June 2011

Two to Tango: Optimum Competitive Balance in Professional Sports Leagues

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Abstract. This paper revisits existing theory of competitive balance in sports leagues using basic Quirk-Fort-Vrooman (*QFV*) profit-max theory for closed and open leagues with adaptations for win-max sportsmen (*sportsman effect*).The analysis addresses the impact of revenue sharing and salary caps in profit-max and win-max leagues on competitive balance, team revenues, player costs, club profit and fan welfare. Theoretical propositions are followed by empirical evidence on the effects of salary caps, revenue sharing and media revenue on optimum competitive balance in the Big 4 North American sports leagues and the Big 5 European football leagues.

"We need to recognize that the smaller clubs are necessary for competition. After all, 15 clásicos at the Bernabéu and 15 at Camp Nou would be a bit boring wouldn't it?"

—Fernando Roig, President of Villarreal CF, Spanish Primera Division

I Introduction

According to received theory, the perfect game is a symbiotic contest between equal opponents. The practical economic problem is that professional sports leagues form imperfectly competitive natural cartels where games are played between teams with asymmetric market power. In the realm of pure theory the natural duality of sports leagues seems to imply that dominant teams are really only as strong as their weakest opponents. In the real world however, the success of unbalanced leagues dominated by a few perennially powerful clubs raises the important empirical question as to whether optimal competitive balance may obtain at less than absolute team equality.

The economics of sports has been preoccupied with two prescient propositions from Rottenberg's classic paper on the baseball players' labor market. The first argument centers on the *invariance proposition* that free agency for baseball players would yield the same talent distribution as the reserve system (since 1876) that bound a player to one team for life. In its strong form the *invariance proposition* holds that revenue sharing has no effect on talent distribution and it serves only to deepen player exploitation.

In theory, there are only two ways to beat large-market clubs. The logical way is to increase product market competition by adding more teams to their monopoly markets. The second solution involves the internalization of diseconomies of dominance by the large market clubs themselves. According to the *uncertainty of outcome hypothesis (UOH)*, fans prefer close competition with quality opponents and large market dominance is ultimately self-defeating. *UOH* conveniently implies concave revenue functions and diminishing marginal revenue from winning that dampen the internal objectives of profit maximizing team owners. The *UOH* rests on the simplifying assumption that fans prefer balanced competition, when they may in fact prefer dominance.

The theoretical foundations of the economics of sports are found in El Hodiri and Quirk (1971). The modern awakening of sports economics came when Quirk and Fort (1992) published a popular version of Quirk's early model, followed by two separate adaptations of sports league theory to the changing realities of the American sports-scape (Fort and Quirk, 1995; Vrooman, 1995). European theorists (Szymanski, 2003, 2004; Szymanski and Kesenne, 2004) used non-cooperative game theory to show that the invariance proposition does not hold in open markets of European football, and that revenue sharing leads to less competitive balance. Open and closed-market theories both lead to the same paradox: revenue sharing does increase competitive balance.

The open-market distinction may not make any difference in the end however, because both open and closed labor market models are based on assumptions that owners are profit maximizers. It is likely team owners are *sportsmen* who sacrifice profit in order to win (Kesenne, 1996; Vrooman 1997a, 2000, 2007). At the limit, sportsman owners become win-maximizers, who spend to win at all cost. The *sportsman* is constrained by zero-profit rather than maximum profit, and distinctions between closed and open labor markets become academic. If owners are sportsmen, then intuition prevails over paradox and it is easy to show that revenue sharing increases competitive balance.

It can easily be shown that sportsman leagues are less balanced than profit-max leagues (Vrooman 2007, 2009), but also that win-max imbalance is superior to profit-max balance in terms of fan welfare. This is true because fans and win-max owners share the singular objective to win. There is evidence that major sports leagues have become dominated by sportsman owners. The players' share of revenue has recently exceeded 60 percent in the four major North American (NA) Leagues and 4 of the Big 5 European Leagues. Player cost controls have also evolved to be very similar in NA, where all leagues except MLB have imposed salary caps just below 60 percent of league revenue.

Over the last two decades the Big 5 European leagues have experienced explosive transformations in their media revenues. In 2010 media revenues were 50% or more of total revenues in EPL, Italian Serie A, Spanish La Liga and the NFL. The media revolution transforms optimal competitive balance in two interrelated ways. First, quasi-public games become less-exclusive through increased media coverage. Media expands or globalizes "home markets" and alters fan preferences more toward home team dominance and less toward competitive balance and quality opposition. Given their local home clubs in ticket/gate leagues, fans can only choose among quality opponents, but in media leagues they can freely choose their home teams, regardless of where they reside.

Second, media revenue sharing in sportsman leagues can alter revenue asymmetries among clubs and thereby change increase competitive balance. In all NA leagues national media revenue is shared equally. In 4 of the Big 5 European leagues Media revenue is split using equal/merit/appearance formulae. Ironically, the brave new world of win-max owners playing in media leagues has negated the two founding propositions of sports economics. First, if competitive balance can be engineered through revenue sharing then the *invariance proposition* does not hold. Second, if competitive balance is not socially optimal in media revenue leagues, then the *UOH* does not hold either.

This paper begins with a restatement of the general theory of sports leagues followed by a comparison of operating rules of the Big 4 NA leagues and Big 5 European football leagues. After addressing empirical questions about the effects of media revolutions throughout the leagues, the argument concludes with a comparison of competitive balance in the world's nine major sports leagues over the last 40 years.

II Sports League Theory

A. Profit Maximizing Owners

Conventional theory of sports leagues (Fort and Quirk, 1995; Vrooman, 1995) begins with simultaneous maximization of twin profit functions in a simplified two-team league:

$$\pi_1 = R_1[m_1, w_1(t_1, t_2)] - ct_1 \qquad \pi_2 = R_2[m_2, w_2(t_2, t_1)] - ct_2 \qquad (1)$$

Revenue R_1 of team 1 is a function of its market size m_1 and its winning percentage w_1, which is determined by a contest success function of the standard logistic probability form $w_1(t_1, t_2) = t_1/(t_1 + t_2)$, first used in a sports context by El-Hodiri and Quirk (1971). The zero-sum nature of an n-team league requires $\Sigma w_i = n/2$ and $\partial w_1/\partial w_2 = \partial w_2/\partial w_1 = -1$. A profit-maximizing owner's objective is to max π_1 with respect to t_1. In contrast, a *sportsman* owner's goal is to maximize wins w_1 produced through t_1, given $\pi_1 \geq 0$.

At the profit maximum, team 1 sets payroll ct_1 by acquiring talent until the marginal revenue product of talent MRP_1 is equal to the marginal cost of talent c (marginal factor cost), which is assumed to be the same for both teams that share a common talent pool:

$$MRP_1 = MR_1MP_1 = (\partial R_1/\partial w_1)(\partial w_1/\partial t_1) = c \qquad (2)$$

Simultaneous profit maximization (mutual best response) for both teams yields:

$$MRP_1 = (\partial R_1/\partial w_1)(\partial w_1/\partial t_1) = c = MRP_2 \qquad (3)$$

The standard logit $w_1 = t_1/(t_1 + t_2)$ yields the marginal product of talent MP_1,

$$MP_1 = \partial w_1/\partial t_1 = (t_2 - t_1\, \partial t_2/\partial t_1)/(t_1 + t_2)^2 \qquad (4)$$

That satisfies $\partial w_1/\partial t_1 > 0$; $\partial^2 w_1/\partial t_1^2 < 0$; $\partial w_1/\partial t_2 < 0$. In league equilibrium, the *MRP* for both teams is equal to their mutual wage rate c:

$$MRP_1 = MR_1\, MP_1 = [\partial R_1/\partial w_1][(t_2 - t_1\, \partial t_2/\partial t_1)/T^2] = MRP_2 = c \qquad (5)$$

1. Open and Closed Leagues

In a *closed league* an inelastic supply of skilled talent $T^* = t_1 + t_2$ is fixed, and one team's talent gain is another team's zero-sum talent loss $\partial t_1/\partial t_2 = \partial t_2/\partial t_1 = -1$. Substitution into (5) yields the *closed league* equilibrium condition:

$$MR_1 = MR_2 = cT^* \qquad (6)$$

By comparison, teams in an *open league* face an elastic supply of talent at an exogenous wage rate c^*. In an *open league* team 1 talent acquisition has no effect on the talent of team 2, such that $\partial t_1/\partial t_2 = \partial t_1/\partial t_2 = 0$. Substitution into (5) yields the *open league* solution:

$$MR_1w_2 = MR_2w_1 = c^*T \qquad (7)$$

2. Asymmetric Markets

An asymmetric revenue advantage $m_1 > m_2$ for team 1 can be shown through a model that generalizes profit-max solutions with a parameter $\sigma > 1$. The *UOH* is the empirical argument that fans prefer close wins instead of blow outs. Fan-preference for competitive balance implies strictly concave revenue functions where $\phi \in [0, 1]$:

$$\pi_1 = \sigma[\phi w_1 + (1-\phi) w_1 w_2] - ct_1 \qquad \pi_2 = [\phi w_2 + (1-\phi) w_1 w_2] - ct_2 \tag{8}$$

UOH suggests $\phi = .5$ and the zero-sum constraint $w_2 = 1 - w_1$ simplifies (8):

$$\pi_1 = \sigma(w_1 - .5w_1^2) - ct_1 \qquad \pi_2 = w_2 - .5w_2^2 - ct_2 \tag{9}$$

In a *closed league* from (6), simultaneous profit maximization yields:

$$MR_1 = MR_2 = \sigma w_2 = w_1 = cT^* \tag{10}$$

Team 1 dominates a *closed league* by the imbalance ratio $w_1/w_2 = \sigma$ with respective team win percentages $w_1 = \sigma/(1+\sigma)$ and $w_2 = 1/(1+\sigma)$. League payroll is $cT^* = \sigma/(1+\sigma)$ and respective team payrolls are $ct_1 = w_1 cT^* = \sigma^2/(1+\sigma)^2$ and $ct_2 = w_2 cT^* = 1/(1+\sigma)^2$. The closed-league solution is shown at *A* in Figure 1 for $\sigma = 2$, where $w_1/w_2 = .667/.333$.

By comparison the σ-model *open-league* solution from (7) is:

$$MR_1 w_2 = MR_2 w_1 = \sigma w_2^2 = w_1^2 = c^*T \tag{11}$$

An *open league* has greater competitive balance $w_1/w_2 = \sigma^{1/2}$ for team win percentages $w_1 = \sigma^{1/2}/(1+\sigma^{1/2})$ and $w_2 = 1/(1+\sigma^{1/2})$. The open league Nash solution at *B* is compared to the closed league solution at *A* in Figure 1 for $\sigma = 2$, where $w_1/w_2 = .586/.414$.

3. Invariance Proposition

The strong form of the *invariance proposition* holds that competitive balance in a sports league will be the same with or without revenue sharing. In effect revenue sharing serves only to shift monopsony rent from players to owners. *Strong form* invariance can be shown with a straight pool-sharing formula $R_1' = \alpha R_1 + (1-\alpha)(R_1+R_2)/2$, where each team blends an α-share of its revenue with an equal $(1-\alpha)$-share of a league revenue pool, where $\alpha \in [0,1]$. The league's zero-sum win constraint implies $\partial w_1/\partial t_1 = -\partial w_2/\partial t_1$ and closed league α–sharing from (10) yields the σ–solution for $MR_1' = MR_2' = c'T$:

$$\alpha\sigma w_2 + (1-\alpha)(\sigma w_2 - w_1)/2 = \alpha w_1 - (1-\alpha)(\sigma w_2 - w_1)/2 \tag{12}$$

This results in the same imbalance $w_1/w_2 = \sigma$ as (10), regardless of the level of α– sharing. The second term in (12) vanishes for both teams at equilibrium ($\sigma w_2 = w_1$) and the lower league payroll $c'T = \alpha\sigma w_2 = \alpha w_1 = \alpha\sigma/(1+\sigma)$ reveals the degree of talent exploitation equal to the league pooled revenue share $(1-\alpha)$. The perfect syndicate solution ($\alpha = 0$) is shown at *C* in Figure 1 for $\sigma = 2$, where the invariance proposition still holds and the cost per unit of talent has been reduced to the reservation wage.

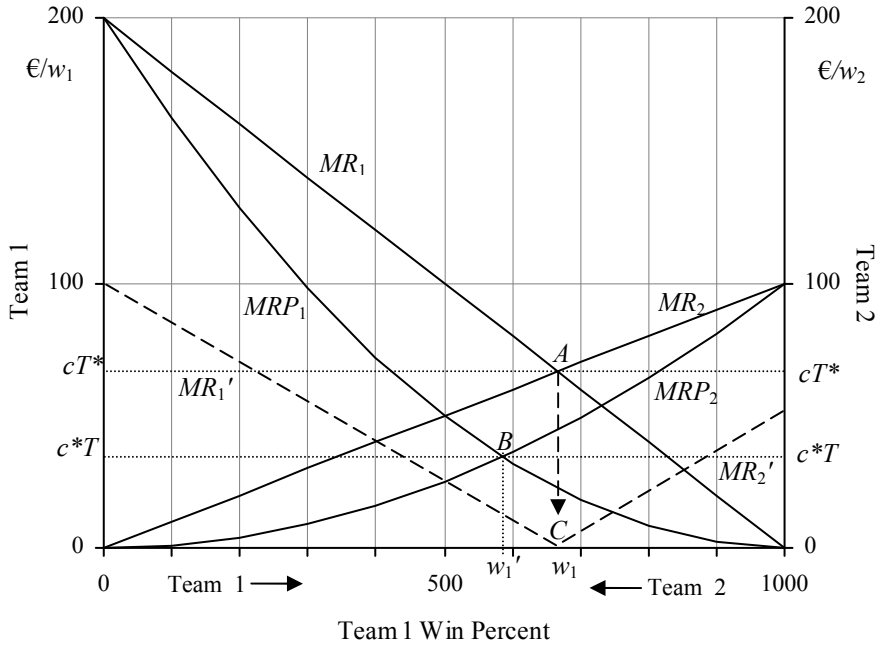

Figure 1. Open and Closed Leagues

By comparison the *open-league* revenue sharing solution from (11) implies:

$$2\alpha(\sigma w_2^2 - w_1^2) + (1-\alpha)(\sigma w_2 - w_1)(w_1 + w_2) = 0 \tag{13}$$

If there is no revenue sharing (α =1) then the second term vanishes and (13) reduces to the Nash *open league* solution $w_1/w_2=\sigma^{½}$ in (11), but as the league approaches a perfect syndicate ($\alpha\rightarrow 0$) the first term vanishes and the second term approaches the closed league solution $w_1/w_2 =\sigma$ in (10). At the revenue sharing limit (α = 0) open and closed league solutions are identical at *C* in Figure 1. Revenue sharing in an open league *reduces* competitive balance and allows teams to collusively maximize league-cartel revenues.

4. Payroll Cap in a Profit-Max League

A league-wide payroll cap constrains each team's payroll to a constant λ–share of the average club's revenue $cTw_1=\lambda(R_1+ R_2)/2$. If CAP_1 is defined as an *iso*-payroll cap constraint (locus of $\lambda(R_1+R_2)/2$ for all w_1) for team 1, the closed league solution becomes:

$$CAP_1 = MR_2 = \lambda (R_1+ R_2)/2w_1 = cT \tag{14}$$

In order for the cap to constrain team 1, $\lambda \leq 4\sigma^2/ [(1+\sigma)(1+\sigma +\sigma^2)]$. To achieve absolute balance at $w_1= w_2$ a cap should be set a $\lambda = 1.33/(1+\sigma)$. The cap-constrained equilibrium is shown at *B* in Figure 2 for $\sigma = 2$ and $\lambda =.44$. The effect of the payroll cap on team 1's profit is ambiguous, because gains from lower payroll .5 $(c - c^*)T$ are offset by revenue losses from winning fewer games (shaded triangle between MR_1 and cT). Team 2's improvement is unambiguous because lower payroll and higher revenue increase team 2's profits from the triangle between MR_2 and cT to the triangle between MR_2 and c^*T.

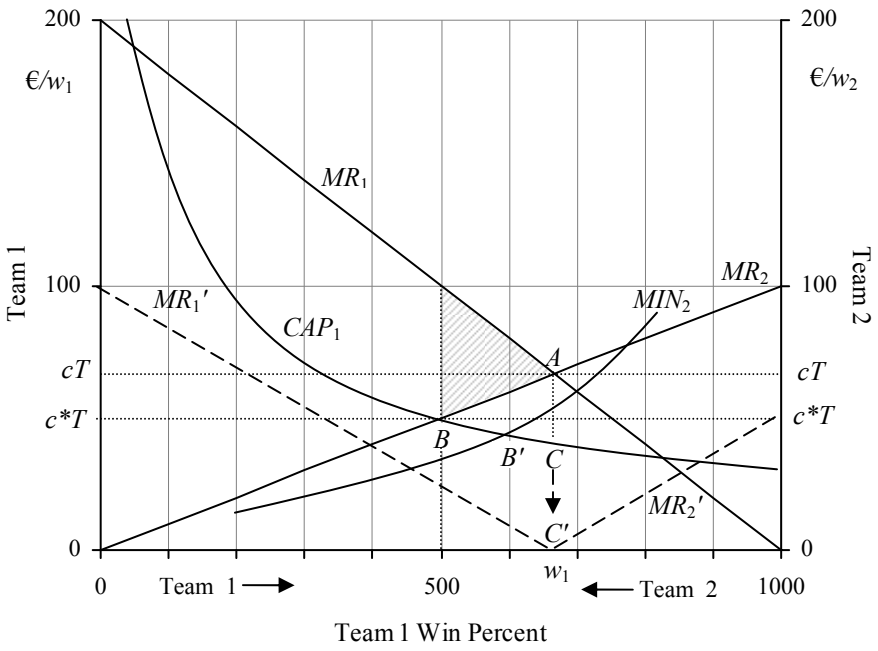

Figure 2. Payroll Cap and Revenue Sharing in Profit-Max League

5. Joint Payroll Cap and Revenue Sharing

Team 1 has an incentive at B to circumvent the cap because $MR_1 > MR_2$ at .500. The dead-weight loss (shaded triangle between MR_1 and MR_2) suggests mutual gain from a revenue-sharing side deal between clubs. As more revenue is shared, MR_1 and MR_2 are vertically displaced downward in Figure 2 and league equilibrium between MR_2' and CAP_1 moves along CAP_1 from B to C. CAP_1 is no longer a constraint for team 1 payrolls below C, and unbalanced league equilibrium is restored at $MR_1' = MR_2'$ and *the* original state of imbalance $w_1/w_2 = \sigma$. As $\alpha \rightarrow 0$ league π-max equilibrium C approaches C' at the limit. This leads to the conclusion that when taken alone a salary cap in a π–max league will constrain large market teams and improve competitive balance. When a payroll cap is combined with revenue sharing the disincentive to win for both teams negates the cap and the league returns to its original state of imbalance $w_1/w_2 = \sigma$.

A payroll minimum is necessary to create competitive balance in a profit-max league with revenue sharing. If the payroll minimum is set at $MIN_2 = \mu\, CAP_2$ ($\mu < 1$) in Figure 2, league revenue sharing equilibrium would follow the path from B to B' along CAP_1. At B' the league is constrained by $CAP_1 = MIN_2$ at $w_1/w_2 = 1/\mu$ ($w_1 = .600$ for $\mu = .66$ in Figure 2). With additional sharing the league moves along $MR_1' = MIN_2$ until team 1 payroll falls to the point where both clubs are symmetrically constrained at .500 by the payroll minimum at $MIN_1 = MIN_2$. (CAP_2 and MIN_1 are not shown in Figure 2). This leads to the conclusion that revenue sharing in a profit-max league leads to competitive balance, but only if revenue is shared in combination with a *minimum* team payroll requirement.

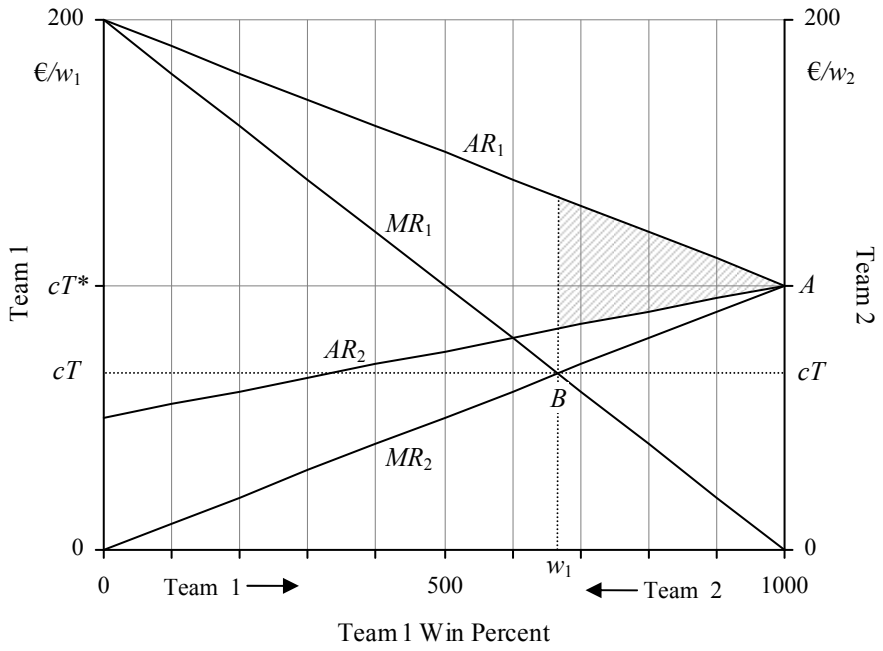

Figure 3. Sportsman Win-Max League

B. Sportsman League

In *sportsman leagues*, team owners are willing to sacrifice profit for winning. At the limit, a *pure sportsman* becomes a win maximizer, constrained by zero profit rather than maximum profit, such that $R_1 = ct_1$ and $R_1/w_1 = ct_1/w_1 = cT$, where $t_1 = w_1T$. The *sportsman league* win-max solution becomes:

$$AR_1 = AR_2 = cT \tag{15}$$

This is true whether the talent markets are *open* or *closed*. Substitution of (9) into (15) yields the *pure sportsman* σ–model result:

$$AR_1 = AR_2 = \sigma(1 - .5w_1) = (1 - .5w_2) = cT \tag{16}$$

with less balance than either open or closed π–max solution: $w_1/w_2 = (2\sigma - 1)/(2 - \sigma)$; with win percentages $w_1 = (2\sigma - 1)/(1 + \sigma)$ and $w_2 = (2 - \sigma)/(1 + \sigma)$. Team 1's total win-max dominance of team 2 ($w_2 = 0$) is shown at A in Figure 3 for $\sigma = 2$. Existence of the league therefore constrains $\sigma \leq 2$ for the *UOH* assumption $\phi = .5$ in (9)

It is easy to see that social welfare (comprised of club profit, player salaries and fan surplus) is maximized by the win-max sportsman where the area under the *AR* (demand) curves is maximized at $AR_1 = AR_2$. In a win-max league, the sum of player salaries cT^* and fan surplus is maximized and profit is zero. The win-max social optimum is realized because sportsman owners have essentially the same objectives as their fans. This leads to the conclusion that fans prefer more competitive imbalance than that implied by profit-max owners in open or closed leagues, and that interior profit-max optima are inferior with respect to social welfare. (Profit-max welfare loss is the shaded area in Figure 3).

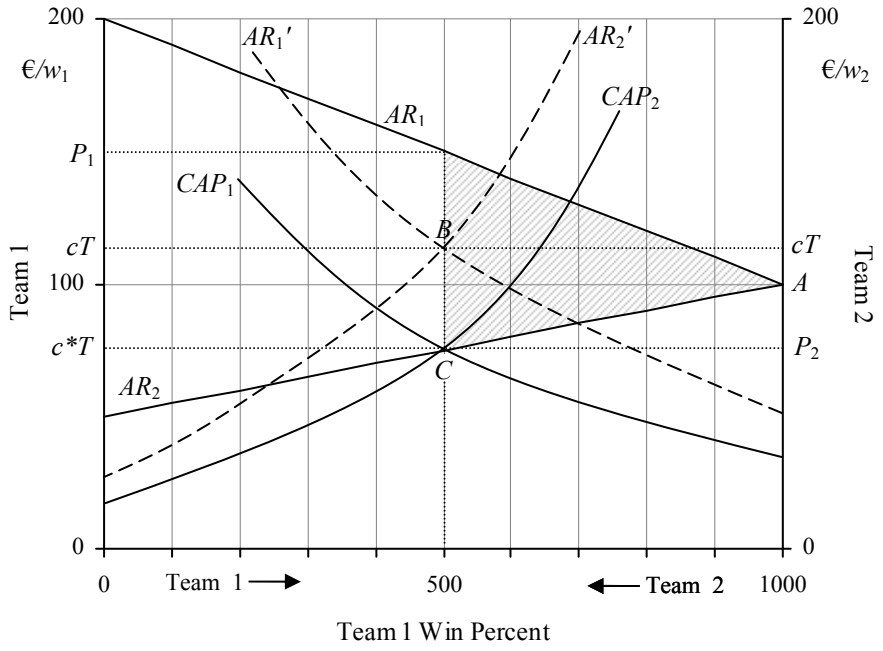

Figure 4. Payroll Cap and Revenue Sharing in Sportsman League

2. Revenue Sharing in Win-Max League

The question whether the *invariance proposition* holds in a win-max league can be answered by modifying the pool-sharing formula in (12) so that $AR_1' = AR_2' = cT$:

$$\alpha R_1/w_1 + (1-\alpha)(R_1+R_2)/2w_1 = \alpha R_2/w_2 + (1-\alpha)(R_1+R_2)/2w_2 = cT \qquad (17)$$

If there is no revenue sharing (α=1) then the second term vanishes for each team and AR_1=AR_2 = cT as in (16). In a pure syndicate (α = 0) revenues and payrolls become the same for each team $(R_1+R_2)/2$, which implies that the league is competitively balanced at $w_1 = w_2$ =.500. A pure sportsman syndicate is shown at *B* in Figure 4.

In a win-max syndicate league payroll is equal to total revenue, which is divided equally between clubs $cT/2$. The σ–solution yields pure syndicate revenue and payroll of cT =.375(1+σ) or €112.5 million for σ= 2 in Figure 4. Both clubs have zero profits because all revenue is paid to the players to maximize wins. League payroll increases with revenue sharing toward the league total revenue maximum. Maximum revenue at $\sigma w_2 = w_1$ requires $\alpha = [\sigma^4+\sigma^3-(\sigma+1)]/[\sigma^4+\sigma^3-(3\sigma+1)]$. If σ= 2 for example, then α =.64 would yield an internal league revenue maximum for a sportsman league. The most interesting conclusion is that revenue sharing in the singular pursuit of competitive balance leads to a net loss in social welfare (the shaded area between *AR* curves).

3. Payroll Cap in Win-Max League

To see the equalizing effects of a separate payroll cap in a win-maximizing league reconsider the cap solution from (13) revised for a *sportsman* league $CAP_1 = AR_2 = c^*T$.

$$\lambda(R_1+R_2)/2w_1 = R_2/w_2 = \lambda\,[.5 + \sigma w_1 - .5(\sigma+1)\,w_1^2]\,/2w_1 = (1 - .5w_2) \qquad (18)$$

Competitive balance at $w_1 = w_2 = .500$ requires a payroll cap $\lambda = 2/(1+\sigma)$. A payroll cap of $\lambda = .67$ for $\sigma = 2$ is shown in Figure 4 at *C* where $CAP_1 = AR_2$. Under the *iso*-payroll cap, payroll for each team is $c^*T/2 = R_1/\sigma = R_2$ at $w_1 = w_2$. Team 1's profit rate is $1/\sigma\, R_1$ (50 percent of €75 million for $\sigma = 2$) and team2's profit is zero, because it spends all of its revenue on its €37.5 million payroll. If $\sigma = 2$ then league payroll of $75 million is 67 percent of league revenue of €112.5 million. League revenue maximum obtains if the payroll cap set at $\lambda = 4\sigma^2/(1+\sigma)(1+\sigma+\sigma^2)$. If $\sigma = 2$, for example, then $\lambda = .76$ payroll cap yields the revenue maximum ($\sigma w_2 = w_1$) in a sportsman league (€116.7 million for $\sigma = 2$). Once again, however, the payroll cap constraint leads to a net reduction in social welfare.

4. Joint Payroll Cap and Revenue Sharing

The combined implementation of a payroll cap ($\lambda = .67$) and equal revenue sharing ($\alpha = 0$) virtually clones equality in team revenues $cT/2$ at *B*, team payrolls $c^*T/2$ at *C*, and profits $(c - c^*)\,T/2$ in Figure 4. Each team has the same revenue, payroll and profit, and total payroll capped at two-thirds of league revenue. These results lead to opposite conclusions for π–max and win-max leagues. In π-max leagues revenue sharing does not increase competitive balance, but it does increase talent exploitation. Players are paid less than their marginal revenue product by the amount of revenue that is shared.

In contrast, win-max leagues initially have greater competitive imbalance than profit-max leagues, but revenue sharing in sportsman leagues can potentially increase competitive balance and lead to higher revenue and greater payroll toward the league maximum. This is because sportsmen owners pay players their *average revenue product* to maximize wins. Unfortunately these player gains come at the expense of inferior fan welfare (shaded net loss between the *AR* curves in Figure 4).

C. Optimal Competitive Balance

1. Fan Preference

UOH appeals to our intuition and yields well-behaved and tractably concave revenue functions (downward sloping *MR* curves), but the simplifying assumption that fans prefer balanced competition over dynasties remains an important empirical question. The more general issues of fan-preference for competitive balance and fan-welfare optimization can be can be addressed by relaxing the limiting assumption that $\phi = .5$ in (9). The zero-sum constraint simplifies (8) in more general terms of ϕ:

$$\pi_1 = \sigma\,(w_1 - (1-\phi)\,w_1^2) - ct_1 \qquad \pi_2 = w_2 - (1-\phi)\,w_2^2 - ct_2 \qquad (19)$$

In a *closed profit-max league* ($\partial t_1/\partial t_2 = \partial t_2/\partial t_1 = -1$) simultaneous profit max of (19):

$$MR_1 = \sigma\,[1 - 2(1-\phi)\,w_1] = MR_2 = 1 - 2(1-\phi)\,w_2 = cT^* \qquad (20)$$

yields the closed-league competitive balance $w_1/w_2 = (\sigma+1-2\phi)\,/(\sigma+1-2\sigma\phi)$ where:

$$w_1 = [\sigma+1-2\phi]/[2(\sigma+1)(1-\phi)] \qquad w_2 = [\sigma+1-2\sigma\phi]/[2(\sigma+1)(1-\phi)] \qquad (21)$$

Substitution of (21) into (20) sets league payroll $cT^* = 2\sigma\phi/(\sigma+1)$. Existence of the league requires $w_2 \geq 0$, which constrains $0 \leq \phi \leq [(\sigma+1)/2\sigma]$ for $\sigma \geq 1$.

In a *win-max sportsman league*, simultaneous win maximization of (19):

$$AR_1 = \sigma[1-(1-\phi)w_1] = AR_2 = 1-(1-\phi)w_2 = cT^* \tag{22}$$

yields the *win-max-league* competitive balance solution $w_1/w_2 = (\sigma-\phi)/(1-\sigma\phi)$ where:

$$w_1 = (\sigma-\phi)/(\sigma+1)(1-\phi) \qquad w_2 = (1-\sigma\phi)/(\sigma+1)(1-\phi) \tag{23}$$

Substitution of (23) into (22) sets league payroll $cT^* = \sigma(\phi+1)/(\sigma+1)$. Existence of the league requires $w_2 \geq 0$, which constrains $0 \leq \phi \leq 1/\sigma$ for $\sigma \geq 1$.

2. Ticket and Media Leagues

Fort and Quirk [2007] suggest that the length of seasons in professional sports leagues determines the relative importance of competitive balance in fan preferences. If the season is relatively short like the 8 home-games in the NFL, then fans base their preferences more on the quality of the home team than the quality of the visitor. If the season is relatively long like the 81 home games in MLB, then fans are more selective about the quality of the opponent. The shorter NFL season increases the attractiveness of season-tickets, while the longer MLB season increases the appeal of single-game tickets.[1]

A broader distinction can be made between leagues that rely on gate (ticket) revenue (MLB, NBA, NHL, and Bundesliga) and those leagues that rely more heavily on media revenue (NFL, and more recently EPL, La Liga Serie A and Ligue 1). The gate-media distinction closely follows the intuition that individual team quality is better suited for media leagues, while the quality of the opposition (competitive balance) is more important in gate (ticket revenue) leagues. This distinction also advances the hypothesis that fan preference for competitive balance is inversely related to increased media coverage of league games across leagues over time. Media revolutions in sports leagues expand local "home" markets and result in the wider global appeal of dominant teams.

Comparative analysis of competitive balance in ticket leagues and media leagues can be accomplished by setting the ϕ fan-preference parameter approximately equal to the media share of total revenue in each league over time. For example, substitution of $\phi = 0$ for extreme ticket leagues into equation (21) yields the profit-max solution $w_1/w_2 = 1$ and a win-max equilibrium $w_1/w_2 = \sigma$. Fan preference for competitive balance in a ticket league is shown at profit max $MR_{T1} = MR_{T2}$ (point *C*) and win-max $AR_{T1} = AR_{T2}$ (point *B*) in Figure 5. Profit for both teams is the area under their respective *MR* curves. Profit-max payroll is zero in a ticket-league because fan preference for absolute balance negates the incentive to win for either team. The ticket-league win-max solution from (23) at *B* is also the social welfare optimum. The welfare loss of profit-max competitive balance for the ticket league at *C* is the shaded triangle between AR_{T1} and AR_{T2}.

[1] Fort and Quirk [2010a, 2010b] concluded that socially optimal competitive balance remains an empirical question in both single game (MLB) and season ticket (NFL) leagues.

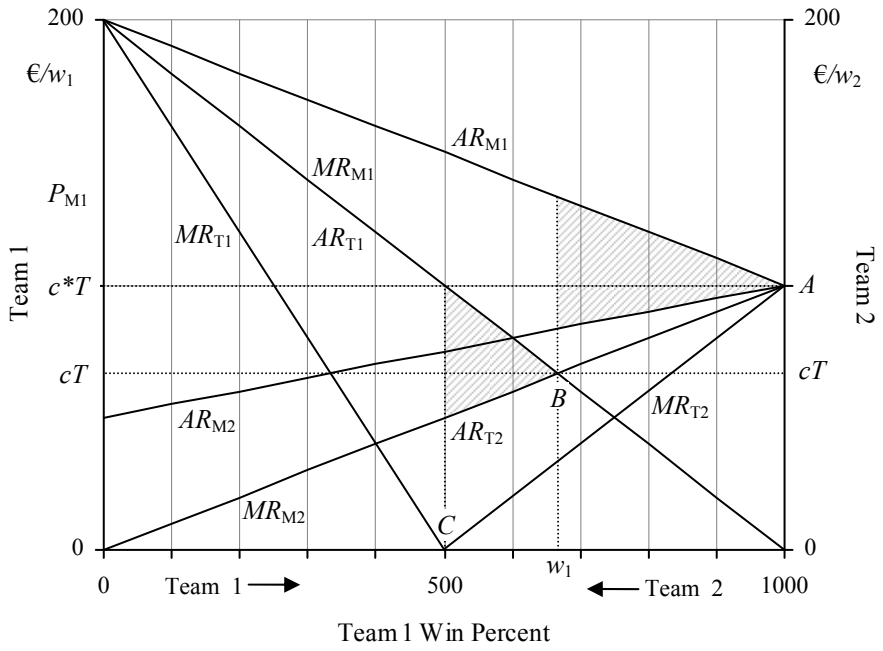

Figure 5. Media and Optimum Balance

Substitution of $\phi = .5$ for media leagues into equation (21) yields the familiar profit-max solution $w_1/w_2 = \sigma$ at B and a win-max equilibrium from (23) at C where $w_1 = 1$. Fan preferences for Team 1's increased dominance in media leagues is shown at both the profit max solution $MR_{M1} = MR_{M2}$ (point B in Figure 5) and win-max solution $AR_{M1} = AR_{M2}$ (point A in Figure 5). Media-league profit for each team is the area between their respective MR curves and payroll cT. The media-league win-max solution at point A is also the social welfare optimum, and the welfare loss of profit-max for the media league at B is the shaded triangle between AR_{M1} and AR_{M2}. When ticket leagues evolve into media leagues, fan preferences, profit maxima and welfare optima all shift toward less competitive balance and greater dominance for large market teams. The first conclusion is that social welfare is optimized at a greater competitive *imbalance* than required by profit maximum in either open or closed leagues, regardless if the leagues are driven by ticket or media revenue streams.[2] The second conclusion is that welfare is optimized at even greater imbalance in leagues that depend more heavily on media revenue.

[2] *Open-league* competitive balance solutions: $w_1/w_2 = 1$ for $\phi = 0$; $w_1/w_2 = \sqrt{\sigma}$ for $\phi = .5$ and $w_1/w_2 = \sigma$ for $\phi = 1$. The *open-league profit-max* solution is unconstrained because $w_2 \geq 0$ for $0 \leq \phi \leq 1$ and $\sigma \geq 1$. Dietl and Lang [2008] and Dietl, Lang and Werner [2009] use a nonlinear demand distribution from Falconieri, Palomino and Sakovics [2004] and fan preference function from Vrooman [2008; 2009] to show that welfare is maximized at greater competitive imbalance $w_1/w_2 = \sigma$ than the internal profit maximum $w_1/w_2 = \sigma^{½}$.

III. Empirical Questions

A. Win-Max Media Revolution

Table 1. Media Revolution in Professional Sports Leagues (€millions)

	Revenues 2009				Revenues 1997			
	Total	Gate	Media	Payroll	Total	Gate	Media	Payroll
National Football League	5,673	.188	.466	.571	1,650	.291	.553	.674
Major League Baseball	4,174	.381	.253	.554	1,307	.390	.382	.537
National Basketball Assoc.	2,693	.301	.244	.579	1,178	.406	.370	.469
National Hockey League	1,995	.422	.053	.534	778	.605	.150	.512
English Premier League	2,326	.286	.488	.670	685	.420	.209	.471
German Bundesliga	1,575	.230	.310	.510	444	.322	.250	.502
Spanish La Liga	1,501	.281	.414	.626	524	.280	.424	.439
Italian Serie A	1,494	.131	.597	.732	551	.374	.361	.575
French Ligue 1	1,048	.143	.550	.689	293	.218	.324	.608

€1 = $1.413 (6/30/2009)

A comparison of league-wide revenues and player cost structures for the Big 4 NA sports leagues and the Big 5 European football leagues is shown in Table 1. Player cost-revenue ratios of 60 percent in all NA leagues suggest that these leagues are win-max sportsman leagues. Three of the four NA leagues (exception MLB) are controlled by salary caps. MLB is interesting because the players' share of revenues is similar to the other N.A. leagues (at just below 60 percent) without exogenous league controls.[3] In absence of player cost controls in 4 of the Big 5 Euro leagues the players' share of revenue has rapidly grown to 70 percent since the *Bosman* verdict in 1995-96. The exception is Bundesliga which is audit-controlled by strict licensing requirements. This player cost squeeze serves as additional evidence that the Big 5 Euro leagues are also controlled by win-max sportsmen.[4]

The media revenue revolution in the Big 4 N.A. leagues occurred over 40 years after the Sports Broadcasting Act of 1961, which exempted collective negotiation of TV rights from antitrust violation.[5] As a result of legislated antitrust exemption, the NFL TV cartel has become the most media dominated N.A. league. National media generates over one-half of total NFL revenues, and local media revenue is insignificant. Local/regional TV comprises about half of media revenues in the other 3 leagues. Over the last two decades all N.A. leagues have gone through counter-revolutions in venue revenue derived from a proliferation of exclusive luxury-seat venues. As a result TV revenue reliance of all 4 N.A. leagues has been reduced. Only the NFL can still be considered a media league, and the other 3 N.A. leagues are driven primarily by local revenue. As a result, fan preference for imbalance in the NFL should be much higher than for the other local-revenue leagues.

[3] MLB has an ineffective competitive balance (luxury) tax that applies to clubs over a high payroll threshold (NY Yankees). MLB player development expenses are counted separately from payroll, and on average player development expenses (a multi-tiered minor league system is subsidized by the parent MLB club) usually amount to about 10 percent of revenues. NFL and NBA player development expenses are insignificant because training costs are shifted to the amateur NCAA (National Collegiate Athletic Association) college where players acquire general playing skills as undergraduates. The 2005 NHL CBA rolled back all player contracts by 24% to lower the player-share from75% before the 2004-05 lockout to 57% by 2005.

[4] Bundesliga also has a 50+1 rule that requires that the majority of a club be owned by the fans. Fan ownership also implies that Bundesliga is controlled by ownership groups whose sole objective is winning at all cost.

[5] See Vrooman [2008] for discussion of revenue revolutions in N.A. leagues and [2007] for Big 5 Euro leagues.

Table 2. North American Revenue Sharing and Payroll Cap Rules

	NFL	MLB	NBA	NHL
Revenue Sharing				
National media	100%	100%	100%	100%
Local media	0%	31%	0%	0%
Gate	34%	31%	0%	0%
Venue	0%	31%	0%	0%
Payroll Cap				
Maximum	57%	…	57%	57%
Minimum % of max	90%	…	75%	- $16m

NFL local media is insignificant comprises about one-half of media revenue in other NA leagues.
NFL allows 15% deduction for game-day expenses before 40% visiting teams share, so effective tax rate is .85 x .40 = .34.
MLB allows a deduction for stadium expenses including depreciation before the 31% visitors share is calculated. MLB visitor share was 20% before 2002, 34% from 2002-06 and 31% after 2006 CBA.
NFL cap can be temporarily avoided through signing bonuses pro-rated over the length of contracts.
NBA payroll cap is considered a soft cap because it can be exceeded to resign own free agents
MLB imposes a competitive balance tax for payrolls above a threshold which usually only applies to the New York Yankees.
Payroll cap base in all leagues excludes revenues unrelated and is subject to deductions over time for team venue expenses.
NFL hard payroll cap began in 1994, NBA soft cap in 1984 and NHL hard cap after the 2004-05 lockout.
NHL does have a modest sharing system where top clubs subsidize bottom clubs to make the payroll minimum.

The media revenue revolution is shown in Table 1 for the Big 5 Euro leagues.[6] EPL broadcast revenues grew from nine percent of total revenue in 1992 to twelve percent at the time of *Bosman,* and then exploded to 45 percent by 2004. All Big 5 leagues except Bundesliga have become media dominated leagues. Theory suggests that fans' preference for competitive *imbalance* is directly proportional to the importance of media revenue. Fans should therefore prefer unbalanced competition in NFL, EPL, La Liga, Ligue 1 and Serie A, and prefer balanced leagues in MLB, NBA, NHL and Bundesliga.

B. Revenue Sharing and Payroll Caps

1. North American Big Four

Revenue sharing and payroll cap arrangements of the Big 4 American leagues are compared in Table 2. National media revenue is shared equally in all Big 4 leagues. The major equity issue in N.A. leagues is the sharing of local revenues. Local media revenues in the NFL are insignificant and 34 percent of gate revenue is pooled and split evenly among the clubs.[7] The NFL's current problem is that unshared local venue revenue has grown from 10 percent to 23 percent of total revenue because of the venue revolution. Nonetheless the NFL is the most socialistic league with 53 percent of its revenue shared.

In MLB after the 1994-95 player strike 20 percent of all local revenues (media, gate and venue) were shared until 2002 CBA when 34 percent was shared, and currently after the 2006 CBA when 31 percent of local revenue is shared.[8] Local TV rights on regional MLB sports networks are significant and overall they comprise about 16 percent of total revenue. NY Yankees local annual revenue from team-owned YES Network is estimated at €115 million, compared to smaller markets at €10 million media revenue. These estimates put the amount of revenue shared in MLB at about 42 percent.

Local revenue sharing in NBA and the NHL is relatively insignificant and so the amount of revenue shared is roughly equal to the national TV money in the NBA, and a

[6] The exception is Bundesliga, resulting from financial collapse of KirchMedia in 2002. Original Kirch rights of €1.53 billion 2001-04 were replaced with €290million for 2002-04 and €295million and €300 million 2005-06
[7] Before 2002 each 34% visitor's share was derived from games in which teams actually played. After 2002 realignment shares were pooled and split evenly so that all teams received the same visiting teams share
[8] In both NFL and MLB clubs can deduct private stadium costs from revenues before the tax rate is applied. In this way large market clubs like the NY Yankees and Mets and the NY Giants and Jets can shield stadium expenses from revenue sharing and effectively shift visitor share of stadium costs to the rest of the league.

modest revenue transfer from the top ten revenue clubs to the bottom ten revenue clubs so they can afford the salary cap minimum. Estimates put the amount of revenue sharing in the NBA at about 25 percent and in the NHL at about 12 percent.

The NFL and the NHL both have hard salary caps in that they cannot be exceeded in the long run.[9] Both maximum payrolls are set at about 57 percent of total revenues. The NFL has a minimum payroll set at 90 percent of the maximum, and the NHL minimum payroll is set at about €11.43 million below the maximum before each season.[10] MLB has implemented a luxury tax rather than a hard team-salary cap in each CBA after the 1994-95 strike. The "competitive balance tax" (CBT) is a tax on team payrolls over a threshold set so high that the tax is effectively a NY Yankee tax.[11]

The NBA has a "soft cap" in that it can be exceeded for a variety of exceptions including resigning a team's own free agent. Since the soft cap began in 1984, the overt strategy of the NBA has been to promote team continuity, competitive imbalance and dynasties to maximize national TV rights fees. This NBA dynasty strategy is basically a corollary of the theory advanced above. There is a direct relationship between fan preferences for competitive imbalance and national/global TV coverage. The ideal goal of revenue sharing and payroll caps in win-max sportsman leagues is to allow the optimal competitive balance consistent with those consumer preferences.

2. European Big Five

Media revenue sharing arrangements of the Big 5 European leagues are compared in Table 2. Since its media motivated breakaway from the Football Association in 1992 the EPL has shared collectively negotiated broadcast rights according the formula: fifty percent for solidarity, 25 percent for merit (standings), and 25 percent for facility fee (appearances). A one-half parachute TV share is given to relegated teams for two years, and international media revenues are shared equally. As media revenues have soared, EPL's redistribution formula has become the model for the rest of the Big 5 leagues.

German Bundesliga divides collectively negotiated TV revenue 50 percent equally, 37.5 percent based on merit over the last three years and 12.5 percent based on current standings. Before 2005, French Ligue 1 split 83 percent of its collectively marketed TV revenue equally for solidarity, ten percent for merit and seven percent based on appearances. Beginning in 2005, however, Ligue 1 reduced the solidarity share and increased the merit share to 50 percent each, with 30 percent merit based on league finish (25 percent current season, five percent last five seasons) and 20 percent based on appearances (15 percent current and five percent last five seasons). Increased merit sharing under *Charte 2002 des clubs de football* was justified on premise that Ligue 1 clubs faced a disadvantage in European competition because of solidarity sharing.

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[9] The NFL cap was part of the 1994 CBA compromise whereby NFL players received free agency after 4 years of service, and the NHL cap was imposed after the 2004-05 NHL lock-out.

[10] NFL cap can be temporarily avoided by signing bonuses that are prorated over the length of the contract which averages about 4 years in the NFL. Current team payroll including bonuses can exceed the cap now but are amortized forward to restrict payroll below the cap by an equivalent amount in the future (dead cap space).

[11] The Yankees have been taxed each season since the CBT began in 2003 and they have paid over 90 percent of the total tax. Luxury tax rate is 22.5% of payroll over €121 million in 2010, €127 million in 2011; tax rate escalates to 30% and 40% for 2nd and 3rd breach. The tax is paid in addition to revenue sharing.

Table 3. Big 5 European Media Revenue Sharing Rules

	Equal	Merit	Facility	Market
English Premier League	50%	25%	25%	…
German Bundesliga	50%	50%	…	…
French Ligue 1	50%	30%	20%	…
Italian Serie A	40%	30%	…	30%
Spanish La Liga	40%	60%	…	…

Bundesliga merit is 75% based on previous 3 season s and 25% on current season.
Ligue 1 merit and facility shares (number of appearances) based on 5 previous seasons and current season.
Ligue 1 changed the shares before 2004-05 season to improve the chances of French clubs in Europe. Before 2004-05 Ligue 1 shares were 83% equal, 10% merit for current season and 7% for appearances over the 4 previous and current seasons.
Starting in 2010-11 Serie A merit share: 10% club history, 15% last 5 years and 5% current season. No sharing before 2010..
La Liga proposals after 2014 season: Big clubs: Barcelona and Real Madrid 34%; Valencia and Atletico 11% and the rest of the league 55%; Alternative formula proposed by Villareal and Sevilla would be 40% equal and 60% merit.

Italian Serie A returned to collective selling of TV rights for 2010-11 (individual rights allowed since 1999) and clubs now distribute fees: 40 percent solidarity, 30 percent performance (10% history, 15% last 5 years and 5% for current season) and 30 percent according to fan base (5% home market and 25% estimated number of "supporters").

Spanish La Liga will also negotiate as a collective for 2014-15, and the distribution formula is currently under negotiation. Real Madrid and Barcelona have agreed to take 34 percent of La Liga's TV revenue (under individual selling both receive about one-half), leaving 11% for Athletico Madrid and Valencia and 45 percent to be split among the remaining 16 clubs.[12] A rival proposal by Sevilla and Villarreal would divide 40 percent equally among the clubs and 60 percent based on merit and fan base (similar to Serie A).

Salary caps and cost controls are much discussed but rarely used in Europe's premier leagues. The Big 5 leagues briefly considered a salary cap proposed (G-14) for the 2005-06 season that would have capped club payrolls at 70 percent of that clubs revenue, but the cap was never applied. More recently UEFA has developed a financial fair play plan (FFP) with a "break even rule" whereby clubs will only be allowed to enter European competition if their revenues are greater than or equal to their costs.

Based on information from the 2011-12 and 2012-13, initial action can be taken during the 2013-14 season with the first possible exclusions from UEFA competition taking place in 2014-15.[13] While the ostensible targets are high wages and transfer fees, the main impact of G-14 payroll caps and FFP cost controls will be felt by lower revenue clubs. Ironically FFP targets sugar-daddy owners of large market teams, but the primary effect will be to constrain small market clubs and reduce competitive balance.

C. Global Preference

1. Champions Effect

In the wake of the European media explosion since 1990, UEFA was forced to make a series of revolutionary changes in Champions League format that have since distorted competitive balance throughout domestic European football. The constant threat of a breakaway European Super League in 1990 forced UEFA to change its knockout format from the European Champions Cup (since 1955) to include a group stage in 1991-92 and Ironically change its name to "Champions League." UEFA pre-empted two more threats in 1997-98 by allowing second place team to qualify for UCL in the eight top national

[12] 9 percent shared with Segunda division and each of 3 relegated clubs would receive €9 million parachute.
[13] Money invested in stadiums and player development does not count in expenditures for FFP. Sportsman owners are allowed to contribute up to a maximum of €45 million for the 2013-14 and 2014-15 seasons together and €30 million for 2015-16, 2016-17 and 2017-18 combined.

Table 4. Top 12 European Club Media Rights 2009-10 (€M)

Club 2009-10	Media	UEFA	%UEFA	Revenue	%Media
Barcelona	178.1	39.5	22.2%	398.1	44.7%
Real Madrid	158.7	27.2	17.1%	438.6	36.2%
AC Milan	141.1	24.1	17.1%	235.8	59.8%
Internazionale Milano	137.9	49.2	35.7%	224.8	61.3%
Juventus	132.5	21.8	16.5%	205.0	64.6%
Manchester United	128.0	46.4	36.3%	349.8	36.6%
Arsenal	105.7	33.8	32.0%	274.1	38.6%
Chelsea	105.0	32.6	31.0%	255.9	41.0%
Liverpool	97.1	29.4	30.3%	225.3	43.1%
Bayern Munich	83.4	45.3	54.3%	323.0	25.8%
Olympique Lyonnais	78.4	29.4	37.5%	142.1	55.2%
Olympique Marseille	70.8	17.3	24.4%	141.1	50.2%

Source: Deloitte Sports Business Group. Media revenue includes UEFA.

leagues. Then in 1999-2000 four teams in the top three leagues could qualify. Successive super-league breakaway threats reveal the underlying tendency toward the unification of European football. Instead of a legitimate super-league, UEFA has created a de facto meta-league within UCL format that distorts domestic competition throughout Europe.

Total media revenue distributed to the 32 teams in group stage of Champions League has grown to €746.4 million in 2009-10. [14] In terms of total media revenue this places UEFA Champions League third behind EPL (€1,134 million) and Serie A (€892 million), ahead of La Liga (€621 million), Ligue 1 (€576 million) and Bundesliga (€489 million). The distribution of UCL media revenues is shown in Table 4 for the top 12 media clubs in Europe for 2009-10. It is clear that the addition of UCL media rights complicates the revenue sharing arrangements of the Big 5 Euro leagues. This list is topped by La Liga's two traditional media giants, followed by Serie A's Big 3, EPL's Big 4, Bundesliga's exception Bayern Munich and finally two perennial Ligue 1 contenders Lyon and OM.[15]

Table 4 also reveals the nature of media in the Big 5 leagues. The two Spanish giants garner about 45.2 percent of La Liga domestic media without UEFA, and 56.4 percent of media revenue including UEFA. UCL media is roughly 20 percent of total media for Barcelona and Real Madrid. The Big 3 from Serie A derive 60 percent of their revenue from media and UCL's share of their media is normally below 20 percent The exception was UCL champion Inter Milan whose prize share was 35.7 percent of their media revenue. The Big 4 EPL clubs derive about 40 percent of their revenue from media and about one-third of that comes from UEFA. UCL runner up Bayern Munich received only a quarter of its revenue from media and over one-half of that came from UEFA. Lyon and OM derive over one-half of their revenue from media and about a quarter of that comes from Champions League. The exception in 2010 was UCL semi-finalist Lyon whose prize share was 37.5 percent of their media revenue total.

[14] The champion effect occurs when post-season tournaments introduce a convexity to strictly concave regular season revenue functions [Vrooman 2007, 2011]. This creates multiple league equilibria and polarizes competion in domestic leagues. The champion effect depends on the relative size and certainty of the post season prize. The most likely conditions for the champion effect are found in MLB and UEFA leagues.

[15] 2009-10 CL results: champion Inter Milan; runner-up Bayern Munich; semi-finalists: Barcelona and Lyon.

Table 5. European & Domestic Fan Bases 2010 (millions)

European Fan Base	Fans	Domestic Fan Base	Fans	Share
FC Barcelona	57.8	FC Dynamo Kyiv	5.3	47%
Real Madrid CF	31.3	AFC Ajax	4.3	39%
Manchester United FC	30.6	Galatasaray SK	5.9	39%
Chelsea FC	21.4	Real Madrid CF	6.8	36%
FC Bayern München	20.7	Olympique Marseille	6.6	36%
Arsenal FC	20.3	Fenerbahce SK	5.2	35%
AC Milan	18.4	FC Bayern München	10	29%
FC Internazionale	17.5	FC Barcelona	5.5	29%
Liverpool FC	16.4	FC Zenit St. Petersburg	12.4	27%
Juventus FC	13.1	Juventus FC	5.5	24%
FC Zenit St. Petersburg	12.6	Olympique Lyon	4.4	24%
CSKA Moscow	10.5	CSKA Moscow	10.5	23%
FC Spartak Moscow	9.0	FC Spartak Moscow	8.6	19%
Olympique Marseille	7.8	Manchester United FC	4.7	18%
AFC Ajax	7.1	AC Milan	4.1	18%
Galatasaray SK	6.8	Liverpool FC	4.4	17%
Olympique Lyon	6.6	FC Internazionale	3.1	17%
Fenerbahce SK	6.1	Arsenal FC	3.9	12%
AS Roma	6.0	AS Roma	1.6	7%
FC Dynamo Kyiv	5.3	Chelsea FC	1.6	6%

Source: SPORT+MARKT. European fans include domestic fans
Barcelona had 41.4 million European fans in 2005-06 compared to Real Madrid with 48.6 million

2. Extended Fan Base

It is well known that UEFA Champions League creates significant media revenue imbalances among clubs and distorts competition throughout European domestic leagues. What we have previously failed to realize or acknowledge is that UEFA also expands the global fan bases of these perennially dominant teams. Whether fan globalization occurs through Champions League or ultimately from a formal unification of European football, it creates unbalanced competition abhorred by purists but vastly preferred by global fans.

The results of a survey by SPORT+MARKT comparing national and European fan bases for 2010 is shown in Table 5 for the top 20 clubs.[16] The European fan bases are obviously related to a team's success in European competition (compare to Table 4) and a club's home base is related to its success in domestic competition. The most interesting result, however, concerns La Liga's Barcelona and Real Madrid. Real Madrid is more popular in Spain with 36 percent of the fans (6.8 million) compared to Barcelona with 29 percent of domestic Spanish fans (5.5 million). Almost two-thirds of the fans in Spain prefer one of the participants in El Clasico (any match between Barca and Real Madrid).

El Clasico is viewed by over 14.6 million Spaniards with a 75 percent share, and worldwide it may have more viewers than Champions League final or the Super Bowl.[17] On the broader European football stage 57.8 million fans back Barcelona, while 31.3 million prefer Real Madrid. This leads to the conclusion that increased media expands or globalizes fan preferences for dominant teams and in quasi-public way, media coverage increases the socially optimal level of competitive imbalance (dominance).

[16] SPORT+MARKT is conducting a similar fan base survey being used in the Serie A revenue sharing formula.
[17] About 109 million people watched Barcelona beat Manchester United in 2009 UCL final, while 106 million (68 percent share) watched the New Orleans Saints defeat the Indianapolis Colts in Super Bowl XLIV (2010)

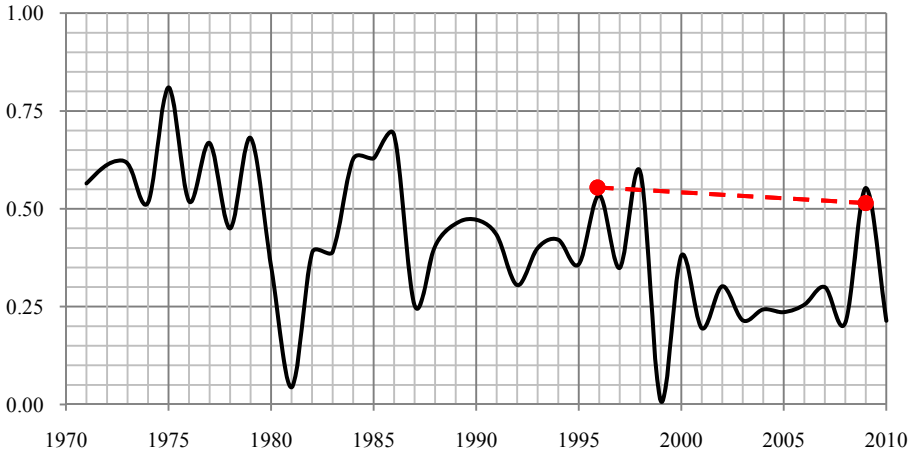

Figure 6. National Football League

E. Competitive Balance

This section explores the relationship between media revenue and competitive balance in the Big 4 NA leagues and the Big 5 European leagues. The dynamics of competitive balance can be captured by an auto-regressive β-estimate (*beta balance*) of winning percentages w_{ijt} for team i in league j from season t-1 to season t:

$$w_{ijt} = \alpha + \beta w_{ijt\,-1} + \varepsilon_{ijt} \tag{24}$$

$\beta \in [0,1]$. If α =.500 and β = 0 then (24) becomes w_{ijt} = .500, and each season is a random walk and every team has an equal chance to win. At the other extreme, if α=0 and β=1, then (24) reduces to $w_{ijt} = w_{ijt\text{-}1}$ then season outcomes are predetermined.

Beta balance coefficients are shown in Figures 6-14 over the period 1970-2010 for each of the 9 leagues (solid lines) along with the media revenue ratios (dashed lines) from Table 1 for the 1997 and 2009. The intuition is that the percentage of media revenue should roughly approximate fan preference for imbalance, and that a comparison with league betas should indicate the relative efficiency of revenue sharing and payroll caps in the optimization of fan welfare. It is assumed that all leagues are sportsman leagues.

As shown in Figure 6, the NFL has the lowest betas (greatest competitive balance) of all leagues and it has effectively become a random league after 1998. This is due to both cost controls and revenue sharing (Figure 4). The hard salary cap that was imposed in 1994 became effective after a 4-year lag (equal to the length of average contract).[18] Equally shared NFL TV rights fees more than doubled from $1.1 billion per year (1994-97) to $2.6 billion annually (1998-2005) and $3.73 billion (2006-11). The problem with the NFL is that a random league has been engineered from both the revenue and cost side, when in fact the major national media presence suggests that fans would instead prefer greater imbalance. In this case the NFL has imposed suboptimal random mediocrity in the name of competitive balance.

[18] The NFL hard cap can be temporarily avoided by prorating large upfront bonuses over the length of NFL contracts. Unfortunately the amortized bonus continues to count against future salary caps and create what is called dead cap space.. In the cap's first season 1994 the average NFL contract increased from 3 to 4 years.

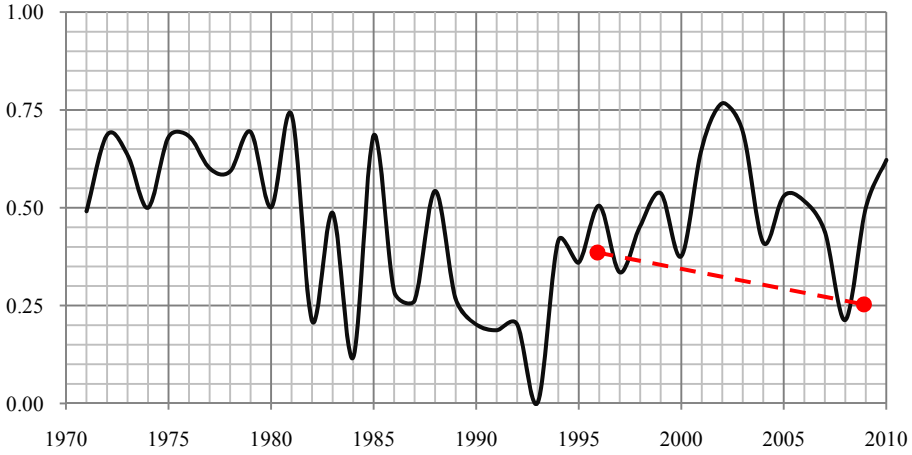

Figure 7. Major League Baseball

Since the players' strike (1994-95) beta balance ($\beta = .5$) in MLB has been consistent with the decline in national media. MLB TV revenue dropped from €260 annually (1990-93) to €150 (1994-95); €232 million (1996-2000); €400 million (2001-05) and €575 million (2007-13). Increased reliance on gate revenue has shifted fan preference toward greater competitive balance, and modest revenue sharing in the absence of a salary cap has allowed competition to approach the welfare optimum. Random competition ($\beta = 0$) before the strike (1990-93) reflects inferior mediocrity/parity similar to the current NFL.

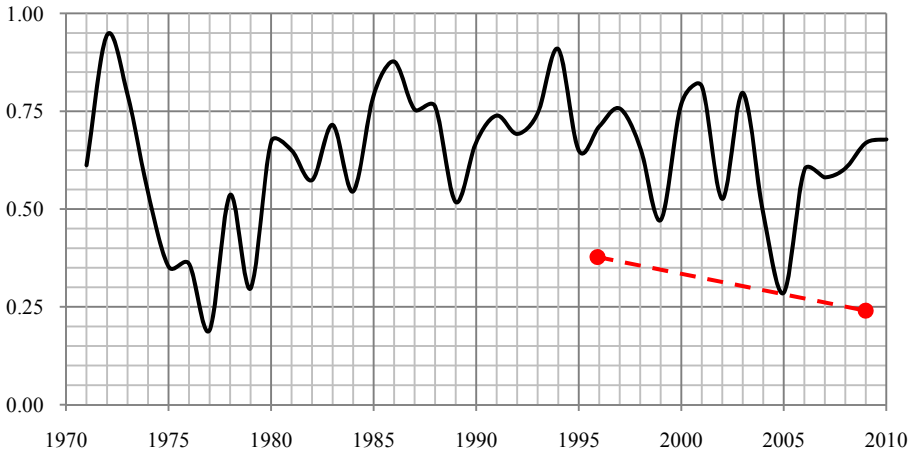

Figure 8. National Basketball Association

Competitive imbalance ($\beta > .5$) engineered by the NBA since 1984 is consistent with the intent of the soft salary cap and minor revenue sharing tactics designed to maintain dynasties preferred by national TV audiences. Given the recent decline in the relative importance of national TV rights in the NBA, the NBA is proposing a hard salary cap in current CBA negotiations. This implies that the NBA switching competitive balance strategy and is efficiently seeking increased balance preferred by local fans derived from increased importance of local gate and venue revenue.

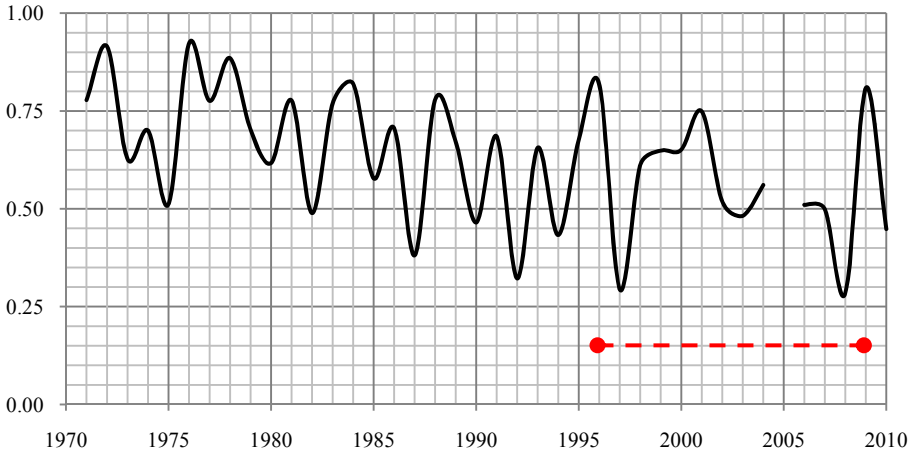

Figure 9. National Hockey League

Competitive balance in the NHL has gradually declined over the last 40 years. The hard salary cap imposed after the 2004-05 owners' lock-out has effectively balanced the league at (β .5). Given the insignificance of national TV revenue (6 percent including Canada and US) and the relative importance of gate and venue revenues, the NHL should seek even greater balance and superior fan welfare through increased revenue sharing.

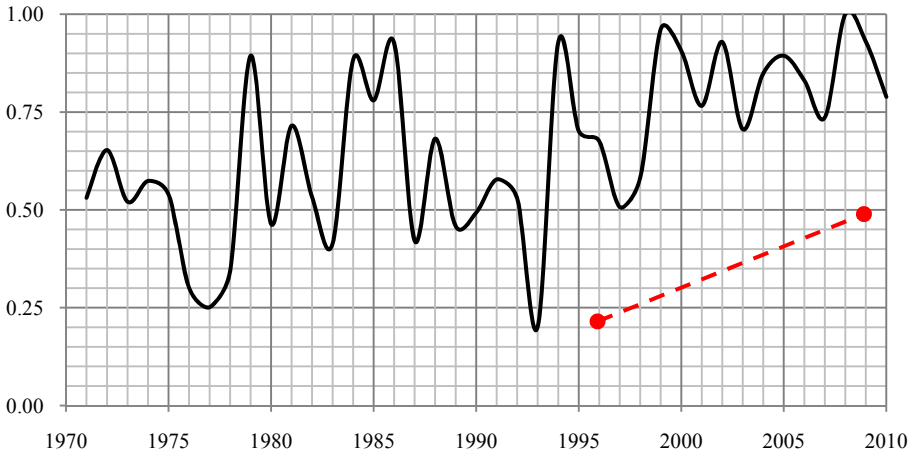

Figure 10. English Premier League

Competitive balance in the EPL has decreased markedly since 1998, the first year of multiple teams placed in Champions League (champion effect). This is also the first season of the major TV contract of the EPL media explosion. Annual TV rights increased from €75.7 million, in 1992-97 to €313.3 million in 1998-2001; €815.6 million in 2002-04; €704.8 in 2005-07; and €1,243.1 in 2008-10. As a result of the media explosion, the increased dominance of the Big 4 is consistent with fan preferences and welfare also shifting toward imbalance. The difference between the EPL and NFL (as a media league) is the absence of salary cap and the 50/25/25 revenue sharing formula, both of which allow EPL competitive balance to approach the social optimum. In contrast, revenue sharing and cost constraints have trapped the NFL in socially inefficient mediocrity.

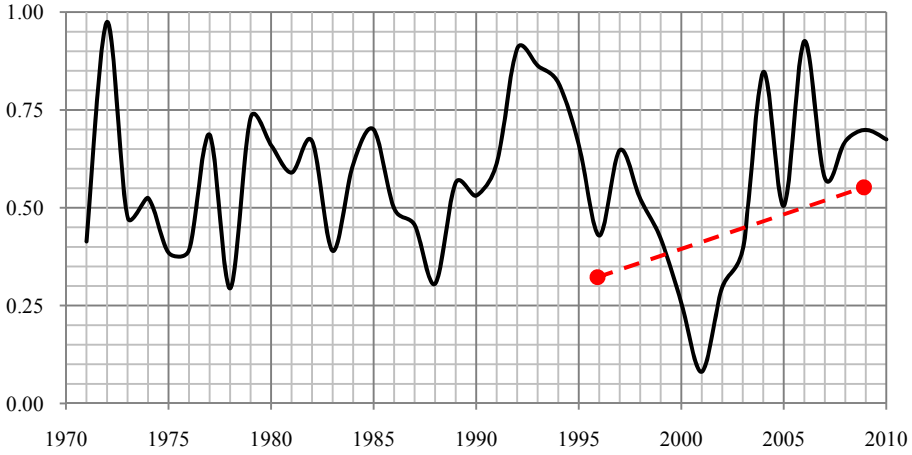

Figure 11. French Ligue 1

French Ligue 1 has been considered the European exception because of its unique competitive balance between large and small markets. The problem with intra-league balance in the midst of unbalanced leagues is that French clubs were at a disadvantage in European competition. Beginning in 2005-06 Ligue 1 reduced its solidarity share and adopted a 50:30:20 formula that sacrificed intra-league balance to improve inter-league chances. The new formula became effective when Ligue 1 annual TV rights exploded from €335 million in 2000-05 to €600 million in 2006-08; and €668 million in 2009-12.

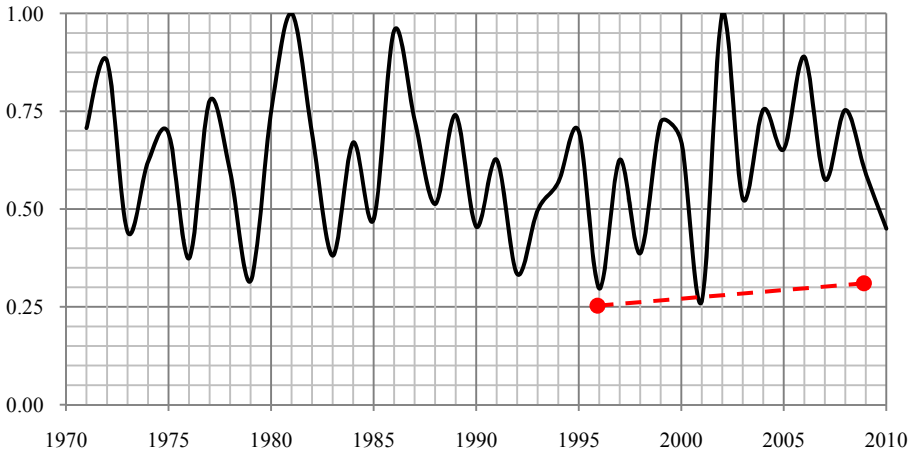

Figure 12. German Bundesliga

Bundesliga has become the new European exception. Bundesliga has the least media revenues and the most competitive balance of the Big 5 leagues. Given equal importance of gate, venue and media revenues, Bundesliga should have the greatest fan preference for competitive balance. In 2009-10 only 31 percent (€489 million) of Bundesliga's €1,575 million revenue came from media, compared to 23 percent from gate, 31 percent from venue sponsorships and 15 percent merchandizing. Strict licensing controls and 50+1 ownership rules have created a balanced league consistent with fan preference.

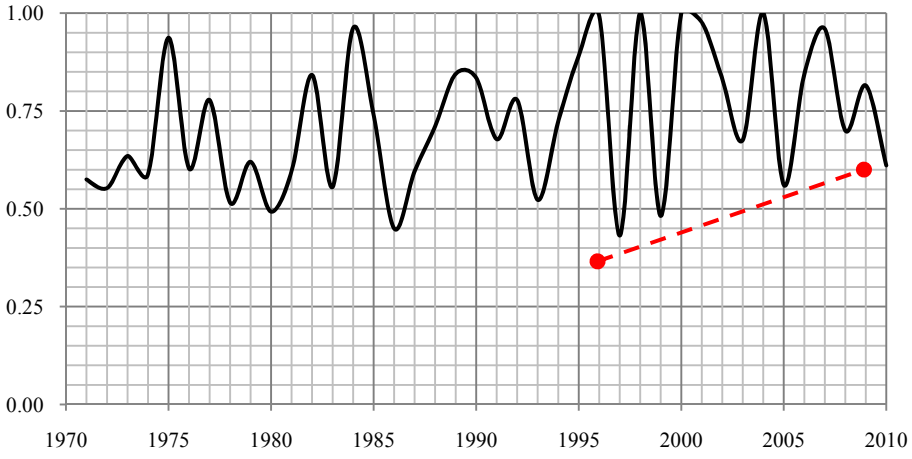

Figure 13. Italian Serie A

Until recently Italian Serie A has relied most heavily on media revenue (60 percent) and has been the least balanced of all Big 5 leagues ($\beta = .8$). Media coverage should increase fan preference for imbalance (Big 3 dominance). Ironically, individual negotiation of media rights and unequal distribution of media revenues 1999-2010 have created an unbalanced league that is superior in terms of fan welfare. Fan welfare is a function of media, but competitive balance is a function of media revenue distribution. The 40/30/30 formula from 2010-11 should bring balance closer to the welfare optimum.

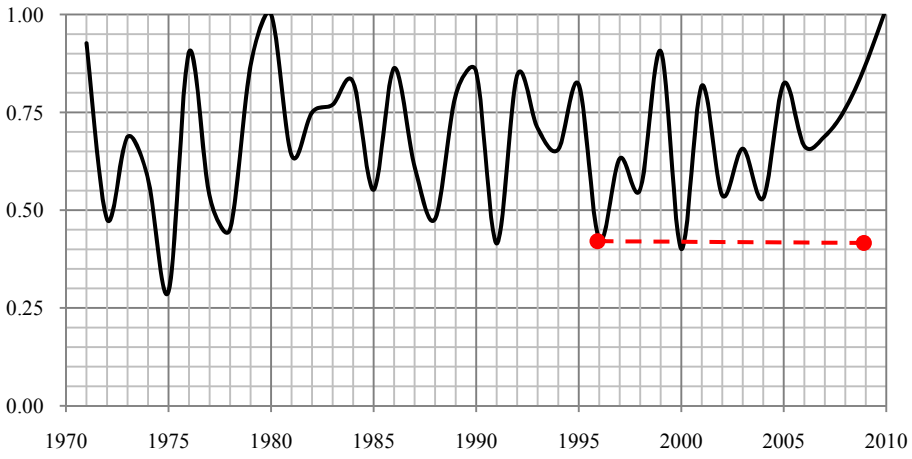

Figure 16. Spanish La Liga

Since 2006 La Liga has lost its competitive balance ($\beta = .6$ before 2005) with the dominance of Real Madrid and Barcelona. Unequal media revenue distribution yields a suboptimal dominance for a league with 41 percent media share in 2009-10. Barcelona and Real Madrid individually negotiated contracts for 45.2 percent of €597.1 million La Liga media revenue in 2009-10, and 47.2 percent of €712.6 million league revenue after UCL prize distributions. This supports the efficiency argument for collective TV rights with an egalitarian 40/60 sharing formula similar to that adopted by Serie A in 2010-11.

IV Conclusion

The core theory of sports economics is based on the simplifying hypothesis (*UOH*) that fans prefer balanced competition between evenly matched opponents. In fact optimal competitive balance remains an empirical question complicated by the real world success of unbalanced leagues dominated by a few perennially powerful clubs. The core theorem (*invariance proposition*) traditionally holds that revenue sharing and salary caps are welfare inferior in profit-max leagues because they only shift the surplus from players to owners and have ultimately have no impact on competitive balance. In the real world sporting owners are more interested in maximizing wins than profits, and revenue sharing and salary caps can efficiently adjust competitive balance toward a social optimum

There is convincing evidence that all major sports leagues have become dominated by sportsman win-max owners whose objectives are to win at all cost. Players' shares of revenues have recently exceeded 60 percent in the Big 4 N.A. leagues, and approached 70 percent in four of the Big 5 European football leagues. Revenue sharing regimes are different among N.A. leagues, but player cost controls are very similar. Salary caps have been imposed in all N.A. leagues except MLB just below 60 percent of league revenue.

In the Big 5 Euro leagues there are currently no salary caps but break-even licensing requirements are effective cost controls in Bundesliga and UEFA. In the near future all Big 5 Euro leagues will sell TV rights collectively with revenue redistribution formulas set to insure some degree of solidarity. If there is an optimal competitive balance and if revenue sharing and salary caps be used adjust relative balance, optimum combinations of cost caps and revenue sharing regimes can be used to maximize social welfare.

Over the last two decades all sports leagues have been rapidly transformed by increased media coverage and exploding media rights fees. Media revenues comprise 50% or more of total revenues in EPL, Italian Serie A, Spanish La Liga and the NFL. It is argued here that media coverage expands or globalizes home markets and shifts fan preferences more toward home-team dominance and less toward quality opposition and competitive balance. In media leagues fans can freely choose their "home" teams regardless of where they reside. They can simultaneously support competitive balance for their local club and have a preference for the dominance of their global club. For example, Sport+Markt 2010 estimates that Real Madrid has 6.8 million fans for 36% of the domestic Spanish market, compared to Barcelona with 5.5 million fans for 29% of the local market. The opposite is true throughout Europe however, where FC Barcelona has 57.8 million fans compared to Real Madrid with 31.3 million fans.

These arguments imply that revenue sharing and payroll caps are tools to find optimal competitive balance consistent with media coverage and fan preference, but also that overly aggressive controls in the singular pursuit of parity could lead to suboptimal competitive balance and mediocrity. In N.A. for example, the welfare inferiority of parity/mediocrity in the NFL is a matter of fan preference but in Europe, the inferiority of intra-league parity can become a matter of inter-league survival. In 2004-05 French Ligue 1 reduced its egalitarian sharing formula from 83/10/7 (equal/merit/appearances) to 50/30/20 to improve the competitive chances of domestic French clubs in Europe.

Equal solidarity/merit (50/50) sharing has moved competitive balance toward an optimum in EPL, Bundesliga, and Ligue 1 consistent with media coverage and fan preference for more imbalance. The recent prospects of 40/60 equal/merit (market size) sharing of collectively negotiated TV rights in Serie A and La Liga (proposed) are steps toward increased social welfare (profits + wages + fan welfare) in these two historically excellent and yet unbalanced leagues. N.A. leagues (NFL) should re-examine misguided obsession with absolute parity. Socially optimal competitive balance lies between dynastic distortions from large market monopoly power and competitive mediocrity from overcompensating constraints that serve to tear apart excellent and efficient teams.

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