

ISSN 0111-1760

University of Otago
Economics Discussion Papers
No. 0512

October 2005

Revenue Sharing in Professional Sports Leagues¹

Eberhard Feess²
Frank Stähler

Contact Details

Frank Stähler
Department of Economics
University of Otago
P.O. Box 56
Dunedin
New Zealand
Email: fstaehler@business.otago.ac.nz

¹We are grateful to Gerd Mühlheusser and workshop participants in Venice, Auckland, Otago, Kiel, Hamburg and Prague for helpful comments. The usual disclaimer applies.

²Department of Economics, University of Aachen, Templergraben, 64, D-52056 Aachen, Germany, email: feess@rwth-aachen.de.

Abstract

We employ a model of n heterogeneous profit-maximizing clubs to analyze the impact of revenue sharing in a professional sports league. Individual revenues depend on both talent demand and competitive balance. We identify three effects of revenue sharing. The revenue effect reduces talent demand of each club because a part of the revenues is generated by competitors. The asymmetric cost effect supports the first effect, and is even stronger for weak clubs. The competitive balance effect makes clubs more sensitive to competitive balance. We show that the asymmetric cost effect unambiguously dominates the competitive balance effect so that revenue sharing decreases both talent demand and competitive balance, and thereby aggregate profits and social welfare.

JEL-Classification: L83, L59, D43.

Keywords: Revenue sharing, professional sport leagues.

1 Introduction

The issue of revenue sharing in professional sports leagues has attracted considerable attention in recent years. In the US for example, gate revenue sharing in major sports leagues such as the National Football League (NFL) or the Major League Baseball (MLB) has long been accepted as an exemption from antitrust law.¹ The reason is that revenue sharing is supposed to enhance competitive balance by transferring funds from strong to weak clubs, allegedly a vital feature of many sporting contests. In some of the major European football leagues like England and Germany, the revenue from selling broadcasting rights is distributed according to rules designed by the National Football Associations, and performance plays only a minor role.² Although the European Commission criticizes the collective sale of broadcasting rights as anti-competitive, it also emphasizes that revenue sharing may indeed be appropriate to improve suspense. Hence, some form of revenue sharing would continue to be tolerated even if clubs are required to sell the TV rights for their home matches on their own.³

The impact of revenue sharing on competitive balance is theoretically highly controversial. Building on an idea of Rottenberg (1956), El Hodiri and Quirk (1971) have shown that, when the total number of talents is exogenously given, revenue sharing does not influence the talent distribution between profit maximizing clubs at all. This so called "invariance proposition" has dominated the literature for a long time, so that the different rules observed both in the USA and in Europe seemed to be hardly justified by theoretical arguments.⁴ Recently, however, it has been shown that the invari-

¹See e.g. the survey articles by Szymanski (2003) and Fort and Quirk (1995). More information on the history of revenue sharing in the US is also provided in Quirk and Fort (1997).

²In Germany, for instance, 50% of the broadcasting revenues from its top league (Bundesliga) are distributed lump sum, and the other 50% according to a scoring model. For further details on European football leagues, see Falconieri, Palomino and Sákovics (2004).

³See e.g. the speech of Commissioner Monti on the conference "Governance in Sports", Brussels 26 February 2001. Forrest, Simmons and Szymanski (2004) show that collective broadcasting in the English Premier League leads to an inefficiently low supply of soccer in TV that is even below the amount a monopolist would offer on the market.

⁴See also Vrooman (1995) who demonstrates that salary caps can be interpreted as

ance proposition fails to hold under many circumstances. More specifically, the invariance theorem may be violated when fans also have a preference for absolute quality (Marburger, 1997, Késenne, 2000 and Dobson and Goddard, 2001), when teams seek to maximize their win percentages rather than profits (Késenne, 2004, 2005), if teams are wealth-constrained (Palomino and Rigotti, 2004), if players have different qualities (Késenne, 2000), if marginal costs of hiring talents are increasing (Szymanski and Késenne, 2003), or if the marginal productivity of a player is decreasing in the number of players in a club (Bougheas and Downward, 2003).

Most of the literature quoted above shares the assumption with the seminal literature that the total talent supply is constant. This assumption, however, is certainly unreasonable for European football after the Bosman judgement from 1995 which has established an international players market.⁵ It is now common that about eight or nine out of eleven players are foreigners (especially from South America), which means that a club can hire a further talent without reducing the number of talents in other clubs competing in the same league. But even for US sports leagues, treating the number of talents as given is questionable, since top players from European Basketball Leagues perform well even in the States, and the same holds for Czechian or Russian ice hockey players. Furthermore, a constant talent supply does not allow to apply the Nash equilibrium as the solution concept when determining each club's individual talent demand. The reason is that, in an n club model, the n -th club, say, is not free to choose the profit maximizing amount of talents to hire, but its demand is exogenously given through the choices of its $n - 1$ rivals and the add-up condition. To overcome this problem, the literature uses some kind of conjectural variation assumption which is clearly improper for modelling non-cooperative behavior.

To our knowledge, only Szymanski and Késenne (2004) and Falconieri, Palomino and Sákovics (2004) discuss revenue sharing in a model which as-

revenue sharing regimes under certain circumstances, and Dobson and Goddard (2001) for recent extensions of the basic model.

⁵See Court of Justice of the European Communities, Case C-415/93. For an analysis of the Bosman judgement on labor contracts between players and clubs, see Feess and Mühlheusser (2003).

sumes that the total number of talents hired in the league is endogenous and derived from each club's profit maximizing behavior. Szymanski and Késenne (2004) employ a two club contest model and find that revenue sharing unambiguously reduces suspense. The reason is that weak clubs reduce their demand by more than strong clubs, and hence revenue sharing serves as a collusion device which shifts talent demand from less efficient to more efficient clubs. Since strong clubs are more efficient by definition (this is modelled such that talents are cheaper for strong clubs), revenue sharing ultimately deteriorates competitive balance. Falconieri, Palomino and Sákovics (2004) employ a contest model, too, in order to discuss the pros and cons of a collective sale of TV rights. They assume that teams differ with respect to their individual bargaining power when selling TV rights on an individual basis. Their paper shows that the collective sale can be welfare dominant if the league is small and teams do not differ much in terms of bargaining power.

From a methodological point of view, our model follows these papers as we also derive the talent demand of each club as the Nash equilibrium played by profit maximizing clubs. Besides, our analytical framework is quite different. Both papers exploit the usual contest model where profits depend on win probabilities, and hence on the *relative* strength of clubs. The contest approach has the important advantage that the results can easily be compared to other papers. However, it has also some drawbacks. Most importantly, the analysis is limited to the two team-case and can hardly be extended to a more general framework.⁶ This is an important restriction, because it makes it impossible to analyze the impact of revenue sharing on the behavior of "mediocre" teams. Furthermore, Szymanski and Késenne (2004) assume that the own profit is strictly increasing in the win probability (and hence decreasing in the talent demand of other clubs). This is not always convincing, since Real Madrid may well benefit if Barcelona improves its quality. Also competitive balance has no impact on individual profits in their contest

⁶The generalization to n teams is possible if only two types of teams exist in the league which is a quite restrictive assumption. Falconieri, Palomino and Sákovics (2004) assume that each club has either all the bargaining power or no bargaining power in individual negotiations with a TV station.

model. This can well be questioned – if competitive balance is a warranted feature because it improves the spectators’ utility, then it should also have a positive impact on their willingness to pay and hence on clubs’ profits.⁷ The contest model of Falconieri, Palomino and Sákovics (2004) takes both quality and competitive balance into account. However, they compare the collective sale of TV rights including revenue sharing with an individual sale without revenue sharing. They do not consider individual sale including revenue sharing which is obviously the model the European Commission has in mind.

For these reasons, we depart from the contest model in order to put the issue further. To this end, we develop an n -club model where each club’s revenue depends both on its own talent demand and on competitive balance. As usual, competitive balance is measured by the inverse of the variance, so that competitive balance increases (decreases) in the talent demand of weak (strong) clubs.⁸ Incorporating competitive balance in the revenue function implies that a strong club is partially interested in the talent demand of a weak club *even without* revenue sharing as it cares about the variance of talents. Contrary to contest models, we do *not* assume that the win probability has an impact on revenues. This has three advantages: first, it allows us to incorporate the competitive balance into the revenue function. Second, we can extend the model to n heterogeneous clubs. Third, as mentioned above with respect to the Madrid-Barcelona example, the impact of the talent demand of other clubs on the own profit is far from straightforward. Moreover, Szymanski and Késenne (2004) have already demonstrated (restricted to the two-club-mode, though) that the contest effect unambiguously leads to a higher variance if revenue sharing increases, so that we can safely focus on other effects.

In such a model, we show that *both* competitive balance *and* aggregate

⁷Additionally, the question whether talents are strategic substitutes or strategic complements (which is important for the results when the model is extended) depends on the relative strength of a team.

⁸This is the usual measure of competitive balance in the literature, although sometimes the Gini-coefficient is used instead. See *e.g.* Quirk and Fort (1997), Horowitz (1997), Humprey (2002) and the discussion in Szymanski (2003).

talent demand, and thereby also total profits generated by the league, unambiguously decrease with revenue sharing. Although we do not explicitly incorporate a social welfare function, it is clear that these results imply that social welfare also decreases – total profits are lower, and consumers care about quality and suspense, which are both adversely affected. The reasons for our findings can be described as follows: first, the *pure revenue effect* decreases the talent demand of *all* clubs due to a simple externality problem – costs are fully borne by the clubs themselves, but part of the revenue generated is appropriated by other clubs. Note that this is due to the fact that clubs do not share their gross profits (*i.e.*, their difference between revenues and costs before revenue sharing), but only their revenues. Second, the fact that only revenues but not costs are shared has a higher impact on weak clubs as they have higher unit costs and/or a lower drawing potential by definition of weak clubs.⁹ Hence, this *asymmetric cost effect* leads to a lower talent demand of weak clubs *relative* to strong clubs. Third, there is the *competitive balance effect*: Considering each club’s reaction function, the impact of competitive balance implies that each club’s talent demand is *ceteris paribus* increasing in all other clubs’ demand as to stabilize competitive balance. In other words, according to this effect, talents are strategic complements (reaction curves are upward sloping). In equilibrium, when considered separately, the impact of the suspense on clubs’ profits indeed enhances the competitive balance, but this can never outweigh the cost effect. Intuitively, the reason is that the cost effect is completely taken into account (100% percent of costs are borne by clubs themselves), whereas a higher suspense is good for *all* clubs, and only part of the positive suspense effect is internalized via the direct impact on own profits and via revenue sharing.

The remainder of the paper is organized as follows: In section 2, we introduce the model. Section 3 derives the clubs’ reaction functions and distinguishes between three different effects at work. Section 4 derives the results

⁹Our results would not change if we assumed instead that all clubs have identical talent costs, but strong clubs have a higher drawing potential (which are the only two ways to distinguish between strong and weak clubs). However, with respect to the distinction between weak and strong clubs, we wanted to follow the literature as closely as possible.

for the impact of revenue sharing on talent demand and competitive balance. Section 5 concludes.

2 The model

We assume the following sequence of decisions. In the first stage, the revenue sharing regime is fixed. In the second stage, clubs demand talents simultaneously and independently. Talent demand determines the individual revenues of the club. As usual in the literature, we assume that talents can be measured as a continuous variable which is publicly known. The model is as simple as possible. We assume that a club can generate revenues at the beginning of a season, *e.g.* by selling TV rights and season tickets and by merchandising.¹⁰ Each club's revenues, R_i are given by

$$R_i = \alpha T_i - \frac{\beta}{2} T_i^2 - \delta V, \alpha, \beta, \delta > 0 \quad (1)$$

where T_i is the number of talents of club i and V is the variance of the talent distribution among clubs. The part $\alpha T_i - \frac{\beta}{2} T_i^2$ can be interpreted as the *quality effect* where the assumption that revenues are concave in quality seems to be a natural one. $-\delta V$ is the *variance effect* which is clearly negative because competitive balance (and hence suspense) decreases in variance. The aggregate number of talents in the league is defined as $T \equiv \sum_n T_i$.

Total talent costs for club i are given by $w_i \cdot T_i$ where w_i denotes the individual wage per talent of club i . We model the asymmetry among clubs in terms of different wage costs. It should be clear, however, that this is equivalent to different drawing potentials: if a club's home market is relatively weak, the club will not be able to raise substantial revenues (*e.g.* from TV coverage) even if the club performs well on the pitch. In other words, different unit costs w_i may also originate from different productivities due to different home market sizes. If w_i (or the $R_i(\cdot)$ -function's themselves) would not differ, revenue sharing in professional sports leagues could not be an issue at all.

¹⁰The assumption that revenues are generated at the beginning of a season is reasonable since fixtures and the players of each team are common knowledge. Furthermore, these could also represent the discounted sum of expected revenues over the season or revenues based on season contracts with TV stations.

Due to the asymmetry with respect to w_i , talents will be unevenly distributed in equilibrium. Denoting $\bar{T} \equiv \sum_n T_i/n$ as the average number of talents per club, the variance is given by

$$V = \frac{1}{n} \sum_{i=1}^n (T_i - \bar{T})^2. \quad (2)$$

The larger V is, the less competitive balance is produced by the league. The marginal change in competitive balance by an individual change in talent demand is

$$\frac{\partial V}{\partial T_i} = \frac{2}{n}(T_i - \bar{T}). \quad (3)$$

Eq. (3) shows that, if a club unilaterally increases its talent demand, it will increase (decrease) competitive balance if $T_i < (>)\bar{T}$. We refer to those clubs with a talent demand less than the average talents per club, *i.e.*, $T_i < \bar{T}$, as *weak clubs*, and to those with a talent demand more than the average talents per club, *i.e.*, $T_i > \bar{T}$, as *strong clubs*.

The profits of clubs do not only depend on individual talent demand and the variance of talents but also on the revenue sharing regime. As usual in the literature, let ρ denote the revenue sharing parameter which gives the share of revenues left to the club generating these revenues. If $\rho = 1$, no revenue sharing occurs. The lower ρ is, the more revenues are shared. With revenue sharing, the profits of each club are given by

$$\Pi_i = \rho R_i + \frac{1-\rho}{n-1} \sum_{j \neq i} R_j - w_i T_i \quad (4)$$

with R_i and R_j defined as in (1). Eq. (4) will now be used to analyze the impact of revenue sharing on talent demand and competitive balance.

3 Revenue sharing and reaction curves

As clubs behave non-cooperatively and maximize their profits,¹¹ we get the following set of first order conditions

$$\frac{\partial \Pi_i}{\partial T_i} = \rho(\alpha - \beta T_i) - \frac{2\delta}{n}(T_i - \bar{T}) - w_i = 0 \quad \forall i. \quad (5)$$

Of course, talent demand will only be positive if wages w_i are not prohibitively high, which we will henceforth assume.¹² The set of reaction functions is

$$T_i = \frac{\rho\alpha n^2 - w_i n^2 + 2\delta \sum_{j \neq i} T_j}{\rho\beta n^2 + 2\delta(n-1)} = \underbrace{\rho\alpha \frac{n^2}{\rho\beta n^2 + 2\delta(n-1)}}_{\equiv T_i^I} - \underbrace{\frac{w_i n^2}{\rho\beta n^2 + 2\delta(n-1)}}_{\equiv T_i^{II}} + \underbrace{\frac{2\delta \sum_{j \neq i} T_j}{\rho\beta n^2 + 2\delta(n-1)}}_{\equiv T_i^{III}} \quad \forall i. \quad (6)$$

Considering expression (6) shows that we can distinguish three terms in a club's reaction function. Differentiating T_i^I with respect to the revenue sharing parameter yields

$$\frac{\partial T_i^I}{\partial \rho} = \frac{(n-1)2n^2\alpha\delta}{(\rho\beta n^2 + 2\delta n - 2\delta)^2} > 0$$

and reveals the *revenue effect*. If revenue sharing increases (*i.e.*, if ρ decreases), revenue sharing leads to a lower talent demand, because own revenues become less important. Differentiating T_i^{II} yields

$$\frac{\partial T_i^{II}}{\partial \rho} = \frac{\beta n^4 w_i}{(\rho\beta n^2 + 2\delta n - 2\delta)^2} > 0,$$

$$\frac{\partial^2 T_i^{II}}{\partial w_i \partial \rho} = \frac{\beta n^4}{(\rho\beta n^2 + 2\delta n - 2\delta)^2} > 0$$

¹¹The assumption of profit maximization is obviously adequate for the major US sports leagues, and becomes more and more important for European football where leading clubs as Lazio Roma, Manchester United and Borussia Dortmund have already gone public.

¹²Note that $\partial^2 \Pi_i / \partial T_i^2 < 0$ so that the second order condition is fulfilled.

and demonstrates the *asymmetric cost effect* which goes into the same direction as the revenue effect: if ρ decreases, talent demand increases, too. Importantly, the cross derivative shows that this effect becomes the more important the higher the unit costs w_i are which means that, when considering only the cost effect, weak clubs will reduce their talent demand more than strong clubs if revenue sharing increases. Finally, differentiating T_i^{III} yields

$$\frac{\partial T_i^{III}}{\partial \rho} = -\frac{2\delta \sum_{j \neq i} T_j \beta n^2}{(\rho \beta n^2 + 2\delta n - 2\delta)^2} < 0.$$

and demonstrates the *competitive balance effect*. The competitive balance effect goes opposite to the other two effects because talent demands are strategic complements. It shows that competitive balance becomes more important for individual talent demand with increasing revenue sharing.

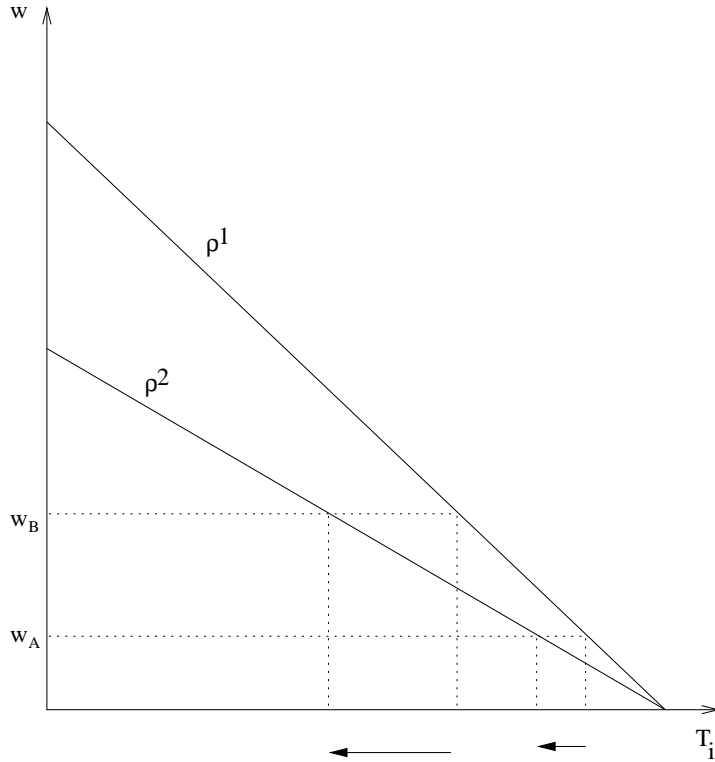


Figure 1: Marginal revenues and talent demand

Before we turn to the equilibrium analysis in the next section, let us first

consider the cost effect as this effect will be important to understand why revenue sharing deteriorates competitive balance. To this end, let us completely ignore the impact of the variance on the revenues for a moment, *i.e.*, we assume that $\delta = 0$. Then, marginal revenues are simply $dR_i/dT_i = \rho(\alpha - \beta T_i)$. Figure 1 shows marginal revenues with substantial revenue sharing (ρ^2) and with little revenue sharing ($\rho^1, \rho^1 > \rho^2$). Now consider a strong club A and a weak club B , and hence $w_A < w_B$. Due to the asymmetric cost effect, switching from ρ_1 to ρ_2 reduces talent demand of club A by much less than it reduces talent demand of club B . Thus, the cost effect alone would lead to the unwarranted result that revenue sharing reduces competitive balance.

4 Revenue sharing, talent demand and competitive balance

By now, we have only explained how the revenue sharing parameter ρ affects the clubs' behavior by considering each club's reaction curve. Although this sharpens the intuition, it says little about the equilibrium impact of ρ as all talent demands change simultaneously. Solving the first order conditions (6), we finally find

Lemma 1 *In the Nash equilibrium, the talent demand of each club is explicitly given by*

$$T_i = \frac{\alpha}{\beta} - \frac{w_i}{\rho\beta} + \frac{2\delta(w_i - \bar{w})}{\rho\beta(n\rho\beta + 2\beta)} \quad \forall i \quad (7)$$

where $\bar{w} = \sum_n w_i/n$ denotes the average wage.

Proof. See Appendix. Making use of Lemma 1, we immediately get our main result:

Proposition 1 (i) *Revenue sharing reduces individual and aggregate talent demand ($dT_i/d\rho > 0 \forall i, \forall \rho$). (ii) Revenue sharing deteriorates competitive balance ($dV/d\rho < 0 \forall \rho$).*

Proof. Part (i). From (7), we get immediately

$$\frac{dT_i}{d\rho} = \frac{4\delta\bar{w}(\delta + \beta n\rho)}{\beta\rho^2(2\delta + \beta n\rho)^2} + \frac{\beta n^2 w_i}{(2\delta + \beta n\rho)^2} > 0 \quad \forall i \quad (8)$$

which of course implies

$$\frac{dT}{d\rho} = \sum_i \frac{dT_i}{d\rho} > 0.$$

Part (ii). Substituting T_i into the definition of the variance (see (2)) leads to

$$V = \frac{n}{(n\rho\beta + 2\delta)^2} \sum_n (\bar{w} - w_i)^2, \quad (9)$$

and hence to

$$\frac{dV}{d\rho} = -\frac{2n^2\beta}{(n\rho\beta + 2\delta)^3} \sum_n (\bar{w} - w_i)^2 < 0. \quad \blacksquare \quad (10)$$

In fact, part (i) of Proposition 1 is simple. Since each club has to fully pay the wages for its talent demand whereas part of its revenue is appropriated by other clubs, equilibrium talent demand of each club decreases. Part (ii), however, is not straightforward and deserves a thorough explanation. Two facts are crucial as to understand the result. First, talent demand is not determined by the impact of revenue sharing on *total* profits, but on *marginal* profits. Total profits may become more equalized through the redistribution effects of revenue sharing, but this does not hold true for marginal profits. As the asymmetric cost effect has demonstrated in the former section, marginal costs of talent demand (w_i) are higher for weak clubs, so that each reduction of marginal revenues caused by $\rho < 1$ leads to a higher reduction in talent demand for weak clubs.

The second crucial point to understand part (ii) is why the countervailing effect caused by the impact of the variance on talent demand cannot dominate. Indeed, revenue sharing sets an incentive to take the impact of the variance on other clubs' revenues into account as part of the revenue is shared. However, revenue sharing does not only mean that a club gets part of the other revenues, but also that a club has to sacrifice part of its own revenue – and this sets incentives to be less concerned about competitive balance. This is the reason why the competitive balance effect can not dominate

in our model *regardless of the value for the weight δ , i.e.*, the result holds for all combinations of α , β and δ allowing for positive talent demands at all.

Graphically, the fact that the competitive balance effect can never dominate can nicely be illustrated in the two-club case. Figure 2 shows the reaction functions for a weak club j and a strong club i (see subscripts) for the case of little revenue sharing, denoted by the superscript 1, and the case of substantial revenue sharing, denoted by the superscript 2. Due to the competitive balance effect in (6), the slopes of the reaction curves must coincide in each scenario. This is the reason why the angles denoted by α and β , respectively, are of the same size. Due to the cost effect, an increase in revenue sharing shifts the reaction curve of the weak club j more downwards than the reaction curve of the strong club i leftward.

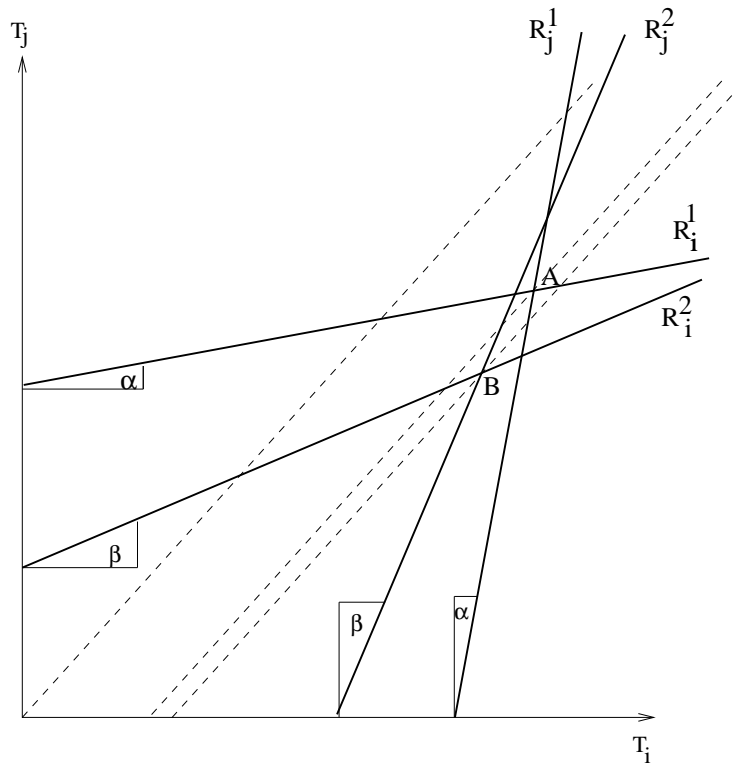


Figure 2: Equilibrium with little (A) and substantial (B) revenue sharing

Figure 2 demonstrates also the increasing disparity in talent demands with revenue sharing. The dashed lines are isovariance lines. For the case of

two clubs, the slope of isovariance lines is equal to unity:

$$\begin{aligned} dV &= \frac{2}{n}((T_i - \bar{T})dT_i + (T_j - \bar{T})dT_j) = \\ \frac{2}{n} \left(\left(T_i - \frac{T_i + T_j}{2} \right) dT_i + \left(T_j - \frac{T_i + T_j}{2} \right) dT_j \right) &= 0 \\ \Rightarrow \frac{dT_j}{dT_i} &= 1. \end{aligned}$$

The zero variance and maximum suspense is indicated by the isovariance line through the origin since zero variance warrants identical talent demands. The variance is positive at the equilibrium point A with little revenue sharing as the strong club demands more talents than the weak club. An increase in revenue sharing makes each club more sensitive to the talent demand of the other club so that the slope of both reaction function becomes larger, as can be observed when comparing angles α and β . However, the competitive balance effect cannot outnumber the revenue and the cost effect. In particular, the asymmetric cost effect implies that not only talent demands are reduced but also that the ratio of talent demands is negatively affected. The isovariance line through the equilibrium point B demonstrates clearly that revenue sharing has increased the relative demand of the strong club and the variance so that an increase in revenue sharing has deteriorated competitive balance.

Even though we have emphasized that the talent demand of profit maximizing clubs is driven by the impact of revenue sharing on *marginal* profits, analyzing the consequences for *total* profits is an interesting objective. Our results are summarized in

Proposition 2 *Revenue sharing (i) may increase the profits of weak clubs, while the profit of strong clubs certainly decreases, and (ii) reduces aggregate profits.*

Proof. Part (i). Applying the envelope theorem yields

$$\frac{d\Pi_i}{d\rho} = \frac{\partial\Pi_i}{\partial\rho} + \sum_{j \neq i} \frac{\partial\Pi_i}{\partial T_j} \frac{dT_j}{d\rho} \quad (11)$$

where the direct effect

$$\frac{\partial \Pi_i}{\partial \rho} = R_i - \frac{\sum_{j \neq i} R_j}{n-1}$$

is negative (positive) for weak (strong) clubs, which is due to the fact that weak clubs get more than they pay from revenue sharing by definition of weak clubs. Eq. (11) can be rewritten as

$$\frac{d\Pi_i}{d\rho} = \underbrace{-\delta \frac{dV}{d\rho}}_{> 0} + \underbrace{\frac{2\delta}{n}(T_i - \bar{T}) \frac{dT_i}{d\rho}}_{< (>)0 \text{ if } T_i < (>)\bar{T}} \quad (12)$$

The variance effect $-\delta dV/d\rho$ is positive for all clubs, meaning that reducing the degree of revenue sharing improves individual profits. The second effect is negative (positive) for weak (strong) clubs, so that the overall result is negative for strong clubs, and ambiguous for weak clubs. *Part (ii)*. Defining aggregated profits as $\Pi \equiv \sum_n \Pi_i$, we get

$$\frac{d\Pi}{d\rho} = \sum_n \frac{d\Pi_i}{d\rho} = -n\delta \frac{dV}{d\rho} + \delta \frac{dV}{d\rho} + \sum_n \left(R_i - \frac{\sum_{j \neq i} R_j}{n-1} \right) = -(n-1) \delta \frac{dV}{d\rho} < 0 \quad (13)$$

$$\text{as } \sum_n \left(R_i - \frac{\sum_{j \neq i} R_j}{n-1} \right) = 0. \blacksquare$$

Part (ii) of Proposition 2 demonstrates that aggregate profits in the league decrease through revenue sharing for two reasons: first, clubs deviate from the optimality condition where marginal revenues equal marginal costs as part of the revenue is given to other clubs. This is clearly an inefficiency which *ceteris paribus* reduces profits. And second, competitive balance decreases, so that the overall effect must be negative. Nevertheless, profits of weak clubs may increase as they benefit from the redistribution of wealth among clubs.

5 Conclusions

In this paper, we have shown that revenue sharing in professional sports leagues does not only decrease individual and aggregate talent demand, but

also competitive balance. Hence, we conclude that revenue sharing affects social welfare negatively. The underlying assumptions of the model seem to be reasonable: talent demand is endogenously derived from profit-maximizing asymmetric clubs, the asymmetry is modelled with respect to different unit costs of labor (thereby expressing the differences in productivity due to different drawing potentials), and revenues generated depend on the club's quality (expressed by the number of talents hired) and suspense. We conclude that revenue sharing is an inappropriate means of redistributing wealth among clubs.

This given, one might wonder why revenue sharing was introduced, and why some kind of revenue sharing is still persistent in almost every important sports league all over the world. With respect to the first point, one has to bear in mind that, at least in European football, the assumption of win maximizing clubs seems to have been a sensible one up to, say, the early nineties. And with win maximizing clubs, the talent demand does not depend on marginal but on total profits as revenues will be spent completely on talents. Then, revenue sharing might have been an appropriate tool to enhance competitive balance.¹³ But in the process of commercialization of professional sports, revenue sharing is no longer justified.

With respect to the second point, part of the explanation may have been derived in our Proposition 2 where we demonstrated that, even though total profits decrease, weak clubs may still benefit from revenue sharing in the sense of increasing profits. And in Germany, for instance, all decisions are made in the German Football League Foundation ("Deutsche Fußballliga"), and in this foundation, each club has one vote. Hence, the persistence is probably not due to economic efficiency, but due to unsolved distributional issues.

Finally, let us emphasize that we restricted attention to a revenue sharing

¹³In our model, the first order effects for win maximizing clubs indeed point into this direction. However, we could neither exclude that the second order effects dominate, nor could we find reasonable conditions ensuring that the problem is well-defined (note that nothing like first order conditions can be adopted with win maximizing clubs). Hence, we confined our attention to profit maximizing clubs which seems to be the relevant case at least in the future anyway.

system where the sharing parameter ρ is the same for all clubs. Obviously, if ρ were allowed to depend on the heterogeneity parameter w_i , we could easily prove that a revenue sharing vector $\rho \equiv (\rho_1(w_1), \rho_1(w_1), \dots, \rho_n(w_n))$ exists which maximizes social welfare – mechanism design with complete information is a simple task. However, it is not by chance that the revenue sharing systems all over the world use identical sharing parameters. We believe that one reason is asymmetric information with respect to the clubs' drawing potentials and cost functions, and for everyone who has ever been involved in the bargaining of clubs upon the collective sale of matches, it seems hardly conceivable that a second best solution will ever be reached by using the insights of the mechanism design literature. Hence, confining attention to identical ρ 's when assessing the impact of revenue sharing seems to be appropriate.

Appendix: Proof of Lemma 1

Denoting

$$A \equiv \rho(\alpha - \beta T_i) - \frac{2\delta}{n}, B \equiv \frac{2\delta}{n}$$

allows to rewrite the first order condition (5) as

$$\rho\alpha - AT_i + BT_{-i} - w_i = 0 \tag{A.1}$$

where $T_{-i} = \sum_{j \neq i} T_j$. Taking the difference of (A.1) for T_1 and T_2 yields

$$-A(T_1 - T_2) + B(T_{-1} - T_{-2}) = (w_1 - w_2) \tag{A.2}$$

Since $T_{-1} - T_{-2} = T_2 - T_1$, it follows from (A.2) that

$$T_1 - T_2 = \frac{w_2 - w_1}{A + B} \Leftrightarrow T_2 = T_1 + \frac{w_1 - w_2}{A + B}. \tag{A.3}$$

Aggregation yields

$$T_{-1} = (n - 1)T_1 + \frac{\sum_{j \neq 1} (w_1 - w_j)}{A + B} \tag{A.4}$$

and hence (A.1) can be written as

$$\rho\alpha - AT_1 + B(n-1)T_1 + \frac{B}{A+B} \left(\sum_{j \neq 1} w_1 - w_j \right) - w_1 = 0 \Leftrightarrow \quad (\text{A.5})$$

$$\rho\alpha - AT_1 + B(n-1)T_1 + \frac{B}{A+B} n(w_1 - \bar{w}) - w_1 = 0,$$

where \bar{w} denotes the average wage. Lemma 1 follows then from (A.5) and

$$A + B = \rho\beta + \frac{2\delta}{n}, \quad \frac{B}{A+B} = \frac{2\delta}{n(n\rho\beta + 2\delta)}. \quad \blacksquare$$

References

- Bougheas, S., Downward, P. (2003), The Economics of Professional Sports Leagues: Some Insights on the Reform of Transfer Markets, *Journal of Sports Economics*, 4: 87-107.
- Cave, M., Crandall, R.W. (2001), Sports Rights and the Broadcast Industry, *The Economic Journal*, 111: F4-F26.
- Dobson, S., Goddard, J. (2001), The Economics of Football, Cambridge University Press, Cambridge.
- El Hodiri, M., Quirk, J. (1971), An economic model of a professional sports league, *Journal of Political Economy*, 79: 1302-1319.
- Falconieri, S., Palomino, F., Sákovics, J. (2004), Collective versus Individual Sale of Television Rights in League Sports, *Journal of the European Economic Association*, 2: 833-862.
- Feess, E., Mühlheusser, G. (2003), Transfer fee regulation in European football, *European Economic Review*, 47: 645-668.
- FIFA (2001), *FIFA Regulations for the Status and Transfer of Players*.
- Forrest, D., Simmons, R. (2001) and Szymanski, S. (2004), Broadcasting, Attendance and the Inefficiency of Cartels, *Review of Industrial Organization*: 1-23.

- Fort, R., Quirk, J. (1995), Cross-subsidization, incentives and outcomes in professional team sports leagues, *Journal of Economic Literature*, 33: 1265-1299.
- Humphreys, B. (2002), Alternative measures of competitive balance in sports leagues, *Journal of Sports Economics*, 3(2), 133-148.
- Horowitz, I. (1997), The increasing balance in Major League Baseball, *Review of Industrial Organization*, 12: 373-387.
- Késenne, S. (1996), League management in professional team sports with win maximizing clubs, *European Journal for Sports Management*, 2: 14-22.
- Késenne, S. (2000), Revenue Sharing and Competitive Balance in Professional Team Sports, *Journal of Sports Economics*, 1: 56-65.
- Késenne, S. (2004), The win maximization model reconsidered. Flexible talent supply and efficiency wages, mimeo.
- Késenne, S. (2005), Revenue Sharing and Competitive Balance: Does the invariance proposition hold?, *Journal of Sports Economics*, 6: 98-106.
- Marburger, D.R. (1997), Gate Revenue Sharing and Luxury Taxes in Professional Sports, *Contemporary Economic Policy*, 15: 114-123.
- Palomino, F., Rigotti, L. (2000), The sport league's dilemma: competitive balance versus incentives to win, working paper, University of California, Department of Economics, 292.
- Palomino, F., Sákovics, J. (2004), Inter-league competition for talent vs. competitive balance, *International Journal of Industrial Organization*, 22: 783-797.
- Porter, P., Scully, G. (1996), The Distribution of Earnings and the Rules of the Game, *Southern Economic Journal*, 63: 149-162.

- Quirk, J., Fort, R. (1997), *Pay Dirt: The Business of Professional Sports*, Princeton University Press, Princeton.
- Rascher, D.A. (1997), A model of a professional sports league, in W. Hendricks (ed.), *Advances in the economics of sport*, Vol. 2, Greenwich: JAI press, 27-76.
- Rottenberg, S. (1956), The Baseball Player's Labor Market, *Journal of Political Economy*, 64: 242-258.
- Szymanski, S. (2003), The Economic Design of Sporting Contests: a Review, *Journal of Economic Literature*, 41: 1137-1187.
- Szymanski, S., Késenne, S. (2004), Competitive balance and revenue sharing in team sports, *Journal of Industrial Economics*, LII/1, 165-177.
- Vrooman, J. (1995), A general theory of professional sports leagues, *Southern Economic Journal*, 61: 971-990.