TWO TO TANGO

COMPETITIVE BALANCE IN PRO SPORTS LEAGUES

JOHN VROOMAN
VANDERBILT UNIVERSITY, USA

"EL CLÁSICO IS NOT JUST A BIG MATCH, IT'S THE BIGGEST MATCH ANYWHERE IN THE WORLD."

– WALL STREET JOURNAL

"WE NEED TO RECOGNIZE THAT THE SMALLER CLUBS ARE NECESSARY FOR THE COMPETITION. AFTER ALL, 15 CLÁSICOS AT THE BERNABÉU AND 15 AT CAMP NOU WOULD BE A BIT BORING WOULDN'T IT?"

–FERNANDO ROIG, VILLARREAL PRESIDENT

INTRODUCTION

According to received theory, the perfect game is a symbiotic contest between equal opponents. In the real world however, the success of unbalanced leagues (dominated by perennially powerful clubs) raises the important (unavoidable) empirical question as to whether optimal competitive balance may obtain at less than absolute team equality.

According to the *Yankee paradox*, fans prefer close competition with quality opponents and large-market dominance is self-defeating. The *Yankee paradox* rests on the simplifying assumption that fans prefer balanced competition, when they may in fact prefer dominance.

It can easily be shown that sportsman leagues are less balanced than profit-max leagues, 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 same objective to win.

There is convincing evidence that major sports leagues have become dominated by sportsman owners who are trying to win at any cost.

Players' shares of revenues have recently exceeded 60 percent in 8 of the world's 9 largest sports leagues. Player cost controls have also become remarkably similar in N.A., where all leagues except MLB have imposed salary caps just below 60 percent of league revenue.

Over the last two decades all major sports leagues have experienced explosive transformations from media revenues. Media revenues now comprise 50% or more of total revenues in EPL, Italian Serie A, Spanish La Liga and the NFL.

Media expands (globalizes) home markets and alters fan preferences more toward home-team dominance and less toward competitive balance and quality opposition. In media leagues fans freely choose their "home" teams regardless of where they reside.

Sport+Markt 2010 estimates that FC Barcelona has 57.8 million fans throughout Europe compared to Real Madrid with 31.3 million fans. In domestic Spain, Real Madrid has 6.8 million fans (36% of the market) compared to Barcelona with 5.5 million fans (29%).

Media revenue sharing in sportsman leagues can suddenly and significantly alter revenue asymmetries. In all N.A. leagues national media revenue is shared equally. In 4 of the Big 5 European leagues media revenue is split using similar equal/merit/appearance formulas.

Ironically, the brave new world of win-max owners playing in media leagues has effectively negated 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 *Yankee paradox* does not hold either.

These arguments imply that revenue sharing in the singular pursuit of parity could lead to suboptimal competitive balance and mediocrity.

In N.A. the welfare inferiority of parity/mediocrity in the NFL may be a matter of preference, but in Europe the inferiority of intra-league *egalite* 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 French clubs in the rest of Europe.

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, the argument concludes with a comparison of competitive balance in the world's nine major sports leagues over the last 40 years.

PROFIT-MAX LEAGUE

Conventional theory of sports leagues [(QFV) Fort and Quirk, 1995; and 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 function of standard logistic probability form $w_1(t_1, t_2) = t_1/(t_1 + t_2)$.

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.

At the profit max, team 1 sets its payroll ct_1 by acquiring talent until the marginal revenue product of talent MRP_1 is equal to the marginal cost of talent c, which is assumed to be the same for both teams:

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

Simultaneous profit max (mutual best response) 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,

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

In league equilibrium, the *MRPs* for both teams are equal to their mutual wage rate c:

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

OPEN & CLOSED CASE

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

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

By comparison, *open league* teams face an elastic supply of talent at an exogenous wage rate c^* (similar to European football leagues). One team's talent acquisition has zero effect on the talent of the other team, such that $\partial t_1/\partial t_2 = \partial t_1/\partial t_2 = 0$. Substitution into (5) yields the *open league* solution:

$$MR_1 w_2 = MR_2 w_1 = c^* T \qquad (7)$$

ASYMMETRIC MARKETS

An asymmetric revenue advantage $m_1 > m_2$ for team 1 can be shown generalizing profit-max solutions for a market size parameter $\sigma > 1$. The *Yankee paradox* is the argument that fans prefer close competition. Fan-preference for competitive balance implies strictly concave revenue functions measured by the preference scale parameter $\phi \in [0, 1]$:

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

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

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

In a *closed league* from (6), simultaneous profit max of (9) yields:

$$MR_1 = MR_2 = \sigma w_2 = w_1 = cT^* \qquad (10)$$

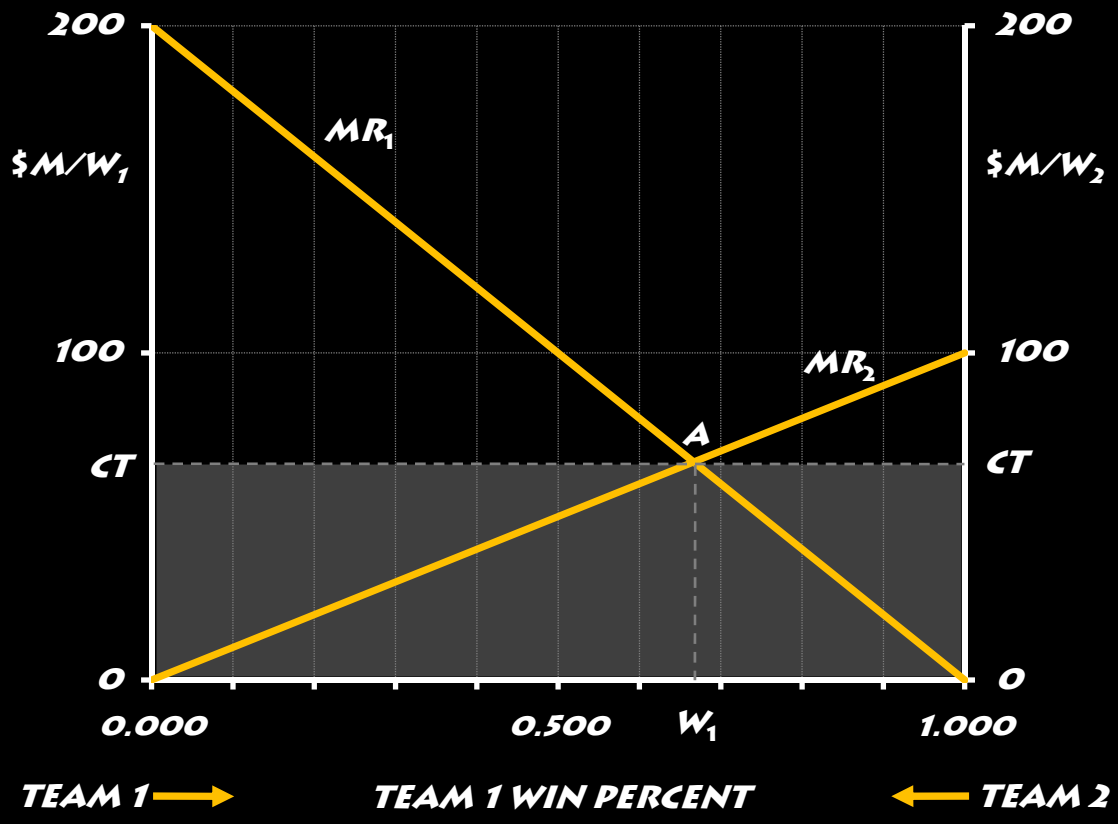
Team 1 dominates a *closed league* by the ratio $w_1/w_2 = \sigma$ with respective win percentages, $w_1 = \sigma/(1+\sigma)$ and $w_2 = 1/(1+\sigma)$. League payroll is: $cT^* = \sigma/(1+\sigma)$ with team payrolls $ct_1 = \sigma/(1+\sigma)^2$ and $ct_2 = 1/(1+\sigma)^2$

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

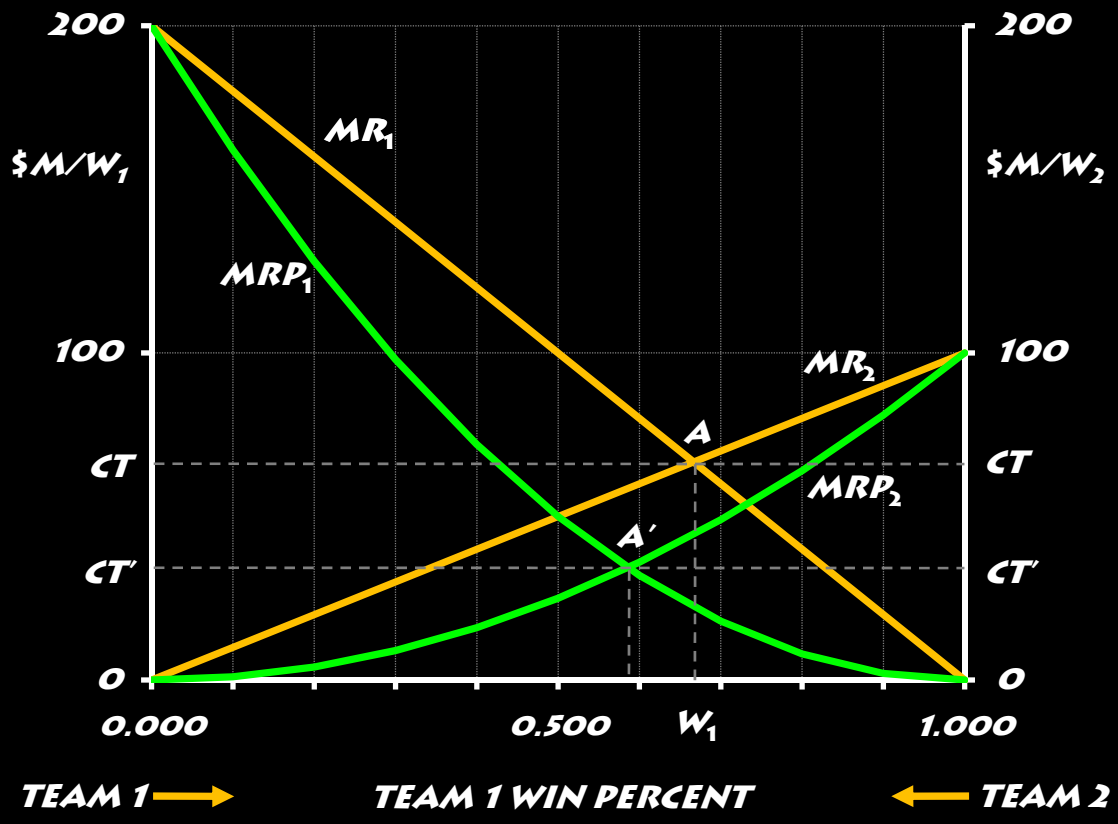
$$MR_1 w_2 = MR_2 w_1 = \sigma w_2^2 = w_1^2 = c^*T \qquad (11)$$

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 $w_2 = 1/(1+\sigma^{1/2})$.

LEAGUE EQUILIBRIUM



OPEN & CLOSED PROFIT-MAX LEAGUES



INVARIANCE PROPOSITION

The *invariance proposition* holds that competitive balance in a sports league will be the same with or without revenue sharing. Revenue sharing serves only to shift monopsony rent from players to owners.

Consider 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 home revenue with an $(1-\alpha)$ visiting-team share of a common league revenue pool, where $\alpha \in [0,1]$.

The zero-sum 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 $MR_1' = MR_2' = c'T$:

$$\alpha\sigma w_2 + (1-\alpha)(\sigma w_2 - w_1)/2 = \alpha w_1 - (1-\alpha)(\sigma w_2 - w_1)/2 \qquad (12)$$

This yields the same balance $w_1/w_2 = \sigma$ as (10) regardless of α-share. The second term in (12) vanishes at league equilibrium $\sigma w_2 = w_1$, and lower league payroll at $c'T = \alpha\sigma w_2 = \alpha w_1 = \alpha\sigma/(1+\sigma)$ reveals that the rate of exploitation is equal to the degree of revenue sharing $(1-\alpha)$.

By comparison, the *open-league* revenue-sharing solution implies:

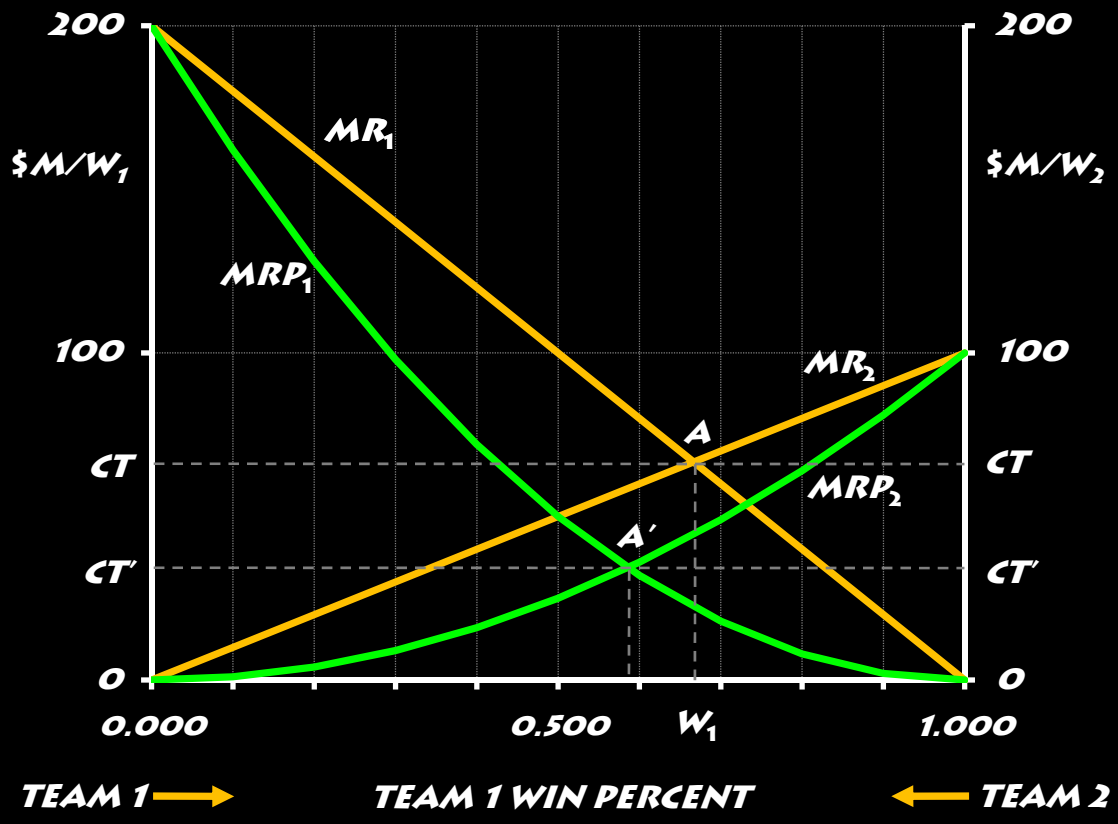
$$2\alpha(\sigma w_2^2 - w_1^2) + (1-\alpha)(\sigma w_2 - w_1)(w_1 + w_2) = 0 \qquad (13)$$

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). As league-sharing 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 limit ($\alpha = 0$) open and closed league solutions are identical and cost per unit of talent is reduced to reservation wage.

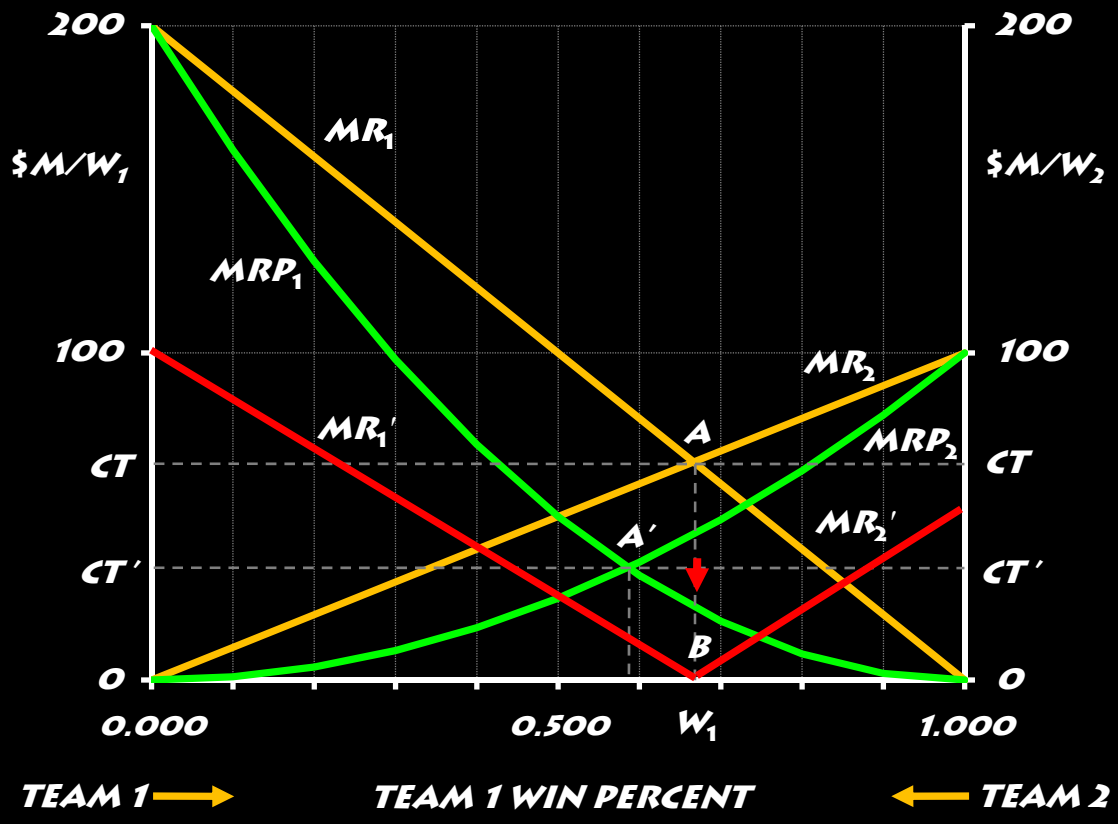
The invariance proposition still holds in a closed league, but revenue sharing in an open league actually *reduces* competitive balance.

The counter-intuitive conclusion is that revenue sharing does not lead to competitive balance in either closed or open profit-max leagues, but it does create mutual disincentives that lead to the exploitation of talent.

OPEN & CLOSED PROFIT-MAX LEAGUES



INVARIANCE PROPOSITION



PAYROLL CAP

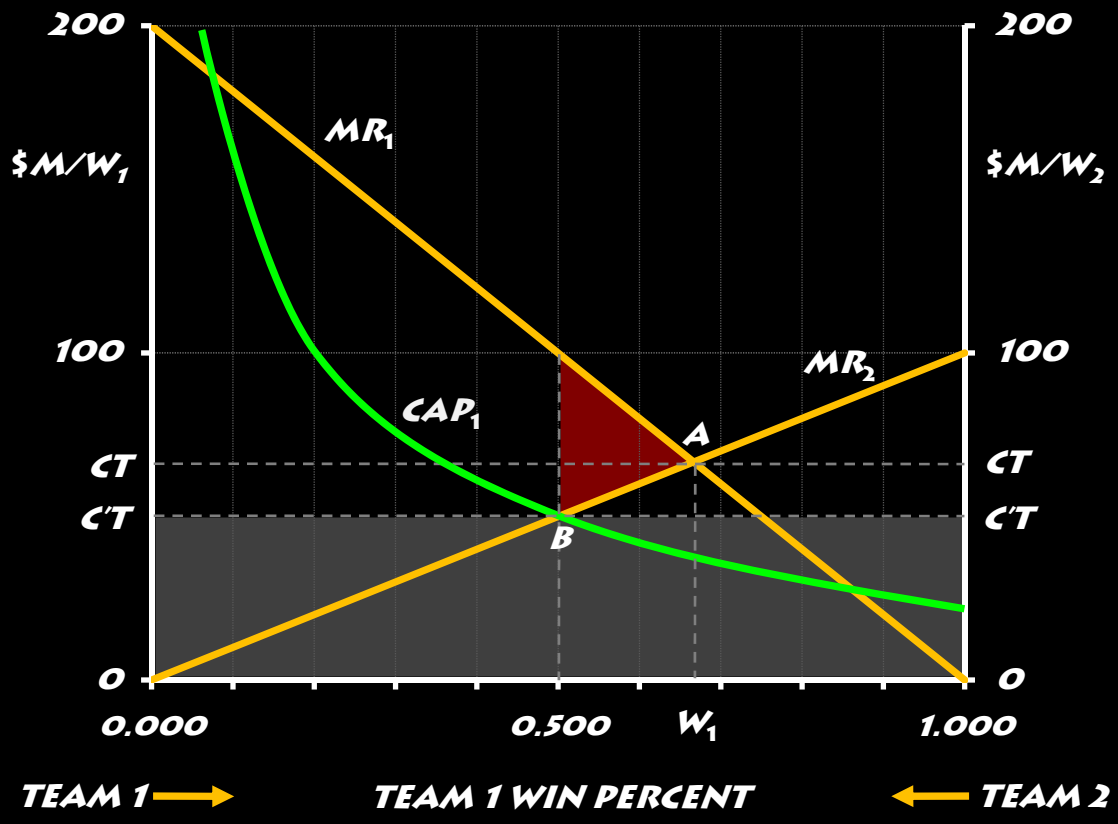
A league-wide payroll cap constrains each team's payroll to a constant λ-share of the average club's revenue such that: $w_1 cT = \lambda(R_1 + R_2)/2$. If CAP_1 is defined as an *iso*-payroll constraint (locus of $\lambda(R_1+R_2)/2$ for all w_1) for team 1, the closed league solution becomes:

$$CAP_1 = MR_2 = \lambda\,(R_1 + R_2)/2w_1 = cT \qquad (14)$$

In order for the cap to constrain team 1, $\lambda \leq 4\sigma^2/\,[(1+\sigma)(1+\sigma\ +\sigma^2)]$. To achieve absolute balance $w_1 = w_2$ the cap should be $\lambda = 1.33/(1+\sigma)$.

The effect of the payroll cap on team 1's profit is ambiguous, because gains from lower payroll are offset by revenue losses from fewer wins. Team 2's improvement is unambiguous because team 2 profits increase from both lower payroll and higher revenue from more wins.

PAYROLL CAP



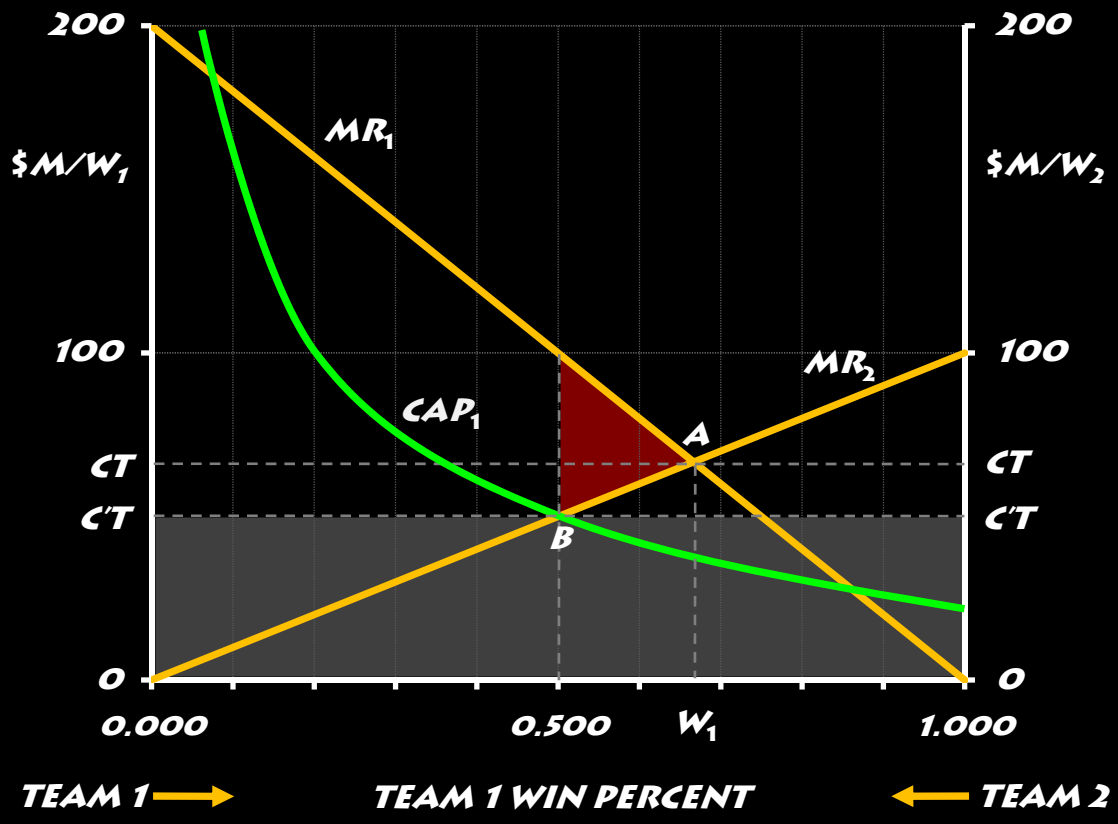
PAYROLL CAP & REVENUE SHARING

Team 1 has an incentive to circumvent the cap because $MR_1 > MR_2$ at .500. The dead-weight loss (shaded area between MR_1 and MR_2 above .500) suggests mutual gain from a revenue-sharing deal between clubs.

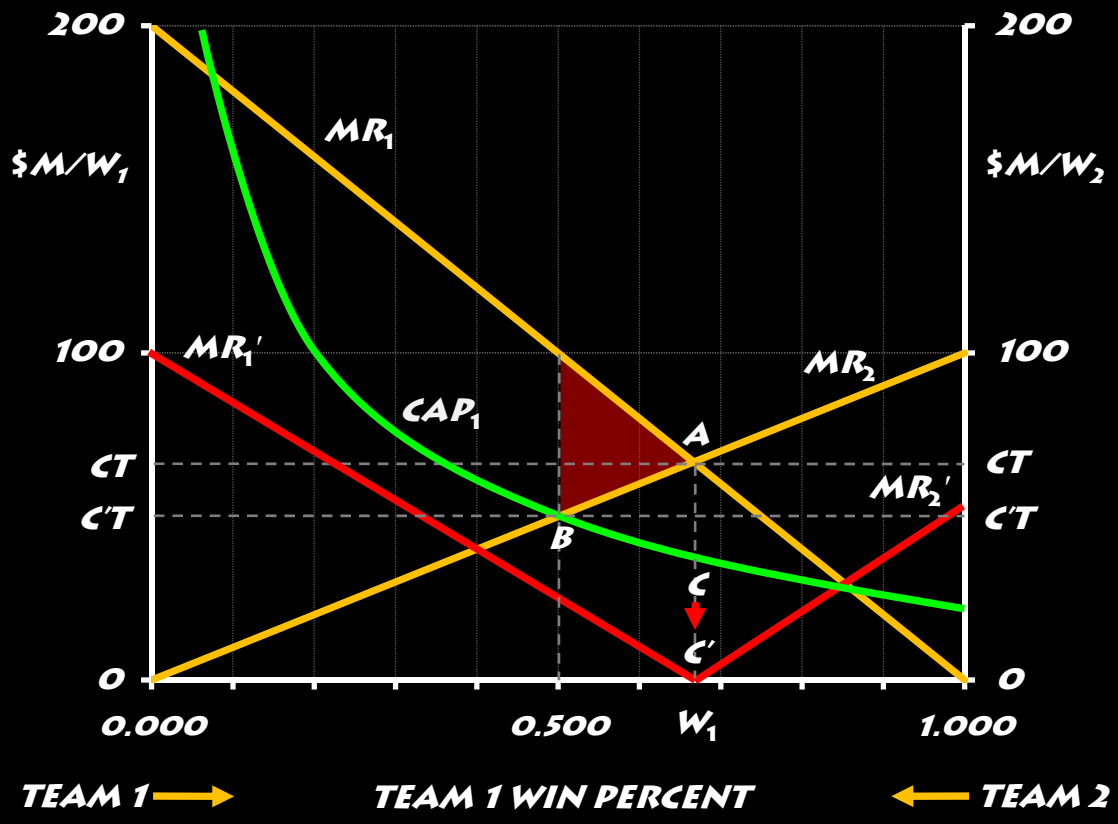
If a payroll cap is combined with revenue sharing then MR_1 and MR_2 are vertically displaced downward and CAP_1 no longer constrains the payroll of team 1. League equilibrium is restored at $MR_1' = MR_2'$ and the original state of imbalance returns to $w_1/w_2 = \sigma$.

This leads to the conclusion that a payroll cap by itself will constrain large market teams in a π-max league and improve competitive balance. But when a payroll cap is combined with revenue sharing the disincentive to win negates the cap and the league returns to its original state of imbalance. *Ironically* a payroll minimum is necessary to create competitive balance in a profit-max league with revenue sharing.

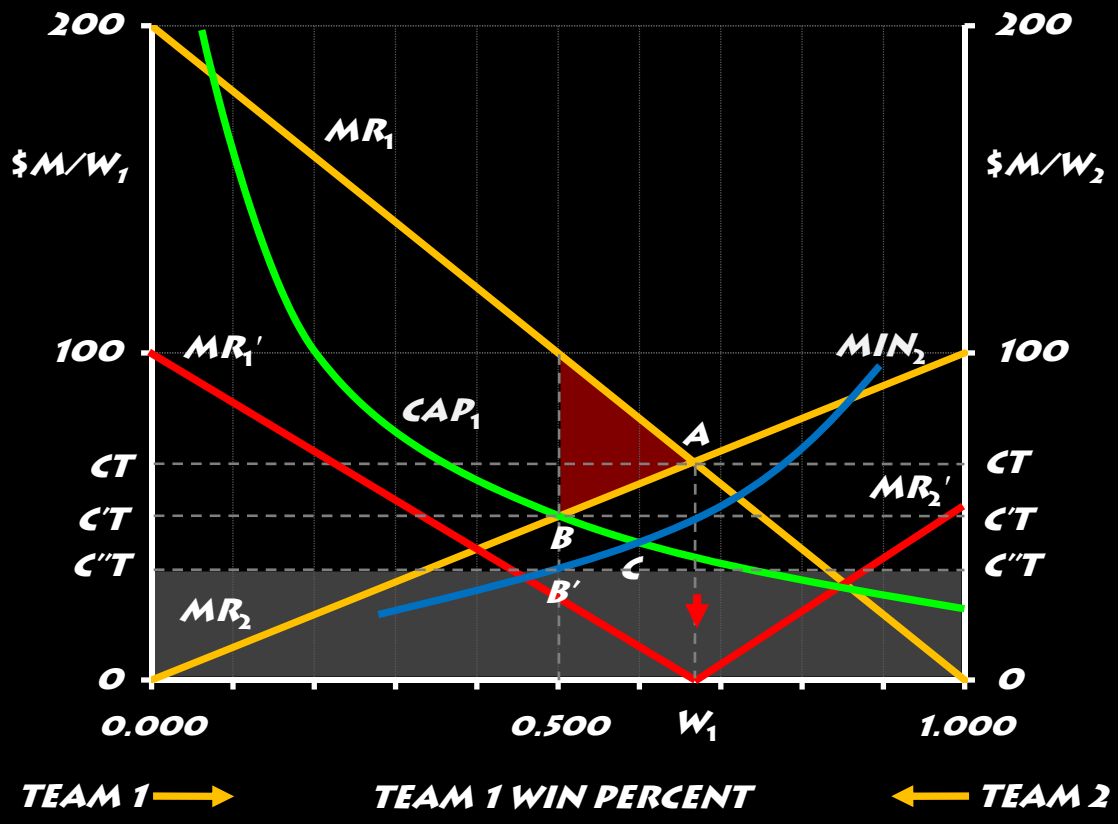
PAYROLL CAP



PAYROLL CAP & REVENUE SHARING



REVENUE SHARING & PAYROLL MINIMUM



CHAMPION EFFECT

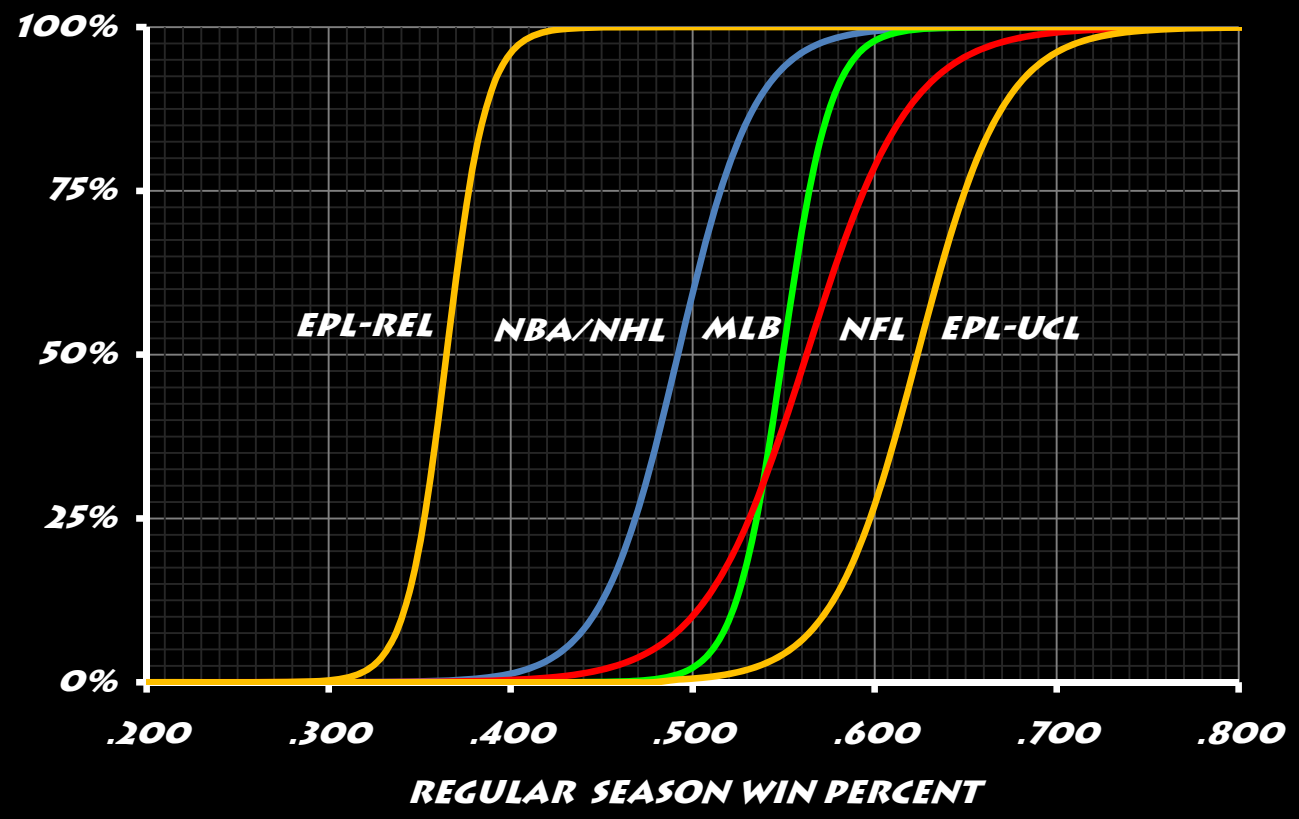
Post-season championship tournaments complicate the convenience of concave revenue functions, because of the redoubled importance of winning. With an added chance for post-season play, each team is built to win the regular season, but also to win the post-season tournament. The *champion effect* is the polarizing feedback that the post-season has on regular season competitive balance.

The degree of revenue convexity caused by the *champion effect* depends on the size and certainty of the champion's prize compared to regular-season revenue. The probability θ_1 of team 1 making the post-season tournament based on its regular-season performance w_1 can be expressed as a logistic cumulative density function (*CDF*):

$$\theta_1 = 1(1 + \exp[(\alpha + \beta w_1)] \quad (15)$$

where $\theta \in \{0,1\}$; $\alpha < 0$; $\beta > 0$. The mean $\mu = -\alpha/\beta$ is the win-threshold where teams have a 50/50 chance of qualifying for the post-season.

PLAYOFF PROBABILITY

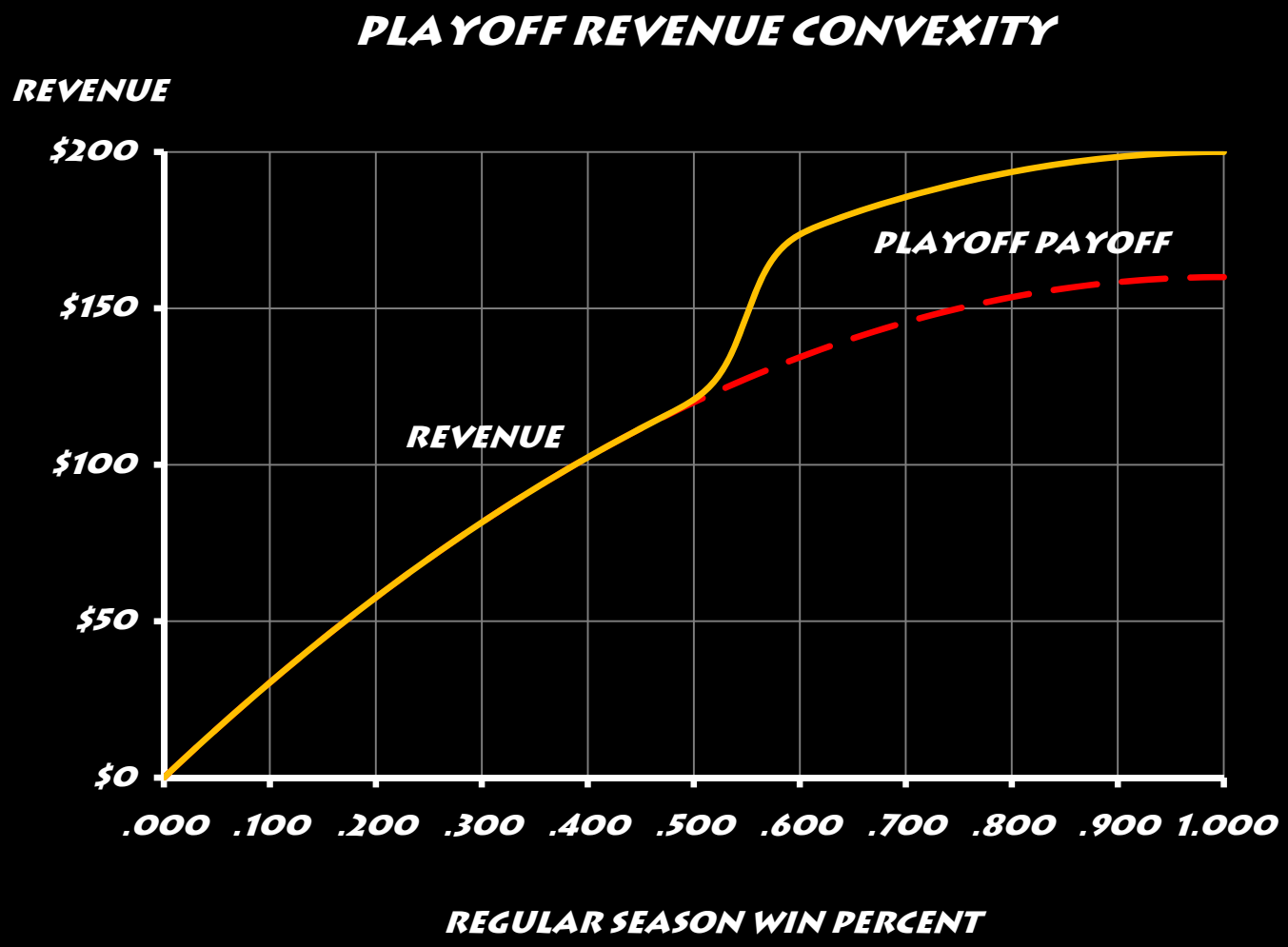


If δ is the ratio of the champion's prize to regular season revenue and $\omega_1 = w_1/(w_1+ \mu)$ is the probability of playoff success against teams with expected win percentage μ, then the combined revenue function R_1^* becomes complicated by convexity:

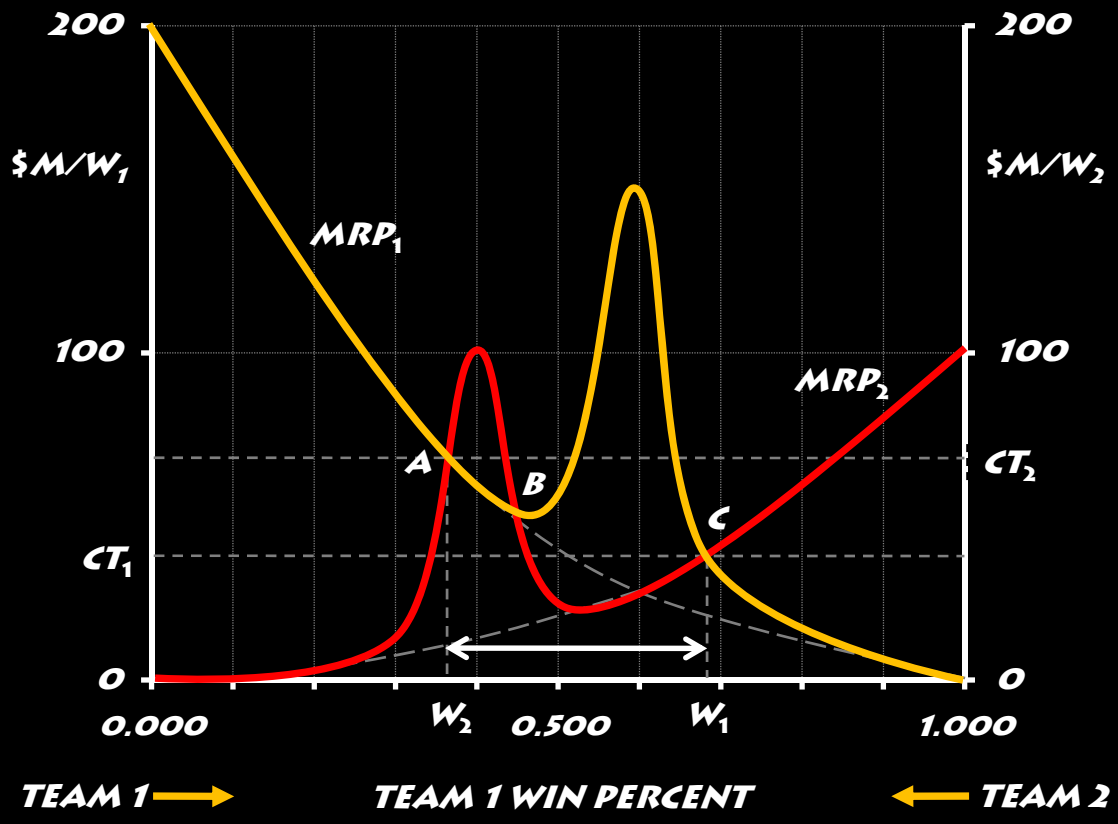
$$R_1^* = \sigma[\, w_1 - .5w_1^2 + \delta\theta(\omega_1 - .5\omega_1^2)] \qquad (16)$$

An important complication of the *champion effect* is that post-season revenue convexity introduces instability and competitive imbalance into the regular-season. The adjusted *MRP*s of both teams reflect probability distribution functions (*PDFs*) as derivatives of the respective *CDFs*.

As either team approaches the playoff threshold μ, the marginal revenue from additional qualifying win explodes and creates an unstable local minimum bracketed by two local maxima. These split equilibria explain polarizing threshold behavior during mid-season transfer windows and trade deadlines for teams on the edge of qualifying for the playoffs.



TRANSFER WINDOW



SPORTSMAN LEAGUE

In *sportsman leagues*, team owners sacrifice profit for winning. At the limit, a *pure sportsman* becomes a win maximizer, constrained by zero profit rather than max 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:

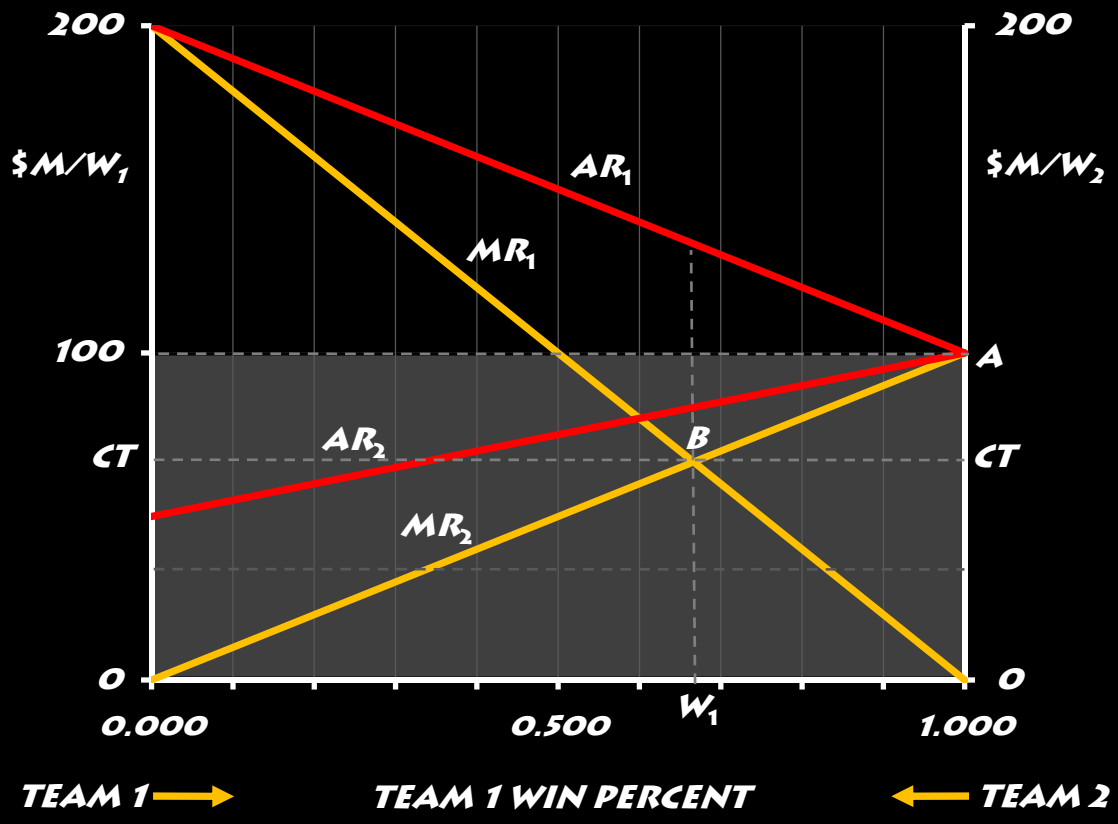
$$AR_1 = AR_2 = cT \qquad (17)$$

This is true whether talent markets are *open* or *closed*. Substitution of (9) into (17) yields the *pure sportsman* σ-model result:

$$AR_1 = AR_2 = \sigma(1 - .5w_1) = (1 - .5w_2) = cT \qquad (18)$$

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 $w_2 = (2 - \sigma)/(1 + \sigma)$. Existence of the league requires $w_2 > 0$ and therefore constrains $\sigma < 2$ for the assumption that $\phi = .5$ in (9).

SPORTSMAN WIN-MAX LEAGUE



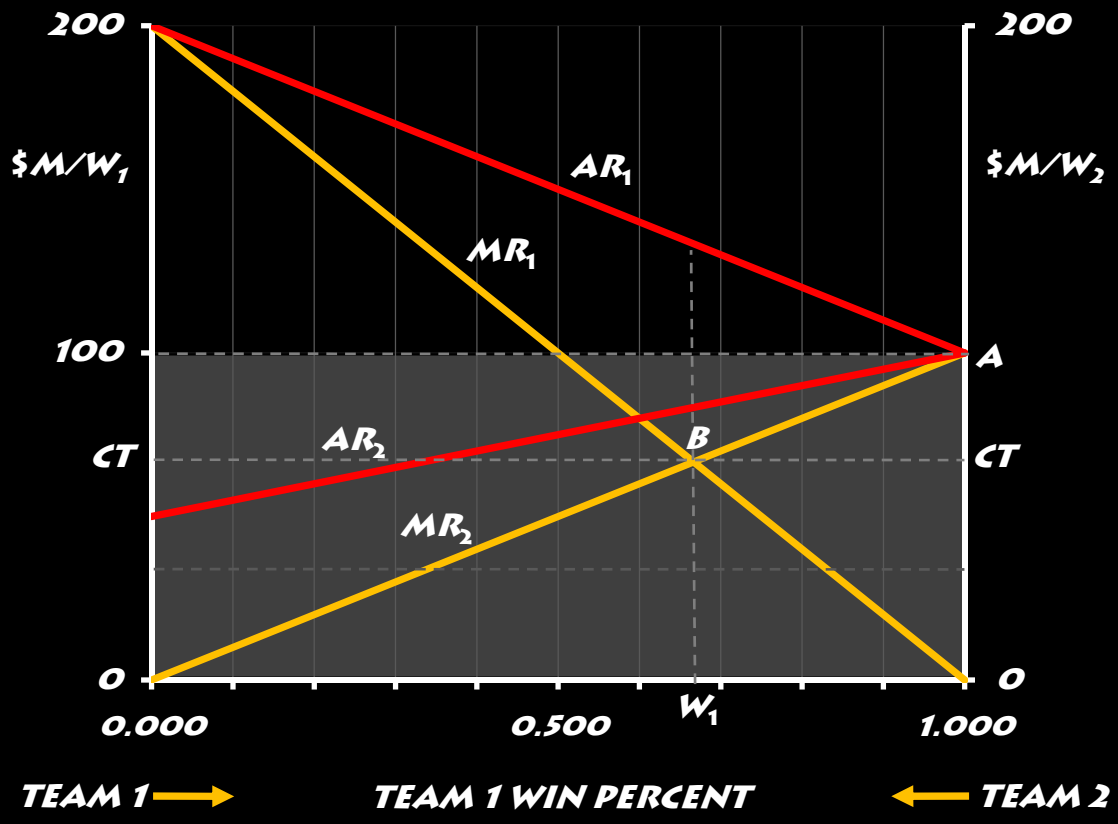
FAN WELFARE

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* curves is maximized at $AR_1 = AR_2$.

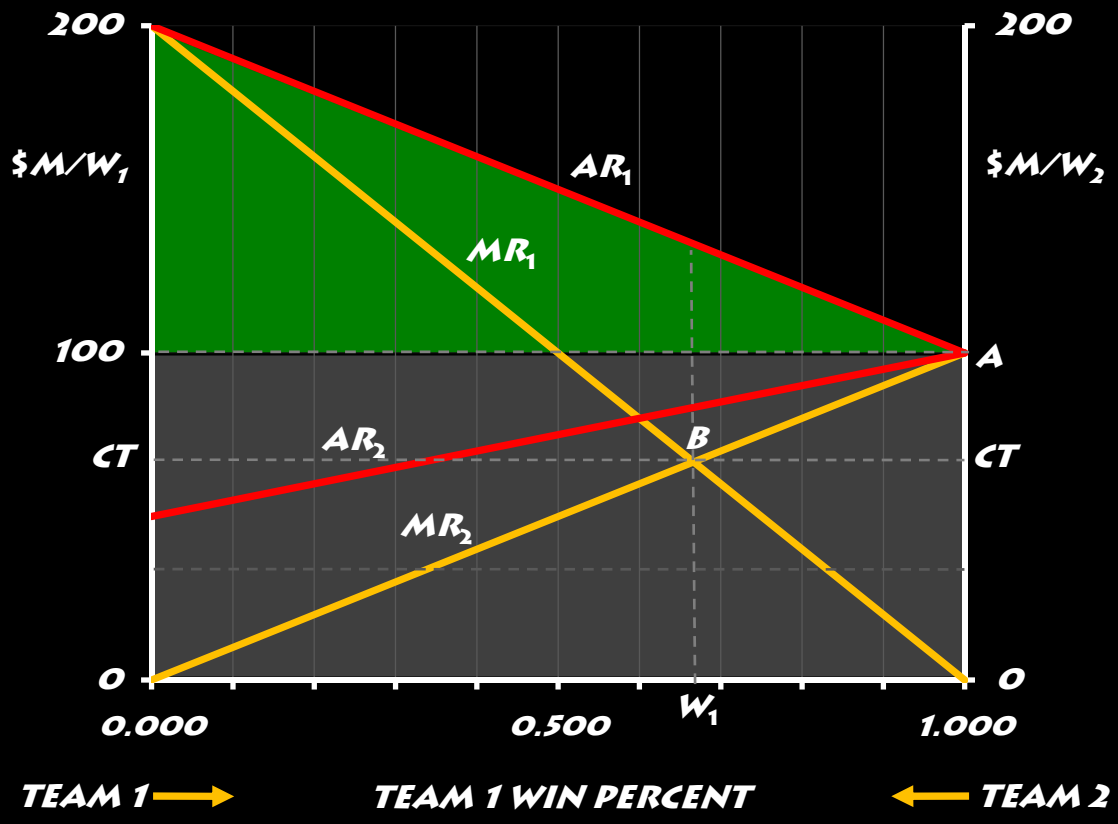
In the case of the win-max league, player salaries and fan surplus are maximized and profit is zero. The intuition is straightforward. The win-max social optimum is realized by sportsman owners because they share essentially the same objectives as their fans.

This leads to the conclusion that fans prefer greater imbalance than that sought by profit max owners in either open or closed leagues, and that interior profit max optima are inferior with respect to social welfare.

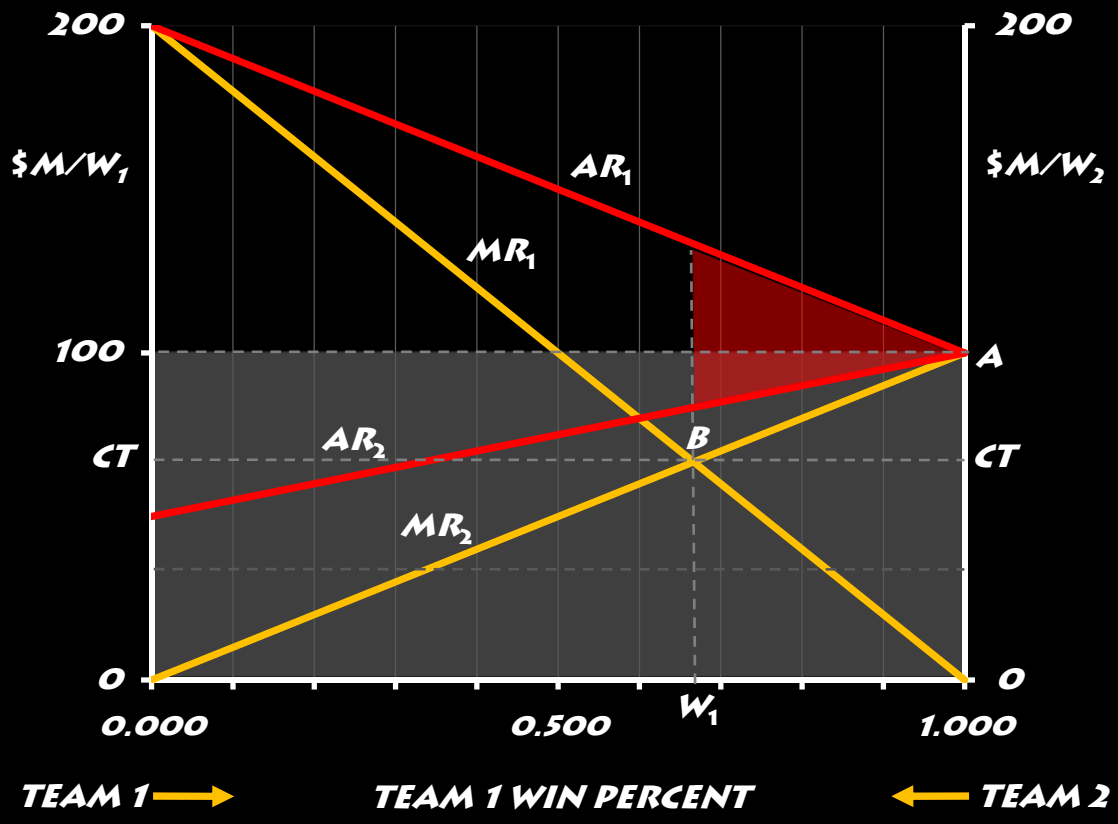
SPORTSMAN WIN-MAX LEAGUE



WIN-MAX OPTIMUM



PROFIT-MAX WELFARE LOSS



REVENUE SHARING

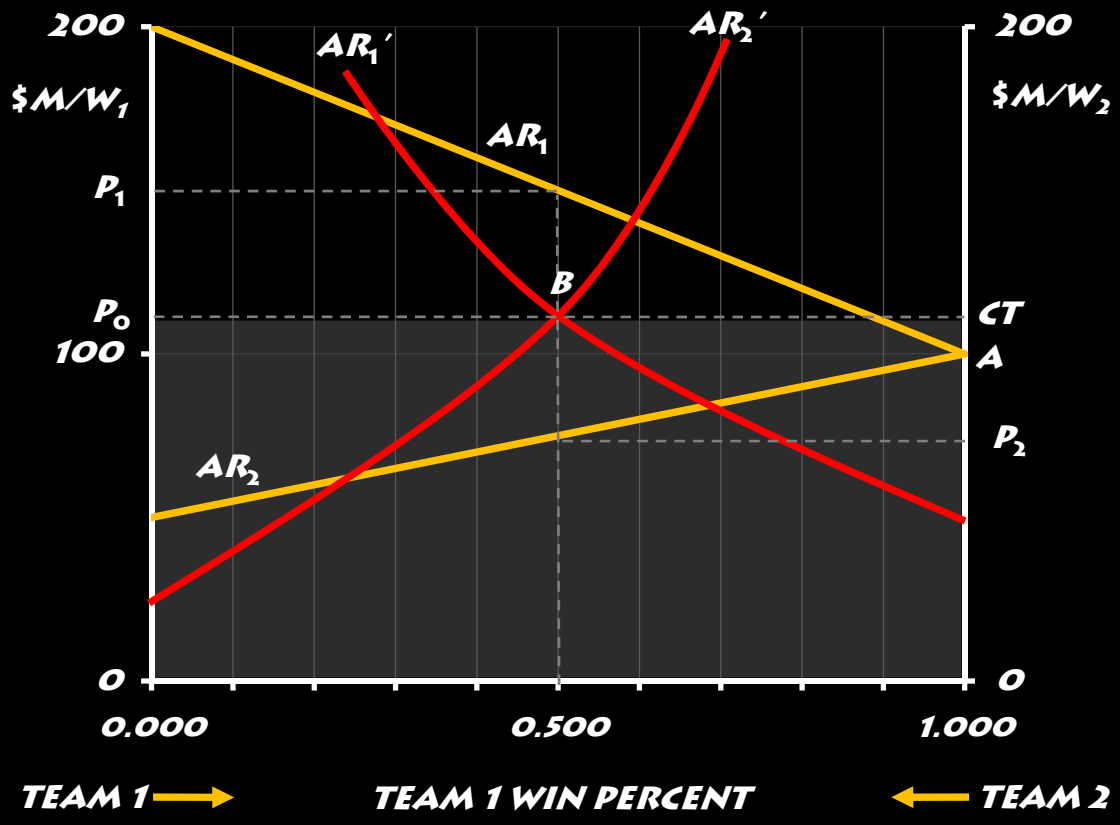
The question whether *strong form* invariance holds in a sportsman win-max league can be answered by modifying the pool-sharing formula in (12) so that $AR_1' = AR_2' = c'T$:

$$\alpha R_1/w_1 + (1-\alpha)(R_1+R_2)/2w_1 = \alpha R_2/w_2 + (1-\alpha)(R_1+R_2)/2w_2 = c'T \qquad (19)$$

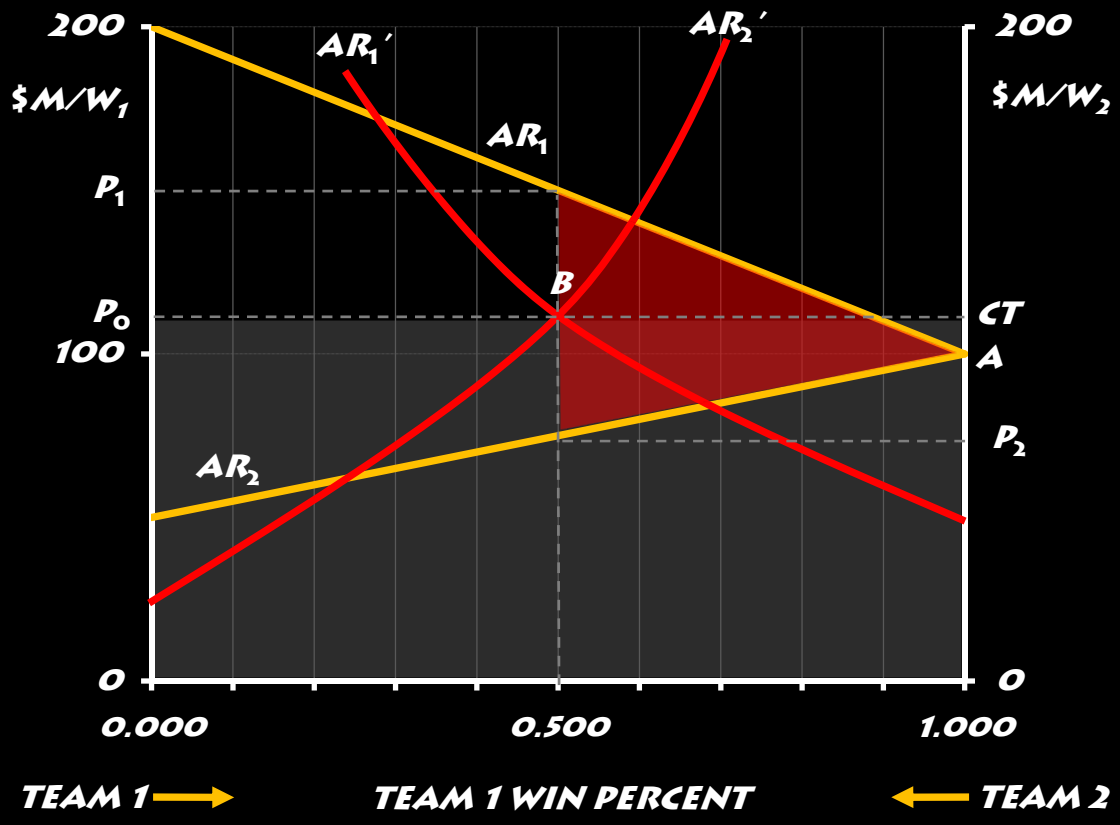
If there is no revenue sharing (α =1) then the second term vanishes for each team and $AR_1=AR_2 = cT$ as in (18). In a pure syndicate (α = 0) revenues and payrolls become identical for each team $(R_1+R_2)/2$, which implies that the league is competitively balanced at $w_1= w_2 = .500$.

In a win-max syndicate league payroll is equal to total revenue, which is divided equally between clubs. Both clubs have zero profits because all revenue is paid to the players to maximize wins. League payroll increases with revenue sharing as competitive balance approaches the total revenue maximum. Maximum league revenue at $\sigma w_2 = w_1$ could be captured by setting $\alpha = [\sigma^4+\sigma^3-(\sigma+1)]\ /[\sigma^4+\sigma^3-(3\sigma+1)]$. If $\sigma = 2$, for example, then α =.64 would yield a league revenue maximum.

WIN-MAX REVENUE SHARING



FAN WELFARE LOSS



PAYROLL CAP

To see the effects of a payroll cap in a win-max league reconsider the cap solution from (13) revised for a *sportsman* league, $CAP_1 = AR_2 = c*T$:

$$\lambda(R_1 + R_2)/2w_1 = R_2/w_2 = \lambda\,[.5 + \sigma w_1 - .5(\sigma+1)\,w_1^2]\,/2w_1 = (1 - .5w_2) \quad (20)$$

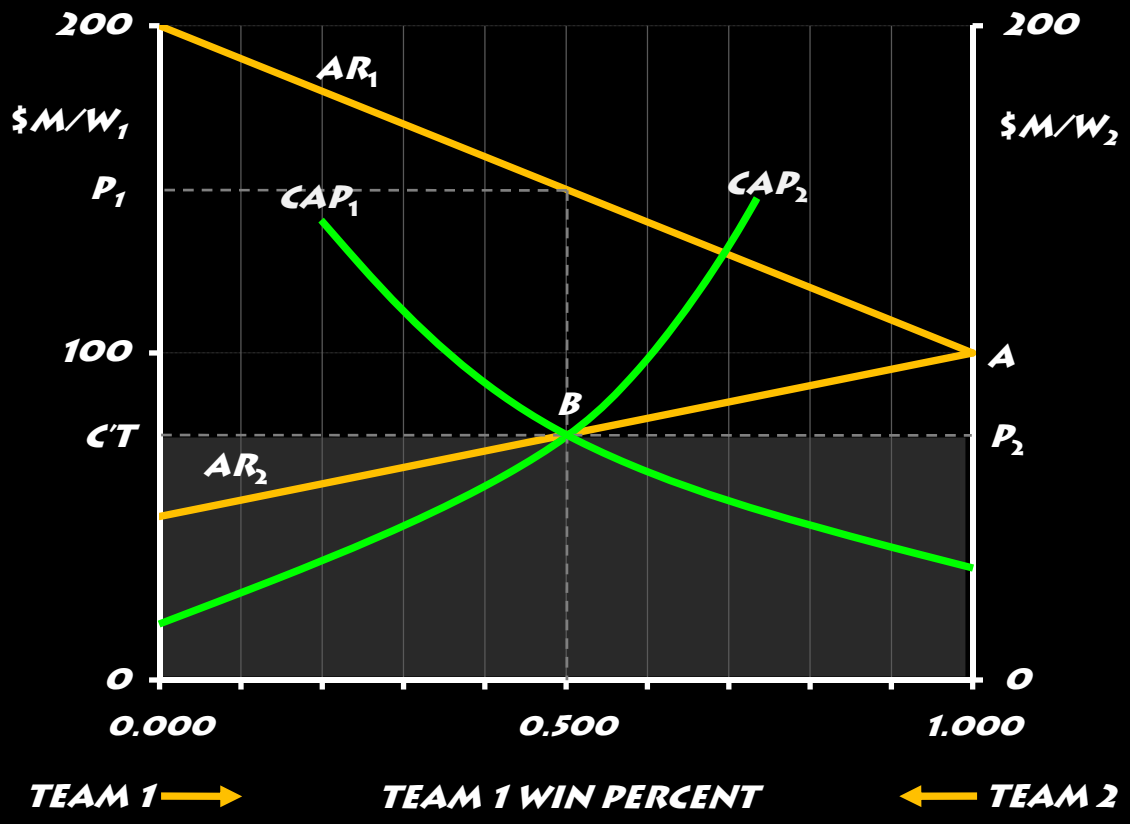
Absolute balance at $w_1 = w_2 = .500$ requires a payroll cap $\lambda = 2/(1+\sigma)$. League revenue max at $\sigma w_2 = w_1$ requires a cap $\lambda = 4\sigma^2/(1+\sigma)(1+\sigma+\sigma^2)$. If $\sigma = 2$, for example, then a payroll cap $\lambda = .76$ yields the revenue max.

Combination payroll cap ($\lambda = .67$) and revenue sharing ($\alpha = 0$) virtually clones equality in team revenues, payrolls and profits.

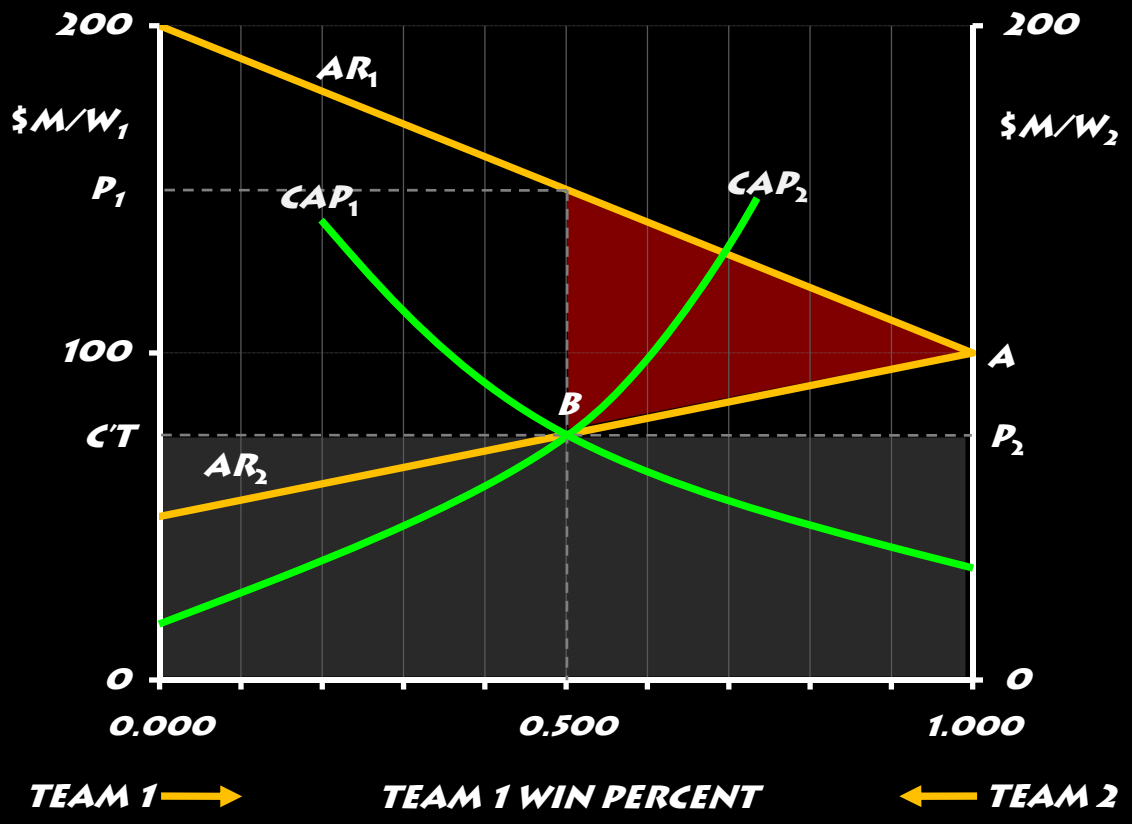
These results lead to opposite conclusions for revenue sharing in π–max and win-max leagues. In π-max leagues revenue sharing increases team profits and talent exploitation but does not increase competitive balance.

Revenue sharing in sportsman leagues does increase competitive balance and it can lead to higher payrolls and revenues toward the maximum, but these gains come at the expense of lower fan welfare.

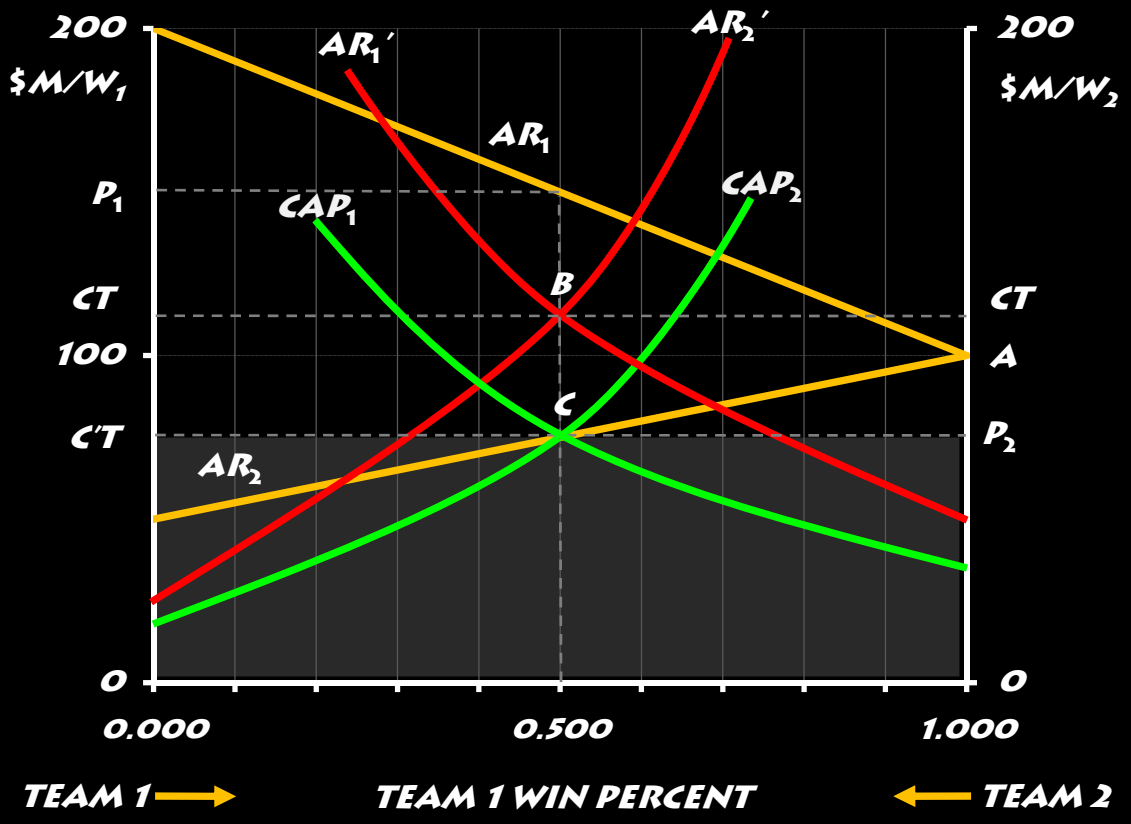
WIN-MAX PAYROLL CAP



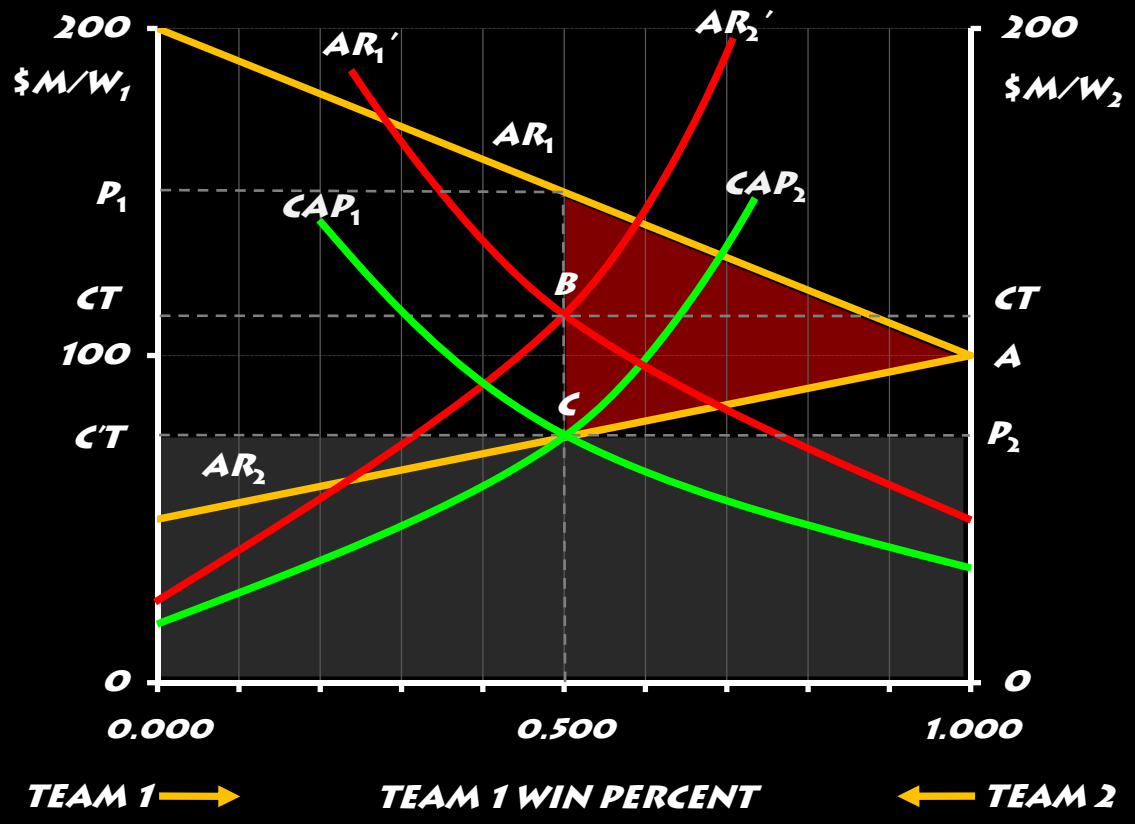
FAN WELFARE LOSS



PAYROLL CAP & REVENUE SHARING



FAN WELFARE LOSS



SEASON-TICKET OPTIMUM

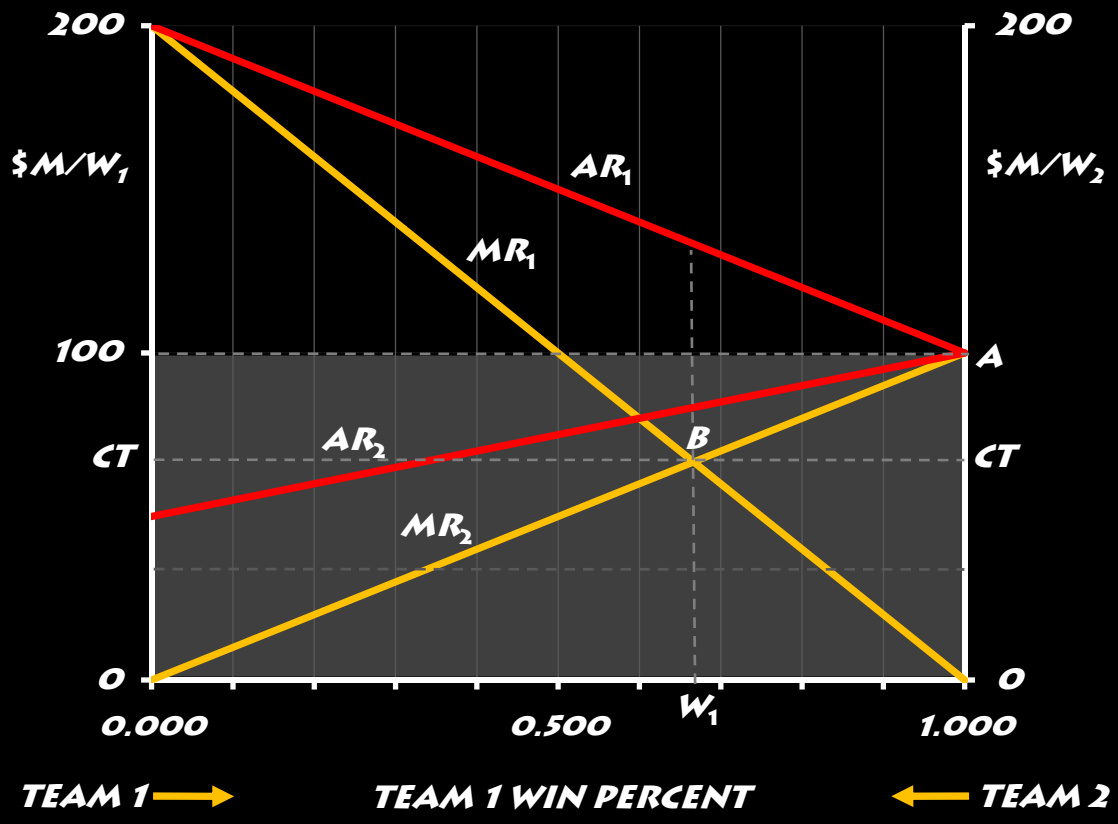
All-or-nothing season-tickets are a convenient form of quasi-perfect price discrimination that yields the second-best solution for optimal social welfare (club profit, player salaries and fan surplus).

The difference is that in season-ticket scheme player salaries and club profits are maximized, while the fan surplus is reduced to zero. The all-or-nothing demand curve AR_1* is the average value of the total fan welfare for each win (integral of the demand curve AR_1 divided by w_1).

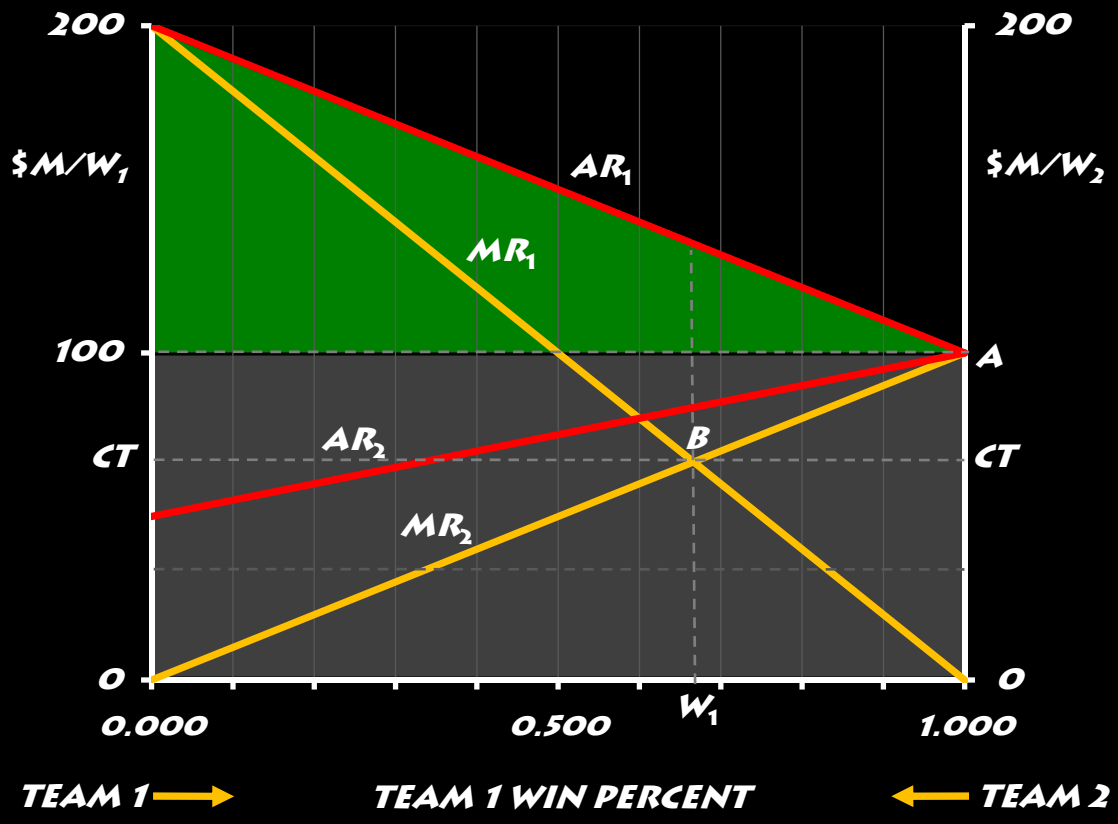
The season-ticket marginal revenue curve is the original AR_1 curve and simultaneous season-ticket profit max is the same as win max in (16). The difference is that the season-ticket price is set along AR_1* to exhaust fan surplus by equating it to the fan deficit.

The important conclusion is that season-ticket solution is superior to conventional profit-max solution and that competitive imbalance and large market dominance are welfare superior to competitive balance.

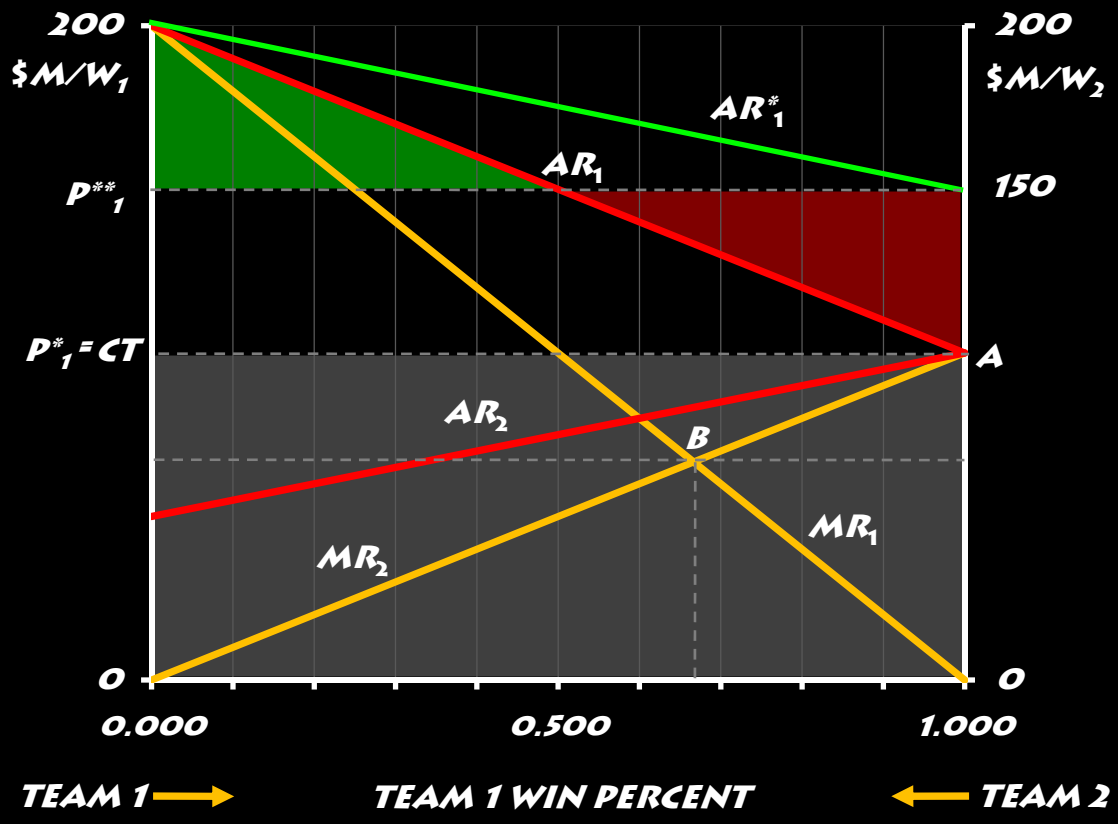
SPORTSMAN WIN-MAX LEAGUE



WIN-MAX OPTIMUM



SEASON-TICKET OPTIMUM



PERSONAL SEAT LICENSE (PSL)

A Personal Seat License (PSL) is a season ticket pricing scheme that forces season ticket holders to make a partial down payment for the value of their season-ticket options over time. A PSL works best in season-ticket leagues where the quality of the home team is more important from season to season, as opposed to game-ticket leagues where the quality of the opponent is valued more from game to game.

A PSL is the present value of a season-ticket discount over the life of the season-ticket option. If priced properly, a PSL season-ticket and a non-PSL season ticket are equivalent over time. For example, if the true (non PSL) value of the season ticket is $1000 per season ($100 per game for 10 games), a $5,000 PSL could be paid up front for the season ticket priced at $500 over time. (In this case a PV of 10X the ticket discount of $500 assumes a perpetuity discount rate of 10%).

PSLs work best for NFL relocation or expansion teams and first time season-ticket holders. PSLs do not work if there is no discount or there is a limit to the life of the PSL option. The Oakland Raiders bungled PSL offering in 1995 relocation violated both of these principles.

FAN PREFERENCES

The *Yankee paradox* appeals to intuition and yields well-behaved and tractably concave revenue functions (downward sloping *MR* curves), but the simplifying assumption that fans prefer competitive balance over dominance remains an important empirical question.

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 league zero-sum constraint simplifies (8) in more general terms of ϕ:

$$\pi_1 = \sigma(w_1 - (1-\phi)\, w_1^2) - ct_1 \qquad \pi_2 = w_2 - (1-\phi)\, w_2^2 - ct_2 \qquad (21)$$

PROFIT-MAX LEAGUE

In a *closed profit-max league* $\partial t_1/\partial t_2 = \partial t_2/\partial t_1 = -1$, and simultaneous profit max of (21) yields:

$$MR_1 = \sigma[1 - 2(1-\phi)\, w_1] = MR_2 = 1 - 2(1-\phi)\, w_2 = cT^* \qquad (22)$$

yields *closed-league* balance solution $w_1/w_2 = (\sigma+1-2\phi)\,/(\sigma+1-2\sigma\phi)$ for the respective win percentages:

$$w_1 = [\sigma+1-2\phi]/[2(\sigma+1)(1-\phi)] \quad w_2 = [\sigma+1-2\sigma\phi]/[2(\sigma+1)(1-\phi)] \qquad (23)$$

Substitution of (23) into (22) sets the league payroll at $cT^* = 2\sigma\phi\,/(\sigma+1)$. Existence of the league requires $w_2 > 0$ and $\phi < [\,(\sigma+1)/2\sigma\,]$ for $\sigma > 1$.

Open-league competitive balance : $w_1/w_2 = 1$ for $\phi = 0$; $w_1/w_2 = \sigma^{1/2}$ for $\phi = .5$ and $w_1/w_2 = \sigma$ for $\phi = 1$.

WIN-MAX LEAGUE

In a *win-max league*, simultaneous win maximization of (21):

$$AR_1 = \sigma[1 - (1-\phi)\, w_1] = AR_2 = 1 - (1-\phi)\, w_2 = cT^* \qquad (24)$$

yields competitive the competitive balance ratio $w_1/w_2 = (\sigma - \phi)/(1-\sigma\phi)$ for the respective win percentages:

$$w_1 = (\sigma - \phi)/(\sigma+1)(1-\phi) \qquad w_2 = (1 - \sigma\phi)/(\sigma+1)(1-\phi) \qquad (25)$$

Substitution of (25) into (24) sets league payroll $cT^* = \sigma(\phi + 1)/(\sigma+1)$. Existence of the league requires $w_2 > 0$ and $\phi < 1/\sigma$ for $\sigma > 1$.

GATE & MEDIA LEAGUES

Fort and Quirk [2007, 2010a, 2010b] argue that the length of the season determines fan preferences for single-game tickets and season-tickets. If the season is short, then fans base preferences more on the quality of the home team than the quality of the visitor. If the season is relatively long, then fans are more selective about the quality of the opponent.

A broader distinction is made here between leagues that rely on gate (ticket) revenue (MLB, NBA, NHL and Bundesliga) and leagues that rely more heavily on media revenue (NFL and other Big 5). Games with excess demand during shorter seasons are better suited for TV than games during longer seasons where game attendance is more important.

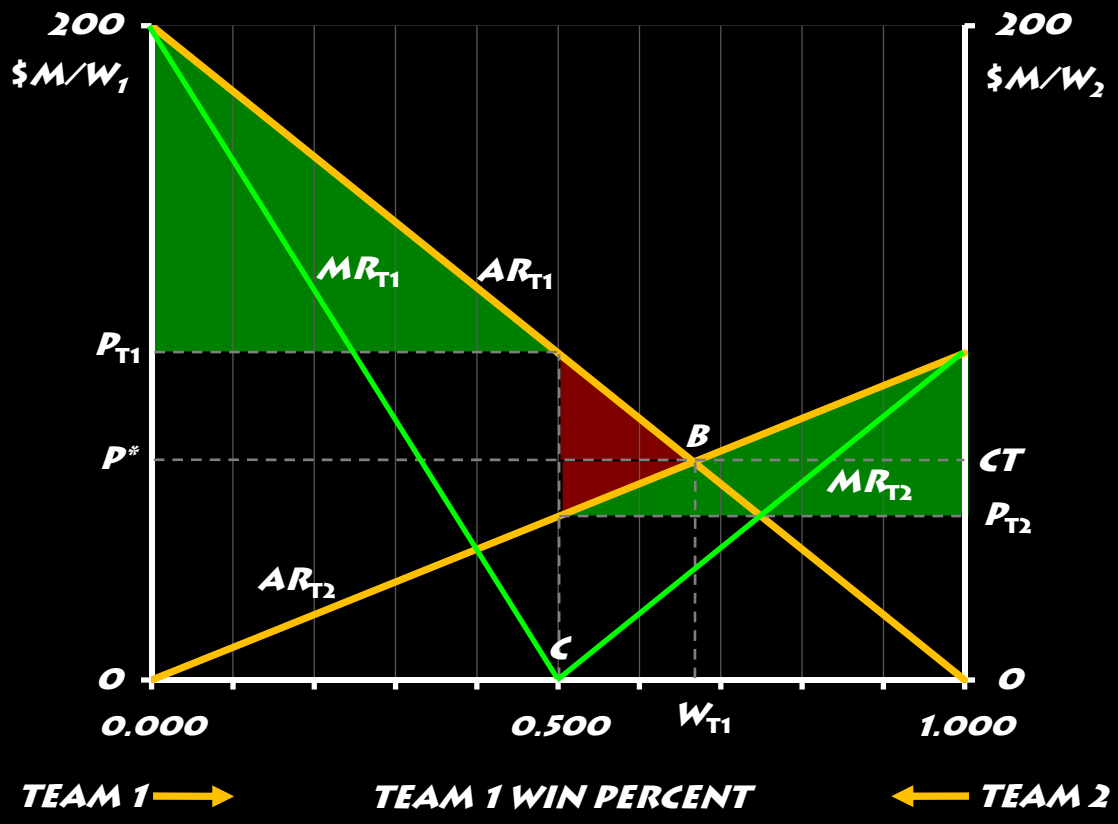
This advances the hypothesis that fan preference for competitive balance is inversely related to increased importance of national media coverage. Media revolutions expand local home markets and result in wider global appeal of dominant teams and less preference for competitive balance.

TICKET LEAGUE

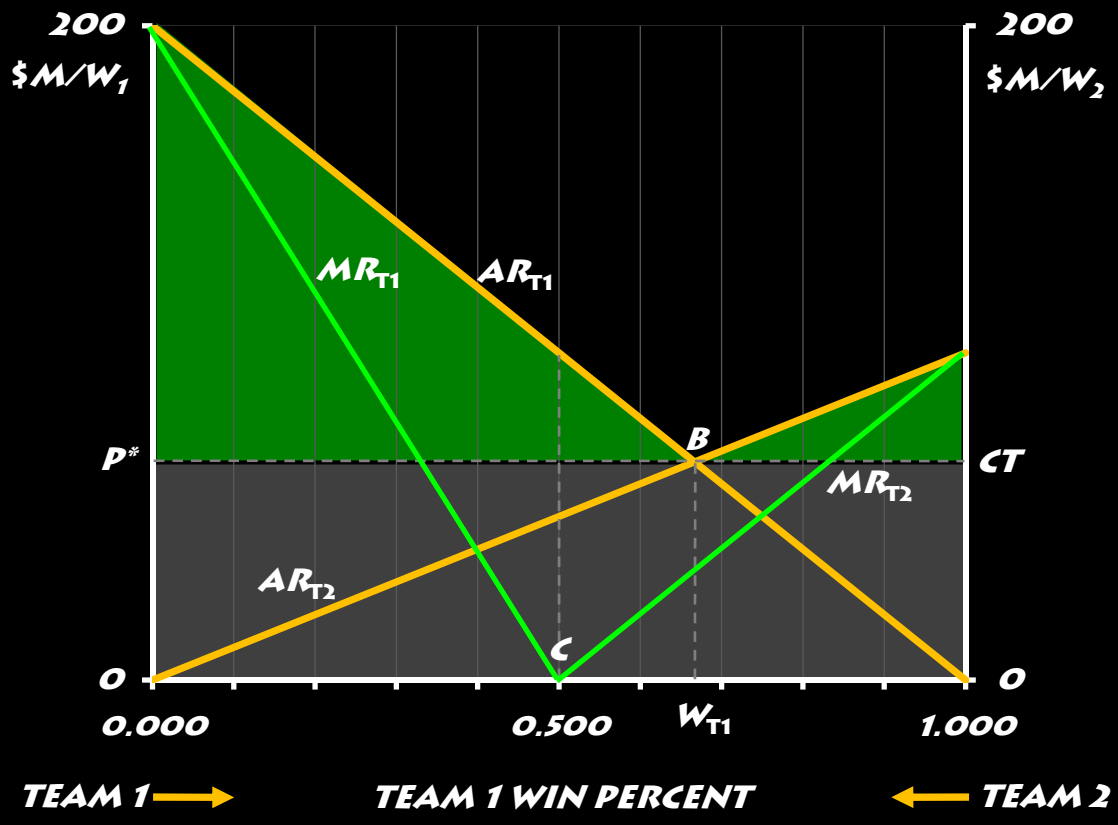
Comparative analysis of competitive balance in ticket leagues and media leagues can be accomplished by setting the fan-preference parameter ϕ approximately equal to media share of total league revenue. Substitution of $\phi = 0$ for pure ticket leagues into equation (21) yields the profit-max solution $w_1/w_2 = 1$ and a win-max equilibrium $w_1/w_2 = \sigma$.

Profit-max payroll is zero in a ticket-league because fan preference for absolute balance completely cancels the incentive to win for either team. Win-max profit is zero, so the win-max social welfare optimum for the ticket league is comprised of payroll (grey shade) and fan welfare (green shade). The welfare loss of profit-max solution at *.500* is the shaded red triangle between AR_{T1} and AR_{T2} in the following series.

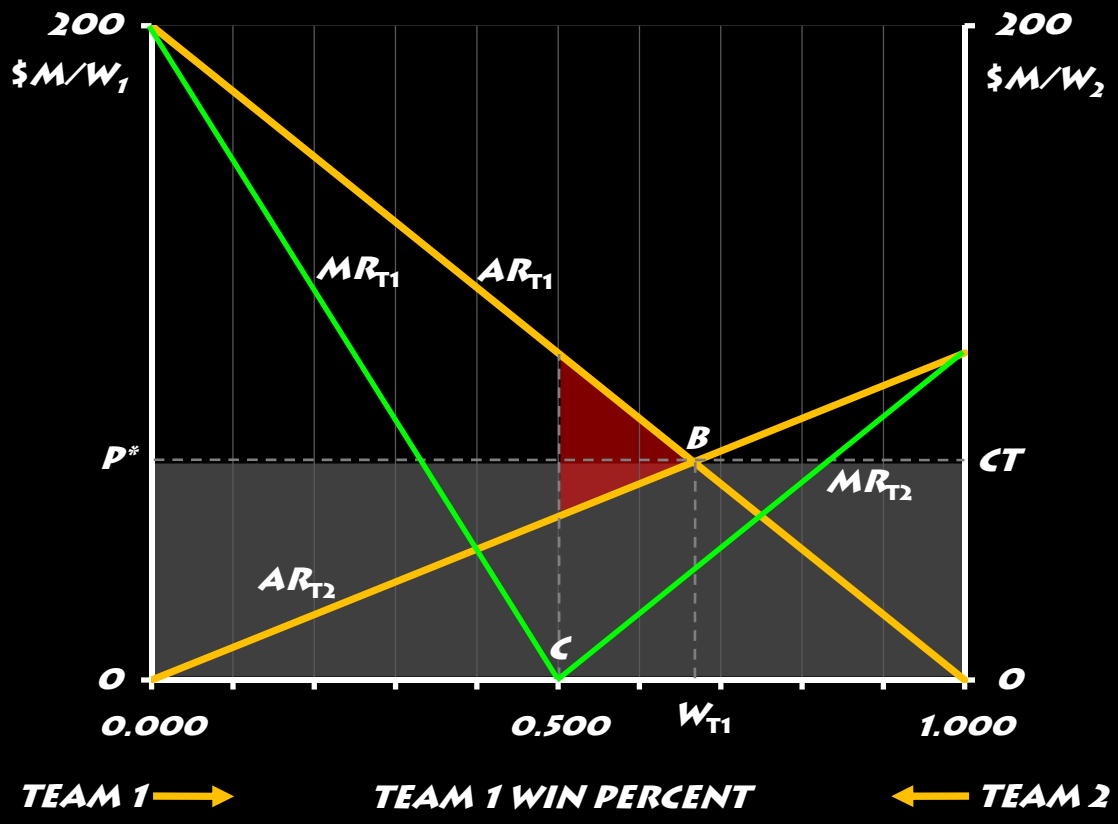
PROFIT-MAX TICKET-LEAGUE



WIN-MAX TICKET-LEAGUE



TICKET-LEAGUE OPTIMUM



MEDIA LEAGUE

Substitution of $\phi = .5$ for media leagues into equation (25) yields the profit-max solution $w_1/w_2 = \sigma$ and a win-max equilibrium $w_1 = 1$. Fan preferences for Team 1's increased dominance in a media league are shown at the both the profit-max solution $MR_{M1} = MR_{M2}$ and win-max solution $AR_{M1} = AR_{M2}$.

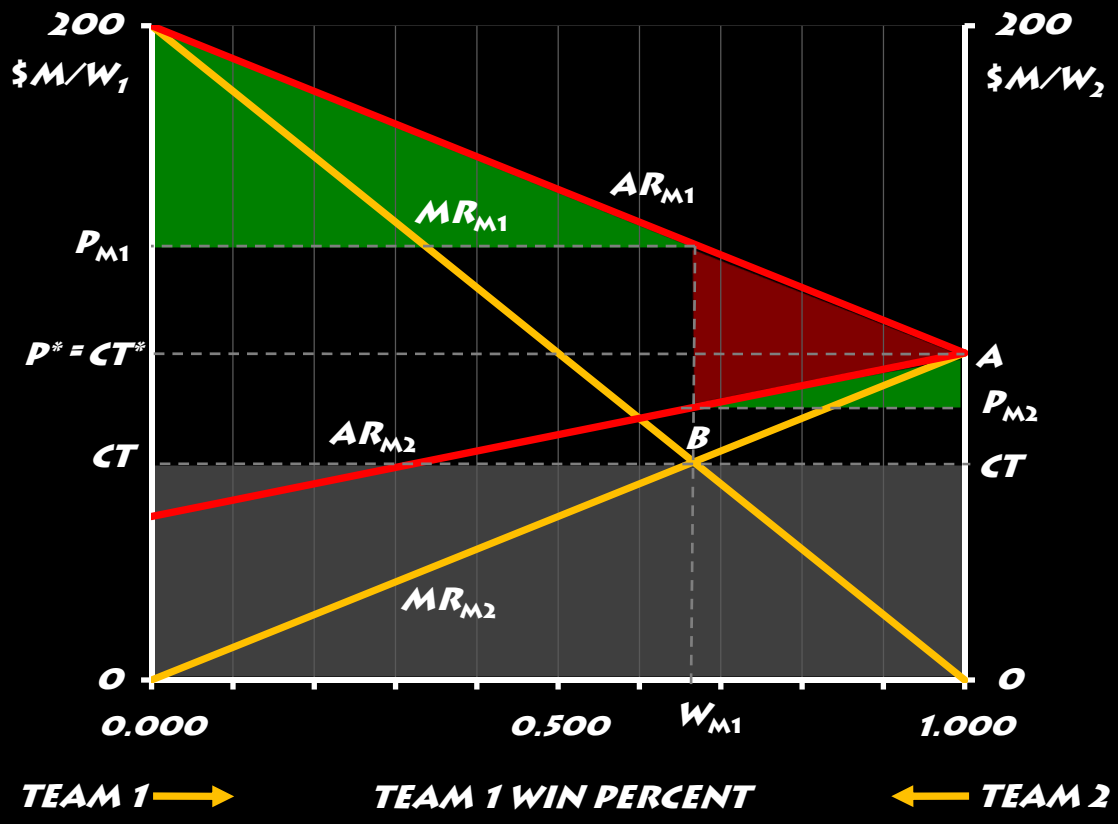
Club profits are again zero in a media win-max league and the win-max social optimum is comprised of only player salaries and fan surplus. The welfare loss of profit-max for the media league is the shaded red triangle between AR_{M1} and AR_{M2}.

The important conclusion is that when ticket leagues evolve into media leagues, fan preferences, profit maxima and welfare optima all shift toward less competitive balance for the large market team.

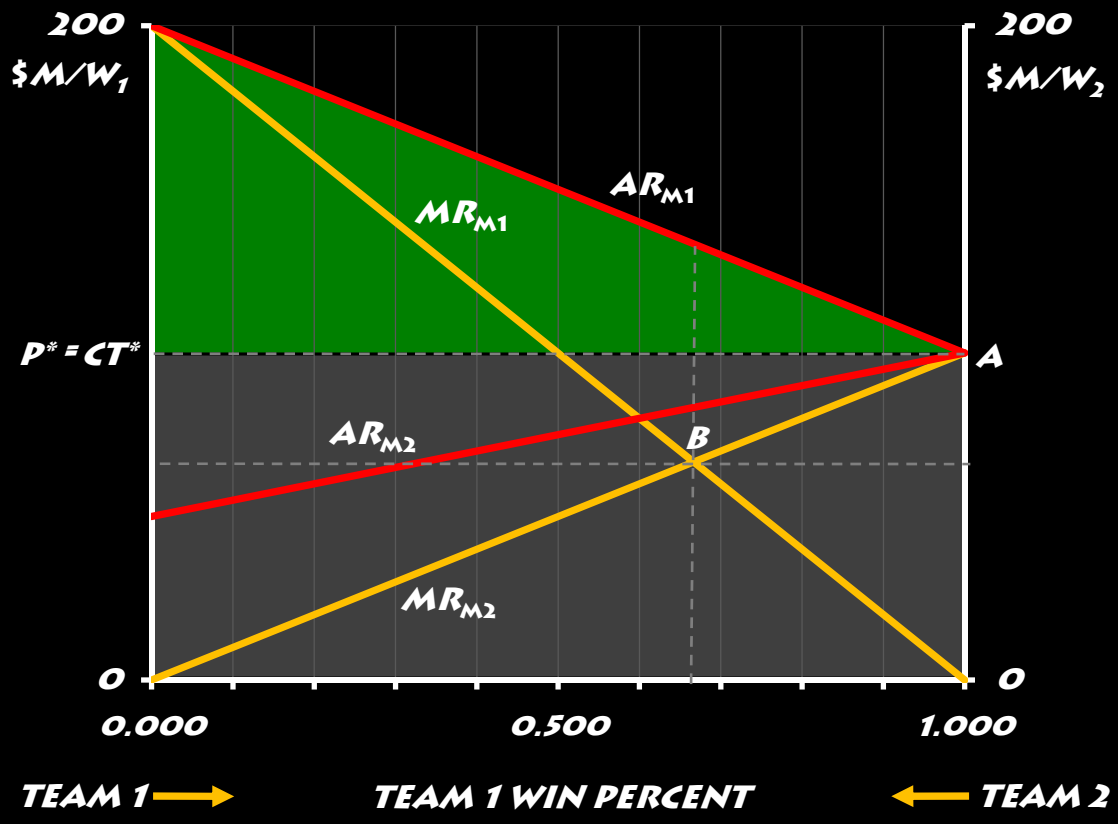
Open-league competitive balance solutions are $w_1/w_2 = 1$ for $\phi = 0$; $w_1/w_2 = \sigma^{1/2}$ for $f = .5$ and $w_1/w_2 = \sigma$ for $\phi = 1$. The *open-league profit-max* solution is unconstrained because $w_2 > 0$ for $\phi < 1$ and $\sigma > 1$.

Dietl and Lang [2008] and Dietl, Lang and Werner [2009] use a nonlinear demand distribution taken from Falconieri, Palomino and Sakovics [2004] and fan preference function taken from Vrooman [2008; 2009] to show that welfare is maximized at greater competitive imbalance $w_1/w_2 = \sigma$ than the internal profit maximum $w_1/w_2 = \sigma^{1/2}$

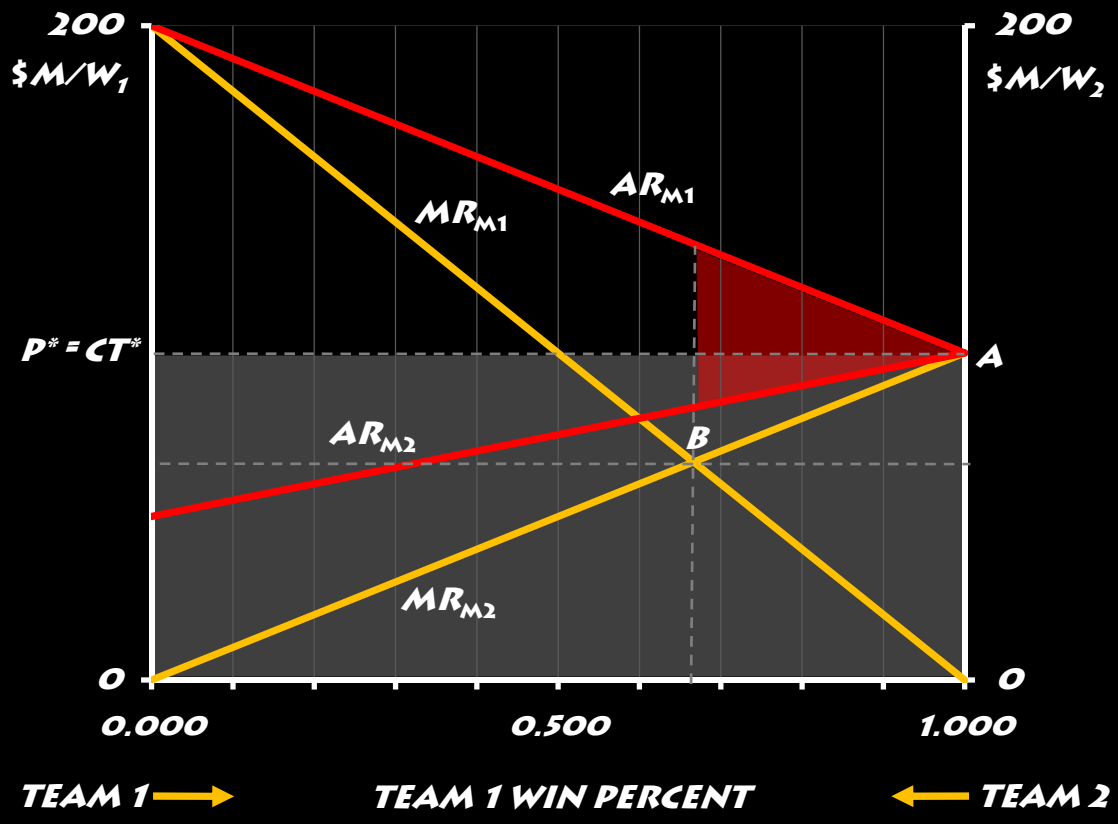
PROFIT-MAX MEDIA LEAGUE



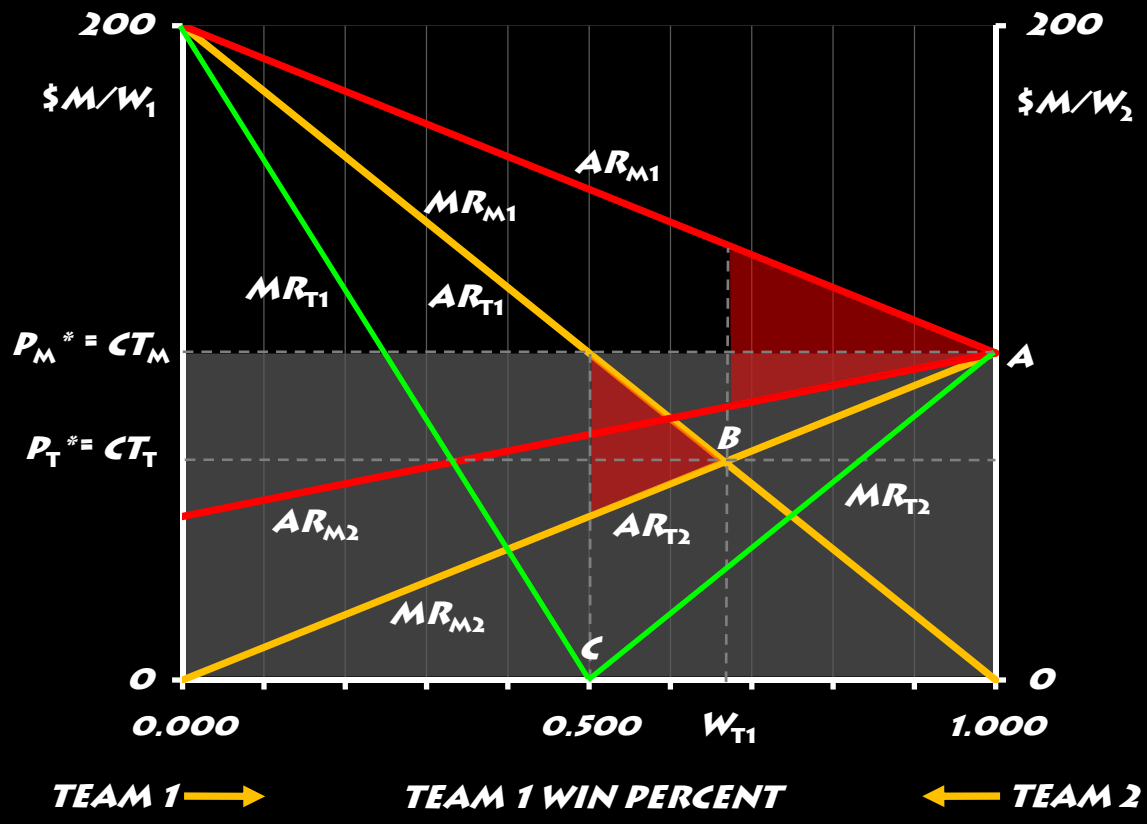
WIN-MAX MEDIA LEAGUE



MEDIA LEAGUE OPTIMUM



MEDIA & OPTIMUM BALANCE

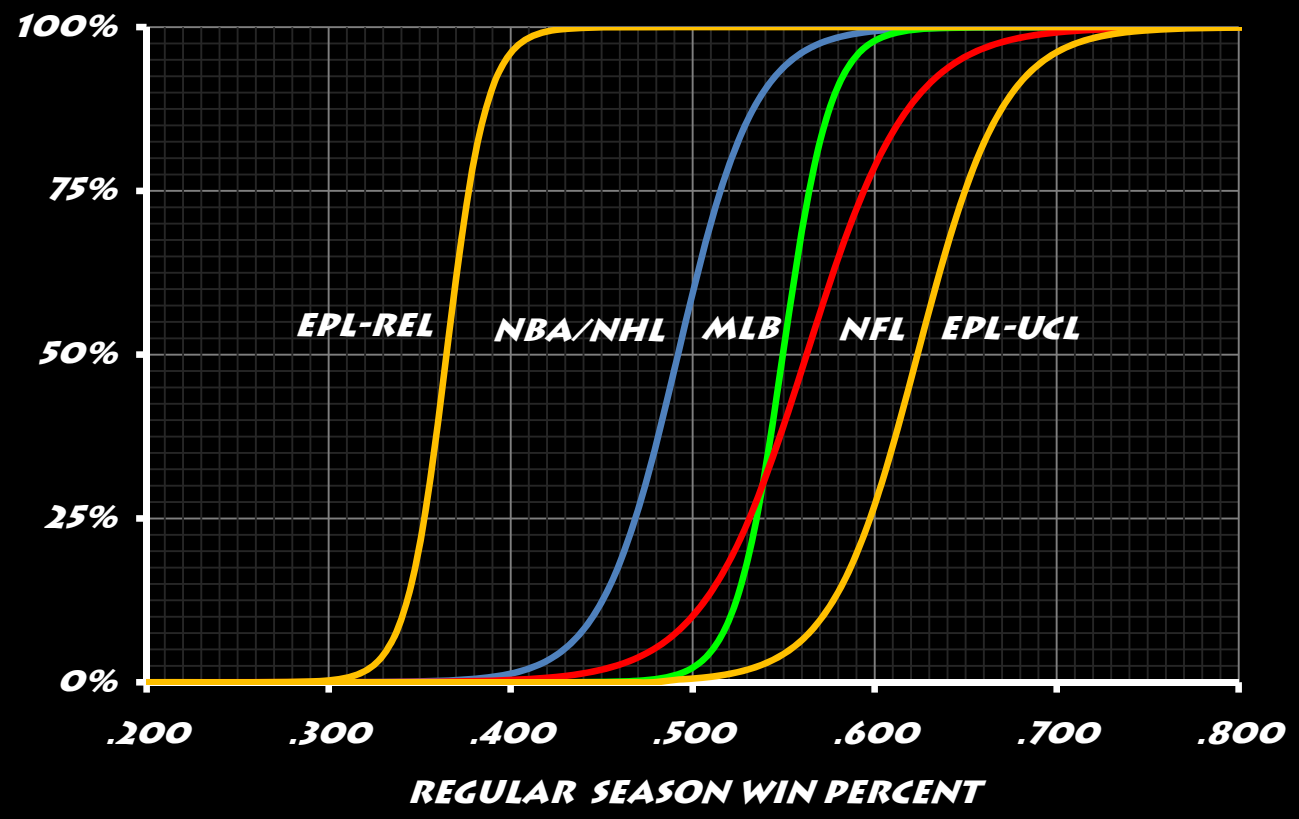


EMPIRICAL EVIDENCE

CHAMPION EFFECT

	MLB	NFL	NBA	NHL	EPL
Size of the playoff prize	■	□	□	□	■
Regular season length	■	□	■	■	■
Post-season playoff length	□	□	■	■	■
Playoff threshold asymmetry	■	■	□	□	□
Overall Champion effect	■	□	□	□	■

PLAYOFF PROBABILITY



REVENUE REVOLUTION

Revenue Sources in Professional Sports Leagues (€M)

■ Media League
■ Gate League

	Revenues 2009				Revenues 1996			
	Total	Gate	Media	Pay	Total	Gate	Media	Pay
National Football League	€5,673	19%	51%	57%	€1,650	29%	55%	67%
Major League Baseball	4,174	38%	25%	55%	1,307	39%	38%	54%
National Basketball Association	2,693	30%	24%	58%	1,178	41%	37%	47%
National Hockey League	1,995	42%	15%	53%	778	61%	15%	51%
English Premier League	2,326	29%	49%	67%	685	42%	21%	47%
German Bundesliga	1,575	23%	31%	51%	444	32%	25%	50%
Spanish La Liga	1,501	28%	41%	63%	524	28%	42%	44%
Italian Serie A	1,494	13%	60%	73%	551	37%	36%	58%
French Ligue 1	1,048	14%	55%	69%	293	22%	32%	61%

Source: Deloitte Sports Business Group and John Vrooman. €1= $1.413 (30/6/2009)

EXTENDED FAN BASE

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

REVENUE SHARING

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 Revenue	34%	31%	0%	0%
Venue Revenue	0%	31%	0%	0%
Payroll Cap				
Payroll Maximum	57-58%	…	57%	57%
Minimum % of max	90%	…	75%	– $16m

NFL local media is insignificant and local media comprises about 16% of total 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 (among a variety of exceptions)
MLB imposes a competitive balance tax for payrolls above a threshold which usually only applies to the New York Yankees.
The payroll cap base in all leagues excludes revenues unrelated and is subject to deductions over time for team venue expenses.
NFL payroll cap began in 1994, NBA in 1984 and NHL after the 2004-05 lockout.
NHL does have a modest sharing system where the top club subsidize bottom clubs that cannot make the payroll minimum.

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%	…	…

TV rights collectively sold in EPL, Bundesliga and Ligue 1 and individually sold in La Liga and Serie A before 2010-11 season.
Bundesliga merit: 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% appearances over the 4 previous and current seasons.
Starting in 2010-11 Serie A merit: 10% club history, 15% last 5 years and 5% current season.
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 Villarreal and Sevilla would be 40% equal and 60% merit.

English Premier League Media Revenue Shares 2008-09 (€M)

Club	Basic	Facility	Merit	Foreign	EPL TV	UEFA	Total
Manchester United	16,328	14,949	17,884	11,287	60,447	38,278	98,726
Liverpool	16,328	14,413	16,989	11,287	59,017	23,168	82,185
Chelsea	16,328	12,275	16,096	11,287	55,986	30,911	86,897
Arsenal	16,328	11,741	15,201	11,287	54,557	26,748	81,305
Everton	16,328	10,671	14,306	11,287	52,593	-	52,593
Aston Villa	16,328	11,207	13,413	11,287	52,235	365	52,600
Tottenham Hotspur	16,328	10,671	11,625	11,287	49,911	385	50,296
West Ham United	16,328	9,068	10,730	11,287	47,413	-	47,413
Fulham	16,328	6,930	12,518	11,287	47,063	-	47,063
Manchester City	16,328	9,603	9,835	11,287	47,053	5,375	52,428
Wigan Athletic	16,328	6,930	8,942	11,287	43,486	-	43,486
Stoke City	16,328	6,930	8,047	11,287	42,592	275	42,866
Newcastle United	16,328	12,275	2,683	11,287	42,573	-	42,573
Bolton Wanderers	16,328	6,930	7,154	11,287	41,698	-	41,698
Portsmouth	16,328	6,930	6,259	11,287	40,803	-	40,803
Blackburn Rovers	16,328	7,465	5,366	11,287	40,445	-	40,445
Sunderland	16,328	6,930	4,471	11,287	39,015	-	39,015
Hull City	16,328	6,930	3,576	11,287	38,121	-	38,121
West Bromwich Albion	16,328	7,999	895	11,287	36,509	-	36,509
Middlesborough	16,328	6,930	1,788	11,287	36,333	-	36,333
6-team parachute	48,990	-	-	33,858	82,848	-	82,848
EPL Totals	375,554	187,774	187,779	259,590	1,010,697	125,505	1,136,202

EPL sharing formula: 50% equal, 25% merit (standings), and 25% facility (appearances).

La Liga and Ligue 1 Media Revenues 2009-10 (€K)

La Liga	Media	UEFA	Ligue 1	Media	UEFA
Barcelona	178,100	39,522	Olympic Lyonnais	78,750	29,368
Real Madrid	158,700	27,208	Olympique Marseille	70,999	17,268
Atlético de Madrid	62,200	15,369	Girondins Bordeaux	65,377	30,106
Sevilla	48,720	24,720	Paris St. Germain	32,032	
Valencia	47,123	5,123	Lille	37,970	3,340
Villarreal	28,527	3,527	Stade Rennais	26,605	
Getafe	18,000		Toulouse	22,657	
Athletic de Bilbao	17,000		Saint-Etienne	25,120	
Zaragoza	14,000		Monaco	25,890	
Deportivo	14,000		Auxerre	30,923	
Español	13,700		Nice	18,099	
Mallorca	13,700		Lorient	22,327	
Osasuna	13,000		Sochaux-Montbeliard	18,151	
Racing de Santander	12,800		Nancy Lorraine	19,615	
Almería	12,500		Valenciennes	19,466	
Hércules	12,500		Grenoble	14,071	
Sporting de Gijon	12,000		Le Mans	14,945	
Málaga	12,000		Boulogne	13,948	
Sociedad	12,000		Lens	25,250	
Levante	12,000		Monpellier	24,528	
Totals	712,570	115,469	Totals	606,723	80,082

Media revenues include UEFA TV revenues

Big 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%
Fiorentina	69.7	22.7	32.6%	106.4	65.5%
Manchester City	66.0			152.8	43.2%
Roma	65.6	2.4	3.7%	122.7	53.5%
Girondins de Bordeaux	65.4	30.1	46.0%	115.8	56.5%
Aston Villa	63.6			109.4	58.1%
Tottenham	62.9			146.3	43.0%
Atlético de Madrid	62.2	15.4	24.8%	124.5	50.0%
Stuttgart	47.8	23.7	49.6%	114.8	41.6%
Schalke	35.4			139.8	25.3%
Hamburger	33.7	8.0	23.7%	146.2	23.1%

Source : Deloitte Sports Business Group. Media revenue includes UEFA TV money.
List includes all clubs with total revenue over €105 million. in 2010
By comparison 32 NFL clubs each received €90 million media revenue in 2010.

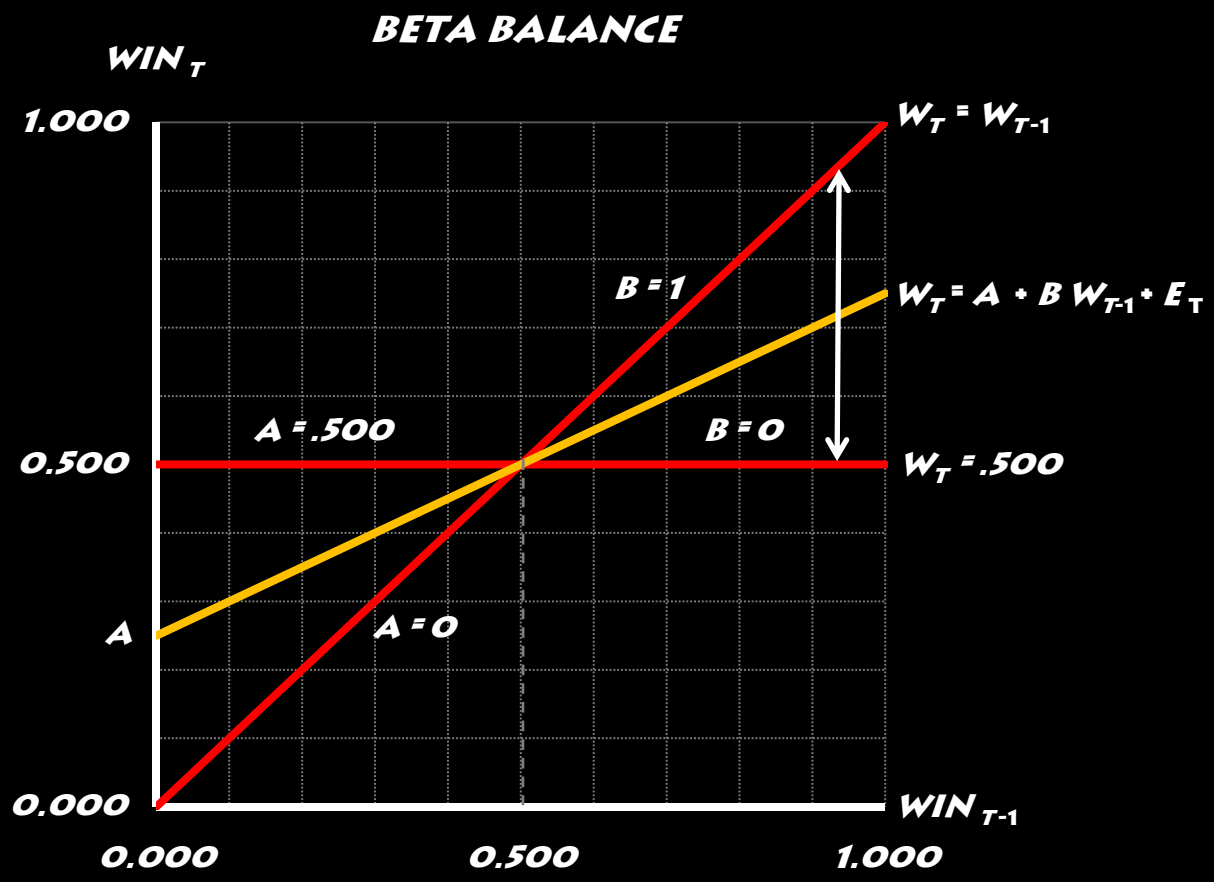
COMPETITIVE BALANCE

The inter-seasonal dynamics of competitive balance can be captured in an auto-regressive β-estimate of continuity of winning percentages w_{ijt} for team i in league j from season t-1 to season t, where $\beta \in [0,1]$.

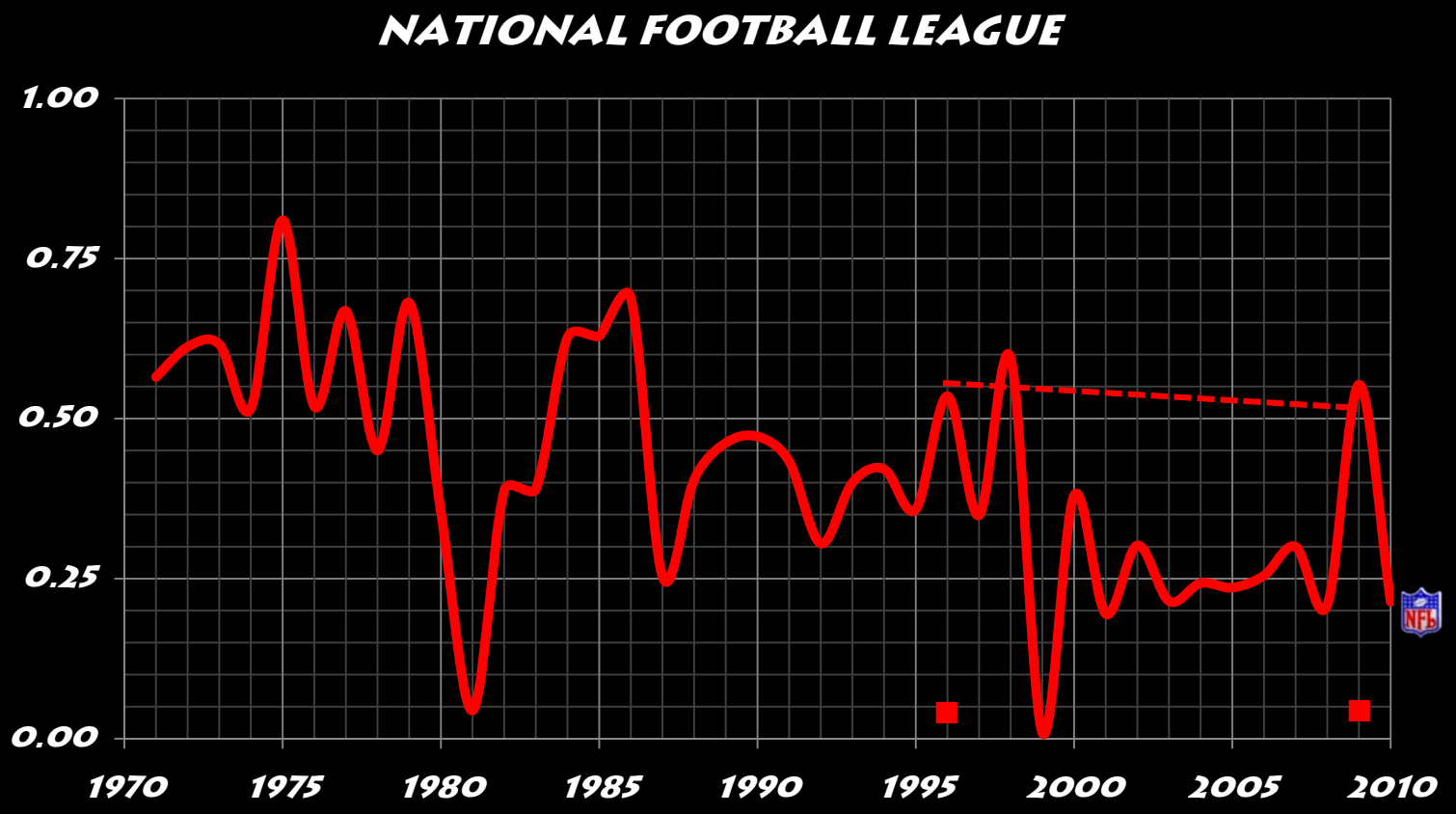
$$w_{ijt} = \alpha + \beta w_{ijt-1} + e_{ijt}$$

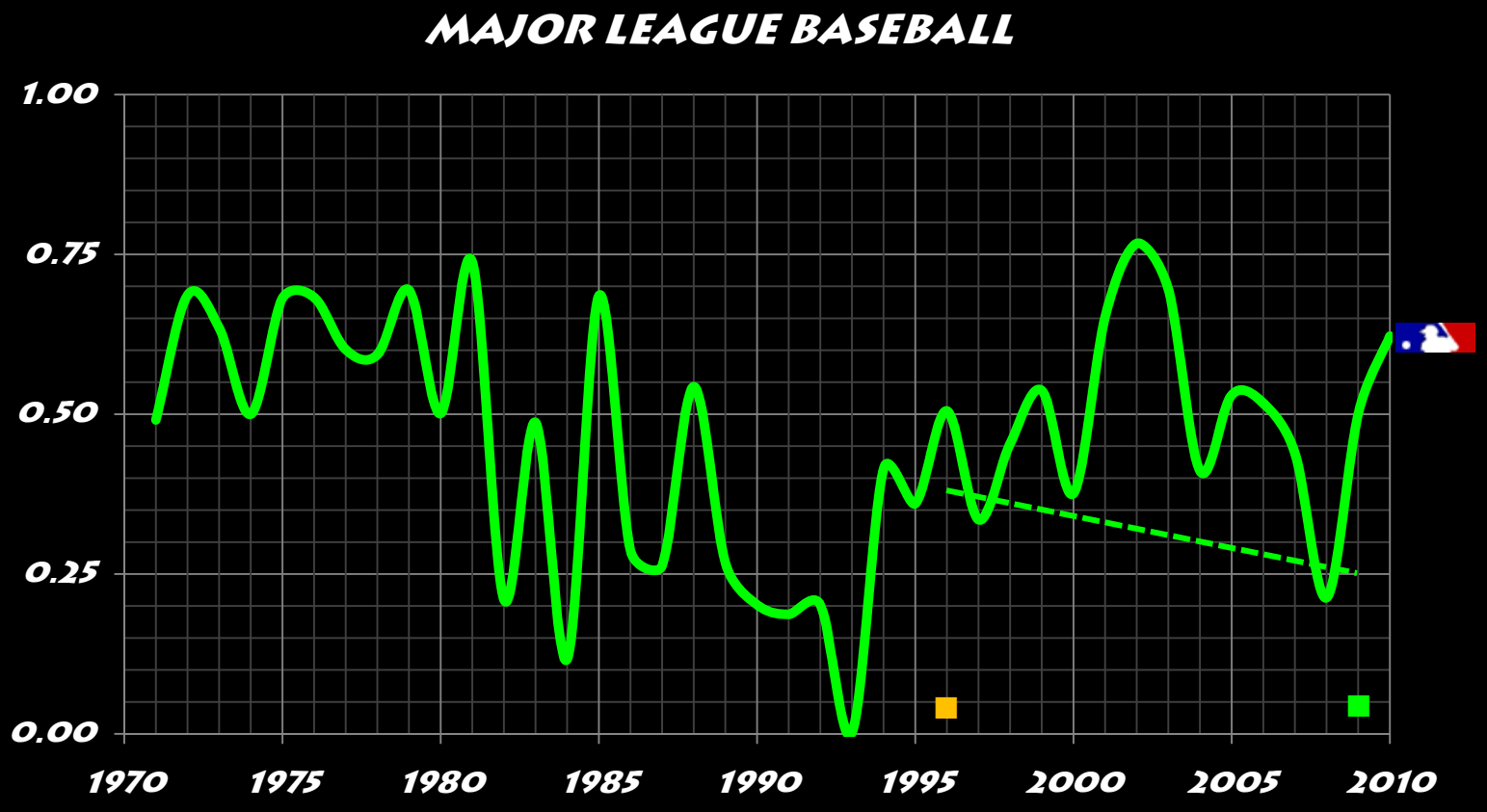
If α =.500 and β = 0 then w_{ijt} = .500 and each season is a random walk and every team has an equal chance to win.

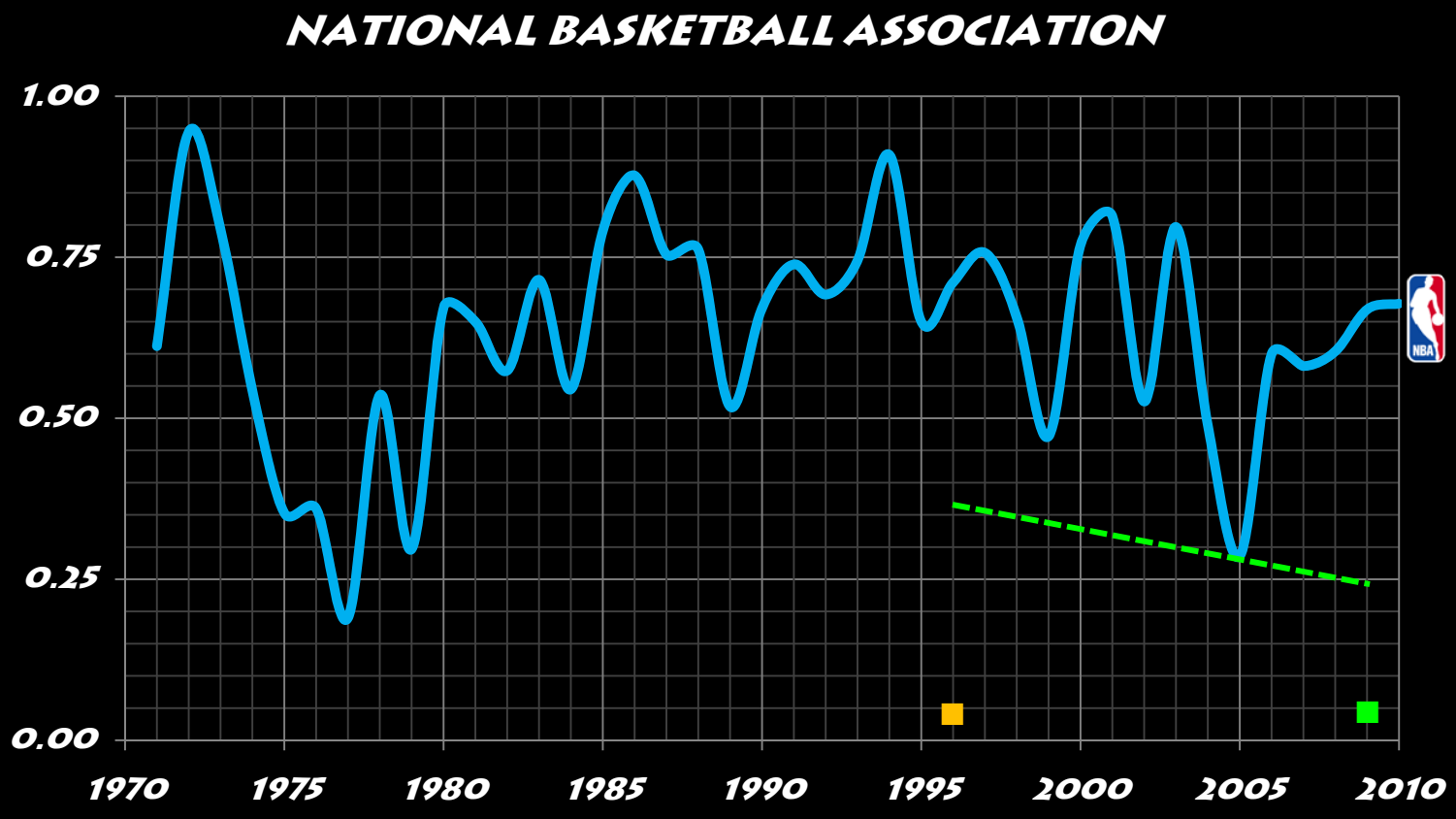
If α=0 and β=1, then $w_{ijt} = w_{ijt-1}$ then outcomes are predetermined.

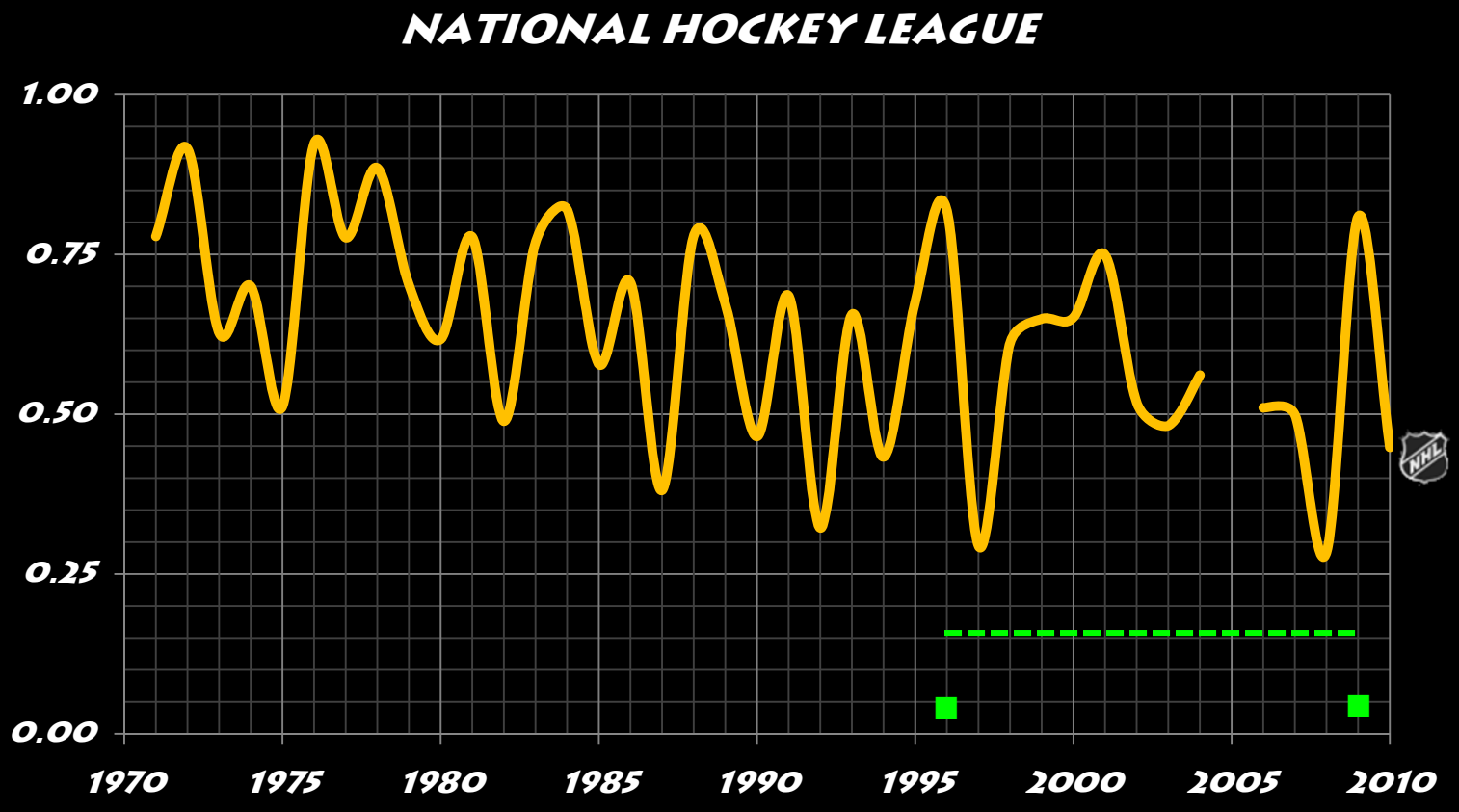


NORTH AMERICAN LEAGUES

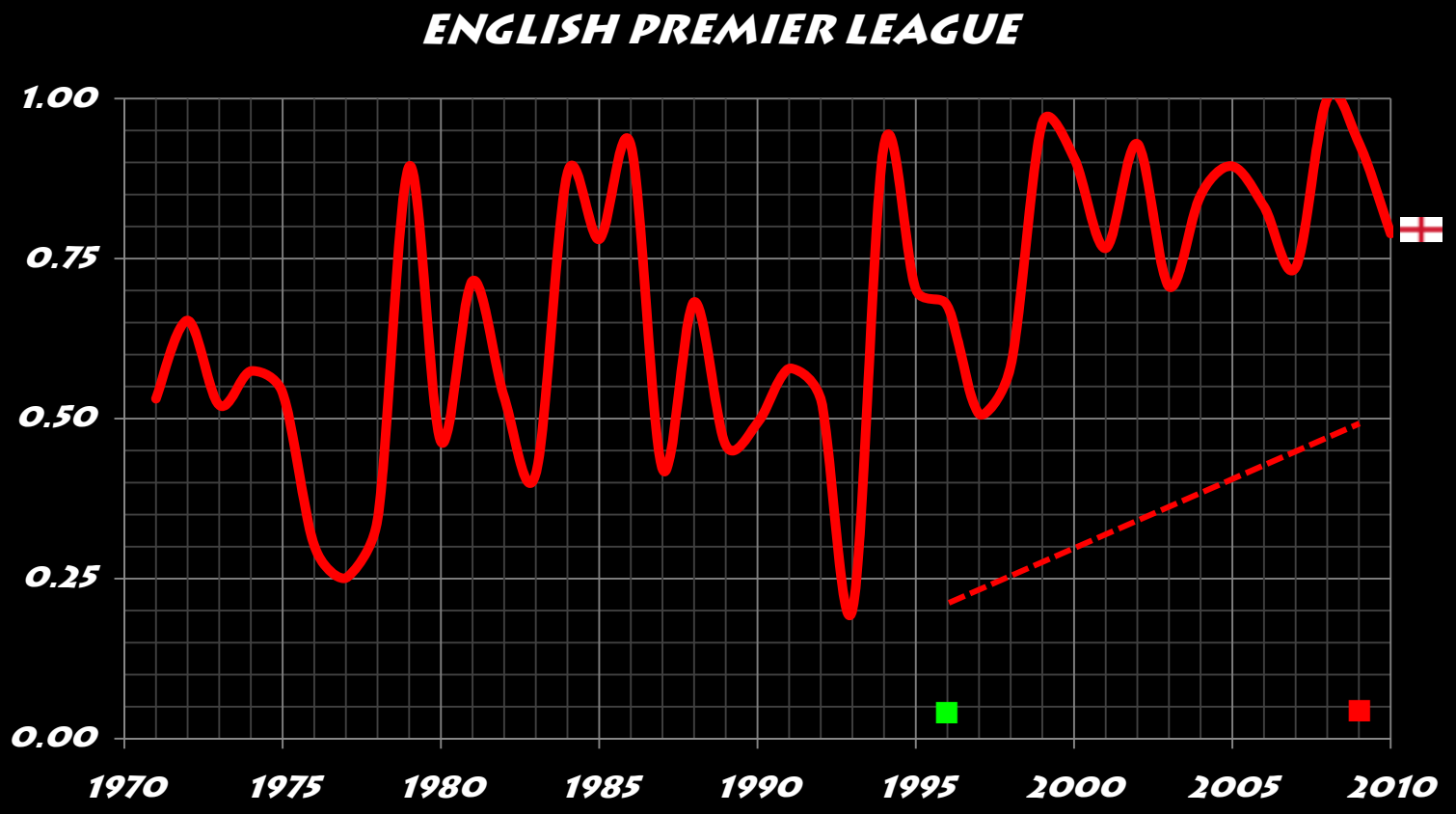


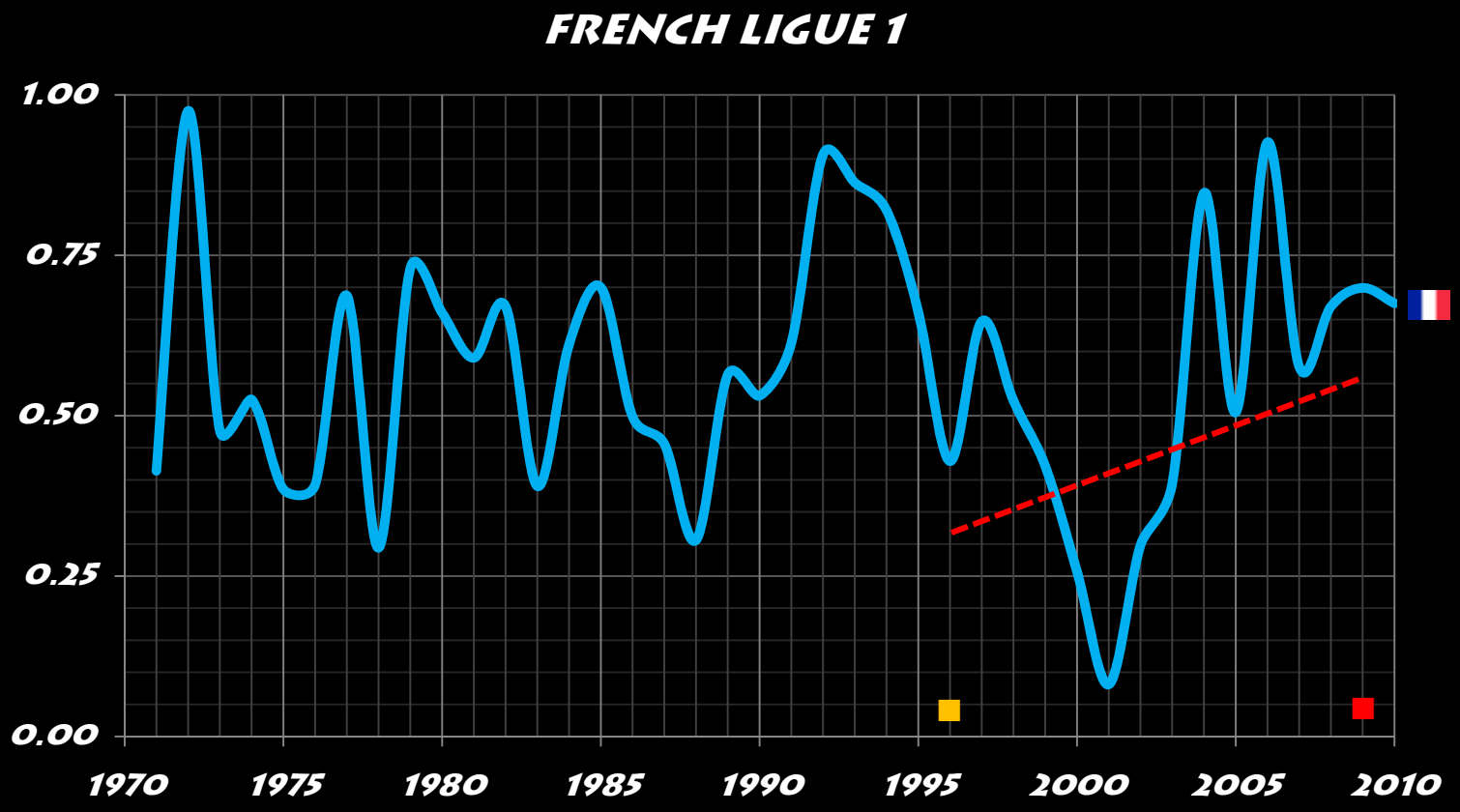


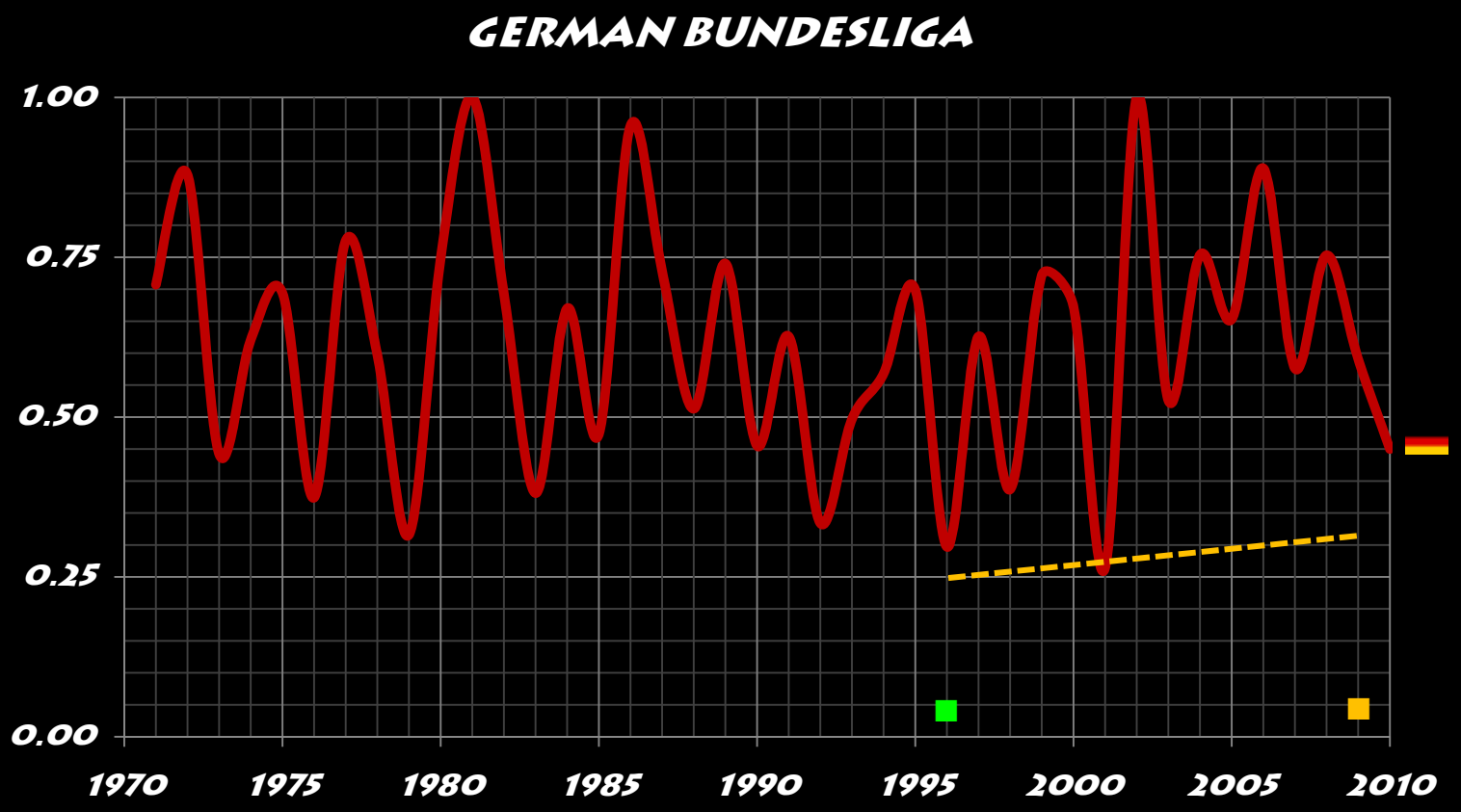


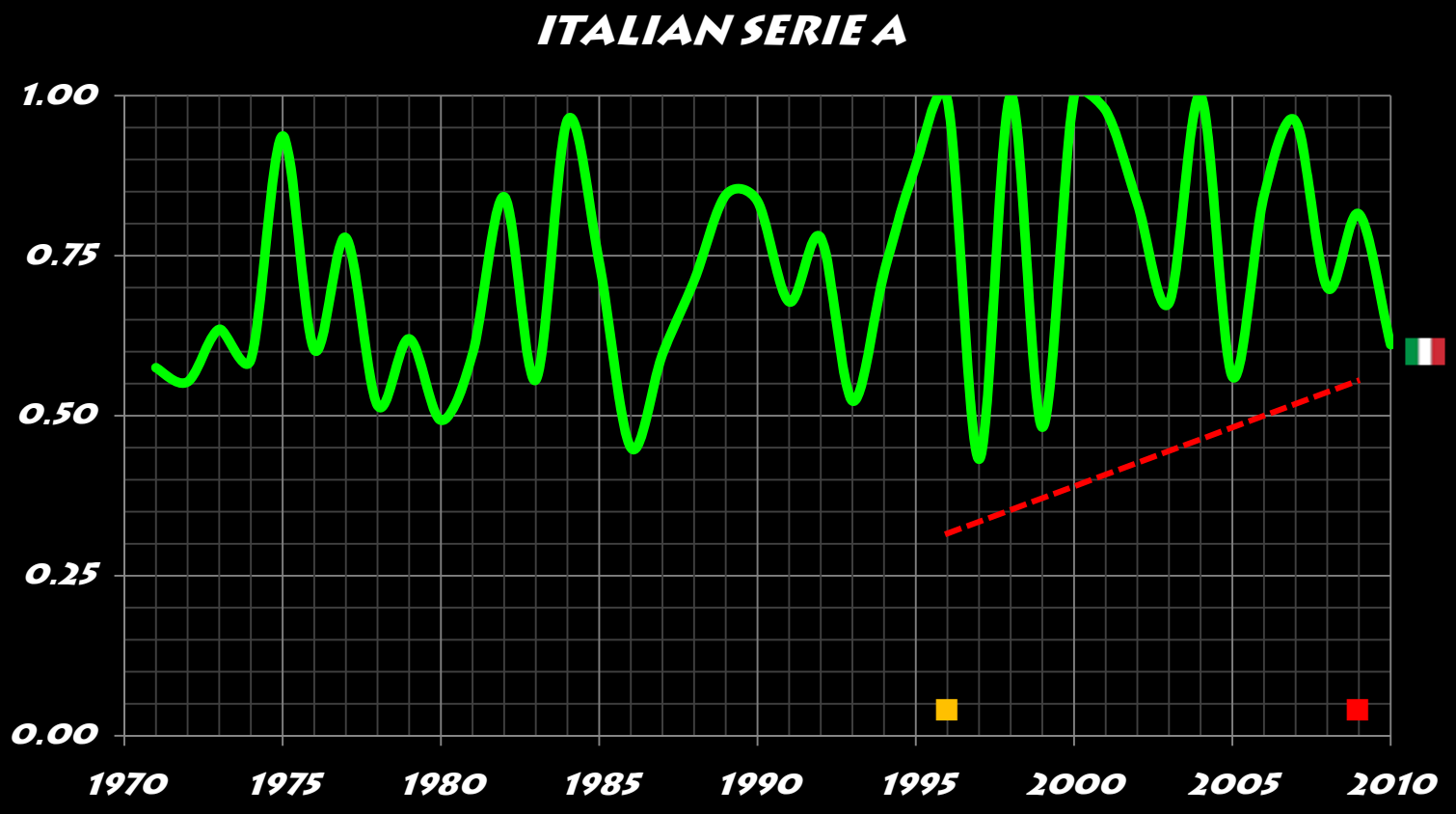


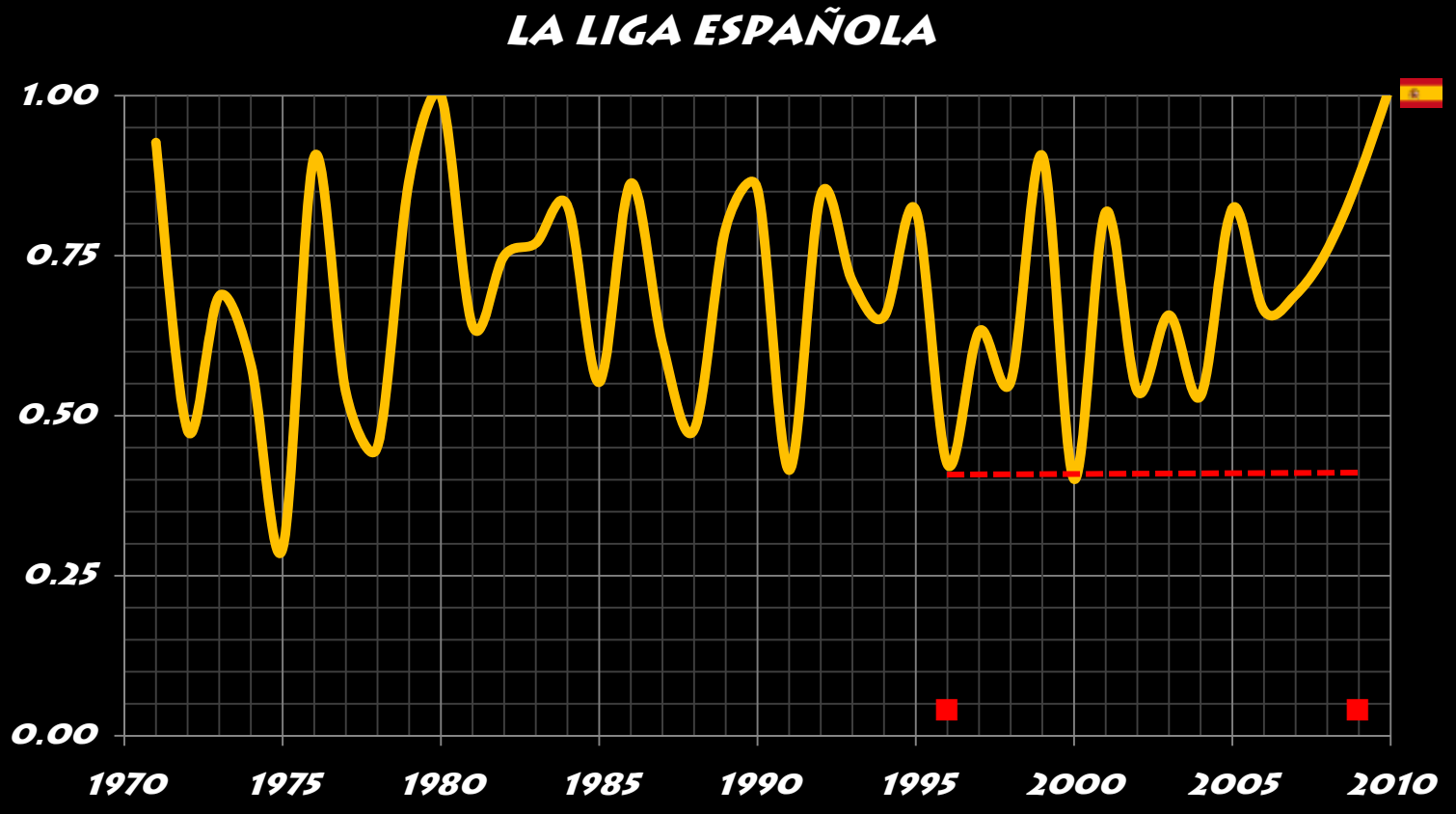
BIG 5 EUROPEAN LEAGUES



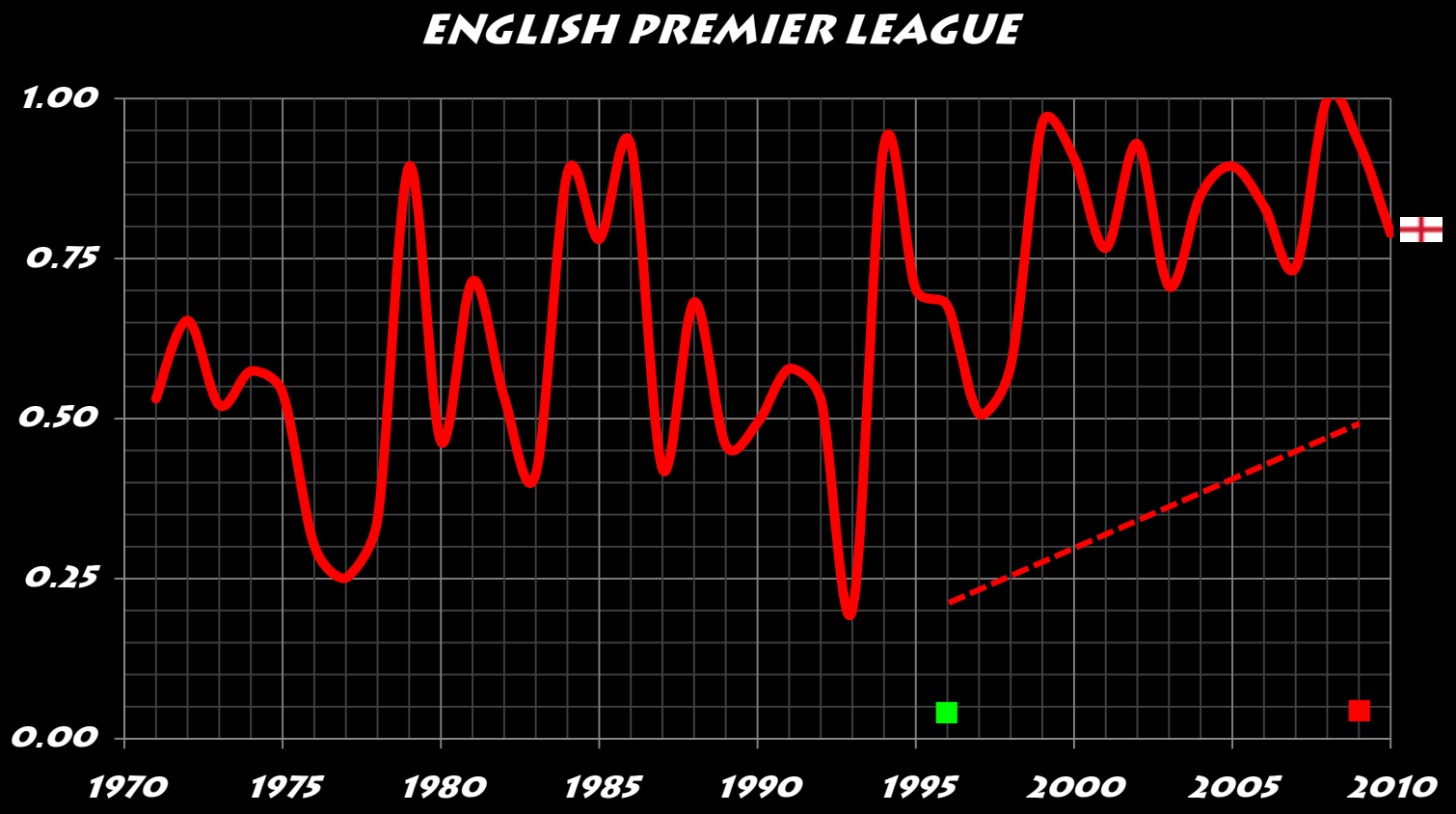


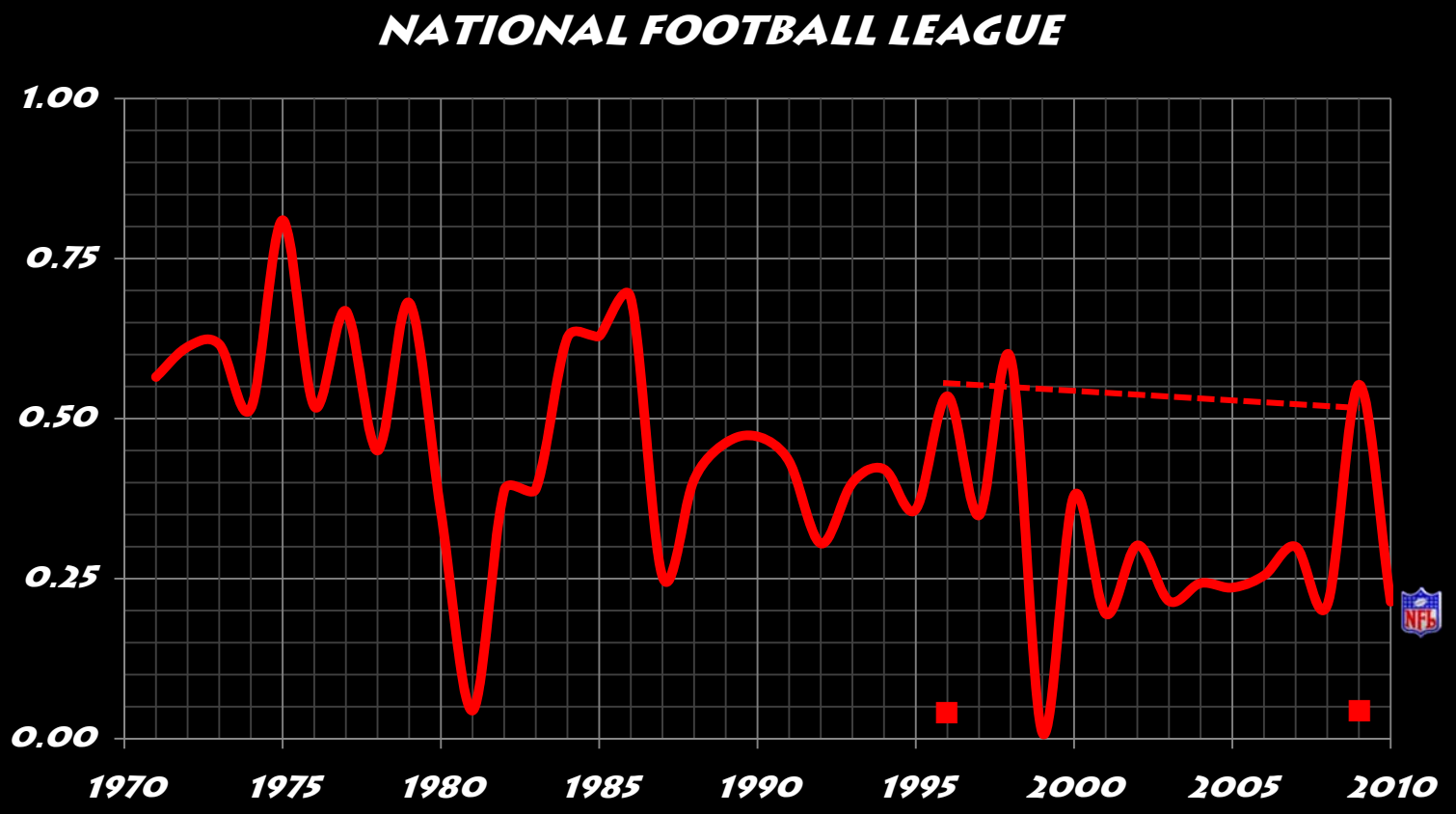


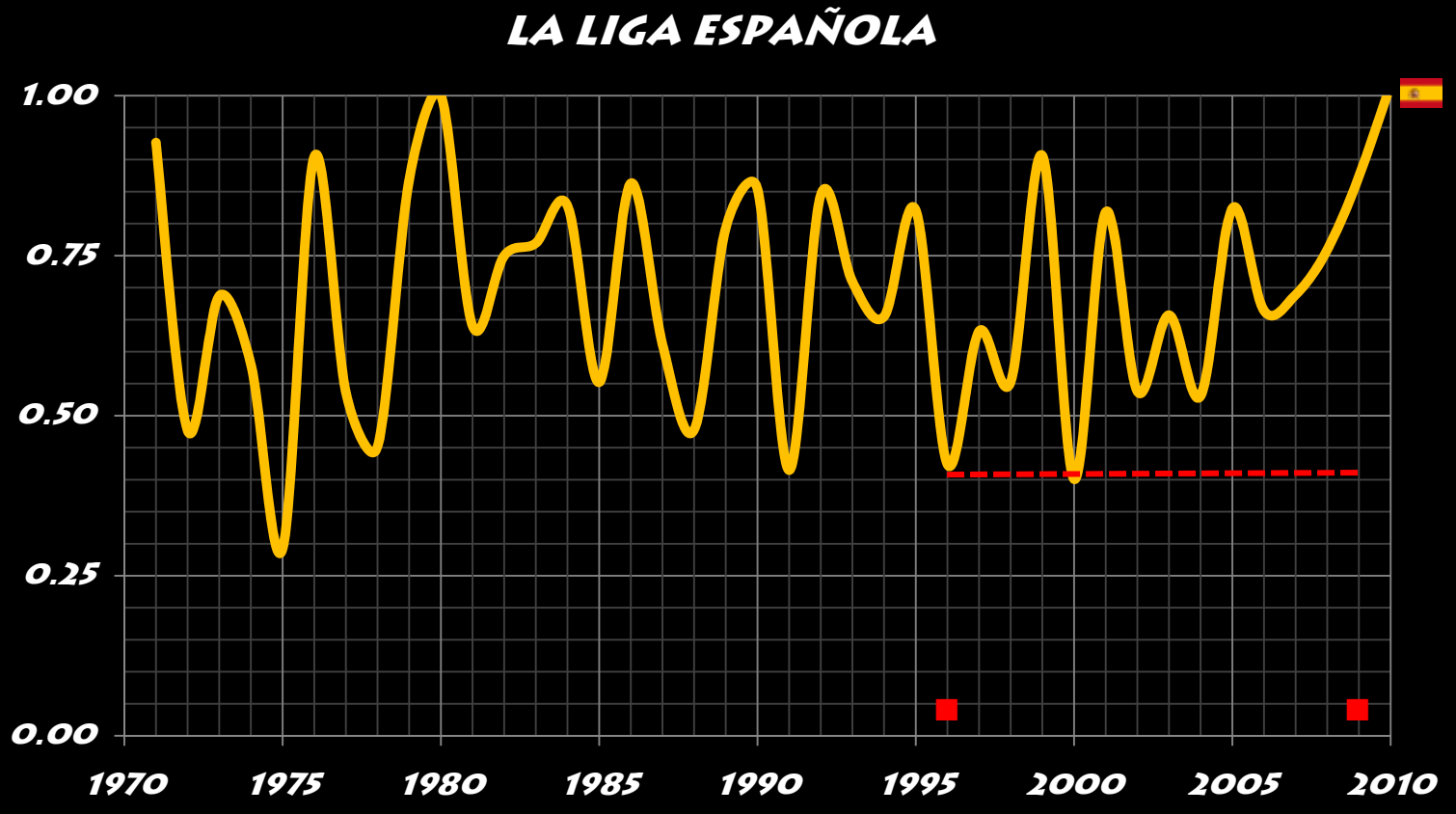




DISCUSSION







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%	…	…

TV rights collectively sold in EPL, Bundesliga and Ligue 1 and individually sold in La Liga and Serie A before 2010-11 season.
Bundesliga merit: 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% appearances over the 4 previous and current seasons.
Starting in 2010-11 Serie A merit: 10% club history, 15% last 5 years and 5% current season.
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 Villarreal and Sevilla would be 40% equal and 60% merit.