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## Competition among national football leagues. Does it exist ? Should we regulate ?

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# Competition among national football leagues. Does it exist ? Should we regulate ?

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## Abstract

It is often supposed that the stakeholders of a national football league draw more satisfaction from their sport if the league is balanced. This is the so-called Competitive balance hypothesis. If there exists an international competition like the European champions league, this hypothesis can be challenged however. The utility of national leagues' stakeholders could be higher, the higher the probability of winning of their representative club at the international level. If it is correct, a league's governing body intending to maximise the quality of the national league by making use of redistributive schemes would face a trade-off between national competitive balance and international performance of the national representative club. We propose a simple microeconomic framework to model this trade-off. If there exists a non-cooperative game among the national league governing bodies, whether it is a Nash or a Stackelberg one, this game would result in inefficient redistributive policies. We find "soft" empirical evidences suggesting that such a competition occurs among the big 5 football leagues in Europe. This result supports the idea of the creation of an international regulatory body. We derive the conditions under which the international regulatory body should ensure that the leagues' governing bodies implement redistributive schemes guaranteeing the respect of the national competitive balance. We also emphasize the risk of experiencing a drop in the quality of leagues if one of them becomes too big relatively to the others, what we call the tragedy of the wealthy.

*JEL-Classification:* J3, D3, L5, L83

*Keywords:* Sports economics, National football leagues, International football league, Interleague competition, Competitive balance, Regulation of sports, European football champions league

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## 1. Introduction

As stated by Arnaud Rouger, Sport director at the LFP (Professional Football League, France) : "Every league faces a pressure to manage its championship with the recognition that some of the clubs will participate in international competition. This is a delicate situation because the league has to preserve its national championship while still trying to satisfy the clubs which want to qualify for these international competitions. Thus the league faces a political decision regarding income redistribution.<sup>1</sup> The league may decide to unbalance the redistribution and favour the clubs at the top of the league with the intention of helping them in international competition, or to adopt a more equal redistribution, which might impair the competitiveness of its clubs internationally. If it chooses the first alternative, it runs the risk of harming its primary product, unbalancing the national competition and undermining public interest".<sup>2</sup>

This statement is a perfect summary of the thorny issue facing the governing bodies of the European football leagues. Implicitly, it is mostly a matter of inter-league competition by making use of within league revenue sharing schemes.<sup>3</sup> For instance, a national league could improve the performance of its representative club at the international level by redistributing revenues coming from broadcast contracts or ticket sales which would favor the emergence of a strong domestic champion. By doing so, it makes the representative clubs of the opposite leagues relatively less performant in the international competition. This could trigger a reaction from the opposite leagues' governing bodies. This is the channel through which inter-league competition may occur.

Surprisingly this issue has not received much attention in the economic literature so far. Some papers study the effect of redistributive schemes on the teams' demand for talent and then on league's competitive balance, but in the case of a single league (for instance Kesenne and Szymanski, 2004, Dietl et al., 2011, Peeters, 2012). Only a few authors propose a framework where some domestic clubs can also play in an international championship. This is for instance

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<sup>1</sup>This issue is also emphasized by Bourg (2004, p.12): "An optimal distribution of broadcast rights fees that encourages balance among teams in the pursuit of a national championship would have implications for the ability of the national champions as they move on into competition for European championships."

<sup>2</sup>quoted by Ducrey et al, 2003.

<sup>3</sup>see Fort and Quirk (1995) or Vrooman (2007, 2013) for a discussion of these redistributive schemes.

the case of Hoehn and Szymanski (1999), but they do not focus on the interactions among leagues resulting from the existence of the international competition. In Palomina and Sakovics (2004)'s paper, the presence of interactions among leagues is not due to the existence of an international championship but to the inter-league competition for talent. The national leagues are in competition to increase their domestic stock of talents and the authors raise the issue of which kind of Club reward scheme may help reaching that goal. None of the leagues' governing bodies have preferences for the quality of the international championship. In fact, these papers do not raise the same questions as our paper do and the frameworks they propose are different to ours.

In this paper we propose a very simple game theoretical framework to study the properties of an inter-league competition through revenue sharing, as described by Rouger. We first consider the case of two leagues, each of them having two opposite targets: on the one hand getting a balanced domestic championship and on the other hand having a performant representative club in the international competition. These targets may be reached through revenue sharing procedures. The main results we obtain are the following. From a normative perspective, not surprisingly, we show that the competition among leagues is never optimal. We also show that an allocation of talents which guarantees that the national competitive balance is reached may be efficient. This allocation however can be realized only through regulation by an international regulatory body. The efficiency of the national competitive balance is met when the national leagues are similar in their characteristics. On the contrary, when the leagues are different, in size for instance, the conclusion may be reversed. In the latter case, the inter-league competition may be Pareto improving compared with a regulatory policy which would force the league governing bodies to implement domestic competitive balance. We also suggest the existence of an optimal size, in terms of payroll, for a dominating league. Beyond this size, the overall quality of the dominating league may decrease, a risk that we call the tragedy of the wealthy. Lastly, we find out "soft" empirical evidences suggesting that such a competition may occur in Europe among the big 5 football leagues. Even if we focus on football, our framework may be used to analyze the quality of any sports championships for which two conditions hold:

First there exist domestic championships and second the best national clubs compete with each other in an international competition. In other words, our model applies to any sports, whenever there are two levels of competition, a national and an international level. For example, it is the case in Europe for rugby with the European Rugby Champions Cup, for basketball with the Euroleague Basketball, or for Handball with the European Men's Handball Championship.

The paper is organized as follows. The theoretical framework is presented in section 2. Section 3 examines the optimal distribution of players payroll among the clubs of the leagues. In section 4 we present the properties of the inter-league competition in terms of equilibrium and efficiency. Section 5 gives empirical evidences of the likely existence of such a competition in Europe. In section 6 we discuss the objectives an international regulatory body shall pursue to optimize the global quality of the show. In the last section, we make some additional comments as regards the decline in the global quality of the show when a league becomes too big relatively to the others, what we call the tragedy of the wealthy.

## 2. The framework of the model

For sake of simplicity we only consider two national leagues denoted  $K$ ,  $K = A, B$ .<sup>4</sup> The total players' payroll of league  $K$  is denoted  $s^K$  and is supposed to be constant. This assumption may be justified by the fact that the total payroll of a league is determined by the size of the market for football.<sup>5</sup> We assume that the wage bills are expressed in real term. Each league is composed of two teams. We have  $s^K = s_i^K + s_j^K$  where  $s_i^K$  and  $s_j^K$  are the players' payroll of team  $i$  and  $j$  respectively. As in Hoehn and Szymanski (1999) and Le Maux and Rocaboy (2012), we assume that the dominant factor to explain performance is wage expenditure. Accordingly, the probability of winning of team  $i$  in league  $K$  can be expressed as the following contest success

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<sup>4</sup>We could have dealt with more than two leagues without changing the normative results of the model but by making the presentation much more tedious. However we generalize some results in section 3 and we provide some simulations from the model in the context of the European big 5 football leagues in section 5 and 7.

<sup>5</sup>Since 2002 the total payroll of the Big 5 European leagues has increased yearly by about 6.5% on average. The total players' payroll of the French Ligue 1 amounts to around 45% of that of the English Premier League and this percentage has not varied much since the late nineties (see figure 16 below).

function:

$$\pi_i^K = \frac{s_i^K}{s_i^K + s_j^K} \quad (1)$$

We assume that the stakeholders of league  $K$  (fans, club owners, cities, etc) would like the balance between the two teams of their national league to be such that the probability of winning of team  $i$  is equal to  $\alpha^K$ ,  $\frac{1}{2} \leq \alpha^K \leq 1$ . If  $\alpha^K = \frac{1}{2}$ , the perfect competitive balance is the ideal situation for the stakeholders. If  $\alpha^K > \frac{1}{2}$  the stakeholders prefer a certain degree of national competitive imbalance.<sup>6</sup> Only one club per league can participate in the international competition. The international championship is then composed of two teams representing the two national leagues.<sup>7</sup> The ideal degree of competitive (im)balance at the international level for league  $K$ 's stakeholders is denoted  $\beta^K$ ,  $1 \geq \beta^K \geq \alpha^K \geq \frac{1}{2}$ . The stakeholders derive utility from the quality of their national league and from the performance of their representative club at the international level. This utility is represented by a loss function, the higher the value of the function, the lower the utility of the stakeholders. This loss function may be seen as a way to measure the league's global quality that determines the commercial exploitation of the domestic league. It has been designed such that it measures the quality of leagues belonging to the same category (here the national leagues) and which share a common international championship. This second characteristic is the originality of the paper. This objective function is not suitable to measure the quality of leagues if these two conditions are not met. It differs from previous papers where the actors are clubs whose objectives are to maximise profit, win or fan welfare, e.g., in Madden and Robinson (2012).

Formally, this function is supposed to be the quadratic weighted sum of the difference between the probability to win and the competitive (im)balance target at the national and

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<sup>6</sup>We do not discuss here how this ideal competitive balance is determined. See for instance Fort and Quirk (2011) on this issue.

<sup>7</sup>The international championship in this model is similar to the UEFA Champions League.

international league levels. The loss function for league  $A$  may be written as:

$$L^A = \gamma^A \left( \frac{s_i^A}{s_i^A + s_j^A} - \alpha^A \right)^2 + (1 - \gamma^A) \left( \beta^A - \frac{s_i^A}{s_i^A + s_i^B} \right)^2, \quad (2)$$

where  $\gamma^A$  represents the relative preferences of stakeholders  $A$  for the national competition ( $0 \leq \gamma^A \leq 1$ ). The Loss function can be rewritten as follows:

$$L^A = \gamma^A \left( \frac{s_i^A - \alpha^A s^A}{s^A} \right)^2 + (1 - \gamma^A) \left( \frac{(\beta^A - 1) s_i^A + \beta^A s_i^B}{s_i^A + s_i^B} \right)^2. \quad (3)$$

We define the national or domestic competitive balance as the within league distribution of payroll which cancels out the loss of the leagues in their national championship, namely  $s_i^K = \alpha^K s^K, K = A, B$ . We also define the bliss point of league  $K$ 's stakeholders as the distribution of payroll in league  $A$  and  $B$  which leads to a zero loss for  $K, K = A, B$ . It represents the first best outcome for league  $K$ 's stakeholders. League  $A$ 's bliss point is reached when  $s_i^A = \alpha^A s^A$  and  $s_i^B = \frac{(1 - \beta^A) \alpha^A s^A}{\beta^A}$ . For instance, if  $\beta^A = 1$ , the national stakeholders would like their representative club to win over its foreign adversary with a probability of one. This will be the case when  $s_i^B = 0$ . On the other hand, if  $\beta^A = \frac{1}{2}$ , the domestic stakeholders favor a perfect balanced international competition. The ideal foreign opponent team payroll from league  $A$  stakeholders' perspective is then  $s_i^B = \alpha^A s^A$ . A league iso-loss curve depicts all the within league allocations of payroll,  $s_i^A$  and  $s_i^B$ , yielding the same level of loss for a league. The iso-loss curves are represented by ellipses around the league's Bliss point. The more distant an iso-loss curve from the Bliss point, the higher the loss for the league.

### 3. Is the national competitive balance efficient ?

In this section we discuss the issue of whether the national competitive balance is a Pareto efficient distribution of the total domestic teams' payroll. More precisely, the question we raise is the following: departing from the national competitive balance, can we change the distribution of the teams' payroll within a league by improving the league's situation without deteriorating

the opposite league's situation? To answer this question we have to solve a Pareto optimization problem to find out the set of efficient allocations and to check whether the national competitive balance belongs to this set. Formally,

$$\begin{aligned} & \underset{s_i^A, s_i^B}{\text{minimize}} && L^A(s_i^A, s_i^B) \\ & \text{subject to} && L^B(s_i^A, s_i^B) = \bar{L}^B, \\ & && s_i^A < s^A, s_i^B < s^B. \end{aligned}$$

We get the following first-order condition:

$$\frac{C^A s_i^A}{\gamma^A (s_i^A - \alpha^A s^A) (s_i^A + s_i^B)^3 - C^A s_i^B} = \frac{\gamma^B (s_i^B - \alpha^B s^B) (s_i^A + s_i^B)^3 - C^B s_i^A}{C^B s_i^B}, \quad (4)$$

where  $C^A = (1 - \gamma^A) (s^A)^2 (\beta^A s_i^B - (1 - \beta^A) s_i^A)$  and  $C^B = (1 - \gamma^B) (s^B)^2 (\beta^B s_i^A - (1 - \beta^B) s_i^B)$ .

Interestingly, the national competitive balance meets the first order condition for Pareto optimality. When  $s_i^K = \alpha^K s^K$ ,  $K = A, B$ , equation (4) holds. From a geometrical point of view, it means that the national competitive balance is a point of tangency between two iso-loss curves. Consequently, it might be on the contract curve. We have to check however whether a marginal change in the distribution of payroll within a league, in  $s_i^A$  for instance, from the national competitive balance always yields an additional loss for at least one of the two leagues. If so, the national competitive balance is Pareto efficient. If not, some situations may exist where the national competitive balance is not on the contract curve. To do that we have to compute the value of  $\frac{\partial L^A}{\partial s_i^A}$  and  $\frac{\partial L^B}{\partial s_i^A}$  at the national competitive balance. We obtain:

$$\frac{\partial L^A}{\partial s_i^A}(\alpha^A s^A, \alpha^B s^B) = -\frac{2\alpha^B s^B (1 - \gamma^A) (\beta^A \alpha^B s^B - (1 - \beta^A) \alpha^A s^A)}{(\alpha^A s^A + \alpha^B s^B)^3}, \quad (5)$$

and

$$\frac{\partial L^B}{\partial s_i^A}(\alpha^A s^A, \alpha^B s^B) = \frac{2\alpha^B s^B (1 - \gamma^B) (\beta^B \alpha^A s^A - (1 - \beta^B) \alpha^B s^B)}{(\alpha^A s^A + \alpha^B s^B)^3}. \quad (6)$$

A national competitive balance is not efficient if  $\frac{\partial L^A}{\partial s_i^A}(\alpha^A s^A, \alpha^B s^B) < 0$  and  $\frac{\partial L^B}{\partial s_i^A}(\alpha^A s^A, \alpha^B s^B) \leq 0$ .

This is the case if

$$\alpha^B s^B > \frac{(1 - \beta^A) \alpha^A s^A}{\beta^A} \quad \text{and} \quad \alpha^A s^A \leq \frac{(1 - \beta^B) \alpha^B s^B}{\beta^B}, \quad (7)$$

which can be rewritten as:

$$\beta^A > \frac{\alpha^A s^A}{\alpha^A s^A + \alpha^B s^B} \quad \text{and} \quad \beta^B \leq \frac{\alpha^B s^B}{\alpha^A s^A + \alpha^B s^B}. \quad (8)$$

From inequalities 8, we see that if league  $A$  is the smallest league, i.e.,  $\frac{\alpha^A s^A}{\alpha^A s^A + \alpha^B s^B} < \frac{1}{2}$ , increasing  $s_i^A$  from the national competitive balance always improves league  $A$ 's situation since we have  $\beta^A \geq \frac{1}{2} > \frac{\alpha^A s^A}{\alpha^A s^A + \alpha^B s^B}$ . It does not make league  $B$  worse off if  $\beta^B \leq \frac{\alpha^B s^B}{\alpha^A s^A + \alpha^B s^B}$ .

The intuition behind these inequality conditions is straightforward. First, the only chance to obtain a Pareto improving marginal increase in  $s_i^A$  from the national competitive balance is to make the international competition more balanced, i.e. to increase the payroll of the smallest league's representative club. If it is the payroll of the wealthiest league's representative club which has increased marginally, the international competition becomes less balanced and the smallest league is worse off. Second, this change is effectively Pareto improving if the stakeholders of the wealthiest league value a quite balanced international competition.

To put it differently, suppose that the representative club's competitive balance payroll in league  $B$  is bigger than that in league  $A$  (i.e.,  $\frac{\alpha^A s^A}{\alpha^B s^B} < 1$ ). Thus a marginal increase in  $s_i^A$  from the national competitive balance makes league  $A$ 's domestic championship slightly more unbalanced but also makes its representative club more performant at the international level, which benefits league  $A$ 's stakeholders. This increase makes also the international league more balanced since the difference between the teams' payroll in the international competition has been reduced. If league  $B$ 's stakeholders value a balanced international league, i.e.,  $\beta^B$  is low, league  $B$ 's loss drops. This increase in  $s_i^A$  is thus pareto improving and the national competitive balance is not efficient. On the other hand, if league  $B$ 's stakeholders wish their team to be performant at the international level, i.e.,  $\beta^B$  is high, this change in  $s_i^A$ , by reducing

the probability of league  $B$ 's representative club to win, increases league  $B$ 's loss. The national competitive balance is thus efficient. To sum up, when the leagues highly value the performance of their team at the international level and/or when the payroll of the representative clubs at the national competitive balance is close, then the chance of the national competitive balance to be an efficient distribution of payroll within leagues is high.

Figure 1 is an illustration of a case where the national competitive balance, denoted  $NCB$ , is not efficient (inequalities 7 hold). The  $NCB$  is located on ellipses representing iso-loss curves. League  $A$  and  $B$ 's bliss points are denoted respectively by  $BP^A$  and  $BP^B$ . From the  $NCB$ , a marginal increase in  $s_i^A$  makes leagues  $A$  and  $B$  better off. This move reduces the loss of both leagues. In other words, by increasing marginally  $s_i^A$ , i.e., by making the small domestic league less balanced, it increases the performance of league  $A$ 's representative club at the international level, and also makes the international league more balanced then reducing the loss of both leagues' stakeholders. On the other hand, figure 2 presents a case where a marginal increase in  $s_i^A$  or  $s_i^B$  from the  $NCB$  improves the situation of one league and makes the other worse off. The  $NCB$  is Pareto efficient (inequalities 7 are not satisfied).

These results can be generalized to more than two leagues. We consider the following Loss function for league  $K$ :

$$L^K = \gamma^K \left( \frac{s_i^K}{s_i^K + s_j^K} - \alpha^K \right)^2 + (1 - \gamma^K) \frac{1}{N-1} \sum_{M \neq K} \left( \beta^K - \frac{s_i^K}{s_i^K + s_i^M} \right)^2, \quad (9)$$

where  $N$  denotes the number of national leagues. To exhibit the conditions under which the  $NCB$  is not efficient, we have to examine the case where league  $K$  is the smallest league and the case where it is not. When league  $K$  is the smallest league, the only chance to improve the situation of all leagues is by increasing  $s_i^K$  from the  $NCB$ . As previously stated, this change is Pareto improving if  $\beta^M \leq \frac{\alpha^M s^M}{\alpha^M s^M + \alpha^K s^K}, \forall M \neq K$ . Figure 3a depicts a situation where there are three leagues, namely  $A$ ,  $B$  and  $C$  and where league  $A$  is the smallest league. Increasing marginally  $s_i^A$  makes every league better off since the probability of  $B$  and  $C$  to win over  $A$  in the international competition decreases and gets closer to their international competitive balance target  $\beta^B$  and

$\beta^C$ .

When league  $K$  is not the smallest league, a Pareto improving change from the  $NCB$  may only be obtained by decreasing  $s_i^K$ . Increasing it would lead to a deterioration in the situation of the leagues which are smaller than  $K$ . This change is Pareto improving if  $\beta^M \geq \frac{\alpha^M s^M}{\alpha^M s^M + \alpha^K s^K}$ ,  $\forall M \neq K$  and if  $\beta^K < \frac{\sum_{M \neq K} \frac{\alpha^M s^M}{(\alpha^K s^K + \alpha^M s^M)^3}}{\sum_{M \neq K} \frac{\alpha^M s^M}{\alpha^K s^K} \frac{\alpha^K s^K + \alpha^M s^M}{(\alpha^K s^K + \alpha^M s^M)^3}}$ . Figure 3b gives an example where the national competitive balance may not be efficient when league  $A$  is not the smallest league (from the figure we see that league  $B$  is bigger than league  $A$  which is itself bigger than league  $C$ ). Decreasing  $s_i^A$  marginally from the  $NCB$  improves league  $C$  and  $B$ 's situations and may make league  $A$  better off if  $\beta^A$  is low enough to meet the above inequality.

We can summarize our results as follows:

**Proposition 1.** *In the case of two leagues, the national competitive balance is not a Pareto optimal allocation of payroll among teams within leagues if*

$$\alpha^A s^A < \frac{(1 - \beta^B) \alpha^B s^B}{\beta^B} \quad \text{and} \quad \alpha^B s^B \geq \frac{(1 - \beta^A) \alpha^A s^A}{\beta^A},$$

or if

$$\alpha^A s^A > \frac{(1 - \beta^B) \alpha^B s^B}{\beta^B} \quad \text{and} \quad \alpha^B s^B \leq \frac{(1 - \beta^A) \alpha^A s^A}{\beta^A}.$$

#### 4. The competition between leagues

We now assume that the governing bodies of the two national leagues can enter into competition with each other through the channel of the international championship. We consider here two types of competition, first when the leagues play simultaneously (Nash competition) and second when one of the leagues, the leader, plays first (Stackelberg competition).

#### 4.1. Nash equilibrium of the competition between leagues

The goal of the national leagues is to distribute optimally the total payroll  $s^K$  between the two teams of their league through revenue sharing schemes. In other words, the leagues governing bodies can set the wage bills at their desired level through redistributive policies. We indirectly assume here that they integrate the transmission mechanism from the redistribution policies to the wage bill level. This assumptions makes the model easily tractable without changing the main results of the model.

To reach that goal, league  $A$  seeks to minimize its loss function not cooperatively by choosing  $s_i^A$ . By doing so, we obtain the reaction function of league  $A$ :

$$\frac{\partial L^A}{\partial s_i^A} = 2\gamma^A \left( \frac{s_i^A - \alpha^A s^A}{(s^A)^2} \right) - 2(1 - \gamma^A) \left( \frac{(\beta^A - 1) s_i^A s_i^B + \beta^A (s_i^B)^2}{(s_i^A + s_i^B)^3} \right) = 0, \quad (10)$$

which gives:

$$\gamma^A (s_i^A - \alpha^A s^A) (s_i^A + s_i^B)^3 - C^A s_i^B = 0. \quad (11)$$

Similarly, the reaction function of league  $B$  is as follows:

$$\gamma^B (s_i^B - \alpha^B s^B) (s_i^A + s_i^B)^3 - C^B s_i^A = 0. \quad (12)$$

Not surprisingly, when  $\gamma^K \neq 1$ ,  $K = A, B$ , the Nash equilibrium is not Pareto efficient. The left-hand side and the right-hand side of equation 4 are different when equations 11 and 12 hold. The left-hand side is equal to  $+\infty$  while the right-hand side is equal to 0. It is also easy to show that the national competitive balance is not a Nash equilibrium. Replacing  $s_i^K$  with its value at the national competitive balance ( $s_i^K = \alpha^K s^K$ ,  $K = A, B$ ) does not satisfy equations 11 and 12. On the other hand, when  $\gamma^K = 1$ , the national stakeholders do not care about the performance of their representative club at the international level. The national league is not victim of any externalities from the opposite league. Reaching the competitive balance in the domestic league only matters. The payroll of the representative club of league  $K$  at the equilibrium is equal to

$\alpha^K s^K$  and the loss is null. The choice of the league is efficient.

We can provide a graphical depiction of these results (see figure 4). By using the implicit function theorem, we compute the slope of the iso-loss curves of league  $A$  in the  $(s_i^A, s_i^B)$  plane as follows:  $\frac{ds_i^B}{ds_i^A} = -\frac{\frac{\partial L^A}{\partial s_i^A}}{\frac{\partial L^A}{\partial s_i^B}}$ . These ellipses reach a summit when  $\frac{\partial L^A}{\partial s_i^B} = 0$ . This latter expression is also the definition of league  $A$ 's reaction function. As a result, the reaction curve intersects the ellipses representing league  $A$ 's iso-loss curves at their summits. Besides, the intuition behind the shape of the reaction curves is straightforward. It derives from a trade off between having a balanced national championship and being performant at the international level. Let us take the case of league  $A$ 's reaction curve. When the opposite league does not exist, i.e.,  $s_i^B = 0$ , the optimal choice of league  $A$  is to set the distribution of payroll according to the national competitive balance. The X-intercept of  $A$ 's reaction curve is then  $s_i^A = \alpha^A s^A$ . For small amounts of league  $B$ 's payroll, the best response of league  $A$ 's governing body to any increase in league  $B$ 's representative club payroll is to lower its own representative club payroll. This payroll will be less than that at the national competitive balance,  $s_i^A < \alpha^A s^A$ . This decrease in  $s_i^A$  in reaction to the augmentation in  $s_i^B$  leads to an improvement in the balancing of the international competition which outweighs the deterioration of league  $A$ 's domestic competitive balance. The reaction curve is then decreasing. It may even be in the interest of league  $A$ 's governing body to send its less performant team to the international competition. If we rule out this possibility, we may obtain non-continuous reaction curves as suggested on the figure.

Above a payroll threshold of league  $B$ 's representative club, an increase in that payroll triggers an augmentation in league  $A$ 's representative club payroll in order to keep it performant at the international level. The reaction curve is increasing and goes through league  $A$ 's bliss point. Finally when the payroll of league  $B$  is very high compared with league  $A$ 's payroll, a marginal improvement in league  $A$ 's national competitive balance is preferred to a more performant representative club. The reaction curve is decreasing again. At the limit, when league  $B$ 's representative team payroll tends toward infinity, the best response of league  $A$ 's governing body is to focus on its national championship and to favor the implementation of the national competitive balance ( $s_i^A \rightarrow \alpha^A s^A$ ). In short, the reaction curve of league  $A$ 's governing

body in the  $(s_i^A, s_i^B)$  plane follows an inverse S-shaped pattern.

Figure 4 illustrates the case where the national competitive balance,  $NCB$ , is not efficient and league  $A$  is the biggest league ( $\alpha^A s^A > \alpha^B s^B$ ). Point  $NE$  represents the Nash equilibrium of the competition game between the two leagues. This competition leads to an equilibrium which is Pareto improving compared to the national competitive balance. A more imbalanced small league and a more balanced international league would result from the inter-league competition. At the Nash equilibrium, the biggest league, namely league  $A$ , may even choose the less performant team as its representative at the international level. For example, if  $\alpha^A = \frac{1}{2}$  then  $s_i^A$  is less than  $\frac{1}{2}s^A$  at the Nash equilibrium. Figure 5 is a 3D presentation of a situation where there are two small leagues and a bigger one.

This discussion may be summarized as follows:

**Proposition 2.** *When the National competitive balance is not efficient,*

1. *the Nash competition is Pareto-improving (compared to the NCB),*
2. *the Nash competition makes the international championship more balanced (compared to the NCB),*
3. *the Nash competition may lead the biggest league governing body to choose the less performant team of the league as its representative in the international championship.*

Figure 6 and 7 depict two different settings when the national competitive balance is efficient. In both cases, the most performant team is sent to the international competition by the leagues' governing bodies. The difference between these two situations lies in the fact that moving from  $NE$  to  $NCB$  is Pareto improving in the first case while it is not in the second case. When does competition lead to a worse situation for both leagues compared to the national competitive balance ? Competition is Pareto deteriorating when, starting from the national competitive balance, the magnitude of the best response from the leagues is very similar. It means that competition will not improve significantly the situation of one league in comparison with the other one. This will happen when the leagues are very similar in their parameters  $\beta^K$  and  $\alpha^K s^K$ . Figure 8 is a 3D figure where there are three identical leagues. Figure 9 displays the

unlikely case where the bliss point is the same for both leagues. This is the only situation where the Nash equilibrium is efficient.

The following proposition sums up our results:

**Proposition 3.** *When the National competitive balance is efficient,*

1. *the Nash competition might be Pareto-deteriorating (compared to the NCB),*
2. *the Nash competition makes the international championship more or less balanced (compared to the NCB),*
3. *the Nash competition leads the league governing bodies to choose their most performant team as their representative in the international championship.*

#### 4.2. *Stackelberg equilibrium of the competition between leagues*

We assume that league *A* is the biggest league and therefore is the leader in the competition game. The issue is to know whether having a leadership is welfare enhancing compared with a competition à la Nash. In the case where the national competitive balance is not efficient, i.e. when the leagues are very different in size and/or when they value a balanced international competition, the leadership may increase or decrease the loss of the follower. Being the leader, the biggest league will force the smallest to be more performant at the international level. If the leader is not too large compared with the follower (the Nash equilibrium is on the increasing part of the follower's reaction curve), it will increase its representative club payroll and then force the smallest league governing body to do the same (see figure 10). The Stackelberg equilibrium, denoted *SE*, is on the increasing part of league *B*'s reaction curve, on the right-hand side of the Nash equilibrium. The *SE* is further away of league *B*'s bliss point than the *NE*. League *B*'s loss is higher at the *SE* than at the *NE*. On the other hand, if the leader is of a much bigger size than the follower (the Nash equilibrium lies on the decreasing part of the follower's reaction curve), it will reduce the payroll of its representative club to make it less performant at the international level, which will make valuable an increase in the follower representative club's payroll (see figure 11). In that case, having a leader in the game is Pareto-improving compared to a competition à la Nash. In both cases the leadership augments the unbalancing of the smallest

league.

The previous discussion may be summarized as follows:

**Proposition 4.** *When the National competitive balance is not efficient, compared to the competition à la Nash,*

1. *the Stackelberg competition might be deteriorating for the follower,*
2. *the Stackelberg competition might produce a more balanced international championship,*
3. *the Stackelberg competition makes the league of the follower less balanced.*

When the national competitive balance is efficient, the Stackelberg competition leads to a decrease in the representative club payroll of both leagues which makes them better off because both prefer a more balanced national league than that they have at the Nash equilibrium (see figure 12).

These results yield the following proposition:

**Proposition 5.** *When the National competitive balance is efficient, compared to the competition à la Nash,*

1. *the Stackelberg competition is Pareto-improving,*
2. *the Stackelberg competition produces more balanced national leagues.*

#### 4.3. *The tragedy of the wealthy*

Within our framework it is easy to show that there might be a tragedy of the wealthy, namely the fact that an increase in the wealth of the wealthiest league may make it worse off. A geometrical presentation of this issue is given on figure 13. The graph of function  $s_i^B = \frac{(1-\beta^A)}{\beta^A} s_i^A$  is the locus of league A's blisspoints when  $s^A$  changes. Whatever the competition at stake, Nash or Stackelberg, league A's optimal payroll is reached when this graph intersects League B's reaction curve. It is the case for a total payroll which amounts to  $s^{A*}$ . Any increase in A's payroll from  $s^{A*}$  yields an equilibrium where league A's loss has increased.

## 5. Does competition among national football leagues occur in Europe ?

Let us consider the case of the big 5 European football leagues: the English Premier League (EPL), the French Ligue 1 (L1), the German Bundesliga, the Spanish Primera Liga, and the Italian Serie A. On average, around 50% of the league resources come from the selling of TV broadcasting rights. For season 2012/2013, it ranges from 31% in Germany to 59% in Italy (Deloitte Annual Review of Football Finance 2014). Most of the time, the leagues negotiate directly with the televisions in the name of the leagues' clubs and use these resources to redistribute revenues among clubs. An exception is Spain where clubs negotiate their TV deals individually. The way TV rights are distributed among clubs differs from one league to another. It is based on revenue-sharing rules taking into account various criteria, like merit, appearances or solidarity. Table 1 displays the distribution of TV broadcasting rights in the big 5 leagues for season 2012/2013. The distribution is very unequal in Spain due to the selling of TV rights on a club-by-club basis. Almost half of the total revenue goes to two clubs, Real Madrid and Barcelona. The Gini index is equal to 0.48. On the other hand, in the English Premier League, the Gini index is low, 0.08, evidencing that the distribution of revenue among the English clubs is quite equal. The TV rights are much more important in Italy than in France, almost twice as big, but the way they are distributed is exactly the same according to the Gini index. The latter is equal to 0.23 for both leagues. As regards the German league, the Gini index is equal to 0.13, slightly bigger than that of the English one, displaying a more unequal distribution of TV rights in the Bundesliga than in the English Premier League.

Interestingly, there seems to be a negative relationship between the gini index of the distribution of TV rights (Table 1) and the average club wage costs of the Big 5 European leagues in 2012-2013 (Table 2), as suggested by figure 14. In England, where the average wage costs per club is the highest of the big 5 leagues, the distribution of TV rights among the English clubs is also the less unequal. On the other hand, the French Ligue 1, which is the smallest league in terms of average club wage costs, is also the league where the TV rights are the less equally distributed among those where these rights are negotiated collectively. We can simulate this relationship from our model only if the  $\gamma$  coefficients are different from zero i.e if the national

**Table 1.** Distribution of TV broadcasting rights for season 2012/2013 (€m).

EPL		Bundesliga		Ligue 1		Serie A		Liga BBVA	
Manchester U.	71,8	Bayern Munchen	25,8	Marseille	48	Juventus	103,8	Real Madrid	140
Manchester City	70,4	Borussia Dortmund	25,1	Paris SG	44,1	AC Milan	87,7	Barcelona	140
Chelsea	66,8	Bayer Leverkusen	24,3	Lyon	44	Inter Milan	87,7	Atlético Madrid	42
Tottenham	66,6	Shalke 04	23,6	Bordeaux	32,1	SSC Napoli	65,6	Valencia	42
Arsenal	65,4	Hannover	22,8	Lille	32,1	Roma	65,1	Villareal	29
Liverpool	64,8	Borussia Mönchen.	22	Saint-Etienne	30,4	Lazio	52,8	Sevilla	24
Everton	58,6	Mainz	21,3	Nice	26	Fiorentina	45,2	Getafe	18
West Bromwich	56,9	Stuttgart	20,5	Toulouse	24	Udinese	41,1	Atlético Bilbao	17
Swansea	55,9	Werder Bremen	19,6	Rennes	23,8	Palermo	38,3	Zaragoza	14
West Ham	55,1	Freiburg	19	Lorient	22,6	Sampdoria	37,1	Real Sociedad	13,7
Norwich City	54,2	Hamburg	17,5	Montpellier	21,8	Genoa	36	Espanyol	13,7
Newcastle	53,8	Wolfsburg	16,7	Valenciennes	19,6	Bologna	36	Mallorca	13,7
Fulham	53,4	Hoffenheim	16	Sochaux	16,5	Cagliari	35,6	Osasuna	13
Stoke	52,4	Eintracht Francfort	15,2	Bastia	16,5	Atalanta	35,6	Levante	12
Southampton	51,9	Augsburg	14,4	Evian-TG	15,7	Torino	34,6	Racing	12
Aston Villa	50,7	Fortuna Düsseldorf	13,7	Reims	16,6	Catania	34,2	Betis	12
Sunderland	48,9	Greuther Fürth	12,9	Ajaccio	15,1	Parma	32,3	Rayo	12
Wigan	48,1	Nürnberg	12,2	Nancy	15,1	Chievo	29,1	Sporting	12
Reading	47,2			Brest	13,8	Siena	27,2	Malaga	12
QPR	46,3			Troyes	12,9	Pescara	24,8	Granada	12
Total	1139,2	Total	342,6	Total	490,7	Total	949,8	Total	604,1
Gini index	0,08	Gini index	0,13	Gini index	0,23	Gini index	0,23	Gini index	0,48

leagues care about the performance of their representative club in the international competition. Figure 15 displays this link for different value of  $\gamma$  and for the average wage costs per club of the five European leagues for year 2012-2013. The domestic and international competitive balance targets are set at  $\alpha^K = 0.5$  and  $\beta^K = 0.7, \forall K$ . The domestic league imbalance is measured by the probability of the representative club to win over its national contestant at the Nash equilibrium, namely  $\frac{s_i^K}{s_K^K}$ . We show that, for given wage costs, the lower  $\gamma$ , the higher the domestic league imbalance and, for a given  $\gamma$ , the higher the average wage costs, the lower the domestic league imbalance.

The intuition behind this is straightforward. It is obvious that an increase in the league stakeholders' interest for the international competition (a decrease in the value of parameter  $\gamma$ ) accentuates the imbalance of the national championships when the characteristics of the leagues are similar. Besides, when a league is wealthier than the others, its average club is more performant at the international level than the others'. Guaranteeing the domestic competitive balance for the wealthiest league is thus made easier since, even in that case, its representative

**Table 2.** Wage costs for the Big 5 European leagues (€m).

<b>Big 5 European leagues</b>	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13
English Premier League	1090	1094	1209	1162	1235	1440	1511	1556	1708	1765	2049	2080
Italian Serie A	1010	884	845	830	806	722	972	1093	1181	1157	1180	1193
Spanish La Liga	559	607	608	658	739	822	900	939	971	1027	1060	1046
German Bundesliga	553	556	580	576	608	620	725	803	891	923	953	1030
French Ligue 1	441	467	450	437	541	619	703	722	778	777	841	862

<sup>a</sup> Source: Deloitte Annual Review of Football Finance, 2013/2014. There are 18 teams in the Bundesliga and 20 in the others four leagues.

club remains performant at the international level. For example, for the season 2012/2013, the average wage costs per club of the English Premier League and those of the French league 1 amount to €104 millions and €43.1 millions respectively. The probability of the average English club to win over the average French club may be computed as  $\frac{104}{104+43.1} \approx 71\%$ . To obtain a relative improvement in its performance at the international level, the French league governing body has to promote a less equal distribution of TV rights than the English league has. This may affect the quality of the French championship but also enhance the overall quality of the French league, *ceteris paribus*, since it makes it more visible internationally. This may explain the positive relationship we observe between the wealth of a league and the balance of its domestic championship.

## **6. Should the national competitive balance be the objective of the international regulatory body ?**

If we assume that there exists an international governing body in charge of regulating the competition between the leagues, should this regulatory body ensure that the leagues' governing bodies implement redistribution schemes guaranteeing the respect of the national competitive balance? The answer to this question is positive if the values of the parameters of the model are such that they meet the efficiency conditions of the *NCB*. Is it the case as regards Europe's Big 5 leagues ? For sake of simplicity, let us assume that the *NCB* is reached when the wage costs are the same for each team within a league:  $s_i^K = \alpha^K s^K$ , where  $\alpha^K = \frac{1}{T^K}$  and  $T^K$  is the number of clubs in league  $K$ . Table 2 gives the Big 5 leagues total wage costs from 2001 to

2012. Over this period of time, the French Ligue 1 remains the smallest league in terms of wage costs. From this table, we compute the ratio  $\frac{\alpha^K_{s^K}}{\alpha^M_{s^M}}$  where  $K$  is the French Ligue 1 and  $M$  denotes the other four European leagues. Figure 16 displays the value of this ratio. The English Premier league is consistently the largest league. The wage costs of the French Ligue 1 average team amount to 45% of those of the English Premier League average team, on average over the period. It represents around 60% of the Italian average team and 75% of the Spanish and German average teams. Figure 17 displays the threshold of the  $\beta^M$  parameters above which the *NCB* is efficient when one increases the domestic imbalance of the French league to make its representative club more performant at the international level. This Threshold is equal to  $\frac{\alpha^M_{s^M}}{\alpha^M_{s^M} + \alpha^K_{s^K}}$  (see inequalities 8). The average  $\beta^M$  threshold over the period is equal to 0.7 for the English Premier League, 0.62 for the Italian Serie A and 0.56 for both the Spanish Liga and the German Bundesliga. If the  $\beta^M$  parameters are greater than these threshold values, the *NCB* is a good objective for the regulatory body to pursue. Making the French league less balanced to increase its performance at the international level would not be Pareto improving. For instance, if the national league stakeholders have strong preferences for the dominance of their representative club in the international competition ( $\beta^M > 0.7, \forall M$ ), a more unbalanced French league would make the other four leagues worse off compared with their situation at the *NCB*. Similarly, if  $\beta^M$  takes intermediate values, for instance  $\beta^M = 0.6, \forall M$ , a less balanced French league would benefit the English and the Italian leagues and damage the Spanish and the German ones. Here again, the *NCB* is an efficient target for the international regulatory body. On the other hand, if the national league stakeholders support strong competitive balance at the international level ( $\beta^M < 0.56, \forall M$ ), increasing the performance of the French representative club would benefit the other leagues. Guaranteeing the *NCB* would be a wrong objective for the regulatory body. What happens if there is no regulation in the case where the *NCB* is efficient? The leagues may face a prisoner's dilemma (like on figure 6). Entering in competition, which is a dominant strategy, would then lead to a worse situation for them (in comparison with the competitive balance). This might be the kind of situation we observe in Europe since the late nineties regarding the Big 5 leagues. For instance, as regards the sharing of broadcasting rights

over the period 1998 to 2003, the French Ligue 1 has reduced its egalitarian sharing formula from 91/9/0 (Equal/Merit/Appearances) to 50/30/20 making the league less balanced but also in the hope to make the French representative clubs in the European champions league more performant.

In the case where the *NCB* is not efficient i.e. when the leagues strongly differ in size and/or when the stakeholders of the biggest leagues have some interest for a relatively balanced international competition (like on figure 4), a Sport policy consisting in setting the *NCB* as a target would not be relevant. Competition would improve the situation of both kinds of leagues, small and big.

## **7. Conclusion and comments**

A few ideas emerge from this simple framework. First, we have some empirical evidences suggesting that a competition among domestic football leagues occurs in Europe. The distribution by the leagues of collectively negotiated broadcasting rights are the channels through which this competition happens. Second, since the leagues behave non-cooperatively, this competition is not efficient which leaves room for the creation of an international regulatory body. In particular, regulation is necessary for similar leagues. If no regulation exists, the competition, by increasing the imbalance among clubs within these leagues, would affect too much the quality of the national championships. In that case, a possible regulation would be to ensure that the national leagues implement redistributive schedules such that the domestic championships are balanced according to the National competitive balance.

Besides, by growing too much, a league could see its own quality lowered, as well as the quality of the competing leagues. This would also lead the dominated leagues to focus on their domestic championship or to split off and reorganize into a separate league. To illustrate this idea, we provide some simulations from our model. We take the value of the average wage costs per club for season 2011/2012 for the Italian Serie A (€58.95 millions), the Spanish Liga (€52.85 millions), the German Bundesliga (€52.94 millions) and the French Ligue 1 (€42.05 millions), and we multiply them by 2 to compute the total wage costs of the simulated leagues,

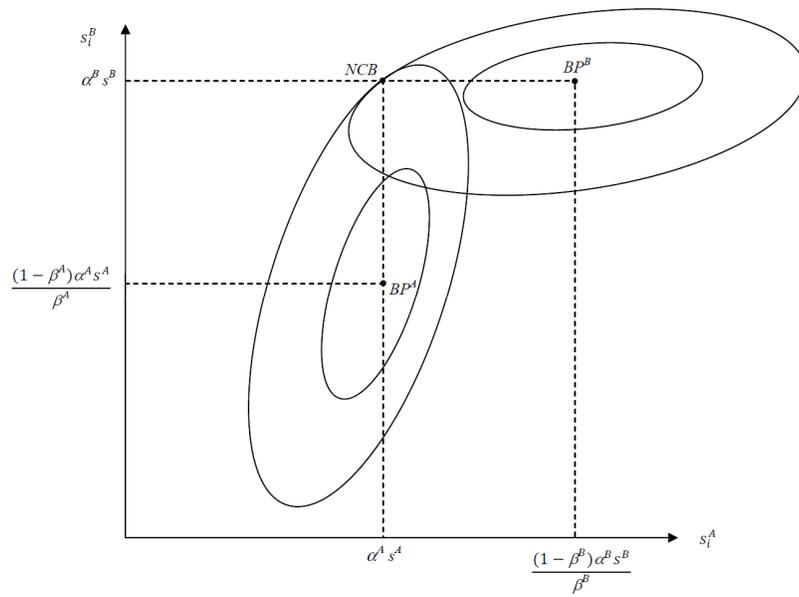
$s^K$ . The parameters of the model are set to the following values:  $\gamma^K = 0.5$ ,  $\alpha^K = 0.5$ , and  $\beta^K = 0.7, \forall K$ .

We simulate an increase in the wage costs of the English Premier League average team, from €120 millions to €200 millions (in 2012, these costs amounted to €102.5 millions) and we compute the loss and the domestic imbalance of each league at the Nash equilibria. The domestic imbalance is measured as the probability of the domestic representative club to win over its domestic contestant. Figures 18, 19 and 20 display the results of these simulations. As regards the EPL, the optimal average wage costs are around €145 millions. Above this cost level, the quality of the EPL deteriorates (Fig. 18). At the same time, the other four leagues see a decrease in their overall quality after the EPL wage costs rise (Fig. 19 and 20). Besides, the EPL domestic competitive balance target is reached when the wage costs are optimal. Above this optimal level, the English domestic championship gets less balanced as the average wage costs rise and the optimal decision of the EPL governing body would be to send its less performant team to the international championship. We find an opposite pattern for the other four leagues: first, a deterioration in the competitive balance of the national championships, then the competitive balance improves as the EPL wage costs go up.

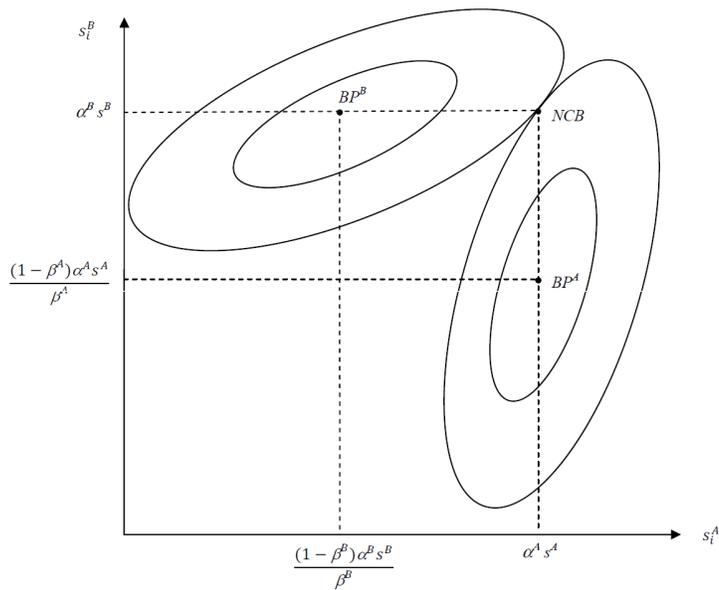
Our model however does not take into account the fact that some market forces could intervene to prevent the dominating league from getting too big. This weakness of the model has to be addressed carefully before worrying about the risk of facing a tragedy of the wealthy.

## References

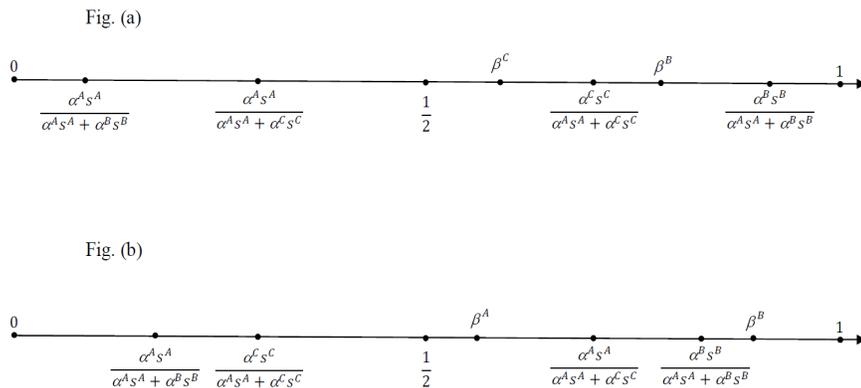
- Bourg, J. (2004). Professional team sports in Europe: Which economic model? In Fort, R. and Fizez, J., editors, *International Sports Economics Comparisons*, pages 3–18. Greenwood Publishing Group.
- Dietl, H. M., Grossmann, M., and Lang, M. (2011). Competitive balance and revenue sharing in sports leagues with utility-maximizing teams. *Journal of Sports Economics*, 12:284–308.
- Ducrey, P., Ferreira, C., Huerta, G., and Marston, K. (2003). *UEFA and Football Governance: A New Model*. Neuchâtel : Centre international d'étude du sport.
- Fort, R. and Quirk, J. (1995). Cross-subsidization, incentives, and outcomes in professional team sports leagues. *Journal of Economic Literature*, 33:1265–1299.
- Fort, R. and Quirk, J. (2011). Optimal competitive balance in a season ticket league. *Economic Inquiry*, 49:464–473.
- Hoehn, T. and Szymanski, S. (1999). The Americanization of European football. *Economic Policy*, 14:203–240.
- Kesenne, S. and Szymanski, S. (2004). Competitive balance and gate revenue sharing in team sports. *The Journal of Industrial Economics*, 52:165–177.
- Le Maux, B. and Rocaboy, Y. (2012). A simple microfoundation for the utilization of fragmentation indexes to measure the performance of a team. *Economics Letters*, 116:491–493.
- Madden, P. and Robinson, T. (2012). Supporter influence on club governance in a sports league: a "utility maximisation" model. *Scottish Journal of Political Economy*, 59:339–360.
- Palomino, F. and Sakovics, J. (2004). Inter-league competition for talent vs. competitive balance. *International Journal of Industrial Organization*, 22:783–797.
- Peeters, T. (2012). Media revenue sharing as a coordination device in sports leagues. *International Journal of Industrial Organization*, 30:153–163.
- Vrooman, J. (2007). Theory of the beautiful game: The unification of European football. *Scottish Journal of Political Economy*, 54:314–354.
- Vrooman, J. (2013). Two to tango: Optimum competitive balance in pro sports leagues. In Rodriguez, P., Kesenne, S., and Garcia, J., editors, *The Econometrics of Sport*. London: Edward Elgar.



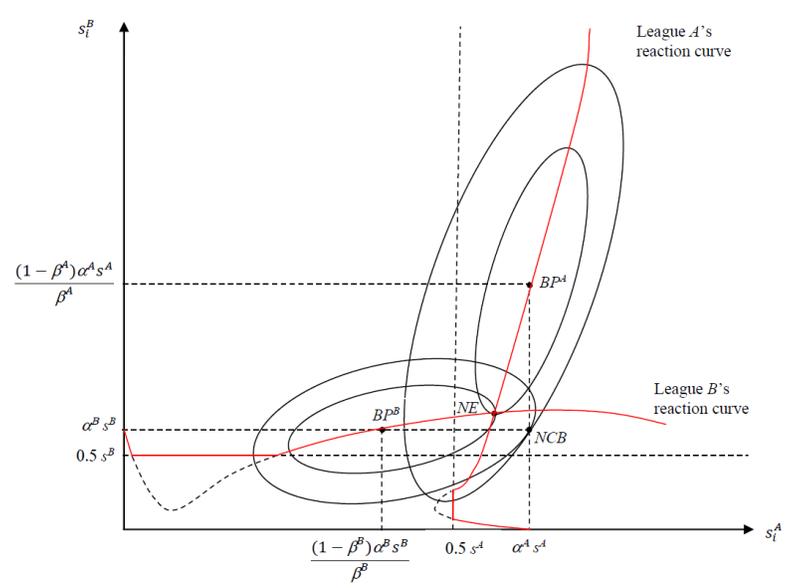
**Figure 1.** The  $NCB$  is not efficient because  $\alpha^A s^A < \frac{(1-\beta^B)\alpha^B s^B}{\beta^B}$  and  $\alpha^B s^B > \frac{(1-\beta^A)\alpha^A s^A}{\beta^A}$



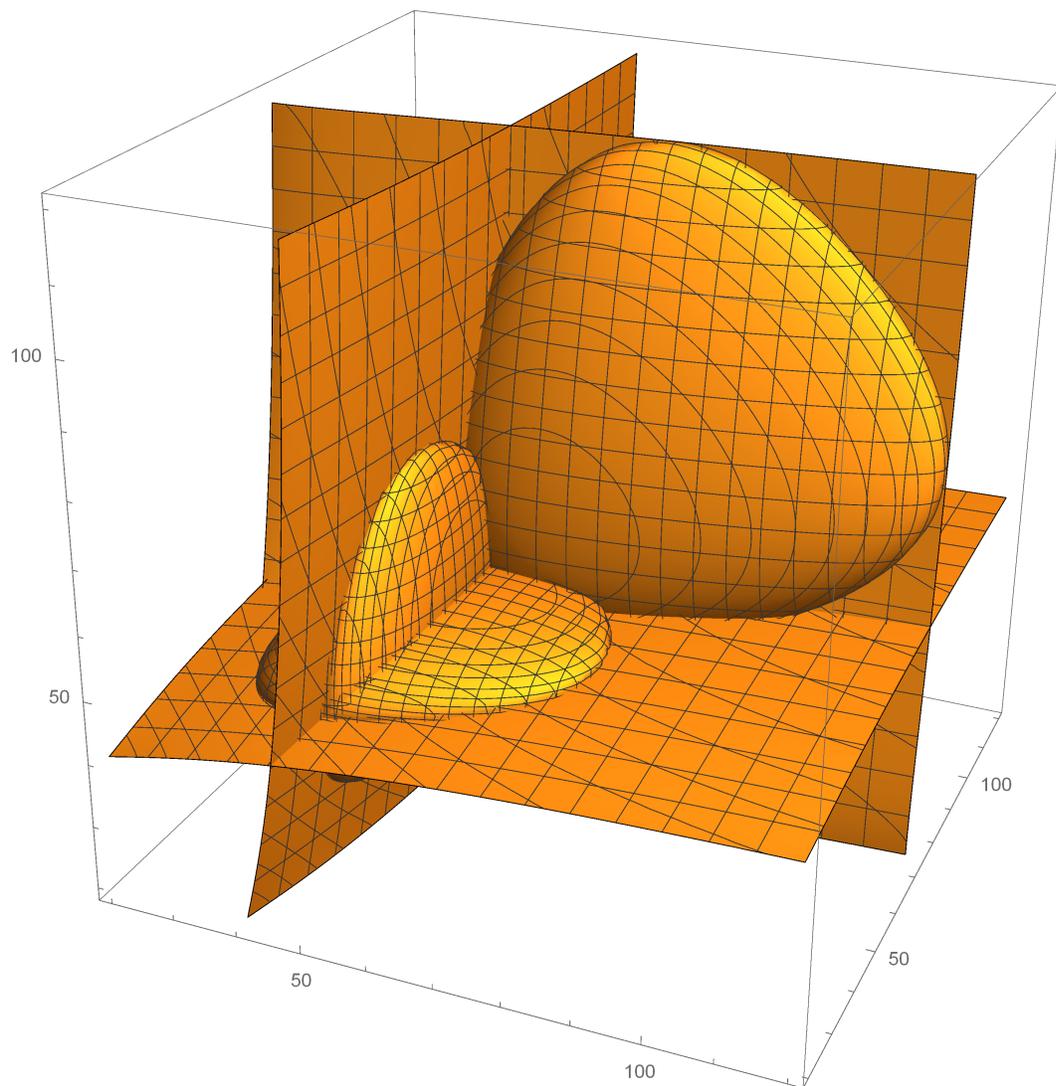
**Figure 2.** The  $NCB$  is efficient because  $\alpha^A s^A > \frac{(1-\beta^B)\alpha^B s^B}{\beta^B}$  and  $\alpha^B s^B > \frac{(1-\beta^A)\alpha^A s^A}{\beta^A}$



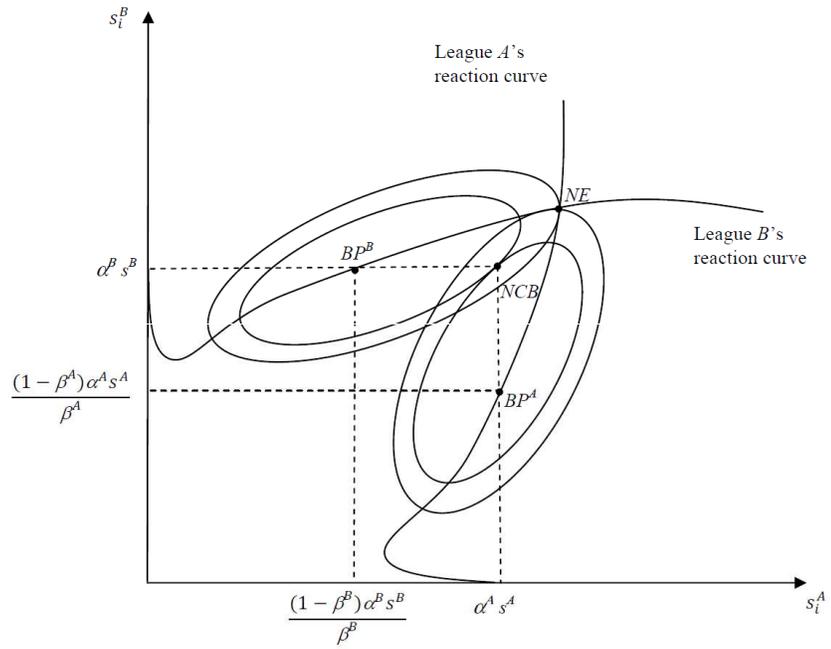
**Figure 3.** Inefficiency of the national competitive balance



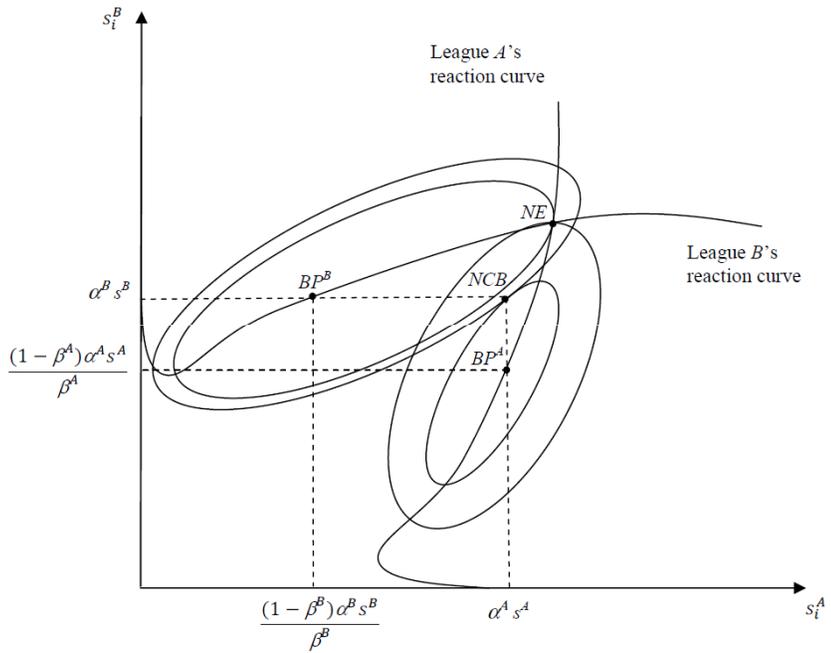
**Figure 4.** Nash equilibrium when the national competitive balance is not efficient



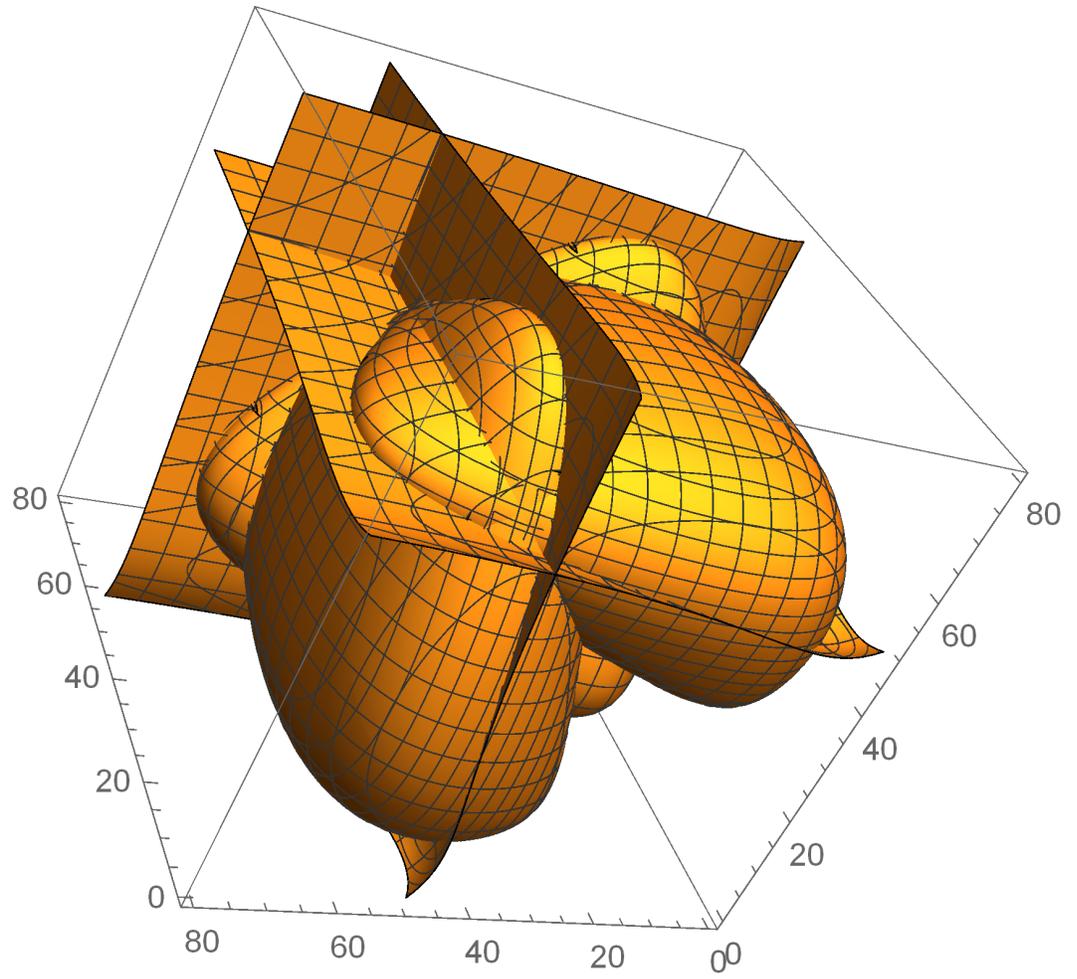
**Figure 5.** Three leagues: Nash equilibrium when the national competitive balance is not efficient



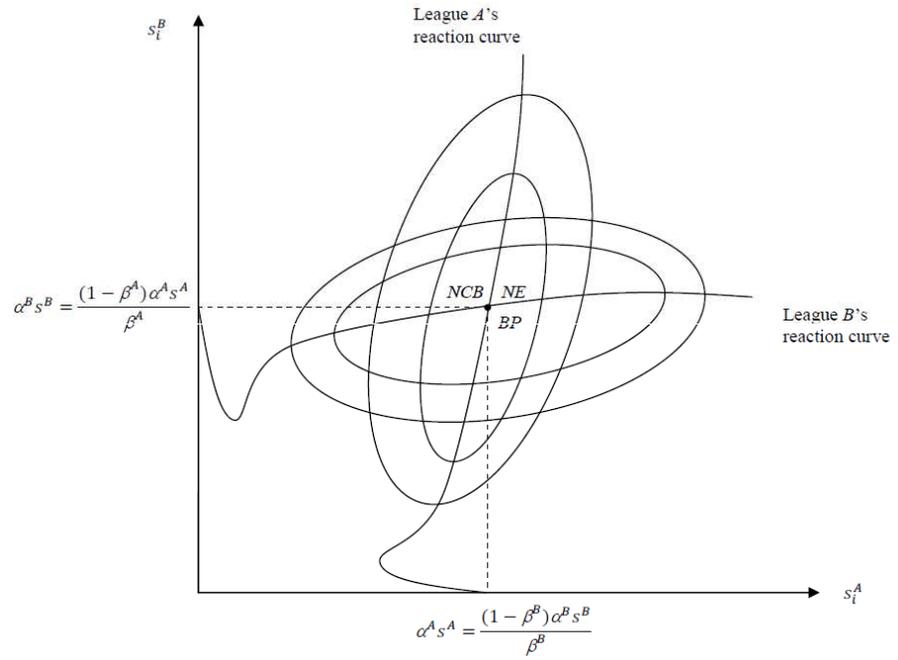
**Figure 6.** Nash equilibrium when the national competitive balance is efficient and Pareto improving



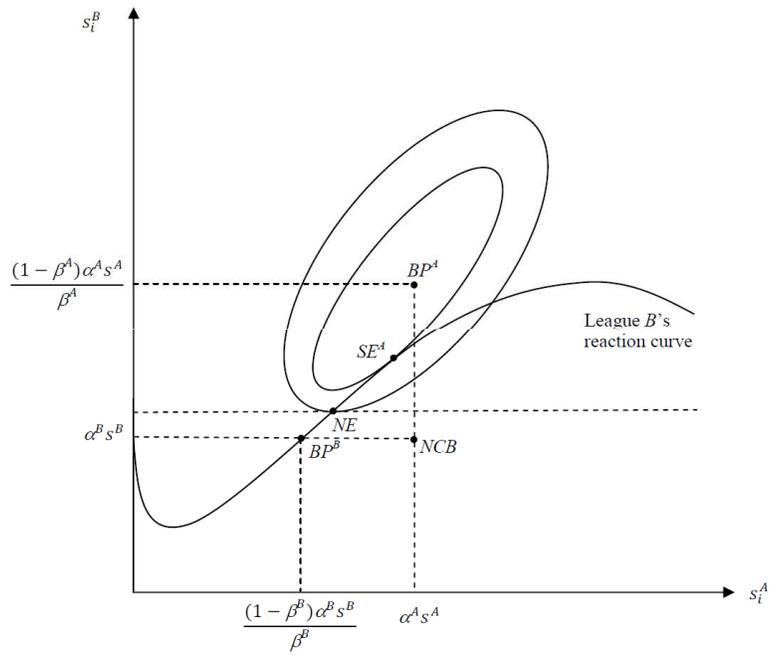
**Figure 7.** Nash equilibrium when the national competitive balance is efficient but not Pareto improving



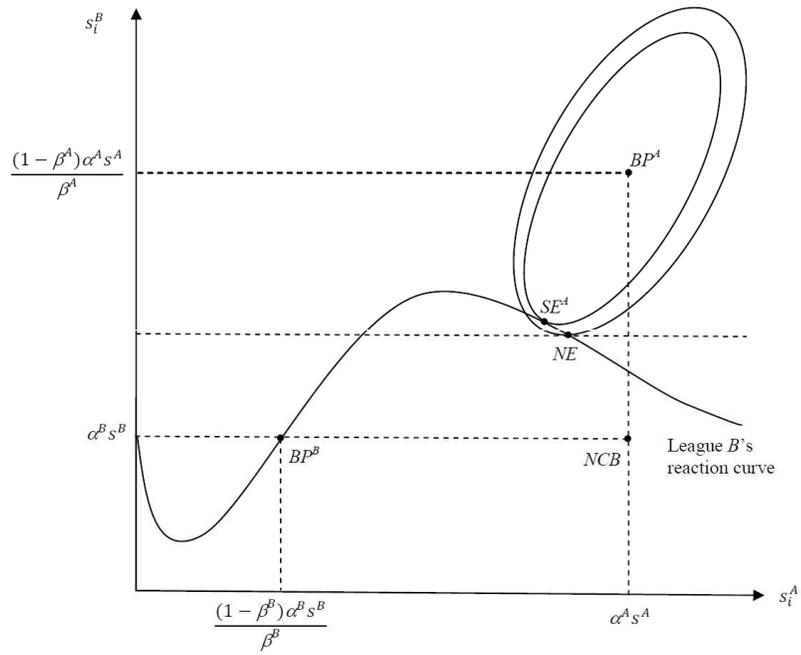
**Figure 8.** Three leagues: Nash equilibrium when the national competitive balance is efficient



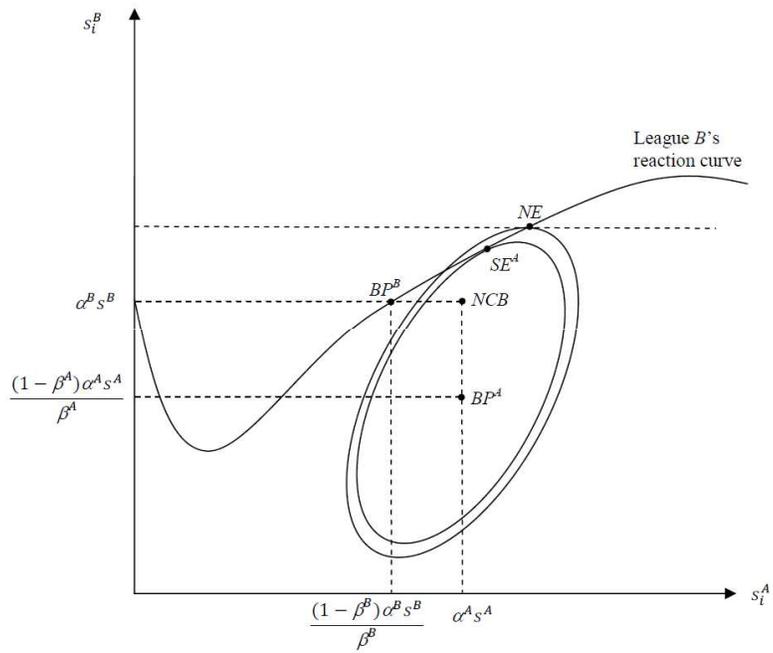
**Figure 9.** Nash equilibrium when the bliss points are identical



**Figure 10.** Stackelberg equilibrium when the national competitive balance is not efficient and the leagues are not too different



**Figure 11.** Stackelberg equilibrium when the national competitive balance is not efficient and the leagues are very different



**Figure 12.** Stackelberg equilibrium when the national competitive balance is efficient

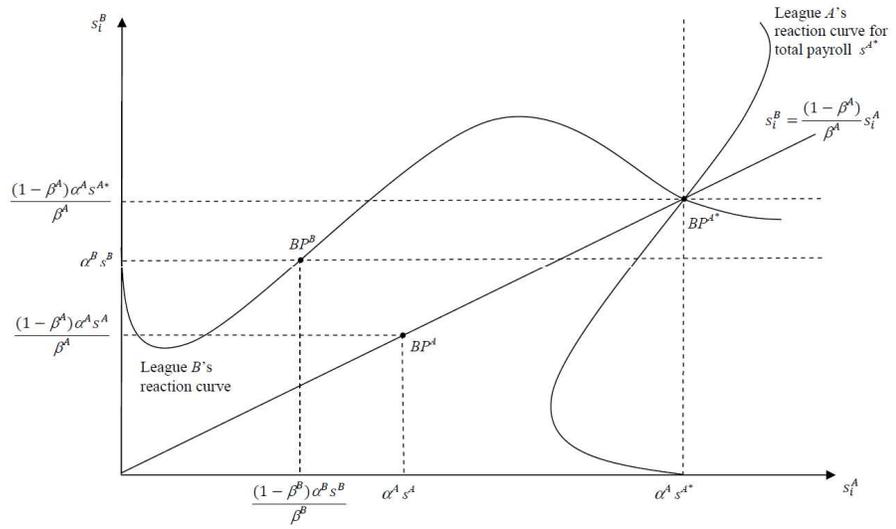


Figure 13. Optimal league A's total payroll  $s^{A*}$

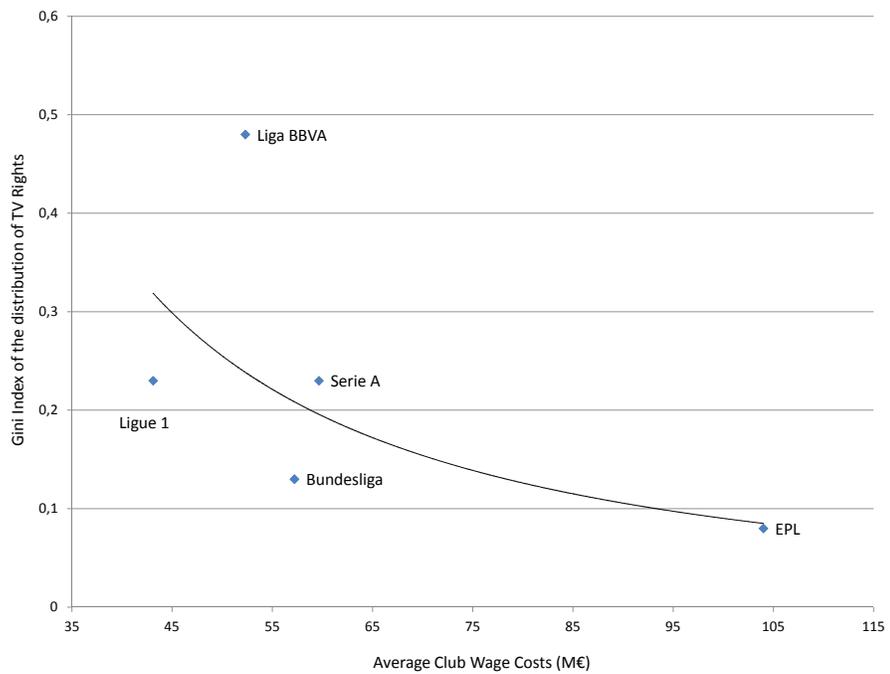


Figure 14. Average Club Wage costs and Gini Index of the distribution of TV rights (2012-2013)

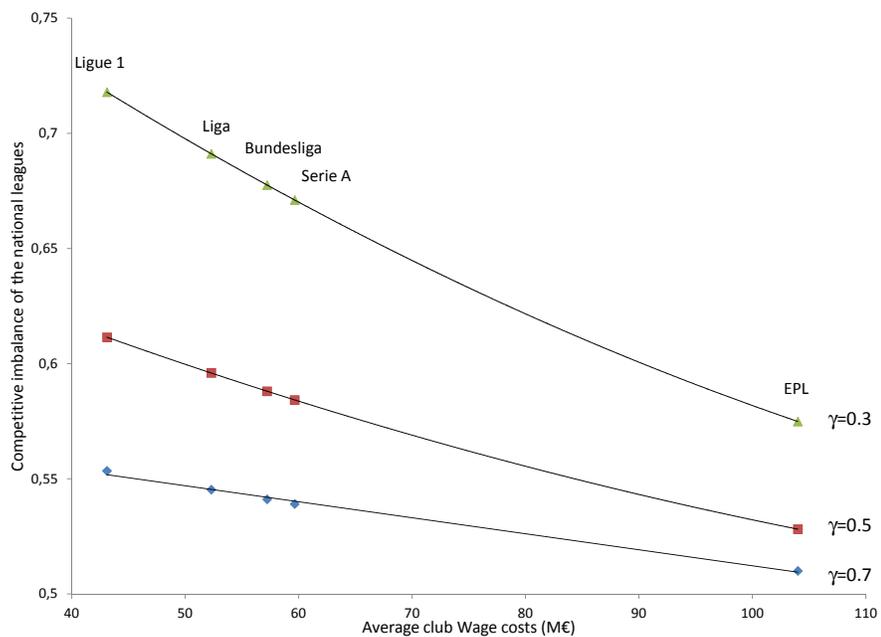


Figure 15. Average club Wage costs (2012-2013) and simulated Competitive imbalance for different values of  $\gamma$

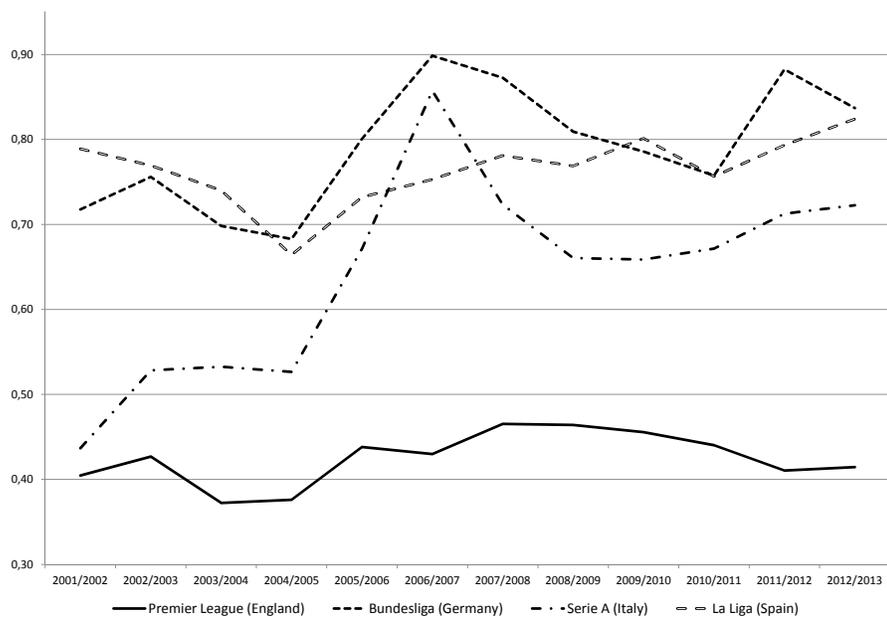
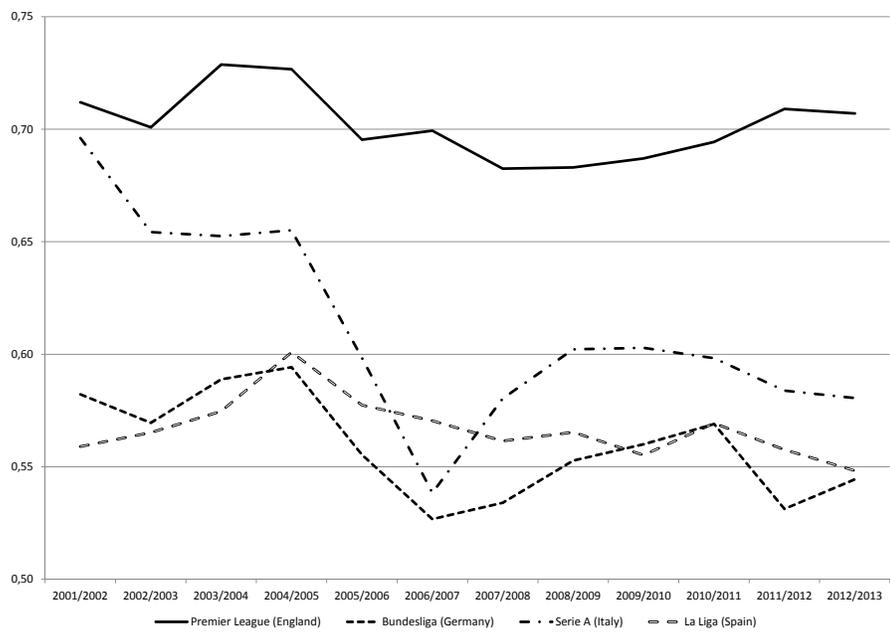
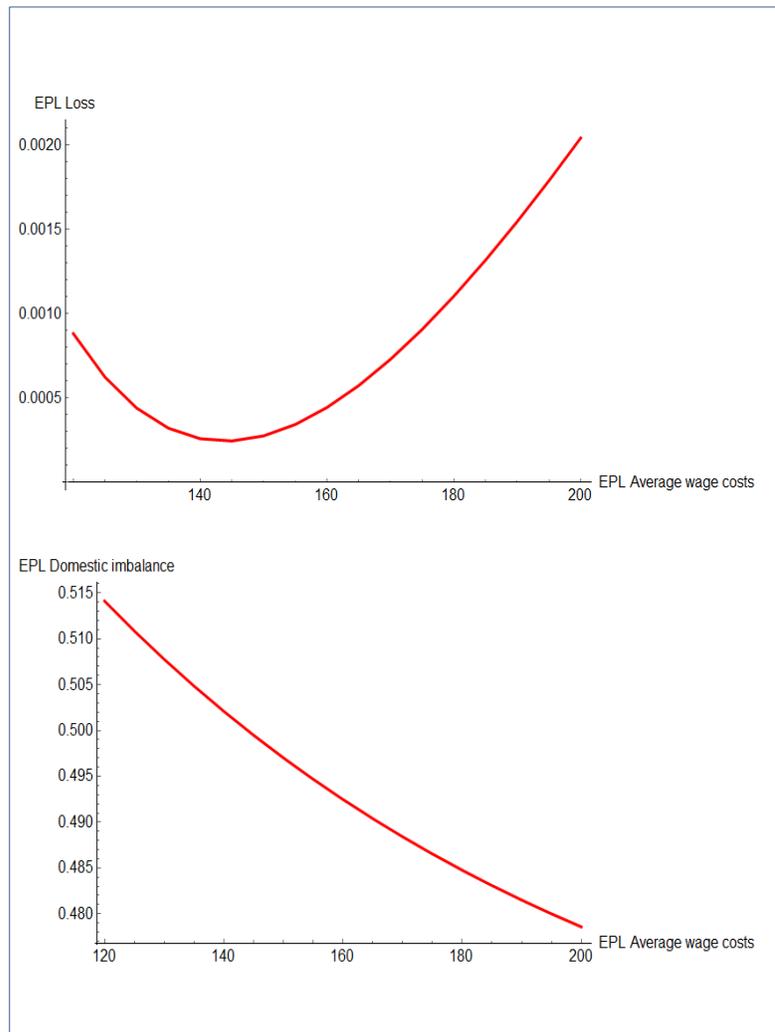


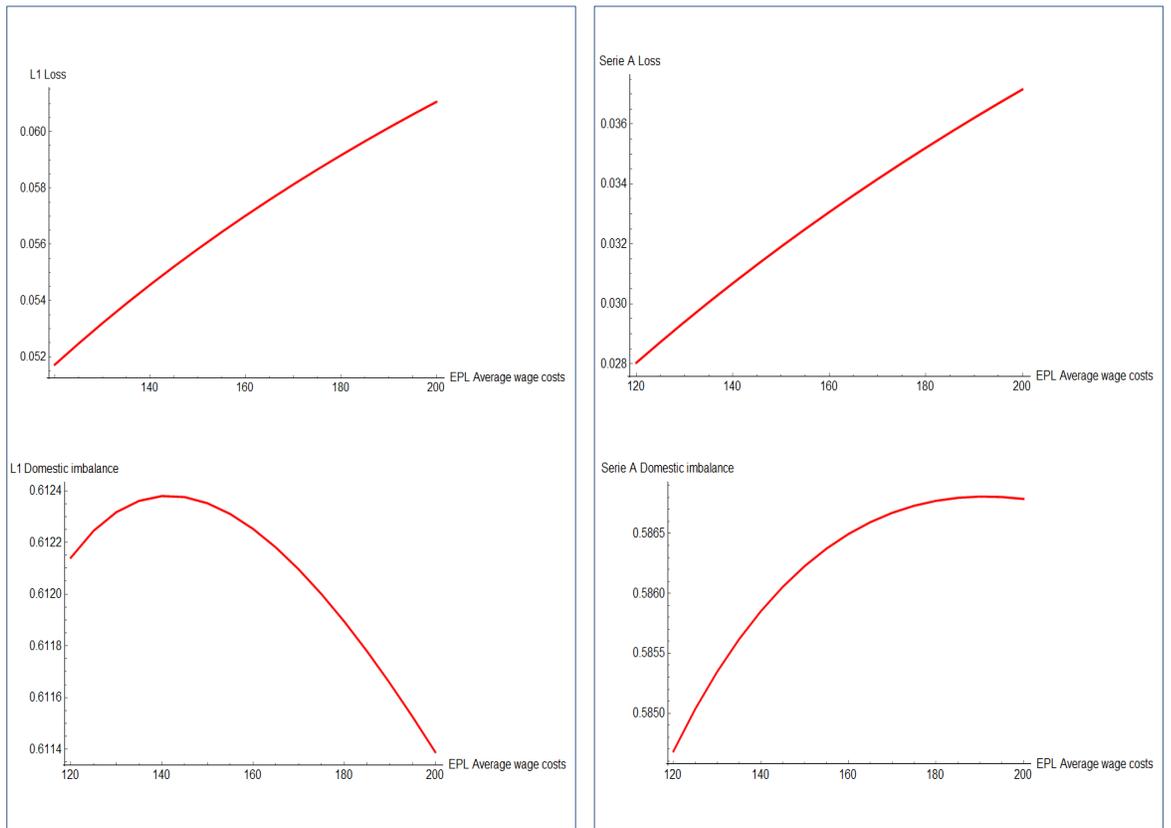
Figure 16. Ratio of leagues' average club wage costs to the French average club wage costs:  $\frac{\alpha_{S^K}^K}{\alpha_{S^M}^M}$  where  $K$  denotes the French Ligue 1



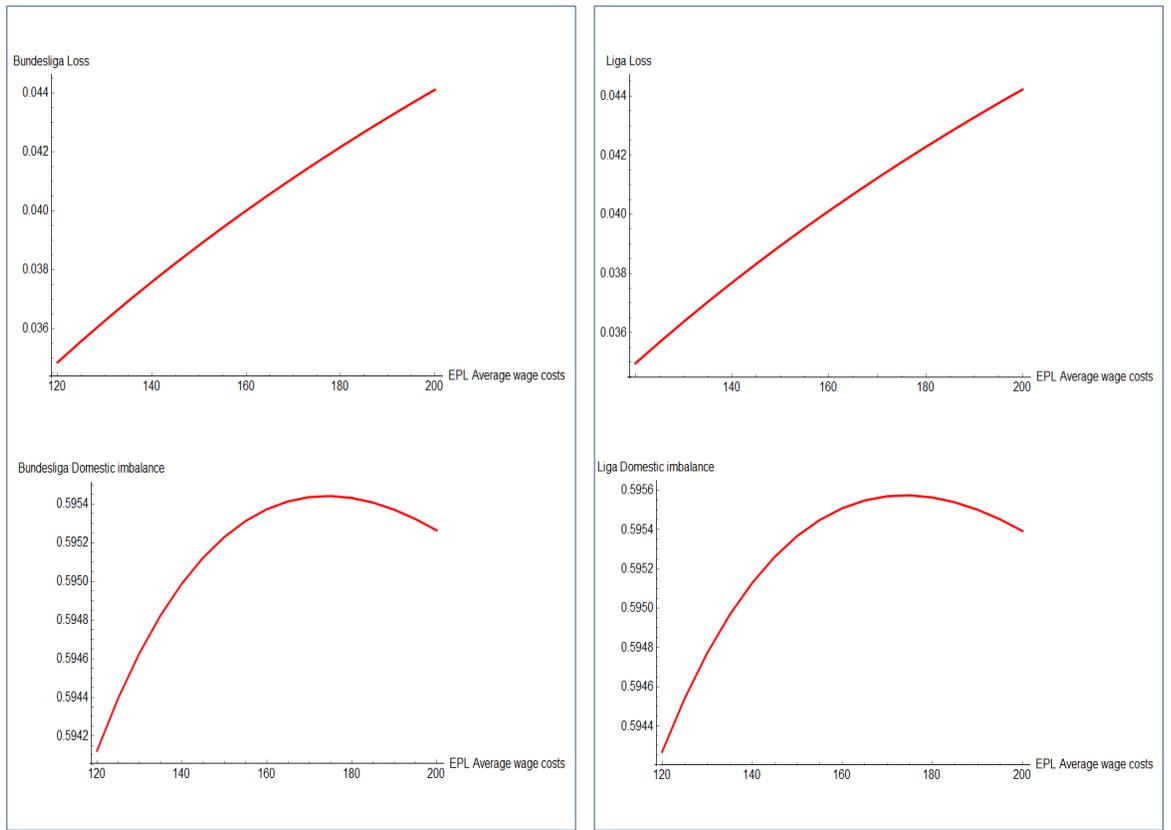
**Figure 17.**  $\beta^M$  Threshold



**Figure 18.** Simulated optimal wage costs for the English Premier League



**Figure 19.** Simulated Loss and domestic imbalance for the L1 and Serie A



**Figure 20.** Simulated Loss and domestic imbalance for the Bundesliga and Liga