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Collective vs: Individual Sale of TV Rights in League Sports[*]

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Abstract

In many countries, the collective sale of TV rights by sports leagues has been challenged by the antitrust authorities. In several cases, however, leagues won in court, on the ground that sport cannot be considered a standard good. In this paper, we investigate the conditions under which the sale of TV rights collectively by sports leagues, rather than individually by teams, is preferred from a social welfare viewpoint. We find that collective sale is socially preferable when leagues are small, relatively homogeneous in terms of clout and where teams get little performance-related revenues.

Keywords: talent, competitive balance, revenue sharing, broadcasting rights.

JEL Classification: L10, L83.

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Introduction

The sale of broadcasting rights by sports leagues to TV networks has become a highly debated issue because of the legal and economic questions it raises. One of the most contentious issues is the collective and exclusive control of the TV rights by sports leagues { as con¯rmed by the number of cases brought to court. In 1996, in the Netherlands, the Football Association (KNVB) sold the TV rights for the retransmission of league games to a newly established sports channel. Feyenoord (a team from Rotterdam) objected to the deal claiming that broadcasting rights belong to the club in whose stadium the game is being played. The KNVB said that the league was the product sold and as the organizer was the owner of these rights. The Amsterdam District Court ruled that home teams own the broadcasting rights. The situation in Italy and Mexico is similar: teams are the owners of the right for their home games and negotiate directly with broadcasters (See OECD, 1997). Conversely, in France, the Sports Law of July 16, 1984, (amended by the Law of July 13, 1992) says that the \right to a sporting event or competition belongs to the organizer of that event" (Article 18-1). This means that in the case of national competitions, the rights belong to the national league.

In England, the collective sale of TV rights by the Premier League (top soccer league) has been challenged in court by the O±ce of Fair Trading (OFT) on the ground that centralized sale leads to abnormal pro¯ts. In 1996, John Bridgeman, Director general of OFT, declared that

> \Developments in broadcasting have intensi¯ed the importance of sport in the market for television programs. Within that market the Premier League has a major, if not unique position. By selling rights collectively and exclusively to the highest bidder, it is acting as a cartel. The net e®ect of a cartel is to in°ate cost and prices".

In 1999, the OFT brought the case to the Restrictive Practices Court and attacked the Premier League on the ground that it prevents teams from individually selling the rights to televise their games (See OFT, 1999). The court ruled that a ban on collective rights sales would have undermined the Premier League's ability to market its championship as a whole, robbed the clubs of revenues and harmed attempts to maintain a competitive balance between big and small clubs.

In the United States as well, courts have had to rule many times on antitrust cases regarding sports leagues (see Flynn and Gilbert, 2001).

These examples indicate that there is no general agreement between courts and legislators about the degree of cooperation to be allowed among the members of a sports league.

The goal of this paper is to shed more light on this problem by performing a comparative welfare analysis of the two salient ways leagues use to sell TV rights to broadcasters. In other words, the question we ask is the following: Under what circumstances, if any, does the sale of TV rights collectively by the league, rather than directly by teams, lead to a welfare loss?

To answer this question, we build a model in which clubs with heterogeneous bargaining power participate in a Championship. Before the beginning of the competition, teams choose how much to invest in talent (players, coaches, etc.). For each team, the probability of winning the competition depends on its relative talent level with respect to all the other teams. As in Fort and Quirk (1995), Palomino and Sákovics (2001) and Szymanski (2001), we assume that the demand for each match by sport fans depends on two elements: competitive balance, that is the outcome uncertainty, and the (average) talent of the two playing teams. Teams are assumed to be profit maximizing agents and have two sources of revenues: an exogenous monetary prize[1] they get for their performance in the championship and the sale of TV rights.

In this context, we compare an individual with a collective system of sale of TV rights.

[1]This prize is a proxy for all sorts of performance-related revenues, including progression to international competition such as the UEFA Champions League in the case of European soccer or the Heineken Cup in the case of European rugby union. We normalize non-performance related revenues (other than broadcasting fees) to zero.

Under the individual system, TV networks negotiate with each team separately the rights to broadcast its home games. In contrast, under a collective system the league negotiate collectively the sale of TV rights for all the games with broadcasters. TV revenues are then allocated among all teams according to a given sharing rule.

We isolate three e®ects. The ¯rst one is a bargaining power e®ect: by selling their rights collectively, teams' bargaining power is modi¯ed with respect to the case of individual sale. This e®ect may have a positive or negative impact on welfare, depending on the relative values of the bargaining powers. The second e®ect is a prize e®ect. If the exogenous monetary prize is small, the league can increase teams' incentives to invest by choosing a performance-based revenue sharing scheme. In such a case, collective sale is welfare improving. The last e®ect is a free riding e®ect. When rights are sold collectively, teams take into account the impact of their investment on TV revenue for both their home games and their away games. However, since the TV revenues are shared by all teams, the larger is the number of teams in the league the smaller are teams' incentives to invest .

The combination of these three e®ects shows that individual sale is more appropriate in a league which is large in term of number of playing teams,[2] has relatively heterogeneous teams with respect to their bargaining power, and with a rich exogenous prize.

Our model is related to the literature on cartels and joint ventures. The speci¯c feature of sport is that, because of its cooperative nature, it spontaneously leads to cartel formation. As stated by the US Supreme Court (in NCAA vs. Board of Regents) football (as well as any other team sport) is \an industry in which horizontal restraints on competition are essential if the products is to be available at all". [3] In other words, a certain degree of economic coordination in the sports leagues is needed to guarantee a high quality product. This is the main di®erence between joint pro¯t maximization in standard product markets

[2]For a same sport, top domestic league may di®er in size across countries. For example, in soccer, the Swiss league has 8 teams, the Scottish league, 12 teams, the French, Italian and German leagues, 18 teams, and the English and the Spanish league, 20 teams.

[3]Report from the conference on \TV Rights in Soccer" by M. Moccia, organized by ISIMM (Istituto per lo studio dell'Innovazione nei Media e per la Multimedialita'), Rome 30 April 1999.

and team sport games. In the former, collusion among producers only results in higher price whereas sport leagues can influence both the price and the quality of the product. The quality of sport games depends on the competitive balance of the competition. The more balanced a competition is, the more enjoyable it will be to the fans. Leagues can affect the quality of a competition they organize by choosing how to redistribute the revenues from TV deals across teams. For example, in several top European soccer leagues, teams are rewarded on a performance basis (See Szymanski (1998), Palomino and Rigotti (2001) and Palomino and Sákovics (2001)). Conversely, in US sports leagues (Baseball Major League, National Basketball Association, National Football League), revenues from national TV deals are split evenly among teams.[4]

If teams are profit maximizing entities, the reward scheme chosen by the league influences teams' incentives to win and consequently, the investment in talent (players) they are willing to make which in turn determines the level of competitive balance and the quality of the product. In this respect, a sport league is comparable to R&D joint ventures where the degree of cooperation (or collusion) between parent firms in the production stage influences their contribution in the R&D stage. (See, for example, D'Aspremont and Jacquemin (1988), Kamien et al. (1992), and Suzumura (1992)).

The analysis of the collective sale of TV rights also relates our paper to those on the efficiency in partnership by Legros and Matsushima (1991) and Legros and Matthews (1993). These papers derive conditions under which there exist transfer rules that deter partners from deviating from the efficient action. One feature of these rules is that they are dependent on the identity of the partners whereas the transfer rules, i.e., revenue sharing rule, the league can choose are necessarily independent of the identity of the winner.

The paper is organized as follows. Section 1 presents the model. Section 2 contains the characterization of the equilibrium and analyses in two different subsections the individual and the collective sale of TV rights respectively. Section 3 compares the impact on social welfare of the two selling mechanisms, Section 4 discusses some of the assumptions and

[4]Furthermore, this reward scheme is supported by other rules - selection mechanisms of players, salary caps, limited amount of investment - also aiming at keeping a high competitive balance within the league.

Section 5 concludes.

1 The model

The Teams - There are $2N$ ($N \geq 1$) clubs (teams), half of them – $i = 1, 2, \ldots, N$ – are "powerful", half of them – $i = N+1, N+2, \ldots, 2N$ – are "weak" in terms of their bargaining power (see below). They are assumed to maximize expected profits.[5] Teams interact in a competition – described below – and choose how much to spend on players (this is their only decision variable). We denote by I_i the investment in talent (players/coaches) of team i.

The Competition - The competition is organized as a round Robin tournament with home and away games. Hence, each team plays overall $2(2N-1)$ games, $2N-1$ at home and $2N-1$ away. At the end of the competition, the team ranked first receives a monetary prize [6] z while the other teams receive nothing.

As is standard in the literature on sports leagues (see, for instance, Atkinson, Stanley, and Tschirhart (1988), Forth and Quirk (1995)), we assume that the probability f_i for team i of winning the competition depends on its relative level of investment. That is,

$$f_i(I_1, \ldots, I_{2N}) = \frac{I_i}{\sum_{j=1}^{2N} I_j}.$$

The Quality of a Match - Following the literature, we assume that the quality of a game played by teams i and j depends on two factors: the talent level, T_{ij}, and the competitive balance, B_{ij}, that is, the uncertainty of the outcome. We measure talent by the average investment in talent of the two teams, i.e., $T_{ij} = \frac{I_i + I_j}{2}$, and competitive balance by $B_{ij} = -\left(\frac{I_i - I_j}{2}\right)^2$. Similar investments by the two teams imply close probabilities of winning the match and consequently a high outcome uncertainty.

[5] An alternative assumption sometimes used when considering European teams is that they maximize the probability of winning under some budget constraint. (See Szymanski (2001) for more comments.)

[6] In Europe, this may include earnings from participation in a continental competition the following season (UEFA Champions' League in Soccer, Euroligue in Basketball, Heineken Cup in Rugby, ...), or any other performance related revenue.

Finally, we define the quality of a game as $Q_{ij} = \left(B_{ij} + T_{ij}^2\right)^{\beta}$ with $\beta \in (0; 1/2)$. Substituting for T_{ij} and B_{ij} in the expression for Q_{ij}, we deduce that the quality of a game played by teams i and j is

$$Q_{ij} = I_i^{\beta} I_j^{\beta}:$$

That is, the quality of a match between team i and j is produced by a Cobb-Douglas technology with decreasing returns to scale.[7] Note that by this particular functional form we can simultaneously capture both the substitutability – an increase in the investment (talent) of any team always improves quality even if it reduces competitive balance – and the complementarity – the above rate of improvement depends on the talent level of the opponent – of investments.[8] It is the exponent, β, that parametrizes the rate at which the marginal rate of substitution is diminishing – that is, the relative magnitude of these two effects.

The Demand for a Match - There is a continuum of TV viewers who differ in their willingness to pay for a match of a given quality. Each agent k's net utility gain from watching a game played by teams i and j is

$$\mathrm{Max}(x_k Q_{ij} - p_{ij}; 0)$$

where p_{ij} is the price charged by the TV network for the game[9] and x_k measures the keenness on sport of agent k. Thus, $x_k Q_{ij}$ is the reservation price of agent k for this match.

[7] The same Cobb-Douglas technology to measure the quality of a game could be obtained in several different ways. For instance, we could alternatively measure competitive balance by the opposite of the variance of the probabilities to win, i.e.

$$-2B_{ij} = \left(\frac{I_i}{I_i + I_j} - 1/2\right)^2 + \left(\frac{I_j}{I_i + I_j} - 1/2\right)^2$$

and then define the quality of a game as $Q_{ij} = \left[(1 + 4B_{ij})\, T_{ij}^2\right]^{\beta}$:

[8] This is what warrants the squaring of T_{ij} in the formula for Q_{ij}.

[9] We implicitly assume that TV viewers can buy games on an individual basis, i.e., a pay-per-view system is in place. This assumption is made for tractability. Our results go through if we assume that TV viewers buy all the games in case of collective sale, and buy all the home games of the considered team in case of individual sale.

For simplicity, we assume that the x_i are uniformly distributed in $[0,1]$ – and thus the measure of potential viewers is normalized to 1.

The aggregate demand for a game played by teams i and j is then

$$D_{ij}(p_{ij}) = \frac{Q_{ij} - p_{ij}}{Q_{ij}}.$$

It follows that, normalizing the cost of broadcasting to zero, the profit from broadcasting this game is $\pi_{ij} = p_{ij} D_{ij}$. The profit of the network π^n_{ij} is a fraction of the broadcasting profits, determined by its bargaining power vis-à-vis the team or the league. The network wants to maximize its profit. As a consequence, it sets $p_{ij} = Q_{ij}/2$, yielding a broadcasting profit $\pi_{ij} = Q_{ij}/4$.[10]

The Negotiation - There are two possible mechanisms. Under individual sale, simultaneously, each club negotiates directly with the TV network the broadcasting rights for their home games, meaning that each team sells the right to broadcast $2N - 1$ games. Clubs differ in their bargaining power when negotiating with a TV network. Team i's bargaining power is captured by a coefficient $\alpha_i \in [0,1]$ which measures what fraction of the profit from the broadcast of its home games team i gets. If $\alpha_i = 0$, then the broadcaster has all the bargaining power and so gets all the surplus. Conversely, if $\alpha_i = 1$, then team i has all the bargaining power and so gets all the surplus.[11] We denote by α_p and α_w ($\alpha_p > \alpha_w$) the bargaining weights of the powerful and weak clubs, respectively. Similarly, under the collective sale, the bargaining power of the league when selling the TV rights is captured by $\alpha_L \in [0,1]$ which measures the fraction of the profit from the broadcast of all the games the league is able to get from the network.

Revenue Sharing - If TV rights are sold collectively, then – as Atkinson, Stanley and Tschirhart (1988) – we assume that the it chooses the level of revenue sharing so as to maximize the teams' joint profit.[12] We denote by θ the fraction of the TV revenues

[10] The study of competition in the pay TV market is beyond the scope of this paper. See Armstrong (1999) and Harbord and Ottaviani (2001) for papers addressing this issue.

[11] According to Chemla (2001), α_i also measures the degree of competition in the broadcasting industry. The more competitive this industry, the larger share of profit the selling team gets.

[12] In practice, the governing body of a league is comprised of one voting representative from each member

awarded at the end of the competition to the winner, the remaining fraction $(1 - \theta)$ being redistributed evenly to teams before the competition. If the league sets $\theta = 0$; we have a full revenue sharing, i.e., the league splits the TV revenues evenly across teams independently of their performances. Note that — given that the clubs are symmetric under collective sale — the revenue sharing does not play any role in achieving competitive balance. That is, by assuming symmetry, we bias our analysis against the collective selling procedure.

The Timing - The sequence of events is the following:

1. If a collective system of sale is in place, the league sets the revenue sharing rule.
2. Teams choose how much to invest in talent.
3. Deals are negotiated with TV networks, according to the selling mechanism in place.
4. The competition takes place.

2 The equilibrium levels of investment

In this section we derive the level of investments that clubs make in equilibrium (under both sales mechanisms), which will enable us to carry out the welfare comparison in the next section.

2.1 Individual sale of TV rights

The expected profit of team i is given by

$$\Pi_{ind;i} = z \frac{I_i}{\sum_j^{2N} I_j} + \frac{\alpha_i}{4} \sum_{j \neq i} I_i^{\beta} I_j^{\beta} - I_i.$$

club and major issues must be approved by majority or supermajority vote. (See Flynn and Gilbert, 2001). Here, we implicitly assume that the maximization of the joint profits has been approved as the objective of the league and its implementation has been delegated to a commissioner.

The first and second terms represent the expected monetary value of winning the competition and the revenue from the sale of TV rights for the $2N-1$ home games the team plays, respectively. The last term is the expenditure on talent.

In the case of individual sale, an equilibrium is a vector of investment levels $(I^*_{ind,1},\dots,I^*_{ind,2N})$ such that for all $i=1,\dots,2N$,

$$I^*_{ind,i} \in \operatorname{Argmax}_{I_i} \Pi_{ind,i}(I^*_{ind,1},\dots,I^*_{ind,i-1},I_i,I^*_{ind,i+1},\dots,I^*_{ind,2N}).$$

For the sake of simplicity, in the rest of the paper we concentrate on symmetric equilibria, i.e., equilibria in which all powerful teams choose the same investment level $I^*_{ind,p}=I^*_{ind,i}$ with $i=1,\dots,N$ and all weak teams choose the same investment level $I^*_{ind,w}=I^*_{ind,j}$ with $j=N+1,\dots,2N.$

The first-order condition of team i's maximization program is thus

$$z\frac{\sum_{j\neq i} I_j}{\left[\sum_j^{2N} I_j\right]^2}+\frac{\alpha_i\beta}{4}\sum_{j\neq i} I_i^{\beta-1}I_j^{\beta}=1.$$

Hence[13] a symmetric equilibrium $(I^*_{ind,p},I^*_{ind,w})$ is a solution of the following system of equations.

$$z\frac{NI_w+(N-1)I_p}{N^2[I_w+I_p]^2}+\frac{\alpha_p\beta}{4}I_p^{\beta-1}(NI_w^{\beta}+(N-1)I_p^{\beta})=1; \tag{1}$$

$$z\frac{NI_p+(N-1)I_w}{N^2[I_w+I_p]^2}+\frac{\alpha_w\beta}{4}I_w^{\beta-1}(NI_p^{\beta}+(N-1)I_w^{\beta})=1. \tag{2}$$

2.2 Collective sale of TV rights

The main qualitative difference between the collective and the individual sale of TV rights is that in the former case, the league can choose how to redistribute the revenues from the sale of the TV rights to teams. Denote by θ the fraction of the TV revenues awarded to the winner of the competition, the remaining fraction $(1-\theta)$ being redistributed evenly to

[13] It is easy to check that the S.O.C. for a maximum are satisfied

teams. If the league sets $\theta = 0$; we have full revenue sharing, that is, the league splits the TV revenues evenly across teams independently of their performance. If $\theta = 1$, we have a winner-takes-all situation.

Let $R_T(I_1;\ldots;I_{2N})$ be the total revenue generated by the broadcast of all the games given that team i ($i = 1;\ldots;2N$) chooses an investment level I_i. Then,

$$R_T(I_1;\ldots;I_{2N}) = \frac{1}{4}\sum_{i=1}^{2N}\sum_{j\neq i} I_i^{\beta} I_j^{\beta}: \tag{3}$$

For a given level of revenue sharing θ, the profit of team i is then

$$\Pi_i(I_1;\ldots;I_{2N};\theta) = z\frac{I_i}{\sum_{j=1}^{2N} I_j} + \left(\theta\frac{I_i}{\sum_{j}^{2N} I_j} + \frac{1-\theta}{2N}\right)\frac{\alpha_L}{4}\sum_{i=1}^{2N}\sum_{j\neq i} I_i^{\beta} I_j^{\beta} - I_i:$$

where the first term represents the expected exogenous prize and the second one the expected TV revenues. In fact, if $\theta > 0$, the TV revenues received by a team are performance-dependent. Therefore, a team receives $\theta\alpha_L R_T$ with probability $I_i/\sum_j^{2N} I_j$; i.e., if it wins the competition, and $(1-\theta)\alpha_L R_T/2N$ with probability 1.

As a consequence, the optimal investment level chosen by team i; $I_{c;i}^*$, will depend on the level of revenue sharing chosen by the league.

The league's objective function is then to maximize the joint profit with respect to θ; i.e.

$$\arg\max_{\theta} \Pi_L = \sum_{i=1}^{2N} \Pi_i(I_{c;1}^*;\ldots;I_{c;2N}^*;\theta):$$

2.2.1 Characterization of the symmetric equilibrium

Let us turn to the problem of the league first. If it could choose the (common) investment level, I_c^*, the league would maximize

$$\Pi_L = N(2N-1)\frac{\alpha_L}{2}(I_c^*)^{2\beta} - 2N I_c^*:$$

The first-order condition for profit maximization is

$$N(2N-1)\beta\alpha_L(I_c^*)^{2\beta-1} - 2N = 0;$$

from which we deduce that the league wants

$$(I_c^*)^{1-2\beta} = \frac{(2N-1)\beta\alpha_L}{2}. \tag{4}$$

That is, the collectively optimal investment level of the clubs is increasing in the number of teams in the championship (since the number of games played increases geometrically), in the returns to scale of the "quality producing" technology, and in their collective bargaining power. Notice that there is a threshold level at $(2N-1)\beta\alpha_L = 2$, yielding $I_c^* = 1$. If the LHS is larger then the optimal level of investment is likely to be quite high, while in the opposite case, quite low – where the steepness of the transition is the more pronounced the closer is β to a half.

The question then is whether the league can induce the clubs to make the collectively optimal investment by a judicious choice of revenue sharing.

Given the θ chosen by the league, the first-order condition of profit maximization of team i is

$$\frac{\sum_{j\neq i} I_j}{\left(\sum_j^{2N} I_j\right)^2}\left(z + \frac{\alpha_L\theta}{4}\sum_i^{2N}\sum_{j\neq i} I_i^{\beta} I_j^{\beta}\right) + \beta\frac{\alpha_L}{2}\left(\theta\frac{I_i}{\sum_j^{2N} I_j} + \frac{1-\theta}{2N}\right) I_i^{\beta-1}\sum_{j\neq i} I_j^{\beta} = 1.$$

Therefore,[14] we obtain that in a symmetric equilibrium, the investment level I_c^* is the solution of

$$\frac{2N-1}{4N}\left(\theta\frac{2N-1}{2} + \beta\right)\alpha_L I^{2\beta-1} + z\frac{2N-1}{4N^2 I} = 1. \tag{5}$$

While this equation cannot be solved analytically, it is easy to see that – generically – it does have a unique, positive solution.[15] Moreover, as expected, $I(\theta)$ is strictly increasing in the winner's share (θ).

Plugging (4) in (5), rearranging, and taking into account the constraint that $\theta \geq 0$, we obtain

$$\theta^* = \mathrm{Max}\left(0; \beta\left[2 - \frac{z}{N}\left(\frac{(2N-1)\beta\alpha_L}{2}\right)^{1/(2\beta-1)}\right]\right) = \mathrm{Max}\left(0; \beta\left[2 - \frac{z}{N I_c^*}\right]\right). \tag{6}$$

[14] Again, it is easy to check that the S.O.C. is satisfied.

[15] Note that the LHS is continuous and strictly decreasing in I, from infinity to zero.

From here, the following proposition follows directly:

Proposition 1 The optimal level of revenue sharing for the league is always strictly lower 1. In particular, $\theta^* \in [0, 2\beta]$. It will be able to attain its first-best investment (I_c^*) if and only if the aggregate first-best investment ($2N I_c^*$) exceeds the exogenous prize. Otherwise, it will choose full revenue sharing as a second-best solution.

There are two incentive effects at work here among teams. On the one hand, a revenue sharing system independent of performance produces a free-riding effect. Note that teams' investment decisions have a direct impact on the TV revenues from both their home and away games ($2(2N - 1)$ games overall). However, under full revenue sharing they will get only a fraction $1/2N$ of these revenues. Consequently, the clubs do not internalize the positive externalities of their investment decision and rather, tend to free ride on each other. A performance-related reward can countervail this effect.

On the other hand, a performance-related reward acts as a substitute for the exogenous prize, z by enhancing teams' incentives to win and, therefore, to invest. The competition for this composite prize gives rise to a rent-seeking effect, which may be detrimental to competitive balance within the league.

In conclusion, when z is small, teams have little incentives to win, so the free-riding effect dominates. The league can correct this situation by choosing a θ larger enough in order to enhance investment. Conversely, when z is large, the league needs to moderate teams' incentives to win and, thus, chooses a large level of revenue sharing (small θ). In fact, for very large z, it would in principle be optimal to punish teams for doing well in the competition. The best the league can do in this case is to opt for full revenue sharing.

3 Welfare analysis

In order to perform a comparative welfare analysis of the two selling mechanisms, we need to compute the level of social welfare generated by each of them first.

In Section 1, we derived that the price of a game played by teams i and j is $p_{ij} = Q_{ij}/2$, yielding a profit $\pi^n_{ij} = Q_{ij}/4$. The consumers' surplus from having the game broadcast is then

$$S_{ij} = \int_{Q_{ij}/2}^{Q_{ij}} \frac{Q_{ij} - p}{Q_{ij}} dp = \frac{Q_{ij}}{8}.$$

It follows that consumers' surplus if rights are sold collectively is

$$S_c = \frac{N(2N-1)}{4}(I_c^*)^{2\beta};$$

while if rights are sold individually, consumers' surplus is

$$S_{ind} = \frac{N}{8}\left[(N-1)\left((I^*_{ind;p})^{2\beta} + (I^*_{ind;w})^{2\beta}\right) + 2N(I^*_{ind;p})^{\beta}(I^*_{ind;w})^{\beta}\right].$$

We define the level of social welfare as the sum of consumers' welfare, teams' profit, the TV network's profit, and players' revenue (i.e., teams' investment in talent). Given that the only cost faced by teams is player's revenue, it does not influence the level of social welfare. It is only a transfer from teams to players. Furthermore, since there are no broadcasting costs, the sum of the profit of the network and teams is the total profit generated by game broadcasting. This implies that social welfare for a single game is determined by the sum of consumers' surplus and the total TV profits (the producers' surplus), i.e.

$$W_{ij} = \frac{3}{8}Q_{ij}$$

It follows that the level of social welfare under collective sale is given by

$$W_c = \frac{3N(2N-1)}{4}(I_c^*)^{2\beta}.$$

and, similarly, in the case of individual sale, the level of social welfare is

$$W_{ind} = \frac{3N}{8}\left[(N-1)\left((I^*_{ind;p})^{2\beta} + (I^*_{ind;w})^{2\beta}\right) + 2N(I^*_{ind;p})^{\beta}(I^*_{ind;w})^{\beta}\right].$$

Note that maximizing the social welfare is proportional to the total quality. Therefore, the socially optimal system of sale is the one which maximizes the total quality of the tournament and, this choice is irrespective of whether the regulator is concerned with TV viewers' welfare, the producers' surplus or both.

In order to isolate the various effects generated by the collective sale of TV rights (as compared to individual sale), we consider several cases. First, we separate the cases $N = 1$ and $N > 1$.

3.1 A two-team "league"

If $N = 1$, there are only two teams in the league and only two games are played. As a result, the free-riding effect is still positive, but equally strong under both selling mechanisms. To see this, recall that under collective sale the clubs recoup a proportion of $\frac{2(2N-1)}{2N}$ of the marginal product of their investment. Under individual sale, they only care about their home games, so the same factor is $2N - 1$. When $N = 1$, the two factors coincide. Consequently, if the exogenous prize is not high enough, the league can improve welfare — as compared to individual sale — by setting up a performance related reward.

We analyze first the case $z = 0$, for which we are able to derive closed-form solutions in the investment game both in the case of collective and individual sale. In this case, the only source of revenue for teams is the sale of TV rights. From the system of first-order conditions (1) and (2), we deduce that if rights are negotiated individually,

$$I^*_{ind,w} = \left(\beta\alpha_w^{1-\beta}\alpha_p^{\beta}/4\right)^{1/(1-2\beta)} \qquad I^*_{ind,p} = \frac{\alpha_p}{\alpha_w} I^*_{ind,w}$$

Therefore, the level of social welfare is

$$W_{ind} = \frac{3}{4}\left(\frac{\alpha_p\alpha_w\beta^2}{16}\right)^{\beta/(1-2\beta)}.$$

If rights are sold collectively, then

$$I^*_c = (\beta\alpha_L/2)^{1/(1-2\beta)}.$$

It follows that the level of social welfare is

$$W_c = \frac{3}{4}\left(\frac{\beta\alpha_L}{2}\right)^{2\beta/(1-2\beta)}.$$

We deduce that $W_c > W_{ind}$ is equivalent to

$$4\alpha_L^2 > \alpha_w\alpha_p.$$

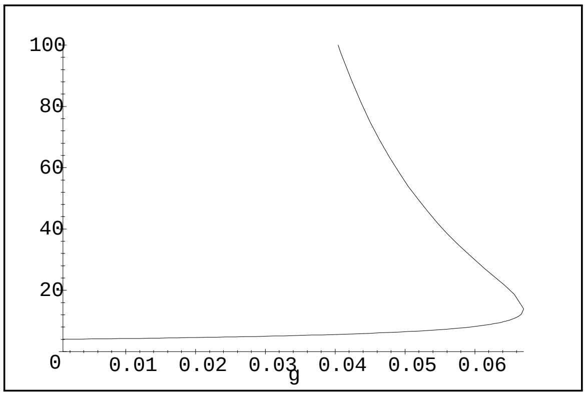
Assume that $\alpha_L = \gamma\alpha_p + (1 - \gamma)\alpha_w$ with $\gamma \in [0; 1]$. That is, the league's bargaining power is somewhere in between the bargaining powers of the powerful and weak team's. We can derive the following proposition.

Proposition 2 Assume that $N = 1$ and $z = 0$:

(i) If $\alpha_w > \alpha_p/4$, then $W_c > W_{ind}$.

(ii) If $\gamma > \frac{2-\sqrt{3}}{4}$ then $W_c > W_{ind}$.

(iii) Otherwise, $W_{ind} > W_c$; if and only if $\frac{\alpha_p}{\alpha_w} \in \left(\frac{\frac{1}{8}-\gamma(1-\gamma)}{\gamma^2} - \frac{\sqrt{\frac{1}{16}-\gamma(1-\gamma)}}{2\gamma^2}; \frac{\frac{1}{8}-\gamma(1-\gamma)}{\gamma^2} + \frac{\sqrt{\frac{1}{16}-\gamma(1-\gamma)}}{2\gamma^2} \right)$.



The area where individual sale dominates

Proof: See Appendix.

When $z = 0$, we know from Subection 2.2 that the league chooses $\mu^* = 2\beta$. As a consequence, the league creates a prize for the winner. This generates the optimal incentives to invest for both teams. We call this effect the prize effect. Collective sale has a two more effects on investment (as compared to individual sale). First, if $\gamma > 0$, then the weak team's incentives to invest increase since its bargaining power increases. In turn, this increases the powerful team's incentives to invest because of strategic complementarity. Second, if $\gamma < 1$, the powerful team has less incentive to invest because its bargaining power is decreased. In turn, this decreases the weak team's incentives to invest. We call these two effects bargaining power effects.

If α_p/α_w is not too far from one (at least smaller than 4), the bargaining power effects are relatively small. At the same time, the prize effect is independent of the ratio α_p/α_w.

Thus, if $\alpha_w > \alpha_p/4$, the prize effect is the stronger, hence collective sale yields a higher level of social welfare than individual sale irrespective of γ.

To illustrate this, consider the extreme case in which $\alpha_w = \alpha_p = \alpha$. Under such an assumption, we have $W_{ind} = \frac{3}{4}(\alpha\beta/4)^{2\beta/(1-2\beta)}$ and $W_c = \frac{3}{4}(\alpha\beta/2)^{2\beta/(1-2\beta)}$.

If α_p/α_w is large (i.e., larger than 4), then the bargaining power effects are important. If γ is small, then the negative bargaining power effect dominates the positive one. As a consequence, the level of social welfare with individual sale is larger than with collective sale. As γ increases, the intensity of the negative bargaining power effect decreases, while the intensity of the positive bargaining power effect increases. As a consequence, there exists a threshold beyond which collective sale again increases the level of social welfare.

Note that the above analysis also applies when there is a positive exogenous prize. As long as the league wishes to implement an endogenous prize,[16], the result remains qualitatively the same as above. The only difference is that, as z grows, the conditions for collective sale to be the dominant selling mechanism become tighter.

When z is large, there is no prize effect: The league chooses full revenue sharing ($\theta^* = 0$). Undere collective sale, the equilibrium investment is the solution of

$$\beta\alpha_L I_c^{2\beta} + z = 4I_c. \tag{7}$$

whereas, under individual sale, I_w and I_p are the solution of

$$\frac{\beta\alpha_p}{4}(I_p I_w)^{\beta} + z\frac{I_p I_w}{(I_w + I_p)^2} = I_p; \tag{8}$$

$$\frac{\beta\alpha_w}{4}(I_p I_w)^{\beta} + z\frac{I_p I_w}{(I_w + I_p)^2} = I_w. \tag{9}$$

Despite the lack of "organizational" advantage, if the league's bargaining power is sufficiently close to the powerful club's one, the bargaining power effect is so strong that collective sale still results the socially preferable mechanism.

[16] That is, $z < 2\left(\frac{\beta\alpha_L}{2}\right)^{1/(1-2\beta)}$; c.f. Proposition 1.

Proposition 3 Assume that z is large so that $\theta^* = 0$ in case of collective sale. If the league's bargaining power is closer to the powerful team's one, i.e. $\gamma \geq 1/2$, then collective sale dominates individual sale, $W_c > W_{ind}$.

Proof: See Appendix.

3.2 Large leagues

As we have seen, when there are more than two teams in the league, the collective sale of TV rights generates a free-riding effect. In order to characterize it, we analyze an homogeneous league, i.e., a league in which all teams have the same bargaining power: $\alpha_p = \alpha_w = \alpha_L = \alpha$. Of course, in such a case the bargaining power effect is null. Also, we assume that z is large so that $\theta^* = 0$. In such a case the prize effect is also null.

From Equation (5), we deduce that in the case of collective sale, the first-order condition of profit maximization for teams is

$$\frac{2N-1}{4N^2 I_c} z + \frac{2N-1}{4N} \alpha \beta I_c^{\beta-1} = 1.$$

From Equations (1) and (2), we deduce that in the case of individual sale, the first-order condition of profit maximization is

$$\frac{2N-1}{4N^2 I_{ind}} z + \frac{2N-1}{4} \alpha \beta I_{ind}^{\beta-1} = 1.$$

It is straightforward that $I_{ind} > I_c$, whenever $N > 1$. Hence, individual sale generates a higher welfare level than collective sale.

The reason for this result is the following. Under individual sale, the clubs' investment has a direct effect on their payoff only through their home games ($2N-1$ games), since they only receive TV revenues for their home games. Under collective sale, the effect is on all their games, but divided among the $2N$ clubs: $\frac{2(2N-1)}{2N}$. Clearly, the marginal incentive under collective sale is $1/N$ times the one under individual sale.

4 Discussion

Apart from the exogenous monetary prize, our model focuses exclusively on TV revenues (both are performance-dependent). TV revenues have indeed become increasingly important in teams' budgets as shown by the table below:

1999-2000 season	England	Italy	Spain	Germany	France
Total clubs' revenues	530	430	380	360	230
Total TV revenues	200	260	190	105	210
TV revenues/tot. revenues (%)	38%	60%	50%	29%	91%

Table 1: Data on clubs' revenues for the major European football leagues
Source: World Soccer, June 2000. The data are in millions of pounds

In reality, however, teams have other sources of revenues, such as gate and sponsorship income, which may not be performance-related. For example, a fraction of gate income may come from fans who attend games independently of the quality of the visiting team. If team i has a specific revenue $S_i(I_i)$, this provides additional incentives to invest, and so the social welfare increases under both individual and collective sale. However, our results would not change qualitatively by the introduction of this additional source of revenue because the three effects we have identified (bargaining, prize and free riding effect) will still be at work.

Another implicit assumption of our model is that teams have unlimited access to the capital market (that is, they are not budget constrained), hence they can always implement their first best investment decision which is the best reply to their competitors' strategy. Introducing budget constraint means that teams are no longer symmmetric under a collective sale. There would be poor and rich teams. Then the collective sale of TV rights would also generate a wealth effect. The league would transfer revenues from rich teams to poor teams in order to increase the investment level of poor teams and decrease that of rich teams. However, since the welfare level is concave in investment levels, the increase of the welfare level due to the higher investment of poor teams is larger than the decrease of the welfare level due to the lower investment of rich teams. As a consequence, the redistribution of TV revenues increases the welfare level. Hence, budget constraints provide an additional reason to promote collective sale.

5 Conclusion

The way sports teams should be allowed to market the TV right for their home games (collectively or individually) is a highly debated issue in many countries. In order to ¯nd which system is better, we have performed a comparative welfare analysis. Taking individual sale as a benchmark, we have shown that collective sale generates three e®ects. The ¯rst one is a bargaining power e®ect: by selling their rights collectively, teams' bargaining power is modi¯ed with respect to the case of individual sale. This e®ect may have a positive or negative impact on welfare, depending on the relative values of the bargaining powers. The second e®ect is a prize e®ect. If the exogenous monetary prize is small, the league can increase teams' incentives to invest by choosing a performance-based revenue sharing scheme. In such a case, collective sale is welfare improving. The last e®ect is a free-riding e®ect. When rights are sold collectively, teams take into account the impact of their investment on TV revenue for both their home games and their away games. However, this TV revenue is shared by all teams. The result is that the larger is the number of teams in the league the smaller are teams' incentives to invest when rights are sold collectively.

Taking into account these three e®ects, we derive the result that individual sale is more appropriate in a league which is large, (that is, with a large number of teams) has relatively heterogeneous teams and a relatively weak league (that is, the di®erence of bargaining power between teams is large and the league's bargaining power is close to the weak teams') and where the exogenous prize is large.

Appendix

Proof of Proposition 2:

We already know that $W_c > W_{ind}$ is equivalent to

$$4\alpha_L^2 > \alpha_w \alpha_p \tag{10}$$

Given that $\alpha_L = \gamma\alpha_p + (1-\gamma)\alpha_w$, this last inequality is equivalent to

$$\gamma^2\alpha_p^2 + (1-\gamma)^2\alpha_w^2 + 2\gamma(1-\gamma)\alpha_w\alpha_p > \frac{\alpha_w\alpha_p}{4}.$$

Rearranging and dividing both sides by α_w^2, we obtain the following second-order polynomial in $x = \alpha_p/\alpha_w$:

$$x^2 + x\frac{2\gamma(1-\gamma) - 1/4}{\gamma^2} + \left(\frac{1-\gamma}{\gamma}\right)^2 > 0.$$

It is straightforward to verify that the LHS has no real root for $\gamma \in \left(\frac{2-\sqrt{3}}{4}, \frac{2+\sqrt{3}}{4}\right)$. Also both roots are below one for $\gamma > \frac{2+\sqrt{3}}{4}$. When $\gamma < \frac{2-\sqrt{3}}{4}$, then any x value that is not between the roots will satisfy the inequality.

$\square$

Proof of Proposition 3: As we have seen, in case of collective sale, the equilibrium investment is the solution of

$$\beta\alpha_L I_c^{2\beta} + z = 4I_c,$$

which is equivalent to

$$\frac{\beta\alpha_L}{4}(I_c I_c)^{\beta} + z\frac{I_c I_c}{(I_c + I_c)^2} = I_c$$

In the case of individual sale, I_r and I_p are the solution of

$$\frac{\beta\alpha_p}{4}(I_p I_w)^{\beta} + z\frac{I_p I_w}{(I_r + I_p)^2} = I_p$$

$$\frac{\beta\alpha_w}{4}(I_p I_w)^{\beta} + z\frac{I_p I_w}{(I_w + I_p)^2} = I_w$$

Now, note that when $N = 1$, $W_c > W_{ind}$ is equivalent to $I_c^2 > I_p I_w$: Thus, we need to compare

$$I_c I_c = \frac{\text{¯}^2}{4} \text{®}_L \text{®}_L \left(I_c I_c\right)^{2\text{¯}} + \frac{z^2 \left(I_c I_c\right)^2}{\left(I_c + I_c\right)^4} + \left(\text{®}_L + \text{®}_L\right) \frac{z^{\text{¯}} \left(I_c I_c\right)^{1+\text{¯}}}{2\left(I_c + I_c\right)^2};$$

with

$$I_p I_w = \frac{\text{¯}^2}{4} \text{®}_w \text{®}_p \left(I_w I_p\right)^{2\text{¯}} + \frac{z^2 \left(I_w I_p\right)^2}{\left(I_w + I_p\right)^4} + \left(\text{®}_w + \text{®}_p\right) \frac{z^{\text{¯}} \left(I_w I_p\right)^{1+\text{¯}}}{2\left(I_w + I_p\right)^2}:$$

Therefore, if ° ¸ 1=2 (that is, 2®_L ¸ $\text{®}_w + \text{®}_p$) we have that $W_c > W_I$ since { because the ®'s are no greater than one {, ° ¸ 1=2 also implies $\text{®}_L^2 > \text{®}_w \text{®}_p$. 2

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