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The Interplay of Organizational Demography and Institutional Change[+]

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Abstract

Our paper analyzes the interplay of organizational demography with the propensity to adopt an innovative practice. In particular, we examine how the demographical composition of professional German football teams influenced the adoption of the chain-defense-system ("Viererkette") as well as the success of implementing this system. In doing so we strongly believe that the underlying relationship between organizational demography and the innovation diffusion process is not only relevant for football teams: Other smaller organizations or profit centers whose team structures seem comparable to those of football teams might be subject to similar processes.

We hypothesize that a high level of team heterogeneity leads to a greater propensity to change. We also hypothesize that homogeneous teams are more successful in executing a new practice once they have overcome their skepticism. Our results support the hypotheses on change, but do not provide final support for our hypothesis on performance.

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1 Introduction

Most of the ongoing discussion on institutional change is either related to the implementation of institutionalized structural elements (e.g. Dobbin et al. 1993), the consequences of implementation (e.g. Ruef and Scott 1998) or the changes in an institutional field (e.g. Scott et al. 2000). Studies on how and why organizational change in response to institutional pressure is impeded or promoted by organizational members are very rare, although Lynne Zucker (1977) offered a seminal contribution to this topic at the time when the neo-institutionalist approach was developed. However, this stream of research – the so called Micro-Institutionalism – has not found many successors (for an exception see e.g. Mühl 1998).

Even though our paper does not follow the original track of micro-institutionalism, which concentrated on shared beliefs and norms in an organization and its influence on the institutionalization and taken-for-grantedness of organizational routines, we think that we can offer a new perspective on the internal organizational contingencies of institutional change. The general goal of this study is to analyze the interplay of organizational demography (Williams and O'Reilly 1998; Guzzo and Dickson 1996; Pfeffer 1983) and the propensity to adopt a practice which has been considered rational in the environment of the focal organization. In particular, we want to examine how the demographical composition of German Bundesliga (the German premier league, i.e. the highest division of professional football in Germany) football teams influenced the adoption of the chain-defense system ("Viererkette") and the success of implementing this system.

This study extends prior research on organizational demography and institutional isomorphism basically on two different dimensions. Firstly, we contribute to the vital discussion as to whether team heterogeneity is beneficial or harmful to organizations by clearly distinguishing between different effects of heterogeneity. In accordance with a great number of other studies (e.g Goodstein and Boeker 1991; Wiersema and Bantel 1992; Boeker 1997) we hypothesize that a high level of team heterogeneity leads to a greater susceptibility to innovation – thus to a greater propensity to change. However, in contrast to many other studies which do not discuss the consequences of implementation of an innovative organizational practice for different degrees of team heterogeneity we also hypothesize that homogeneous teams are more successful in executing a new practice once they have overcome their skepticism towards the practice and have implemented it.

Secondly, this study on the adoption and the consequences of the chain system on German football teams allows us to almost unambiguously identify institutional change. As we will show below in more detail, the diffusion of this defense system was triggered by distinct institutional processes. Hence, the great advantage of the data which we use lies in the fact that for each club the individual applications of the chain system and their specific variations are clearly documented. Instead of relying on announcements or uncertain self-reports of firms, the documented observation of the Bundesliga matches leaves no doubt whether the teams have applied this practice or not. Moreover, the success of the football teams and thus the consequences of adoption can also be observed univocally, since this observation only requires the registration of the results of the matches.

2 Literature: Football Teams as a Field of Inquiry for Economic Research

The literature about the economics of team sports has been steadily increasing since the mid-1950s. Seminal contributions to this strand of literature are from Rottenberg (1956), Grusky (1963), Neale (1964), and Jones (1969). However, as this branch of research originated in the US, most of its publications still focus on the popular American forms of team sport (for a review see Fort and Quirk 1995). European football, which had been introduced to the academic community by Moroney (1956), Reep et al. (1971) and Sloane (1971), did not really seem to attract researchers until the late 1990s. This reluctance might be explained by the fact that the organizational structures of European football leagues had been predominantly inspired by the traditional ideals of honorary sport clubs. Thus, football leagues and teams have not been considered a worthwhile field of economic and organizational research. Yet, at least in the case of the big four European leagues (Spain, Italy, England and Germany), the 1990s saw an immense increase in the demand for television broadcasting rights, rising gate revenues and exponential growth rates of players' salaries which unavoidably induced sustained structural change in the form of increasing commercialization dynamics. With respect to total turnovers, the top fourteen European clubs of the 1999/2000 season all stemmed from one of these four countries and eight of them being quoted on the stock exchange (Süßmilch et al. 2002).

Professional football therefore represents a remarkably developing branch of the prospering sport business today. For example in Germany the 2001/2002 average revenues of clubs in the Bundesliga amounted to more than 62 million € (DFL 2002).

Thus, two driving forces which stimulated recent research interests in professional football can be identified:

- The growing economic impact of the football industry due to the spectacular increase in the demand for football over the last decade. For example, in the German Bundesliga the number of total stadium attendants rose from about 6.3 million in 1990/1991 to approximately 9.5 million in 2001/2002. This development uncovered questions in the economics of football which had just not been appreciated before.
- The grown awareness of sport teams as economic subjects which operate with identical production functions and compete against each other in an almost identical environment. Hence, given the fact that a unique variety of individual football data has been made available in recent years, an empirical analysis of these observations offers an exclusive opportunity for a disaggregated inquiry of organizational theories.

This increased attention towards football as a field of economic and organizational research is accompanied by the ease of use of unique data sets on football organizations. *"A major attraction of sports to empirical economists, indeed, is that the availability of data permits investigation of a large number of economic propositions that would be difficult to test in other areas, because of a lack of suitable data. The professional football sector therefore offers opportunities for empirical research in areas such as consumer behaviour, labour economics and industrial organization [...]"* (Dobson and Godard 2001, XVI).

Consequently, economic and organizational publications on football consider various aspects of this topic (for an ample overview of studies on football see Dobson and Goddard 2001): Ridder, Cramer and Hopstaken (1994) quantified the effects of a red card based on the results of 340 matches of the professional Dutch football division. OLS estimates of the home ground advantages of English football clubs have been presented by Clarke and Normann (1995). Estimates of job-departure hazard functions for English football managers were given by Audas, Dobson and Goddard (1999). Koning (2000) analyzed the 'balance in competition' in Dutch football. Recently, Szymanski and Smith (2002) considered this topic with respect to Italian, Spanish, Portuguese and English top division football leagues whereas the effects of firing a coach on team performance have been studied, i.a. by Bruinshoofd and Ter Weel (2003) or Koning (2003) for the case of the Netherlands.

So far, data on the German Bundesliga has stimulated an astonishingly small amount of empiric research. As a matter of fact, German researchers seem to have discovered the wide-area of football econometrics only very recently. For example Swieter (2002) conducted an economic analysis of the German Bundesliga. Kern and Süssmuth (2003) presented a statistical analysis of coach efficiency in German football, drawing heavily on Dawson et al. (2000) while Sutter and Kocher (2004) analyzed the alleged home bias of referees. The introduction of new defense systems or other major changes in a football team's strategy have – to the best of our knowledge – not been subjects of empirical studies so far. Moreover, studies on the demographical composition of sport teams are still very rare (but see e.g. Timmerman 2000).

3 Case Study: The Institutionalization of the Chain-Defense System

Football is *the* most popular sport in Germany. It attracts by far the greatest audiences and is the only sport where matches are attended regularly by more than 30,000 people in cities all over Germany. Other popular sports like ice-hockey, handball or basketball have much smaller audiences. The media coverage of football is more ample and intense than of any other sport. For example the two most popular sports magazines, "kicker" and "Sport Bild" devote the vast majority of the content of each volume to the coverage of football matches and to background stories concerning football. Television coverage is also amazing. Each Bundesliga match is shown live – on pay TV – and in shortened recorded versions several times on a variety of channels each weekend. Since the introduction of the NFL-Europe, in few specific German cities matches of American football are attended by audiences which – in terms of size – come close to those of football audiences. However, there are only four NFL Europe-clubs in Germany and the media coverage of American football is not even rudimentarily comparable to the coverage of football.

Thus, the Bundesliga clubs can be considered as the most important profit organizations in the German sports entertainment industry. Interestingly, the revenues of these organizations depend to an increasing extent on merchandising and, even more importantly, on the fees that TV stations pay for broadcasting matches and to a decreasing extent on ticket sales. However, this development should not lead to the impression that the actual playing of football has lost importance for Bundesliga clubs. On the contrary: Qualification for the European club competitions, for example, guarantees the assignment of enormous amounts of money from the broadcasting fees to the clubs.

However, in Germany only the top five clubs in the final end of season ranking as well as the winner of the German cup final directly qualify either for the champions league (the top two clubs) or the UEFA Cup (the next three clubs and the German cup-winner). Moreover, the last three clubs in the final ranking of a season are relegated to the second German football league, where they have to play against less attractive opponents and receive a lot less money for the broadcasting of league matches. As a consequence, the ability to outperform rivals on the playground is vital for the economic well-being of any German Bundesliga club.

Therefore it can be stated that the basic “product” of German football clubs on which their economic success depends still is the playing of football matches. And the “core technology” of football clubs is the tactics a team uses in order to beat an opponent. Nonetheless, it is not the case that each football team plays with totally different tactics. Most teams play with a similar organization of defense, mid-field and offensive. For decades team coaches sought competitive advantages over other teams, not by introducing revolutionary new playing systems, but by making small variations to well known practices. However, in the early 1990s the beginning of a new era in football tactics was witnessed. A new defense system was developed and adopted by famous European and South American clubs and national teams. This system was the so called four-link-chain. Also a variation of that system – the three-link-chain (“Dreierkette”)– emerged at the beginning of 1990s.

The basic idea of the chain system is inspired by the aim of active field dominance. In the traditional “Libero”-system, defense players were forced to interpret their role in a passive manner: Blocking passes to and kicks by the antagonistic strikers, each of the defenders had to follow his individual opponent. This kind of football might prevent rival teams from scoring any goals, yet, it surely does not support an offensive game in which the defense players also initialize own attacks.

A chain system, on the other hand, liberates the defense players from this kind of personal marking: The defenders are now responsible for a certain area on the playing field so they do not have to stick to their individual opponents over the whole playing time. Instead, they have to interact much closer with their own midfield partners. This, together with an extensive usage of the offside-rule, allows a much greater variability for own offensive actions. Consequently, successful implementation of the chain-link-system should be attractive to those teams which really do strive for a win.

German teams, indeed, were reluctant to adopt this new practice. One reason for the skepticism of German football clubs might have been that the previous defense system, where only the head of the defense (the Libero) had no direct opponent, was developed in Germany. A vital role in the creation of the position of the Libero in the early 1970s was played by Franz Beckenbauer who is to date the most successful and most admired German football player. Manfred Kaltz, Lothar Matthäus and Matthias Sammer are other very famous agents of German football who played the role of the Libero with elegance and creativity.

Since the introduction of the chain system means to abolish the position of the Libero and given that German football was tremendously successful from the 1970s until the early 1990s with this form of defense, it is hardly surprising that German football teams stuck for a long time with the traditional system of defense. In the 1993/1994 season of Bundesliga football, Erich Ribbeck, the coach of Bayern München, tried to install the chain system for a longer period. However after a couple of matches he was told by Franz Beckenbauer, now the CEO of Bayern München, to return to the old system, since Beckenbauer was convinced that the new defense system reduced the success of the team.

However, the situation changed in the mid 1990s when the German national team dropped out of the 1994 World Cup in the quarter finals (against Bulgaria!). This was considered a national disaster by the sports press. Now, a vigorous discussion on whether German football was still competitive began and attention towards the new defense system increased. The reporting on the advantages of the chain system grew and more and more coaches let their teams play the new system. Most of them were still experimenting, thus they often returned to the Libero-system after a couple of matches played with the chain system. But over time the chain system prevailed.

Nowadays the diffusion of the chain system appears completed. Almost every Bundesliga team is playing either with a four-link- or a three-link-chain-defense system at each match. Hence, it is justified to say that the chain system is now taken for granted and the institutionalization of this practice which belongs to the core technology of football organizations has finally reached German football – a laggard with respect to the implementation of the new defense system.

4 Hypotheses: Team Heterogeneity and Subgroup Strength in the Diffusion Process

It is common sense that the success of football teams relies to a great extent on the ability of their members to cooperate effectively. The mutual understanding and anticipation of the team members' moves is a decisive resource for effective team play. Thus, the development of a common perspective on the team's actions – the building of a "cohort" (Gibson and Vermeulen 2003) – is of extreme importance for the strength of a team. Moreover, successful changes in the team's practices require the common acceptance of the team members. In this respect, football teams are not different from other organizational teams. It only might be the case that these preconditions of a group's success and organizational change are more accentuated in sport teams than in other organizational groups.

Among analysts of team processes, there exists great consensus over the assumption that the development of common perspectives and innovativeness among team members is strongly dependent on the heterogeneity or homogeneity of the team members' demographical attributes. Therefore, we claim that besides the effect of the overall institutionalization of the chain-defense system, the adoption of this practice by German Bundesliga clubs is also determined by aspects of team heterogeneity and demographical attributes of team members. Moreover, we also claim that a successful implementation of this new defense system is also influenced by demographical variables.

In an integrating attempt to describe the importance of organizational demography for group formation, Williams and O'Reilly (1998) relate group processes and the outcomes of these processes to three different sociological concepts, namely social categorization, the similarity/attraction paradigm and information and decision making processes. While theories of social categorization and the similarity/attraction paradigm underscore that people have the need to identify themselves as belonging to a group of similar others and that similarity in attributes furthers satisfying interaction among group members, theories on information and decision-making point out that heterogeneous groups have stronger access to information and knowledge from external networks (see also Tsui et al. 1992). Since heterogeneity in teams leads to integration problems and unsatisfactory communication processes, members of such heterogeneous teams are inclined to seek communication with agents in the external environment to whom they are more similar than to their team colleagues.

With respect to group processes, homogeneity within teams should lead to greater contentment of team members and to an intensified and positively reinforced process of communication among members which should result in collective norms and perceptions. A couple of empirical studies support these considerations. For example, Chatman and Flynn (2001) found that heterogeneity early in the existence of groups has a negative effect on the perception of corporate norms while Bunderson and Sutcliffe (2002) showed that interpersonal diversity of team members' dominant work experiences lowers the amount of information sharing in teams. O'Reilly et al. (1989) found that homogeneity of groups leads to higher levels of social integration. As a consequence, turnover rates of employees increased with group heterogeneity, a result which was also found by Wagner et al. (1984). Strong contact and intensive communication between team members also leads to an amplified development of routines (Wiersema and Bantel 1992) which brings about an easier and quicker handling of procedures and a more secure execution of tasks as the learning curve literature proves (e.g. Yelle 1979).

However, a further effect of strong routinization is a greater propensity to overlook alternative, probably more suitable solutions to current problems because of improved competencies with prior solutions (Levitt and March 1988) and thus the development of inertia (Hannan and Freeman 1984) and resistance to change (Tushman and Romanelli 1985). Therefore, the limitation of within-group interaction and information sharing due to heterogeneous group composition should be accompanied with greater access to (innovative) information from outside and a greater variety of the group members' skills since the members' activities are not so strongly limited to certain routines. Moreover, the lower level of routinization in heterogeneous groups should also lead to a greater openness to innovations and a greater propensity to engage in organizational change. In accordance with these considerations it was found in various studies that heterogeneity in top management teams was associated with higher rates of strategic change or innovativeness (Wiersema and Bantel 1992; Boeker 1997; Goodstein and Boeker 1991; Hambrick et al. 1996; Bantel and Jackson 1989; but see Goodstein et al. 1994).

With respect to the spread of the chain system, it seems unlikely that homogeneous teams had limited access to information about this innovative element of team tactics since the media reported extensively about the new system. Thus, each professional football player and each team coach – the person who is responsible for determining a team's tactics – should have been able to come into contact with this new kind of defense organization.

Routinization processes, on the other hand, are especially prevalent in team sports. As already mentioned, the ability to execute certain collective moves or to perform special tricks (e.g. at a free kick) requires a lot of collective practice where team members communicate with each other and learn to adjust to other team members' actions. As a result, collective moves should be performed easier and without a lot of cognitive activity of each team player (Simon 1960).

Football teams therefore try to *routinize* the complex collective actions on the pitch. Homogeneity among team members should support this routinization process through a higher level of communication and information sharing at practice sessions. Since the introduction of an innovative playing system destroys the developed routines and the competitive advantages that were linked to them, neither the team members nor the coaches of teams with highly routinized playing capabilities should be especially keen to adopt such a practice.

In contrast, heterogeneous teams should not have developed the same amount of routines and should therefore be more open to innovative practices which are receiving increasing popularity through institutionalization processes. Accordingly, heterogeneous teams should be more inclined to install a playing system which is considered as *the* new way of efficient football playing.

As a result, we expect that during the diffusion process of the chain system, more homogeneous and therefore (supposedly) more routinized teams have a lower propensity to change from the traditional defense system to the chain system. We hypothesize:

> *H1: The rate of adoption of the chain-defense system increases with team heterogeneity.*

Team composition is not only characterized by the level of heterogeneity within the team but also by a team's tendency to build distinct fractions which differ from each other. This potential of fraction building is covered by the concept of subgroup strength (Gibson and Vermeulen 2003). This concept accounts for the fact that some team members may be very similar to a certain subgroup of the team on a variety of traits and very dissimilar to another subgroup of the team. Such a constellation results only in medium heterogeneity but in strong subgroup strength. One can expect that a high level of subgroup strength leads to a strong homogeneity and an increased interaction within a subgroup. The increased interaction of subgroup members, on and off the pitch, should enhance the similarity of the subgroup members' attitudes. Since resistance to change is a normal reaction of organizational members when innovations are planned (Kieser et al. 1998) increased subgroup strength should therefore lead to a more collective resistance against an innovation within the subgroup. Thus, the higher the subgroup strength within a team the more powerful the different subgroups should be in their ability to prevent an innovation from being implemented. We therefore hypothesize:

H2: The rate of adoption of the chain-defense system decreases with sub group strength.

However, as Tolbert and Zucker (1983) point out, the effects of certain organizational attributes on the adoption of institutionalized practices should be stronger at the beginning of an institutionalization process. At this time organizations with certain organizational characteristics are more likely to adopt the new practice than other organizations because adoption seems rational for organizations with these characteristics.

As the institutionalization process moves on, pressures to adopt a practice which is considered rational in the environment of an organization increase and organizations are forced to adopt an institutionalized practice, no matter whether their characteristics are adequate for it or not. During the observation period of our study almost all Bundesliga teams switched to the chain-defense system. Therefore we expect that the influences of team heterogeneity and subgroup strength on the adoption rate should diminish over time since institutionalization pressures increasingly force reluctant teams, i.e. teams with high levels of homogeneity or subgroup strength, to take over the chain system. We state:

H3a: The positive effect of team heterogeneity on the adoption rate reduces with time.

H3b: The negative effect of subgroup strength on the adoption rate reduces with time.

Since the tendency to retain a certain playing system should be higher the more this system has been engraved in the team members' movements and since such an engraving can only be accomplished by a routinization process, heterogeneous teams in general should have lower difficulties to switch between playing systems. Thus, the higher amount of volatility of heterogeneous teams should make them also more prone to play with the old Libero system again, e.g. if the team is not satisfied with the new system or if the coach thinks that a certain opponent is better faced with the old defense system. Therefore, we state:

H4: The rate of returning to the Libero system increases with team heterogeneity.

Consequently, the higher within group homogeneity in teams with high levels of subgroup strength should lead to a higher tendency to stick to the new playing system, once it has been introduced. Thus, we hypothesize:

H5: The rate of returning to the Libero system decreases with subgroup strength.

Since the hypothesized effects of heterogeneity and subgroup strength on the rate of returning to the Libero system are caused by different degrees of volatility and *not* by an institutional process, these effects should also be independent of time.

The consequences of organizational change and adaptation to institutional expectations on organizational performance have been extensively explored (Barnett and Carroll 1995; Walgenbach 2002). Also the effects of heterogeneity on team performance have attracted a lot of attention from researchers (Williams and O'Reilly 1998). However, there is a dearth of research into the question of whether heterogeneity or homogeneity of teams is helpful in implementing organizational change *successfully*. We now want to address this research question by arguing that a greater propensity of heterogeneous teams to take over innovations does not necessarily mean that these teams are also more successful in executing a new practice. On the contrary: There are good reasons to suppose that heterogeneity in teams leads to disadvantages in the exertion of innovations. The transition to a new system of collective action requires a lot of communication and interaction among team members. The collective acquisition of a new team practice, the adjustment of collective actions and the development of correct reactions to individual actions can only be achieved when the team members communicate intensively with each other. Since communication and information sharing is limited in heterogeneous teams, the members of these teams should find it difficult to become acquainted with a system with which they have no prior experience. Thus, the very processes which make heterogeneous teams more prone to innovations should work as a constraint in the successful execution of these innovations. Since the level of communication and interaction is higher in homogeneous teams these teams should find it easier to perform a new team practice once they have overcome their resistance to change and have adopted the innovation. Therefore we hypothesize:

H6: The performance consequences of the adoption of the chain system are worse for heterogeneous teams than for homogeneous teams.

We do not set up a hypothesis concerning the chain system's performance consequences of teams with a high level of subgroup strength because these consequences should be mixed. Positive consequences of within subgroup homogeneity should be offset by negative consequences of between subgroup heterogeneity.

5 Empirical Study

Our empirical study is based on a comprehensive dataset covering 11 Bundesliga seasons from August 1992 to May 2003. Each championship was contested by 18 different teams of which facing the others twice (once at home and once away). Consequently, a total of 306 matches per season were observed, giving a total of 3366 Bundesliga matches over 11 seasons. Due to the end-of-season relegation system which replaces the 3 worst performing teams by the 3 best performing teams of the lower division (Second Bundesliga), these 3366 matches were carried out by a total of 32 different football clubs which joined the first division within this 11 years period. For each match, a complete record of sports statistics has been provided by "Sport-Dienst-Agentur Merk", a commercial service agency which offers a wide variety of football data. Together with standard information about, i.a. match dates, match results, scorers and player substitutions, these statistics offer remarkable insights into the organizational demography of the analyzed teams. For each player brought into action during any match and for every participating coach the following characteristics have been recorded: Date of birth, nationality, curriculum vitae (signed Bundesliga-contracts), previous experience on the job (amount of participated Bundesliga matches) as well as previous successes on the job (titles won in the Bundesliga, in the German and European cup competitions).

Historical Bundesliga data for the chain system-adoption process have not been available until now. Therefore, additional sources of information had to be integrated into our dataset. Stylized playing-schemes have been routinely presented by the “kicker” magazine over the whole obersavation sample. However, these informations were not available in an electronic format, so we restricted our usage of kicker information to the first three years of our sample (kicker 1992-1995). Thereafter, beginning with the 1995/1996 season, we rely on playing schemes presented by the “digital tainment pool” on their commercially distributed “Freistoss” CD (digital tainment 2004). Based on these sources, we have been able to construct a cross section time series data set which traces the German chain system adoption process. The initial data set for the analysis of the adoption of the chain system consisted of *each* match since 1992 for *each* team, i.e. each match was considered *twice* in the data. However, we had to constrict this data set for several reasons discussed below.

5.1 Empirical Study: Methods

In order to test the hypotheses on the adoption of the chain system we estimated continuous time event history models (Blossfeld and Rohwer 2002). Thus, we estimated the “risk” of a team switching from the Libero system to the chain system. We did not distinguish between a four-link and a three-link-chain, but combined both into one single category. Since teams experienced this transition several times (teams often returned to the Libero system after they had adopted the chain system and then switched again to the chain system) we estimated multi-episode models. In these models the duration clock began to “tick” at the time the team appeared in the Bundesliga for the first time during the observation period. The clock was reset to zero each time a team returned to the Libero system. Thus, with the return to the Libero system a new episode began. The duration times ended when the teams switched to the chain system. Duration time was measured in number of matches minus one so that duration time began with zero. As the data consisted of all matches since 1992 for each team, this procedure required to take off all matches after a transition in which the teams continuously applied the chain system without interruption. When an interruption in the application of the chain system did occur, the transition process started anew.

Each club was only observed until it had to relegate for the first time. If a club did not relegate during the observation period (only seven clubs) we could use all matches in which these clubs took part. Thus, the final data set for the adoption analysis consisted of 3554 matches in which 31 Bundesliga teams experienced 373 transitions from the Libero system to the chain system. One team had to be dropped from the analysis because this team applied the chain system in all of the observed matches.

The analysis of the risk of returning from the chain system back to the Libero system was also undertaken with event history models. For this transition we used the reversed construction of the data set. Hence, all observations in which the teams continuously applied the Libero system after a transition from the chain system to the Libero system took place, had to be taken off the data. This resulted in a data set which consisted of 2687 matches of 24 Bundesliga teams. 360 transitions from the chain system to the Libero system occurred. The observations of eight teams had to be dropped since they applied the Libero system in all of the observed matches.

For both transitions we estimated exponential models and took duration time (*t*) as a covariate. Hence, the models had the following form:

$$r(t) = \exp(\alpha + \beta t + \gamma' x)$$

where α denotes the constant and x stands for a vector of time varying covariates, among them team heterogeneity. This model approximates a Gompertz model (Blossfeld and Rohwer 2002). In the results section we will present the effects on the natural logarithm of the hazard rate r(*t*).

It should be noticed that for our performance analyzes the above-mentioned restrictions do not apply. We are therefore able to present performance measures based on 3366 observed match results between the 1992/1993- and the 2003/2003-season. Stylized facts of these match outcomes have been visualized by the empirical distribution of the goal difference, defined as goals scored by the home team minus goals scored by the away team in Figure 1. The resulting histogram depicts three major issues which have to be regarded by our modeling approach: The discrete scale of the success measure, a significant home advantage (48.28% of the home teams won their matches whereas 27.09% of all encounters ended with a draw) and the high degree of randomness in football results (57.90% of all matches resulted in an absolute value of the goal difference less than two).

Figure 1 about here

In the last 50 years, all of these issues have already been discussed by sports economists (to our knowledge, Moroney (1956) presented one of the earliest attempts to model football results). Thus, we consulted the so-called “Balance in Competition” literature (see, e.g., Dobson and Goddard 2001, chapter 3, and the references therein) in our search for a suitable modeling framework. Finally, we decided to follow the suggestion of Koning (2000) who assumes the outcome (home loss, draw or home win) of an arbitrary match in an 18-team league as being determined by a latent random variable D_{ij}^* for which holds:

$$D_{ij}^* = \alpha_i - \alpha_j + \varepsilon_{ij}, \qquad \varepsilon_{ij} \sim N(0,1), \qquad i, j = 1, \ldots 18, i \neq j \qquad .$$

In the context of our research plan this specification represents some major advantages: First, with all of the individual characteristics of a team being captured by the strength parameter α (Strength of the home team: α_i , strength of the away team: α_j), our baseline performance models appear as parsimonious as possible. Second, the introduction of additional vectors of covariates x_i and x_j straightforwardly generalizes this approach to account for the additional impacts of team specific variables (see also Koning 2003, who resembles this approach to account for the effects of firing a coach). Furthermore, from a methodological point of view, the latent variable specification seems to provide a preferable framework as it explicitly accounts for the categorical character of our dependent variable and the high degree of randomness in football results: Under the assumption that an observed match result D_{ij} can be attributed to the latent difference in strength as

$$D_{ij} = \begin{cases} 1 & for \quad D_{ij}^* \leq c_1 \\ 2 & for \quad c_1 < D_{ij}^* \leq c_2 \\ 3 & for \quad c_2 < D_{ij}^* \end{cases},$$

with $D_{ij} = 1$ if the home team loses, $D_{ij} = 2$ in case of a draw and $D_{ij} = 3$ if the home team wins, we obtain a well defined ordered probit model which can be estimated by standard maximum likelihood procedures.

It should be noted however that it is not possible to identify all model parameters. Each individual strength coefficient α can be formally interpreted as team specific fixed effect estimator. Hence, some additional standardization is required: Dropping one club from our regressor list, the remaining α parameters may be estimated by the help of adequately defined dummy variables. As a result, we receive relative performance measures, with positive α parameters corresponding to a superior performance compared to the omitted "scaling" club.

Our model can now be understood as follows: Consider a match between two hypothetical teams i, j (with i denoting to the home team) of equal strength (i.e. $\alpha_i = \alpha_j$). With given limit points c_1 and c_2, the final result D_{ij} then has to be determined by mere chance as $D_{ij}^* = \alpha_i - \alpha_j + \varepsilon_{ij} = \varepsilon_{ij}$. Note, that the aforementioned home effect is now obviously linked to the limit points: Given the distributional assumptions about ε_{ij}, a limit point constellation of $c_1 = -c_2$ would assign equal probabilities to $D_{ij} = 1$ (home loss) and $D_{ij} = 3$ (home win).

Hence, a statistical significant home effect has to imply $c_1 \neq -c_2$. To test this hypothesis, we derived an overall ranking of the German Bundesliga clubs 1993-2003 (Table 1 in the appendix) by estimating the model over the whole sample period.[1] As can be seen from the last two rows of Table 1, the hypothesis $c_1 = -c_2$ indeed has to be rejected at any usual significance level. Furthermore, our estimates of the home effect in German football are astonishing close to Koning (2000), who reports limit points estimates of $\hat{c}_1 = -0.721$ and $\hat{c}_2 = -0.060$ for the whole history of Dutch premier league football up to 1996. As this specification assumes a constant home effect for all teams, we also performed a likelihood ratio test for the overall significance of additional team specific home effects. The resulting test statistic amounted to 28.9783 which corresponds to a p-value of 0.5703, so we do not have to reject our constant home effect-assumption.

However, whereas the results of Table 1 reproduce a descriptive ranking, one should bear in mind that these results also rest on the assumption that the teams' individual strength-parameters did not change over an eleven years horizon. This supposition can surely be doubted since it is obviously challenged by usual transfer activities, rapidly rising operating revenues and ongoing commercialization of German premier league football. Thus, we decided to base our performance models on a time varying team strength specification: For each season, 17 different strength parameters have been estimated, so that each of our performance models includes 187 individual team dummies.

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[1] Note the intrinsic merits of this kind of "all-time-ranking". Whereas usual league schedules have to rank relegated teams at the bottom as they rest on accumulated wins and draws, our estimates avoid this kind of bias (see, e.g. the Karlsruher SC which left the Bundesliga at the end of the 1997/1998 season. Yet, based on the relative club performance over six seasons, Karlsruhe has been ranked in front of 1860 München, which joined the Bundesliga in nine seasons of our estimation sample.

5.2 Empirical Study: Variables

All models contained indices of team heterogeneity and subgroup strength which were built according to a conception made by Gibson and Vermeulen (2003).

The heterogeneity index is a relational measure which covers the amount of differences among team members. Our index of team heterogeneity rests on the following players' characteristics: Tenure, overall tenure, age, nationality, experience and success. The tenure variable is measured as calendar days elapsed since the beginning of validity period of the current contract. However, as football professionals frequently change their employment status within the same division, an overall tenure variable, calculated as calendar days since beginning of the validity period of the first contract signed on this club, also considered those situations in which an actual employee returned to a team which he had already joined in the past. Age is measured in years whereas experience has been calculated as the number of Bundesliga matches a player had attended before the actual match. Finally, as a measure of a player's overall success, we include the number of titles won by each player before the actual match (German championship and cup competition, as well as the European Champions League and the UEFA Cup competition). In addition to these metric variables, we also accounted for team heterogeneity in terms of nationality.

Then, comparing each of these individual players' characteristics x_i with the corresponding ones of every active team mate in a particular match, we computed individual indices of overlap between every pair of players. For metric variables, this was done by computing ratios between the minimum and the maximum observation for any pair of players (i,j) (with $overlap_{i,j}=1$ for $\max(x_i,x_j)=\min(x_i,x_j)=0$). However, some scaling seemed advisable for us: The age variable, for instance, approximately covers an interval between 18 and 40. So, its "plain" overlap ratio could only range between 0.45 and 1. Yet, as we would like to analyze homogeneity indices ranging from zero to one, our concrete metric of overlap was calculated according to the following equation (with $\min_{sample}$ and $\max_{sample}$ denoting overall sample minima and maxima of variable x):

$$overlap_{i,j} = \frac{\min(x_i, x_j)}{\max(x_i, x_j)} - \frac{\min_{sample}}{\max_{sample}} \cdot \frac{1 - \frac{\min(x_i, x_j)}{\max(x_i, x_j)}}{1 - \frac{\min_{sample}}{\max_{sample}}} \quad .$$

For nationality, we set our measure of overlap to one for pairs with the same nationality and to zero otherwise. The results of these individual comparisons were summed up over all six variables, yielding a team vector of pair-wise overlap metrics. As the mean of this vector aggregates individual comparison data to a team-specific scalar-index, this mean has been interpreted as our measure of total team homogeneity whereas team heterogeneity was calculated as its inverse (see table 2 for descriptive statistics of our heterogeneity measures of the performance analysis).

Additionally, subgroup strength has been interpreted as the empirical standard distribution of a teams overlap vector. If all members of a team are dissimilar to each other to the same extent, there is only a low standard distribution of the overlap vector. However if some players are very similar to some other player but very dissimilar to another group of players the standard deviation of the total overlap pairs is high.

Table 2 about here

In addition to heterogeneity and subgroup strength, the following variables were used as covariates in both the transition and the performance models. In the performance models all variables were constructed for the home and the away team seperately. All variables were updated at each observed match.

Team tenure: The mean number of calendar days for which the players in the current match have continuously belonged to the club. Prior affiliation to the club was not considered.

Team age: The mean of the current player's age, in years.

Team experience: The mean number of prior Bundesliga matches which the players have experienced before the current match.

Team successes: The mean number of prior successes (wins of German championships, German cups, UEFA Cups or Champions League wins) of the current players.

Coach tenure: The mean number of days for which the current coach has continuously belonged to the club. Prior affiliation to the club was not considered.

Coach age: The age of the coach, measured in years.

Coach experience: The number of prior Bundesliga matches which the current coach experienced as a coach.

Coach's player experience: The number of Bundesliga matches which the current coach experienced as a player.

Coach successes: The number of the coach's prior successes as a coach.

Coach's player successes: The number of the coach's successes as a player.

Rank: The team's rank in the overall Bundesliga before the current match. (Bad teams have high ranks!).

Further additional variables of the performance models were:

Chain: A dummy variable indicating matches in which the observed team had chosen to apply the chain system.

Change: Number of new players in the line-up for the current match compared to the line-up of the foregoing match.

In order to test hypothesis H6 we interacted the chain variable with the heterogeneity variable. For exploratory reasons several other demographic variables have also been interacted with the chain variable.

The transition analyses contained additional covariates:

Duration: The number of matches before a team switches from the Libero system to the chain system -1 or the number of matches before a team switches from the chain system to the Libero system -1 respectively.

Episode index: The number of the current episode in which the team is playing with the Libero or chain system.

Time: Calendar time measured in days since the founding of the Bundesliga (05.09.1963). In order to test hypothesis H2, we interacted this variable with heterogeneity and for exploratory reasons with subgroup strength.

5.3 Empirical Study: Results

Figure 2 shows the enormous rise in occurrences of the chain system at Bundesliga matches over the observation period. In the last season observed, 2002/2003, there was hardly a match to be found where at least one of the two opponents played with the old Libero system. Thus, the end of the observation period marks the almost total diffusion of the chain system. Figure 2 also shows that the clubs differed in their tendency to switch between the two systems. Also the points in time from which on the clubs applied the chain system more or less continuously differs among the clubs.

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Figure 2 about here
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In figure 3 an example of the adoption pattern of the chain system is given for Bayern München, the top ranked club of table 1. The scatter plot exemplifies that clubs, after having adopted the chain system for the first time, did not play continuously with this system thereafter. In times when the chain system was still young and the amount of general experience with it was still low, the teams applied it only occasionally. Over time this pattern changed. Towards the end of the observation period the Libero system occurs only occasionally.

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Figure 3 about here
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Table 3 shows the results of the multivariate models of the adoption of the chain system. In the first model, only the main effects of team heterogeneity and subgroup strength are considered besides the duration variable and the other control variables. Neither the heterogeneity nor the subgroup strength variable exerts a significant influence on the rate of the chain system adoption. However, this picture changes dramatically when the interactions of these variables with time are included. Now the adoption propensity increases strongly with team heterogeneity and decreases strongly with subgroup strength. Over time the positive influence of heterogeneity and the negative effect of subgroup strength diminish significantly. Thus, the second model in table 3 gives ample support for hypotheses H1, H2 and H3. The institutionalization of the chain system leads to a situation in which the demographic aspects of heterogeneity or subgroup strength no longer play a role with respect to the adoption propensity. These variables are mostly important at the beginning of the institutionalization process, when the chain system was new and really innovative.

Moreover, the propensity to adopt the chain system decreases significantly with the number of matches a team has continuously played with the Libero system (Duration) and increases significantly with (calendar) time. The latter effect represents the process of institutionalization of the chain system which was already depicted in figure 2. Furthermore, it is especially the more successful teams – the teams with low values on the rank variable – which adopt the chain system. Model II also displays that coaches are more reluctant to implement the chain system when they had a lot of successes during their careers as players. Probably this makes coaches believe that a system which made themselves successful when they were active football players should work at later times as well. However this effect is only slightly significant. The other demographic variables do not exert a significant influence on the adoption rate.

Table 3 about here

Table 4 shows the results of the models for the transition from the chain system back to the Libero system. As supposed in H4 the propensity to return to the Libero system increases significantly with team heterogeneity. This result indicates that the higher volatility of heterogeneous teams makes them more prone to switch to the old system. Subgroup strength displays – as expected – a negative effect on this transition rate, which is not significant. Therefore H5 cannot be supported.

Again, the duration variable exerts a negative effect on the propensity of returning to the Libero system: Team tenure also has a significant negative effect. The longer the team members have played together the more likely it is that they stick to the new system once it has been adopted. Moreover, successful clubs have a lower tendency to return to the Libero system since the rank variable exerts a positive effect. This means that teams with high rank values (bad teams) are more prone to switch back to the traditional system. Finally team experience and coach experience lead to a slightly lower propensity of returning to the Libero system while prior successes of a coach lead to a slightly increased propensity to stick to the chain system.

Table 4 about here

Table 5 shows the results of the performance models. Recall that our ordered dependent variable D_{ij} ranges over integer values from one (home loss) to three (home win). Thus, a positive impact on the winning probabilities of the home team corresponds to positive parameter estimates. Consequently, judged by the estimates for model I which considers the main effects of our demographic variables, team heterogeneity significantly lowers the success probabilities of the affected team: The positive coefficient of the away teams' heterogeneity stands for a rise of the home teams' winning probabilities with increasing away teams' heterogeneity measures whereas the negative coefficient of home teams' heterogeneity corresponds to a lowering of the home teams' winning probabilities with increasing own heterogeneity. Yet, whereas team tenure and coaches' player experience appear to have a significant positive impact on their respective teams (the coaches' negative tenure effect might be owed to the fact that, after a short period of grace at the beginning of their agency, coaches are usually fired in times of prolonged disappointments), we can not detect a global chain-effect at any reliable statistical significance level. Thus, our data set will not afford an ultimate conclusion about the dependencies between innovation-induced performance consequences and team heterogeneity up to this point.

Regarding the remainder of the covariates it becomes evident that the performance of home teams increases with their rank and decreases in similar manner with the opponent's rank. This effect controls for the mean-reversion in league sports: Consider a team winning its first matches at the beginning of a season. As a result, the team might be ranked at position one. Yet, some of the matches won by our hypothetical team might just have been good luck as the German Bundesliga never saw any team beating all of its competitors. Thus, such a run of luck (which indeed is quite common to the Bundesliga) is likely to end in the near future.

The results for model II, which allows for additional interaction effects between the chain dummy and the remaining covariates of model I (except team line-up changes and coach tenure) are of interest on their own. Hypothesis H6 can not be supported by these results as we are not able to provide evidence for an additional heterogeneity-chain interaction. Instead of that, we detect a significant negative interaction effect of team tenure with the chain system. Moreover, away teams practicing the chain system appear additionally affected by team age (negative effect) as well as the coaches' former success (positive effect).

Table 5 about here
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6 Discussion

We conducted this study on the interplay of aspects of organizational demography and institutional change because we felt that previous investigations on the adoption of institutionalized practices neglected the influence of differences among organizational members. Our analysis with data on German Bundesliga teams showed that in fact heterogeneity of teams is an important aspect in influencing the willingness of a club to adapt to institutional developments. Heterogeneous teams have a higher propensity to switch from the Libero system to the chain-defense system at times when the chain system was new and innovative, thus showing that they are less reluctant to adopt an element of team play which is in the process of becoming institutionalized. However, heterogeneity of teams loses its influence on the adoption rate as this process moves on. Thus, the stronger the institutional pressure on Bundesliga teams, the less important the role of homogeneity or heterogeneity of teams with respect to the adoption probability.

Subgroup strength, which accounts for the fact that some team members can be very similar to a certain fraction of players but very dissimilar to other fractions, displays parallel effects. The within subgroup homogeneity leads to a greater resistance to change and thus to a lower propensity to adopt the newly developed defense system at the beginning of the institutionalization process. However, this reluctance of teams with high levels of subgroup strength diminishes over time since the institutionalization process also forces these teams to adopt the chain system.

Moreover, the greater volatility of heterogeneous teams makes them more likely to return to the traditional Libero system after they have adopted the chain system. The reasons for a return to the “old” Libero system and thus to a deviation from the institutionalized expectations could e.g. be the dissatisfaction of players or the conviction that some opponents can be better faced with the traditional system. We hypothesized that the greater within subgroup homogeneity of teams with high levels of subgroup strength should lead to negative effect of subgroup strength on the rate of returning to the Libero system. While the effect turned out to be negative the statistical significance did not suffice to get support for this hypothesis. As a consequence, heterogeneity turned out to be more influential on the rate of returning to the “anti-institutional” system than subgroup strength.

Finally we found that heterogeneous teams had no performance disadvantages when applying the chain system which runs counter our hypothesis. Thus, it is not the case that homogeneous teams are more capable of exerting the innovation than heterogeneous teams. We expected such an effect since we thought that although homogeneity leads to reluctance to the adoption of an innovation, it should also lead to better understanding of team mates actions once the new system has been implemented. However, we found that the mean tenure of the team members as well as the team member’s mean age lead to such performance disadvantages when the new system is applied. Older teams and teams whose members which play a long time together obviously find it harder to adapt to the new playing system. On the other hand, prior successes of the coach when he was a player himself lead to performance advantages when the chain system is applied. Perhaps, these coaches can better put themselves in the position of the players in the process of adopting a new playing system than other coaches.

We strongly believe that the analysis of organizational demography and the adoption and execution of innovations is not only relevant for Bundesliga football teams. Other smaller organizations or profit centres of companies whose team structures are comparable to those of football teams should exhibit similar processes. Thus, we think that there is an ample new field within organizational research which could be explored in the future.

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Appendix: Tables and figures

Table 1: German Bundesliga, Overall Club Ranking 1993–2003

Club	***Coefficient***	***Std. Error***	***Z-Statistic***	***p-Value***
Bayern München	0.5525	0.0838	6.5973	0.0000
Borussia Dortmund	0.3120	0.0825	3.7836	0.0002
Bayer Leverkusen	0.2546	0.0819	3.1069	0.0019
Hertha BSC Berlin	0.1921	0.1000	1.9211	0.0547
1. FC Kaiserslautern	0.1570	0.0843	1.8617	0.0626
Werder Bremen	0.1220	0.0820	1.4876	0.1369
FC Schalke 04	0.0493	0.0813	0.6057	0.5447
VfB Stuttgart	0.0385	0.0817	0.4714	0.6373
Karlsruher SC	0.0358	0.0982	0.3644	0.7156
VfL Wolfsburg	0.0222	0.0986	0.2248	0.8221
TSV 1860 München	-0.0432	0.0865	-0.4988	0.6179
Hannover 96	-0.1281	0.2055	-0.6234	0.5330
Spvgg Unterhaching	-0.1747	0.1524	-1.1460	0.2518
Mönchengladbach	-0.1003	0.0867	-1.1580	0.2469
Eintracht Frankfurt	-0.1238	0.0939	-1.3182	0.1874
Hansa Rostock	-0.1328	0.0899	-1.4777	0.1395
SSV Ulm 1846	-0.3140	0.2103	-1.4935	0.1353
SC Freiburg	-0.1365	0.0899	-1.5195	0.1286
Fortuna Düsseldorf	-0.2747	0.1505	-1.8249	0.0680
MSV Duisburg	-0.2087	0.0987	-2.1142	0.0345
1. FC Köln	-0.1975	0.0904	-2.1852	0.0289
FC Saarbrücken	-0.4921	0.2043	-2.4087	0.0160
Union Cottbus	-0.3537	0.1307	-2.7067	0.0068
Wattenscheid 09	-0.4198	0.1541	-2.7247	0.0064
Arminia Bielefeld	-0.3237	0.1149	-2.8168	0.0049
VfL Bochum	-0.2792	0.0944	-2.9576	0.0031
Dynamo Dresden	-0.3937	0.1278	-3.0815	0.0021
1. FC Nürnberg	-0.3415	0.1063	-3.2120	0.0013
VfB Leipzig	-0.8030	0.2180	-3.6832	0.0002
Bayer Uerdingen	-0.4858	0.1296	-3.7501	0.0002
FC St. Pauli	-0.4929	0.1299	-3.7940	0.0001
C_1	-0.7294	0.0243	-30.0236	0.0000
C_2	0.0461	0.0221	2.0866	0.0369

Note: Performance Measured in Relation to Hamburger SV

Table 2.a: Heterogeneity (Home Teams) - Descriptive Statistics

Season	***Mean***	***Median***	***Max***	***Min.***	***Std. Dev.***	***Obs.***
1993	0.2333	0.2311	0.2817	0.1843	0.0202	306
1994	0.2340	0.2331	0.2859	0.1820	0.0219	306
1995	0.2374	0.2385	0.2815	0.1934	0.0209	306
1996	0.2372	0.2382	0.2913	0.1892	0.0198	306
1997	0.2427	0.2424	0.3011	0.2017	0.0198	306
1998	0.2520	0.2496	0.3024	0.2134	0.0190	306
1999	0.2512	0.2489	0.2985	0.2087	0.0180	306
2000	0.2519	0.2465	0.3130	0.2057	0.0225	306
2001	0.2525	0.2469	0.3163	0.2089	0.0213	306
2002	0.2534	0.2517	0.3093	0.2060	0.0192	306
2003	0.2529	0.2514	0.2929	0.2245	0.0148	306
Whole Sample	0.2453	0.2447	0.3163	0.1820	0.0214	3366

Table 2.b: Heterogeneity (Away Team) - Descriptive Statistics

Season	***Mean***	***Median***	***Max***	***Min.***	***Std. Dev.***	***Obs.***
1993	0.2330	0.2299	0.2792	0.1891	0.0194	306
1994	0.2333	0.2337	0.2832	0.1818	0.0216	306
1995	0.2366	0.2364	0.2845	0.1900	0.0202	306
1996	0.2367	0.2366	0.2868	0.1900	0.0201	306
1997	0.2427	0.2427	0.3000	0.2009	0.0197	306
1998	0.2517	0.2503	0.3055	0.2114	0.0188	306
1999	0.2508	0.2494	0.3012	0.2042	0.0181	306
2000	0.2518	0.2471	0.3065	0.2078	0.0221	306
2001	0.2515	0.2461	0.3079	0.2024	0.0209	306
2002	0.2533	0.2517	0.3136	0.2048	0.0197	306
2003	0.2518	0.2490	0.2944	0.2198	0.0148	306
Whole Sample	0.2448	0.2443	0.3136	0.1818	0.0212	3366

Table 3: Exponential Models of the Adoption of the Chain System

Variable	Model I Coefficient	Model I p-Value	Model II Coefficient	Model II p-Value
Duration	-0.0242	0.000	-0.0232	0.000
Heterogeneity	**3.4414**	**0.358**	**161.9391**	**0.001**
Heterogeneity*Time			**-0.0123**	**0.001**
Subgroup strength	**0.0764**	**0.900**	**-27.2859**	**0.000**
Subgroup strength*Time			**0.0021**	**0.000**
Team tenure	0.0002	0.272	0.0003	0.119
Team age	0.0299	0.611	0.2930	0.619
Team experience	-0.0018	0.407	-0.0024	0.268
Team successes	0.0229	0.846	-0.0112	0.924
Coach tenure	-0.0001	0.207	-0.0000	0.832
Coach age	-0.0113	0.302	-0.0081	0.470
Coach experience	-0.0000	0.993	-0.0005	0.492
Coach’s player experience	0.0004	0.357	0.0002	0.671
Coach successes	-0.0095	0.880	0.0169	0.792
Coach’s player successes	-0.0698	0.120	-0.0754	0.093
Rank	-0.0513	0.000	-0.0508	0.000
Episode index	0.0102	0.238	0.0110	0.225
Time	0.0007	0.000	0.0020	0.007
Constant	-10.8089	0.000	-28.4647	0.002
Log Likelihood	-513.432		-506.2099	
LR Statistic	375.42	0.000	390.29	0.000
Number of events	371		371	
Number of observations	3554		3554	

Table 4: Exponential Model for Returning to the Libero System

Variable	Coefficient	p-Value
Duration	-0.0376	0.000
Heterogeneity	**7.5739**	**0.037**
Subgroup strength	**-0.4497**	**0.461**
Team tenure	-0.0008	0.000
Team age	0.0282	0.646
Team experience	0.0039	0.074
Team successes	0.1718	0.170
Coach tenure	0.0000	0.723
Coach age	-0.0061	0.610
Coach experience	0.0012	0.097
Coach’s player experience	0.0005	0.271
Coach successes	-0.1097	0.096
Coach’s player successes	-0.0170	0.719
Rank	0.0292	0.012
Episode index	-0.0070	0.477
Time	-0.0005	0.000
Constant	2.8475	0.157
Log Likelihood	-502.2956	
LR Statistic	204.9	0.000
Number of events	360	
Number of observations	2687	

Table 5: Results for the Performance Models

	Model I		Model II	
Variable	Coefficient	p-Value	Coefficient	p-Value
Heterogeneity	-7.2812	0.0004	-8.3522	0.0006
Heterogeneity (Away Team)	5.6995	0.0055	4.8451	0.0464
Team Tenure	0.0004	0.0016	0.0006	0.0001
Team Tenure (Away Team)	-0.0003	0.0217	-0.0005	0.0011
Coach Tenure	-0.0002	0.0004	-0.0002	0.0009
Coach Tenure (Away Team)	0.0003	0.0000	0.0002	0.0001
Coach's Player Exp.	0.0009	0.0027	0.0007	0.0153
Coach's Player Exp. (Away Team)	-0.0007	0.0208	-0.0004	0.1615
Rank	0.0570	0.0000	0.0569	0.0000
Rank (Away Team)	-0.0585	0.0000	-0.0590	0.0000
Changes	-0.0383	0.0213	-0.0393	0.0184
Changes (Away Team)	0.0257	0.1177	0.0267	0.1057
Chain	-0.0540	0.3555	0.4224	0.7149
Chain (Away Team)	0.0814	0.1600	-2.7601	0.0150
Chain*Heterogeneity			**3.0294**	**0.2668**
Chain*Heterogeneity (Away Team)			**1.3194**	**0.6230**
Chain*Tenure			-0.0003	0.1050
Chain*Tenure (Away Team)			0.0003	0.0763
Chain*Age			-0.0335	0.3711
Chain*Age (Away Team)			0.0822	0.0259
Chain* Coach's Player Success			0.0289	0.2536
Chain* Coach's Player Success (A.T.)			-0.0609	0.0123
C_1	-1.0216	0.0070	-1.4729	0.0028
C_2	-0.1804	0.6336	-0.6280	0.2023
Log Likelihood	-3134.2382		-3124.1151	
LR Statistic	719.8963	0.0000	740.1425	0.0000
No. of Parameters	203		211	
No. of Observations	3328		3328	

Note: The Results for Additional 187 Individual Strength Estimators have been Omitted.

Figure 1: Empirical Distribution of the Goal difference

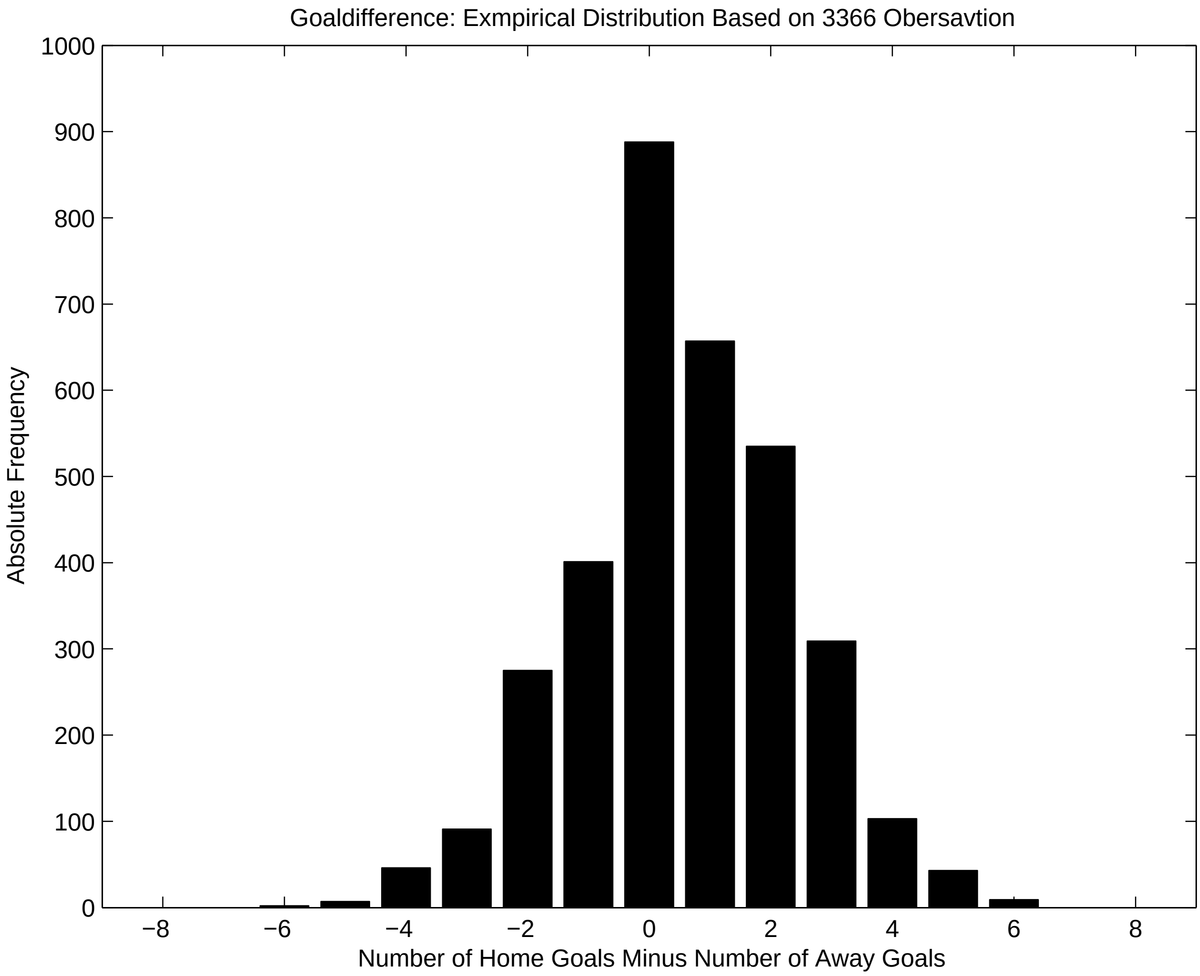
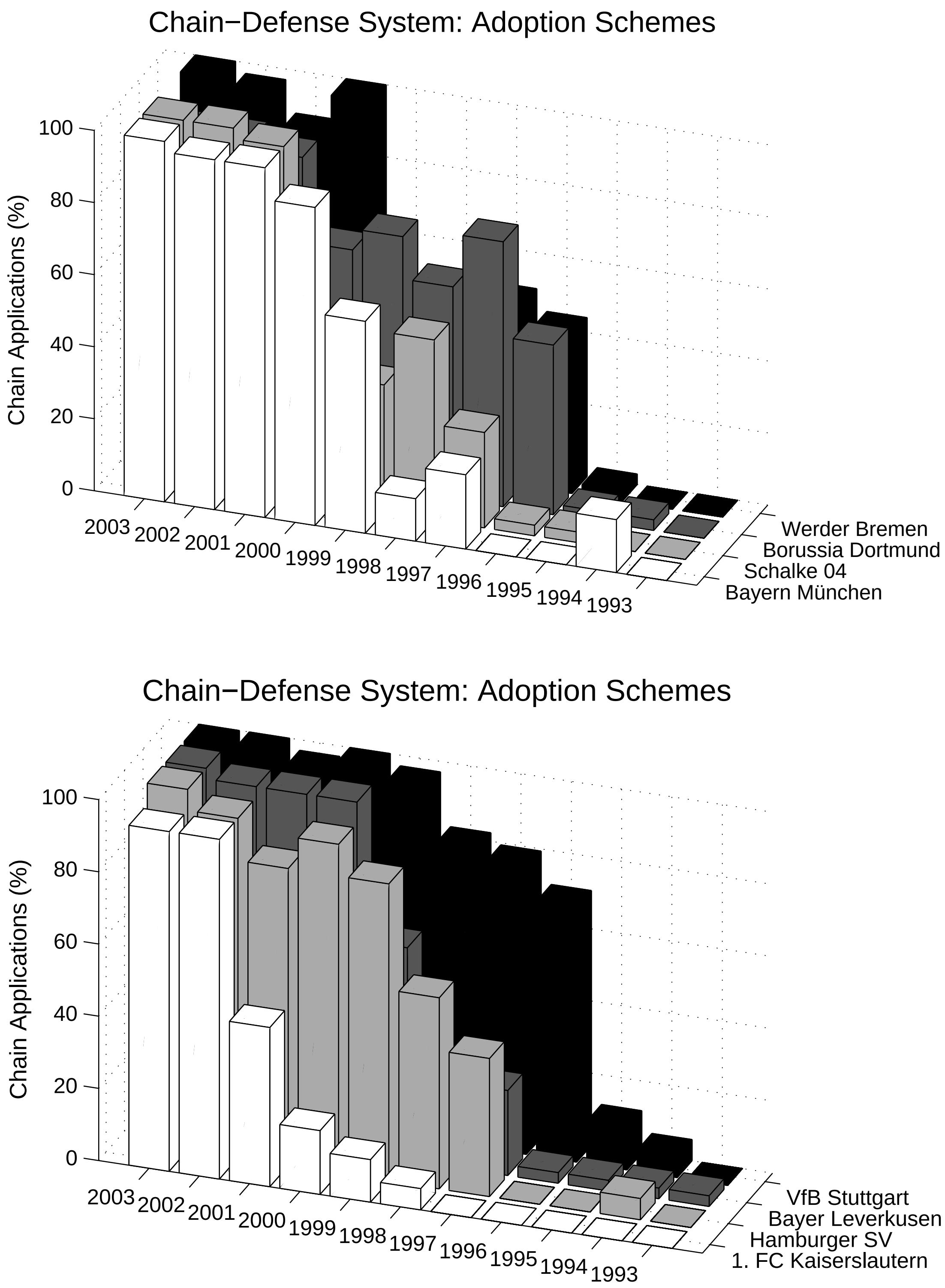


Figure 2: Cumulated Individual Adoption Patterns 1993-2003



Note: Due to the Relegation System, 1. FC Kaiserslautern was not Observed in 1996/1997.

Figure 3: Exemplary Adoption Pattern over the Whole Sample Period