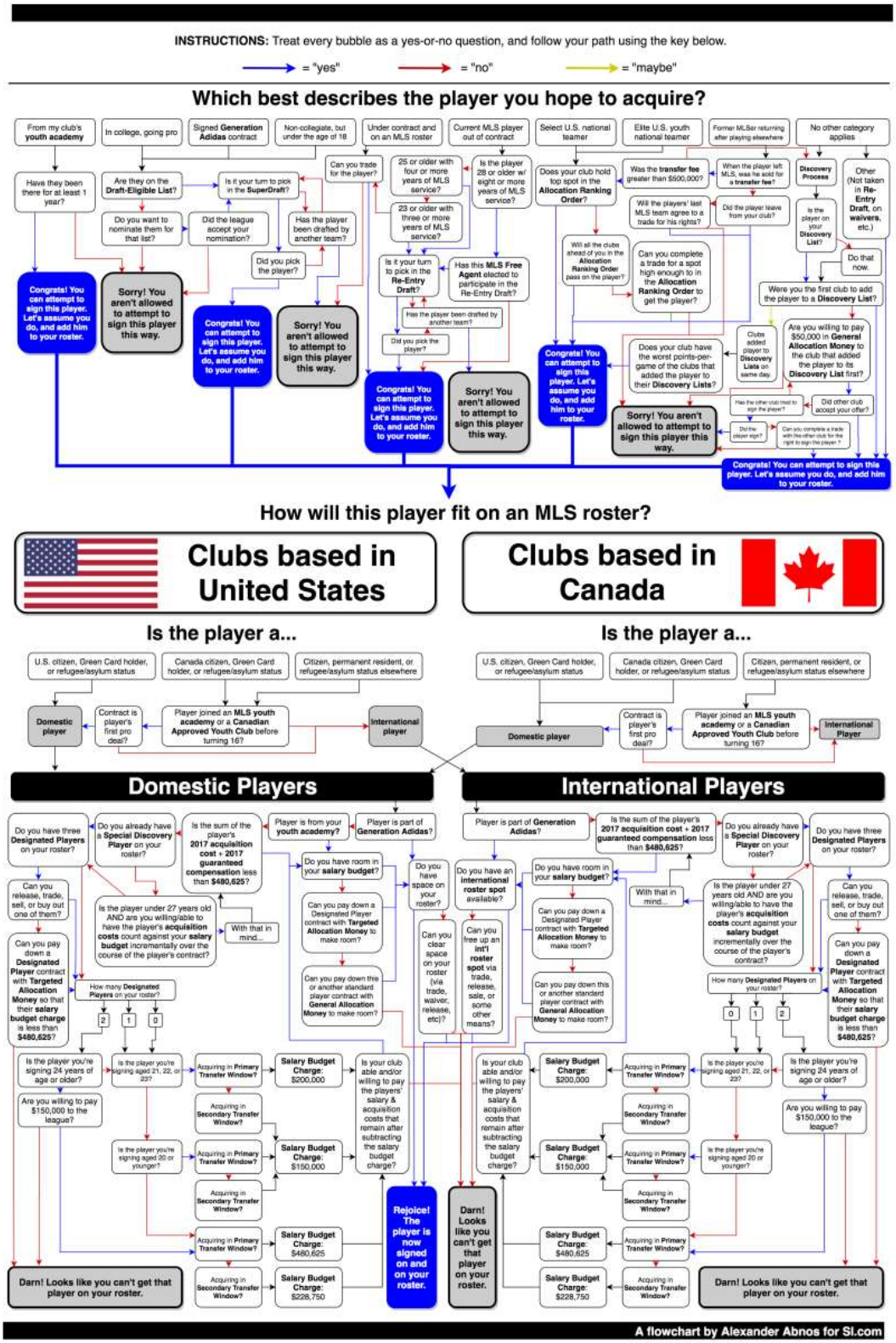
Appendix A


INSTRUCTIONS: Treat every bubble as a yes-or-no question, and follow your path using the key below.
= "yes"
= "no"
= "maybe"
Which best describes the player you hope to acquire?
From my club's youth academy
In college, going pro
Signed Generation Adidas contract
Non-collegiate, but under the age of 18
Under contract and on an MLS roster
Current MLS player out of contract
Select U.S. national teamer
Elite U.S. youth national teamer
Former MLSer returning after playing elsewhere
No other category applies
Have they been there for at least 1 year?
Are they on the Draft-Eligible List?
Do you want to nominate them for that list?
Did the league accept your nomination?
Is it your turn to pick in the SuperDraft?
Has the player been drafted by another team?
Did you pick the player?
Can you trade for the player?
25 or older with four or more years of MLS service?
23 or older with three or more years of MLS service?
Is it your turn to pick in the Re-Entry Draft?
Has the player been drafted by another team?
Did you pick the player?
Is the player 28 or older w/ eight or more years of MLS service?
Has this MLS Free Agent elected to participate in the Re-Entry Draft?
Does your club hold top spot in the Allocation Ranking Order?
Was the transfer fee greater than $500,000?
When the player left MLS, was he sold for a transfer fee?
Will the players' last MLS team agree to a trade for his rights?
Did the player leave from your club?
Will all the clubs ahead of you in the Allocation Ranking Order pass on the player?
Can you complete a trade for a spot high enough to in the Allocation Ranking Order to get the player?
Discovery Process
Is the player on your Discovery List?
Other (Not taken in Re-Entry Draft, on waivers, etc.)
Do that now.
Were you the first club to add the player to a Discovery List?
Are you willing to pay $50,000 in General Allocation Money to the club that added the player to its Discovery List first?
Clubs added player to Discovery Lists on same day.
Does your club have the worst points-per-game of the clubs that added the player to their Discovery Lists?
Has the other club tried to sign the player?
Did other club accept your offer?
Did the player sign?
Can you complete a trade with the other club for the right to sign the player?
Congrats! You can attempt to sign this player. Let's assume you do, and add him to your roster.
Sorry! You aren't allowed to attempt to sign this player this way.
How will this player fit on an MLS roster?
Clubs based in United States
Clubs based in Canada
Is the player a...
Is the player a...
U.S. citizen, Green Card holder, or refugee/asylum status
Canada citizen, Green Card holder, or refugee/asylum status
Citizen, permanent resident, or refugee/asylum status elsewhere
Domestic player
Contract is player's first pro deal?
Player joined an MLS youth academy or a Canadian Approved Youth Club before turning 16?
International player
Domestic Players
International Players
Do you have three Designated Players on your roster?
Do you already have a Special Discovery Player on your roster?
Is the sum of the player's 2017 acquisition cost + 2017 guaranteed compensation less than $480,625?
Player is from your youth academy?
Player is part of Generation Adidas?
Player is part of Generation Adidas?
Is the sum of the player's 2017 acquisition cost + 2017 guaranteed compensation less than $480,625?
Do you have room in your salary budget?
Can you release, trade, sell, or buy out one of them?
Can you pay down a Designated Player contract with Targeted Allocation Money to make room?
Can you pay down this or another standard player contract with General Allocation Money to make room?
Do you have space on your roster?
Can you clear space on your roster (via trade, waiver, release, etc)?
Do you have an international roster spot available?
Can you free up an int'l roster spot via trade, release, sale, or some other means?
With that in mind...
Is the player under 27 years old AND are you willing/able to have the player's acquisition costs count against your salary budget incrementally over the course of the player's contract?
How many Designated Players on your roster?
Can you pay down a Designated Player contract with Targeted Allocation Money so that their salary budget charge is less than $480,625?
Is the player you're signing 24 years of age or older?
Are you willing to pay $150,000 to the league?
Is the player you're signing aged 21, 22, or 23?
Is the player you're signing aged 20 or younger?
Acquiring in Primary Transfer Window?
Acquiring in Secondary Transfer Window?
Salary Budget Charge: $200,000
Salary Budget Charge: $150,000
Salary Budget Charge: $480,625
Salary Budget Charge: $228,750
Is your club able and/or willing to pay the players' salary & acquisition costs that remain after subtracting the salary budget charge?
Rejoice! The player is now signed on and on your roster.
Darn! Looks like you can't get that player on your roster.
Congrats! You can attempt to sign this player. Let's assume you do, and add him to your roster.
A flowchart by Alexander Abnos for SI.com