Competitive Balance in Team Sports
and
the Impact of Revenue Sharing

a survey of the economic theory

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In this paper, we present a survey of the main results from economic theory regarding the variables that affect the competitive balance in a professional sports league and the impact of revenue sharing. The generally accepted proposition that revenue sharing does not affect the competitive balance in a profit maximizing league has been challenged by many. It is shown that the competitive balance and the impact of revenue sharing do not only depend on the relative size of the market of the clubs, but that they are also affected by the objectives of the club owners and the importance to spectators of absolute team quality and uncertainty of outcome. Also the clubs' hiring strategies, including the talent supply conditions, turn out to be important elements affecting competitive balance and the impact of revenue sharing.

One of the major concerns of league administrators in the professional team sports industry on both sides of the Atlantic has always been the competitive balance in the league. Although the empirical research does not always confirm the importance of a balanced competition (see Borland and Mc Donald, 2003), it is generally accepted that an excessive imbalance in sports competitions will have a negative impact on spectator interest. In the literature, different measures have been proposed to improve the competitive balance. Among these regulations, revenue sharing has been the most controversial one. The proposition that revenue sharing does not affect the distribution of playing talent among profit maximizing teams, has been challenged by many sports economists since the article of Rottenberg (1956) and the formal proof of the proposition by Quirk and El Hodiri (1974).

In dealing with the impact of revenue sharing on competitive balance, it is important to realize that there are important structural differences between the US major leagues and the EU national leagues. The US leagues are closed monopoly leagues with no possibility of relegation or promotion, and with a more or less constant supply of talent at a give moment of time. US teams are playing more than just one home and one away game against other teams. Most US major leagues organize play-offs after the regular season. North America does not organize international championships for the winners of the national league championships, such as the Champions League or the UEFA cup in European soccer. Also, Europe does not have any kind of rookie draft system. Nevertheless, the analysis in this review applies to both league structures if a few important differences are taken into account as will be discussed below.

The aim of this paper is to present an overview of the main findings from economic theory regarding the competitive balance in a league and the impact of revenue sharing. No discussion of the empirical evidence is included. In the next sections, we start with the basic model specification. In the following sections, the main determinants of competitive balance and the impact of revenue sharing are analysed and some policy implications are discussed. The last section concludes.

Model Specification

The model describes a single monopoly league in professional team sports. The clubs are located in large or small markets, where they hold a local monopoly position. Relocation is excluded. Clubs are wage takers on a competitive player market. The season revenue of each club depends on three important variables: the size of the market, which affects the drawing potential of the club for supporters and players, the winning percentage of the team, because supporters prefer to watch a winning team, and the uncertainty of outcome. Spectators' interest and match attendance are assumed to fade if the winning percentage of a team becomes too high so that there is not enough uncertainty of outcome. The winning percentage of a team depends on its relative playing strength, which is a function of the number of playing talents of the team compared with the other teams in the league. On the cost side, the total season cost of a club consists of the cost of capital and the cost of playing talent.

In order to show the main results from economic theory, we start from a simple 2-team model with well-behaved quadratic club revenue functions. This model is flexible enough to derive the most important results, on the one hand, and it allows us to show some results using simple graphical representations, on the other hand. However, it should be clear that not all results, based on this simplified model, are also true for a more general revenue function in an n-team model (See Fort and Quirk, 2004; Kesenne, 2000).

We assume that both clubs have the following revenue function:

$$R_i = m_i w_i - b_i w_i^2 \qquad (1)$$

where R_i is the season revenue of a club; w_i is the winning percentage of club i and m_i *is* the size of the market. Both variables are assumed to have a positive impact on team revenue. The negative second term represents the importance of the uncertainty of outcome. The parameter b_i reflects the spectators' preference for a more balanced competition, which can be different for each club. The higher value of b_i , the more the supporters prefer a balanced competition. This specification of the revenue function implies that, initially, the winning percentage has a positive but decreasing marginal effect on club revenue, but that the effect can turn negative in case of an excessive competitive imbalance. The winning percentage of a club, which depends on its relative playing strength, can be written as:

$$w_i = \frac{x_i}{x_i + x_j} \qquad (2)$$

where x_i is the number of playing talents (not the number of players) of team i. The denominator, which is the sum of all talents in the league, can be considered to be the total supply of playing talent in the league.

On the cost side, the cost of playing talent depends on the unit cost of talent c^*. The capital cost c_i^0 is assumed to be proportional to the number of talents in a team, i.e.: $c_i^0 = kx_i$ where k is the proportionality factor that is the same for every club. The total season cost (C_i) can then be written as:

$$C_i = c^* x_i + c_i^0 \quad \text{or} \quad C_i = cx_i \qquad \text{where} \qquad c = c^* + k \tag{3}$$

This assumption simplifies the analysis and the graphical representation of the results.

Competitive Balance and Revenue Sharing

The most important factor that affects the competitive balance in a league is the difference in the size of the market where the clubs are located. The larger the market, in terms of population size and density, the larger a team's drawing potential for spectators and players. However, it is obvious that many other factors affect the competitive balance in a league, and the impact of revenue sharing. Starting from the simple model specification in (1) to (3), four major factors will be discussed:

- the objectives of the clubs
- the spectator preferences
- the specifics of the sharing arrangement
- the hiring strategies of clubs

The objectives of the clubs

In the US literature, the usual assumption is that all clubs are profit maximizers, meaning that are trying to maximize the difference between total season revenue and total season cost (see Noll, 1974; Scully, 1989; Fort and Quirk, 1995):

$$Max\ \pi_i = R_i - C_i \tag{4}$$

where π_i indicates season profits. However, some European sports economists assert that professional soccer clubs are utility maximizers (see Sloane, 1971). A more operational variant of the utility maximization assumption is called win maximization. Kesenne (1996, 2000) argues that clubs are trying to maximize their winning percentage under the breakeven constraint or a given profit or loss rate. A club can be profitable without being a profit maximizer. The only way to maximize the winning percentage is to maximize the playing talent of the team, so that the model can be written as:

$$\begin{aligned} &Max\ x_i \\ &\text{Sub } R_i - C_i = \pi_i^0 \end{aligned} \tag{5}$$

where π_i^0 is a fixed amount of profits. For simplicity reasons, we will further assume that profits are zero.

Also in the US, economists have their doubts about the profit maximizing assumption in the major leagues (see Zimbalist, 2003). Rascher (1997) introduced a model assuming that professional sports clubs are maximizing a linear combination of profits and wins, which can be written as:

$$\text{Max } \pi_i + \alpha_i w_i \qquad \text{with } \alpha_i \geq 0 \tag{6}$$

Also this utility maximization model allows a club to be profitable without being a profit maximizer.

These different club objectives have an important impact on the competitive balance in a league. To show this, we will consider only the two extremes cases of profit maximization and win maximization. Given the model specification in (1) to (3), and assuming that clubs only differ in the objectives of the owners, one can derive that the distribution of talent is more unequal if all clubs are win maximizers, compared with a league where all clubs are profit maximizers. This can be illustrated graphically in figure 1, which shows the clubs' demand curves for the large market club *i* and for the small market club *j*. Both clubs differ only in market size, indicated by the starting point of the demand curves on the vertical axis.

(insert Figure 1)

On the vertical axis the unit cost of talent is indicated, and on the horizontal axis the number of playing talents. The origin of the large market club is on the left side of the diagram, the origin of the small market club is on the right side. The distance between the two origins indicates the (constant) supply of playing talent. If clubs are profit maximizers, the linear demand curves for talent are given by the marginal revenue (MR). The marginal revenue is the extra revenue of one more talent in the team; profit maximizing clubs are only interested in hiring more talent if the extra revenue is higher than the unit cost of talent. The point of intersection of the two MR-curves yields the competitive market equilibrium E_p in a profit maximizing league, with the distribution of talent X_p on the horizontal axis, and the market clearing unit cost of playing talent C_p on the vertical axis. The linear demand functions of a win maximizing club are given by average revenue (AR). The average revenue is the revenue per unit of talent. If clubs are win maximizers under the breakeven condition, they will hire talent until the average revenue equals the unit cost of talent. The point of intersection of the two AR-curves indicates the player market equilibrium E_w for a win maximization league. As can be seen in figure 1, the distribution of talent X_w in a win maximization league is more unequal than in a profit maximizing league. It follows that regulations to cure the imbalance are more needed in a win maximization league. Moreover, it can be shown that, in a win maximization league, also total league revenue is lower than in a profit maximization league, where playing talent is more efficiently allocated. The distribution of playing talent in a win maximization league is causing a welfare loss. Players are employed in the team where their productivity is not at the highest possible level (see Kesenne, 2000)-. Another consequence of win maximization is that the unit cost of playing talent is higher ($C_w > C_p$), because win maximizing clubs spend all their revenue on talent so that the market demand for talent in higher.

Figure 1 shows also that the distribution of playing talent is different if one club is a profit maximizer and the other is a win maximizer. If the small market club is a win maximizer and the large market club is a profit maximizer, the competition will be more balanced as given by the point of intersection of MR_i *and* AR_j (and vice versa).

The next question is how revenue sharing changes the distribution of talent. For model (1) to (3), it can be shown that, in a profit maximization league, gate revenue sharing does not affect the competitive balance (Rottenberg, 1956; Quirk and El Hodiri, 1974; Fort and Quirk, 1995). All clubs equally reduce their demand for talent, because they all have to share the extra match revenue from an extra talent with each visiting club. Consequently, also the unit cost of talent goes down.

(insert Figure 2)

This can be seen in figure 2. The downward shift of both demand curves results in the same competitive balance after sharing X_p. Because the supply of talent is constant and the total demand for talent goes down, the competitive market outcome is that also the unit cost of talent will be lower ($C_p^* < C_p$).

However, in a win maximization league, it can be easily seen that revenue sharing improves the competitive balance. Given the breakeven constraint, the small market club will increase its demand for talent as long as it benefit from the sharing arrangement, while the large market club lowers its talent demand. The impact of revenue sharing on the equilibrium unit cost of talent in a win maximization league is less obvious. Because the large market club reduces its demand for talent and the small market club increases its demand for talent, the outcome depends on the relative size of the demand shifts. Because the downward shift of the demand curve of the large market club is smaller than the upward shift in the small market club, the unit cost of talent will go up. The reason is that revenue sharing moves the distribution of talent in the direction of the profit maximization equilibrium, where total league revenue is at its maximum level given the efficient allocation of talent. An alternative explanation is that the large market club has more talents, and since the number of talents appears in the denominator of the average revenue ($AR= R/x$), the shift in the large club's demand curve is smaller

.

(insert Figure 3)

Figure 3 illustrates the impact of revenue sharing in a win maximization league. Before sharing, the distribution of playing talent is indicated by X_1. After sharing, the large market club's demand for talent has come down, while the small clubs demand has gone up, which results in a more equal distribution of playing talent as indicated by X_2. The unit cost of talent goes up from C_1 to C_2.

The spectator preferences

When clubs only differ in market size, the large market club dominates the small club in terms of talent. However, clubs can also differ in the preferences of their supporters for a more balanced competition. The larger the parameter b_i in revenue function (1), the more spectators value a balanced competition. If parameter b_i is large enough to offset the difference in market size m_i , it is possible that the small market club dominates the large market club. An important implication of this situation is that, if the small market team dominates, the distribution of playing talent in a profit maximization league is more unequal than in a win maximization league, (see Kesenne, 2004a).

(insert Figure 4)

In figure 4 this type of imbalance is shown. The slope of the demand curve of the large market club, which is determined by the parameter b_i , is much steeper than the slope of the demand curve of the small club. It can be seen that in this case the distribution of talent in a win maximising league X_w can be more equal than in a profit maximizing league X_p.

This situation has consequences for the impact of gate revenue sharing. In a profit maximization league, the proposition still holds that revenue sharing does not change the distribution of talent. In a win maximization league, gate revenue sharing still improves the competitive balance but, in this situation, now the ill-performing large market club profits from the sharing arrangement to the disadvantage of the well-performing small market club. The reason is that the small market club has the largest budget if it dominates the large market club. Moreover, in this scenario, gate revenue sharing implies a loss of total league revenue, because the distribution of talent is moving away from the most efficient allocation of talent.

In revenue function (1), only the winning percentage of the home team, as an indication of the relative quality of that team, is included. However, the interest of spectators can also be influenced by the absolute quality of the teams (see Marburger, 1997) or by the winning percentage of the visiting team. Certainly in the small European countries, where many supporters travel with their team to watch the away games, the winning percentage of the visiting team can be a important determinant of club revenue. For instance, revenue function (1) can be adjusted as:

$$R_i = m_i w_i - b_i w_i^2 + \varepsilon_i w_j \tag{7}$$

where ε_i is a positive parameter. Depending on the relative size of the parameter ε_i for each club, the competitive balance will be affected. But more important is that, with revenue function (7), gate sharing improves the competitive balance in a profit maximization league (see Kesenne, 2000).

The specifics of the sharing arrangement

The two most important sharing arrangements, gate sharing and pool sharing, can have a different impact on competitive balance. A gate sharing arrangement implies that the revenues from the ticket sales of every single match are shared between the home and the visiting club. In a 2-club league, the season revenue of a club, after sharing with share parameter μ, can be written as:

$$R_i^* = \mu R_i + (1-\mu)R_j \tag{8}$$

where the star refers to the after-sharing revenue. The 60/40 gate sharing in NFL (the National Football League in the US) is the best example of this kind of arrangement.

In a simplified pool sharing system, all clubs contribute a certain percentage of their total season revenue in a pool, which is managed by the league and equally distributes among all clubs. In its simplest version, this can be written as:

$$R_i^* = \mu R_i + \frac{(1-\mu)}{2}(R_i + R_j) \tag{9}$$

The sharing of broadcasting rights in the North American major leagues and in most European national soccer leagues are examples of this sharing arrangement. However, both sharing systems are identical, apart from the value of the share parameter, if there are only 2 clubs in the league, but they clearly differ in the realistic case of more than 2 teams. It is also possible that some club revenues are not shared. Fort and Quirk (1995) have shown that, for revenue function (1), gate sharing can also worsen the competitive balance if some club revenues, such as local broadcasting rights, are not shared. Kesenne (2001) has shown that, for revenue function (7), gate sharing improves the competitive balance in a profit maximization league, whereas pool sharing does not change the balance.

In a win maximization league, revenue sharing always improves the competitive balance, whatever the specifics of the sharing arrangement. Nevertheless, if an imbalance shows up where the small market club dominates the large market club, revenue sharing punishes the well-performing small market team and lowers total league revenue. Therefore, one might consider another sharing system, which is not based on the size of the budget, but on the size of the market. The following sharing arrangement can serve as an example:

$$R_i^* = R_i - \beta(m_i - \overline{m}) \qquad \text{with} \qquad \beta > 0 \tag{10}$$

where $\overline{m}$ is the average market size of all clubs in the league, and a higher value of the parameter β means more sharing. In this case, money is taken away from the large market club and given to the small market club. This sharing arrangement not only has the advantage of establishing a more balanced competition in the scenario where the large club dominates the small market clubs, it also avoids the disadvantage that the small market club is punished for performing better than the large market club. Moreover, this sharing arrangement always increases total league revenue by reducing the welfare loss, because it moves the win maximization equilibrium closer to the profit maximization equilibrium. It follows that, practical implementation problems aside, sharing system (10) looks superior to (8) and (9).

The hiring strategies of clubs

In most studies, to the best of our knowledge, the explicit or implicit assumption is made that the supply of talent is constant (Quirk and El-Hodiri, 1974; Fort and Quirk, 1995; Vrooman, 1995). Moreover, it is assumed that team managers also take the constant supply into account when hiring new talent, because they know that one extra talent not only strengthens the own team, but also weakens another team in the league. One of the implications of this approach is that the winning percentage in the model (1) to (3) can be simply replaced by the number of playing talents. As can be derived from (2), the winning percentage w_i is equal to x_i if the total supply of talent is constant and normalized to equal unity. In this model, the strategy of one club is not affected by the strategy of the other club so that the competitive market equilibrium can be easily found as illustrated in figure 1.

However, in a recent paper, Szymanski and Kesenne (2004) argue that the constant-supply approach is not a realistic option in Europe with its many open national soccer leagues, certainly after the Bosman verdict of 1995 by the European Court of Justice in Luxemburg, which established a free move of players between the countries of the European Union. Given the increased international player mobility in Europe, the supply of talent in each national league is variable. But even if the supply is constant, it is questionable if it can or will be fully internalized in the hiring decisions of the owners. Moreover, it is more realistic to assume that the hiring strategy of one team depends on the strategy of the other teams, which is a scenario that should be approached by game theory. Szymanski (2004) shows that, in a profit maximization league, the Cournot-Nash equilibrium results in a more equal distribution of talent than in the Walrasian competitive market equilibrium. The explanation can be found in the negative external effects that clubs cause on each other when hiring new talent. In the competitive equilibrium approach, it is implicitly assumed that these external effects are fully internalized, that is, they are taken into account in the hiring decisions of the clubs, so that they are neutralized. In the game theoretic approach, these externalities are not internalized. Because the large club has a higher marginal revenue, the negative external effect that the small club causes on the large club is larger then the external effect that the large club causes on the small club, so that the small club is better off in the game theoretic approach. Kesenne (2004b) shows that, in a win maximization league, the Cournot-Nash equilibrium and the Walrasian equilibrium both result in the same distribution of talent.

A simple numerical example shows the importance of the distinction between the Walrasian and the Cournot-Nash equilibrium. Let the parameters of revenue function (1) take the following values:

$$\begin{aligned} m_i &= 1 > m_j = 0.8 \\ b_i &= b_j = 0.5 \end{aligned} \tag{11}$$

and let the supply of talent be constant, and equal to one, in a competitive player market. In the conventional approach of a constant talent supply that is fully internalized, the talent distribution can be found at the point of intersection of the two the marginal revenue curves in figure 1, i.e.: $m_i - w_i = c = m_j - w_j$, which results in:

$$\frac{w_i}{w_j} = \frac{x_i}{x_j} = \frac{1+(m_i - m_j)}{1-(m_i - m_j)} = 1.5 \tag{12}$$

With a given marginal cost of talent, the Cournot-Nash equilibrium can be found by the solution of: $(m_i - w_i)w_j = c = (m_j - w_j)w_i$ (because $\frac{\partial w_i}{\partial x_i} \neq 1$) which results in:

$$\frac{w_i}{w_i} = \frac{x_i}{x_j} = \frac{m_i}{m_j} = 1.25 \tag{13}$$

Comparing (12) and (13) it can be seen is that the game theoretic approach results in a more balanced competition.

In a win maximization league, the talent distribution can be found at the point of intersection of the average revenue curves. In both the Walrasian and the Counot-Nash equilibrium, the talent distribution can be found as the solution of: $(m_i w_i - 0.5w_i^2)/x_i = c = (m_j w_j - 0.5w_j^2)/x_j$, which results in:

$$\frac{w_i}{w_j} = \frac{x_i}{x_j} = \frac{0.5 + (m_i - m_j)}{0.5 - (m_i - m_j)} = 2.33 \tag{14}$$

Comparing (14) to (12) and (13), one can see that the win maximization league shows a more unbalanced competition than the profit maximization league.

Turning to the impact of revenue sharing in the Cournot-Nash approach, Szymanski and Kesenne (2004) have proven that, for a 2-club model, with revenue functions (1), revenue sharing worsens the competitive balance a profit maximization league. This can be explained by the fact that revenue sharing partly neutralizes the negative external effects that clubs cause on each other, which is to the disadvantage of the small clubs. Kesenne (2005) has shown that this negative impact of revenue sharing disappears with a larger number of clubs in the league, which confirms the well-known general proposition that the Nash-Cournot equilibrium approaches the Walrasian competitive equilibrium if the number of firms increases.

Szymanski (2003) has also shown that revenue sharing improves the competitive balance if the sharing arrangement is such that a fixed sum is contributed to a prize fund awarded to the winning team.

Again, revenue sharing improves the competitive balance if clubs are win maximizers. As long as the sharing arrangement implies that money is transferred from the large budget club to the small budget club, it causes an upward shift of the small club's average revenue curve and a downward shift of the large club's average revenue curve.

Discussion and policy implications

If a reasonable degree of competitive balance is important for spectators, what can league administrators conclude from the findings of economic theory regarding the impact of revenue sharing? One of the first things to find out is if clubs are profit or win maximizers. So far, the empirical tests have not been of great help. All tests, based on the ticket pricing rule or the size of the price elasticity, do not reject the hypothesis of profit maximization, but they do not reject the win maximization hypothesis either, because the pricing rules turn out to be the same in both scenarios (Kesenne, 2002).

In general, the case for revenue sharing in a profit maximization league is not very strong. In the benchmark scenario of Rothenberg (1956) and Quirk and El Hodiri (1974), revenue sharing does not affect the competitive balance. Moreover, the distribution of talent is optimal if clubs are profit maximizers, so that revenue sharing, which leads to a less efficient allocation of talent, is not needed. So far, to the best of our knowledge, the impact of revenue sharing in the most realistic scenario has not been analysed. This scenario should include a league with more than 2 clubs, where club revenue is affected by both the winning percentage of the home and the visiting team, where the revenue sharing system is based on the sharing of gate receipts, the pool sharing of broadcasting rights and the non-sharing of some other revenue, and where the talent supply can be fixed or flexible, but analysed in an appropriate game theoretic setting. Some partial results, taking onto account deviations from the benchmark case, show that revenue sharing can improve or worsen the competitive balance, which leads to the general conclusion that the impact of revenue sharing on the competitive balance can expected to be rather limited in the profit maximization scenario.

According to most American economists, this scenario seems to apply to the North American major leagues, where clubs are assumed to be profit maximizers, and the supply of talent is constant and internalized into the hiring strategy of the owners. Some club revenues are shared, like gate receipts in NFL (National Football League) and MLB (Major League Baseball). Also federal broadcasting rights are pooled and redistributed, while local television rights are not shared.

If all clubs are win maximizers, the theory shows that revenue sharing is effective in establishing a more balanced distribution of talent among large and small market clubs. Moreover, it can be expected that, without any sharing, the distribution of talent in a win maximization league is more unequal than in a profit maximization league. Also, the distribution of talent without sharing is suboptimal in terms of total league revenue, because of the inefficient allocation of talent among clubs. In the national soccer leagues in Europe, where clubs are assumed to behave more like win maximizers, revenue sharing will be even more appropriate after the abolition of the transfer system by the Bosman verdict. The small market clubs, being net-sellers of talent on the transfer market, complain about a dramatic loss of revenue. If the transfer market has partially functioned as a redistribution system between large and small market clubs, revenue sharing might remedy the weak financial position of the small market clubs. However, in European football, the combination of national leagues and the European Champions League is a serious obstacle to any revenue sharing arrangement on the national level. In the small football countries, like Holland or Belgium, the big clubs are not willing to share revenue with the small clubs, because this will further weaken their position in the Champions League where they have to face the rich clubs of the Big Five (England, Spain, Italy, Germany and France). The growing gap between the Big Five and the other European countries, on the one hand, and the growing gap between the bigger and the smaller clubs in the national leagues, on the other hand, is a serious threat to the competitive balance and the health of European football.

Conclusion

The competitive balance in a league, which mainly depends on the distribution of playing talent among clubs, has been a central issue in the economics of professional team sports. It turns out that the size of the market is the most important, but not the only factor affecting the talent distribution. Also the objectives of the clubs, the supporters' preferences, the talent supply conditions and the specific sharing arrangements can affect the competitive balance and the impact of revenue sharing. A survey of the economic theory suggests that revenue sharing in a profit maximization league can be expected to have only a minor impact on competitive balance, whereas revenue sharing in a win maximization league clearly improves the competitive balance.

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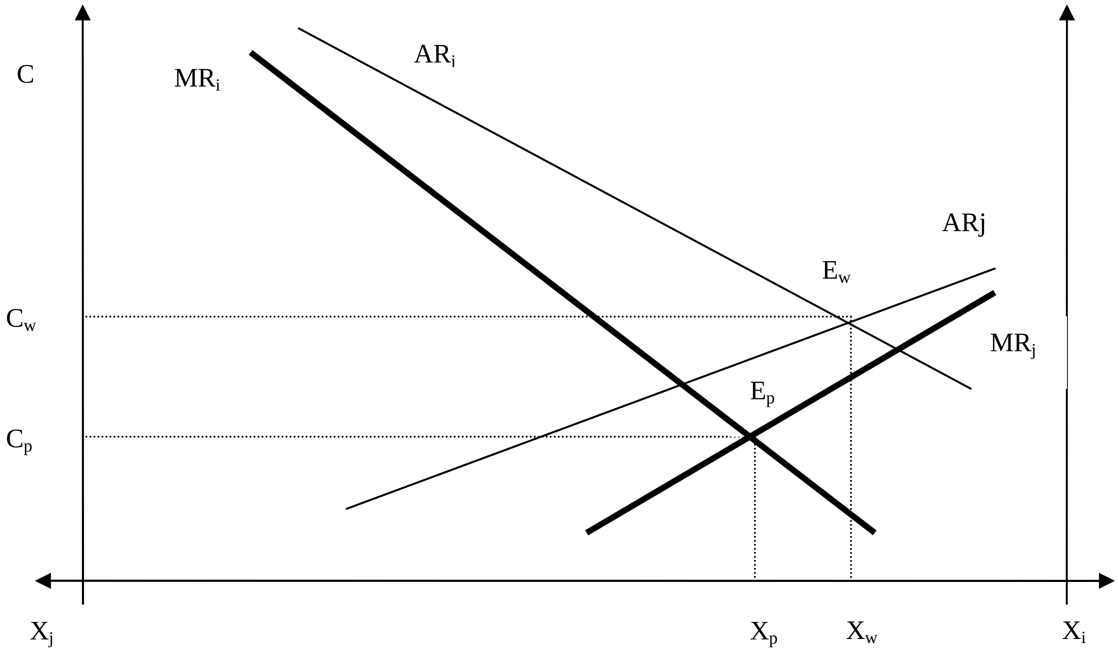

Figure 1. Profit versus win maximization

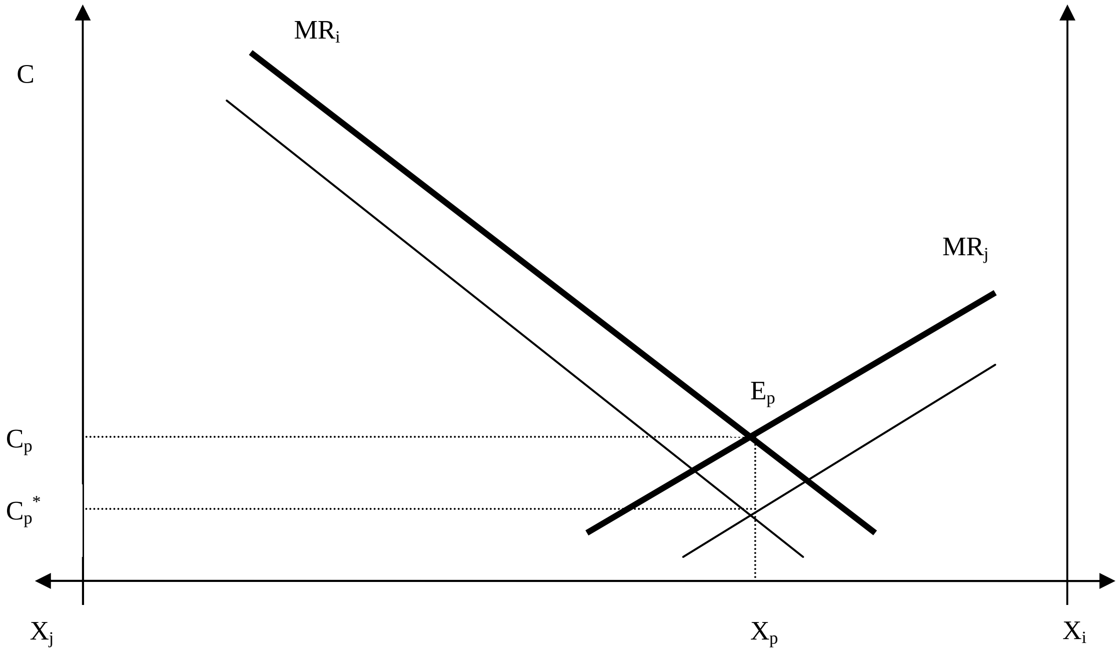

Figure 2. Revenue sharing in a profit maximization league

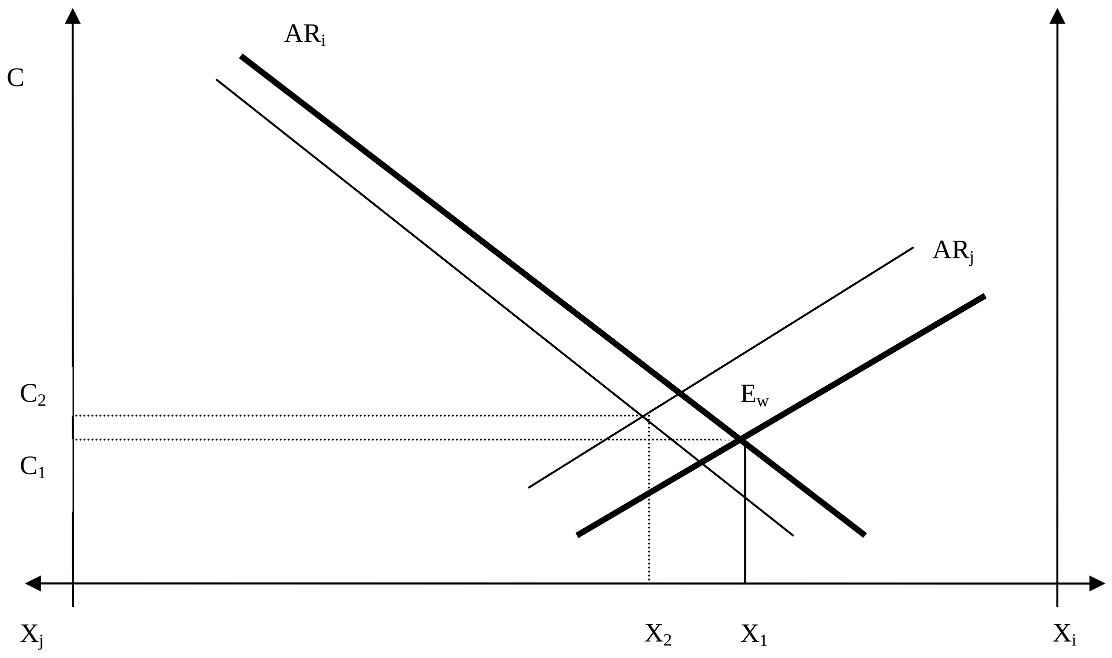

Figure 3. Revenue sharing in a win maximization league

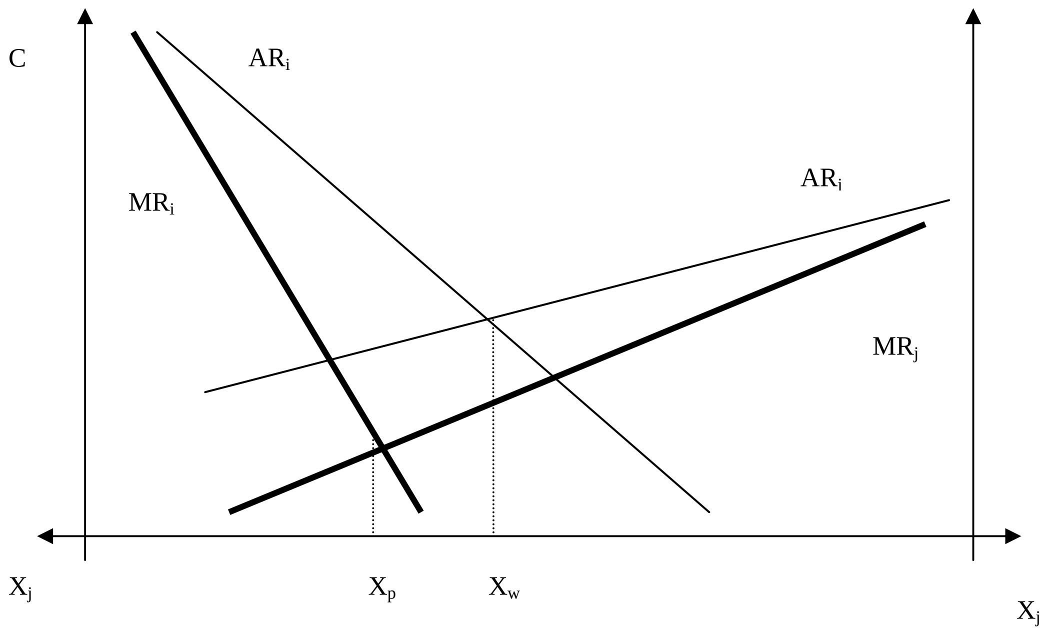

Figure 4. Small market club dominating the large market club