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ABSTRACT

Rank-Order Tournaments, Probability of Winning and Investing in Talent: Evidence from Champions League Qualifying Rules*

We analyse how a change in the probability of winning a tournament affects an agent's effort using the qualification rules for entry into the group and playoff stages of the UEFA Champions' League. Our results suggest that increasing the number of slots that a national league gets in the Champions' League leads to increases in investment in talent *ex ante*. This effect is largest among the teams that in the previous season just failed to qualify. This suggests that changes in prize structure leads to changes in investment decisions amongst those clubs most affected at the margin. However, we also find that incumbent teams that have already qualified for the Champions' League simultaneously raise their efforts, consistent with the occurrence of an arms race among top European football teams.

JEL Classification: M5

Keywords: tournaments, UEFA Champions League

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1. Introduction

Rank order tournaments are commonly used in organizations where the ordinal rank of output determines agents' compensation, yet output is only observed *ex post* and is partly determined by a random component. Notwithstanding the fact that under certain assumptions these tournaments theoretically achieve first-best agents' effort, the effort effects of tournaments are hard to test empirically because it is difficult to observe both a principal's rewards and an agent's effort. A sector where arguably both rewards and effort can be observed is the sports industry. As a result a body of research has developed, specifically using golf, running and tennis, where tournaments have *ex ante* fixed prize structures. One difficulty with this approach is that there tends to be little variation in prize structure over time within a given tournament. As a result, econometric identification of prize effects on effort is largely driven by either across tournament variation (Ehrenberg and Bognanno, 1990) or within tournament variation in the pool of competitors surviving at different levels of the tournament in the presence of paired contests (Sunde, 2009). We add to this literature by using a novel source of time variation in prize structure within a sporting tournament and we examine how this variation in prizes influences agents' *ex ante* decisions.

Specifically, we use the qualification rules for entry into the group stage of the UEFA Champions' League, which is a multi-national European soccer competition (tournament) for top league clubs across Europe. Entry into the Champions' League can be thought of as a tournament in its own right, delivering access to substantial prize money for teams even in the early stages. We use data from twelve different national leagues to test whether a proxy for team effort responds to a change in the number of slots that are assigned by the Champions' League qualification rules to each league, and thus the probability of winning this entry tournament.

The previous empirical literature on tournaments has emphasised effort responses to prizes and treated selection on ability into tournaments as a confounding factor to be controlled

for (Ehrenberg and Bognanno, 1990; Coffey and Maloney, 2010; see Frick and Simmons, 2008 for a survey). Using the qualifying rules of the UEFA Champions' League, we adopt a different approach and specifically examine agents' (clubs') responses to different expected prize spreads by trying to enhance the ability of their workers (teams). In particular, we identify changes in the expected prize spreads via changes in the probability that a team in a given league qualifies to the Champions' League indicated by the number of slots that each league has at any given stage of the competition. We examine the effects of this variation in expected prizes on investment in talent at the beginning of a season. A challenge faced by researchers using dynamic sports settings (e.g. a tennis match, a marathon or a golf tournament) to understand tournaments is that in most dynamic settings, agents' effort in period *t* will be a function of the agent's relative outcome in *t-1*. That is, as the state of nature reveals itself, the agents can increase or decrease their effort accordingly and this will confound any estimates of the relationship between the prize spread and effort. In contrast, European soccer presents a static setting where club investments can only occur in two predetermined periods: either during the transfer window in July and August, covering the close season and the beginning of the new season or during January. This allows us to identify how an exogenous discrete change in the probability of winning the tournament (and hence the expected prize spread) changes the incentives for the agent (here the team) to supply effort.

Our results suggest that increasing the probability of winning the tournament, by increasing the number of slots that a national league receives in the Champions' League, leads to increases in investment in talent *ex ante*. This effect is positive and statistically significant and is largest among the teams that are marginally affected by the change in the rules, those who in the previous season just failed to qualify. This result suggests that changes in expected prize structure leads to changes in investment decisions amongst those clubs most affected at the margin. However, we also find that clubs at the top of their domestic leagues increase their investments

in talent so as to sustain their presence in the Champions' League in the face of competition from marginal teams aspiring to qualify for the competition. More generally, this provides support for the idea that in settings where ability can be manipulated, larger prize spreads increase investment in talent.

2. Theoretical and Institutional Background

The UEFA Champions' League was established in 1992 as a successor to the previous European Cup, in which national football league winners competed in a knockout competition. The new competition had a qualifying stage, a divisional round-robin stage and then a knockout phase. Currently, 77 teams take part in this competition. UEFA itself is a pan-European umbrella organisation which does not organise any domestic league but instead fields the Champions' League, the Europa League, the national team European Championship and a number of youth competitions.

Interestingly, UEFA has rejected (implicitly or explicitly) two alternative competition formats. One is an end of season playoff competition akin to playoffs in North American leagues. This would not be feasible due to the sheer number of domestic leagues in Europe. The second, more feasible design, is a breakaway European 'superleague' where elite teams detach themselves from their domestic leagues to form a separate competition, either closed or open with promotion or relegation. This alternative format was seriously considered by a group of European clubs, the G14 group, in the 1990s. Késenne (2007) argues that a separate supra-national competition would have the advantage of preserving competitive balance in domestic leagues. However, Shokkaert and Swinnen (2013) show that outcome uncertainty has increased within the Champions' League after the introduction of the new qualifying rules. Nevertheless, the threat of a breakaway European league has receded and this is surely correlated with the success of the UEFA Champions' League in terms of growing audience size and revenues. This revenue growth benefits participating clubs, UEFA itself and fans (arguably). The established

Champions' League competition design has games scheduled in midweek to avoid conflicts with the weekend fixtures in domestic league competitions facilitating coexistence with domestic leagues.

For soccer teams in Europe, qualifying for the UEFA Champions' League has become a high stakes tournament, as the rewards usually run into millions of Euros. For example, Juventus earned more than €50m from the 2012-2013 tournament. The rank order nature of qualification into the Champions' League and discrete jumps in prize money lead to large discontinuities in club revenue. The difference between qualification and non-qualification leads to a large prize spread across two rank positions in the league table. This, and any variation in the number of qualification places, can influence club incentives over several dimensions including pre-season investment decisions. More generally, a number of empirical papers have shown how team payroll spending is correlated with League ranking and hence the likelihood of qualifying for the Champions' League (Simmons and Forrest, 2004; Frick, 2013; Szymanski, 2013).

The UEFA Champions' League is an example of a sequential, elimination, multi-prize tournament. That is, players (teams), proceed through various stages until a winner is realised. These various stages carry with them prize monies that increase as contestants progress. Unlike treatments of tournaments where individual athletes compete for prizes, the agent in our set-up is a team. Also, teams that qualify for the Champions' League compete simultaneously in domestic league and Cup competitions and so can attain prizes from different competitions.

The current theory of contests in sports starts from a Tullock contest success function (Szymanski, 2003). For two teams in a contest, labelled 1 and 2, the probability that team 1 wins is given by $[T_1^a/(T_1^a + T_2^a)]$ where T denotes talent or ability and a is the discriminating power of the contest. If $a = 1$ then the contest is described as fully discriminating. In most sports tournament applications, T is the talent of players on the team roster and this is typically proxied by team payrolls (see e.g. Peeters and Szymanski, 2014).

Extending this idea to a tournament with a single prize, the probability of winning this prize depends on efforts of the participants. However, the effect of multiple prizes on the effort of contestants is not straightforward. Following the survey by Sisak (2009), for multiple effort contests, players can choose more than one effort where each effort can be invested specifically in a sub-group of prizes. In this structure, winners of preceding sub-contests are excluded. Contestants can choose effort and can choose how many sub-contests to invest in. This is clearly not how the UEFA Champions' League is organised since in this case, as generally with sports contests, the winner of one sub-contest (round) proceeds to compete in the next sub-contest until eventually the winner is revealed.

Various contest models have been offered in the theoretical literature (Sisak, 2009). In Clark and Riis (1998), a symmetric, pure strategy equilibrium may not exist as the contest is too discriminating; competition is so fierce that any potential equilibrium implies a loss for each contestant. Clark and Riis (1998) do not restrict values of prizes to be rising in finish rank, which again contradicts how actual sports tournaments are organised. A high last placed prize discourages effort. A high first prize makes it profitable for each individual player to invest more effort than the others. In a symmetric simultaneous contest aggregate effort is maximised when only one prize is given, again at odds with standard sports tournament design. An increasing number of contestants raises aggregate effort. If there are many prizes in relation to number of participants then increasing the number of contestants reduces aggregate effort. Extra prizes reward inferior effort and the opportunity costs of a low rank are reduced. This highlights a key role for the prize to participants ratio.

The case of asymmetric, heterogeneous players is considered by Szymanski and Valletti (2005) and this would appear to be highly relevant for the design of sports tournaments. With symmetric risk-neutral players a single prize will be optimal to maximise total effort. Introducing asymmetric abilities can make multiple prizes optimal. Weak contestants have a low probability

of winning the first prize. Lower prizes have a greater effect on the decisions of weaker players to invest in effort. This increases competition and induces the stronger players to invest more. There is a trade-off between the incentive effects of all prizes on all different ability types.

In Glazer and Hassin (1988), ability translates into costs of effort. The greater is ability the less costly it is for an agent to raise their output. Since there is a continuum of ability types and asymmetric information, a pure strategy equilibrium exists with sorting. Concavity of the utility function penalises high-valued prizes. There is a decreasing incentive effect of prizes on total effort the lower the rank. In this model structure, some prizes should be zero.

From the simplest tournament theory, now captured in various personnel economics textbooks such as Garibaldi (2006), the following empirically testable predictions emerge:

1. Effort depends on prize spread but not upon the change in absolute level of prizes
2. Effort depends negatively on marginal cost of effort
3. Effort depends on extent to which additional effort raises the probability of winning

By 'effort' it is typically meant the exertion of effort at the time of a particular stage in the contest. The first prediction has been tested empirically in the field, for example by Ehrenberg and Bognanno (1990) using the PGA tournament. Regarding the last prediction, in some tournament models, the probability of winning the top prize has an ambiguous effect on effort (Lazear and Rosen, 1981). Some experimental work shows that participants reduce effort when the perceived value of winning the contest is reduced, even in the presence of social stigma associated with effort reduction (Fershtman and Gneezy, 2011). We would then expect the converse to apply: if the perceived value of winning the contest increases sufficiently then effort will increase.[1]

[1] In the context of marathon running, Allen *et al.* (2014) show that runners speed up their pace near the end of a race when they are close to achieving a time below a given reference point that might generate monetary or non-pecuniary reward.

The third proposition that a change in the probability of winning a tournament affects effort and outcomes remains unexplored in the field, although it has been modelled and tested experimentally in controlled classroom experiments by Schotter and Weigelt (1992). They test how agent heterogeneity, equal opportunity laws and affirmative action laws determine agent effort; theoretically they predict that changing the probability that an agent wins an asymmetric tournament by including affirmative action laws results in lower effort by high cost and low cost agents. Their classroom experiment shows that when heterogeneity is low, an increase in the players' probability of winning the tournament decreases their effort. Yet, they also show that when heterogeneity is large, an increase in the probability of winning, induced by an affirmative action law, leads to increased effort by the less able players who have high costs of effort. We see a strong theoretical similarity between the tournament structure in the Affirmative Action laws explored by Schotter and Weigelt (1992) and the UEFA Champions' League qualification rules. In the latter, the hypothesis is that an exogenous change in the number of spots available in the tournament, and thus each agent's probability of winning, changes the agents' decision to invest in human capital (player ability).

Following Feddersen *et al.* (2012), mechanisms by which teams deliver greater effort include: i) more effort by players in games ii) selection of players by head coaches and iii) hiring new players and releasing inferior players through the transfer market. The focus of their analysis is the capability of team managers to vary team effort within a contest i.e. channels (i) and (ii) at game level. Our paper focuses on the third channel, in particular investment in playing resources through the transfer market with purchase of player registrations with cash. This represents a different kind of cost of effort to that usually considered in tournament theory. Essentially, teams restructure their playing squads in the close season so as to compete more effectively in the next season. As noted, this can only be done within a 'transfer window' during July and August. Renegotiation and re-signing of player contracts can occur at any time. In our setting,

contestant ability is no longer exogenous and is certainly heterogeneous. Asymmetric contestants then compete in a sequential, elimination tournament with multiple prizes and with some effort expended before the competition starts. From UEFA's perspective, multiple prizes provide incentives for teams to make appropriate efforts to attempt to qualify for their tournaments. The eliminations by stages can be viewed as a sorting device so that the best teams succeed in getting to the semi-finals and final.[2] Prior to this, the close season investment spending on team payrolls is itself a sorting device since smaller teams will generally lack the financial resources to compete effectively for star players in the transfer market. In domestic leagues, teams effectively sort themselves into categories ranked by investment in payrolls. These categories are, broadly in ascending order, acceptance of relegation, avoidance of relegation and hence retention of top division status, qualification for Europa League, qualification for Champions' League and champions.

Some North American literature on the National Basketball Association (NBA) has revealed an incentive for teams to under-perform in regular season games after they have been eliminated from playoff contention, termed 'tanking' (Taylor and Trogdon, 2002, Price *et al,* 2010, Soebbing and Humphreys, 2013). The rationale for this apparent deviant behaviour is that teams who are lowest in the league rankings get highest-placed draft picks under the reverse-order draft system. In the NBA, entry of professional players into the league is mostly through college draft. Feddersen *et al.* (2012) extend this idea to encompass the possibility of reduced effort by teams in European football leagues that have been condemned to relegation or have

[2] Note that selection and sorting mechanisms are widely practised in tournaments for individual sports such as golf, tennis and marathon running (see Frick (2003) and Frick and Simmons (2008) for surveys of tournaments for individual sports). Entry restrictions and seeding mechanisms are typical devices. A further complication in the Champions' League is that third placed teams in the group stages are eliminated from the Champions' League but are re-assigned to the Europa League and so can benefit from continued, albeit smaller, prize monies from UEFA's second (and lower status) competition. This increases the expected value of prizes for smaller teams which are less likely to progress beyond the group stages.

already been eliminated from qualification for European competitions in the regular season. They find evidence in favour of these predictions. [3]

In this paper, we exploit two different sources of variation that the UEFA rules generate. Not only does the number of spots in each national league vary across time, but we also take advantage of the variation of where these spots fall in the qualification stages. The Champions' League is divided into six stages. The first three stages consist of double round elimination matches, where each team plays a game at home. Currently, the first stage is composed of the four teams comprising the champions of the four lowest ranked domestic leagues. The second stage includes the two winners from the first stage, plus the champions of the leagues ranked 17-49 (34 teams). The third round includes the 17 winners from the previous round, the champions from leagues ranked 14-16, the runners up from leagues ranked 7-15 and the third place from leagues ranked 6 (30 teams). The playoff stage is a two legged, home and away round comprising the 15 winners of the previous round, two third place teams from leagues ranked 4-5 and three fourth place teams from leagues 1-3 (20 teams). Finally, the group stage of 32 teams comprises the 10 winners from the previous round, the champions from leagues 1-13, the runners up from leagues 1-6, and the third placed from leagues 1-3. This is followed by the knockout phase where the 8 winners and runner ups of the group stage meet (16 teams).

The further a team advances in the Champions' League, the higher the team revenue will be from prize money. While earnings in the qualifying rounds are relatively modest, earnings on the group phase and after are quite substantial, indicating a classic convex prize schedule in line with received tournament theory. Teams which fail to qualify to the group stage earn €150,000 if they play in the first stage, €200,000 if they play in the second stage and €250,000 if they play in the third stage playoff. The biggest returns start with the group stage. For example, for the 2012-2013 Champions' League a total of €904m was distributed to teams participating in the

[3] Van Ours and Tuijl (2011) offer evidence to show that national football teams supply less effort in the last few minutes of matches.

group stage by formula. Teams were compensated according to their performance but also according to their market size, linked to broadcast audiences. First, €495m was distributed with teams playing in the group stage receiving a stage fee of €8.6m, plus €1m for every win and €0.5m for every draw. Teams that qualified to the knock-out phase earned an additional €3.5m, teams that further qualified to the quarterfinals earned an additional €3.9m, and teams making it to the semi-finals earned an additional €4.9m. The winner of the final received €10.5m while the runner up earned €6.5m. In addition, €409m was distributed based on each team's market pool. (http://www.uefa.org/management/finance/news/newsid=1979893.html) Note that the total prize money for the 2013-2014 season had increased from €904m to €1,285m. Increasing broadcast rights revenues augment the market pool.

Figure 1 shows the evolution of payments to teams from each of the top five leagues from 2006 to 2011. Note that while the trend is increasing on average for all leagues, the largest increases in absolute terms are for the smaller leagues that are all collapsed into one category and England.

Table 1 presents the number of spots as defined above from each of the 12 leagues from 2005-2013. England, Spain and Germany are the leagues with the most spots with four each. While England and Spain had a fixed number of spots over this time period, Germany received one more. In contrast, Italy and Portugal experienced some variation in spots with Italy moving between four and three and Portugal between one and three. Not surprisingly, the smaller leagues have fewer spots. For example, Scotland and Switzerland experienced variation between one and two slots. Table 2 presents descriptive data for team payroll valuations and UEFA prize money, by league.

Similar to Schotter and Weigelt's (1992) asymmetric tournament above, an important feature of the Champions' League tournament is that a change in a team's probability of qualification should have a greater effect on the incentives of those agents whose marginal return

from increasing payrolls is highest. The teams that normally finish at the top of the domestic league table, and those near the bottom, have little marginal benefit from raising their effort as the number of Champions' League places changes. Indeed, teams that marginally qualified or failed to qualify for the competition should vary their spending by the largest amount as the number of Champions' League places increases. Importantly for our empirical design, the number of teams from each national League that qualifies into the Champions' League is determined by the UEFA Coefficient, which is in turn calculated based on previous European competition performances of all teams within a given League. This coefficient is time varying, but orthogonal to current season investment in the playing squad. Italy moved between three and four qualification spots over the last 10 years. A greater number of slots implies a higher probability of qualification for a team in a given domestic league. Again, our empirical prediction is that changes in the number of available slots will mostly affect those teams effectively competing for the extra spot in the Champions' League, and the stage of that spot will differ across leagues and across time.

3. Data and Descriptive Statistics

As payroll data is not publicly available we use team valuation from transfermarkt.de for 12 leagues for the seasons 2006-2007, 2008-2009, 2010-2011 and 2013-2014.[4] The ranking from each country, qualifying teams and payoffs from participating in European competitions are obtained from the UEFA Financial Reports (Available from http://www.uefa.com/uefa/management/finance/index.html), and the total points and league rankings are from ESPN FC. The leagues in our sample are England, Spain, Italy, France, Germany, Turkey, Netherlands, Portugal, Greece, Scotland, Poland, and Switzerland.

[4] Payroll data are available for two countries, France and Italy. For these countries the correlation coefficient between payroll data and transfer market team valuations is 0.91. Hence, we argue that our valuation data captures most of the variation that exists in the payroll information.

Figure 2 shows the evolution of team payroll valuations for the top five leagues with all other leagues combined as a new category. As with earnings from the Champions' League, these valuations are increasing the most for the category with all smaller countries collapsed and for England. This is prima-facia evidence that higher team payroll (as measured by team valuation) is associated with higher earnings and access to the Champions' League, but of course this association may very well be driven by league heterogeneity or by other secular trends in the soccer environment.

While public information on payroll is not available for the majority of leagues, an important question is how well transfermarkt values capture a team's incentive to invest in payroll. It has been argued that valuations based on reports by fans or experts may be biased (Peeters, 2014) and thus transfermarkt values may not capture the real payroll cost of a player. We argue that transfermarkt values are valid for two reasons. First, Hern *et al* (2014) explore fan valuations at length and their results suggest that fan valuations do explain future realized transfer amounts. Second, in the context of multiyear contracts where teams often face the decision whether to sell a player or not to a different team, transfermarkt values not only capture the explicit cost to the player's team, but also the implicit cost that is associated with keeping a player on a team rather than selling it. For example, a player who performs well in the World Cup finals might register an increased market valuation. Then the team's market valuation could increase without any addition to human capital.[5] However, the team could have earned a transfer fee for this player by accepting an offer from another club. The team has demonstrated increased commitment to this player by retaining him. This represents additional investment in current playing talent.

4. Empirical Specification

Our empirical specification relies on the fact that the UEFA coefficient, and thus the number of spots each league gets in the Champions' League, is determined by each country's

[5] We thank an anonymous referee for drawing our attention to this possibility.

teams' outcomes in the past five years of Champions' League competition. As such, any single team in a given year only influences its countries' future UEFA coefficient marginally. Moreover, changes in the number of Champions' League slots for a given league should only affect the decisions of teams operating at the margin of qualification. For example, in the Spanish league an extra spot will not directly change the investment decisions of either Real Madrid or Barcelona, the teams whose performance most influences Spain's coefficient. Any incentive effect will instead be concentrated on the decisions of the teams just below these such as Sevilla or Valencia.

In line with previous literature we predict that teams with higher payroll valuations will achieve higher league positions, ceteris paribus, resulting in greater probability of entry into the Champions' League. Simmons and Forrest (2004) and Frick (2013) offer evidence in support of this proposition for a number of European football leagues. Szymanski (2013) shows that teams that have greater spending on transfer fees also have higher league positions. Again, the team valuations that we use are based on independent expert assessments of individual player values, and incorporate potential transfer fees. Frick (2011) argues that these market valuations are proportional to a subset of observed player salaries in the Bundesliga and we expect this proportionality to hold across European leagues. [6]

Our main specification estimates how an extra spot in the Champions' League changes teams' incentives to increase the value of their payroll. This effect depends on how far each team is at the end of each season from qualifying to the Champions' League. We estimate the following linear regression model:

$$ln(y_{i,t,c}) = \sum_{j=1}^{4} \gamma_j D_{i,t-1,c}^{j} + \sum_{j=1}^{4} \theta_j D_{i,t-1,c}^{j} \times CH_{t,c} + \eta_i + \varepsilon_{i,t,c} \quad (1)$$

[6] Frick (2011) uses player valuation data from *Kicker* magazine but close inspection shows that *Kicker* valuations and *transfermarkt* valuations used here are closely correlated. Franck and Nüesch (2012) showed that *Kicker* and *transfermarkt* valuations had a correlation coefficient of 0.89 in their study of Bundesliga players between 2001 and 2006.

where the dependent variable is the log of the team's *i* payroll valuation in season *t* in country *c*. where *D* is a series of dummies indicating whether the team qualified for the Champions' League in the previous season, was 1 to 3 positions (places in league ranking)) away from qualification, 4-6 positions away or 7 or more positions away. These dummy variables are interacted with $CH_{t,c}$ which is the number of Champions' League qualification spots the league has been granted for season *t* at each stage. This equation is also estimated with η_i which are team fixed effects, the rank of each team in the previous season and each team's monetary prize from UEFA competition during the previous year.

A potential issue is that team's payroll valuation will be determined in part by the team's prize from European competition from previous seasons, and thus prizes from past tournaments will determine payroll in the current period. To control for such a possibility, we include in all specifications the prize money each team received from European competitions in the previous year, and we include a time trend in all estimations. We also include a continuous measure of distance away from Champions' League qualification, *Places from qualifying*, not interacted with spots in the Champions' League to control for direct effects of league standings on payroll spending absent the motivation to enter the Champions' League. Finally, to give every league equal representation, each observation is weighted by the inverse of the square root of the number of observations in each league.[7] All estimations include robust standard errors. Our coefficients of interest are θ_j which measures the change in team's payroll valuation when the number of spots in each Champions' League stage varies for each team in category *j*. $\theta_j > 0$ suggests that an extra spot in a given stage is associated with an increase in a team's payroll valuation of θ percentage points. The coefficient γ_j represents the change in team's payroll

[7] To show the robustness of our estimates, and to be able to account for league heterogeneity we also estimate equation (1) using country fixed effects instead of club fixed effects, and in this specification we include a variable for total payroll value in the previous period as well. These fixed effects capture league idiosyncratic characteristics such as strength of the competition and number of teams. The results with country fixed effects are similar and are available from the authors on request. Because we are more concerned with the heterogeneity across teams within a league we prefer the estimates with team fixed effects.

valuation across the different groups in the position table. In addition, we estimate a variant of equation (1) where the position dummies, *D*, are replaced with a series of dummy variables capturing the distance, in terms of points, from qualification in the previous season.

Results

Estimates of equation (1) are presented in Table 3 where log payroll valuation is regressed on control variables and dummy variables for distance bands of positions, showing numbers of places away from qualifying for the different stages in the Champions' League, interacted with the number of spots that each league is assigned for each stage of the Champions' League. In the first column we estimate the relationship between payroll valuation and distance the team finished the previous season from the number of spots from qualifying to the Group phase; the second column estimates the relationship between payroll valuation and the distance from qualifying for the Playoff phase; the third column the relationship between payroll valuation and qualifying for the Third round; the fourth column the relationship between payroll valuation and the distance from the second round so each column represents a different estimation.

The top panel of Table 3 presents estimates for all leagues together, the middle panel for the larger leagues, and the bottom panel presents estimates for the smaller leagues. The classification of larger and smaller leagues, although somewhat arbitrary, is supported by the number of spots each league gets the Champions' League as in Table 1. The larger leagues comprise England, France, Germany, Italy, Portugal and Spain. The smaller leagues are Greece, Netherlands, Poland, Scotland, Switzerland and Turkey.[8]

[8] We choose to define Portugal as a large league because three of its teams consistently and successfully participate into the later stages of European competition: Benfica, Sporting Lisboa, and FC Porto. Also, this classification gives us a clean separation of leagues, where large leagues do not have any spots into the second round, and small teams have no spots in the playoff stage.

The results in Table 3 are broadly consistent with the hypothesis that an extra spot in the different stages in the Champions' League is associated with larger payroll valuation. The results in the top panel, where all leagues are included into the sample, suggest that an extra spot in the Group phase increases payroll by 19 per cent for the teams that previously qualified for this stage and by 14 per cent those who finished between one or three places away, i.e. marginally failed to qualify. However, the latter effect is imprecisely estimated. An extra spot in the Playoff stage increases the payroll valuation for all teams in the league, yet the largest magnitudes of effects are for teams that just failed to qualify (20 per cent) and those within four to six places from it (22 per cent). Two things are worth noting in this first panel: first, while it is possible that there are significant differences between large and small leagues, a change in the Group or Playoff stage is positively associated with higher valuations. Second, that an extra spot in either the Third or the Second Round is not associated with larger valuations, probably because winning these rounds has rather low monetary prizes and qualifying for them does reflects a lower probability of advancing into the Group phase, where prizes are large but seeding applies to selection. Hence, the option value of progressing beyond the initial qualifying rounds is quite low.

The second panel shows the estimates when the sample is composed of large leagues, and the results mimic those for all leagues. Among large leagues, an extra spot in the Group phase is associated with higher valuations for teams that qualified, with a point estimate of 16 per cent. An extra spot in the Playoffs is associated with larger payroll valuation throughout a given league, but the largest magnitudes are among the teams that just failed to qualify with point estimates of 19 per cent for teams one to three places away and 24 per cent for four to six places away. The bottom panel represents the estimates when the sample is composed of small leagues. The results suggest that for these leagues an extra spot in the Champions' League Group phase is associated with larger payroll valuations, but only for the teams who just failed to qualify i.e. one to three places away from qualifying. These results support our hypothesis that increasing the

probability that an agent wins a tournament results in greater ex-ante effort by that agent. However, we also find evidence that incumbent agents who have already qualified for the tournament also raise their efforts in anticipation of increased efforts by potential rivals.

In Table 4 we estimate equation (1) utilising an alternative measure of distance, the deviation in points from qualifying to the Champions' League in the previous season. The results are similar to those in Table 3. In the top panel for all leagues, teams that qualify for the Champions' League increase their payroll valuation by 13 per cent for an extra Group phase spot. Similarly, teams that fail to qualify by less than nine points increase their payroll valuation by eight per cent while teams that are nine to 15 points away raise their payrolls by only five per cent, where this effect is imprecisely estimated. In contrast, an extra spot in the Playoffs phase is not significantly associated with payroll for teams that are up to eight points from qualification, although we do find a marginally significant effect for teams that end up nine to 15 points short[9]. Among large leagues, the effects are statistically insignificant apart from for teams that have already qualified (a nine per cent effect, significant at the 10 per cent level). Finally, the bottom panel shows that in smaller leagues, an extra spot in the group phase is associated with a considerably larger valuation in payroll, a 34 per cent point estimate just for those teams who finished within three wins of qualifying.

It is important to highlight that these results are also consistent with an arms race among the top teams in Europe. That is, the top teams in the largest leagues increase their payroll valuation when there is an extra spot in the Group phase and to the lesser extent in the Playoff phase in response to potential upgrading of team talents by potential marginal rivals. Some researchers have identified arms race behaviour in payroll spending on player talent in Spanish football e.g. Ascari and Gagnepain (2006), Barajas and Rodriguez (2010) and Garcia-del-Barrio and Pujol (2007). The consequence of this arms race is likely to be a concentration of talent

[9] 15 points or less is an intuitive threshold for us, as this represents a difference of no less than five wins.

among a few very rich teams such as Barcelona, Bayern Munich, Chelsea, Paris Saint-Germain and Real Madrid. Moreover, this arms race could endanger financial viability of some football clubs and this is one motivation for the current UEFA Financial Fair Play policy, specifically designed to reign in deficits and debts of European clubs with Champions' League ambitions (Franck, 2014).

Nevertheless, our results suggest that an extra spot in the playoff stage for the large leagues does incentivize larger expenditures by the teams who are on the margin between qualifying or not such as Braga, Real Sociedad, or Schalke. In contrast, among smaller leagues, the results suggest that it is an extra spot in the Champions' League Group Phase that is associated with larger payroll valuation for marginal competing teams. Here, we do not observe the arms race observed among the top teams of the large leagues and the incentive effect from that extra spot in the tournament is identified more cleanly.

5. **Conclusion**

In this paper we use variations in qualifying rules from the Champions' League to understand how agents react to an exogenous change in the returns to a given rank in a rank-order tournament. Our results suggest that increasing the number of spots that a league has for its teams to qualify into the Champions' League results in higher payroll by teams that in the previous season fell short of qualifying. The estimates are larger for teams who marginally failed to qualify and they decrease for teams that are farther down in the league tables. Importantly, the payrolls of teams who did qualify in the previous season also increase with an additional Champions' League spot, suggestive of an arms race in payrolls and transfer spending across European football.

Moreover, if a league loses a Champions' League slot, then our model predicts a reduction in team payrolls both for teams that still qualify and for marginal teams close to qualification. This

suggest a negative externality effect on a domestic league through loss of a Champions' League spot, especially in the Group or Playoff phases, where the quality of this domestic league is undermined as star players leave for better prospects of Champions' League football elsewhere in Europe. This seems to the case in Italy's Serie A, where the decline in league quality has been documented by Boeri and Severgnini (2014). The removal of a Champions' League spot for Italy exacerbates the sporting and economic decline of Serie A.

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Table 1. Number of Spots per Country for Each Qualifying Stage in the Champions League

	(1)	(2)	(3)	(4)
	2006	2008	2010	2013
England	2, 0, 2, 0	2, 0, 2, 0	3, 1, 0, 0	3, 1, 0, 0
Spain	2, 0, 2, 0	2, 0, 2, 0	3, 1, 0, 0	3, 1, 0, 0
Italy	2, 0, 2, 0	2, 0, 2, 0	3, 1, 0, 0	3, 1, 0, 0
France	2, 0, 1, 0	2, 0, 1, 0	2, 1, 0, 0	2, 0, 1, 0
Germany	2, 0, 1, 0	2, 0, 1, 0	2, 1, 0, 0	3, 1, 0, 0
Turkey	0, 0, 1, 1	0, 0, 1, 1	1, 0, 1, 0	1, 0, 1, 0
Netherlands	1, 0, 1, 0	1, 0, 1, 0	1, 0, 1, 0	1, 0, 1, 0
Portugal	2, 0, 1, 0	1, 0, 1, 0	1, 0, 1, 0	2, 1, 0, 0
Belgium	0, 0, 1, 1	0, 0, 1, 1	0, 0, 2, 0	1, 0, 1, 0
Greece	1, 0, 1, 0	0, 0, 1, 1	1, 0, 1, 0	1, 0, 1, 0
Scotland	0, 0, 1, 1	1, 0, 0, 0	0, 0, 1, 0	0. 0. 0, 1
Switzerland	0, 0, 1, 1	0, 0, 1, 0	1, 0, 1, 0	1, 0, 1, 0

Table 2. Payroll and UEFA Champions League Prize Descriptive Statistics

	(1) Payroll Value	(2) UEFA CL Prize	(3) Payroll Value 90 pct	(4) Payroll Value 10 pct
England	141,351	33,270	337,110	52,929
	11,620	1,817		
Spain	110,752	25,902	276,339	34,424
	13,044	2,335		
Italy	100,803	29,924	233,567	31,994
	8,940	2,651		
France	62,966	22,004	108,807	24,550
	5,300	1,920		
Germany	81,353	27,572	135,256	30,823
	7,598	3,055		
Turkey	40,245	13,957	92,033	18,316
	3,407	3,031		
Netherlands	28,493	14,072	65,497	8,952
	2,711	3,115		
Portugal	35,305	11,481	101,565	9,568
	5,424	1,151		
Greece	21,472	6,351	46,082	9,576
	1,868	1,878		
Scotland	16,442	12,643	56,228	5,187
	2,803	2,383		
Poland	10,171	2,557	18,218	5,236
	724	269		
Switzerland	14,272	6,005	20,976	7,144
	1,231	2,212		

Table 3 Estimates for a Change in Payroll Value and a Change in Distance in Places from Qualification

	(1) Groups	(2) Playoffs	(3) Third Round	(4) Second Round
		All Leagues		
CL X Qualified	0.191**	0.164***	-0.018	-0.100
	(0.077)	(0.062)	(0.029)	(0.090)
CL X 1-3 Places Away	0.140*	0.200**	-0.038	-0.030
	(0.083)	(0.088)	(0.033)	(0.076)
CL X 4-6 Places Away	0.124	0.221***	-0.070*	0.011
	(0.085)	(0.083)	(0.042)	(0.091)
CL X 7+ Places Away	0.100	0.159**	-0.004	0.012
	(0.091)	(0.064)	(0.032)	(0.112)
Places from Qualifying	0.130	0.052	0.010	0.044
	(0.083)	(0.032)	(0.035)	(0.036)
Club's UEFA Earnings *(t-1)*	0.013***	0.013***	0.015***	0.015***
	(0.005)	(0.005)	(0.005)	(0.005)
Observations	701	701	701	701
R-squared	0.961	0.961	0.961	0.961
		Large Leagues		
CL X Qualified	0.159**	0.118*	0.000	
	(0.074)	(0.070)	(0.034)	
CL X 1-3 Places Away	0.130	0.193*	-0.034	
	(0.082)	(0.100)	(0.043)	
CL X 4-6 Places Away	0.126	0.243**	-0.028	
	(0.089)	(0.096)	(0.052)	
CL X 7+ Places Away	0.135	0.187**	-0.009	
	(0.097)	(0.080)	(0.037)	
Places from Qualifying	0.153*	0.075**	0.020	
	(0.087)	(0.037)	(0.041)	
Club's UEFA Earnings *(t-1)*	0.012**	0.013**	0.014**	
	(0.006)	(0.006)	(0.006)	
Observations	409	409	409	
R-squared	0.957	0.958	0.957	
		Small Leagues		
CL X Qualified	0.169		0.069	-0.143
	(0.158)		(0.066)	(0.089)
CL X 1-3 Places Away	0.140**		0.031	-0.098
	(0.070)		(0.064)	(0.070)
CL X 4-6 Places Away	-0.074		-0.023	-0.141
	(0.091)		(0.072)	(0.086)
CL X 7+ Places Away	-0.078		0.135	-0.039
	(0.083)		(0.101)	(0.108)
Places from Qualifying	-0.022		-0.045***	-0.038***
	(0.014)		(0.017)	(0.013)
Club's UEFA Earnings *(t-1)*	0.011		0.011	0.011
	(0.009)		(0.009)	(0.009)
Observations	292		292	292
R-squared	0.917		0.917	0.915

Robust standard errors in parentheses. Each regression includes club's rank in previous season the domestic league, club fixed effects, a year time trend, and it is weighted by the inverse of the number of teams in each league. *** p<0.01, ** p<0.05, * p<0.1

Table 4 Estimates for a Change in Payroll Value and a Change in Distance from Qualification

	(1) Groups	(2) Playoffs	(3) Third Round	(4) Second Round
		All Leagues		
CL X Qualified	0.127***	0.076	0.008	-0.064
	(0.041)	(0.072)	(0.036)	(0.108)
CL X 1-8 Points Away	0.083***	0.087	-0.042	0.210
	(0.030)	(0.083)	(0.050)	(0.139)
CL X 9-15 Points Away	0.047*	0.136*	-0.026	-0.053
	(0.027)	(0.076)	(0.039)	(0.130)
CL X 16+ Points Away	-0.034	0.063	-0.035	-0.037
	(0.045)	(0.052)	(0.028)	(0.067)
Points from Qualifying	-0.001	-0.001	-0.003*	0.002
	(0.001)	(0.001)	(0.002)	(0.002)
Club's UEFA Earnings *(t-1)*	0.013***	0.014***	0.014***	0.016***
	(0.005)	(0.005)	(0.005)	(0.005)
Observations	701	701	701	701
R-squared	0.962	0.962	0.961	0.961
		Large Leagues		
CL X Qualified	0.086*	0.029	0.025	
	(0.044)	(0.072)	(0.039)	
CL X 1-8 Points Away	0.058	0.083	-0.022	
	(0.037)	(0.085)	(0.053)	
CL X 9-15 Points Away	0.032	0.123	-0.019	
	(0.027)	(0.077)	(0.045)	
CL X 16+ Points Away	-0.043	0.042	-0.017	
	(0.048)	(0.075)	(0.036)	
Points from Qualifying	-0.003	0.000	0.000	
	(0.004)	(0.004)	(0.004)	
Club's UEFA Earnings *(t-1)*	0.012**	0.014**	0.015**	
	(0.006)	(0.006)	(0.006)	
Observations	409	409	409	
R-squared	0.958	0.957	0.957	
		Small Leagues		
CL X Qualified	0.162		0.107	-0.070
	(0.229)		(0.124)	(0.118)
CL X 1-8 Points Away	0.342**		0.008	0.146
	(0.172)		(0.126)	(0.144)
CL X 9-15 Points Away	0.094		0.155	-0.197
	(0.137)		(0.105)	(0.127)
CL X 16+ Points Away	-0.172		0.000	-0.082
	(0.239)		(0.070)	(0.073)
Points from Qualifying	-0.003		-0.002	-0.001
	(0.005)		(0.002)	(0.003)
Club's UEFA Earnings *(t-1)*	0.012		0.013	0.016*
	(0.009)		(0.009)	(0.009)
Observations	291		291	291
R-squared	0.925		0.922	0.921

Robust standard errors in parentheses. Each regression includes club's rank in previous season the domestic league, club fixed effects, a year time trend, and it is weighted by the inverse of the number of teams in each league. *** p<0.01, ** p<0.05, * p<0.1

Figure 1

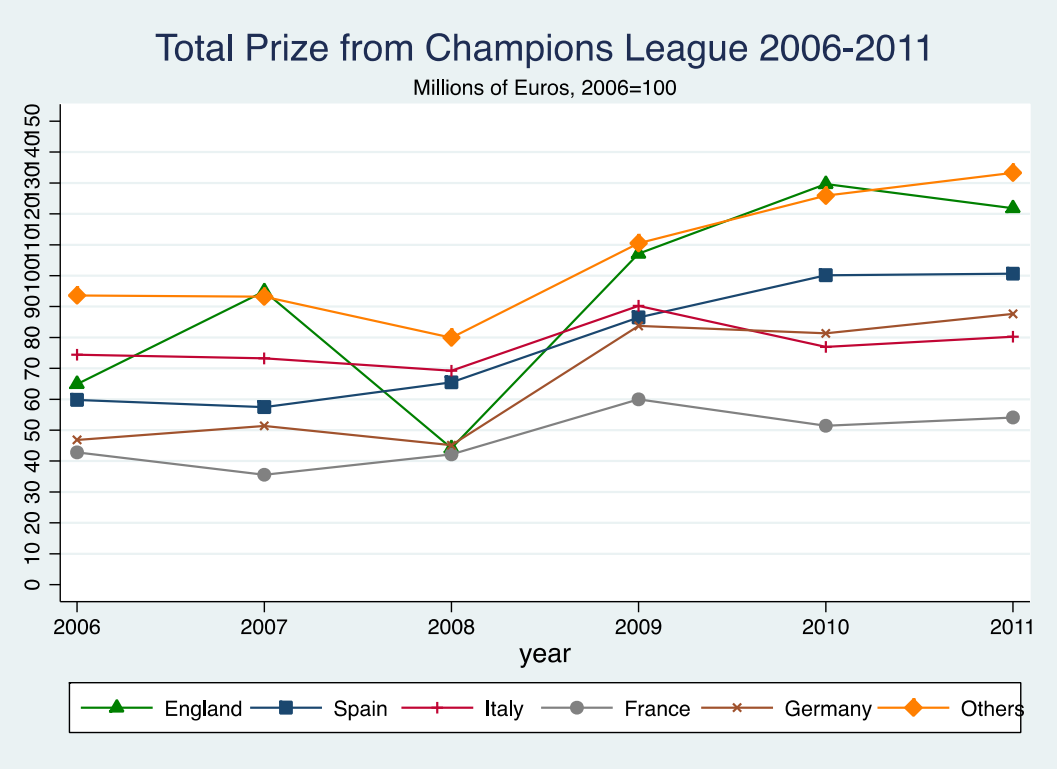

Figure 2