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Investigation of Sunk Cost Fallacy in European Football – Empirical Evidence from English Premier League and German Bundesliga

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ABSTRACT

Sunk cost fallacy is a behavioral decision-making concept that leads to biased decisions and sub-optimal outcomes. Although academics have shown some interest in this phenomenon, only a few studies investigate the presence of sunk cost fallacy in European football. This study investigates whether the sunk cost fallacy exists in Europe's top two football leagues using transfer fees and playing time. The presence of sunk cost fallacy would indicate a faulty decision-making process. The conducted regression continuity design results suggest that the coaches in the English Premier League make biased decisions due to sunk cost fallacy, whereas the coaches in German Bundesliga do not. The biased decisions of Premier League managers indicate managerial inefficiency, which might lead to undesired outcomes.

INTRODUCTION

Decision-making is a critical process for both day-to-day activities and long-term projects. Conventional decision-making theories suggest that people are rational; hence they make the choices that lead to the best possible outcome. However, in practice, that is often not the case. People make irrational and biased decisions from time to time, leading to the emergence of behavioral economics. A field that uses psychological insights to explain the irrationalities in decision-making behavior (Hursh, 1984). Behavioral economics is a relatively new field of economics however, it has been used to explain the behavior of economic agents in many different fields of economics.

Several sports economics literature studies have used behavioral concepts, especially for player contracts (Hinton & Sun, 2020; Farah & Baker, 2021). It is common to see erroneous and biased decisions in a field such as sports, where rationality is often lost by players, coaches, owners, and fans. Due to sports' dynamic nature, decision-making is a critical process that determines the winners and losers. Organizers, club owners, coaches, managers, and athletes constantly make short-term and long-term decisions. Although there have been important studies regarding sports decision-making processes, there is still a huge gap in the literature.

In professional sports, it's quite common to see managers who try to make better use of their most promising players however the question is whether these players are promising because they are the most talented or because they are the most paid ones. In the behavioral economics literature, two phenomena are often used to define the cost-oriented biased decisions: escalation of commitment and sunk cost fallacy.

This paper examines whether sunk costs are influential on the playing time decisions made by the managers in the English Premier League and German Bundesliga. If evidence can be provided regarding sunk cost fallacy, it would be an indicator of managerial inefficiency. The English Premier League and German Bundesliga are investigated for the existence of sunk cost fallacy in new transfers between the 2013/2014 and 2017/2018 seasons.

With the increasing number of in-game statistics for football, it is easier to measure player performance. More data is available for managers ~ however, managing and interpreting the newly available data is another expertise than managing a team. Occasionally managers fail to make good use of the new data. The objective interpretation of the data would enable the determination of best performing players however, often people tend to overweigh the negative attributes than the positive ones. As Oliva and his colleagues (1995) and Anderson

and Sullivan (1993) argue there is an asymmetry in the perception of the influence of negative and positive externalities on the outcome.

In the light of the studies in the literature, it can be foreseen that managers will be able to distinguish between "bad" performing players due to the asymmetry in the perception of positive and negative externalities. The initial hypothesis suggests that distinguishing between "bad" performing players will be easier, so it is expected to have a sunk-cost fallacy in the playing times of the players performing "good".

The investigation is done by conducting an RDD (Regression Discontinuity Design) to illustrate the shift in the playing time of the players that cost more than average compared to the ones who cost less. Illustrating biased playing times, due to higher financial commitment in terms of higher transfer fees, would provide empirical evidence for the sunk cost fallacy phenomenon. Other than the contribution to sports economics and behavioral economics literature such evidence would also contribute to professional football. Portraying the biased decisions would be an indicator of managerial inefficiency which is a problem to be fixed especially for smaller-scale clubs where funds are scarce and much more valuable.

Theoretical Background

Sunk cost fallacy is a decision-making bias that occurs when individuals make future decisions under the effect of previous expenditures. Neoclassic economists believe that sunk costs should be ignored hence decision-making should only be based on marginal benefits and marginal costs. There are numerous studies (Arkes, 1996; Bazerman et al., 1982; Garland, 1990; Thaler, 1980) that provide evidence of the sunk cost fallacy bias in making real-life decisions however it should be noted these are all experimental evidence. These studies are often criticized for being small stake decisions and not being generalizable as in the case for all other experimental evidence.

Sports leagues are large sums of data that are also high-stake decisions, making it an appropriate data source for sunk cost fallacy studies. So far, several studies have been conducted regarding the sunk cost fallacy phenomenon in professional sports, specifically basketball. There are studies conducted regarding sunk cost fallacy in the National Basketball Association (Camarer and Weber 1999; Leeds et al., 2015; Staw and Hoang, 1995). In recent years, other studies have been published regarding different types of sports such as Keefer's two papers (2015a; 2015b) regarding the sunk cost fallacy in the National Football League.

Staw (1976), Teger (1980), Shubik (1971), and many other studies illustrate the escalation of commitment. This phenomenon argues that sometimes people commit to a

position more than its value as in the case of the playing minutes of the NBA players. Players with higher contracts are given more playing minutes by the coaches regardless of their performance. Staw and Hoang (1995) demonstrate that NBA players who have higher draft rankings are given more minutes than they have deserved in terms of performance. Rational decision-making suggests a losing course of action however behavioral research suggests that it might not be the case.

Keefer (2015a) conducted a similar study for the NFL and found similar results such that escalation of commitment exists in the National Football League furthermore Keefer can associate the draft ranking with costs due to the structure of NFL drafts. Higher round picks in the draft are paid more than the picks in the lower rounds of the drafts which creates natural cutoff points in Keefer's data therefore very suitable for conducting a regression discontinuity design. The shift in playing time around the threshold level illustrates the sunk cost fallacy in the NFL.

Hackinger (2019) investigates the existence of sunk cost fallacy in the German Bundesliga between the seasons 2008/2009 and 2012/2013. The author concludes that there is no evidence of sunk cost fallacy in the investigated period.

It should be kept in mind that players have contracts therefore additional costs along with transfer fees. However, the data for the contracts are not publicly available for all the players/teams which makes them impossible to be used in this study. Also, some players change teams when their contracts end so there is no transfer fee paid to them. When Zlatan Ibrahimovic moved to Manchester United from Paris Saint-Germain in the 2016/2017 season, he was a free transfer however he was paid about 19 million pounds per season (Dailymail, 2017) which makes him costlier than many other newcomers to the Premier League. There are not many players like Zlatan Ibrahimovic therefore a few outliers do not distort the results in several hundred observations.

METHODS

Data Collection

Three bits of data are required to estimate the effect of financial commitment on playing time. The first one is the data regarding transfer fees gathered from the well-known website "Transfermarkt.co.uk". Secondly, data for the playing time for each player is needed, which is gathered from "Whoscored.com", a website that uses OPTA's data to provide statistics. For each player; appearances and minutes played to determine the playing time. Third, to control the differences in performance players with similar performance should be compared in terms

of cost and playing time relation. As an indicator of performance Whoscored.com ratings are used. The website underlines that their rankings are used by media giants, bookmakers, and football clubs hence a very well-known and respected performance indicator. WhoScored.com (2018) define their rating as a "unique, comprehensive statistical algorithm, calculated live during the game. There are over 200 raw statistics included in the calculation of a player's/team's rating, weighted according to their influence within the game. Every event of importance is considered, with a positive or negative effect on ratings weighted with its area on the pitch and its outcome."

Data for 1200 players have been collected, who have been transferred between the 2013/2014 and 2017/2018 seasons to the English Premier League and German Bundesliga. 624 of 1200 are transfers made by the clubs in English Premier League and 576 by the clubs in German Bundesliga.

To enhance the depth of the investigation, transfers have been examined in different sub-groups. First, players are grouped following their performances as "good" and "bad" using WhoScored.com's ratings. Since performing "good" is challenging in a "bad" team, relative performance ratings are used instead of absolute ratings. Relative performance is the player's rating to his team's rating.

Later the players are categorized into "defensive" and "offensive" by their playing positions. Transfermarkt's player positions are used for categorizing the players into defensive and offensive sub-groups. The defensive positions are: Centre-Back, Right-Back, Left-Back, and Defensive Midfield and the offensive positions are: Attacking Midfield, Central Midfield, Centre-Forward, Left Midfield, Right Midfield, Left Wing, Right Wing, and Secondary Striker. Then, these six subgroups are investigated for sunk cost fallacy in terms of appearances and minutes played. There are two transfer windows in European football, one in mid-season and one in the end season break. The players transferred in mid-season have than those transferred at the beginning of the season. To overcome this bias, the percentage of minutes and matches played are used instead of the number of minutes and matches played.

Finally, the free transfers are removed from the dataset to prevent any distortion in the data. Free transfers are often players which are either promising youngsters who do not get much playing time or veterans who are at the end of their careers transferred just as a contingency. There are occasional exceptions, but if a player is valuable, his club will not be letting him go freely.

Study Design

Regression Discontinuity Design was introduced by Thistlethwaite and Campbell (1960) to illustrate the causal effects of interventions by determining a threshold above or below which an intervention is assigned. The observations close to the threshold on both sides are compared and contrasted so an average treatment effect can be estimated. Using regression discontinuity design produces the highest internal validity among all quasi-experimental designs which estimate the local average treatment effect at the cutoff point hence it is the most favored one (Radoman, 2015).

$(Y_i(0), Y_i(1), X_i), i = 1, 2, \dots, n, \qquad X_i \; continous$

$T_i \in \{0,1\}, \qquad T_i = 1(X_i \geq \bar{x})$

$(Y_i, T_i, X_i), i = 1,2, \dots, n, with$

$$Y_i = \begin{cases} Y_i(0) & if \quad T_i = 0 \\ Y_i(1) & if \quad T_i = 1 \end{cases}$$

$$\tau_{SRD} = \mathbb{E}[Y_i(1) - Y_i(0) | X_i = \bar{x}] = \lim_{x \downarrow \bar{x}} \mathbb{E}\,[Y_i | X_i = x] - \lim_{x \uparrow \bar{x}} \mathbb{E}\,[Y_i | X_i = x]$$

(Sebastian, Cattaneo, & Titiunik, 2013)

We are investigating whether there is a discontinuity in playing times after a certain transfer fee threshold. The threshold is the average transfer fee paid to the players in the sample and we believe that there will be a sharp shift in playing times around the cutoff point. Following Radoman's (2015) methodology, a regression discontinuity design should be characterized by a set of assumptions that are relevant to this study:

- Two sets of players in terms of transfer fee around to cutoff point are represented by a dummy variable T.
- Players' transfer fees are constant therefore they cannot manipulate assignment, called exchangeability, which causes the treatment effects to be random around the cutoff point.
- Treatment indicator is T.
- Control variable (X) continuous around the cutoff point.

The existence of sunk cost fallacy can be tested through the estimation of the following regression.

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 X_i + \varepsilon_i$$

Where $T = 0$ for the player who cost less than the average transfer fee and $T = 1$ for players who cost more. Y_i is the playing time measured in terms of percentage of minutes and percentage of matches played. X_i is the transfer fee and ε_i is the error term. For Stata, statistical software for data science, a package has been developed by Calonico et al. (2014) for conducting regression discontinuity designs. A robust package has been used and the present results are the output of the used package. The variance estimators are used as the ones suggested by Calonico et al. (2014) and the method for the bandwidth selection process is the one used in the same study.

RESULTS

The main purpose of this study is to investigate whether there is a decision-making fallacy in the English Premier League and the German Bundesliga. This section provides the results of the attempts to illustrate the sunk cost fallacy in different leagues. The table below provides the results of the different regression discontinuity designs for the subgroups mentioned earlier using Premier League's data.

Table 1 presents the results of the RDD and as can be seen, Transfer Fee is significant for some of the sub-groups indicating the presence of a decision-making bias. Sunk cost fallacy is present in the subgroups a), d), and e) when the playing is measured in both Percentage of Minutes Played and Percentage of Matches Played.

The following figures illustrate the shifts in the playing times between the players who were paid more and less than the average transfer fee.

Figures 1, 2, and 3 visualize the increase in playing times both in Percentage of Minutes Played and Percentage of Matches Played. Figure 1 illustrates the sunk cost fallacy in players performing "good" without any positional segregation whereas Figures 2 and 3 illustrate offensive players which perform "bad" and defensive players which perform "good".

Table 1. RDD Results for the English Premier League

	Dependent Variable	**Percentage of Minutes Played**
	Independent Variable	**Transfer Fee**
a)	All Players / Good	0.277 (2.064)**
b)	All Players / Bad	-0.77 (-0.653)
c)	Offensive Players / Good	-0.011 (-0.127)
d)	Offensive Players / Bad	0.595 (3.516)***
e)	Defensive Players / Good	0.307 (1.954)*
f)	Defensive Players / Bad	Not Enough Observations

Table 2. (Continued)

	Dependent Variable	Percentage of Matches Played
	Independent Variable	**Transfer Fee**
a)	All Players / Good	0.355 (2.578)***
b)	All Players / Bad	-0.055 (-0.055)
c)	Offensive Players / Good	-0.035 (-0.127)
d)	Offensive Players / Bad	0.595 (3.516)***
e)	Defensive Players / Good	0.279 (2.037)*
f)	Defensive Players / Bad	Not Enough Observations

Z-statistics are in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

Table 2 provides the results for German Bundesliga as Table 1 did for the English Premier League. It can be seen that the explanatory variable Transfer Fee is not significant for any of the subgroups so it cannot be used to explain the variation in playing times. There is no empirical evidence that sunk cost fallacy is present in the German top-flight.

Table 3. RDD results for the German Bundesliga

	Dependent Variable	Percentage of Minutes Played
	Independent Variable	**Transfer Fee**
g)	All Players / Good	0.277 (2.064)**
h)	All Players / Bad	-0.77 (-0.653)
i)	Offensive Players / Good	-0.011 (-0.127)
j)	Offensive Players / Bad	0.595 (3.516)***
k)	Defensive Players / Good	0.307 (1.954)*
l)	Defensive Players / Bad	Not Enough Observations
	Dependent Variable	**Percentage of Matches Played**
	Independent Variable	**Transfer Fee**
g)	All Players / Good	0.355 (2.578)***
h)	All Players / Bad	-0.055 (-0.055)
i)	Offensive Players / Good	-0.035 (-0.127)
j)	Offensive Players / Bad	0.595 (3.516)***
k)	Defensive Players / Good	0.279 (2.037)*
l)	Defensive Players / Bad	Not Enough Observations

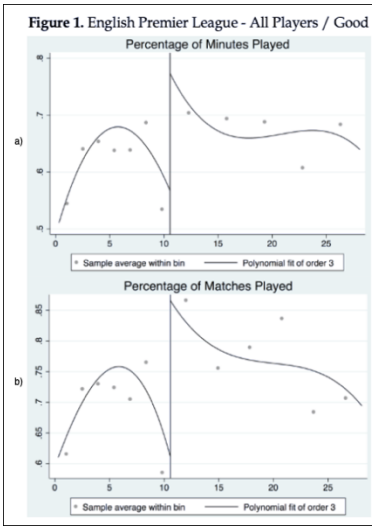

Figure 1. English Premier League - All Players / Good

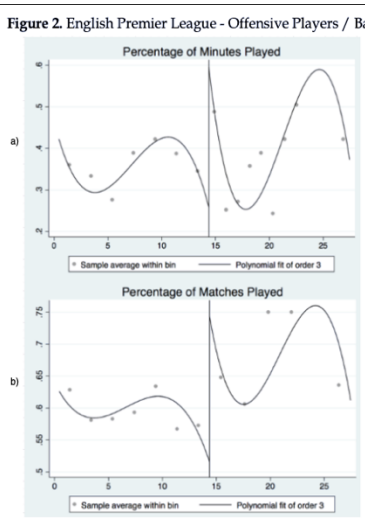

Figure 2. English Premier League - Offensive Players / Bad

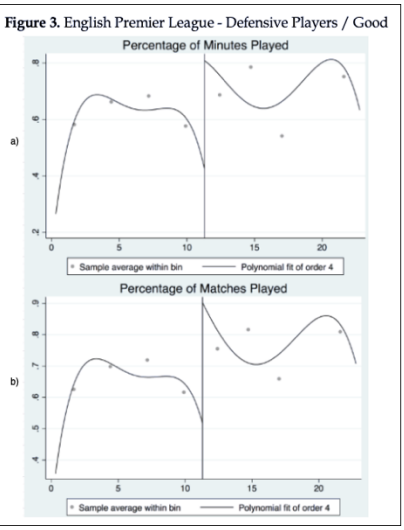

Figure 3. English Premier League - Defensive Players / Good

The next section will discuss the results presented in this section. First, the two leagues will be compared and contrasted in terms of managerial efficiency later the results for each league will be interpreted separately.

DISCUSSION

Managerial efficiency has been subject to numerous studies in the literature (Scully, 1994; Dawson et al., 2000; Kern & Süssmuth, 2005; Frick & Simmons, 2008) both for football and other team sports. Frick and Simmons (2008) use coaching experience and the percentage of points collected as measures reflecting managerial ability. Even the most successful manager of a low reputation team will not collect as many points as the manager of one of the league's giants hence the percentage of points collected could be misleading in measuring managerial efficiency or inefficiency. Providing empirical evidence for the presence of the sunk-cost fallacy could be used for illustrating managerial inefficiency since it would indicate a manager's failure to make the best use of his/her team.

This study compares the managerial efficiencies using the existence or non-existence of the sunk-cost fallacy in the English Premier League and German Bundesliga. As empirical evidence suggests there is no sunk-cost fallacy in the German Bundesliga unlike the case of the English Premier League. The findings regarding the German Bundesliga coincide with the findings of Hackinger (2019). Table 1 and Table 2 provide the results of the regression discontinuity designs for the cases of England and Germany. As can be seen from the tables, the Transfer Fee is significant as an explanatory variable for both the Percentage of Minutes Played and the Percentage of Matches Played in some of the sub-groups for England. In contrast, it is insignificant in all sub-groups for Germany. There is evidence that managerial inefficiency is present in the form of sunk-cost fallacy in the English Premier League. Managers

in the English Premier League make biased decisions for offensive players that are performing poorly and defensive players that are playing well. In these two subgroups managers' decisions regarding playing times are affected by the cost of the transfers. Providing more playing time to players that cost more, even though they are performing poorly, is an inefficient usage of resources. Managers should be susceptible to sunk costs and act accordingly.

For amplifying the depth of the discussion regarding managerial inefficiencies the number of manager changes in the two leagues is compared for the period. Manager change is a result of poor managerial execution therefore the average number of manager changes could be used as a proxy for managerial inefficiency. The average number of manager changes in the Premier League between the season 2013/2014 and 2017/2018 is 16.8 whereas it is 14.6 for the Bundesliga also the average number of manager changes during seasons for the same periods are 11.8 and 9.8 respectively. English teams change managers more than German teams, both between and during seasons, which is an indication of a higher degree of unsatisfactory managerial performance in the Premier League. The higher number of manager changes in England coincides with the results presented in Tables 1 and 2. The managers that are making biased decisions have shorter spells therefore the number of manager changes is higher.

On the other hand, Garland and Newport (1991) argue that the size of the sunk cost increases the sunk cost effect. The average transfer fee for the five-season period is 10.56 million Pounds in England whereas it is 5.16 million Pounds in Germany. Since the costs of transfers are higher in England when compared to Germany, so are the sunk costs. It could be another explanation why the sunk-cost fallacy can be observed in the English Premier League but not in German Bundesliga.

As expected, due to the asymmetry in the perception of negative and positive stimulators, sunk cost fallacy is present in players performing "good" but not in players performing "bad". Figures 1 a) and b) illustrate the shift in the playing times of the players performing "good" which cost more than the average both in terms of Percentage of Minutes Played and Percentage of Matches Played. Table 1 presents that Transfer Fee has a higher degree of significance on Percentage of Matches Played and it is significant even in 99.9% confidence interval whereas for Percentage of Minutes Played, it is significant in 99% confidence interval. The explanatory variable is highly significant in both cases and has a positive coefficient hence can be used as empirical evidence for the presence of the sunk-cost fallacy. The coefficient for the Transfer Fee is positive in all the cases where the explanatory

variable is significant which means that playing time increases as the transfer fee increases. For the offensive players, the sunk-cost fallacy cannot be observed in "good" performing players however there is empirical evidence for its presence among the "bad" performing ones. The Transfer Fee is significant for both the Percentage of Minutes Played and the Percentage of Matches Played as can be seen from Table 1. The effect of Transfer Fee can visually be observed relatively easier in Figure 2 b), the expensive transfers are subbed in even if it is for the last 5-10 minutes therefore their Percentage of Matches Played is high even though they get to have only a few minutes to play.

In the case of the defensive players, the ones performing "good" are again victims of the biased decisions. The sunk-cost fallacy is present among the defensive players. Managers tend to play players more, which costs more than the average compared to the ones which cost less. Transfer Fee is a significant explanatory variable in 95% confidence interval as Table 1 presents. Figures 3 a) and b) illustrate the high playing times of defensive players which cost more than the average transfer fee.

The presence of sunk cost fallacy in "good" performing players was expected as mentioned earlier however in the case of offensive players the decision-making bias is present among the "bad" performing players. Offensive performance is relatively easier to observe than defensive performance. Scoring and assisting goals, creating chances, successful dribbles, and key passes are even visible to the naked eye whereas defensive performance indicators are less captivating so distinguishing between offensive players that are performing "good" is relatively easy compared to the ones performing "bad". Among the offensive players with low performance, the ones who cost more are given more minutes and matches to play which is quite common. More is expected from expensive forwards generally and often they are on the pitch even though they do not contribute to the team.

CONCLUSION

The sunk cost fallacy indicates that the decisions made are irrational and the outcomes are suboptimal. In European football, where stakes have grown enormously high, reaching suboptimal or undesired outcomes are very costly. Often teams and coaches reach undesired outcomes due to bad decision-making in critical times. The empirical evidence provided in this study would help the coaches to understand the distinction between making transfers and making use of these transfers.

The total transfer expenditure between the seasons 2013/2014 and 2017/2018 is 6.69 billion Pounds and 2.28 billion Pounds respectively for the English Premier League and

German Bundesliga (Transfermarkt, 2018). Among the Top five Leagues of Europe, Premier League clubs have the highest income hence the highest transfer expenditures. The previous studies in the literature suggest that as the size of the sunk-cost increase the effect increases and since the Premier League has the highest transfer expenditures it was the most probable league to observe the sunk-cost fallacy in playing times. The investigation of sunk cost fallacy in English and German leagues provided valuable insight. As aligned with the initial hypothesis players which cost more, in the English Premier League, are given more games and minutes to play even though they do not perform better. There is empirical evidence that biased decisions are made in playing times therefore there is managerial inefficiency. For German Bundesliga, it is not possible to talk about the sunk-cost fallacy in the five-season period between 2013/2014 and 2017/2018. It could be because the transfers cost less on average therefore sizes of the sunk costs are smaller, or it could be because of efficient management or a combination of both.

It is important to remind that this study investigates five years and two major leagues in Europe. The extension of the period and addition of other leagues in Europe might provide different results and English clubs' higher income might be causing English clubs to be reckless spenders compared to the teams from other leagues. Another reason why English clubs are giving more playing time to players who cost more, despite their poor performance, might be their attempt to make use of their expensive transfers which is very understandable. Nonetheless, the empirical evidence provided here enables us to state that sunk cost fallacy is indeed present in the English Premier League.

Illustrating the existence of sunk cost fallacy in European football could help the club owners' ability to assess their coaches as well as improve coaches' performance. It is a concept that has been often disregarded in sports literature and could have disastrous consequences.

Authors' contributions

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Declaration of conflict interest

The author declares that there is no conflict of interest.

REFERENCES

Anderson, E. & Sullivan, M. (1993). The Antecedents and Consequences of Customer Satisfaction for Firms. Marketing Science, 125-212. https://doi.org/10.1287/mksc.12.2.125

Arkes, H. (1996). The Psychology of Waste. Journal of Behavioral Decision Making, 213-224. https://doi.org/10.1002/(SICI)1099-0771(199609)9:3<213::AID-BDM230>3.0.CO;2-1

Bazerman, M., Beekun, R., & Schoorman, D. (1982). Performance evaluation in a dynamic context: A laboratory study of the impact of a prior commitment to the rate. Journal of Applied Psychology, 873-876.

Calonico, S., Cattaneo, M., & Rocio, T. (2014). Robust data-driven inference in the regression-discontinuity design. The Stata Journal, 909-946.

Camarer, C., & Weber, R. (1999). The econometrics and behavioral economics of escalation of commitment: a re-examination of Staw and Hoang's NBA data. Journal of Economic Behavior and Organization, 59-82. https://doi.org/10.1016/S0167-2681(99)00026-8

Dailymail. (2017, May). The price of trying to bring glory days back to Manchester United: £367,640 a week for Zlatan Ibrahimovic... and a £3.5million loyalty bonus for Paul Pogba. Retrieved from Dailymail: https://www.dailymail.co.uk/sport/football/article-4485750/Cost-Man-Utd-signing-Ibrahimovic-Pogba-revealed.html

Dawson, P., Dobson, S., & Gerrard, B. (2000). Estimating Coaching Efficiency in Professional Team Sports: Evidence from English Association Football. Scottish Journal of Political Economy, 399-421.

Frick, B., & Simmons, R. (2008). The impact of managerial quality on organizational performance: evidence from German soccer. Managerial and Decision Economics, 593-600. https://doi.org/10.1002/mde.1431

Garland, H. (1990). Throwing Good Money After Bad: The Effect of Sunk Costs on the Decision to Escalate Commitment to an Ongoing Project. Journal of Applied Psychology, 728-731. https://doi.org/10.1037/0021-9010.75.6.728

Garland, H., & Newport, S. (1991). Effects of Absolute and Relative Sunk Costs on the Decision to Persist with a Course of Action. Organizational Behavior and Human Decision Processes, 55-69. https://doi.org/10.1016/0749-5978(91)90005-E

Hackinger, J. (2019). Ignoring millions of Euros: Transfer fees and sunk cost fallacy in professional football. Journal of Economic Psychology, 1-53. https://doi.org/10.1016/j.joep.2018.10.006

Keefer, Q. (2015a). Performance Feedback Does Not Eliminate the Sunk-Cost Fallacy: Evidence From Professional Football. Journal of Labor Research, 409-426.

Keefer, Q. (2015b). The Sunk-Cost Fallacy in the National Football League: Salary Cap Value and Playing Time. Journal of Sports Economics, 1-16. https://doi.org/10.1177/1527002515574515

Kern, M., & Süssmuth, B. (2005). Managerial Efficiency in German Top League Soccer: An Econometric Analysis of Club Performances On and Off the Pitch. German Economic Review, 485-506. https://doi.org/10.1111/j.1468-0475.2005.00143.x

Leeds, D., Leeds, M., & Motomura, A. (2015). Are Sunk Costs Irrelevant? Evidence from Playing Time in the National Basketball Association. Economic Inquiry, 1305-1316. http://dx.doi.org/10.1111/ecin.12190

Oliva, T., Oliver, R., & Bearden, W. (1995). The relationship among customers satisfaction, involvement, and product performance: A catastrophe theory application. Journal of

the Society for General Systems Research, 104-132. https://doi.org/10.1002/bs.3830400203

Radoman, M. (2015). Labor Market Implications of Institutional Changes in European Football: The Bosman Ruling and Its Effect on Productivity and Career Duration of Players. Journal of Sports Economics, 1-22. https://doi.org/10.1177/1527002515594555

Scully, G. (1994). Managerial Efficiency and Survivability in Professional Team Sport. Managerial and Decision Economics, 403-411.

Sebastian, C., Cattaneo, M., & Titiunik, R. (2013). Robust data-driven inference in the regression-discontinuity design. The Stata Journal, 14(4), 909-946.

Shubik, M. (1971). The Dollar Auction game: a paradox in noncooperative behavior and escalation. Journal of Conflict Resolution, 109-112. https://doi.org/10.1177/002200277101500111

Staw, B. (1976). Knee-deep in the big muddy: a study of escalating commitment to a chosen course of action. Organizational Behavior and Human Performance, 27-44. https://doi.org/10.1016/0030-5073(76)90005-2

Staw, B., & Hoang, H. (1995). Sunk Costs in the NBA: Why Draft Order Affects Playing Time and Survival in Professional Basketball. Administrative Science Quarterly, 474-494.

Teger, A. (1980). Too Much Invested to Quit. New York: Pergamon.

Thaler, R. (1980). Toward a positive theory of consumer choice. Journal of Economic Behavior and Organization, 39-60. https://doi.org/10.1016/0167-2681(80)90051-7

Thistlethwaite, D., & Campbell, D. (1960). Regression-discontinuity analysis: An alternative to the ex post facto experiment. Journal of Educational Psychology, 51(6), 309-317.

Transfermarkt. (2018, June). Transfermarkt. Retrieved from Transfermarkt: https://www.transfermarkt.com/transfers/transfersalden/statistik/plus/1?sa=&saison_id=2013&saison_id_bis=2017&land_id=&nat=&pos=&w_s=

WhoScored. (2018, June). WhoScored. Retrieved from Transfermarkt: https://www.whoscored.com/Regions/81/Tournaments/3/Germany-Bundesliga