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Abstract

Historically, European team sports leagues were run by their respective national and international associations and were legally independent from the professional clubs playing in these leagues. Recently, European leagues have adopted an organizational form similar to their North American counterparts who are organized since their beginning in a cooperative-like manner. Based on a comparative institutional analysis, we explain the advantages of the cooperative form of league organization over contractual governance. With our four-stage game-theoretic model, we show that contractual governance of sports leagues leads to larger investment distortions than cooperative league organization.

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1 Introduction

Professional team sports are characterized by legally independent entities that jointly produce a product which essentially is the championship race. In contrast to their North American counterparts, most European professional sports leagues have only quite recently transformed their organizational structure into one of cooperative governance.

In Germany, for example, in the year 2000, the 36 clubs of the first and second division of the German national soccer league (Bundesliga) founded the so-called "Ligaverband" (league-association). The German soccer federation DFB (Deutscher Fußball-Bund) exclusively ceded the rights to stage the Bundesliga championship to the league-association. The latter then has created the German soccer league DFL (Deutsche Fußball Liga GmbH) of which the league-association is the sole partner. The DFL is responsible for the operations of the league-association and manages the implementation of its decisions. In particular, the DFL supervises league play and markets the first and second division exclusively. Thus, until 2000, league operations in Germany were fully conducted by the soccer federation DFB which is also responsible for the administration of amateur and female soccer. Only from the year 2000 onwards, the professional soccer clubs began to organize and market their championships with a high degree of independence from the national federation DFB.

By adopting a cooperative form of governance at the league level the German Bundesliga followed a development which North American professional sports leagues have pioneered long ago. In a cooperative setting, club-owners retain their independence on the level of individual team-production and are able to act discretionarily given league restrictions. However, on the level of championship production, club-owners have partially integrated forwardly in order to govern league affairs. In the U.S. Major Leagues, all strategic questions of league-wide relevance are decided by majority voting. The associates entitled to vote are but the participating club-owners. This institutional innovation has been realized by the foundation of the Baseball National League in 1876 and has since represented the single most robust element of organization in professional team sports. Other Major Leagues have quickly adopted this transformation and European soccer leagues have recently tended to do so.

The nature of the relationship between clubs and the league bodies before this development is best described as one of contractual governance between vertically separated entities. Under such a contractual governance, the league essentially acts as an intermediary for the individual clubs' products. Similar situations are still observed in individual sports, where single athletes and tournament organizers negotiate contracts regulating the athletes' participation. Also, the Formula One (F1) motor racing league resembles such a situation. Manufacturers which finance the racing teams and F1 management are by and large independent and regularly negotiate contract parameters, especially the distribution of rents.

The question then is why European professional soccer leagues have moved away from a contractual towards a cooperative form of governance. It seems to be the case that, in the context of professional team sports, a cooperative governance system possesses some advantages over a contractual regime. In order to address the sources of these advantages we will provide a formal model that compares production in professional sports leagues under both a contractual as well as a cooperative form of governance. As has been noted in the literature regarding efficiency aspects of cooperatives (e.g. Nilsson, 2001) the allocation of residual rights is crucial. However, matters are complicated in team sports by the fact that the production of surplus occurs through a contest to which all participating clubs need to contribute. In the contractual setting, not being able to contract for investments into the club, the league governing body as the holder of the residual rights acts as a principal who provides investment incentives for the clubs in order to maximize his profits. In the cooperative setting, the participating clubs set up the contest themselves.

In principle, an additional form of governance, a "league-corporation", is feasible for organizing relationships among participating entities. However, it is well known why corporate solutions have failed to organize sports leagues successfully (Franck, 1995; Franck, 2003). Firstly, if clubs were consolidated under one corporate roof, they would act as local subsidiaries of the league-corporation. Simultaneously, the league-corporation's property rights can be interpreted as an endowment with decision rights reaching into the subsidiaries. Consumers would suspect the corporate league-owner of influencing the rules of the game discretionarily in order to maximize his profits. The possibility of doing so would therefore significantly undermine the integrity and credibility of the championship race. To the extent that consumer demand is increasing in the fairness and integrity of the championship, such conflicts of interest would adversely affect demand. From this viewpoint, it is not surprising that attempts to organize leagues as corporations have remained unsuccessful so far. Consumers have revealed their preferences, and attendance figures reflect that they prefer - so to speak - the Chicago Bulls to the Harlem Globetrotters and therefore genuine sportive competition to a mere show. Thus, corporate league organizations face additional costs of credibly signaling the absence of exerting influence onto on-pitch outcomes - even in the presence of possibilities of doing so. These considerations also apply to organizational forms similar to the league-corporation such as franchising. In a franchising organization, the franchisor will always possess residual rights. The franchisor can issue additional licenses, be unwilling to prolong existing franchising contracts, and so forth. From this viewpoint, the potential for affecting the sportive outcome by the franchisor remains significantly high.

Secondly, and arguably more important than the integrity issue, the firm structure induces a moral hazard problem. Team owners will be replaced by employed managers as clubs become subsidiaries of a unified firm. It seems reasonable to assume that the effort managers exert in team-development is not observable by the central league authority. This may be a consequence of the fact that the local markets of the subsidiaries differ greatly due to historical, cultural or ethnic peculiarities. In such a case, local and implicit knowledge becomes important for making value-enhancing decisions at the club level. Such knowledge cannot be monitored effectively by a central league-owner. Moreover, the league-owner cannot infer managerial effort by observing output, for example, by looking at the championship performance of a team. Since managerial effort is not contractible as a consequence, the firm-solution comes at the price of a nontrivial problem to provide efficient managerial incentives. The latter essentially constitutes a "hidden action" problem. It has to be noted that economic theory has provided incentive structures that yield adequate managerial effort (e.g. Hart and Holmstrom 1987). The downside is their rather unclear implementation in practice. To circumvent such problems, Holmstrom and Milgrom (1987) have derived conditions under which a linear compensation scheme is optimal from the viewpoint of the principal. However, it is unclear whether these conditions apply in the environment of professional sports leagues.

Due to the inappropriateness of the corporate leagues for the reasons mentioned above, this paper focuses on the contractual and cooperative forms of governance and seeks to provide a rationale for the stylized fact that professional sports leagues tend to choose cooperative governance as their preferred organizational structure. Of course, there are differences between sports leagues which are ignored in this paper. These differences concern the criteria for admitting new members, the amount of influence exerted by outsiders such as sports federations, the governance structure within the cooperative, and so forth. Nonetheless, we believe that the similarity stemming from the fact that they are all governed cooperatively outweigh their differences. Additionally, we are abstracting from agency problems within a cooperative. While this, of course, constitutes a simplifying assumption, we believe that our approach is reasonable in order to highlight the effects stemming from the governance form as such.

The paper is organized as follows: The next section presents some peculiarities of professional sports production which are needed to understand the setup of the model. Section 3 then presents the model, its equilibria and a comparative governance analysis. Section 4 provides testable hypotheses that can be derived from the model. The final section discusses the results and concludes.

2 Some Peculiarities of Sports Production

2.1 Two-Stage Production Process

Professional sports clubs' revenues are largely compiled from five sources: Matchday revenue and broadcasting rights combined account for one-half to three-fourths of total league revenue, the rest is made up by merchandising, advertising and sponsoring (Deloitte 2004). At first sight, any single game and the attention generated by it are relevant for matchday and broadcasting revenue. However, when comparing revenues from exhibition games to those from championship games, it becomes evident that the value of the latter significantly exceeds the value of the former. The value of any game depends on the participating teams' playing strengths. But a larger contribution to the game's value is made by the relevance of the game for the championship. Seen from this viewpoint, value-creation in professional team sports occurs on two distinct stages (Franck 1995, Franck 2003): On the first stage, the stage of the individual clubs, club-owners invest into the playing strength of their respective teams. The problem, though, is that no single team is able to produce a marketable product. In order to do so, any team is in need of at least one opponent. The value of the resulting games can then be increased significantly if they are integrated into a championship race. Thus, on the second stage of the production process, the stage of the league, single games act as inputs for the production of the final meta-product, the championship itself. In some leagues such as the European soccer leagues, there exists a third stage, on which the output of the second stage, the national champions, represent inputs for a higher-order championship of national champions, the UEFA Champions League.

2.2 Economic vs. Sportive Competition

This multi-stage production process is characterized by some economic peculiarities. Firstly, a distinction has to be made between economic competition and competition on the pitch. In sports, any team will try to dominate its opponents and maximize its winning percentage. From a league-wide economic point of view, however, the attractiveness of the championship might be increasing in the balance of the competition. Thus, on aggregate, the absence of single teams dominating the championship is economically preferable. This phenomenon is in stark contrast to the notion of economic competition, where the goal of any competitor is to attain monopoly status in order to maximize its profits. In sportive competition, scholars such as Rottenberg (1956) and Neale (1964) have recognized early on that an on-pitch monopoly of any single team will lower the team's profits as the championship becomes unattractive and demand subsequently decreases. Thus, to produce a valuable product, it is necessary for any team to possess potent competitors and a league that coordinates the championship. However intuitive this insight might be, the question remains as to which degree of competitive balance maximizes aggregate league revenue. If consumers' utility and thus their willingness to pay are increasing in the winning percentage of their supported team, then the clubs' individual potential fan bases, their market-sizes, must be considered when deriving the optimal degree of competitive balance. An additional win of a large-market team will generate higher aggregate marginal utility than the one of some small-market team, due to the larger number of fans deriving utility from that additional win. Therefore, a fully balanced league might not maximize aggregate revenue.

Even though the relevance of competitive balance for demand is intuitively plausible, there is mixed evidence on its empirical significance. First of all, it is unclear which dimension of competitive balance affects demand the most. Sanderson (2002) as well as Sanderson and Siegfried (2003) differentiate three notions of competitive balance: (i) uncertain match outcome, (ii) uncertain championship outcome and (iii) long-term uncertainty of outcome, that is, the absence of so-called dynasties. Apart of these problems of proxying competitive balance, the empirical evidence on the effects of the different notions of competitive balance onto demand remains ambiguous. Szymanski (2003) surveys 22 empirical studies and concludes that "ten offer clear support for the uncertainty of outcome hypothesis, seven offer weak support, and five contradict it". A similar conclusion is drawn by Downward and Dawson (2000), who state that "the evidence suggests that uncertainty of outcome has been an overworked hypothesis in explaining the demand for professional sports".[1] Note that there is not only mixed empirical evidence on the relevance of competitive balance for attendance but also the specifications used to examine competitive balance and attendance vary significantly across the studies (e.g. the specification of consumer demand and the relevant elements of outcome uncertainty, handling the time series characteristics of attendance data beyond a correction for serial correlation etc.).[2]

Thus, although the exact nature of the relevance of competitive balance for consumer demand is unclear, it is fair to state that while clubs are competitors on the pitch their economic relation seems to be rather complementary.

2.3 League Monopoly and Hold-Up

Another peculiarity of professional sports production is the fact that, per definition, any championship race must possess monopoly status. The validity of the championship primarily rests on this monopoly status. If there are several championships per market area and sport, no consistent ranking of all performers is achieved and, hence, the championship will lose a significant part of its value for consumers. A brief look at the history of Major League sports shows that the periods of inter-league competition have been rather short and ended in mergers if the contender succeeded in seriously challenging the established league at all (Quirk and Fort 1992, Fort 2006a). In European soccer, this uniqueness of national championships is additionally enforced on a formal basis by

[1] See also Borland and MacDonald (2003).

[2] See Fort (2006b) who reviews all of the different ways in which game uncertainty, playoff uncertainty and consecutive season uncertainty have been measured. Moreover, he shows how the specification error of not including all of the different measures of outcome uncertainty can lead to bias in coefficient estimates in demand analyses.

UEFA's lack of approval for any national league not licensed by the respective national soccer federation.

The definitory monopoly status of Major Leagues yields an important consequence for the participating clubs. Investments of club-owners into their teams are specific in the sense that they cannot be transferred to alternative, equally profitable endeavours. Any individual club-owner has no economically viable exit-option from a monopolistic Major League other than shutting down and selling the team. Therefore, whenever clubs and the league coordinate their relations via contracts, a hold-up risk arises (Klein et al. 1978). Having made investments into the teams, club-owners cannot redirect their investments into other businesses without losing a significant part of their value and are thus forced to accept whichever conditions are offered by the league governing body. While European soccer clubs have tried to adapt to this situation by striving to increase their independence from association-governed soccer leagues, the full extent of such a situation is felt in F1 motor racing. Even though no single club-owner can produce a championship race on his own, some subset of clubs may be tempted to threaten to set up some competing league - knowing that the probability of success of such a league might be low a priori. This is exactly what could - until recently - be observed in F1, where a subset of racing teams threatened not to prolong the "concorde agreement", the agreement governing relations between the team association FOCA and the F1 management, in order to start an own racing league dubbed GPWC. The European soccer clubs' G-14 can be interpreted as a similar endeavour since its primary aim is to augment their bargaining power versus the respective national leagues and the UEFA.

These measures of soccer clubs and F1 racing teams are essentially aimed at distorting the distribution of rents to their favour. A standard remedy in the presence of specific investments that helps avoiding unproductive rent seeking is the vertical integration of the two levels of production (Williamson 1975, Klein et al. 1978). The unification of club-owners and the league body under one single corporate roof solves the hold-up problem. Unfortunately, it gives rise to new problems (i.e. integrity, moral hazard) affecting revenue and profits in a detrimental manner. The following section formally shows how forward integration of clubs into the stage of championship production increases league productivity relative to a contractual interaction of clubs and the league.[3]

[3] Note that "league productivity" is defined as aggregate profits of the clubs and the league (for more detail see Section 3.1.2).

3 Model

Suppose there are two types of clubs: one large-market club l and one small-market club s. The large-market club l is assumed to possess an advantage over the small-market club s in the sense that it is able to invest any given amount into the team at a lower cost. Each type of club can either engage in a championship administered by the league body or choose to pursue an outside option, the value of which is determined endogenously. The championship is modelled as a standard contest along the lines of Tullock (1980). That is, contingent on joining the league, clubs compete for the league prize v by means of a contest. The probabilities of success are supposed to be non-discriminating logit contest-success-functions, i.e.

$$p_i = \frac{e_i}{e_s + e_l}, \tag{1}$$

where $e_i \in [0, \infty)$ denotes club-owner i's investments into the team such as players, support staff, infrastructure, medical assistance, and so forth. We adopt the so-called "Contest-Nash conjecture" $\frac{de_i}{de_j} = 0$ and thus compute the derivative of (1) as $\frac{\partial p_i}{\partial e_i} = \frac{e_j}{(e_s+e_l)^2}$.[4] As usual in contests, one of the participants will turn out to be the winner, i.e. it will be the case that $p_l = 1 - p_s$. Total league revenue $R(e_l, e_s)$ is assumed to be a concave function of aggregate investments into the teams. This reflects the fact that demand for league games increases with increasing quality of play which again is increasing in team-specific investment.[5] Throughout this section, total revenue is assumed

[4]Szymanski (2004), p.112 states that the "Nash solution to the noncooperative game of talent choice in a professional sports league [..] is inconsistent with the standard representation of the competitive equilibrium". According to Szymanski, the so-called "Walrasian fixed-supply conjecture model" is not meaningful. This model does not fulfil the conditions of a Nash equilibrium since the incorporation of the constant supply conjectures leaves one team without a choice of strategy (see footnote 6 on p. 124). Therefore "it makes no sense to talk of any conjectural variation other than zero" (p.118). Moreover, Szymanski and Késenne (2004), p.176 agree with Szymanski (2004) and furthermore state: "When the choice of one team automatically constrains the other in a two team model, and so every possible choice of talent is a Nash equilibrium, because the other team has only one feasible response, which is therefore 'best.' However, this clearly makes little sense as an economic model." See also Atkinson et al. (1988), Szymanski (2003), Falconieri et al. (2004), Dietl and Lang (2008) and Dietl et al. (2008) who apply the "Contest-Nash conjectures" in their models. Moreover, our paper is focused on the open European sports leagues in which talent supply is generally assumed to be flexible; especially after the Bosman verdict in 1995 which has established an international player market. In contrast, see Fort and Quirk (2007) for an analysis in the context of the US major leagues.

[5]The implicit assumption is that quality is increasing in team-specific investment. The possibility of demand being affected by competitive balance is neglected. As mentioned previously in Section 2, empirical findings on the relevance of competitive balance have been highly mixed. It remains to be shown that the results derived below hold true in a setting in which revenue is not independent of competitive balance.

to be given by

$$R(e_l, e_s) = (e_l, e_s)^{\frac{1}{2}}. \tag{2}$$

Whether the derived results can be generalized to all concave revenue functions is subject to future research. Prior to joining the league, both club-owners may invest some amount $z_i \in [0, \infty)$ into their outside options, the values of which are supposed to be given by $a(z_i) = rz_i^{0.5}$, where r has to be sufficiently low in order to ensure that league production is ex ante desirable.[6] It is important to note that the costs of these outside option-investments are sunk.

Investment costs are given by $c_i(s_i, z_i) = \beta_i c_l e_i + c_s z_i$ where $\beta_s = 1$ and $\beta_l \equiv \beta \in \left(\frac{1}{2}, 1\right)$. Thus, the parameter β incorporates club asymmetry into the model and reflects the fact that club l is able to invest any given amount into the team at a lower cost than club s. Note that this formulation is equivalent to a formulation in which clubs are symmetric regarding their costs but asymmetric regarding their drawing potential, i.e. the potential revenue given some vector (e'_l, e'_s). The parameters c_l and c_s denote the (marginal) costs of both investment types. Since the parameter determining outside option profitability is restricted to be less than unity, it can be assumed without loss of generality that $c_s \equiv 1$. Then, the parameter $c_l \equiv c$ can be interpreted as a measure of relative investment costs. However, in order to ensure that league-participation is desirable, it must be the case that $c \in (0, 1]$.

In the next subsection, club and league behavior in a setting in which league governance occurs through contracts, is analyzed. In the following subsection, a situation in which clubs integrate forwardly into the stage of championship production is modelled. Then, the results will be compared and discussed.

3.1 Equilibrium - Contractual Governance

In what subsequently will be referred to as "contractual governance", it is assumed that relations between clubs and the independent league body are governed through contracts. If a championship evolves, then the league provides the teams with the organization of the championship, that is, the league is administering the rules of play, the scheduling of play, transfer restrictions, and so forth. By the assumption of investment specificity, the

[6] Note that the derived results are robust to different choices of functional forms for the outside option.

league body is the holder of the residual right implying that the league passes the prize v to the clubs and is able to keep the residual revenue. An implicit assumption is that the league cannot contract for the team-specific investment levels. This is reasonable since it would be nearly impossible to credibly monitor all investment activities of the clubs. Additionally, contracting for team-specific investments moved the championship into the direction of the league corporation, resulting in the aforementioned problem of integrity. Essentially, this breaks down to an agency problem: Facing investments into the outside options on behalf of the teams, the league body will thus maximize $R(e_l, e_s) - v$. In order to do so, the league has to induce club-owners via the prize v and the share awarded to the winner k taking into account individual rationality constraints on behalf of the club-owners. The latter is due to the lack of alternative income sources for the league, which implies that club-participation is the only possibility for the league to generate positive profits. Note that the outside option and championship participation are mutually exclusive alternatives for the club-owners.

The timing of events is as follows:

1. Club-owners select their outside option investment levels $z_i \in [0, \infty)$, $i \in \{l, s\}$.
2. Observing z_i, the league makes a "take-it-or-leave-it"-offer (v, k) to the clubs.
3. Club-owners decide whether to accept the offer and participate in the championship with investment levels e_i or pursue their respective outside options.
4. Payoffs are realized.

The model will be solved using backward induction. Thus, when analyzing the club-owners' investment choices in stage 3, it is assumed that they have decided to join the league, given the offer (v, k).

3.1.1 Solution

Stage 3 When choosing to join the league and participate in the championship, any club-owner invests some amount e_i into the team in order to compete for the championship prize v. However, the league may award some share $1 - k \leq \frac{1}{2}$ of total prize money to the team finishing second. Then, expected profits are given by:

$$\begin{aligned} E(\pi_l) &= p_l k v + p_s(1-k)v - \beta c e_l - z_l && (3) \\ &= \frac{(e_l - e_s)k + e_s}{e_l + e_s} v - \beta c e_l - z_l \\ E(\pi_s) &= p_s k v + p_l(1-k)v - c e_s - z_s && (4) \\ &= \frac{(e_s - e_l)k + e_l}{e_l + e_s} v - c e_s - z_s \end{aligned}$$

Having already decided to engage in championship play, team-specific investment choices of the club-owners will be such as to maximize their respective expected profits. Thus, club-owner $i \in \{l, s\}$ solves:

$$\underset{e_i}{max} E(\pi_i)$$

where $E(\pi_i)$ is given above by equations (3) and (4) respectively. Solving the resulting system of reaction functions for the respective equilibrium investment levels of the subgame beginning in stage 3 yields:

$$(\hat{e}_l(v,k), \hat{e}_s(v,k)) = \left(\frac{v(2k-1)}{c(1+\beta)^2}, \frac{\beta v(2k-1)}{c(1+\beta)^2} \right) \tag{5}$$

where $\hat{e}_i = \underset{e_i}{argmax} E(\pi_i)$ for $i \in \{l, s\}$. In line with standard contest results, equilibrium team-investment levels are increasing in the spread between first and second prize $v(2k-1)$. Additionally, increasing relative investment costs lead to less team-investment in equilibrium. Increasing team-heterogeneity (i.e. a lower β) yields more investment into the team of the more productive club (club l) and less team-specific investment on behalf of the less productive club in equilibrium. As asymmetry has been incorporated through marginal costs, a higher degree of asymmetry is equivalent to lower marginal costs of club l which thus will increase its team-investments up to the point in which marginal costs and marginal revenue are equal. The contrary holds true for club s. As a reaction to the increased investment level of club l, club s will lower its own investments into the team.

Stage 2 Anticipating the behavior of club-owners in stage 3, in stage 2 the league body will select the championship prize and distribution among participants so as to maximize its profits. As has been shown, the measure which matters for equilibrium team-specific investments is the spread between first and second prize $v(2k-1)$. Therefore, in order to maximize revenue, the league will try to maximize the spread. The league is able to affect the spread both via k and v. While an increase in the championship prize v will not only increase the spread, but simultaneously affect the residual accruing to the league negatively, changes in k will not alter league profits directly since they do not generate implicit costs on behalf of the league. Therefore, whenever possible, the league will set $k = 1$. However, the league's behavior is constrained since it has to ensure both clubs' participation in the championship. It will be shown in the following lemma, that - regarding individual rationality (IR) - the league can entirely focus on the small-market club s.

Lemma 1

Given the timing of the model, in equilibrium, the large-market club's IR-constraint will be satisfied whenever the small-market club's is, that is, $E(\pi_s) \geq a(\tilde{z}_s) - \tilde{z}_s \Longrightarrow E(\pi_l) \geq a(\tilde{z}_l) - \tilde{z}_l$*, where* $\tilde{z}_i$ *represents equilibrium investments into the respective outside options.*

Proof. See Appendix A.1. ■

Hence, in equilibrium, the league will choose a vector (v, k), such that club s prefers joining the league which then again implies that club l, too, prefers participating in the championship. It is assumed that in case of indifference, club s participates in the championship.

The league's problem thus is the following:

$$\begin{aligned} \underset{v,k}{max} \{R(\hat{e}_l, \hat{e}_s) - v\} &= \underset{v,k}{max} \left\{(\hat{e}_l + \hat{e}_s)^{\frac{1}{2}} - v\right\} \\ s.t.\ E(\pi_s) &\geq r z_s^{0.5} - z_s \\ k &\in \left[\tfrac{1}{2}, 1\right] \end{aligned} \tag{6}$$

where the left-hand side of the IR-constraint is given by equation (15) from Appendix A.1 minus the costs of investing into the outside option, which are given by z_s. The solution to this problem is summarized in the following proposition:

Proposition 1

Suppose that $\beta \in \left(\frac{1}{2}, 1\right)$*,* $r \in (0, 1)$ *and* $c_l \in (0, 1]$*. Then, the solution* $\left(\hat{k}, \hat{v}\right)$ *of problem*

(6) is given for $a_0 = \frac{\beta^2}{4c_l(1+\beta)^3}$ *and* $a_1 = \frac{\beta^2(1+\beta)}{4c(\beta^2-2\beta-1)^2} > a_0$ *by*

$$\hat{k} = \begin{cases} \frac{1+3\beta+2\beta^2+4crz_s^{0.5}\left(\beta^2-2\beta-1\right)^2}{\left(1+2\beta-\beta^2\right)\left[1+\beta-8crz_s^{0.5}\left(\beta^2-2\beta-1\right)\right]} & \text{if } rz_s^{0.5} > a_1 \\ 1 & \text{elsewhere} \end{cases}$$

$$\hat{v} = \begin{cases} 2rz_s^{0.5} + \frac{1+\beta}{4c\left(1+2\beta-\beta^2\right)} & \text{if } rz_s^{0.5} > a_1 \\ \frac{rz_s^{0.5}(1+\beta)^2}{\beta^2} & \text{if } a_0 \leq rz_s^{0.5} \leq a_1 \\ \frac{1}{4c(1+\beta)} & \text{elsewhere} \end{cases}$$

Proof. *See Appendix A.2* ■

The profit-maximizing prize $\hat{v}$ offered by the league is a non-decreasing function of the value of the small-market club's outside option which again depends on the investments into the outside option and the parameter r determining the value of the outside option, i.e. $\hat{v} = f(a(z_s)) \equiv \hat{v}(z_s)$. Analogously, $\hat{k}(z_s)$ is a non-increasing function of the value of the small-market club's outside option. Note that both $\hat{v}(z_s)$ and $\hat{k}(z_s)$ are continuous. The two functions $\hat{v}(z_s)$ and $\hat{k}(z_s)$ are plotted in Figures 1 and 2 below for some given set of parameters (β', c_l').

Interestingly, as long as $rz_s^{0.5} < a_0$, the IR-constraint of club s is not binding. This can easily be seen in the two figures by noting that for $rz_s^{0.5} < a_0$, on the one hand, $k = 1$ and, on the other hand, both the optimal prize $\hat{v}$ and the share awarded to the winner $\hat{k}$ remain constant as the value of the small-market club's outside option increases. Thus, facing very low values of the outside option of club s, the league can attain its global profit maximum given the subsequent contest and the constraint on k. The reason for this is quite simple: In order to maximize the residual, the league has to generate revenue for which it has to ensure that the participating clubs exert a sufficient amount of investment into their respective teams. This again implies that the league has to pass some amount of total revenue back to the clubs, leaving them with higher profits than they would attain in their rather unprofitable outside option. As the small-market club's investments into the outside option and/or the profitability of the outside option and subsequently its value increases, the latter will pass a threshold after which club s prefers not to join the league, were the league not to increase the expected profits of club s. The league can either do so by increasing the prize or - since $\hat{p}_l = \frac{1}{1+\beta} > \frac{\beta}{1+\beta} = \hat{p}_s$ - decrease the share of the prize awarded to the champion. Both measures will decrease the league's profits. Increasing the prize v will increase revenues via increased team-investments but also increase the league's implicit costs. Decreasing the share k lowers revenues due to the reduced spread. For moderate values of the outside option, the former negative effect is smaller in absolute terms than the latter. Once the value of the small-market club's outside option passes a second threshold, i.e. $rz_s^{0.5} > a_1$, marginal costs of the league due to increased prize money will surpass the implicit marginal costs associated with a decreasing spread. Thus, the league will reduce the winner's share while still increasing prize money, albeit at a lower rate.

The above illustrates how investments into the outside option can act as a means of rent appropriation. Even though the formal bargaining power lies in the hands of the league - it is able to make some "take-it-or-leave-it"-offer (v, k) to the clubs - the factual bargaining power rests with the less productive of the two clubs which can determine the outcome through its investments into the outside option. However, the threat of league-exit and the subsequent appropriation of rents by the "weaker" of the two clubs will only occur if the outside option is sufficiently profitable and/or if investments into the outside option are sufficiently high. This helps to understand why European soccer clubs not only founded the G-14 but also institutionalized the group by providing it with a headquarters, annual meetings, and so forth. Merely founding the group might imply an investment level too low to act as a credible threat. Analogously, the negotiations of GPWC racing teams with track-owners and race promoters could have been interpreted as investments augmenting the value of the outside option of race teams, i.e. their own racing league.[7]

Stage 1 The following proposition summarizes stage 1-investment behavior of club s:

Proposition 2

Suppose that $\beta \in \left(\frac{1}{2}, 1\right)$, $r \in (0, 1)$ and $c_l \in (0, 1]$. Then, facing $\left(\hat{k}, \hat{v}\right)$ as derived in Proposition 1, club s will always join the league. Positive investments in the outside option by club s will be made if the outside option is relatively profitable to league-interaction, that is, if

$$a\left(z_s^*\right) - z_s^* \geq E\left(\pi_s \left| z_s = 0\right.\right) \Longleftrightarrow r^2 \geq \frac{\beta^2}{c(1+\beta)^3} \tag{7}$$

[7] The question arises as to how this result generalizes to a n-team setting with $n > 2$. In such a case, the league needed to select (v, k) so as to maximize its profits under the restriction that at least the two most productive clubs join the league.

where $z_s^* = \underset{z_s}{argmax} \{a(z_s) - z_s\}$.

Proof. *See Appendix A.3* ■

Thus, for club s to make any investments into the outside option, it must be the case that the outside option is relatively profitable. The reason for this stems directly from the derivation of Proposition 1. The crucial point is that there exists $\tilde{v} = \frac{1}{4c_l(1+\beta)}$ which globally maximizes the league's profits. If the small-market club's outside option is rather unproductive (i.e. condition (7) is violated) then club s is better off joining the league at $v = \tilde{v}$ and $k = 1$, than at the profit maximum of the outside option - which is the profit accruing to club s once its IR-constraint is binding. Thus, in such a scenario, club s will restrain from investing into the outside option and be happy to join the league without bearing any additional investment costs. However, as the outside option becomes more productive or league-interaction less attractive due to higher costs c, the league will have to deviate from its globally desired prize $v = \tilde{v}$ and ensure the small-market club's participation by increasing the prize money v and - at a later stage - also increasing the share of the prize awarded to the loser.[8] Note that club l knows that only the investments into the outside option by club s are relevant for the prize structure. Thus, in order to maximize its profits, club l will not spend any resources by unnecessarily investing into its outside option, i.e. in equilibrium, it is always the case that $z_l = 0$.

The result derived in Proposition 2 shows that unproductive rent-appropriation measures on behalf of some subset of clubs are prevailing only if the outside options of some clubs are relatively profitable. Thus, profit-maximizing league bodies in sports in which there is a market for but one league - and a subsequent relative unprofitability of competing leagues founded by exiting teams - need not fear any "rioting" behavior on behalf of the clubs. Note also that as long as the league can afford to pay off the clubs threatening to exit the league, it will do so thus providing incentives and lastly inducing such threatening.

[8] Note that this result holds for all functional forms of the outside option as long as the latter is relatively unproductive in the sense that the league is able to make club s indifferent while still enjoying non-negative profits. This is ensured by $r^2 \leq \frac{(1+\beta)}{4c(1+2\beta-\beta^2)}$.

3.1.2 Equilibrium Properties

Summarizing the results derived in Propositions 1 and 2, the investment levels that prevail in equilibrium are the following:[9]

$$
\begin{aligned}
z_l^* &= 0 \\
z_s^* &= \begin{cases} 0 & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ \frac{r^2}{4} & \text{otherwise} \end{cases}
\end{aligned}
$$

$$
\begin{aligned}
\hat{e}_l(v^*, k^*) &= \begin{cases} \frac{1}{4c^2(1+\beta)^3} & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ \frac{1+\beta}{4c^2(\beta^2-2\beta-1)^2} & \text{otherwise} \end{cases} \\
\hat{e}_s(v^*, k^*) &= \begin{cases} \frac{\beta}{4c^2(1+\beta)^3} & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ \frac{\beta(1+\beta)}{4c^2(\beta^2-2\beta-1)^2} & \text{otherwise} \end{cases}
\end{aligned}
$$

It is useful to briefly look at some properties of the equilibrium team-specific investment levels and profits. First of all, equilibrium investment levels $\hat{e}_l(v^*, k^*)$ and $\hat{e}_s(v^*, k^*)$ are independent of the profitability of the outside option r. The reason for this is that in both cases, the optimal spread between first and second prize $(2k^* - 1)v^*$ is independent of any characteristic of the outside option. This implies that, even in presence of a binding IR-constraint, there exists some team-specific investment level and subsequently a constant revenue level which the league seeks to attain. For $\beta > \frac{1}{2}$, the spread is higher whenever investments into the outside option occur.

On the contrary, both clubs' expected equilibrium profits are non-decreasing in the productivity of outside option-investments. Increased productivity of outside option-investments does not increase the small-market club's profits as long as there are no investments into the outside option. Once such investments occur, the small-market club's IR-constraint is binding implying that the profits of club s are its outside option profits which are increasing in r.

Plugging the respective equilibrium investments as well as the equilibrium prize struc-

[9] The expression of the equilibrium prize structure (v^*, k^*) can be found in Appendix A.4.

ture into (3) and (4) yields the following (expected) club profits:

$$
\begin{aligned}
E(\pi_l) &= \begin{cases} \frac{1}{4c(1+\beta)^3} & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ \frac{1}{2}r^2 + \frac{(1-\beta)(1+\beta)^2}{4c(\beta^2-2\beta-1)^2} & \text{otherwise} \end{cases} \\
E(\pi_s) &= \begin{cases} \frac{\beta^2}{4c(1+\beta)^3} & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ \frac{r^2}{4} & \text{otherwise} \end{cases}
\end{aligned}
$$

The league profit is analogously derived from (2) as:

$$
\pi_L = R(\hat{e}_l, \hat{e}_s) - v^* = \begin{cases} \frac{1}{4c(1+\beta)} & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ \frac{(1+\beta)}{4c(1+2\beta-\beta^2)} - r^2 & \text{otherwise} \end{cases}
$$

Consider how the degree of asymmetry, as represented by the parameter β, affects equilibrium profit levels. Differentiating the respective expressions yields $\frac{\partial}{\partial\beta}E(\pi_l) < 0, \frac{\partial}{\partial\beta}E(\pi_s) \geq 0$. A higher degree of asymmetry increases club l's profits. This is, on the one hand, due to the fact that, as has been shown above, a higher degree of asymmetry increases the difference between club l's equilibrium winning and losing probabilities via increased investments into the team. On the other hand, in case the small-market club's IR-constraint is binding, club s must be compensated by the league for the lowered probability of success resulting from the increased degree of asymmetry. The league does so by reducing the spread.[10] In this case, the combined effect of lowered marginal costs and higher probability of success (for club l) outweighs the dampening effect of the reduced spread onto the expected profits of club l. Regarding the profits of club s, it is straightforward to see that β does not have any effect on the small-market club's profits in case this club invests into its outside option. The less productive club will always be left with its outside option profit $\pi_O = \frac{r^2}{4}$. In the case in which club s does not invest into its outside option, an increase of the degree of asymmetry lowers its expected profits through the lowered equilibrium probability of success.

The league productivity as measured by the sum of aggregate club profits and league profit is then given by:[11]

[10] It can be shown that a higher degree of asymmetry reduces the equilibrium spread in case of positive investments into the outside option on behalf of club s.

[11] Note that "league productivity" should not be confused with "social welfare". In our analysis we refer only to the clubs and the league (also when we use the term "optimal"). We do not consider society at large since the welfare of fans and the player is not included. We are grateful to an anonymous referee for this point.

$$E(W_M) = \begin{cases} \frac{\beta^2+\beta+1}{2c(1+\beta)^3} & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ \frac{(1-\beta)(1+\beta)^2}{4c(\beta^2-2\beta-1)^2} + \frac{1+\beta}{4c(1+2\beta-\beta^2)} - \frac{r^2}{4} & \text{otherwise} \end{cases}$$

It is worth noting that $\frac{\partial}{\partial\beta}E(W_M) < 0$, that is, expected league productivity is increasing in the degree of asymmetry. In case of no investments into the outside option on behalf of club s, the reason is straightforward. A higher degree of asymmetry is equivalent to lower investment costs of club l and subsequently, as discussed above, higher profit levels both for club l as well as the league. These increases are higher than the resulting negative difference in profits for club s. In case of outside option investments on behalf of club s, the higher degree of asymmetry reduces equilibrium investments into the team because club s anticipates that the league will appropriate a major part of the increased revenue. However, expected profits of club l increase by a large amount via reduced investment costs, such that the reduced profits of the league are compensated for.

3.2 Equilibrium - Cooperative Setting

Now, suppose that the league is constituted as a cooperative of the two clubs. Every club-owner accounts for one vote and all major issues are decided by some voting mechanism. Under such a cooperative governance, the club-owners themselves are the holders of the residual rights since the full revenue accrues to them. More importantly, the fact that every participant can cast a vote and thus affect league matters, renders the outside options irrelevant. Investing into outside options in order to extract rents from the league hurts the clubs themselves which, in this setting, constitute the league. Thus, outside option-investments amount to taking money out of the own pocket and will not occur in equilibrium. Hence, they will subsequently not be considered as an alternative. It is assumed in this setting that total league revenue $R(e_l, e_s)$ is distributed among the two clubs, i.e. administrative costs on behalf of the league are neglected. Nonetheless, agency problems may also arise within this cooperative since club-owners have to decide about the fraction $\kappa \in \left[\frac{1}{2}, 1\right]$ of total revenue that is awarded to the champion.

3.2.1 Solution

The clubs' expected profits are given by:

$$E(\pi_l) = p_l\kappa R(e_l,e_s) + p_s(1-\kappa)R(e_l,e_s) - \beta c e_l \quad (8)$$

$$E(\pi_s) = p_s\kappa R(e_l,e_s) + p_l(1-\kappa)R(e_l,e_s) - c e_s \quad (9)$$

where the probabilities of success p_i remain unchanged from Section 3.1, i.e. $p_i = \frac{e_i}{e_l+e_s}$, $i \in \{l,s\}$. Profit-maximization on behalf of both clubs yields the following Nash equilibrium investment levels:

$$(\tilde{e}_l(\kappa),\tilde{e}_s(\kappa)) = \left(\frac{(4\kappa-1)^2(\kappa(3-\beta)-1)}{4c^2(2k-1)(1+\beta)^3}, \frac{(4\kappa-1)^2(\kappa(3\beta-1)-\beta)}{4c^2(2k-1)(1+\beta)^3}\right) \quad (10)$$

Note that $\tilde{e}_s(\kappa) \geq 0$ for $\kappa \geq \frac{\beta}{3\beta-1}$.

Once the two clubs are organized in a cooperative fashion, the problem of allocating the decision rights arises. It is a priori unclear how decisions affecting the league as a whole should be taken. In an asymmetric two-club setting, standard cooperative majority voting will often lead to a stalemate. Consider the question of choosing the sharing parameter κ. The less productive club has an interest in keeping κ low, even though it knows that a high κ and consequently a high spread will increase total league revenue. Nonetheless, for expositional simplicity and in order to focus on the productivity advantages of the governance form per se, we will abstract from agency problems within the cooperative and assume that the sharing parameter $\kappa \in \left[\frac{1}{2},1\right]$ is chosen by some independent commissioner such that total revenue $R(e_l,e_s)$ is maximized. This can be justified by assuming that the commissioner derives utility from his ameliorated reputation through a high revenue (see e.g. Borgen 2004). The commissioner then solves:

$$\max_{\kappa}\left\{(\tilde{e}_l(\kappa)+\tilde{e}_s(\kappa))^{\frac{1}{2}}\right\} \quad \text{s.t. } \kappa \in \left[\frac{1}{2},1\right] \quad (11)$$

The solution to the above problem is given by $\kappa^* = 1$, which can easily be seen by noting that $\frac{d}{d\kappa}\left[\tilde{e}_l(\kappa)+\tilde{e}_s(\kappa)\right] > 0$ for $\kappa \in \left[\frac{1}{2},1\right]$. Thus, as under contractual governance and the case in which the small-market club's IR-constraint is not binding, in order to maximize revenue it is optimal to stage a "winner-takes-all"-contest. Even though clubs are organized as a cooperative, it is desirable from the viewpoint of a revenue-maximizer to award total revenue to the winner. This result, however, is sensitive to, on the one hand, the specific nature of the revenue function and, on the other hand, the fact that revenue rather than joint profits are maximized.

The clubs' equilibrium team-specific investment levels in the presence of $\kappa = \kappa^* = 1$ are then given by:

$$(\tilde{e}_l(\kappa^*), \tilde{e}_s(\kappa^*)) = \left(\frac{9\,(2-\beta)}{4c^2(1+\beta)^3}, \frac{9\,(2\beta-1)}{4c^2(1+\beta)^3} \right) \tag{12}$$

Plugging these investment levels into (8) and (9) and rearranging terms yields the expected profits in equilibrium conditional on $\kappa = \kappa^* = 1$:

$$\left(E(\pi_l^C), E(\pi_s^C)\right) = \left(\frac{3(\beta-2)^2}{4c(1+\beta)^3}, \frac{3(2\beta-1)^2}{4c(1+\beta)^3} \right) \tag{13}$$

The league productivity as measured by aggregate profits is then given by:

$$E\left(W_C\right) = E(\pi_l^C) + E\left(\pi_s^C\right) = \frac{3\left[(\beta-2)^2 + (2\beta-1)^2\right]}{4c(1+\beta)^3} \tag{14}$$

3.2.2 Equilibrium Properties

As in the contractual setting, it is useful to briefly look at the impact of the degree of club-asymmetry onto equilibrium investment levels and profits. It can be shown that $\frac{\partial \tilde{e}_l(\kappa^*)}{\partial \beta} < 0$ and $\frac{\partial \tilde{e}_s(\kappa^*)}{\partial \beta} > 0$. Here, the same mechanisms as in the contractual setting are at work: A lower β is equivalent to reduced marginal costs of club l yielding increased team-specific investment of club l. As a reaction to this increased team-specific investment level of club l, club s lowers its own investments into its team in order to again equalize marginal revenue and marginal costs. More interestingly, it is the case that $\frac{\partial}{\partial \beta} E(\pi_l^C) < 0$, while for $\beta \in \left(\frac{1}{2}, 1\right)$, it is the case that $\frac{\partial}{\partial \beta} E(\pi_s^C) > 0$, i.e. a higher degree of asymmetry decreases the small-market club's profits. The same argumentation as in the previous section and the case in which club s does not invest into the outside option applies.

3.3 Comparison

Having derived equilibrium profits under both forms of governance, the "natural" question that arises is which type of governance is preferable. An attempt to shed some light on the answer is made by comparing league productivity across the two settings. It can be shown that $E(W_C) \geq E(W_M)$ rendering the cooperative organization more desirable.[12] The reasons lie first and foremost in the organizational differences between the two settings. If relations between clubs and the league are governed through contracts, the profit-maximizing league passes some share $\hat{v} < R(\hat{e}_l, \hat{e}_s)$ to the clubs. Because the prize money and subsequently the spread between first and second prize are lower than in the cooperative setting, clubs' investments into their teams are lower, resulting in a suboptimally small aggregate surplus. Additionally, whenever the outside option is sufficiently profitable, club s will augment its bargaining power by investing into its outside option in order to appropriate a larger share of the pie. From an allocative point of view, this distributional fight is unproductive since it generates costs but merely alters the distribution of rents while not increasing total surplus. Furthermore, these investments induce the league to choose a suboptimally high spread between first and second prize.[13] This again distorts the incentives of both of the clubs and causes surplus to decline even further.

Summarizing the results derived in the preceding subsections, it has to be noted that a cooperative organization possesses two major advantages over a contractually governed regime. Firstly, the fact that the league acts as an independent, profit-maximizing agent distorts incentives for the clubs engaging in championship play. Note that this also holds true in cases in which the clubs' outside options are a priori unattractive and the threat of league-exit does not exist. Secondly, whenever the outside option is sufficiently profitable, the less productive club will exert its bargaining power in an unproductive way in order to appropriate a larger share of the pie.

4 Testable Hypotheses

We can derive two main hypotheses from our theoretical analysis. The first main hypothesis concerns the productivity gain that is associated with a move from a contractual towards a cooperative form of league governance. Our model predicts that profits will increase if the league moves from a contractual form to a cooperative organization. The

[12] A technical assumption needed to ensure that indeed the cooperative setting is desirable for all β is that $r^2 c \geq \frac{1}{4}$. However, it can be shown that if the degree of asymmetry is sufficiently high (i.e. $\beta < 0.9$) then aggregate profits are always higher in the cooperative setting.

[13] It can be shown that the spread is higher in the equilibrium in which there are investments into the outside option than in the equilibrium without these investments.

second main hypothesis concerns the outside option. Here, our model predicts that clubs whose league is organized as a cooperative will invest significantly less into outside options than clubs who have contractual relationships with an independent league organization.

Due to the monopolistic structure of professional team sports leagues it is, however, difficult to test these hypotheses empirically. There is simply too little variance to conduct econometrically sound analyses. Professional team sports leagues are usually monopolies. Competing leagues are rather the exception than the rule. Despite these empirical difficulties there is substantial anecdotal evidence that supports our two main hypotheses. A glance at the landscape of professional sports leagues shows that most of them have moved from a contractual towards a cooperative form of governance which is consistent with our predictions.

Why should they have adopted a cooperative governance system if this system does not possess some advantages over a contractual regime? First and foremost, the North American Major Leagues have long ago recognized the productive advantages postulated in this paper. Early on, they began constituting the leagues as cooperatives. An exception is Major League Soccer (MLS). However, developments at least point to the recognition of the inadequacy of its organizational form by MLS management. The MLS is organized in a manner resembling the league-corporation since several participating clubs are under identical ownership. However, the number of clubs under joint ownership has declined in recent years.

In the last few years, also European soccer leagues have adopted a cooperative model and transformed into organizations that refer to their North American counterparts. We have already mentioned the example of the German Bundesliga in the introduction. In contrast to its German counterpart the English Premier League (officially named Barclays Premier League) has a somewhat longer tradition of independence from the English Football Association going back to the year 1992, when the teams of the first division founded the "FA Premier League". Today the Premier League is owned by 20 shareholders – the member clubs. Membership is dependent on sporting performance and relegated clubs are required to transform their ordinary share to the promoted clubs at the end of every season. Each shareholder is entitled to one vote and all rule changes as well as major commercial contracts require the support of two thirds of the clubs voting at a general meeting.

The French "La Ligue de Football Professionnel" is the last step in a rather long chain of attempts to increase the independence of professional football from the Fédération Française de Football. The first attempt to create an own organization by the clubs employing professional players dates back to the year 1932 when an association called "l'Amicale des clubs amateurs utilisant des joueurs professionals" was registered. The Fédération repeatedly voted against this secession and the association therefore remained a hollow shell. It took many steps of development ("Groupement des clubs autorisés", "Ligue nationale de football") until the creation of the "La Ligue de Football Professionnel" in the last decade. The new organization is a registered association of the French clubs playing in the two top flight competitions Ligue 1 and Ligue 2, comparable to its German counterpart Ligaverband.

The Italian "Lega Nazionale Professionisti", better known as "Lega Calcio", and the Spanish "La Liga Nacional de Futbol Profesional", better known as "La Liga", are results of a similar attempt of professional football clubs to gain independence from their respective national associations and take over the governance of their affairs. Both are legally independent units and both are cooperatives of the clubs playing in professional football.[14]

By adopting a cooperative form of governance at the league level the professional European clubs followed a development which North American professional sports leagues have pioneered long ago. The difference to the U.S. Major Leagues is that the European soccer clubs are obliged to operate under the general supervision of national, European and global soccer federations. Championships administered by these supranational organizations employ a rather contractual relationship between them and the clubs and therefore may induce the establishment of rent seeking endeavours, such as the G-14. UEFA has reacted to the G-14 by increasing the share that Champions League participants receive from aggregate league revenue. This represents a stylized fact which is consistent with our model's results. In January 2008, the European Club Association

[14] Note that not only the European soccer leagues move in the North American direction but also the European basketball and handball leagues. See e.g. the German basketball federation DBB (Beutscher Basketball Bund) that exclusively ceded the rights to stage the Basketball Bundesliga championship to the Basketball Bundesliga GmbH (BBL GmbH) in 1994. The equity holders of the BBL are the clubs playing in the championship (74% of the shares) and the federation (26% of the shares). In contrast to this, the Toyota German Handball Bundesliga has been developed as a perfect blueprint of the German football institutions. After the clubs competing in the Bundesliga formed their cooperative association Ligaverband, the latter outsourced its day-to-day operations to the HBL Handball-Bundesliga GmbH.

(ECA) has been formed as an organization representing football clubs in Europa after the dissolution of the G-14. The ECA consists of 103 members with at least one from each of the 53 national associations. This development can be interpreted as a move away from contractual towards cooperative league governance.

The league with the largest lag in recognizing the problems of a contractual setting and reacting accordingly is F1 motor racing. Some teams still try to establish their own racing leagues although all the large teams seem to have joined the set of teams agreeing to the new "concorde agreement". This tends to support our model's prediction that in the contractual setting, the league-owner will try to make the clubs threatening with league-exit indifferent between joining the championship and pursuing their outside options. In the light of the difficulties with the negotiation of the new "concorde agreement", F1 manager Bernie Ecclestone has endowed the Ferrari Racing Team with an extra \$100m.

As can be seen from these considerations, the issues addressed by the models are highly controversial and subject to current debate. It remains to be seen how the G-14 respectively the ECA and UEFA will settle their manifold disputes. The same holds true for F1. The models' predictions that the establishment of a competing league to F1 is but a means of rent seeking and that the remaining "revolting" teams are happy to accept a new agreement once they are made indifferent, seem to be confirmed by the recent commitment of some remaining large teams to sign the new "concorde agreement".

5 Conclusion

This paper has provided a model explaining how cooperative governance may increase league productivity in the environment of professional sports leagues. The model consisted of a standard contest in which investments into the teams on behalf of the club-owners affect the probability of winning the championship. Implicitly, a contest model does not rule out some revenue sharing since the model allows for the appropriate institution - the league governing body or the commissioner respectively - to determine the skewness of the prize function. At the extreme, this is equivalent to full revenue sharing. However, the analysis has shown that both in the contractual as well as the cooperative setting, it is desirable for the clubs and the league, not to share revenue at all but to keep the contest in a "winner-takes-all"-fashion. When a profit-maximizing league body and asymmetric clubs coordinate their activities - i.e. the staging of the championship - via contracts, two mechanisms exist that lead to unproductivity. Firstly, the existence of a profit-maximizing third party endowed with the residual rights provides the clubs with unproductive incentives when engaging in the championship. Secondly, the absence of alternative sources of income for the league body endows some subset of clubs with considerable bargaining power which will be exerted if the outside option is sufficiently profitable. A remedy for these problems is to unite all agents under one legal entity. The formal analysis has shown that a forward integration of club-owners into championship production is the preferable form for this entity. This is due to the fact that the clubs remain independent but are still able to exert influence over matters that affect the league as a whole. Basically, a merger of all clubs into one league-corporation is possible, too. However, as discussed in Section 1, such an organizational arrangement would raise new unfavorable issues. First of all, if clubs were not independent but united under one corporate roof, the corporate league-owner would have a hard time convincing consumers of the integrity of the championship race. This is due to the fact that, in such a situation, the league owner possesses strong incentives to distort the championship as a whole or single games into his favor. But the integrity of the championship race is one of the main pillars of consumer satisfaction with the product "professional sports championship".

A second problem which arises in a corporate league concerns the inducement of local team-managers. If investments are specific by nature, then setting correct incentives for local team managers might prove a difficult task. A cooperative organization, however, circumvents these issues by rendering the clubs independent.

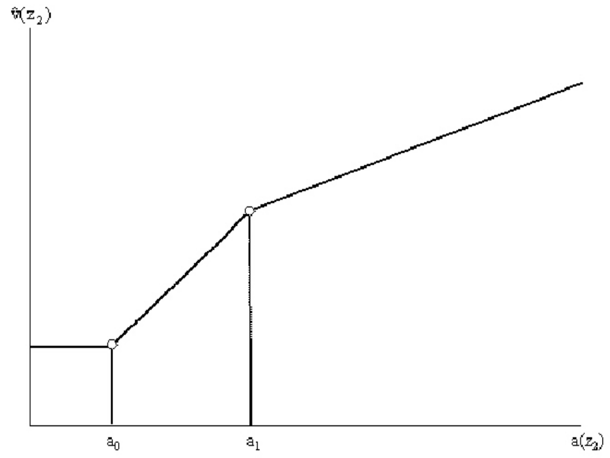

Figure 1: The league's profit maximizing prize $\hat{v}$ as given in Proposition 1.

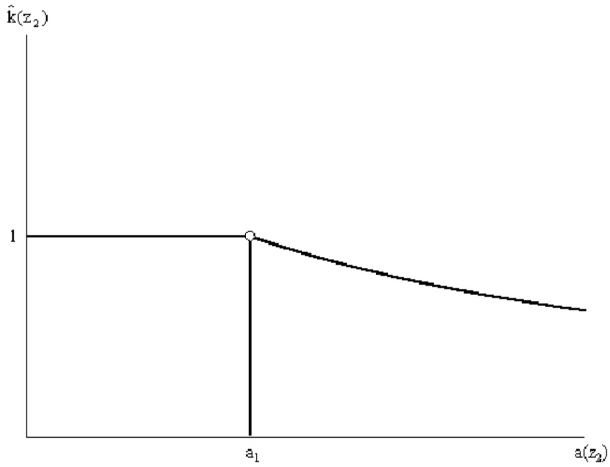

Figure 2: The league's profit maximizing prize-sharing parameter $\hat{k}$ as given in Proposition 1.

A Appendix

A.1 Proof of Lemma 1

Given the equilibrium investment levels $(\hat{e}_l, \hat{e}_s)$ of the contest subgame, the probabilities of success reduce to:

$$(p_l(\hat{e}_l, \hat{e}_s), p_s(\hat{e}_l, \hat{e}_s)) \equiv (\hat{p}_l, \hat{p}_s) = \left(\frac{1}{1+\beta}, \frac{\beta}{1+\beta}\right)$$

Thus, in the absence of investments into outside options, expected profits are given by:

$$\begin{aligned} E(\pi_l \,|z_l = 0\,) &= \frac{1}{1+\beta}kv + \frac{\beta}{1+\beta}(1-k)v - \beta\frac{v(2k-1)}{(1+\beta)^2} \\ E(\pi_s \,|z_s = 0\,) &= \frac{\beta}{1+\beta}kv + \frac{1}{1+\beta}(1-k)v - \beta\frac{v(2k-1)}{(1+\beta)^2} \end{aligned} \tag{15}$$

Note that $E(\pi_l \,|z_l = 0\,) \geq E(\pi_s \,|z_s = 0\,)$. Next, note that both clubs are symmetric regarding their outside options. Thus, it will be the case that $\tilde{z}_l = \tilde{z}_s \equiv z$ and therefore $E(\pi_l \,|z_l = 0\,) - z = E(\pi_l) \geq E(\pi_s) = E(\pi_s \,|z_s = 0\,) - z$ implying that $E(\pi_s) \geq a(z) - z \Longrightarrow E(\pi_l) \geq a(z) - z$.

A.2 Proof of Proposition 1

The Lagrange function of problem (6) is given by:

$$\mathcal{L} = R - v + \lambda\left[\underbrace{\hat{p}_s kv + \hat{p}_l(1-k)v - c\hat{e}_s(v,k)}_{E(\pi_s)+z_s} - rz_s^{0.5}\right] + \omega(1-k) \tag{16}$$

where λ and ω are the multipliers on the IR-constraint and the constraint regarding k.[15] For notational simplicity let $rz_s^{0.5} \equiv a$. Plugging the respective expressions into (16) and rearranging terms yields:

$$\mathcal{L} = R - v + \lambda\left[\frac{v\left[(\beta-1)k+1\right]}{1+\beta} - \frac{\beta v(2k-1)}{(1+\beta)^2} - a\right] + \omega(1-k)$$

[15] Note that there is no non-negativity constraint regarding k. For reasons of simplicity, this constraint has not been added. However, the constraint is satisfied in equilibrium.

Then, the Kuhn-Tucker conditions are given by:

$$\frac{\partial \mathcal{L}}{\partial v} = \frac{1}{2}\left(\frac{(2k-1)v}{c_l(1+\beta)}\right)^{-\frac{1}{2}}\frac{(2k-1)}{c_l(1+\beta)} - 1 + \lambda\left[\frac{\beta k+1-k}{1+\beta} - \frac{\beta(2k-1)}{(1+\beta)^2}\right] = 0 \quad (17)$$

$$\frac{\partial \mathcal{L}}{\partial k} = \frac{1}{2}\left(\frac{(2k-1)v}{c_l(1+\beta)}\right)^{-\frac{1}{2}}\frac{2v}{c_l(1+\beta)} - \omega + \lambda\left[\frac{\beta v - v}{1+\beta} - \frac{2\beta v}{(1+\beta)^2}\right] = 0 \quad (18)$$

$$\lambda\left[\frac{v\left[(\beta-1)k+1\right]}{1+\beta} - \frac{\beta v(2k-1)}{(1+\beta)^2} - a\right] = 0 \quad (19)$$

$$\omega(1-k) = 0 \quad (20)$$

The solution will be derived by breaking the above system into several subcases.

(1) $E(\pi_s) > a - z_s \Rightarrow \lambda_1 = 0$

(1.1) $\omega_1 > 0 \Rightarrow k_1 = 1$

Plugging the respective values into (17) and (18) and solving this reduced system for v and ω yields:

$$(v_1, \omega_1) = \left(\frac{1}{4c_l(1+\beta)}, \frac{1}{2c_l(1+\beta)}\right)$$

Note, however, that this solution holds only conditional on $E(\pi_s) > a - z_s$, that is, it only constitutes a solution if:

$$\frac{v_1\left[(\beta-1)k_1+1\right]}{1+\beta} - \frac{\beta v_1(2k_1-1)}{(1+\beta)^2} > a$$

$$\Leftrightarrow \frac{\left[(1+\beta)-1\right]}{4c_l(1+\beta)^2} - \frac{\beta}{4c_l(1+\beta)^3} > a \Leftrightarrow a_0 \equiv \frac{\beta^2}{4c_l(1+\beta)^3} > a$$

(1.2) $k < 1 \Rightarrow \omega = 0$

Substituting the respective values into (17) and (18) and solving this reduced system for v and k yields $(v,k) = \left(0, \frac{1}{2}\right)$. However, this cannot be a solution because it must be the case that $E(\pi_s) > a - z_s$, which is violated.

(1.3) $k = 1, \omega = 0$

Plugging these respective values into (17) and (18) reveals that for (17) to hold it must be the case that $v > 0$ while for (18) to be satisfied it must be the case that $v = 0$. Hence, there is no solution in this case.

(2) $E(\pi_s) = a - z_s \Rightarrow \lambda \geq 0$

(2.1) $\omega_2 \geq 0 \Rightarrow k_2 = 1$

Under these assumptions, the above system (17) - (19) reduces to:

$$\frac{1}{2}\left(\frac{v_2}{c_l(1+\beta)}\right)^{-\frac{1}{2}}\frac{1}{c_l(1+\beta)}-1+\lambda_2\left[\frac{\beta}{1+\beta}-\frac{\beta}{(1+\beta)^2}\right]=0$$
$$\frac{1}{2}\left(\frac{v_2}{c_l(1+\beta)}\right)^{-\frac{1}{2}}\frac{2v_2}{c_l(1+\beta)}-\omega_2+\lambda_2\left[\frac{\beta v_2-v_2}{1+\beta}-\frac{2\beta v_2}{(1+\beta)^2}\right]=0$$
$$\frac{\beta v_2}{1+\beta}-\frac{\beta v_2}{(1+\beta)^2}-a=0$$

Solving this system for (v_2,λ_2,ω_2) yields:

$$v_2 = \frac{a(1+\beta)^2}{\beta^2} \tag{21}$$
$$\lambda_2 = 1+\frac{1}{\beta^2}+\frac{2}{\beta}-\frac{\left(\frac{a(1+\beta)}{c_l\beta^2}\right)^{\frac{1}{2}}}{2a} \tag{22}$$
$$\omega_2 = \frac{\beta^2(1+\beta)^2}{2\beta^4}\cdot\left[\beta^2\left(\frac{a(1+\beta)}{c_l\beta^2}\right)+2a\left(\beta^2-2\beta-1\right)\right] \tag{23}$$

However, this solution has been derived under the assumption that $\lambda_2\geq 0$ and $\omega_2\geq 0$. Rearranging (22) and (23) yields:

$$\lambda_2 \geq 0 \Leftrightarrow a\geq\frac{\beta^2}{4c_l(1+\beta)^3}=a_0 \tag{24}$$
$$\omega_2 \geq 0 \Leftrightarrow a\leq\frac{\beta^2(1+\beta)}{4c_l(\beta^2-2\beta-1)^2}\equiv a_1 \tag{25}$$

(2.2) $k_3<1\Rightarrow\omega_3=0$

Plugging these values into (17) - (19) and solving the resulting subsystem for (v_3,k_3,λ_3) yields:

$$v_3 = 2rz_s^{0.5}+\frac{1+\beta}{4c_l\left(1+2\beta-\beta^2\right)}$$
$$k_3 = \frac{1+3\beta+2\beta^2+4c_la\left(\beta^2-2\beta-1\right)^2}{\left(1+2\beta-\beta^2\right)\left[1+\beta-8c_l(\beta^2-2\beta-1)\right]}$$
$$\lambda_3 = 2$$

However, it must be the case that $k_3<1$ which is equivalent to:

$$a>\frac{\beta^2(1+\beta)}{4c_l(\beta^2-2\beta-1)^2}=a_1$$

A.3 Proof of Proposition 2

As has been shown above in the proof of Proposition 1, for $a(z_s) \geq a_0$, the small-market club's IR-constraint will always be binding, i.e. when joining the league, club s will always be as well off as in its outside option. Therefore, when deciding whether to invest into the outside option, club s will compare profits out of doing so to profits in case of $z_s = 0$. Maximization of the small-market club's outside option profits $rz_s^{0.5} - z_s$ yields $z_s^* = \underset{z_s}{argmax}\{rz_s^{0.5} - z_s\} = \frac{r^2}{4} = r(z_s^*)^{0.5} - z_s^* \equiv \pi_O$. Note that π_O is also exactly what club s receives when engaging in league play and $a(z_s^*) = a\left(\frac{r^2}{4}\right) = \frac{r^2}{2} \geq a_0 = \frac{\beta^2}{4c_l(1+\beta)^3}$. The alternative for club s is not to invest into the outside option, i.e. $z_s = 0$, leading to a prize structure of $\left(\hat{k}, \hat{v}\right) = \left(1, \frac{1}{4c_l(1+\beta)}\right)$ and following expected profits:

$$
\begin{aligned}
E(\pi \,|z_s = 0) &= \hat{p}_s \hat{k} \hat{v} - c_l \hat{e}\left(\hat{v}, \hat{k}\right) \\
&= \frac{\beta}{1+\beta} \frac{1}{4c_l(1+\beta)} - \frac{\beta}{4c_l(1+\beta)^3} = \frac{\beta^2}{4c_l(1+\beta)^3}
\end{aligned}
$$

Therefore, club s will always invest into the outside option if:

$$
\pi_O \geq E(\pi \,|z_s = 0) \Longleftrightarrow \frac{r^2}{4} \geq \frac{\beta^2}{4c_l(1+\beta)^3} \Longleftrightarrow r^2 \geq \frac{\beta^2}{c_l(1+\beta)^3} \tag{26}
$$

Note that if condition (26) is violated, club s will always choose $z_s = 0$ since $\frac{r^2}{4}$ is the maximum profit club s can achieve using his outside option. Note also that club s will always join the league since it is assumed that in the case of indifference on behalf of club s, club s will join the league.

A.4 Equilibrium Prize Structure - Contractual Governance

The equilibrium prize structure (k^*, v^*) is given by:

$$
k^* = \begin{cases} 1 & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ \frac{1+3\beta+2\beta^2+4crz_s^{0.5}\left(\beta^2-2\beta-1\right)^2}{\left(1+2\beta-\beta^2\right)\left[1+\beta-8crz_s^{0.5}\left(\beta^2-2\beta-1\right)\right]} & \text{otherwise} \end{cases} \tag{27}
$$

$$
v^* = \begin{cases} \frac{1}{4c(1+\beta)} & \text{if } r^2 < \frac{\beta^2}{c(1+\beta)^3} \\ 2rz_s^{0.5} + \frac{1+\beta}{4c\left(1+2\beta-\beta^2\right)} & \text{otherwise} \end{cases} \tag{28}
$$

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