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of German Bundesliga teams reflected by the club's professionalism?**

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Vorwort

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List of Abbreviations

AG	"Aktiengesellschaft"
ATP	Association of Tennis Professionals
BN	Bayesian network
DFB	Deutscher Fußball Bund
"e.V."	"eingetragener Verein"
FIFA	Fédération Internationale de Football Association
GmbH	"Gesellschaft mit beschränkter Haftung"
LLC	Limited Liability Company
MLB	Major League Baseball
NBA	National Basketball Association
NCAA	National Collegiate Athletic Association
NFL	National Football League
NHL	National Hockey League
PPG	points per game
WR	win ratio

1 Introduction

When talking about organisation's performances and the ones responsible for those, it is often asked what to do in times of underperformance. One possible action is to dismiss the manager, making him/her responsible for the lack of performance. But how do we rate the performance of businesses when the result of those managerial changes has to be analysed?

Due to a lack of objective measurements when it comes to analysing a company's performance, an often used application is to take a look at sports teams and their behaviour. In sports, winning is the ultimate goal and the performance is given by objective results at the end of each game. Obviously, there may be good or bad luck involved in one game or the other but over the course of multiple games, this factor is negligible, making the analysis of managerial changes in a sports environment the best possible application for assessing the according behaviour of organisations.

In sports, it generally is the manager's fault if the results do not come up as hoped by the club. This can be shown by the media coverage already prior to the season when the popular German magazine "Focus" asks who will be the first manager to be sacked in the upcoming season (Focus, 2015). The British betting market takes this even further and offers a whole lot of bets on which manager will be replaced when, building an entire branch of the industry on the sacking behaviour of football clubs¹.

The popularity opinion that managers have to be sacked in times of underperformance however serves the purpose of this paper for two reasons; first of all, it shows the relevance of this topic and secondly, it indicates a public opinion that the manager's responsibility is huge and that the team will perform better under a new manager. While this may be the public opinion, research that has been done over decades implies differently. According to most studies published, managerial changes do not have such a positive impact on the team's performance and in some cases the team does even perform worse than before.

In order to assess the usefulness of managerial changes in sports clubs, the following paper will first of all develop a model that enables result prediction based on prior results. This will then be used to analyse team performances as precise as possible, leading to the

¹These bets are available at all betting offices but there are websites entirely devoted to managerial changes as well.

uniqueness of this paper: The effect of a club's professionalism on the sacking behaviour and the sacking performance will be analysed which offers insights into the organisational state of each club and the resulting effects. The professionalism will be measured by three aspects; time, division and legal form of the professional football team.

2 Theorising on Managerial Change

2.1 Literature Review - Managerial Change

The idea of analysing the value and results of a managerial change by conducting studies on sports performances and manager sacking has been present in economics for a rather long time by now. Frankly speaking, the American literature engaged itself with the analysis of managerial changes in sports since the early 1960ies. The basic assumption that sports results serve as a good indicator for measuring the effect of managerial change is given for multiple reasons:

- First of all, performance measures and goals are clearly set in a sports environment by the overall and strict target of winning as many games as possible and therefore the championship. However, measuring goal achievements and performance is much harder for business companies for two reasons; on the one hand, such organisations' goals may vary and on the other hand, there is an inherent lack of one single benchmark to evaluate the performance - which would be the result of the game in sports (Pfeffer & Davis-Blake, 1986).
- While the managerial situation and the definite power of certain parts of the management team may not be perfectly clear when looking at business companies, it is apparent that managers (or coaches as they are called in some sports and countries) in sports do have the absolute power over the team, the players, and the tactics. Hence, a succession is clearly visible and the decision and outcome of sacking the old manager and hiring a new one is analysable easily (Pfeffer & Davis-Blake, 1986). Brown (1982) however argues that not every sports does serve the point of the manager's absolute power equally well as for example baseball is known to require rather high individual skills and performances by the players.
- Further, sports teams within the same league are considered to be structurally similar organisation which have similar goals and offer similar products (Audas et al., 2002; Gamson & Scotch, 1964) which serves as a benefit for the researcher as it is nearly impossible to acquire such a homogeneous group of companies in any other field of business. So, conducting the analysis apparently gets much easier and therefore allows for bigger sample sizes.

As noted above, assessing managerial change and the outcome thereof has a long going history and started off by Grusky (1963) examining and finding a negative correlation between managerial succession and the baseball team's performance in the Major League Baseball (MLB). Following up to these findings, generally three theories prevailed on why there is a negative relationship between succession and performance. Firstly, the manager's effect on the team is unilateral which would result in bad managers getting sacked and teams performing better under better new managers. Secondly, a two-way causality may exist since teams have to adapt to the new manager's style and therefore lack performance which will reflect negatively on the manager and lead to a vicious circle of sacking managers and even worse performances - which has been presumed by Grusky (1963). Finally, it is argued that sacking managers of poor performing teams serves as a scapegoating ritual that covers up other inherent issues within the sports club which is the favoured theory by Gamson & Scotch (1964).

Overall, the scapegoat theory evolved far and up to this date, it is used in the literature as a possible theory to explain managerial sacking both in a sports environment (Audas et al., 2002; Tena & Forrest, 2007; Flores et al., 2012; Dohrn et al., 2015) as well as in a business company environment (Huson et al., 2004). The other prevailing theory most researchers base their studies on is the common sense theory which suggests that the organisation's performance will improve when the bad top management is replaced (Soebbing & Washington, 2011). The common sense theory serves as the basis for multiple articles within the field of managerial change and succession (Rowe et al., 2005)².

The results of the available literature however cannot significantly prove any of the given theories, whether it is the scapegoat theory, the common sense theory, or any other theory that may have been employed in order to explain managerial succession and team performances during such times. However, there are differences in results on sacking performances among different leagues and sports. While studies on football do not show any performance deterioration after managerial changes, American studies on professional sports do rarely show any performance improvement following up to a managerial change.

²Other major contributions considering the common sense theory are Brown (1982), Pfeffer & Davis-Blake (1986), Audas et al. (2002), Balduck et al. (2010a), Frick et al. (2010), González-Gómez et al. (2011), Lago-Peñas (2011), Soebbing & Washington (2011), and Dohrn et al. (2015).

Yet, multiple studies on American leagues do show performance deterioration after managerial changes among different leagues such as the MLB (Grusky, 1963; Hill, 2009), National Collegiate Athletic Association (NCAA) basketball (Fizel & D'Itri, 1997), or the National Hockey League (NHL) (Rowe et al., 2005). However, especially college sports offers positive results on managerial changes in basketball (Fizel & D'Itri, 1999) and American football (Dohrn et al., 2015). Most studies on American sports do not yield any significant changes in team performance after managerial changes which suggests that such changes especially within the season do not offer any reliable results, particularly when considering that team owners have to pay multiple managers when sacking some. This results from multiple studies on the MLB (Gamson & Scotch, 1964; Cannella Jr. & Rowe, 1995), the National Basketball Association (NBA) (Pfeffer & Davis-Blake, 1986), and the National Football League (NFL) (Brown, 1982).

Whereas managerial change within the season does not seem to matter that much in American Sports overall, football (as Europeans know it) produces a slightly enhanced outcome. Multiple studies still show no significant change in team performance following a managerial change among football leagues in different European countries³, in Argentina (Flores et al., 2012), and in college football in the USA (Soebbing & Washington, 2011). However, the majority of papers on managerial sacking and performance thereafter do propose a moderate increase of team performance which can mainly be accounted for by papers on the German Bundesliga (Heuer et al., 2011; Mühlheußner et al., 2013), the English Premier League (Peiser & Franklin, 2000; Audas et al., 2002), and the Spanish Primera División (Tena & Forrest, 2007; González-Gómez et al., 2011; Lago-Peñas, 2011) which also are the most common leagues to be considered by researchers. Obviously, other leagues are taken into consideration as well since research on Dutch (Bruinshoofd & ter Weel, 2003) and Norwegian football (Arnulf et al., 2012) shows performance improvements after managerial changes, too. A paper on Belgian football by Balduck et al. (2010b) serves as an outlier as it clearly states a huge performance increase after a managerial change compared to the rather moderate changes in performance described above.

³Austria (Wirl & Sagmeister, 2008), Belgium (Balduck et al., 2010a), England (Flint et al., 2014), Italy (de Paola & Scoppa, 2012), and the Netherlands (Koning, 2003; ter Weel, 2011)

Despite clearly showing a team performance improvement following up to a managerial change on more than half the papers considered in this literature review, there are still two drawbacks to the conclusion; first of all the regression towards the mean and secondly the control group, or rather the lack thereof. Even though both drawbacks share and describe the same underlying argument, they are worth being looked at separately as the regression towards the mean is more theoretical while the control group serves as a much more applicable practical form of analysis.

The regression towards the mean describes an effect that badly underperforming teams are likely to improve at some point in the future (Heuer et al., 2011) or as Audas et al. (1997) put it; "no team carries on losing forever" (p.36). In order to prove this point, the invention of the control group is a major part in many studies on managerial change and team performances. Following Brown (1982), it was Audas et al. (1997) and Audas et al. (2002) who further popularised the control group as a measure of how teams perform without changing their manager when they face a similar slump as the manager sacking teams. Comparing teams which change their manager after several poor performances to those teams which keep their manager after a comparable performance slump clearly proves the theory of the regression towards the mean. Most papers which consider a control group do end up showing that the teams in the control group do perform better compared to the teams in the managerial change group (Audas et al., 1997)⁴. Other studies show that teams in the control group perform equally well as teams who sacked their manager and hired a new one (Brown, 1982; Heuer et al., 2011; ter Weel, 2011).

It is worth noting that not a single control group yields a worse performance than the according group of manager changing teams. Therefore, the importance of the regression towards the mean cannot be underestimated which casts an unfavourable light on all the positive results concerning team performances after a managerial change. Since underperforming teams are always likely to enhance their results in upcoming games, literature overall suggests that replacing managers just because of bad results does not seem to yield proper outcomes.

⁴Other articles showing a beneficial control group are Audas et al. (2002), Bruinshoofd & ter Weel (2003), Balduck et al. (2010a), and Arnulf et al. (2012).

To sum things up, there for sure are cases when the cohesion and communication between manager and team do not work at all or when the manager simply does not offer good tactics or training methods which will very likely result in a useful managerial change. However, in most cases, a managerial change does not seem to work as intended by the responsible management.

2.2 Theoretical Background

As shown above there is a wide variety on theories how managerial changes may affect a team's performance and why such sackings may or not may be beneficial for the club. Overall, several pros and contras can be found for either view on the benefit of managerial changes:

- + It is most likely that the manager sacking team severely underperformed in the games prior to the managerial change. Therefore, the player's individual, the team's overall, the club's overall, and the club's stakeholder's (supporters) morals are likely to be bad, too. In such cases, changing the manager may lead to a new enthusiasm (Wirl & Sagmeister, 2008) as players and supporters tend to believe that an in-depth change to the club was inevitable. Having an optimistic spirit surrounding the players and the team may lead to a more sophisticated and better future performance.
- + Further, a new manager is unlikely to already have a determined view on every single player from the get go. This incentivises all players on the roster to impress and persuade the new manager to let them play. So, changing the manager may lead to an initial increase in the players' efforts, at least until a new hierarchy has developed and some players lack chances to play (Wirl & Sagmeister, 2008).
- On the other hand, losing a manager does also mean to lose all knowledge this manager has acquired during his career and especially during his term with this specific club. The new manager cannot know all details concerning the roster's and especially the single players' strengths and weaknesses. This does hold true even if the sacking decision led to a bad manager being replaced by a better one. The new manager will need time to evaluate the squad and to acquire his own knowledge on how to play with this roster and on whom to play (Wirl & Sagmeister, 2008).

- Finally, facing prior argument from a different angle, a majority of the players do also neither know the new manager nor the way he likes to play. Given this assumption, it does not only take time for the manager to get himself familiarised with the team but also for the team to get acquainted with the new manager.

Taking all these points into consideration, the difficulties to argue for an overall benefit of a managerial change are evident. However, what can be argued for is an initial short term effect since clubs that sacked their managers have most certainly severely underperformed in recent matches. The importance of a number of bad games (losses) has been shown multiple times by different researchers (Audas et al., 1999; Frick et al., 2010) as well as the influence of the league position on the club's sacking behaviour (Bachan et al., 2008). Allen & Chadwick (2012) went even further and did not only analyse the absolute performance but also the impact of performance expectations by including changes concerning the salary cap and free agency in the NFL. Including some kind of performance expectation appears to be a smart move as it allows to take care of different short-term schedule strengths and the overall strength of the considered team⁵. However, it is worth noting that setting up a proper expectation model is vital in order to not impede the actual purpose of the analysis.

2.2.1 Overall Sacking Performance

Bearing in mind study results which show a clear tendency towards underperformance prior to firing a manager, the initial performance after a managerial change still needs to be assessed. Since underperformance is a huge driver for manager sacking, an initial increase in team performance following the change seems to be the logical consequence. Multiple studies on manager succession in a sports environment have shown such an increase (Lago-Peñas, 2011; Arnulf et al., 2012) while there are also contrasting studies proposing an initial performance decrease (Soebbing & Washington, 2011). Given the underperformance of many teams leading up to a managerial change, most of the increases found in the literature may be related to the regression towards the mean since no team will go on losing every match of the entire season (Audas et al., 2002; Heuer et al., 2011).

⁵A team that is supposed to compete for the championship does still underperform when it increases its performance from .25 points per game (PPG) to 1.25 PPG, whereas a lower tier team may be satisfied by scoring 1.25 PPG as it fulfils or probably even exceeds their projected performance.

While an initial performance increase for clubs which sacked their manager can be assumed, it is also vital to take a look at teams that experienced a similar slump in performance but kept their manager. Literature suggests that teams finding themselves in such a control group will perform similarly good (Brown, 1982; ter Weel, 2011) or even outperform those teams with a new manager (Baldock et al., 2010a; González-Gómez et al., 2011; Arnulf et al., 2012). Based on the overall findings in the literature that short term performance is likely to increase after a severe slump of underperformance, the author hypothesises:

H1a: Teams show a short term performance improvement initially after sacking the manager, with short term being five matches at most.

H1b: Teams which do not sack their manager will initially improve more than teams that sacked their manager while being in a similar situation.

While an initial short term improvement seems plausible due to the regression towards the mean and both the spirit of optimism and the incentive for every single player to put in the highest effort possible under the regime of a new manager, those arguments can no longer be accounted for in the mid run, when the new manager has been at the club for more than five games. Similarly to clubs giving new managers a honeymoon period during which they are not punished for bad results by being sacked (Bell et al., 2013), the whole club experiences some kind of a honeymoon phase as well when a new manager is hired, including enthusiasm and a spirit of optimism. Such a honeymoon period is believed to last for around seven to eight matches under the regime of a new manager (Hope, 2003).

So, the initial "hype" and the resulting enthusiasm around hiring a new manager is expected to wear off after a few weeks with a daily routine evolving in which the new manager has to prove himself. During this following step, the new manager will try to form the team according to his preferred play style and tactics while the players have had enough time to get themselves acquainted with the new manager's ideas. Similarly to Hope (2003), the mid run will in this paper be defined as the sum of all matches between the manager change and the season ending if there are more than nine matches to be played after the initial sacking.

Regarding the team performance under a new manager in the mid run, there have so far only been limited positive findings in the literature. According to Arnulf et al. (2012), a team will return to winning levels six to seven games after sacking the old manager, the basic positive effect of a managerial change in the mid run is also supported by other studies (Koning, 2003). On the other hand, Lago-Peñas (2011) shows a lack of a manager turnover effect in the mid run, similar results are given by Wirl & Sagmeister (2008). Other researchers even find evidence that the actual team performance may decrease within the first year of a new manager placement (Soebbing & Washington, 2011). Given the contradictory results concerning the existing studies and the fact that the initial enthusiastic honeymoon phase is over, the author suggests the following hypotheses for team performances in the mid run:

H2a: Teams that fire their manager do not improve their performance in the mid run, until the end of the season.

H2b: Teams which do not sack their manager will show a better performance in the mid run than teams that sacked their manager while being in a similar situation.

2.2.2 Professionalism vs Sacking

After elaborating on overall managerial changes and the success thereof which has already been done numerous times in research, the following subsection will present new ideas on how to assess managerial changes; by accounting for the club's professional state in the field of time, division and legal form of the first team. All of which has not been done so far.

While mid-20th century football in Europe and Germany can very well be regarded as an amateur sports with limited money, limited coaching staff and a limited player support by the clubs, times have changed making football a multi-billion Euro event today. Multiple changes in kick-off times, club ownership and a higher television coverage in general led to arguments in how far modern football can be associated with the concepts of McDonaldisation and Disneyisation⁶ (Duke, 2002). Even though Duke (2002) does not find

⁶McDonaldisation refers to a sociological concept which implies that the principles of fast food restaurant such as predictability, calculability and maximum efficiency are adopted by the society (Ritzer, 1983).

convincing arguments for every single point of McDonaldisation and Disneyisation, an infiltration by both concepts can be assumed overall which shows a considerable amount of professionalism in modern football. It is also worth noting that the according paper is 13 years old and over the last decade, professional football has changed even more towards the direction of both concepts discussed.

Those changes do offer both threats and chances for football clubs. While the threats can be allocated especially to the supporters of the clubs (Duke, 2002) which is therefore not of striking relevance for this thesis, the chances do very much matter in the context of managerial changes. On the other hand, the main chance pointed out clearly is the amount of revenues generated by the football leagues and the clubs as well.

In general, football revenues have steadily increased over the past 50 years which coincides with the time frame regarded in the following study. An increased budget within a sports club does not only allow to acquire more and better players but also to better educate staff members and to build better infrastructure. Finally, having better financial possibilities should also lead to a better management which should allow clubs with higher revenues to act more professional than lower revenue clubs. In theory, such an improved management, which varies from club to club and therefore can be anything from a club's president via a sports director to a supervisory board, should be able to perform better sacking decisions. Since the amount of money in football is steadily increasing, the decisions to sack the manager should have done so as well. While this has not been done by past studies, a significant increase of mid-season managerial changes in similarly performing teams over the past decades is shown (d'Addona, 2014).

Despite the overall increase of money within football, there have also been two major changes in the history of the Bundesliga: First of all, the introduction of shirt advertisement started in 1973 when Eintracht Braunschweig replaced their logo with the Jägermeister deer in order to advertise for the company. At the start of the season 1973/74, the Deutscher Fußball Bund (DFB) generally allowed shirt advertisement in German football (DFB, 2013). Secondly, the Bosman ruling in 1995 changed the entire transfer system of European football so that clubs are no longer allowed to ask for transfer fees for players

Meanwhile, Disneyisation describes a phenomenon that the principles of Disney theme parks such as merchandising, entertainment and controllability are adopted by an increasing amount of society sectors (Bryman, 1999).

who are no longer contracted to the club (Binder & Findlay, 2012). The latter of the two drastic changes within the football environment has already been shown to affect sports organisations and their behaviour crucially (Barros et al., 2009).

In line with the theoretical argument that money should improve professionalism and therefore a club's decision making, the following hypothesis will be made; sacking performance will be regarded as the outcome of the decision to sack the manager meaning the comparison of the performance under the new manager(s) (if there are interim managers) and the control group clubs which did not sack their manager in a similar situation.

H3: Over the course of the Bundesliga history, clubs show increasing sacking performances as the time goes on.

While the above hypothesis is very much suited to the first Bundesliga which claims the majority of seasons observed in this paper, there may also be an inherent value to take a closer look at clubs in different divisions. The basic assumption that a higher revenue and more financial resources allow clubs to act more professionally comes into place here as well when regarding clubs of the first, second and third Bundesliga.

Previous studies have taken a look at clubs from different divisions within the same country such as the first four divisions in English football (Audas et al., 2002). Results of managerial changes solely for the specific divisions, however, have not been given yet. This enables the following hypothesis which is based on the assumption that higher division clubs obtain more financial resources and therefore are likely to perform better in terms of sacking decisions:

H4a: Clubs in a higher domestic league will show a significantly better sacking performance than lower league clubs.

Due to the considered timescale in this thesis, it is possible to follow a club's promotions and relegations over the past decades. Therefore, both increases and decreases in professionalism can be accounted for by analysing whether promotions and relegations affect a club's sacking performance. Since changing the division increases or decreases the club's revenue, a different sacking performance can be assumed as a result which leads to the following hypothesis:

H4b: The sacking performance of a given club is significantly affected by either a promotion to a higher league or a relegation to a lower league.

Despite the division a club plays in, there is also one other huge possibility for a club to boost its income, and as often argued, its professionalism: The basic idea of changing the professional team's legal form from an "eingetragener Verein" ("e.V.")⁷ to a GmbH⁸ or an AG is to acquire money by selling shares to an investor. Obviously, there are also other possibilities to gain financial advantages for such legal forms (Nagy, 2013) while it has to be noted that the initial advantages of the "e.V." can still be retained due to the "50+1 rule" which states that the parent club always has to keep 50% plus one voting rights and therefore keeps the voting majority and the formal control. However, the supporters' resistance against such a move to outsource the professional team may affect the club management's decision to do so. The resistance may not be underestimated as many supporters do not want their club to modernise too much (Duke, 2002).

Many proponents of the adverse legal forms argue that outsourcing the professional team is advantageous which, in line with the argument of higher financial resources, should result in a more professional club overall. Therefore, the sacking performances of such clubs with a different legal form should be superior to clubs that have not changed the legal form. Also, as in *H4b*, a significant difference may be assumed for a club after changing its legal form:

H5a: Clubs having outsourced their professional football teams will show a significantly better sacking performance than clubs which are organised completely as "e.V.".

H5b: A given club will show a significantly better sacking performance after outsourcing its professional football team.

As given in the previous paragraphs, growing professionalism should in theory be able to allow clubs to make better sacking decisions. This has been argued for in three different aspects; the time, the division and the legal form.

⁷An "e.V." is a registered membership association (Kindler, 2014) which has been the dominant legal form in professional German football clubs a long time and still is up to this date in the amateur scene (Franck, 2010).

⁸A "Gesellschaft mit beschränkter Haftung" (GmbH) is a German legal form of a Limited Liability Company (LLC).

Taking these points as well as this thesis' title into consideration, a final major hypothesis is to be assumed. Since the previous hypotheses describe only a component each, the overall performance of a club has to be regarded as well. Due to the assumed positive influence of professionalism in the separate fractions, the final hypothesis will argue similarly in order to account for a consistent argument throughout the article. As a correlation between the individual aspects and the overall professionalism may be assumed, the author therefore hypothesises:

H6: A higher state of professionalism will overall lead to a significantly higher sacking performance.

3 Data and Measurement of Football Performances

3.1 Data Set

As shown in the literature review, there has been a huge amount of studies on managerial change and the success thereof. Obviously, these studies consist of a wide variety of data sets and therefore underlying sporting results and leagues. Even the sport itself is not limited to football as there are numerous other sports as well, especially American. However, when talking about managerial impact on the game and having a sophisticated data set in which every single team wants to win each and every game, both the choice of sports and the choice of league(s) are hugely important.

Due to the drawn connection between sports clubs and companies, it is vital to concentrate on sports and leagues which are commonly regarded as professional ones. Only in such an environment, a fully goal and therefore winning oriented behaviour of the teams can be assumed since there is a lot on the line in terms of money and prestige. However, there are certain league concepts that do not always favour winning. Therefore, the careful choice of sports is necessary.

While the four big American leagues (MLB, NBA, NFL, NHL) are assumed to be the most professional sporting leagues in the world according to turnover⁹ and coaching staff numbers (ESPN, 2015a) and therefore player preparation, they lack an inherent feature relevant for this thesis: Due to being closed league systems with one professional league per sports, there is no threat of relegation for even the worst teams. Further, the final champion of the league will not be determined by a regular season and therefore a league format but by a playoff system that will be attended by (depending on the league) approximately half of all teams¹⁰. Since all teams are guaranteed to be rewarded the same amount of money by the league (ESPN, 2015b), there is no incentive for a team to still compete heavily for victories when the position is already guaranteeing either a playoff spot or when there is no longer a chance to reach the playoffs.

⁹According to Forbes' "The World's 50 Most Valuable Sports Teams 2015", the four American leagues account for 43 of the 51 most valuable sports teams in the world by having 20 NFL franchises, 12 MLB franchises, ten NBA franchises, and one NHL franchise (Forbes, 2015).

¹⁰Ten out of 30 MLB teams (=33.3%), 16 out of 30 NBA teams (=53.3%), 12 out of 32 NFL teams (=37.5%), and 16 out of 30 NHL teams (=53.3%) will reach the playoffs each season.

To make matters worse, bad teams which are not getting to the playoffs will even be rewarded for losing as many games as possible by the draft system in which - basically starting with the worst teams - every team is eligible to draft new players coming from college or abroad. Since a worse performance grants a higher spot in the upcoming draft and therefore the right to pick better players for upcoming seasons, bad teams are unlikely to perform to their best level once the playoff hopes are gone. Another major flaw of the American sports league systems in terms of analysing performances is the complete lack of a round robin format¹¹, even in the regular season. Each of the four major leagues has its own system to set up the schedule but none of them are even close to a single or multiple round robin tournament format. All those arguments show difficulties and problems for evaluating a team's performance and the manager's performance, especially due to the lack of incentive to win for bad teams.

None of these problems are existent for European football leagues. As those leagues are not closed systems, relegation and promotion is possible which offers huge incentives to win for the bad teams within the competition in order to avoid relegation. Further, the open system allows young players from youth teams to enter the league at any given point in time as long as they fulfil all legal requirements such as minimum age. The absence of a draft system does not incentivise losing either. As a bonus, the competitive football leagues offer a multiple round robin format aiming at determining a champion. There are limitations to this point as for example the Jupiler Pro League (Belgium), the Scottish Premiership, and the Eredivisie (Netherlands) have certain championship rounds or playoff systems. However, the major European leagues in England, Spain, Italy, and Germany solely rely on a double round robin format. This allows for a much easier and comprehensible performance comparison among the teams since everybody plays everyone the same amount of times.

Among the biggest and arguably most professional football leagues in Europe, the author went by his home bias and decided to go with the German Bundesliga. The English Premier League offers interesting analytical possibilities as well since managers in England usually do both the coaching and the managing part of the job while there is a "head

¹¹In a round robin tournament, each team will face every single other team once, twice in a double round robin format.

coach" and a "manager" for this in Germany. The English approach allows the manager to execute much more influence as he is solely in charge of assembling the team's roster besides coaching the team as well. However, the latter one does not bring any benefit since mid-season managerial changes will be analysed while such changes between seasons will not be taken into consideration. In order to avoid linguistic conflicts with existing literature, the author will use the term "manager" in this thesis to elaborate on the staff that coaches the professional team and therefore is responsible for the day-to-day business and the performances on the field.

The German Bundesliga has a history of merely over 52 years dating back to its very first match on August 24, 1963. Since the beginning, the league followed a double round robin format which results in $n * (n - 1)$ total matches per season (n =number of teams in the league that season). Due to having two seasons of 16 teams (1963/64 and 1964/65) and one season of 20 teams (1991/92) while the other 49 seasons consisted of 18 teams, a total of

$$2 * 16 * (16 - 1) + 20 * (20 - 1) + 49 * 18 * (18 - 1) =$$

15,854 matches will be taken into consideration from the 1. Bundesliga. As the professionalism of football clubs serves as the main driver of this thesis, both the 2. Bundesliga and the 3. Bundesliga will be accounted for as well. This study will analyse the results of 20 years of the second German League with 18 teams each season which offers another 6,120 unique games. The introduction of the third German professional league has been done in 2008 with 2008/09 being the first year of the newly opened 3. Bundesliga which consists of 20 teams ever since and therefore adds another 2,660 matches. So, the complete sample for the upcoming analysis consists of 24,634 unique games over a time period of 52 years and up to three leagues.

Instead of dismissing cases of managerial sacking that are followed by an immediate interim manager who is in charge of the team for very few games (mostly up to two), this paper aims at analysing the overall "sacking performance" by a club. Therefore, each time a manager is sacked, one case of managerial sacking is made no matter if the sacked manager is replaced by a new manager immediately or an interim manager for one or two games. So, a second managerial change within four games after the initial one will be considered as a case of putting an interim manager in charge which also is part of the

sacking decision and behaviour and therefore the sacking performance by any club. It is a clear decision to sack the manager and have an interim manager for a short period of time and that is why such cases will be included as some out of many cases in this thesis.

Since the introduction of the 3-points-for-a-win rule in 1995 in Germany, wins grant three (3) points, while draws grant one (1) point and a loss gives no (0) points. Prior to 1995, wins granted only two (2) points instead of three and the change was made in order to incentivise teams to play a more attacking style since a win was now worth three draws instead of only two. Even though the increase of wins was marginal, the author will account for the change in the point-for-a-win rule by calculating with two points for a win from 1963 to 1995 and with three points for a win over the last 20 years.

3.2 Introducing Sports Result Prediction

While there is a huge variety on research and literature on managerial changes within football clubs, most of such literature lacks a measurement for each club's performance that goes beyond either the number of points gained or the number of goals scored and conceded. However, this implies an inherent problem to the performance measurement as these methods do not allow to check for the strengths of the opponent or the strength of the club itself at any given point in time.

This may lead to an ineffective way of assessing a club's performance since there is no benchmark set that offers an estimation of what a club's performance should have been like. Therefore, severe over- and underperformances among different seasons are not taken into consideration which may probably harm the significance of the underlying studies' results.

There are a few articles on managerial changes in a sports environment which do include some kind of a performance measurement such as done by Bruinshoofd & ter Weel (2003) and ter Weel (2011). In both papers, the authors try to determine each club's short term performance by comparing the average amount of points gained over the last four games with the average amount of points gained during the entire season. This enables the authors to assess the short term performance of a given team more adequately since particular results are set into a relation with an overall performance of the same club.

Even though this method allows to analyse winning and losing streaks within a season, there is a flaw to this particular system chosen: By taking the complete-season performance of a club as the given denominator for the performance measurement, the measurement itself looks ahead in time and compares certain game results with the results of the entire season. However, since there are still games to be played at any point within the season, the denominator and therefore the entire performance measurement can only be taken into consideration retrospectively after the season is completed. Further, this method enables some kind of a self-fulfilling prophecy as a potential performance increase after a managerial change simultaneously lowers the previous performance measure that initially led to the managerial change. Overall, comparing previous results to objective estimations is an idea worth pursuing while the practical application in the literature, however, suffers from the biases described above.

3.3 Literature Review - Sports Result Prediction

Due to the lacking variety of performance measurements in the managerial change literature, taking a look beyond the restrictions of such literature may offer further possibilities to measure performance and to predict sports results. Since none of such forecasting articles uses the performance measurement to assess managerial changes, this paper will explore new scientific territory in this regard.

When regarding sports result predictions, several different mechanisms come to mind that help predicting such results. The applied models range from rather simple name recognition (Herzog & Hertwig, 2011) via regression models (Goddard, 2005) to complex Bayesian network (BN)s (Constantinou et al., 2012).

A basic concept to predict the result of sports tournaments is given by "the collective wisdom of individual ignorance" (Herzog & Hertwig, 2011, p.58), a method using the combined opinions and knowledge of both experts and non experts. Such methods have already been used in multiple sports such as football (Edman et al., 2003; Andersson et al., 2009; Herzog & Hertwig, 2011) and tennis (Scheibehenne & Bröder, 2007; Herzog & Hertwig, 2011). A possible application of this method is the name recognition that asks randomly assigned people whether they know the participating players. The theory suggests that the better recognised team or player will win a match. This may work

due to the higher media coverage and therefore higher public awareness of better players (Scheibehenne & Bröder, 2007). A corresponding study within the same theoretic setting by Herzog & Hertwig (2011) shows that such name recognition techniques do offer an equal or even a slightly better outcome prediction than official rankings prior to the tournament such as the FIFA ranking for football World Cups or the ATP ranking for Wimbledon tournaments. Other studies support the idea that name recognition serves as well as an official ranking in tennis (Scheibehenne & Bröder, 2007).

Another application of the crowd wisdom method does not solely rely on mere name recognition but does ask people specifically what outcome they expect of a given match. Studies comparing the predictions of experts and random "normal" people surprisingly show a general lack of an expert-driven dominance. In multiple cases, both groups tend to predict equally well (Edman et al., 2003; Andersson et al., 2009) and in some cases they do even fall behind automatic predictions based on official rankings (Andersson et al., 2005).

A more analytical method to generate result prediction is based on regressions which take into consideration recent results. As an example, Goddard (2005) uses both bivariate Poisson regressions by accounting for goals scored and conceded and ordered probit regressions by using match results (win, draw, loss) to predict the outcome of future games. Overall, combining both styles of data yields the best results in terms of prediction accuracy.

The last major and most prominent method uses Bayesian networks to assess the problem of result prediction. Such networks enable the easy usage of multiple factors that come to mind when regarding future matches such as key player availability, confidence and days of rest. These factors can obviously all be accounted for in other methods as well, however the network technique allows for a simple construction and inclusion of such factors. Literature suggests that even though Bayesian networks are able to learn from the data given, such networks derived by experts are superior to any other form of Bayesian networks (Joseph et al., 2006). Constantinou et al. (2012) use expert BNs as well but their study incorporates an interesting grouping method too; clubs are ranked according to their points during the season and the outcome is then given by comparing matches between teams in such groups in previous seasons. This method provides

even more accuracy due to the consideration of past results. The success of the overall model that includes the components form, fatigue and psychology as well is given by a betting simulation that shows a positive outcome compared to the English betting market (Constantinou et al., 2012).

3.4 Modelling Football Result Prediction

3.4.1 Point-based Model

As described above, there is a variety of ways on how to assess result prediction. The number of possible applications for this thesis however is limited as the sheer amount of unique games taken into consideration do not allow to make educated guesses on individual player importance neither on an subjective nor on an objective basis. Therefore, the performance indicator which will be modelled in this paper, will solely consider objectively accessible results in the season regarded as well as in previous seasons.

The basic idea is to generate a model that enables the estimation of the outcome of a game for the regarded club which will be denoted as O_C and its opponent which will be denoted as O_{Opp} . Prior to start modelling, the concept of the win ratio (WR) which has a strong history in American sports and in literature (Audas et al., 2002) has to be explained; due to the change from the 2-points-for-a-win rule to three points per win in 1995, it is no longer possible to simply calculate by using the pure PPG since the maximum number of points obtainable has been increased by 50 per cent from two to three points per game. Therefore, it is much easier and more comprehensive to account for the points gained by using the WR which will be denoted as followed:

$$WR = \frac{\text{points gained}}{\text{max. points possible}}$$

In general, the outcome $O_{C/Opp}$ is supposed to consist of two major components. On the one hand, the performance by a given club in the regarded season S_0 is used and on the other hand, the performance in the previous seasons S_{PS} is used to determine factors for $O_{C/Opp}$:

- When regarding the performances in previous seasons S_{PS} , the three seasons prior to the current one will be taken into consideration. However, there has to be a distinct differentiation among the influence, each of those three seasons has. Obviously, the last season S_{-1} will have the highest significance with a lowered influence for the seasons $S_{-2/-3}$ prior to that. Therefore, each season S_{-i} will be accounted for by being p times as important as the season prior to that S_{-i-1} with p serving as a factor of season importance which yields the following equations for the single previous seasons:

$$S_{-1} = \frac{p^2}{p^0 + p^1 + p^2} * WR_{S_{-1}} \quad (1)$$

$$S_{-2} = \frac{p^1}{1 + p + p^2} * WR_{S_{-2}} \quad (2)$$

$$S_{-3} = \frac{p^0}{1 + p + p^2} * WR_{S_{-3}} \quad (3)$$

The entire component "previous seasons" S_{PS} will then be calculated as the sum of the individual seasons which results in the following when considering the equations (1) to (3):

$$S_{PS} = \sum_{i=1}^3 S_{-i} \quad (4)$$

There are, however, some adjustments which have to be made when a club has not been in the league for the entire three previous seasons. In such occurrences, the seasonal importance S_{-i} can only be regarded for those seasons the club has had an appearance and has to be modified accordingly. This way, it is ensured that each season is considered to be p^{12} times as important as the preceding season.

- The second major component for the result prediction is solely influenced by results in the regarded season and will therefore be denoted as S_0 . There are basically two ways to assess recent performance and both will be taken into consideration here; firstly, the results in the entire season up to the regarded game S_{0S} and secondly, the results over the last four matches S_{04} . The question remaining considering these two

¹²Even though p can in theory become any number greater than zero, a reasonable one has to be taken in order for $S_{-2/-3}$ to still be at least of any relevance.

aspects is how to weigh them for each single match day G during the season. One possibility may be to account for the increasing importance of the entire season and the decreasing importance of the last four games by using an arithmetic approach. However, logarithmic functions do offer a more dynamic approach to assess the performance and therefore, the regarded season S_0 will be calculated as follows:

$$S_{0S} = (a * \ln G) * WR_{S_0} \quad (5)$$

$$S_{04} = ((-a) * \ln G) * WR_{LAG} \quad (6)$$

$$S_0 = S_{0S} + S_{04} \quad (7)$$

The factor a is used to allow the usage of different shapes of logarithm functions as it changes the steepness of the curve and the intersection between S_{0S} and S_{04} . Due to seasons not having infinitely many match days, a has strict limitations of possibly allowed values as the total coefficient may not exceed 1. Therefore:

$$0 < a * \ln 34 \leq 1 \Leftrightarrow 0 < a \leq \frac{1}{\ln 34} \approx 0.2836 \quad (8)$$

The logarithm of 34 is taken due to the fact that most seasons in the sample have 34 match days. While there are a few seasons with 38 match days, the latter of those matches will be regarded as match 34 of the season in order to nullify the possibility for any of the factors to either fall below 0 or to exceed 1.

After having assessed both major components that are essential for predicting a game's outcome for a given club O_C , the question remains how to link both S_0 and S_{PS} in order to form a suitable prediction. The basic idea is to assign a certain importance to both components that always sums up to 1. Again, an arithmetical approach is dismissed in favour of a logarithmic approach that combines both the regarded and the previous seasons:

$$S_{PS} = -(b * \ln G) + 1 \quad (9)$$

$$S_0 = b * \ln G \quad (10)$$

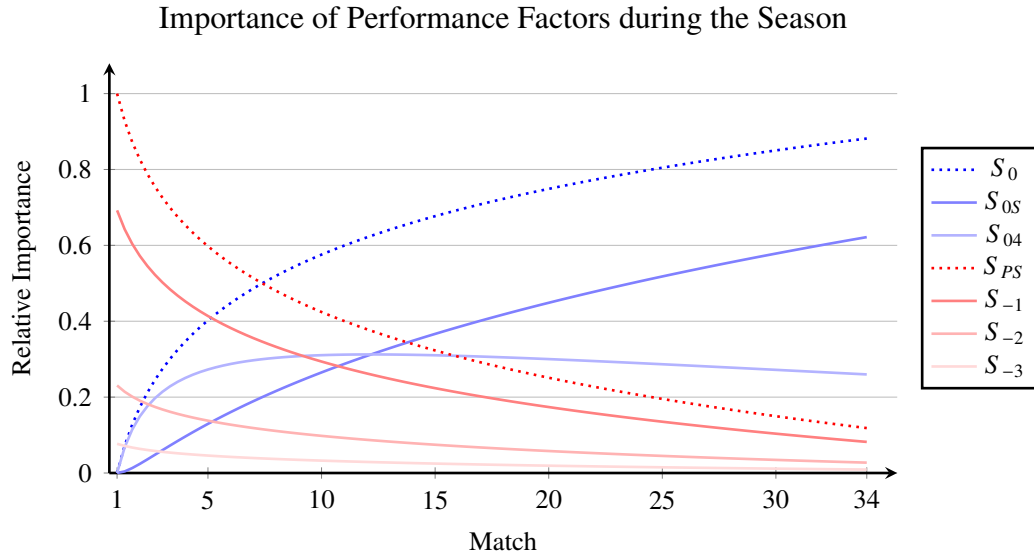


Figure 1: This graph shows the relative importance of the different performance factors prior to game G , with $a = 0.2$, $b = 0.25$ and $p = 3$.

Obviously, the factor b follows the same constraints as a , so that $0 < b \leq \frac{1}{\ln 34} \approx 0.2836$. Summing up both factors and therefore the equations (9) and (10) will yield the initial outcome prediction O_C for a given match of club C .

$$O_C = S_{PS} * (-(b * \ln G) + 1) + S_0 * (b * \ln G) \quad (11)$$

After finalising these basic assumptions of the model, it can be seen how the different factors a , b and p affect the relative importance of each component of the model as shown in figure 1 (p.32). In this example, the previous seasons' performance S_{PS} contributes a dominant share until the seventh match before giving the predominance to the current season's performance S_0 . Within S_{PS} , the previous season S_{-1} is always three times as important as the penultimate season S_{-2} and nine times as high as S_{-3} . If a club has not been in the same league the previous season, an estimate will replace its WR-coefficient. This estimate is calculated by the average win ratios acquired by promoted teams in their first season in the new league. However, this modification is not possible in cases where a club has missed multiple previous seasons in a row since only assumptions about the last season can be made¹³. If a club has been promoted or relegated to a different league within the sample, its $WR_{S_{-i}}$ will be modified in order to account for the different league

¹³For the data availability and the usage in the model, please consult table 9 on page X in Appendix A.

strengths and the new role the club will take in this league. So, a promotion will lower WR_{S-1} and a relegation will increase it.

Within S_0 , the short term performance S_{04} is more relevant than the season performance S_{05} until the twelfth match of the season after which the season performance is more relevant than the short term performance¹⁴.

Due to its importance shown in multiple studies (Wirl & Sagmeister, 2008; Balduck et al., 2010b), the venue a match is taking place at has to be accounted for as well. Therefore, both the club's coefficient O_C and the opponent's coefficient O_{Opp} have to be adjusted for both home and away games respectively. In order to find an appropriate factor that suits each club's prior performances and style, the initial prediction O_C will be multiplied by the percentage of total points the club has acquired at the according venue over the last five years. If there are no such games due to the club being promoted recently, the according factor will be set to 0.65 for home games and 0.35 for away games since these numbers equal the overall home field advantage of professional German football pretty well¹⁵.

In order to enable a proper analysis, both factors O_C and O_{Opp} have to be standardised with regard to the overall amount of win ratios that can be acquired in a match which is 1. The win ratio shares of the regarded club and its opponent will therefore be calculated by¹⁶:

$$O_C^V = \frac{O_C}{O_C + O_{Opp}} \quad (12)$$

$$O_{Opp}^V = \frac{O_{Opp}}{O_C + O_{Opp}} \quad (13)$$

This yields an estimated win ratio for each club in each game which is based on the venue as well as previous performances both in the regarded season and in up to three previous seasons. However, this model is solely focused on theory crafting and even though its components make use of multiple performance measurements used in the past, a further

¹⁴In order see how differing numbers for the factors a , b and p affect the relative importance of each component of the model, please see figure 11 "Impact of Factors on Prediction Model" in Appendix A.

¹⁵These numbers are extracted from the underlying data of this study which consists of over 24,000 games in the first, second and third German Bundesliga since 1963.

¹⁶The following equations will have an updated coefficient O^V with "V" denoting that the venue has been accounted for.

slight focus on real results may be worthwhile. This can be accomplished by searching for the outcomes of previous matches with similar initial conditions such as similar match days or a similar prediction. The possibilities are vast and can also be accounted for by searching for similarities in win ratios acquired up to this point in the season or similar managerial situations.

However, for the purpose of this paper, the search is done for matches in the same division which offer predictions that are within a WR range of 0.05 around the predicted WR for both the regarded club and the opponent. This again yields a win ratio O_M^P based on similar matches that have already been played previously. Obviously, only matches of previous seasons are considered in order to avoid any kind of self-fulfilling prophecy.

Finally, the prediction and the observed WR of previous matches are merged. As indicated previously, all the calculations are very simple under the 2-points-for-a-win rule since each possible outcome of a game leads to 100 per cent of possible points being distributed. However, the amount of draws has to be taken into consideration when regarding matches after 1995 and the introduction of the 3-points-for-a-win rule. Due to draws only contributing 2/3 of the maximum points and in correspondence with the last 20 years of German professional football, the expected number of points distributed for such a match is 2.7 which equals a total WR of 0.9. The approach for mixing both win ratios is arithmetical but with a slight twist that allows to account for the number of years the according division has been taken into consideration so far.

Assuming that five seasons offer enough matches to generate a proper sample size¹⁷, both the previous matches O_M^P and the prediction O_C^V will then be held of equal importance while fewer seasons will lead to a higher importance for the prediction. Overall, the final prediction WR^F will be calculated by:

$$WR^F = \begin{cases} \frac{\min(5; "yrs")}{10} * O_M^P + (1 - \frac{\min(5; "yrs")}{10}) * O_C^V & , \text{ if 2-point rule} \\ 0.9 * (\frac{\min(5; "yrs")}{10} * O_M^P + (1 - \frac{\min(5; "yrs")}{10}) * O_C^V) & , \text{ if 3-point rule} \end{cases} \quad (14)$$

¹⁷5 seasons will approximately lead to 1500 observed matches.

3.4.2 Goal Difference based Model

As already noted above, the goal difference can serve as an indicator of performance as well. Therefore, the model described above will be adjusted for the use with goal differences. During the first steps up until the initial outcome prediction O_C in (11) which from now on will be denoted O_{GD} for the purpose of this second model, the only difference is the usage of goal difference per game instead of win ratios for each season and the previous games.

However, when it comes to adjusting for the venue, O_{GD} will not be multiplied but added to the overall goal difference by that club over the last five years at that given venue, either home or away. In case a club has not recently played in that division, a goal difference of -0.35 goals per game is given to such a club for the previous season since this equals the mean goal difference of clubs which have recently been promoted and play there first season in a new division.

In order to compare both the club's outcome O_{GD}^V and the opponent's outcome O_{OppGD}^V , the difference will be calculated in order to get a prediction O_{GD} for the outcome of the game:

$$O_{GD} = O_{GD}^V - O_{OppGD}^V \quad (15)$$

As a final step, the results of matches with similar predictions will be taken into consideration just like in the point-based model. In order to accomplish that, the average goal difference is calculated for all games in the same division prior to the regarded season, in which the model-based prediction O_{GD} is equal to or deviates at a maximum of 0.05 goals from the prediction of the regarded game. After obtaining the expected goal difference E_{GD} based on real results for similar matches, the final overall prediction based on the goal difference O_{GD}^F will be calculated similarly to before:

$$GD^F = \frac{\min(5; "yrs")}{10} * E_{GD} + (1 - \frac{\min(5; "yrs")}{10}) * O_{GD} \quad (16)$$

3.5 Performance Measurement and Control Group

The models presented previously enable the prediction of the outcome of football matches based on previous results by both teams and the venue. Even though it does by far not outweigh any of the models from the papers on sports result predictions which have been reviewed in this thesis, it does serve the main goal of examining what a club is supposed to perform like in an upcoming game. The idea of mixing the pure prediction and past results of similarly performing teams denies the threat of pure theory crafting and enables a practical influence towards the final prediction WR^F/GD^F . When it comes to practically applying the model in the first place, the numbers taken for the three factors will be $a = 0.2$, $b = 0.25$ and $p = 3$ (figure 1, p.32) as the data supports these numbers most within a reasonable setting by showing the highest correlation $\rho(O_M^P, O_C^V) = 0,825^{18}$ among the initial prediction and the according results based on these predictions.

When analysing the managerial changes and the effects thereof, the pure prediction does not completely do the job. A performance measurement needs to be made that enables judgement whether a club has recently over- or underperformed. This can easily be done by dividing the actual performance by the predicted performance. However, doing this for only one game at a time may yield a lot of volatility since a random element is always part of the game and therefore, teams on a hot streak may not win a game while badly performing teams always have a potential chance to win a game. Taking the last four games into consideration excludes such an element of extreme sensitivity since occasional good or bad games do not significantly alter the overall performance measure (Bruinshoofd & ter Weel, 2003). So, the performance for point t in time will be measured as:

$$P_t^{WR} = \frac{WR_{LAG}}{\sum_{g=1}^4 WR_{t-g}^F} \quad (17)$$

For the goal difference model, the performance measure has to be calculated by subtracting instead of dividing and therefore will look like:

$$P_t^{GD} = \sum_{g=1}^4 GD_{t-g} - \sum_{g=1}^4 GD_{t-g}^F \quad (18)$$

¹⁸The correlation is significant at the 0.01 level.

Obviously, this calculation cannot be done prior to the fourth match day in a season. While leaving out any performance measures for the first three matches within a season may be a possibility, calculating with two and three games instead of four on the according match days at the start of the season seems to be a more suitable solution as it allows to give a rough overview of performances during the early season. For the very first game of the season, however, no performance measurement will be made which corresponds with the argument above that a single game can be too volatile.

Taking all these assumptions into consideration, not each and every single managerial change can be accounted for in the analysis. According to the performance measurement model, a manager needs to be in charge for at least four games before his work can be suitably assessed. Therefore, only those managerial changes which do not occur on either the first four or the last four match days of the season will be considered. Further, the deployment of an interim coach does not affect the suitability as this paper aims to take a look at the sacking decision and the outcome thereof. Signing up an interim manager is a clear decision made by the club's management and does therefore not exclude any case from being taken into consideration.

Obviously, the match constrictions are done for the control group as well, which is supposed to adjust the problem of the regression towards the mean by having a reasonable comparison group. Just as in the managerial change group, selected cases can only show up in the control group when they do not occur during either the first or the last four matches of a given season. Since manager changes usually occur after bad performances, the cases qualifying for the control group should show a significant performance drop as well. Further, those teams should not have extremely overperformed recently because it can be assumed that a very short period of bad results may be accepted by a normally good team. At last, the performance should drop to a value way below one since there would not be a lack of performance otherwise.

These basic rule settings lead to a suggested control group with a performance drop of at least 25 percentage points over the last four games ($P_{t-1} - P_{t-4} \geq -0.25$) a performance value of maximum 110% four games prior to the "sacking" ($P_{t-4} \leq 1.10$) and a maximum of 70% at the point of sacking ($P_{t-1} \leq 0.70$). Even though these numbers seem to be chosen arbitrarily, the selection can be explained. First of all, it partially follows Bruinshoofd

& ter Weel (2003) who had success by constructing a similarly designed control group. Secondly, performing the analyses has shown that the design of the control group does not affect the outcome of the analysis significantly, as long as there is a distinct decline in performances from $t - 4$ to $t - 1$ ¹⁹. Therefore, this control group design will be taken for the upcoming analysis of managerial changes.

¹⁹The construction of six different control groups with a performance decline have shown similar results for the basic overall managerial change analysis, even for those that did not have any restrictions besides the performance drop.

4 Analysis and Results

4.1 Descriptive Analysis of the German Bundesliga

The above described mechanisms to enable the selection of the managerial change group and the control group will be set for the rest of the paper, so that each and every analysis will be done facing the same control group. This leads to an overall amount of 589 managerial changes of which some certainly are voluntarily. However, due to timing restrictions as well as inconsistencies in press releases by clubs that often do not enable an outside observer to judge whether a managerial change is forced or voluntarily, all managerial changes are counted equally within the set of this paper. The control group consists of 3,942 cases during which a given team has shown a significant performance decline.

Of a total of 85 clubs observed during 53 years of the first Bundesliga, 20 years of the second Bundesliga and 7 years of the third Bundesliga, seven teams have never sacked their manager during the season. While most of these teams only spent one to three seasons in competitive football, 1. FC Heidenheim has to be mentioned as a positive example of not sacking a manager once in six years which equals 224 games.

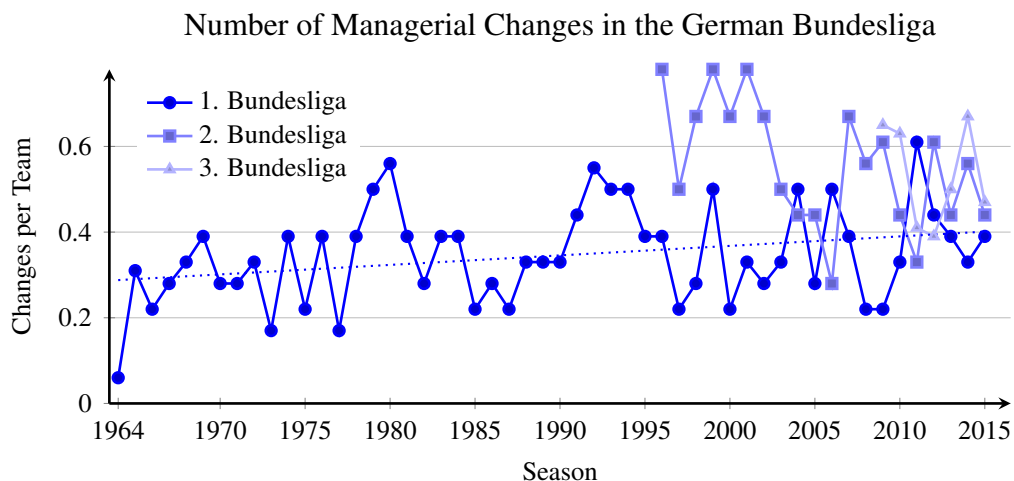


Figure 2: Number of managerial changes per team during the season in the first, second and third Bundesliga. Interim managers (<5 Games) and sackings by U23 teams are excluded. Therefore, the denominator is adjusted each season for the third Bundesliga in order to account for differing numbers of U23 teams. The same is done for the seasons 1963/64, 1964/65 (16 teams each) and 1991/92 (20 teams) of the first Bundesliga.

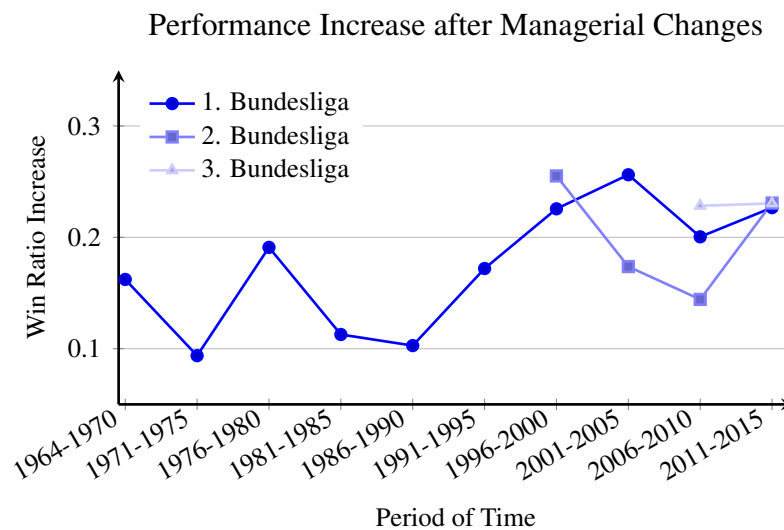


Figure 3: The performance increase is calculated by the difference between the WR over the last four games of the old manager and the first four games of the new manager. A positive outcome indicates an increase in points after the managerial change.

This number impresses even more when taking a look at figure 2 (p.39) which shows the development of managerial changes in each of the first three divisions in German football. Aside from the increase in managerial changes over time in the first Bundesliga, managerial changes occur even more often in lower divisions. The second Bundesliga gives the highest number of managerial changes per team in 12 of 20 seasons observed (= 60%) while the third division reaches the top number in 5 of 7 seasons observed (= 71.4%).

Due to the fact that multiple teams have played in the top divisions of German football for decades, there are 24 clubs with at least 10 mid-season manager changes and 10 clubs with at least 17 of such changes. While the "top" is headed by Nürnberg and Frankfurt with 22 managerial changes each followed closely by Schalke and Hannover with 21 and 20 respectively, an extreme outlier can be found at the bottom; in 22 seasons or 748 matches, Freiburg executed only a single on managerial change, putting the club on top in terms of efficiency. For more details on managerial changes per club, please consult table 10 in Appendix B.

When leaving behind the overall statistics on managerial changes, the three different ways to assess professionalism defined in this paper come to mind. The win ratio increase after a managerial change develops towards a higher level throughout the years starting at 0.1 from 1963 throughout the 80ies and being consistently above 0.2 ever since (figure 3,

p.40). Further, the win ratios do not differ extremely for any of the three divisions even though the second division performs slightly worse initially after a managerial change (table 1, p.41). The fact that the 2. Bundesliga has so many more changes than the first may be due to the fear for relegation to the third league which leads to much bigger losses in revenues than a relegation from the first to the second league. The legal form does show bigger differences as both legal forms that may sell shares to the public show a performance increase that is considerably lower than those of eV and GmbH (table 2, p.41). However, it has to be mentioned that the sample size especially for the AG is too small to make educated guesses.

Table 1: Win Ratio Increase depending on Division

Time	1. Bundesliga	2. Bundesliga	3. Bundesliga
post 1996	0.2099	0.2006	–
Number of MC	129	201	–
post 2009	0.2330	0.2124	0.2422
Number of MC	49	62	64

The win ratios of t_{-4} and t_{+4} are compared.

Table 2: Win Ratio Increase depending on Legal Form

Time	e.V.	AG	GmbH	KGaA
post 1996	0.2207	0.0625	0.2633	0.1408
Number of MC	284	8	44	58

The win ratios of t_{-4} and t_{+4} are compared.

4.2 Testing the Hypotheses

When taking a closer look at the effect of managerial changes during the season, both models previously developed will be used in order to assess the outcome of such changes. While the point-based model will be from now on be denoted as Model 1 (M1), the goal difference based model will be known as Model 2 (M2).

Before going into in-depth detail on how professionalism affects managerial changes, an assessment of managerial changes in general will be made. In order to accomplish that, the mean performances around time t will be considered closely. There is no game happening at time t as this denotes the point of managerial change which occurs between

the two matches t_{-1} and t_{+1} . In general, matches prior or after a managerial change will be denoted as $t_{-g/+g}$ with g being the number of matches prior to or after the change. How this works out in practice can be seen in figure 4 (p.47) which shows the performance of manager changing clubs up to eight games prior to and after the change.

In the following, overall performances around managerial changes will be examined first before the analysis shifts towards the main research issue of this paper by regarding the effect of professionalism on managerial changes.

4.2.1 Analysing Overall Sacking Performances

The first step to examine the effects of managerial changes on a club's performance is to get a general overview on the topic. As already shown above, the performance in general declines sharply prior to a managerial change. However, the performance does increase even more once a new manager has taken over the spot. While managerial changes on average occur on a performance of 55%, there has been a decline of roughly over 20 percentage points over the last four games prior to that. Once a new manager or an interim manager is in place, the performance does increase quickly up until the club reaches its expected performance $P_{t+4}^{WR} = 1$ four games after the change. So, once the last games of the previous manager are not included any longer in the performance measurement, a normal performance by the club can be assumed. However, this does not show that managerial changes do work out in an extremely positive way in terms of overperformances since this result solely shows that teams perform as expected after managerial changes while they underperformed prior to that.

*Hypothesis 1a*²⁰ however can be supported by the data; all of which can be seen in table 3 (p.44). Besides the absolute performance increase after the severe drop which led to the managerial change, the performances of four and five games prior to and after the change can be compared. According to panel (III) of table 3, the performance four and five games after a change is 25 (20) percentage points higher than it was four respectively five games prior to the change. These results which all are statistically significant show

²⁰*H1a*: Teams show a short term performance improvement initially after sacking the manager, with short term being five matches at most.

a clear upside in performances directly after managerial changes within the season which strongly supports *H1a*, even though there are by no means any overperformances.

Compared to the managerial changes, the teams in the control group start out a little higher and then do suffer a much deeper performance drop down to 38.3% of the expected performance at t_{-1} . Accordingly, the performance increase thereafter is also larger by 12 to 15 percentage points depending on the exact point in time since the control group ends up just below a performance of 1. While this can be seen as an indicator to support *H1b*²¹, in-depth numbers on the before-after performance do suggest otherwise. While panel (III) (table 3) shows a significant higher performance increase for control group teams from up to three games before the change compared to after (between 10 and 20 percentage points), the results do differ for the fourth and fifth game. Those two numbers show a balanced performance for game four and even a favourable performance increase for game five for the managerial change group.

This is also supported by the goal difference based model M2 (please see table 11 on page XIII) which does not only also indicate the more significant drop but also a higher instant improvement for the control group. However, at t_{+4} and t_{+5} , the control group lacks performance compared to the teams which changed their manager. Therefore, *H1b* cannot be supported by the data since there is a higher initial performance improvement for the control group which can however not be sustained for more than two or three games. So, the control group's short term sacking performance does not significantly outweigh the managerial change group.

While an improvement of performances in the short term after a managerial change has been shown, the author suggests that there will not be such an improvement in the mid-term (see *H2a*²²). In order to test for that, the win ratio of the entire season up until the managerial change will be compared to the win ratio for the remainder of the season, bearing in mind that cases are not involved when they happened on either the first or the last nine games of the season in order to account for meaningful results. This is done by

²¹*H1b*: Teams which do not sack their manager will initially improve more than teams that sacked their manager while being in a similar situation.

²²*H2a*: Teams that change their manager do not improve their performance in the mid run, until the end of the season.

Table 3: Managerial Changes - Short term Team Performances - Model 1

Time	Man Change	Control Group	CG-MC
<i>(I) Performance Levels at $t_{+/-g}$</i>			
t_{-5}	0.798*** (0.018)	0.891*** (0.006)	0.096*** (0.017)
t_{-4}	0.766*** (0.017)	0.725*** (0.005)	-0.037** (0.015)
t_{-3}	0.750*** (0.016)	0.619*** (0.005)	-0.129*** (0.015)
t_{-2}	0.692*** (0.018)	0.504*** (0.005)	-0.188*** (0.014)
t_{-1}	0.550*** (0.015)	0.383*** (0.003)	-0.168*** (0.010)
t_{+1}	0.624*** (0.016)	0.559*** (0.005)	-0.067*** (0.015)
t_{+2}	0.708*** (0.018)	0.710*** (0.007)	0.002 (0.019)
t_{+3}	0.838*** (0.019)	0.858*** (0.007)	0.021 (0.020)
t_{+4}	1.015*** (0.021)	0.986*** (0.008)	0.029 (0.022)
t_{+5}	1.003*** (0.020)	0.970*** (0.008)	0.034 (0.022)
<i>(II) Performance Decrease and Increase compared to t_{-1}</i>			
$t_{-1} - t_{-6}$	-0.236*** (0.027)	-0.530*** (0.008)	-0.297*** (0.023)
$t_{-1} - t_{-5}$	-0.245*** (0.024)	-0.511*** (0.007)	-0.271*** (0.021)
$t_{-1} - t_{-4}$	-0.215*** (0.020)	-0.342*** (0.020)	-0.131*** (0.018)
$t_{-1} - t_{-3}$	-0.200*** (0.016)	-0.236*** (0.006)	-0.039*** (0.016)
$t_{-1} - t_{-2}$	-0.142*** (0.012)	-0.121*** (0.004)	0.020*** (0.013)
$t_{+1} - t_{-1}$	0.074*** (0.014)	0.176*** (0.005)	0.101*** (0.013)
$t_{+2} - t_{-1}$	0.157*** (0.019)	0.327*** (0.006)	0.170*** (0.018)
$t_{+3} - t_{-1}$	0.287*** (0.023)	0.474*** (0.008)	0.189*** (0.022)
$t_{+4} - t_{-1}$	0.464*** (0.026)	0.603*** (0.008)	0.139*** (0.024)
$t_{+5} - t_{-1}$	0.455*** (0.024)	0.587*** (0.009)	0.133*** (0.024)
$t_{+6} - t_{-1}$	0.447*** (0.026)	0.572*** (0.009)	0.126*** (0.024)
<i>(III) Before-After Performance Comparison g Games prior to/after t</i>			
$t_1 - t_{-1}$	0.074*** (0.014)	0.176*** (0.005)	0.101*** (0.013)
$t_2 - t_{-2}$	0.015 (0.023)	0.206*** (0.009)	0.190*** (0.023)
$t_3 - t_{-3}$	0.088*** (0.026)	0.239*** (0.009)	0.150*** (0.025)
$t_4 - t_{-4}$	0.249*** (0.028)	0.261*** (0.009)	0.008 (0.025)
$t_5 - t_{-5}$	0.204*** (0.027)	0.078*** (0.010)	-0.130*** (0.029)

*is significant at the 10% level, **is significant at the 5% level, and ***is significant at the 1% level.

Standard Errors can be found in parentheses.

Performance levels are measured according to the predicted outcome given by the point-based model M1.

Table 4: Mid-term Performance Change around Managerial Changes

Win Ratio ^a	Man Change	All	All-MC
WR_{bMC}	0.350*** (0.005)	0.358*** (0.002)	0.008 (0.005)
WR_{aMC}	0.437*** (0.006)	0.428*** (0.002)	-0.009 (0.007)
WR_{Inc}	0.087*** (0.007)	0.071*** (0.003)	-0.017** (0.007)

*is significant at the 10% level, **is significant at the 5% level, and ***is significant at the 1% level.

Standard Errors can be found in parentheses.

^a The indices denote the win ratios for a club in the entire given season up until the point of managerial change (WR_{bMC}), from there on until the season finale (WR_{aMC}) and the difference thereof (WR_{Inc}).

Table 5: Mid-term Performance Changes Depending on Team Strength

Win Ratio ^a	Man Change	All Teams	All-MC
(I) <i>Cat. 1:</i> $0 \leq WR_{bMC} < 0.364$			
WR_{bMC}	0.281*** (0.004)	0.294*** (0.001)	0.014*** (0.004)
WR_{aMC}	0.402*** (0.009)	0.402*** (0.002)	-0.000 (0.010)
WR_{Inc}	0.121*** (0.010)	0.108*** (0.002)	-0.014 (0.010)
(II) <i>Cat. 2:</i> $0.364 \leq WR_{bMC} < 0.467$			
WR_{bMC}	0.412*** (0.003)	0.419*** (0.000)	0.008** (0.003)
WR_{aMC}	0.464*** (0.012)	0.443*** (0.001)	-0.023* (0.012)
WR_{Inc}	0.052*** (0.011)	0.024*** (0.002)	-0.031** (0.012)
(III) <i>Cat. 3:</i> $0.467 \leq WR_{bMC} < 0.575$			
WR_{bMC}	0.505*** (0.004)	0.519*** (0.000)	0.013* (0.005)
WR_{aMC}	0.516*** (0.021)	0.485*** (0.002)	-0.032 (0.021)
WR_{Inc}	0.011 (0.021)	-0.034*** (0.002)	-0.045** (0.021)
(IV) <i>Cat. 4:</i> $0.575 \leq WR_{bMC} \leq 1$			
WR_{bMC}	0.623*** (0.016)	0.663*** (0.001)	0.040** (0.016)
WR_{aMC}	0.553*** (0.028)	0.569*** (0.002)	0.016 (0.028)
WR_{Inc}	-0.070** (0.028)	-0.094*** (0.002)	-0.025 (0.028)

*is significant at the 10% level, **is significant at the 5% level, and ***is significant at the 1% level.

Standard Errors can be found in parentheses.

^a The indices denote the win ratios for a club in the entire given season up until the point of managerial change (WR_{bMC}), from there on until the season finale (WR_{aMC}) and the difference thereof (WR_{Inc}).

using the win ratios rather than the point-based or the goal difference based model due to the construction of the models which makes it hard to observe a larger streak of matches.

The results of the analysis can be seen in table 4 (p.44). Clearly, they support the trend that has already been set in the short term, meaning that the managerial change group improves more as time goes by after the change. As can be seen, both MC group and the control group are able to significantly increase their performance after a managerial change or a performance drop by 8.7 respectively 7.1 percentage points. This contradicts the intent of *H2a* as there is a distinct increase in performance.

As already mentioned, the control group - here consisting of all teams that do not change their manager - improves significantly as well which is essential in order to offer support for *H2b*²³. However, the improvement of those teams that change their coach is superior to the control group. Even though the difference is of a rather small scale with 1.7 percentage points, it still is significant.

²³ *H2b*: Teams which do not sack their manager will show a better performance in the mid run than teams that sacked their manager while being in a similar situation.

In order to double-check for that, the same win ratio calculations are done after classifying the teams according to their win ratio at a given time t . All four classes of teams show a superior performance increase for the managerial change group over the other teams even though there is no statistical significance in a few numbers. Overall, bad and lower middle-class teams seem to improve drastically as can be seen in table 5 (p.45) while upper middle-class and top teams stagnate or even decrease in their performance. Despite that loss of performance for top teams, the managerial change group still is outperforming the other teams in all four classes when it comes to the before-after comparison. Therefore, $H2b$ has to be rejected.

Summing up both hypotheses $H1$ and $H2$ yields a surprising outcome that contradicts both the theoretic background of this paper as well as the results of multiple other papers on the effects of managerial changes. While it was suggested that managerial changes only have a positive effect in the short run and that the control group will outperform the manager changing teams, data on the German Bundesliga advises differently. Managerial changes do indeed help in the mid-term and go even with or outperform the control group. So, managerial changes tend to have a positive effect overall.

4.2.2 The Influence of Professionalism on Sacking Performances

As elaborated in the theoretical part of this paper, the main focus will go towards the question in how far a club's level of professionalism affects the result of managerial changes and whether higher professionalism really tends to yield better outcomes of such changes.

The portion of professionalism that has been analysed the most so far in modern literature deals with the difference among divisions. For this paper's sample, games of each of the first three divisions of German football are taken into consideration, offering a variety of different aspects to encounter. In order to account for comparability, the analysis will focus on managerial changes during the time span from 2008/09 to 2014/15 for each of the three divisions since the third Bundesliga has been introduced only seven seasons ago.

In general, third division teams will start out stronger way before a managerial change and then suffer a steeper decline, giving them the lowest average performance directly at the time of the managerial change t_{-1} . The first and second Bundesliga follow a more or

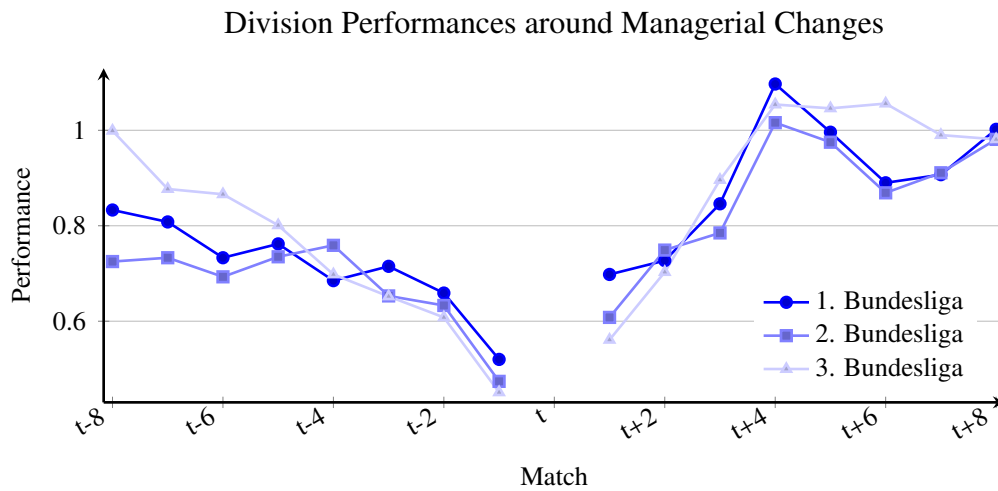


Figure 4: At time t (between two matches), the manager is sacked while $t_{+/-x}$ denotes the matches prior to or after the change. The graph is based on numbers derived by Model 1.

less similar performance development both prior to and after the managerial change as can be seen in figure 4 (p.47). Teams in both divisions reach a winning level of slightly above 1 four games after the managerial change but both do suffer slight decreases after that again. Teams from the third division tend to stay at a stable level of around 100% of the expected performance which sharply contradicts $H4a^{24}$. Further, a comparison between the managerial change group and the control group does not reveal any statistically significant differences for the three divisions (table 13, p.XV).

Even when taking into consideration that the analyses mentioned above little to no statistical significance in order to support the data above, $H4a$ cannot be supported in any way and therefore has to be rejected.

While the lack of sacking performance improvement for higher division clubs is an interesting finding, the question posed in $H4b^{25}$ remains which leads to the analysis of sacking performances of teams that have been promoted and those teams who have been promoted shortly after those specific incidents. As figure 5 (p.48) shows, clubs which have recently been promoted seem to be more patient with their coaches, probably as a result of being an underdog in the higher tier anyway which may accustom the club's management to the idea of losing. The performance increase from t_{-6} to $t_{-4/5}$ on the other

²⁴ $H4a$: Clubs in a higher domestic league will show a significantly better sacking performance than lower league clubs.

²⁵ $H4b$: The sacking performance of a given club is significantly affected by either a promotion to a higher league or a relegation to a lower league.

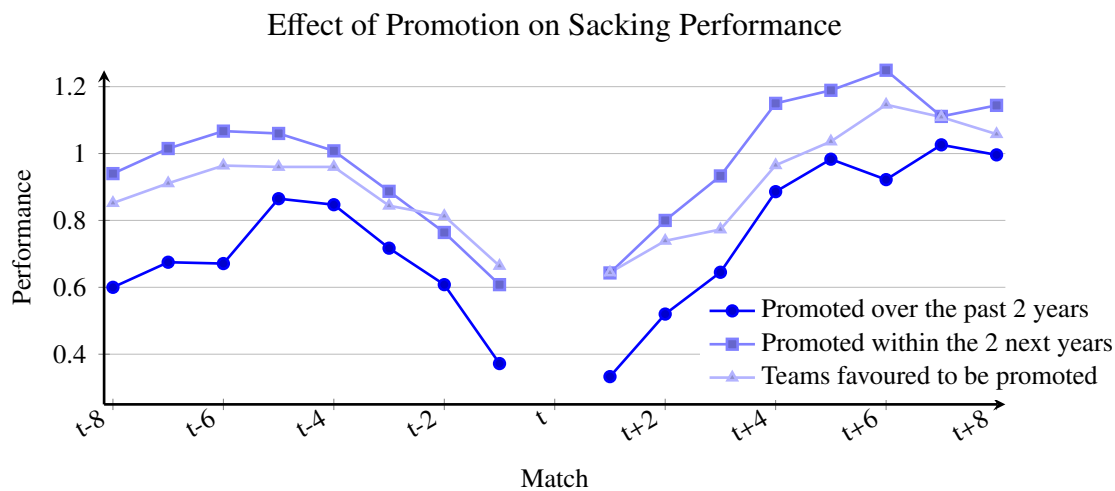


Figure 5: At time t (between two matches), the manager is sacked while $t_{+/-x}$ denotes the matches prior to or after the change. The graph is based on numbers derived by Model 1.

hand suggests that a few good results may have led to higher expectations for the team which thereafter have not been reproducible.

Those teams that will be promoted within two years however tend to follow a very different trend; these teams in most cases enter the season as a favourite and perform beyond the expectations for most of the time which can easily be recognised in figure 5. However, a short span of bad games already seems to be enough for the club's management to pull the trigger and change the manager. The decision seems to pay off as future performances are consistently way beyond the expectations. In order to make a sophisticated judgement, not only the teams that have been promoted may be taken into consideration as that serves as a kind of self-fulfilling prophecy. Therefore, it is vital to check teams that enter the season as a favourite; even though it turns out that no significant differences in terms of sacking performance can be recognised compared to those teams which are promoted later on.

All these assessments have to be done for relegation and the effects thereof as well. The very slow increase in performance after a managerial change for teams that are soon to be relegated (figure 6 on page 49) indicates that these teams indeed are bad and that a new manager has not been able to change their destiny. When compared to other teams who were favoured to be relegated prior to the season, the data shows a rather "normal" performance improvement after the managerial change for such teams. So, when comparing this group of teams to those managerial changes that took place within the first two sea-

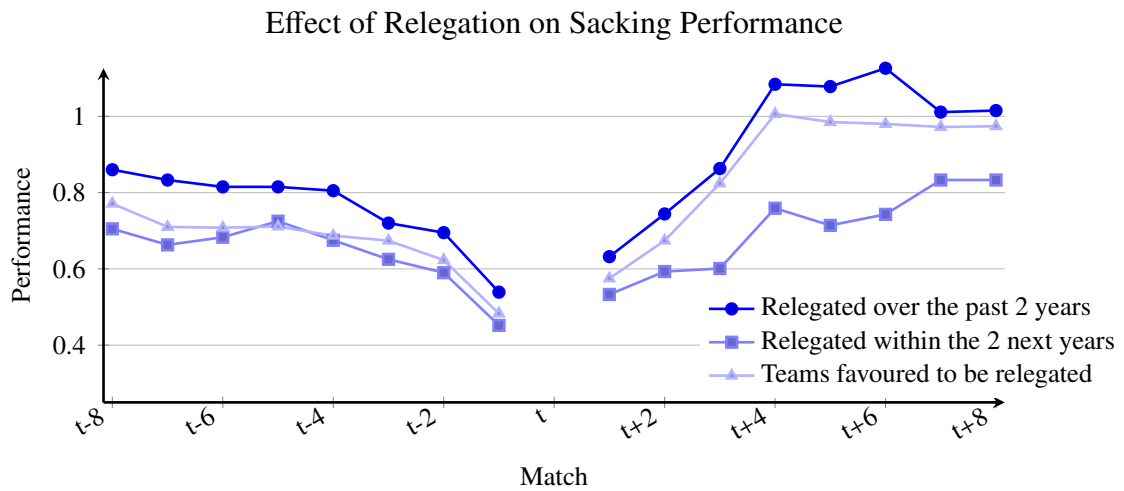


Figure 6: At time t (between two matches), the manager is sacked while $t_{+/-x}$ denotes the matches prior to or after the change. The graph is based on numbers derived by Model 1.

sons after a relegation, similar patterns can be recognised and no significant differences are observed.

Having elaborated on changes in sacking performances after promotions and relegations, *H4b* cannot be supported as there is no evidence for such significant results. Promotions tend to slightly improve the sacking performance while relegations do not seem to matter at all. This might be due to a higher level of professionalism, the club may have acquired prior to the relegation while playing in a higher division. It is worth noting that recently promoted clubs do execute their managerial changes on a significantly lower performance level than other clubs.

In order to assess the second type of professionalism, the influence of time on sacking performance as given by *H3*²⁶, it is important to define milestones within the scope of professional German football that may have possibly affected the sacking performance. As given in the theoretic part, both shirt advertisement and the Bosman ruling come to mind initially which divides the entire 53 years of German Bundesliga into three parts of 12 years (1963/64-1974/75) and twenty years twice (1975/76-1994/95 and 1995/96-2014/15). Obviously, only matches and therefore managerial changes of the first Bundesliga are taken into consideration due to the non-existence of data for the lower divisions prior to the last seven respectively 20 years.

²⁶*H3*: Over the course of the Bundesliga history, clubs show increasing sacking performances as the time goes on.

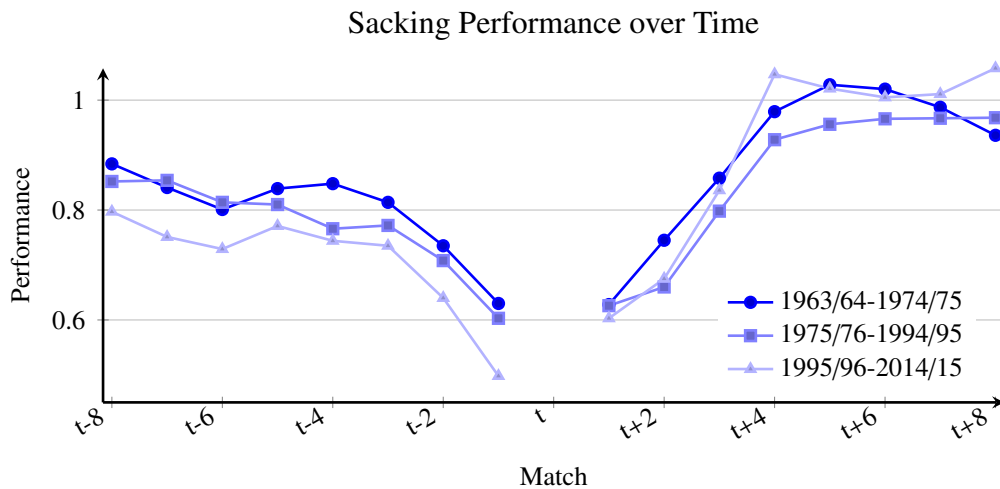


Figure 7: At time t (between two matches), the manager is sacked while $t_{+/-x}$ denotes the matches prior to or after the change. The graph is based on numbers derived by Model 1.

The data shown in figure 7 (p.50) supports the idea that there are significant differences among these groups that go beyond the simple win ratio increase given in figure 3 (p.40). Prior to the managerial change, clubs in the past 20 years do suffer a period of underperformance that is more severe than clubs did prior to that. Combined with the statistically significant much lower performance at t_{-1} , it is interesting to note that clubs tend to wait longer in modern times before a managerial change is executed.

This contradicts the public opinion that the pressure from the club's stakeholders lead to a higher number of managerial changes. While the absolute number of managerial changes has indeed increased over the course of time, the hazard rate which is defined as the number of control group cases divided by the number of managerial changes has not increased significantly over time (see table 6, p.51). So, while a higher number of managers has been sacked in recent years, the overall trend points at an increasing rate of failing to reach the expectations for the teams in recent years. The high inconsistency may be a results of a more and more imbalanced first Bundesliga in which the top teams rarely lose any points while the bottom teams gain less points than in former times.

Getting back to the question in how far sacking performances have improved over time ($H3$), figure 7 also shows a superior performance of the most recent time group when it comes to the first games of the new manager. In order to take a closer look at these findings, a regression on time and the performance of the first four games $t_{+4} - t_{-1}$ is performed. The results shown in figure 8 indicate a slight but significant increase which

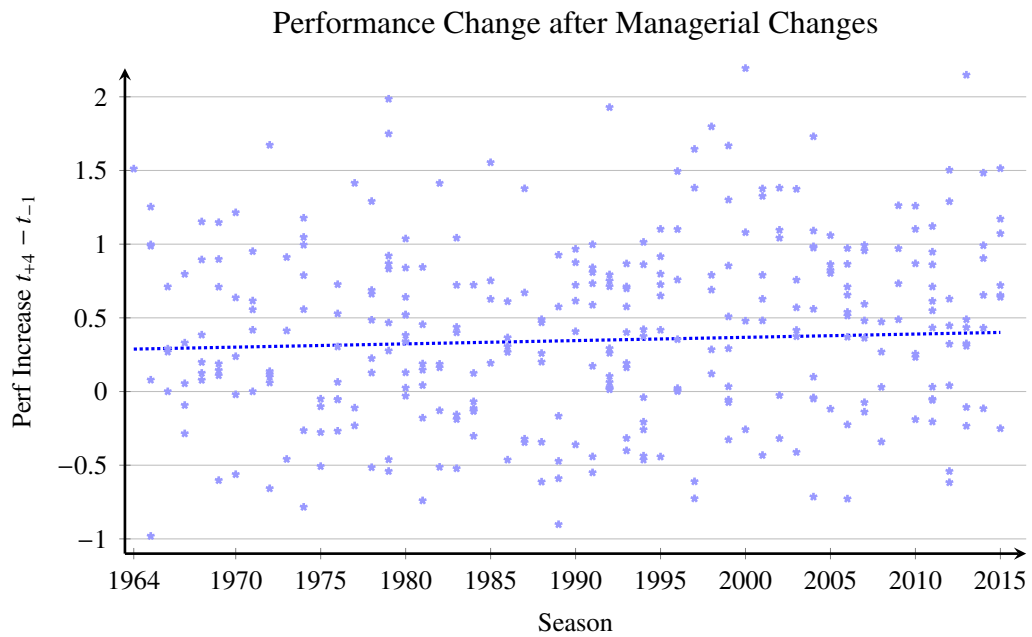


Figure 8: This graph is based on the point-based model M1.

supports the hypothesis that clubs indeed execute better sacking decisions as time goes by. In numbers, there is a slight but significant correlation²⁷ between the performance increase from the change to t_{+4} and the season in which that particular managerial change takes place.

So, it can overall be concluded that sacking performances in the first German football division have increased over the past decades which supports *H3*. Further, the author was not able to find any proof that teams in "modern football" are more likely to replace their managers.

The third and last portion of professionalism that may affect the sacking performance is the legal status of a club's football team. A lot of clubs do outsource their professional football team in order to acquire monetary help or achieve a higher level of professional-

²⁷ $R = 0.134$ is significant at the 5% level.

Table 6: Hazard Rate Development over Time

	'64-70	'71-75	'76-80	'81-85	'86-90	'91-95	'96-00	'01-05	'06-10	'11-15
CG cases	44.9	46.6	45.6	47.8	44.0	46.8	53.8	48.0	55.0	50.0
MC cases	4.7	5.0	7.2	6.0	5.4	8.8	5.8	6.2	6.0	7.8
Hazard Rate	9.6	9.3	6.3	8.1	8.1	5.3	9.3	7.7	9.2	6.4

The hazard rate is calculated as the fraction of the number of control group cases over the number of managerial changes: $\frac{CG}{MC}$

Both the CG cases and the MC cases are given per season within the according five season time span.

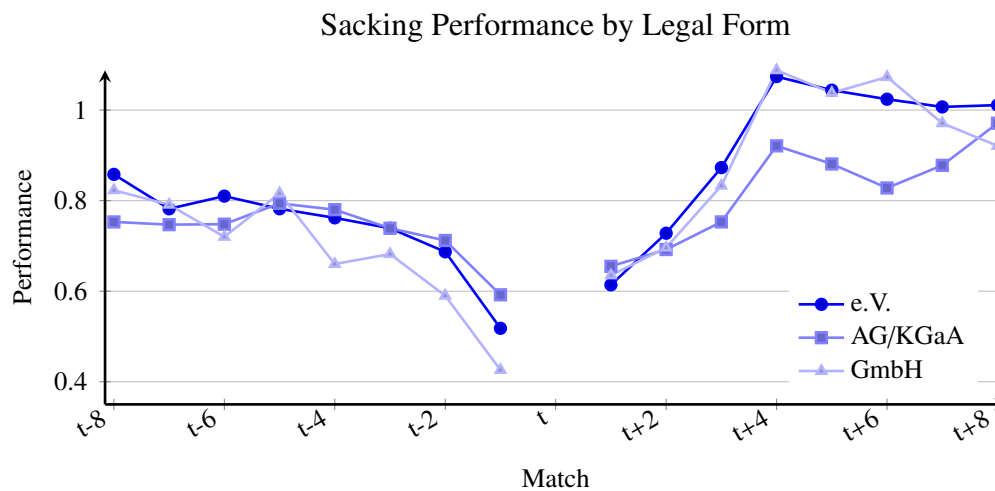


Figure 9: At time t (between two matches), the manager is sacked while $t_{+/-x}$ denotes the matches prior to or after the change. The graph is based on numbers derived by Model 1.

ism within the organisation which leads to $H5a^{28}$. Due to only a few clubs being listed as AG, there are as few managerial changes (8 in total) which is too small of a sample size and therefore leads to insignificant results. That and the fact that both legal forms follow a comparable development is why both legal forms AG and (GmbH & Co.) KGaA are used as one legal form from now on. Further, only data from the past 20 seasons are included as the first German clubs to have changed the manager after outsourcing their professional football teams were Dortmund (twice) and Hannover in 1999/2000.

As shown in figure 9 (p.52), the original club form "eV" does not offer any speciality in terms of sacking performance. Despite the fact that clubs in the form of GmbH do change their manager after a considerably heavier performance drop, both eV and GmbH share a similar development without any significant differences. Clubs which have their team outsourced as a AG or KGaA do however face a different result: While initial results after a managerial change are in normal range, there is a distinct lack of performance later on, especially during the third and seventh game of the new manager. This is also supported by the analysis of managerial changes versus the control group that shows a performance lack for the latter (table 14, p.XVI).

Having in mind the huge lack in performance after managerial changes for AG and KGaA formed clubs, $H5a$ has to be rejected strictly. Due to the small sample size and

²⁸ $H5a$: Clubs having outsourced their professional football teams will show a significantly better sacking performance than clubs which are organised completely as "e.V."

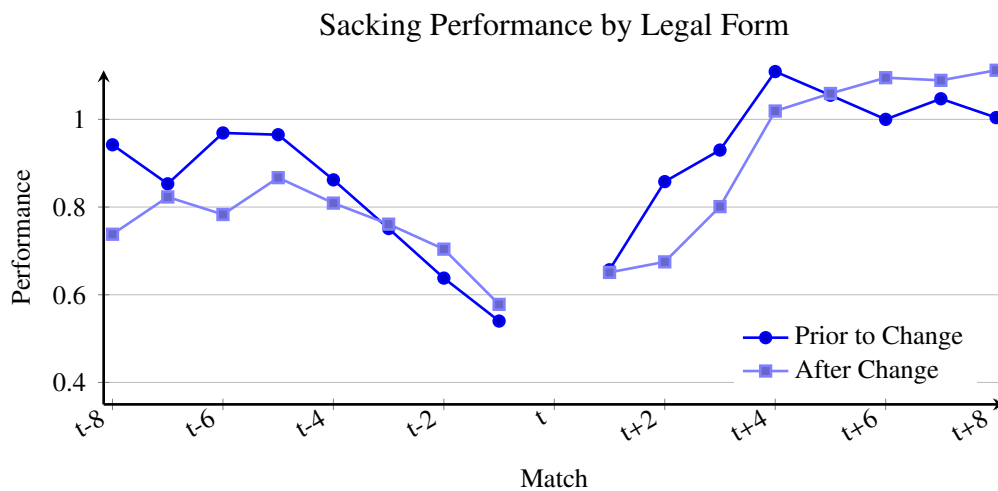


Figure 10: At time t (between two matches), the manager is sacked while $t_{+/-x}$ denotes the matches prior to or after the change. The graph is based on numbers derived by Model 1.

the absence of significant results no more information can be gathered from this but the original legal form "e.V." does not seem to have a disadvantage when compared to other legal forms.

While there is no overall impact of the legal form on the sacking performance, it may be worth following $H5b^{29}$ in order to analyse whether a club's sacking performance develops after the change of legal form. However, this assumption does not seem to hold up against the analysis (figure 10, p.53). Both groups of teams, those which have recently changed the legal form and those which have shortly after within the next three years, follow a similar pattern without any significant deviation. Therefore, $H5b$ has to be rejected.

²⁹ $H5b$: A given club will show a significantly better sacking performance after outsourcing its professional football team.

5 Discussion

5.1 Results and Managerial Implications

When coming to final conclusions on how managerial changes work out and how professionalism affects such outcomes, a quick look at table 7 (p.56) which gives a very brief summary of the results may serve best.

The first important aspect to note is that managerial changes do have a positive influence on team performances which contradicts the author's initial belief and the outcome of many other papers on this topic. While there is indeed a performance benefit, the club's management should still not pull the trigger too fast. First of all, teams in a similar position will eventually develop the same way, with or without changing the manager, even though managerial changes on average give a small but significant edge in performance. Secondly, due to the performance edge not being of a massive scope, a trade-off has to be made by the management regarding the benefit of a slight performance edge versus the detriment of having to pay for a second manager. However, the management has to be aware of the fact that not all managerial changes work out as they were intended to; in 144 out of 589 cases in this paper's sample, the first four games of the new manager(s) were equally bad or even worse than the last four games of the previously changed manager. So, one in four managerial changes does not even lead to a slight performance increase.

Further, picking up the initially named theories on managerial changes, the scapegoate theory may have some value. When looking at the performances at t_{-1} , especially big clubs which have a public image of being turbulent do change their manager at significantly higher performance levels than other clubs³⁰. To confirm the theory, clubs that are expected by the public to act calmly do work the other way round by changing their manager at extremely low performance levels such as Bayer Leverkusen and Werder Bremen. Even though this significant difference occurs in the sacking behaviour, no changes in the outcomes of managerial changes can be found.

Besides the overall effect of managerial changes, the main purpose of this paper was to detect in how far professionalism affects a club's sacking performance. Unfortunately, most results regarding this issue have lagged either statistical significance or did just not

³⁰Those clubs include Bayern München, Hamburger SV, Hannover 96 and Schalke 04

Table 7: Overview on Hypotheses and their Outcome

Hypothesis	Result	Implication
<i>H1a</i>	Supported	short term increase after MC
<i>H1b</i>	Rejected	CG not superior in short term
<i>H2a</i>	Rejected	mid term increase after MC
<i>H2b</i>	Rejected	MC outperform CG in mid term
<i>H3</i>	Supported	sacking performance increases with time
<i>H4a</i>	Rejected	division does not affect outcome
<i>H4b</i>	Rejected	relegation/promotion does not affect outcome ^a
<i>H5a</i>	Rejected	other legal forms not superior to eV
<i>H5b</i>	Rejected	changing legal form does not affect outcome

^aClubs which have recently been promoted seem to be more patient before changing their manager.

work out the way the author hypothesised them to. Out of the three fields of professionalism regarded in this thesis, only the aspect of time has yielded a significant result meaning that sacking performances in the first Bundesliga increase ever since the introduction of the league in 1963. So, this indicates that there is at least some value to the idea of professionalism affecting sacking performances in a positive way.

Another finding concerning the time aspect was that managerial changes do not occur more often today than they did in previous decades. On an absolute number, the changes increased but compared to the overall number of performance drops in the league, the number of changes remain steady throughout time. This can be used as an argument for an increased professionalism within the clubs as the managements seemingly have understood that pulling the trigger too fast is not an option worth pursuing. Probably, clubs do analyse the situations better beforehand and check for available new managers prior to getting rid of the old one.

The analyses on both the division and the legal status have not yielded any sufficient outcome to support either of the hypotheses set up in the beginning. There is absolutely no evidence to assume that higher divisions perform better sacking decisions and if there is one division standing out by a small margin, it is the third Bundesliga which is the lowest division to be considered in this paper. Besides this, the only significant finding is that club managements seem to adapt to their club's situation. When a team is favoured to be promoted, managerial changes occur much faster as the management does not want to lose too many points. After being promoted however, clubs seem to accept being the underdog

which results in allowing longer bad streaks before the manager is replaced. This is supported by the fact that clubs do replace their manager once in every 11.9 performance drops after a promotion while the standard hazard rate is 5.4 for favourite clubs and 6.7 for all clubs³¹. However, this can be argued to be a result of assessing the own situation rather than acting more professional.

Finally, the legal form of the professional football team has been analysed as well. Again, the assumed increase in sacking performances did not take place after outsourcing the football team. To make matters worse, the legal forms GmbH lacked performance severely after managerial changes while both AG/KGaA and the original eV did not show significant differences. When it comes to the question whether outsourcing changes the performance of a given club, this has to be denied as well. The only change, again, can be seen in the hazard rate as clubs that have changed their legal form within the last three years do act significantly faster as there are only 4.2 performance drops observed per managerial change. This is by far the lowest hazard rate in any observation made for this paper which shows that while clubs do not perform better, they at least may think they do. Such clubs probably want to benefit from the structural changes and the monetary income as fast as possible which leads to these fast managerial changes.

So, to conclude the discussion of the results, the final hypothesis $H6^{32}$ has to be answered as it is supposed to serve as a quick overview. Taking all the results and the according explanations into consideration, it has to be said that what the author of this paper perceived to be a higher state of professionalism does not affect any sacking performances in a positive way. The only statistically relevant results have been obtained when considering the hazard rates and in the time aspect. However, the time cannot be influenced by individual clubs which shows an overall increasing state of professionalism for the entire industry. When it comes to individual clubs and their actions, neither the division nor the legal form seem to influence the sacking performance heavily which is why $H6$ has to be rejected.

³¹Please check Appendix D for hazard rates depending on the different fields of professionalism.

³² $H6$: A higher state of professionalism will overall lead to a significantly higher sacking performance.

Table 8: Overview on Hypotheses and their Outcome - H6

Hypothesis	Result	Implication
<i>H6</i>	Rejected	no overall significant impact of professionalism

Overall, the probably most useful device for any club's management is to act wisely and to analyse the situation exactly. There are situations in which a manager has to be replaced and there are the exact opposite situations as well.

5.2 Limitations and Future Research

Considering this particular paper in the scope of what has been done so far in the research on managerial changes, this paper tries a few approaches on the topic that have not been done like that before. The mixture of result prediction and the outcome of managerial changes eradicates the danger of the regression towards the mean that has been prevalent in a few other papers. In the future, researchers probably can expand the connection between the result prediction and the sacking performance.

The sacking performance denoted and used as such is a feature almost exclusively limited to this paper as well. In most studies, the usage of an interim manager leads to the exclusion of that case from the analysis. The approach to argue that not only the new manager but the entire manager changing process are part of the sacking performance is therefore rather new and brings an interesting point of view.

The main purpose of this paper was to connect professionalism to the according club's sacking performance. This has been done previously considering the budget spent for managers and/or players. Taking into consideration the time aspect as well as the division and the legal form brings new light into this research but does not reveal any major consequences. Combining the two unsolved aspects from this paper - time was shown to affect the entire football business but not any specific club - with budget spent may be an interesting research going on. A model including all of these aspects in order to yield one professionalism level may also be an idea worth pursuing in the future.

As explained above, the average performance level of different times at the time of the managerial change indicates a possible prove for the scapegoat theory. However, it was not possible to do this analysis within the limited scope of this paper. Therefore, future

research may very well look deeper into the scapegoat theory. A possible application may be to check the media coverage and notions used by the media in order to get a scientific result for which club can be seen as having a calm or a turbulent environment respectively.

Further, it may be interesting to assess the different sacking behaviours as well as the different sacking performances of clubs from different countries. Unfortunately, this was not possible due to the restrictive scope of this master's thesis but analysing different countries during the same time frame might yield surprising correlations for example to Hofstede's cultural dimensions or other similar cultural measurements.

Overall it can be summarised, that managerial changes do offer a lot of aspects to focus on and even though a wide variety of researches has already conducted studies on this topic, there still are a lot of question marks remaining when it comes to the efficiency of replacing managers in sports teams. Obviously, the importance of this topic may not be under estimated as it serves as a gateway to managerial changes in any kind of business or industry³³.

³³In case you have an interest in taking a look at the underlying data or the analyses, please contact me at sebastian.gollan@web.de

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Appendix A - Model

Figure 11: Impact of Factors on Prediction Model

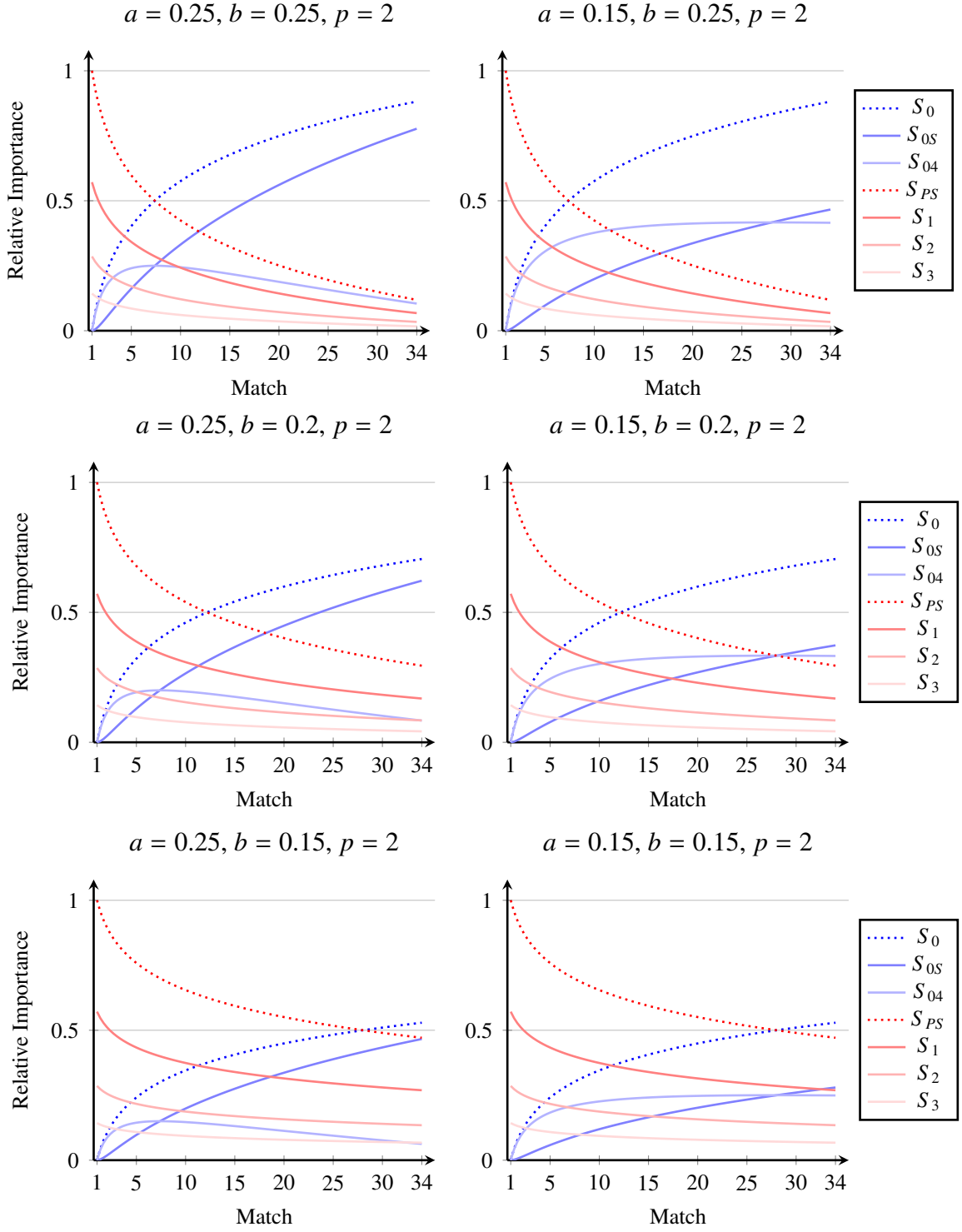


Figure 12: Impact of Factors on Prediction Model - Part 2

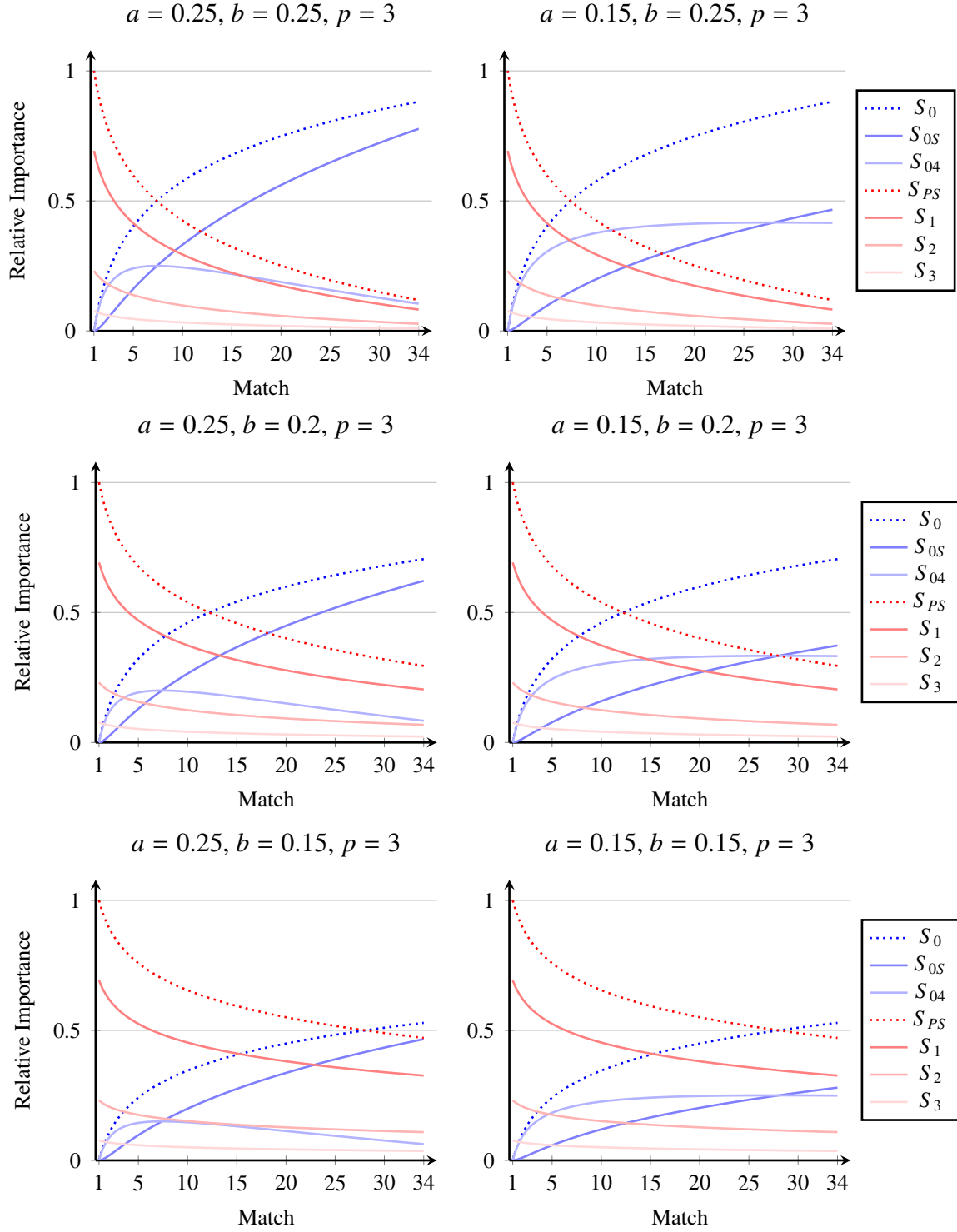


Figure 13: Impact of Factors on Prediction Model - Part 3

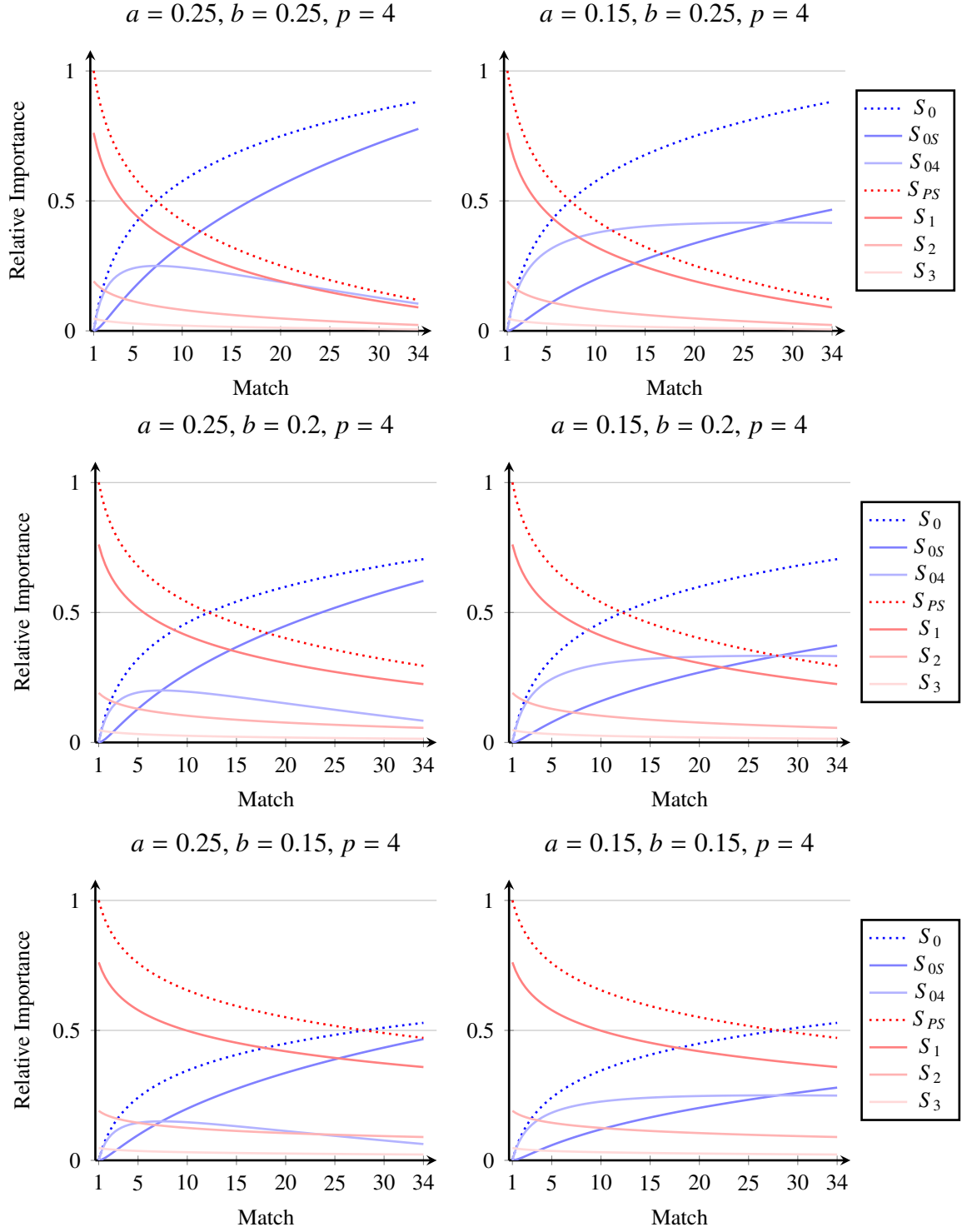


Table 9: Factor Usage for different League Participation

Case	Data available for			Factor for ^a		
	S_{-1}	S_{-2}	S_{-3}	S_{-1}	S_{-2}	S_{-3}
1	✓	✓	✓	9/13	3/13	1/13
2	✓	✓	-	3/4	1/4	-
3	✓	-	-	1	-	-
4	✓	-	✓	9/10	-	1/10

^a with $p = 3$.

Appendix B - Descriptive Analysis

Table 10: Number of Managerial Changes per Club

Team	MC	#G	Games/MC	Team	MC	#G	Games/MC
1.FC Nürnberg	22	1322	60.1	Ingolstadt 04	5	242	48.4
E. Frankfurt	22	1764	80.2	Jahn Regensburg	5	296	59.2
Schalke 04	21	1594	75.9	RW Erfurt	5	300	60
Hannover 96	20	1084	54.2	VfL Osnabrück	5	360	72
VfB Stuttgart	19	1696	89.3	En. Cottbus	5	616	123.2
Karlsruher SC	18	1292	71.8	FC Homburg	4	102	25.5
MSV Duisburg	18	1432	79.6	SSV Ulm	4	102	25.5
1.FC K'lautern	18	1764	98	VfB Leipzig	4	136	34
1.FC Köln	18	1764	98	Darmstadt	4	216	54
Hamburger SV	18	1764	98	Wattenscheid	4	242	60.5
1860 München	17	1046	61.5	SV Sandhausen	4	254	63.5
F. Düsseldorf	17	1062	62.5	1899 Hoffenheim	4	272	68
Bor. M'gladbach	14	1704	121.7	W. Burghausen	4	398	99.5
Arm. Bielefeld	13	964	74.2	Uerdingen	4	578	144.5
Hertha BSC	13	1216	93.5	FSV Zwickau	3	102	34
Bor. Dortmund	13	1628	125.2	Wuppertaler SV	3	178	59.3
K. Offenbach	12	564	47	VfR Aalen	3	216	72
Hansa Rostock	12	734	61.2	Chemnitzer FC	3	254	84.7
VfL Bochum	12	1466	122.2	FC Augsburg	3	306	102
B. München	11	1704	154.9	Erzgebirge Aue	3	416	138.7
C. Zeiss Jena	10	322	32.2	S. Großaspach	2	38	19
RW Oberhausen	10	514	51.4	SV Elversberg	2	38	19
Unterhaching	10	640	64	FC Gütersloh	2	102	51
VfL Wolfsburg	10	680	68	SV Meppen	2	102	51
Stuttgarter K.	9	394	43.8	TB Berlin	2	136	68
St. Pauli	9	680	75.6	SV Babelsberg	2	148	74
B. Leverkusen	9	1228	136.4	TuS Koblenz	2	174	87
Werder Bremen	9	1730	192.2	Pr. Münster	2	182	91
LR Ahlen	8	310	38.8	FSV Frankfurt	2	238	119
Dynamo Dresden	8	462	57.8	SC Paderborn	2	344	172
Greuther Fürth	8	612	76.5	Union Berlin	2	344	172
Braunschweig	8	1024	128	Sportfr. Siegen	1	34	34
Waldh. Mannheim	7	442	63.1	Tasm. Berlin	1	34	34
Saarbrücken	7	454	64.9	Kickers Emden	1	38	38
Mainz 05	7	680	97.1	RB Leipzig	1	72	72
SV Wehen-Wiesb.	6	296	49.3	SSV Reutlingen	1	102	102
RW Essen	6	340	56.7	Holstein Kiel	1	114	114
Alem. Aachen	6	582	97	VfB Lübeck	1	136	136
F. Köln	5	242	48.4	SC Freiburg	1	748	748

Appendix C - Sacking Performance

Table 11: Managerial Changes - Short term Team Performances - Model 2

Time	Man Change	Control Group	CG-MC
<i>Performance Levels at $t_{+/-g}$</i>			
t_{-5}	-0.905*** (0.130)	-0.543*** (0.050)	0.377*** (0.140)
t_{-4}	-1.101*** (0.131)	-1.503*** (0.045)	-0.388*** (0.128)
t_{-3}	-1.127*** (0.129)	-2.154*** (0.048)	-1.025*** (0.138)
t_{-2}	-1.681*** (0.124)	-2.802*** (0.047)	-1.129*** (0.133)
t_{-1}	-2.804*** (0.129)	-3.374*** (0.042)	-0.580*** (0.119)
t_{+1}	-2.198*** (0.129)	-2.217*** (0.047)	-0.030 (0.132)
t_{+2}	-1.663*** (0.136)	-1.248*** (0.051)	0.408*** (0.145)
t_{+3}	-0.685*** (0.140)	-0.356*** (0.053)	0.327** (0.150)
t_{+4}	0.708*** (0.143)	0.423*** (0.053)	-0.293* (0.152)
t_{+5}	0.610*** (0.143)	0.251*** (0.054)	-0.364** (0.153)

*is significant at the 10% level, **is significant at the 5% level, and ***is significant at the 1% level.

Standard Errors can be found in parentheses.

Performance levels are measured according to the predicted outcome given by the point-based model M2.

Table 12: Managerial Changes depending on Division post 2009

Time	L1-L2		L1-L3		L2-L3	
(I) <i>Performance Levels at $t_{+/-g}$</i>						
t_{-6}	0.040	(0.087)	-0.134	(0.086)	-0.173*	(0.080)
t_{-5}	0.026	(0.086)	-0.040	(0.086)	-0.066	(0.080)
t_{-4}	-0.074	(0.085)	-0.013	(0.085)	0.061	(0.079)
t_{-3}	0.062	(0.078)	0.063	(0.077)	0.001	(0.072)
t_{-2}	0.027	(0.077)	0.052	(0.076)	0.025	(0.072)
t_{-1}	0.046	(0.069)	0.069	(0.069)	0.023	(0.065)
t_{+1}	0.090	(0.076)	0.137	(0.075)	0.047	(0.070)
t_{+2}	-0.023	(0.079)	0.024	(0.078)	0.047	(0.074)
t_{+3}	0.061	(0.087)	-0.050	(0.087)	-0.111	(0.081)
t_{+4}	0.081	(0.098)	0.043	(0.097)	-0.038	(0.091)
t_{+5}	0.022	(0.100)	-0.050	(0.099)	-0.071	(0.093)
t_{+6}	0.022	(0.099)	-0.166	(0.098)	-0.187	(0.090)
(II) <i>Before-After Performance Comparison g Games prior to/after t</i>						
$t_{+1} - t_{-1}$	0.044	(0.062)	0.068	(0.062)	0.024	(0.058)
$t_{+2} - t_{-2}$	-0.049	(0.101)	-0.028	(0.100)	0.022	(0.094)
$t_{+3} - t_{-3}$	-0.002	(0.115)	-0.113	(0.114)	-0.112	(0.107)
$t_{+4} - t_{-4}$	0.155	(0.128)	0.056	(0.127)	-0.098	(0.119)
$t_{+5} - t_{-5}$	-0.020	(0.121)	-0.011	(0.120)	0.010	(0.112)

*is significant at the 10% level, **is significant at the 5% level, and ***is significant at the 1% level.

Standard Errors can be found in parentheses.

Performance levels are measured according to the predicted outcome given by the point-based model M1.

Table 13: Managerial Changes vs Control Group - Divisions

Time	1. Bundesliga	2. Bundesliga	3. Bundesliga
<i>(I) Performance Levels at $t_{+/-g}$</i>			
t_{-6}	-0.178*** (0.041)	-0.104** (0.051)	-0.076 (0.064)
t_{-5}	-0.120*** (0.037)	-0.104*** (0.033)	-0.010 (0.064)
t_{-4}	0.016 (0.030)	0.054** (0.027)	-0.016 (0.042)
t_{-3}	0.117*** (0.031)	0.142*** (0.027)	0.044 (0.044)
t_{-2}	0.141*** (0.030)	0.232*** (0.028)	0.131*** (0.042)
t_{-1}	0.127*** (0.022)	0.177*** (0.020)	0.079** (0.031)
t_{+1}	0.050 (0.036)	0.093*** (0.028)	0.020 (0.052)
t_{+2}	-0.033 (0.036)	0.025 (0.034)	0.011 (0.061)
t_{+3}	-0.023 (0.045)	-0.039 (0.037)	0.036 (0.061)
t_{+4}	0.061 (0.047)	0.050 (0.040)	0.061 (0.067)
t_{+5}	0.057 (0.047)	0.018 (0.040)	0.048 (0.070)
t_{+6}	0.043 (0.050)	0.030 (0.041)	0.043 (0.065)
<i>(II) Before-After Performance Comparison g Games prior to/after t</i>			
$t_{+1} - t_{-1}$	-0.077** (0.031)	-0.084*** (0.024)	-0.059 (0.043)
$t_{+2} - t_{-2}$	-0.174*** (0.048)	-0.207*** (0.042)	-0.120* (0.070)
$t_{+3} - t_{-3}$	-0.140** (0.055)	-0.181*** (0.046)	-0.007 (0.081)
$t_{+4} - t_{-4}$	0.045 (0.059)	-0.004 (0.045)	0.078 (0.081)
$t_{+5} - t_{-5}$	0.183*** (0.059)	0.115** (0.052)	0.139 (0.091)

*is significant at the 10% level, **is significant at the 5% level, and ***is significant at the 1% level.

Standard Errors can be found in parentheses.

Performance levels are measured according to the predicted outcome given by the point-based model M1 for the time 1996 to 2015.

All numbers are given from the MC group's view, so negative numbers show a higher performance by the control group.

Table 14: Managerial Changes vs Control Group - Legal Form

Time	e.V.	GmbH	AG/KGaA
<i>(I) Performance Levels at $t_{+/-g}$</i>			
t_{-6}	-0.105*** (0.039)	-0.192** (0.076)	-0.161*** (0.056)
t_{-5}	-0.109*** (0.027)	-0.082 (0.064)	-0.120** (0.055)
t_{-4}	0.045** (0.022)	-0.083* (0.049)	0.040 (0.041)
t_{-3}	0.133*** (0.022)	0.046 (0.056)	0.099** (0.044)
t_{-2}	0.201*** (0.022)	0.092* (0.055)	0.190*** (0.042)
t_{-1}	0.144*** (0.016)	0.062* (0.037)	0.214*** (0.031)
t_{+1}	0.058** (0.023)	0.099* (0.058)	0.099** (0.047)
t_{+2}	0.013 (0.028)	-0.007 (0.062)	-0.011 (0.055)
t_{+3}	0.000 (0.031)	-0.030 (0.074)	-0.094 (0.059)
t_{+4}	0.077** (0.033)	0.080 (0.078)	-0.049 (0.064)
t_{+5}	0.061* (0.033)	0.050 (0.075)	-0.076 (0.065)
t_{+6}	0.057* (0.033)	0.118 (0.075)	-0.135* (0.072)
<i>(II) Before-After Performance Comparison g Games prior to/after t</i>			
$t_{+1} - t_{-1}$	-0.086*** (0.020)	0.037 (0.058)	-0.115*** (0.039)
$t_{+2} - t_{-2}$	-0.188*** (0.038)	-0.099 (0.087)	-0.200*** (0.068)
$t_{+3} - t_{-3}$	-0.133*** (0.038)	-0.076 (0.095)	-0.193** (0.082)
$t_{+4} - t_{-4}$	0.032 (0.038)	0.463* (0.096)	-0.089 (0.075)
$t_{+5} - t_{-5}$	0.166*** (0.043)	0.136 (0.097)	0.049 (0.021)

*is significant at the 10% level, **is significant at the 5% level, and ***is significant at the 1% level.

Standard Errors can be found in parentheses.

Performance levels are measured according to the predicted outcome given by the point-based model M1 for the time 1996 to 2015.

All numbers are given from the MC group's view, so negative numbers show a higher performance by the control group.

Appendix D - Discussion

Table 15: Hazard Rate depending on Division

	1. Bundesliga		2. Bundesliga	3. Bundesliga
	pre 1996	post 1995		
CG cases	45.6	51.4	48.2	66.6
MC cases	6.1	6.5	10.1	9.1
Hazard Rate	7.5	7.9	4.8	7.3

The hazard rate is calculated as the fraction of the number of control group cases over the number of managerial changes: $\frac{CG}{MC}$

Both the CG cases and the MC cases are given per season within the given time span (only 7 years for the 3. Bundesliga).

Table 16: Hazard Rate depending on Promotion and Relegation

	Promotion		Relegation	
	next 2 years	last 2 Years	next 2 years	last 2 Years
CG cases	1.4	3.5	4.8	2.8
MC cases	0.3	0.3	0.7	0.5
Hazard Rate	5.4	11.9	7.1	5.1

The hazard rate is calculated as the fraction of the number of control group cases over the number of managerial changes: $\frac{CG}{MC}$

Both the CG cases and the MC cases are given per season. The number of seasons equals the number of times any club has been part of that specific group.

Table 17: Hazard Rate depending on Legal Form

	e.V.	AG/KGaA	GmbH	All but eV	Change of Legal Form	
					next 3 years	last 3 years
CG cases	3.0	2.5	2.8	2.6	2.9	2.1
MC cases	0.5	0.4	0.5	0.4	0.5	0.5
Hazard Rate	6.2	6.8	5.5	6.3	5.9	4.2

The hazard rate is calculated as the fraction of the number of control group cases over the number of managerial changes: $\frac{CG}{MC}$
Both the CG cases and the MC cases are given per season. The number of seasons equals the number of times any club has been part of that specific group.

Abstract

Die vorliegende Arbeit analysiert das Verhalten von deutschen Fußballvereinen beim Entlassen von Cheftrainern und den Erfolg dieser Handlung. Dabei wird der Fokus sehr stark auf die Professionalisierung der Vereine gelegt um einen möglichen Zusammenhang zwischen eben dieser und dem Erfolg bei Trainerentlassungen festzustellen.

Anstatt sich lediglich auf reine Spielergebnisse zu verlassen, verbindet der Autor die wissenschaftlichen Felder der "succession theory" (Wechsel im Management wie z.B. Trainer) mit der Resultats-Vorhersage, was so im Rahmen von wissenschaftlichen Arbeiten zu Trainerwechseln noch nicht geschehen ist. Zu diesem Zweck werden in dieser Masterarbeit zwei sich ähnelnde Modelle entwickelt, die - einerseits basierend auf Punkten und andererseits basierend auf der Tordifferenz - es auf Basis vergangener Ergebnisse erlauben, die Resultate zukünftiger Begegnungen vorherzusagen.

Diese Modelle werden zur Berechnung der Leistung aller Spiele aller Teams genutzt, was eine objektive Beurteilung von Trainerwechseln ermöglicht. Dabei werden 52 Jahre deutscher Profifußball analysiert, wobei insgesamt 79 Saisons aus drei Ligen in die Analyse einfließen, was über 24.000 einzeln analysierten Spielen entspricht.

Der Hauptfokus der Arbeit liegt im Rahmen der Analyse dann auf dem Zusammenhang zwischen Professionalisierung der Vereine und Trainerentlassungen, mit speziellem Augenmerk auf den geschichtlichen Zeitablauf, die verschiedenen Ligen und die Rechtsform der Fußballabteilung. Diese zuvor kaum erforschten Fragestellungen ermöglichen einen tiefen Einblick in die Handlungsabläufe verschiedener Vereine basierend auf ihrer Professionalität.

CV

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Education

- 10/2012 - ongoing **M.Sc. International Business Administration,**
University of Vienna; Vienna, Austria
Major: Industrial Management
- 08/2013 - 12/2013 **Erasmus Exchange Semester,**
Jönköping International Business School; Jönköping, Sweden
- 10/2008 - 07/2012 **B.Sc. Business Administration and Economics,**
University Hohenheim; Stuttgart, Germany
Majors: Marketing Management, Internal Management, Service Management
Thesis: "Managing waiting times - antecedents and consequences"
- 08/1999 - 06/2008 **Abitur - Certificate of General University Maturity,**
Hittorf Grammar School; Recklinghausen, Germany
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-

Relevant Working Experience

- 04/2015 - 06/2015 **Internship - Event Management and Organisational Development**
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