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Contest Incentives in European Football

Arne Feddersen
University of Southern Denmark

Brad Humphreys
University of Alberta

Brian Soebbing
Louisiana State University

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Arne Feddersen[*] Brad R. Humphreys[†] Brian P. Soebbing[‡]

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Abstract

We examine the effects of financial incentives on effort supplied by football clubs in European domestic leagues. Tournament theory predicts that the amount of effort supplied varies with returns to effort. We analyze variation in 31,746 domestic league match outcomes in ten European leagues over eleven seasons, exploiting the actual standings on the league table to generate variables reflecting incentives to provide effort in each match. Results from ordered logit regressions indicate that the effort implied by observed match outcomes support the predictions of tournament theory in this setting; clubs supply more or less effort in response to changes in incentives.

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Keywords: Effort supply, football, UEFA Champions League

1 Introduction

The structure of sports leagues creates incentives that induce teams to try to win as many matches as possible over the course of the regular season. Examples

[*]University of Southern Denmark, Department of Environmental and Business Economics, Niels-Bohrs-Vej 9, DK-6700 Esbjerg, Denmark; E-mail: af@sam.sdu.dk

[†]University of Alberta, Department of Economics, 8-14 HM Tory Building, Edmonton, T6G 2E5, Canada; E-mail: brad.humphreys@ualberta.ca

[‡]Louisiana State University, Department of Kinesiology, 112 Long Fieldhouse, Baton Rouge, LA, 70803, USA; E-mail: bsoebb1@lsu.edu

include non-linear payoffs for order of finish, where the league champion receives an exceptionally large payoff, the second place team receives a much smaller payoff, and so on, financially lucrative post-season and inter-league tournaments that include only the teams with the best record in the regular season, promotion and relegation systems that lead teams at the bottom of the league table to provide additional contributions at the end of the season in order to avoid relegation, and other incentives. Szymanski (2003) observed that sports leagues want teams to provide maximum contribution throughout the regular season in order to maintain the interest of existing fans and attract new fans to the sport, ensuring the long-run financial health of the league and the sport. Top-level sports leagues also strive to produce matches played at the highest possible level of play.

However, sports economists since Rottenberg (1956) recognized that the staging of matches played at the highest level with maximum contribution by teams is not the only goal of sports leagues. Sports leagues must also organize matches between teams of relatively equal strength, which requires that the distribution of playing talent across teams in a league must be relatively equal. Policies designed to equalize the distribution of playing talent can have unintentional consequences for the provision of effort. For example, the presence of reverse-order entry drafts in North American sports leagues induces teams to intentionally lose games at the end of the season to improve draft position (Taylor & Trogdon, 2002; Price, Soebbing, Berri, & Humphreys, 2010; Soebbing & Humphreys, In press).

In addition, the contribution made by sports teams is costly, creating a disincentive for teams to provide maximum contribution in every match if the incentives vary across matches.[1] The presence of league policies designed to increase

[1]We refer to the contribution made by teams as "effort" in keeping with the terminology used in the analysis of individual sports like running or golf. In a team sport context "effort" also includes tactical decisions made by coaches and managers including the players used, the

the incentives for teams to supply maximum effort do not apply uniformly across all matches; specific details of leagues' postseason appearance policies, the nature of inter-league tournament design, the number of teams included in the leagues' relegation scheme, and typical variability in the league table lead to variation in the incentives to supply effort across matches. The combination of strictly increasing costs associated with effort and variability of benefits associated with effort can create an incentive for teams in sports leagues to provide a lower than optimal level of effort, from the perspective of the league, in some regular season matches. The model developed by Fershtman and Gneezy (2011), which applied to a similar situation in high payoff contests where contestants observe the effort and ability of their opponents, can be applied here to motivate our analysis. His model predicted that participants in a contest would sharply reduce effort supplied when the perceived value of winning the contest was reduced, even in the presence of social stigma associated with the effort reduction. Football teams clearly face social stigma from fans, and perhaps peers, when supplying low levels of effort.

We analyze regular season match outcomes in the top domestic football leagues in ten European countries over eleven seasons to develop evidence that teams supply varying levels of effort in certain matches depending on the financial incentives in place. We posit that effort supplied in individual matches can be inferred form the probability that a team wins a match after accounting for the relative quality of the teams, other match-specific factors, and unobservable random factors. We exploit features of the domestic league, intra-league, and international football fixtures and specific details of league promotion and relegation policies to identify matches in which the incentives for teams to provide effort are weak. The present analysis is the first to use data from multiple

style of play employed in specific games, substitutions, the pace of play, and other short run decisions made by coaches and managers that affect performance.

European professional football leagues to investigate effort supplied by football teams. Fershtman and Gneezy (2011) performed a similar analysis of dynamic tournament incentives but only in experimental setting.

Ordered logit regressions based on a sample of 31,746 European domestic football league matches from ten European countries reveal systematic evidence that teams supply less effort in matches where the incentives are weak, supporting the idea that, despite leagues' efforts to design competitions featuring maximum effort supplied by teams throughout the regular season, the presence of effort-enhancing policies also creates unequal financial returns to effort across matches, and generates unintended incentives for teams to supply less than maximum effort in some matches.

The remainder of the paper is organized as follows. Section 2 gives a brief review of the theoretical and empirical literature on tournament theory without and with relation to sports, summarizes the core elements of tournament theory as developed by Lazear and Rosen (1981) in their seminal paper, and, finally, relates the current reward structure in European football to tournament theory. Section 3 introduces the data and empirical strategy. Section 4 presents the empirical evidence, while Section 5 concludes and offers areas for future empirical research.

2 Contest Incentives in Team Sports Leagues

2.1 Literature Review

As pointed out by Alchian (1988) and Kahn (2000), sport seems to be a promising area for empirical analysis of the monetary incentives and, furthermore, some of the most fascinating empirical evidence on links between incentives to and effort comes from sport. Individual sports like golf, tennis, distance running, bowling, and motor sports had been the subject of much empirical research motivated by tournament theory. Frick (2003) and Frick and Simmons (2008) contain thorough surveys of tournament theory literature. Starting in the early 1990s, several studies showed empirically that as the difference in rewards for winning and losing in a sporting contest increased, the effort level increased. First, Ehrenberg and Bognanno (1990a) and Ehrenberg and Bognanno (1990b), using data from the professional golf, demonstrated that the level and the reward structure influences players' performance, while controlling for players' and opponents' quality, course difficulty, and external influences. Also using golf data, McFall, Knoeber, and Thurman (2009) showed that – after the introduction of the season-ending PGA Tour Championship – players who won early in the season had incentives to exert additional effort and performed better over the course of the season, since entry into this "grand prize" tournament was restricted to the top-thirty players of the money ranking. Furthermore, they found that players who clinched a spot in the final tournament showed less effort compared to those players still competing for qualification.

For contests in individual sports, distinguishing between incentive effects and sorting effects is important. Sorting means that better players tend to compete in tournaments with higher absolute rewards. Maloney and McCormick (2000), using data on foot races from one mile to full marathon distances, reported findings consistent with both sorting and tournament incentives. In contrast, using distance running data from more than one hundred events from 5km to full marathon, Lynch and Zax (2000) showed a positive effect of offering a higher prize to competitors can be attributed to sorting effects rather than incentive effects. As sorting is not an issue in a contest like a team sports league, this hypothesis does not apply to the present analysis. Motor sports was also used as a setting to test tournament theory. For example, Becker and Huselid (1992) examined the influence of differences in rewards on both driver performance and safety in NASCAR racing. They confirmed that the reward spread had incentive effects on individual driver performance.

Prior research on the supply of effort in team sport – in particular the idea that some league policies create unintended incentives for teams to undersupply effort in some games – primarily focused on two specific league policies, amateur player drafts and postseason tournaments in North American and Australian sports leagues. Research examining incentives generated by reverse-order amateur entry drafts in the National Basketball Association (NBA) and Australian Football League (AFL) produced mixed results. Taylor and Trogdon (2002) and Price et al. (2010) found that NBA teams, once eliminated from playoff consideration, responded to incentives generated by entry drafts to lose games late in the regular season to improve their chances of receiving a higher amateur draft pick. Soebbing and Humphreys (In press) examined the incentive effect on sports betting markets. They found that bookmakers altered the point spreads of NBA regular season games due to the belief of teams not putting forth maximum effort late in the regular season. In the AFL, Borland, Chicu, and Macdonald (2009) found that AFL teams did not appear to respond to a similar incentive.

Balsdon, Fong, and Thayer (2007) analyzed game outcomes in NCAA men's basketball postseason conference tournaments for evidence that higher seeded teams intentionally lost games in the conference tournament. The winner of the postseason conference tournament received the league's automatic bid to the NCAA tournament. The remaining spots in the NCAA tournament were filled with "at-large" teams, teams who had strong regular season records but did not win their conference's postseason tournament. Thus, teams who finished first in the conference standings did not need to win the conference tournament as they would receive one of the "at-large" berths. However, if lower finishing team could win the conference tournament and gain an automatic berth to NCAA tournament, that would increase the amount of money all conference member teams received. Balsdon et al. (2007) hypothesized that intentionally losing games by top conference finishers was done to either rest their players or for profit motivations as each game in the 2010 tournament was worth USD 222,206 a year for six years. That makes each game worth USD 1,333,236. That money goes to the team's conference, which then distributes the money to all conference members regardless of if they made the NCAA tournament (Rovell, 2010). The results showed that higher seeds supplied less effort in response to economic incentives. Van Ours and Tuijl (2011) reported evidence that national football teams supplied different levels of effort in the final minutes of football matches.

Previous research also examined the supply of effort by individual athletes. Duggan and Levitt (2002) examined elite Japanese sumo wrestling for evidence of match fixing, which involve supplying less effort. In elite Japanese sumo wrestling, achieving a winning record (eight wins in fifteen total matches) in a tournament brought a higher payoff. As a result, Duggan and Levitt (2002) found that sumo wrestlers who were on the verge of their eighth win (achieving a winning record) won a disproportionate number of matches. In a follow-up study, Dietl, Lang, and Werner (2010) confirmed these findings. Within team sports, individual players may also have an incentive to supply less effort. Previous research on individual players in team sports focused mainly on the performance of players who have signed guaranteed long-term contracts. With a guaranteed long-term contract, players would receive their salary no matter their performance level. The results from previous research that examined effort supplied by players was mixed for both Major League Baseball and the National Basketball Association. Examples of the previous research include Krautmann (1990), Scoggins (1993), Marburger (2003), and Berri and Krautmann (2006).

2.2 The Reward Structure in European Football

In open European football leagues, different explicit and implicit rewards are associated with specific positions in the final league table. Even if, from a sporting perspective, winning the league championship represents the primary reward which generates huge gains in reputation, it might not be the primary financial reward. For example, television rights might also affect financial outcomes in football leagues (Falconieri, Palomino, & Sákovics, 2004). Since the introduction of the reformed UEFA Champions League (UCL) in the 1999-2000 season, winning the domestic championship lost its financial supremacy compared to finishing in one of the top-n table positions that qualify for the UCL in each domestic league. Note that n, the number of teams that qualify for the UCL from a domestic league, varies across leagues and seasons, depending on a league's previous success in the pan-European cup competitions. Pawlowski, Breuer, and Hovemann (2010) analyzed the general implications on European football leagues after the UCL modification. From the start of this competition under the label "European Champion Clubs' Cup" in 1955-56 until 1996-97, only the domestic league champion qualified for this most prestigious pan-European football club competition. The following two seasons, eligibility was expanded to include the runners-up from the largest domestic leagues. Currently, up to four teams from the domestic leagues qualify for the UCL. After the expansion of the UCL, the payouts for participating clubs increased dramatically.

The rewards to successful participants in pan-European club competitions and the guaranteed payout from UCL participation are large. Each team participating in the group stage of the UCL receives a participation bonus of €3.8 million plus a match bonus of €550,000 per group game played. In total a team that competed in the UCL group stage (guaranteed six matches per team) is likely to receive a minimum payout of €7.1 million. Successful teams reach the next knockout round and obtain further performance bonuses which increases as the tournament progresses. These rewards amount to €3 million for qualifying for the round of 16 to €9 million for the winner.

Beyond the participation and performance bonuses, all football clubs participate in the UCL "market pool." For the 2009-10 season, this pool had a value of €343 million (UEFA, 2011). Funds from the pool were distributed according to the proportional value of each TV market represented by the clubs taking part from the group stage onwards. A given domestic league share will then be split between its participating clubs. This revenue sharing agreement leads to a situation where teams from large TV markets like England, Italy, Spain, and Germany obtaining significantly larger total UCL revenues than equally successful teams from smaller TV markets like Portugal or Russia. As a result, a situation could occur where a team from a small TV market is performing well but will be out earned on market pool revenues by a less successful large market team. In the season 2003-04, for instance, Portuguese FC Porto won the UCL and received total UCL revenues of €19.7 million. In the same season Manchester United was eliminated at the end of the round of 16 but earned €27.9 million from the UCL market pool. Based on recent market pool payouts to domestic leagues, the largest TV market and payout was, by far, England with €83 million followed by Italy (€51 million), Spain (€49 Million), and Germany (€47 million). France, in fourth position on the list trails with €28 million from the market pool. The amounts are even smaller for other domestic leagues like Greece (€15 million), Portugal (€9 million), and the Netherlands (€7.5 million). The market pool share of the smaller domestic leagues must be divided by fewer teams due to the qualification rules.

The financial significance of UCL revenues for qualifying clubs can be illustrated by the following figures from the 2009-10 season. For this season, the average payout for participating teams was more than €23 million. The minimum payout (€8.5 million) was received by Israeli club Maccabi Haifa FC which lost all six pool matches. Maccabi Haifa FC received the guaranteed €7.1 million for participating in the group stage and an additional €1.4 million from the market pool. The winner of the 2009-10 UCL, FC Internazionale Milano, collected the largest payout, €48.8 million, including €20 million from the market pool. Compared to the overall revenues of clubs (Deloitte, 2011), UCL revenues make up a large part of the clubs' total revenues. The share of total UCL revenues in overall club revenues lies between 6.1% (Real Madrid) and 21.7% (FC Internazionale Milano), and FC Barcelona (9.8%) is the only club in addition to Real Madrid with a UCL revenue share below 10%. Even large market teams, which were eliminated early, like FC Liverpool, Olympique de Marseille, and Spainish Club Atletico de Madrid, showed a UCL revenue share of about 12%. It can also be shown that the UCL revneues are as important for teams from small TV markets. For example, in the 2004-05 season, Dutch club Ajax Amsterdam was eliminated after the group stage and obtained €7.8 million in UCL revenues including "just" €3.8 million from the market pool.[2] Compared to its overall revenues of €67.0 million, UCL revenues accounted for 11.6% of the total revenues earned by Ajax Amsterdam. Similar shares can be observed for other small TV market clubs like Portugese FC Porto (10.5%) and Scottish Celtic FC (11.5%), which were eliminated in the UCL round of 16 and the group stage respectively. If a team from a relatively small TV market like the French club Olympique Lyonnais is relatively successful, for example reaching the quarter finals, the UCL revenue share the team receives can be more than 20% of total revenues.

Even the Europa League, formerly the UEFA Cup, the second level pan-

[2]As data on revenues for clubs outside the top 20 revenue generating clubs is hard to find, revenue figures for the 2004-05 season, which published by Forbes (2011), have been used.

European club competition organized by UEFA, should be financially attractive enough to generate strong incentives for clubs to perform in the domestic league. Generally, teams with final domestic league positions below the UCL qualifying positions enter the Europa League competition. The overall revenues distributed by UEFA to Europa League participants are much smaller than for the UCL, but successful teams from larger leagues can accumulate additional revenues of €7 million to €10 million from Europa League participation. Europa League revenues typically account for 5% to 12% of overall club revenues. For example, 2009-10 Europa League winner English FC Fulham received €10.6 million in Europa League revenues, which was 11.2% of total revenues, German contender Hamburger SV's Europa League revenues accounted for 5.5%, and SV Werder Bremen's share was 7.5%.

Based on this evidence, we posit that the financial reward from qualifying for one of the two pan-European cup competitions generates enough additional revenues to generate significant incentives to finishing the regular season within the top-n positions in domestic league competitions. The presence of these incentives will lead to variability in the incentives for teams to supply effort over the course of the regular league season. In addition, the possibility of being relegated to a lower division will also provide variable incentives to teams to provide effort over the course of a season. Given an increasing cost to providing effort, teams could be expected to provide a variable level of effort in matches, depending on the specific effects of the incentives operating when that match is played. Taken together, the impact of these incentives on the supply of effort generates testable hypotheses: if matches with different incentives to win can be identified, match outcomes should vary systematically with these incentives, after controlling for other factors like team quality that affect match outcomes. The differential in incentives should be the strongest at the end of the regular season, when the good teams have been separated from the bad over the course of the season and the expected reward from additional effort is clearest. Below we formalize the nature of these rewards in the context of tournament theory, develop research hypotheses, and test these hypotheses using data from football match outcomes in European domestic leagues.

2.3 Tournament Theory and Sports Leagues

Following Lazear and Rosen (1981), and specifically the model developed by Szymanski (2003), the output of a professional sport team depends on deterministic and random components. The deterministic component can be linked to effort put forth by the team and the random component to events that coour in competitions outside the control if the participants. In a simple two-team tournament, the teams are rewarded for performance with two prizes, W_1 and W_2, where $W_1 > W_2$. The larger prize is awarded to the better performing team and the smaller prize to the poorer performing team. According to Knoeber and Thurman (1994), the probability that a team wins the larger prize, i.e. performs better, depends positively upon its own actions, negatively upon the actions of its opponent, and also on the distribution of the random component of performance. Starting from this point, three predictions emerge from tournament theory models. First, effort depends positively upon the prize differential $(W_1 - W_2)$ but is unaffected by changes in the absolute level of prizes that leave this differential constant. Second, effort depends negatively upon the marginal cost of effort. Third, effort depends upon the effect of increasing effort supplied on the probability of winning. Given the structure of rewards, the strategies of the teams can be interpreted as as a non-cooperative Nash equilibrium, whereas the stability of this equilibrium requires a certain level of uncertainty of outcomes. As stated by Frick (2003), if the outcome is too deterministic, each team believes that winning the contest can be guaranteed by exerting only slightly more effort than the opponent.

Previous research applied tournament theory to individual sports like golf, bowling or, most commonly, running. In this setting, the effort supplied by individual athletes was captured by the time it took runners to complete the designated distance, or the score. In the case of golf, lower scores indicated more effort supplied and, in the case of bowling, higher scores indicated more effort supplied. Since we apply tournament theory directly to team sports, the mechanism through which teams provide additional effort is important. We posit that teams supply variable levels of effort through three mechanisms. First, the existing players on the field can provide more individual effort. Football players can run faster, jump higher to reach long passes, defend the goal with more ferocity, tackle harder, and so forth. Second, the team manager can selectively use different sets of players to provide different levels of effort in matches. European football teams do not have roster limits, so the manager of a professional football club has many potential combinations of players that could be used in any given match. Different combinations of players could generate different levels of effort depending on the ability of different players, if talent is heterogenous, or through the ability of different players to interact and carry out the strategy and tactics decided on by the team manager. Finally, the transfer system in place in European football allows teams to vary the quality of players on the roster over the course of a season by either buying or selling players for cash through the transfer window. The mid-season transfer window in European leagues typically includes the month of January. At this point, a club can observe the amount of effort that can be generated by the existing roster and add or subtract players depending on the situation of the club. Since most of our incentive variables are defined for the end of the regular season, after the transfer window has closed, this type of variability of effort supply is not applicable. However, we believe that the other two mechanisms provide football clubs the ability to systematically vary effort in games. In addition, most of our empirical analysis focuses on situations where the club faces an incentive to reduce the amount of effort supplied; for example in cases where a spot in a pan-European competition has already been secured or when the club will definitely be relegated at the end of the season. Both individual players effort and managerial decisions about the composition of the starting lineup should be effective in reducing effort relative to the “average” amount supplied in other games. We recognize that individual players may supply maximum effort in all games, no matter what the team management wants. This recognition of players’ effort will reduce the ability for teams to precisely control effort supply.

The simplest reward structure of a team sports league could be found within a closed league, where a defined number of positions at the top of the final league standing guarantee automatic entry into additional competitions like postseason playoffs or international cup competitions. The qualification for the playoff tournament should be interpreted as positive and equal among qualified teams distributed guaranteed reward. Here, clinching a playoff berth represents the larger reward (W_1) in comparison to non-qualification (W_2). It is quite evident, that in this example $W_1 > W_2$ and the predictions mentioned above should be valid. Simplifying, the regular season of North-American major leagues with top-n teams qualifying for the playoffs could be seen as an archetype of a league offering this simple reward structure.[3] A quite similar reward structure is obtained in European football leagues with regard to the qualification modus for pan-European club competitions organized by UEFA while just ignoring other

[3] The race for better playoff seeding, which leads to inferior opponents in early rounds and home-field advantage throughout the playoffs, might only represent a weak incentive to exert additional effort.

tournament incentives. To some extent the hierarchical European championship model could be compared with the North-American "regular season-playoff" system. The final league standing of the domestic championships determines the qualified teams – this might be comparable to the regular season in North-American major leagues. The qualified teams, then, determine the champion of the superior competition, that is, the UEFA Champions League or the UEFA Europe League – this might be comparable with the playoffs in North-American major leagues. The main difference between North American and European professional sports leagues, which do not have influence on the incentives provided, is that North-American major leagues regular season and playoffs are played successive while the superior pan-European club competitions are played parallel to the following regular season of the domestic leagues.

In contrast to the closed leagues in North America, professional European football leagues are organized as open leagues, where weaker teams will be relegated to a lower tier.[4] Compared to the simple closed league discussed above, the introduction of relegation leads to a more complex reward and incentive structure. In an open league, typically, a third reward (W_3) has to be introduced. Typically, relegation to a lower tier involves tremendous losses in revenues compared to the payouts the team will obtain face in a higher tier.[5] Thus, from the perspective of a single team, the positive but smaller payouts obtained in the second tear in the next season are the reward given for finishing in the bottom-n positions in the final league standing in the actual season. Here, $W_1 > W_2 > W_3$ and, again, the predictions mentioned above should be valid.

The above mentioned predictions rely on two main assumptions. First, agents – here teams – have to be risk neutral. Following Frick (2003, p. 515), athletes

[4]See Noll (2002) on more general economic implications of promotion and relegation systems.

[5]One of the main consequences will be that the share of TV revenues allocated to the club will drop dramatically.

and teams are likely to be risk neutral because rewards are solely based on the relative performance of the contestants. Second, teams have to be homogeneous, that is, equally talented and equally endowed (Knoeber & Thurman, 1994, p. 157). In this case, a symmetric pure strategy equilibrium exists in which all teams choose the same level of effort as a best response to the effort of the opponents. In this equilibrium, the effort level is an increasing function of the difference in rewards between winning and loosing. Team sports leagues can hardly be described as homogeneous. In general, leagues contain large and small market teams with access to different levels of financial resources that have consequences for the distribution of talent across the league. In leagues with heterogeneous teams, teams with more talent and access to greater financial resources have a greater chance of winning matches. The consequence will be that, if league participants have no more information about their abilities and their probability of winning matches than competitors, the league equilibrium in terms of optimal effort supply remains symmetric. On the other hand, both contestants will reduce effort in equilibrium if league participants have information about their own ability and the probability of winning and that of their opponents (Knoeber & Thurman, 1994, p. 157). In sports organized as a single event, either a mass start competition or a knock-out-round tournament, information about the abilities of the opponents remain sufficiently uncertain over the course of the competition in many cases. Under these conditions tournament theory predicts that athletes or teams will not reduce effort at all or just within a small range without risking the loss of rewards. This can be highlighted with two simple examples. First, a tennis player leading during a given match cannot reduce effort supplied because tennis matches continue until the last rally is won. Second, a marathon runner who leads the race by 3 minutes at kilometer 40 cannot walk the remaining kilometers without risking a loss in the race and the reward for first place. This situation differs in a team sport league due to the nature of the league fixture. In a team sports league, the overall competition consists of a fixed number of individual matches. After every match-day each team knows exactly how many points it and all opponents have accumulated. Also, information about the number of match-days left and, thus, the number of remaining points are available to all teams. Thus, situations occur where the probability of winning the reward is 100%; for example when the number of points ahead of the next contender is larger than the remaining achievable points, but the season has not ended.

The implications of tournament theory applied to team sport leagues can be summarized as follows. First, according to Frick (2003), the participants in a sporting contest are assumed to chose actions to optimize their effort given the efforts of opponents, the rules of the game, and the costs and rewards of winning. Assuming that no information asymmetries exist, teams will supply the maximum level of effort as long as the differences between rewards are large enough. In contrast to single event sports, where the winner is not crowned until the very end of the competition, in team sports the winner of the competition is determined before the end of the competition in some cases. This might have clear implications for the probabilities of winning a prize in a team sport competition. The predictions of tournament theory are clear in cases where team performance has obviously no impact on the probability of winning the contest. If maximum effort is not rewarded, contestants would no longer have an incentive to expand effort to increase the perceived probability of winning (Frick, 2003). As discussed above, European professional football leagues typically feature three different prizes. Qualifying for the pan-European cup competitions is the primary reward, not being relegated is the secondary reward, and being relegated to the second tier is the third "reward" in these leagues. Generally, as the season starts, the complete reward structure is effective for the chosen effort level of the clubs. But if the probability to win the highest available reward becomes 100% or drops to zero as the season progresses, only the incentive effects of the remaining statistically likely rewards will influence the behavior of a team. In a league with three reward levels as described above, three specific situations exist where maximum effort is not rewarded. First, when the probability of winning the primary reward is 100% for teams which clinched a qualification berth in a pan-European competition before the end of the regular season. Second, when a team which is simultaneously eliminated from the competition for the league championship and clinched a non-relegation spot can neither improve nor worsen its situation with regard to payouts. In this case, the probability of winning the secondary reward is 100% while the probability of winning the primary reward is zero, as is the probability to drop down to the third "award," relegation. Finally, when the probability to win the third reward is 100% for teams which clinched a relegation position before the end of the regular season, while the probability to improve to one of the higher valued rewards is zero. Based on these three cases, the following testable assumptions can be postulated: (1) A team that clinched a qualification berth has weaker incentives to supply effort. Thus, the probability of winning any particular league match should decrease, all other factors constant. (2) A team that is eliminated from a qualification berth and is, at the same time, eliminated from the threat of relegation has weaker incentives to supply effort in a given game. For this reason, the probability of winning any particular league match also should decrease, other factors constant. (3) A team that has clinched a relegation spot has weaker incentives to supply effort. Consequently, the probability of winning any particular league match again should decrease, other factors constant.

Why might the under supply of effort by teams be a problem from the perspective of the league? The consequences at the match level can be tremendous.

Since the outcome of a sporting competition like a single football match is – apart from random factors – primarily based on the relative performance of the contestants, so small differences in the incentives to perform could have a strong influence on match outcomes. The result could be a biased match outcome compared to the situation where the same fixture was played with consistent incentives to perform for both teams. Moreover, the biased outcome of matches where one team under supplies effort could lead to an additional biased outcome in the league's final standings. This can be illustrated by means of a small example. If team A, which has clinched a qualification berth in a post-season tournament, plays against team B, which is still competing for such a position, the probability that team B wins is higher in situation where the incentives to perform are weaker for team A than it would have been if the match was scheduled earlier in the season. Let team C be in or near the relegation zone and contesting for a non-relegation spot with team B. Further, suppose team C played its matches against team A at a time where team A had not clinched the qualification berth. It can easily be seen that the battle for the non-relegation spot might be distorted in favor of team B if team A under supplies effort. From the perspective of the league, situations in which effort supplied has a significant influence on league outcomes are undesirable because one of the main objectives of the organizing body is the integrity of the competition. The under supply of effort could also be a problem for external stake holders in the league. For example, in Australia, the AFL expressed concern that individual teams under supplying effort late in regular season affected the integrity of the league product in terms of government gambling revenues generated from betting on AFL matches. As a result, the Minister of Gaming in Victoria, Australia, launched an investigation in 2009 into the possibility that AFL teams under supplied effort and the potential effect of this behavior on gambling revenue generated from

AFL games for the government (Dowling, 2009).

3 Empirical Approach

The basic empirical approach is to determine if observable factors related to the incentives for a team to provide effort in a football match explain observed match outcomes. Following the approach taken by Taylor and Trogdon (2002) and Price et al. (2010), we use match level data and exploit specific conditions on the league table, details about the leagues' promotion and relegation structure, and the number of pan-European berths in the league at the point when the match was played to identify matches with different incentives to supply effort. Most of these matches take place in the last few weeks of the regular season. Our empirical approach must account for the trichotomous outcomes in football matches (win, draw, loss) and also control for other factors like relative team quality that affect match outcomes.

3.1 Data

The data set used in this analysis includes every regular season match played in ten different European domestic football leagues. Each of these leagues represent the top tier league in the following countries: Belgium, England, France, Germany, Greece, Italy, Portugal, Scotland, Spain, Turkey.[6] The observation period starts just after the previously mentioned UCL modifications that took place in the 2000-01 season and ends with the most recent season, 2010-11. The overall sample consists of 31,746 matches. The number of matches played in the different leagues differ due to the different size of the national leagues. For example, the top league in Greece consists of 16 teams for the entire ten season

[6] The data was retrieved from http://www.football-data.co.uk/.

period. This results, according to the balanced schedules of European football leagues based on home and away scheduling between each pair of teams, in 240 matches per season or 2,640 matches in total in the top Greek league. In contrast, the English "Premier League" and the Spanish "La Liga" – which both had 20 teams throughout the entire observation period – played 8,360 matches. Starting with the 2009-2010 season, the first Belgian division changed its format from a "normal" round robin system to a combined playoff and round robin system. Due to the completely different incentive structure of this new system, the Belgian "Jupiler Pro League" was excluded after the 2008-09 season. Additionally, information on the date of 1,344 matches from the UCL have been utilized to identify national league matches and upcoming UCL matches.

Information about points, goals scored and allowed, number of matches played, which could be obtained from the actual league table at the time a match was played, have been used to augment the match-based data, which includes only teams involved, home ground, date, and match result. Additionally, the winning percentage of both teams has been calculated in a way that a draw counts – departing from the three-point-a-win rule used in European football – half a win. Furthermore, based on the number of remaining points a team could achieve at the given moment of the season and the (positive or negative) margin with respect to one of the important league positions (first place, UEFA qualification position, relegation spot), we identified when teams were eliminated from participation in each of the league internal sub-competitions. Furthermore, using the same information, we calculated the point in time when a team clinched one of the important pan-European qualification positions.

The first match-day of each season has been omitted from the analysis because no winning percentage for both teams could be obtained. After this elimination, our game-level data includes 63,492 team-game observations. 2,060

(3.3%) of the observations involve a team that has been eliminated from any of the sub-competitions and 302 (0.5%) involve a team that has clinched the championship. Another 3,030 (4.8%) observations involve a teams that have clinched a qualification position for a pan-European cup competition, of which 984 (1.6%) have been eliminated from the race for the championship at the same time. This means that 2,772 (4.4%) involve teams that have clinched a qualification spot and are still in the battle for the championship. Further, 1,048 (1.7%) observations involve teams that have clinched a relegation position. Finally, 3,894 (6.1%) observations involve teams which have to play in a UCL competition within the next five days.[7]

3.2 Empirical Model

We test whether the differences in payoffs from winning, or the negative consequences of losing, as discussed above, are large enough to influence the effort supplied by a team. Like previous research on tournament incentives in team sport (Taylor & Trogdon, 2002; Price et al., 2010; Borland et al., 2009), our empirical model must control for factors that could also influence the outcome of a match other than the tournament incentives. The first empirical model we estimate follows the original Taylor and Trogdon (2002) approach.[8] Due to the differences from the organization of the league in European sports leagues in comparison to North-American, some deviations from the original model have to be made. The basic empirical model for a European context is:

[7]This time span has been used because, under the coordinated match schedule between domestic leagues and UEFA, normally the longest possible elapsed time from a regular domestic league match on Friday to a UCL match on Wednesday is five days. In the case of a longer time span between both matches, we assume no impact of the international match on the effort level in the domestic match.

[8]Because none of the matches from our sample was played on neutral ground, we omit the indicator variable for matches played on neutral courts used by Taylor and Trogdon (2002).

$$
\begin{aligned}
OUTC_{ijkl} = & f(HOME_{ijkl}, WINPCT_{ijkl}, OWINPCT_{ijkl}, \\
& CLINCHTOP_{ijkl}, OCLINCHTOP_{ijkl}, CLINCHREL_{ijkl}, \\
& OCLINCHREL_{ijkl}, ELIM_{ijkl}, OELIM_{ijkl}).
\end{aligned} \tag{1}
$$

First, an important difference to the analysis of US sports is that in European football leagues draws are possible. Therefore, our dependent variable has to include three different states of game outcomes. The dependent variable is not a typical binary variable which takes the value of one if team i wins and zero otherwise. Instead, according to the point scheme used in European football, the variable $OUTC_{ijkl}$ takes the value of three if team i wins game j in season k in league l. It is equal to one if game j was tied and equal to zero if team i loses. The selection of this dependent variable does have an implication for the chosen estimation technique. In contrast to the standard binary model used by many of the other studies, we employ an ordered logit model, consistent with the method used by Taylor and Trogdon (2002) for the NBA.

Following Taylor and Trogdon (2002), we include three variables that control for influences other than the tournament incentives on match outcomes. First, $HOME_{ijkl}$ captures the well established home field advantage in team sports (Boyd & Boyd, 1996; Carmichael & Thomas, 2005; Soebbing & Humphreys, In press). $HOME_{ijkl}$ is equal to one if game j is played on team i's home ground and zero otherwise. The coefficient of this variable is expected to indicate a positive effect on the probability that team i winning, other things constant. To control for the quality of both teams, both team i's winning percentage ($WINPCT_{ijkl}$) and the opponent's winning percentage ($OWINPCT_{ijkl}$) before game j is played are included. It is expected that the probability of team i

winning is increasing while the team's actual winning percentage increases and is decreasing while the opponent's actual winning percentage increases. With other words, the signs of the coefficients are expected to be positive for $WINPCT_{ijkl}$ and negative for $OWINPCT_{ijkl}$.

The tournament incentives should be captured by six variables, instead of just four "incentive" variables as employed by Taylor and Trogdon (2002). As mentioned in Section 2, tournament theory provides clear predictions concerning the effects of tournament incentives generated by the reward structure on effort levels and, thus, on the probability of a particular match outcome. These predictions should be used to designate the expected signs of these variables in the following. First, $CLINCHTOP_{ijkl}$ is a dummy variable which takes the value of one if team i has clinched a qualification berth at the time of game j and zero otherwise. Similarly, the variable $OCLINCHTOP_{ijkl}$ is equal to one if the opponent team has clinched a qualification spot before game j was played and zero otherwise. Here, qualification spots are defined as all positions in the final league standing of league l which guarantee the automatic entry into one of the supranational cup competitions organized by UEFA (Europa League, UEFA Champions League). These numbers differ between leagues or also between seasons for the same league. According to the theoretical considerations and the remarks on the reward structure in European football, a clear incentive to under supply effort should occur if a team clinches a qualification spot. However, counterbalancing this effect is the fact that the race for the championship might offer some "hidden" incentives, which might be pecuniary (e.g. side-payments from sponsors) or even non-pecuniary (e.g. a gain in sporting reputation). If these "hidden" incentives exist, a team which had already clinched a qualification spot still has a strong incentive to exert effort. Therefore, the expected signs of the coefficients of both variables are ambiguous.

Second, the theoretical considerations discussed in section 2.3 gives also clear predictions concerning the effects of being stuck in the middle of the league table before the end of the regular season. These effects should be captured by the following variables. $ELIM_{ijkl}$ equals unity if – at the time game j was played – team i had been eliminated from the race for the qualification spots as well as from the threat of relegation. Otherwise it becomes zero. Analogously, $OELIM_{ijkl}$ takes the value of one if the opponent team was eliminated from both "races" at the time of game j and zero otherwise. Here, clear predictions can be made for the effects of the elimination variables. As pointed out above, the incentives of a team which has been eliminated from receiving both the primary reward (qualification for a superior competition) and the third degree reward (relegation to the second tier) decrease. Thus, it is expected that the probability of team i winning game j increases if the opponent teams was eliminated and decreases if the team itself had been eliminated, other things constant. This would lead to a negative sign of the coefficient of $ELIM_{ijkl}$ and a positive sign of $OELIM_{ijkl}$.

Third, in contrast to the analysis of North-American team sport leagues, the existence of relegation has to be considered. Therefore, two variables which cover the incentive effects of the third-degree reward should be included. $CLINCHREL_{ijkl}$ takes the value of one if team i had clinched a relegation position at the time of any particular match and zero otherwise, while $OCLINCHREL_{ijkl}$ equals unity if the opponent team has clinched a relegation spot and zero otherwise. In contrast to $CLINCHTOP_{ijkl}$ and $OCLINCHTOP_{ijkl}$, the predictions from tournament theory are clear for these two variables. As superior performance is not rewarded any more for a team that has clinched a relegation spot, it has no longer an incentive to expand effort to increase the perceived probability of winning. Thus, we expect $CLINCHREL_{ijkl}$

to have a negative sign and $OCLINCHREL_{ijkl}$ to have a positive sign.

By augmenting equation (1), we would like to test whether within the range of the top positions additional incentives exist for teams. Thus, the following modifications should be done.

$$
\begin{aligned}
OUTC_{ijkl} = f(&HOME_{ijkl}, WINPCT_{ijkl}, OWINPCT_{ijkl}, \\
&CLINCHFIRST_{ijkl}, OCLINCHFIRST_{ijkl}, \\
&CTCF_{ijkl}, OCTCF_{ijkl}, CTEF_{ijkl}, OCTEF_{ijkl} \\
&CLINCHREL_{ijkl}, OCLINCHREL_{ijkl}, ELIM_{ijkl}, \\
&OELIM_{ijkl})
\end{aligned} \tag{2}
$$

This model contains all the explanatory variables in Equation (1). In addition, winning the championship can be regarded as an additional reward and it is assumed that the league design includes four different rewards, implying that the chance to win the championship represents a new primary reward, qualifying for a pan-European club competition is the secondary reward, being not relegated is the third-degree reward, and being relegated is the fourth-degree reward. In the first instance, clinching the championship spot generates the same incentives as in the model above. That is, superior performance is no longer rewarded and, thus, the team has no incentive to expand effort after clinching the championship. The league championship is a rank-order tournament; the champion does not receive any additional financial rewards for winning the championship by a larger number of points. To isolate this effect, the variables $CLINCHFIRST_{ijkl}$ and $OCLINCHFIRST_{ijkl}$ are included. $CLINCHFIRST_{ijkl}$ takes a value of one if team i has clinched the league championship prior to the end of the regular season and zero otherwise. $OCLINCHFIRST_{ijkl}$ takes a value of one if the opponent has clinched the league championship at the time of match j and zero otherwise. The first variable is expected to have a negative sign, while the later one is expected to have a positive sign.

Two additional situations need to be considered for the case where a team has clinched a qualification spot but the race for the championship is still undecided. First, the clinched team could still have a statistical chance to win the championship. In this case, clinching the qualification berth could be seen as a kind of safety net, which could motivate the team to expand their effort to win the championship. Thus, $CTCF_{ijkl}$ and $OCTCF_{ijkl}$ should be included. $CTCF_{ijkl}$ is equal to one if team i has clinched a qualification berths and still could win the championship and zero otherwise, while $OCTCF_{ijkl}$ is defined in the same way from the perspective of the opponent. As, in the case if the team succeeds in winning the championship, the payouts are higher and clear positive incentives to exert the effort level exist. Thus, we expect $CTCF_{ijkl}$ to have a positive sign and $OCTCF_{ijkl}$ to have a negative sign.

Second, the possibility exists that a team has clinched a qualification spot but is eliminated from the race for the league championship prior to the end of the season. The predictions from tournament theory are clear and mentioned above several times. As these teams do neither face any chance to improve to the next reward level nor have the threat to drop down to a lower reward level, any superior performance will not lead to higher payouts and, thus, these teams do not have any incentive to expand effort. To test this, the variable $CTEF_{ijkl}$ takes the value of one if, before match j was played, team i had clinched a qualification berths and had been eliminated from the race for the championship at the same time and zero otherwise. Analogously, $OCTEF_{ijkl}$ equals unity if team i's opponent was eliminated from the championship race and clinched a qualification spot and equals zero otherwise. Here, $CTEF_{ijkl}$ is posited to have

Table 1: Explanatory Variables in the Empirical Model

Variable	Description
HOME_{ijkl}	Home Match Indicator
WINPCT_{ijkl}	Team is winning percentage
OWINPCT_{ijkl}	Opponents winning percentage
CLINCHTOP_{ijkl}	Team clinched spot in pan-European competition
OCLINCHTOP_{ijkl}	Opposing team clinched spot in pan-European competition
$\text{CLINCHFIRST}_{ijkl}$	Team clinched league championship
$\text{OCLINCHFIRST}_{ijkl}$	Opposing team clinched league championship
CTCF_{ijkl}	Team clinched spot in pan-European competition, could win league
OCTCF_{ijkl}	Opposing team clinched spot in pan-European competition, could win league
CTEF_{ijkl}	Team clinched spot in pan-European competition, cannot win league
OCTEF_{ijkl}	Opposing team clinched spot in pan-European competition, cannot win league
ELIM_{ijkl}	Team eliminated from a spot in pan-European competition
OELIM_{ijkl}	Opposing team eliminated from a spot in pan-European competition
CLINCHREL_{ijkl}	Team will be relegated in domestic league
OCLINCHREL_{ijkl}	Opposing team will be relegated in domestic league
UCLNEXT_{ijkl}	Team has UCL match in next five days
OUCLNEXT_{ijkl}	Opposing team has UCL match in next five days

a negative sign; $OCTEF_{ijkl}$ is posited to have a positive sign.

Finally, two indicator variables have been included to measure the effect of an upcoming UCL match on the effort level of the concerned team. Here, conventional wisdom would be that teams which face a UCL match immediately after a domestic league match tend to rest their premier players to maximize the probability to succeed in the superior pan-European club competition.[9] Resting important players might be regarded as an intentional under supply of effort

[9]A comparable phenomenon could be observed in North-American sports when teams that clinched a playoff berths do not nominate some important players in so-called meaningless regular season contests to rest for the postseason (Balsdon et al., 2007, p. 20)

by teams. From a domestic league organizers' perspective, teams resting important players meets the criteria of undesired behavior where agents (teams) are acting in their own self interest while harming the principal (league). Here, $UCLNEXT_{ijkl}$ is a dummy variable which takes the value of one if team i will play an UCL match within the next five days after domestic league match j and zero otherwise. In a similar way, $OUCLNEXT_{ijkl}$ is defined to be one if the opponent team is scheduled for an UCL match within a range of of five days after match j. If conventional wisdom is true, we would expect $UCLNEXT_{ijkl}$ to show a negative sign and $OUCLNEXT_{ijkl}$ to have a positive sign.

Table 1 describes the variables that capture variation in incentives for teams to provide effort in football matches and the other control variables. These incentives come from both the promotion and relegation rules in the domestic leagues and pan-European competitions. Note that most of the variables capture matches where the incentive to provide effort has been reduced, primarily because one of the teams has either clinched a spot in a pan-European competition that will generate significant financial rewards or will certainly be eliminated. Most of these instances occur in the last few weeks of the regular season.

Many of the incentive proxy variables apply in only a small number of matches. For example domestic matches occurring within five days of a UCL match account for only 6.1% of the matches in the sample, and matches involving one or more teams that have already clinched berths in a pan-European competition account for only 4.8% of the matches in the sample. However, these matches should generate tournament incentives markedly different from other regular season matches. Half the matches are home matches, and the average winning percentage of teams in a league over the course of a season must be 0.500 when winning percentage counts ties as half a win like we do here. Previous research on incentives to supply effort in team sports leagues (Taylor &

Table 2: Descriptive Statistics - Incentive Proxies

Variable	Mean	Std. Dev.	Min	Max
CLINCHTOP_{ijkl}	0.026	0.159	0	1
OCLINCHTOP_{ijkl}	0.026	0.159	0	1
$\text{CLINCHFIRST}_{ijkl}$	0.002	0.049	0	1
$\text{OCLINCHFIRST}_{ijkl}$	0.002	0.049	0	1
CTCF_{ijkl}	0.023	0.151	0	1
OCTCF_{ijkl}	0.023	0.151	0	1
CTEF_{ijkl}	0.008	0.091	0	1
OCTEF_{ijkl}	0.008	0.091	0	1
ELIM_{ijkl}	0.019	0.137	0	1
OELIM_{ijkl}	0.019	0.137	0	1
CLINCHREL_{ijkl}	0.009	0.092	0	1
OCLINCHREL_{ijkl}	0.009	0.092	0	1
UCLNEXT_{ijkl}	0.032	0.175	0	1
OUCLNEXT_{ijkl}	0.032	0.175	0	1

Trogdon, 2002; Price et al., 2010; Borland et al., 2009) also have a relatively small number of matches or games where the key incentive effects apply. Note the symmetric nature of the statistics for team i and team i's opponent. This occurs because, like Taylor and Trogdon (2002) and Price et al. (2010), our data set contains two observations for each match. If we did not include each observation twice, we could not estimate a home advantage effect. This affects the estimated standard errors for the regression models but not the parameter estimates.

4 Results and Discussion

The estimation results from Equation (1) are reported in Table 3 for the probability that team i wins the match. Since we estimate an ordered logit model, the results also include estimates of the effects of the explanatory variables on the probability that Team i draws the match. We do not report these results, but instead focus on the win probabilities. The draw probabilities are available by request. Consistent with using a logit model, we report the odds ratio for each independent variable (Table 5). These odds ratios can be interpreted as a one-unit increase in the independent variable on the odds of Team i winning game j in season k in league l holding all other factors constant.

Table 3: Ordered Logit Estimation Results: Basic Model

	[1]	[2]
HOME_{ijkl}	0.989 ***	0.992 ***
	(0.022)	(0.022)
WINPCT_{ijkl}	1.970 ***	1.863 ***
	(0.048)	(0.049)
OWINPCT_{ijkl}	−1.970 ***	−1.863 ***
	(0.048)	(0.049)
CLINCHTOP_{ijkl}	0.443 ***	0.435 ***
	(0.059)	(0.059)
OCLINCHTOP_{ijkl}	−0.443 ***	−0.435 ***
	(0.059)	(0.059)
ELIM_{ijkl}	−0.159 **	−0.165 **
	(0.072)	(0.072)
OELIM_{ijkl}	0.159 **	0.165 **
	(0.072)	(0.072)
CLINCHREL_{ijkl}	−0.451 ***	−0.478 ***
	(0.092)	(0.092)
OCLINCHREL_{ijkl}	0.451 ***	0.478 ***
	(0.092)	(0.092)
UCLNEXT_{ijkl}	–	0.574 ***
		(0.049)
OUCLNEXT_{ijkl}	–	−0.574 ***
		(0.049)
n	63492.000	63492.000

From Table 3, notice that $HOME_{ijkl}$ in both models is positive and significant. Examining the respective odds ratios in Table 5 for the $HOME_{ijkl}$ variable, notice that being the home team has a very large effect on the odds that Team i wins game j. These results confirms previous research documenting the home field advantage in North America and Europe (Boyd & Boyd, 1996; Carmichael & Thomas, 2005; Soebbing & Humphreys, In press). The parameters on Team i and Team i's opponent winning percentages also intuitively makes sense. The positive and significant parameter on $WINPCT_{ijkl}$ indicates that the more successful Team i has been on-the-field this season, the greater the probability that it wins the current match, other things equal.

The results on Table 3 are generally supportive of the predictions of tournament theory. Teams who will finish in the middle of the table with no possibility of getting a berth in a pan-European competition, as captured by $ELIM_{ijkl}$, are less likely to win the current match. Teams playing an opponent who will finish at the middle of the table are more likely to win the current match, other things equal. From Table 5, team i is 1.17 times *more* likely to win game j if its opponent does not have anything to play for in match j. Also, teams facing certain relegation are less likely to win the current match, and teams playing an opponent who faces certain relegation is more likely to win the current match, other things equal. This relegation effect is strong as team i is between 1.5 and 1.69 times more likely to win if its opponent has already clinched a relegation spot. In this situation, teams do not have a strong incentive to supply effort, and the results indicate that those teams are less likely to win the match in question, consistent with reduced supply of effort.

Two of the parameter estimates on Table 3 are not consistent with the predictions of tournament theory. We find that if Team i has clinched one of league l's qualification positions prior to playing game j in season k, as identified by the variable ($CLINCHTOP_{ijkl}$), Team i is 1.56 times more likely to win the match. A team that has already clinched a position in a pan-European competition might have a reduced incentive to supply effort in a match. However, this incentive could also be affected by how close a team is to winning the league championship, which is not controlled for in this model. The model defined by Equation (2) redefines $CLINCHTOP_{ijkl}$ and $OCLINCHTOP_{ijkl}$ to account for this difference.

Finally, Model 2 in Table 3 controls for whether Team i or its opponent is playing a UCL game in the next five days. From Section 3.2, we hypothesized that teams playing a UCL within the next five days would rest its players due to the large financial incentives for winning UCL games. From Table 3, the results do not support this hypothesis. In fact, if Team i is playing a UCL league in the next five days it is approximately 1.8 times more likely to win game j. One explanation for this result is that our hypothesis about the incentives associated with UCL games is incorrect. Another is that the team plays more star players in the match before a UCL match, perhaps to get them into form for the upcoming UCL match.

Table 4 presents the results from Equation (2) for the probability that team i wins the match. Again, we do not report the estimates for the probability that team i draws the match, but these results are available by request. Similar to Table 3, there is a strong home field advantage related to team i winning game j. The signs and significance of the parameter estimates on the other variables that appeared in Table 3 are similar in Table 4. We do not discuss the implications of these parameter estimates, and they were already discussed above.

Recall that Equation (2) includes variables that capture additional incentives associated with the top positions of the league table throughout the various European leagues. The first incentive is if team i or its opponent has clinched the league championship prior to game j and is captured by the variables $CLINCHFIRST_{ijkl}$ and $OCLINCHFIRST_{ijkl}$. These parameter estimates are not significantly different from zero meaning that clinching the league championship does not lead to an increase or decrease in the probability that team i wins game j. Equation (2) also controls for the fact that team i could have clinched a pan-European qualification berth and still could win the league

Table 4: Ordered Probit Estimation Results: Augmented Model

	[1]	[2]
HOME_{ijkl}	0.990 ***	0.992 ***
	(0.022)	(0.022)
WINPCT_{ijkl}	1.963 ***	1.857 ***
	(0.049)	(0.049)
OWINPCT_{ijkl}	−1.963 ***	−1.857 ***
	(0.049)	(0.049)
$\text{CLINCHFIRST}_{ijkl}$	−0.026	−0.007
	(0.177)	(0.178)
$\text{OCLINCHFIRST}_{ijkl}$	0.026	0.007
	(0.177)	(0.178)
CTCF_{ijkl}	0.700 ***	0.683 ***
	(0.073)	(0.074)
OCTCF_{ijkl}	−0.700 ***	−0.683 ***
	(0.073)	(0.074)
CTEF_{ijkl}	−0.653 ***	−0.627 ***
	(0.116)	(0.117)
OCTEF_{ijkl}	0.653 ***	0.627 ***
	(0.116)	(0.117)
ELIM_{ijkl}	−0.218 ***	−0.221 ***
	(0.072)	(0.072)
OELIM_{ijkl}	0.218 ***	0.221 ***
	(0.072)	(0.072)
CLINCHREL_{ijkl}	−0.499 ***	−0.523 ***
	(0.092)	(0.092)
OCLINCHREL_{ijkl}	0.499 ***	0.523 ***
	(0.092)	(0.092)
UCLNEXT_{ijkl}	–	0.568 ***
		(0.050)
UCLNEXT_{ijkl}	–	−0.568 ***
		(0.050)
n	63492.000	63492.000

title. Table 4 shows that team i is more likely to win game j. Team i is less likely to win game j if its opponent has the same position. Finally, the variable $CTEF_{ijkl}$ ($OCTEF_{ijkl}$) controls for if team i (or team i's opponent) clinched a qualification position and has been eliminated from league championship contention. Similar to the $ELIM_{ijkl}$ and $OELIM_{ijkl}$ variables, teams who satisfy these conditions have no incentive to win game j. The results from Table 4 support our hypothesis. The odds rations in Table 5 shows that team i is between 1.87 and 1.92 times more likely to win if its opponent clinched a qualification position and has been eliminated from a chance to capture the championship of league l. Again, this analysis of game outcomes suggest that teams supply more effort in matches where the incentives to supply effort are stronger, and less effort in matches where the incentives to supply effort are weaker.

Table 5: Odds Ratio for a Win

	Table 3		Table 4	
	[1]	[2]	[1]	[2]
HOME_{ijkl}	2.69	2.70	2.69	2.70
WINPCT_{ijkl}	7.17	6.44	7.12	6.40
OWINPCT_{ijkl}	0.14	0.16	0.14	0.16
CLINCHTOP_{ijkl}	1.56	1.54	—	—
OCLINCHTOP_{ijkl}	0.64	0.65	—	—
$\text{CLINCHFIRST}_{ijkl}$	—	—	0.97	0.99
$\text{OCLINCHFIRST}_{ijkl}$	—	—	1.03	1.01
CTCF_{ijkl}	—	—	2.01	1.98
OCTCF_{ijkl}	—	—	0.50	0.51
CTEF_{ijkl}	—	—	0.52	0.53
OCTEF_{ijkl}	—	—	1.92	1.87
ELIM_{ijkl}	0.85	0.85	0.80	0.80
OELIM_{ijkl}	1.17	1.18	1.24	1.25
CLINCHREL_{ijkl}	0.64	0.62	0.61	0.59
OCLINCHREL_{ijkl}	1.57	1.61	1.65	1.69
UCLNEXT_{ijkl}	—	1.77	—	1.76
OUCLNEXT_{ijkl}	—	0.56	—	0.57

We estimated a number of alternative model specifications to check the robustness of the results in Tables 3 and 4. We included both league and season specific intercepts in the model to account for unobservable heterogeneity across leagues and across seasons. Including these variables did not alter our results. We also estimated a random effects model, which is similar to the model estimated by Taylor and Trogdon (2002). This also did not alter the results of the model. Third, we clustered the standard errors by league, which accounts for any within-league heteroscedasticity. Clustering the standard errors by league also had no affect on the results. Instead of estimating an ordered logit, we estimated a standard logit model with the dependent variable equal to one if Team i received at least one point in match j, accounting for a win or a draw. Redefining the dependent variable this way did not alter the results. Finally, we estimated an ordered probit model which qualitatively produced the same results as the ones reported in the present research. Therefore, we are confident that the results presented here, suggesting that teams vary effort supplied in matches with incentives are robust.

In summary, we find that both the home field advantage and the strength of the two teams affect the probability that Team i will win game j. Teams who have nothing to play for – in terms of additional benefits from winning games – are less likely to win. Counter to our original hypothesis, we find that teams playing in a UCL game in the next five days are more likely to win their domestic league game. More importantly, the present research supports the key prediction of tournament theory applied to sport: European professional football teams respond to incentives to perform well by supplying more effort.

5 Conclusions

We examine the relationship between incentives for European professional football clubs to provide effort in matches and match outcomes. Tournament theory (Lazear & Rosen, 1981; Szymanski, 2003) predicts that participants in contests facing an increasing cost of supplying effort respond to financial incentives by providing more effort when the incentives were greater and less effort when the incentives were lower. Nonlinear payoff structures are typically needed to elicit an optimum amount of effort from contest participants. Tournament theory can be applied to teams competing in professional sports leagues. We posit that the large financial payoffs to teams that participate in pan-European football competitions like the UEFA Champions League and the Europa League generate sufficient incentives to lead teams to supply additional effort in domestic league matches that will affect participation in these contests, and that the differential payoff between participation in the UCL and the Europa League, coupled with the financial consequences of relegation, constitute an efficient nonlinear prize structure in the context of tournament theory.

Our analysis of European domestic league match outcomes supports the predictions of tournament theory. Teams are more likely to win matches when the incentives are higher, and less likely to win matches when incentives are lower, holding team quality and home advantage constant. In particular, teams who will certainly finish in the middle of the table, with no possibility for a pan-European berth or relegation, and teams who will certainly be relegated are more likely to lose matches, holding other factors like the quality of the teams constant. These teams face reduced incentives to supply effort, and the match outcomes suggest that they supply less effort. Similarly, teams playing an opponent who will certainly finish in the middle of the table, or an opponent who will certainly be relegated, are more likely to win matches, other things equal.

The effects of clinching a pan-European berth in the basic model does not appear to support the predictions of tournament theory in the basic model defined by Equation (1). However, teams who have clinched a pan-European tournament berth face two different incentives. These teams are at the top of the league table. Some of these teams still have a chance of winning the league championship, while others do not. Teams that have clinched a pan-European tournament berth with a chance of winning the league championship are more likely to win the match, while those who have clinched with no possibility of winning the league championship are more likely to lose the match, other things equal. Once these opposing incentive effects are controlled for, the results are again consistent with the predictions of tournament theory. European football teams competing in domestic leagues face varying incentives to provide effort in matches over the course of the season. Our analysis of match outcomes indicates that teams respond to these incentives in a way consistent with tournament theory.

In addition to confirming the predictions of tournament theory in this setting, these results have implications for league policy. The designers of league policies should realize that teams respond strongly, in terms of effort provided, to the positive and negative incentives generated by league structure and policy. Recall that the supply of effort can include individual player effort and effort involving the acquisition of players in the transfer window, which has a financial cost associated with transfer fees. UEFA recently enacted "Financial Fair Play" regulations that will require clubs to break-even financially in each season. The results in the present research suggest that clubs respond to incentives to supply more effort generated by the financial payoffs from participating in pan-European competitions. This implies that clubs will try to supply more effort by improving themselves in the transfer window whenever possible and may reduce the effectiveness of the fair play regulations.

The present research could be extended in several ways. First, the impact of the modification of the UCL payout structure starting in the 1999-2000 season on the effort supplied by teams could be analyzed. The modification of the reward structure at this time affected not only the absolute level of the primary reward – which would not affect the incentives to exert effort in a team sports league setting – but, in addition, the spread between the primary reward and the secondary reward. Thus, tournament theory would predict that the incentives to exert effort would be stronger after the 1999-2000 change. To test this hypothesis, the data could be expanded to include seasons prior to 2000-01, analogously to the approach used by Price et al. (2010), who tested the incentive effects of different draft systems in the NBA. In particular the empirical analysis could be extended to include interaction effects between the variables of interest and the different UCL regimes. By using data starting in 1992-93, the effects of three different UCL regimes (1992-93 to 1996-97; 1997-98 to 1998-99; after 1999-2000) on incentives to provide effort could be analyzed.

Second, the analysis of tournament incentives in European football offer additional opportunities for further research. Starting from the results presented in this paper, one could ask whether bookmakers adjusting the odds on matches in a way that anticipates variable effort by teams. Second, we only examine the effect on the probability of a win, draw, or loss in this analysis. One mechanism for supplying more or less effort in matches is by they are resting their star players prior to a UCL game. Box score data could be examined to look for patterns in star player appearances consistent with this idea. Here, it could be fruitful to have a deeper look at substitution patters, time of possession in the opponent's half, number of shots on goal, number of corners, number of fouls committed, number of yellow and red cards, etc.

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