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## Welfare Effects of Salary Caps in Sports Leagues with Win-Maximizing Clubs

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### Abstract

A wide range of literature which discusses the impact of the chosen objective function on competitive balance and revenue sharing. Some authors argued that sports clubs (or the owners of the sports clubs) behave like profit maximizers. This assumption of profit maximization coincides with the standard microeconomic theory of firms. On the other hand, some researchers pronounced that European football clubs behave like utility maximizers having a utility function that incorporates variables other than (only) club profits. Also, this assumption is well-known in standard microeconomic theory, since households maximize their utility with respect to a given budget constrain. In this paper, we want give a formal framework for the so called mixed leagues, i.e. professional sports leagues, where some club owners maximize clubs' profits and the rest of the clubs are interested in maximizing their winning probability. This paper fills the gap in the existing literature since mixed leagues have not (formally) discussed, and therefore, no policy implications exist.

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## I. INTRODUCTION

Competitive imbalance leading to boring games and the ruinous escalation of player salaries play the dominant role among the dangers cited in all attempts to regulate professional team sports since the introduction of the first professional leagues in the USA. Throughout their history, American professional team sports have employed a wide array of regulations against these dangers. Reserve clauses limiting free agency of players were the most prominent example in this context. The reserve clause system began to unravel in the 1970s, due largely to the activism of players' unions, and the threat of anti-trust actions. The latest state of development in this struggle for cost controls and the promotion of competitive balance is known under the heading of salary caps.

A salary cap limits the total amount of salaries paid by a club to all its players. All four American major team sports leagues have introduced some variant of a salary cap mechanism in the meantime.<sup>1</sup> In contrast to earlier regulations imposed by the team owners on players, salary caps are now an integral part of the system of labour relations in the league. The maximum (and sometimes minimum) amount of league revenues which should be devoted to player salaries is negotiated between the players' unions and the team owners and fixed in Collective Bargaining Agreements (CBAs). Therefore, salary caps are not subject to anti-trust actions as earlier regulations affecting the player market used to be.

Although European club football has achieved economic and financial potential comparable to the US major leagues in the last decade, it has not followed the example of introducing salary cap mechanisms so far. Presumably, this reluctance is not due to the fact that the dangers of competitive imbalance and financial instability are unknown among the

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<sup>1</sup>Major League Baseball claims not to have a salary cap so far. However, Major League Baseball has a luxury tax mechanism, which requires the definition of a threshold for the application of the tax. The threshold can, of course, be interpreted as an absolute ceiling cap.

stakeholders of European football. Rather, the contrary seems to be the case. The recently published Independent European Sports Review,<sup>2</sup> an expert report based on a process of intensive consultation with the most important stakeholder groups of European football, leaves no doubt about the general perception that competitive balance in European club football is declining and that a large number of clubs have stumbled into a massive financial crisis and are accumulating ever-increasing debt.

The reasons for the past inactivity of European club football to introduce salary cap mechanisms are structural. In contrast to their American counterparts, football leagues in Europe are embedded in association structures. Every national football association governs a system of leagues, which is open through promotion and relegation from the amateur level to the top national division of professional football. On top of the national league pyramid, the European Football Association (UEFA), an association of national associations, organizes European club competitions like the Champions League and the UEFA Cup for the teams meeting certain sportive qualification criteria. Obviously, the labour relations approach employed by the hermetic American major leagues is not feasible within the European association-governed football pyramid. Football associations cannot be compared with the team owners in an American major league, which represent the demand side of the respective labour market. Instead, associations are conceived as democratic governing bodies, which aim to integrate all important stakeholders of football in a certain geographic region including the players and, of course, the representatives of amateur football. At the European level, the different political and market conditions of every football nation create additional stakeholder diversity. It follows that decision processes concerning the introduction of salary caps will be much more complicated in the European association-governed football pyramid, as the interests of various stakeholders need to be properly balanced. In particular, this European

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<sup>2</sup> See Arnaut (2006).

stakeholder diversity has at least the following consequences:

#### *Win-maximizing clubs*

First, a salary cap system must take into account that in many European countries a majority of football clubs are still members' clubs in the classical sense. Legally, clubs like FC Barcelona, Real Madrid, AC Milan and FC Bayern München, all of them winners of the Champions League, are registered associations democratically governed by their members. In the absence of residual claimants, profit-maximization as a club goal does not make sense. Even in the case of English football, where the flagship clubs are organized as firms, the assumption of profit-maximization at the club level seems far-fetched, as the wealthy investors like Chelsea's Roman Abramovich have exhibited the behaviour of sponsors in the past, spending rather than earning significant amounts of money. Consequently, European clubs are treated as win-maximizers and not as profit-maximizers in the sports economics literature.<sup>3</sup>

#### *Percentage-of-revenue cap*

Second, a salary cap system has to take into account the significant market heterogeneity within the European football pyramid. The American system of an absolute capped salary amount applicable to all clubs covered by the CBA will not work in the European football pyramid since, for example, a typical Belgian first division club will earn approximately 13% of the revenues of the typical English Premiership club. As the cost of administering a specific absolute cap for every league in the European football pyramid would be prohibitive, the only workable solution in the European context seems to be a percentage-of-revenue cap. Unsurprisingly, all discussions among the stakeholders of European football focus on this

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<sup>3</sup> See Sloane (1971), Késenne (2000), Fort and Quirk (2004), Késenne (2006).

relative capping strategy.

For example, a small fraction of European football clubs, known as G-14 and established as an interest group of 18 prominent clubs of European football, had already brought up the issue of salary cost controls in 2004. The members of G-14 had planned to limit their salary expenditures at 70% of audited club turnover from the season 2005/2006 onwards. At the same time, the minimum allowable amount for total staff costs of each member was set at 30 million euros. According to the G-14 plan, verification of the clubs' compliance with these principles should be carried out by their statutory auditors. However, the G-14 plan has never been put into practice and G-14 dissolved in January 2008, when the new European Club Association was founded under the auspices of UEFA.

As an outcome of the consultations with important stakeholder groups of European football, the recently published Independent European Sports Review refers to the same relative capping strategy:

The European Professional Football Leagues also consider that a salary cost control system should be further examined, as a possible tool to bring both financial stability to football and help to maintain and improve competitive balance in the sport. A common feature of cost control systems is to stipulate a given percentage of club revenues which may be spent on player salaries.<sup>4</sup>

*Social wealth-maximization as the overall goal of a salary cap system in Europe*

As already mentioned, the hermetic American major leagues operating independently of association structures implemented salary caps as an integral part of a labour relations approach. The player's union and the owners represent the two sides of the relevant labour

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<sup>4</sup> See Arnaut (2006, 83).

market and the state accepts the outcome of their bargaining written down in CBAs. This labour market model is not compatible with the European association model. Associations are not representing one side of a labour market. Instead, they are sports governing bodies. Representing all important stakeholders in sports, they perform regulatory functions normally reserved for the state. For historical and cultural reasons, European states have left the regulation of sports to the sports governing bodies to a more or less substantial extent. This self-regulation of sports is seen as an important expression of European civil society.<sup>5</sup> However, the scope for autonomous regulatory activity by the sports governing bodies is by no means unlimited. Recently, the application of EU law has brought about a situation where the sports governing bodies have found it increasingly difficult to judge whether they are acting in accordance with EU law. The Bosman ruling of the EU Court of Justice is the most prominent case in which a regulation issued by the football associations, the player transfer system, was found to violate EU law, in particular, the principle of freedom of movement in the labour market. In this context, it is a priori unclear if a salary cap mechanism in European football falls under the margin of discretion granted to the associations in order to perform their duties. In any case, the football governing bodies will have to prove that their proposal of a salary control system is doing more than, for example, improving the financial situations of clubs. As the previous interferences of EU institutions into the regulatory activities of sports associations shows, a much broader welfare perspective including the view of consumers is generally applied. It seems likely that the EU institutions will only grant discretion to the football governing bodies if the latter can prove that the new system of salary cost controls is maximizing social welfare.

As will be shown in the next section, a broad body of literature in sports economics analyzes the economic impacts of salary caps. However, this literature is not well-adapted to the

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<sup>5</sup> See Arnaut (2006, 29).

relevant institutional parameters of the European situation as they have just been outlined. From the perspective of European football, the crucial question is whether a percentage-of-revenue cap applied in a league context with win-maximizing clubs has the potential to increase social welfare.

In this paper, we try to give a first answer to this question based on a theoretical model of a team sports league with win-maximizing clubs. The analysis shows that a percentage-of-revenue cap increases competitive balance and decreases the overall salary payments in the league, therefore contributing to financial stability and a more balanced league. The effect on social welfare depends on fans' preferences and on the weight league authorities put on aggregate club surplus in the welfare function. A percentage-of-revenue cap can increase social welfare if the weight on aggregate club surplus in the welfare function is sufficiently high. Additionally, if fans' preferences for aggregate talent are sufficiently high then the percentage-of-revenue cap will always increase social welfare, no matter how much weight the league puts on clubs' surplus. These results hold true despite the fact that a percentage-of-revenue cap decreases aggregate player salaries.

The remainder of the paper is organized as follows. The next section gives an overview of the relevant literature. Section III considers our model of a European team sports league with a percentage-of-revenue salary cap. In the following three Subsections, we present the basic model set-up, analyze the problem of the clubs and consider the problem of the governing league body. Finally, Section IV concludes.

## II. RELATED LITERATURE

Before proceeding with the model, we will give a short overview of the existing literature. The sports economics literature concerning the influence of salary caps in professional team sports leagues is focused on the impact on competitive balance and club profits. Staudohar (1998; 1999; 2005) gives a historical overview of the development of salary caps in the US major leagues. Quirk and Fort (1992) suggest that salary caps may improve competitive balance because they prevent large-market clubs from bidding the full marginal value for additional talent. This effect allows small-market clubs to keep their star players. Fort and Quirk (1995) consider an enforceable salary cap as the only effective device to maintain financial viability and improve competitive balance. Their theoretical model predicts a decrease in the standard deviation of win percentage. However, they find empirical evidence that contradicts their theoretical analysis. Vrooman (1995; 2000) argues that salary caps are a collusive effort by clubs to maximize league revenue by controlling labour costs at the expense of less competitive balance within the league. Késenne (2000a) develops a two-team model consisting of a large- and a small-market club and shows that a payroll cap, defined as a fixed percentage of league revenue divided by the number of teams, will improve competitive balance as well as the distribution of player salary within the league. Moreover, he shows that the profits of both the small- and the large-market club will increase. In Késenne (2003), he compares the salary cap as it has been introduced in some US major leagues with the salary cap in the European football leagues as it is proposed by the G-14. The impact of these two types of salary caps can be very different and depends on the cost structure of the small- and large-market clubs. Dietl et al. (2006) analyze the conditions under which a voluntary salary cap agreement is self-enforcing. Their model suggests that the self-enforcing character of salary caps increases with the clubs' discount factor and the importance of competitive balance. Our paper is closely related to Dietl et al. (2007), in which the impact of salary caps on social welfare in a league with profit-maximizing clubs is analyzed. They



show that the effect of a salary cap on social welfare depends on the relative preference of fans for aggregate talent and for competitive balance. A salary cap that binds only large-market clubs will increase social welfare if fans prefer aggregate talent, despite the fact that the salary cap will result in lower aggregate talent. If fans prefer competitive balance, on the other hand, any binding salary cap will reduce social welfare. However, in their analysis, the salary cap is exogenously determined and the clubs are profit-maximizers. In contrast, in this paper, clubs are win-maximizers and the salary cap is determined endogenously. The salary cap is calculated as a percentage of current revenues.

To the best of our knowledge, no analysis regarding the influence of salary caps on social welfare in the European context has been conducted so far. In this paper, we try to add to the existing literature. Of course, our paper is not the first to integrate consumer preferences into economic models of sports leagues. To our knowledge, Cyrenne (2001) was the first to model consumer preferences explicitly and perform a welfare analysis in a sports league. He develops a quality-of-play model which captures consumer preferences and shows under which conditions the clubs' demand for talented players are strategic complements or substitutes. Falconieri et al. (2004) investigates the conditions under which the collective sale of broadcasting rights is preferred from a social welfare point of view, compared with a regime where teams sell the rights individually. In their model, they derive the demand and the price for a match with a given quality via consumer preferences. Dietl and Lang (2008) consider a contest model of a sports league and analyze the welfare effect of gate revenue sharing based on a quality function similar to our model. They derive that revenue sharing decreases competitive balance but, at the same time, increases both social welfare and aggregate club profits.

### III. MODEL OF A EUROPEAN SPORTS LEAGUE

In the following, we set up a simple model of a European sports league in order to study the impact of a salary cap on social welfare. Since we study a European league, we assume that the  $n$  (an even number) clubs try to maximize their success on the field.<sup>6</sup> Additionally, there is a governing body of the league which distributes league revenues to the clubs and decides whether to implement a percentage-of-revenue salary cap. We use a two-stage set-up. In the first stage, the governing body of the league sets the salary cap. In the second stage, the clubs independently invest in playing talent in order to maximize their own level of talents subject to the salary cap set by the league authority, which is defined as a percentage of the club's revenues. Clubs receive a certain share of the total league revenues, which depends on their market share. We assume that there are two types of clubs, large-market clubs and small market clubs, which differ in the shares they receive of total league revenues.

#### Model Set-Up

The derivation of total league revenues for a league of a certain quality follows Falconieri et al. (2004), Dietl et al. (2007) and Dietl and Lang (2008). The league maximizes total revenues subject to a league demand function derived from fans' preferences. As shown in Appendix A, this results in a simple formulation of total league revenues, which depends only on the quality of the league.

$$LR(x_1, \dots, x_n) = \frac{1}{4} q(x_1, \dots, x_n).$$

Following Szymanski (2003) and Dietl et al. (2007), we assume that league quality depends on the overall level of the competition, as well as the suspense associated with a close

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<sup>6</sup>Note that the clubs in the US major leagues are commonly considered to be profit-maximizers whereas in Europe clubs are usually considered to maximize sporting success or wins. For a discussion of the clubs' objective function see e.g. Sloane (1971), Késenne (2000b), Fort (2004) and Késenne (2006).

competition (competitive balance). Both depend on the vector of talent investments (salary payments)<sup>7</sup> of the  $n$  clubs, where  $x_i$  denotes the talent investment of club  $i$ . League quality is now defined as

$$q(x_1, \dots, x_n) = \theta T(x_1, \dots, x_n) + CB(x_1, \dots, x_n), \quad (1)$$

where  $\theta$  allows the relative importance of the two components of league quality to shift.

The total level of the competition  $T$  is simply measured by the aggregate talent within the  $n$  club league:

$$T(x_1, \dots, x_n) = \sum_{j=1}^n x_j.$$

Competitive balance  $CB$  is measured as minus the variance of salary payments:

$$CB(x_1, \dots, x_n) = -\frac{1}{n} \sum_{j=1}^n (x_j - \bar{x}_n)^2 \quad \text{with} \quad \bar{x}_n = \frac{1}{n} \sum_{j=1}^n x_j.$$

Note that a lower variance of salary payments by the  $n$  clubs implies a closer competition and therefore a higher degree of competitive balance.

Given aggregate salaries  $\sum_{j=1, j \neq i}^n x_j$  of the other  $(n-1)$  clubs, league quality increases in club  $i$ 's salary payment  $x_i$  only until a threshold value  $x_i^*(\theta) = \frac{n\theta}{2} + \frac{1}{n-1} \sum_{j=1, j \neq i}^n x_j$ . After this threshold, quality starts to decline as the league starts to become too unbalanced.

League revenues are split between the two types of clubs according to their market shares. For the sake of simplicity, we assume that half of the  $n$  clubs have large market clubs and half

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<sup>7</sup> In the following, we will use both terms interchangeably.

of them are small market clubs. A fraction  $\frac{m_s}{n/2}$  of league revenues allocated to each of the strong clubs and each of the small clubs receives a fraction  $\frac{m_w}{n/2}$  of league revenues, with  $m_s > m_w$  and  $m_s + m_w = 1$ .

We denote  $I_s$  and  $I_w$  as the set of strong and weak clubs, respectively, i.e.  $I = \{1, \dots, n\} = I_s \cup I_w$ .

We solve the model by following the logic of backward induction. The next subsection deals with the problem of the clubs conditional on the choice of the league authorities in the following subsection.

### The Problem of the Clubs

We first solve the problem of the clubs in the second stage. Each club chooses independently a level of talent in order to maximize the level of own talents subject to the salary cap constraint set in the first stage. We choose this objective function since, according to Késenne (2006), “win maximization is not an operational objective, because clubs cannot control their winning percentage. Clubs can only maximize the talents of the team. The best guarantee for a high winning percentage is fielding a performing team by attracting the best players.”

The revenue function  $R_i(x_1, \dots, x_n)$  of club  $i \in I$  is given by

$$R_i(x_1, \dots, x_n) = \frac{m_\phi}{2n} LR(x_1, \dots, x_n)$$

with  $\phi = s$  for  $i \in I_s$  and  $\phi = w$  for  $i \in I_w$ .

As discussed in the introduction, we assume that the salary cap fixes a maximum

wage/turnover ratio for each club. This maximum amount is defined as a percentage of own revenues.<sup>8</sup> That is, each club faces a club-specific endogenously determined salary cap, given for club  $i \in I$  by  $cap_i = \delta R_i$  with  $\delta \in (0,1]$ . Clubs now choose salary levels such that the level of own talent is maximized subject to their individual salary cap constraint.

The maximization problem for club  $i \in I$  is therefore to maximize talent investments  $x_i$  subject to the salary cap constraint  $x_i \leq \delta R_i(x_1, \dots, x_n)$ .

The corresponding first-order conditions are given by

$$\begin{aligned} 1 + \lambda_i \left[ 1 - \delta \frac{m_\phi}{2n} \left( \theta - \frac{2}{n} \left( x_i - \frac{1}{n} \sum_{j=1}^n x_j \right) \right) \right] &\geq 0, \\ x_i - \delta \cdot \frac{m_\phi}{2n} \left( \theta \sum_{j=1}^n x_j - \frac{1}{n} \sum_{j=1}^n (x_j - \bar{x}_n)^2 \right) &\leq 0, \\ \lambda_i \left( x_i - \delta \cdot \frac{m_\phi}{2n} \left( \theta \sum_{j=1}^n x_j - \frac{1}{n} \sum_{j=1}^n (x_j - \bar{x}_n)^2 \right) \right) &= 0, \end{aligned} \quad (2)$$

where  $\lambda_i$  denotes the Lagrange multiplier for club  $i \in I$  with  $\phi = s$  for  $i \in I_s$  and  $\phi = w$  for  $i \in I_w$ .

In the next lemma, we compute the clubs' investment decision in stage 2.

### Lemma 1

*In stage 2, the clubs choose the following equilibrium salary payments:*

$$\begin{aligned} x_i^*(\delta) &= \frac{2m_s n(\theta\delta - 4)}{\delta((m_s - m_w)^2)} =: x_s^* \quad \forall i \in I_s, \\ x_j^*(\delta) &= \frac{2m_w n(\theta\delta - 4)}{\delta((m_s - m_w)^2)} =: x_w^* \quad \forall j \in I_w. \end{aligned} \quad (3)$$

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<sup>8</sup>For example, in European soccer, the leading clubs, organized as the so-called G-14, planned to limit annual team salaries to 70% of revenues.

In the following, we assume that

$$\delta > \delta^{\min} := \frac{4}{\theta}. \quad (4)$$

For  $\delta \leq \delta^{\min}$ , the salary cap is so restrictive that the clubs decide not to invest in talent at all. As this cannot be optimal from a league authority's point of view, we rule out this possibility in advance. Moreover, in order to assure that  $\delta^{\min}$  is smaller than unity condition (4) implicitly implies that

$$\theta > \theta^{\min} := 4. \quad (5)$$

The equilibrium salary payments (3) show that all strong (weak) clubs choose the same salary level  $x_s^*$  ( $x_w^*$ ). Moreover, the strong clubs invest more in salaries than the weak clubs because the marginal revenue of talent investments is higher for these clubs.

In a league where the league organization has set a salary cap, the level of aggregate salary payments  $T^*(\delta)$  and competitive balance  $CB^*(\delta)$  in equilibrium are given by

$$T^*(\delta) = \frac{n^2(\theta\delta - 4)}{\delta((m_s - m_w)^2)} \text{ and } CB^*(\delta) = -\left(\frac{n(\theta\delta - 4)}{\delta((m_s - m_w))}\right)^2.$$

We now analyze how variations of the salary cap parameter  $\delta$  affect the clubs' optimal choice of salary payments. A more restrictive salary cap, i.e. a lower value of  $\delta$ , induces both clubs to decrease their salary payments. However, the strong club decreases its salary payments in equilibrium more than the weak club. Moreover, we derive that equilibrium salary payments increase in  $\theta$ , i.e. the higher the fans' valuation for aggregate talent, the higher the salary payments.

We derive the following proposition:

**Proposition 1**

*A more restrictive salary cap (a lower variable  $\delta$ ) decreases aggregate salary payments and increases competitive balance.*

The proposition shows that a percentage-of-revenue cap increases competitive balance and decreases the overall salary payments in the league, therefore contributing to financial stability.

The league quality in equilibrium depends on the salary cap parameter  $\delta$  and is given by

$$q^*(\delta) = \frac{4n^2(\theta\delta - 4)}{\delta^2((m_s - m_w)^2)}. \quad (6)$$

Note that (6) is maximized for

$$\delta^q = \begin{cases} \frac{8}{\theta} & \text{for } \theta > \theta' := 8 \\ 1 & \text{for } \theta \in (\theta^{\min}, \theta'] \end{cases} \quad (7)$$

This result shows that a binding salary cap increases league quality until the maximal league quality is achieved if fans have a relatively high preference for aggregate talent ( $\theta > \theta'$ ), even though the salary cap reduces aggregate talent. On the other hand, if fans have a relatively low preference for aggregate talent ( $\theta < \theta'$ ) and hence a relatively high preference for competitive balance, the salary will reduce league quality even though the salary cap will result in a more balanced league. The intuition for this result is that a high fan preference  $\theta$  for aggregate talent leads, in the absence of a salary cap to an overall high level of the competition but to a relatively unbalanced league. In this case, a salary cap can increase the quality of the league by increasing competitive balance – the marginal benefit of increased competitive balance overcompensates for the marginal loss due to a decrease in aggregate

talent. In contrast, if the fans' preference for aggregate talent is relatively low then the league without a salary cap is already very balanced. In this case, the introduction of a binding salary cap  $\delta < 1$  will reduce overall quality.<sup>9</sup>

### The Problem of the League Governing Body

As already mentioned, it is a priori unclear if a salary cap mechanism in European football falls under the margin of discretion granted by the state authorities to the sport associations in order to perform their duties. As the previous interferences of EU institutions into the regulatory activities of sports associations show, the football governing bodies will have to prove that their proposal of a salary control system is doing more than, for example, just improving the financials of clubs. It is well recognized that sound club financials play an important role in avoiding incomplete seasons and maintaining the integrity of football. Clubs operating on the verge of bankruptcy are more inclined to engage in illegal practices like, for example, money laundering, match fixing and tax fraud, which harm the image of the whole industry. However, the history of interventions shows that the EU institutions will assess a salary control system from a much broader social welfare perspective, which is not restricted to the improvement of financial stability alone, but at the same time, aims to secure a fair treatment of players and consumers.

We try to incorporate this specific European perspective into our model by assuming that social welfare depends on aggregate consumer (fan) surplus, aggregate player salaries and aggregate club profits.

The analysis in the previous section shows that the introduction of a salary cap helps to control costs by reducing aggregate salary payments in the league and produces a more

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<sup>9</sup> See also Dielt et al. (2008) for a similar intuition.



balanced league by improving competitive balance. The benchmark case (licensing) is a league without a salary cap, i.e.  $\delta = 1$ .<sup>10</sup> In such a league, clubs invest in equilibrium all their revenues in talent such that  $x_i = R_i$ . As a consequence, clubs have no reserves for financially difficult times. In contrast, an effective salary cap will allow (force) the clubs to make profits. However, due to the reasons stated above, the league authority has to take into consideration the effect of a salary cap on all stakeholders. How are the consumers and players affected?

In order to answer this question, we define the league authority's objective function (social welfare) as depending on aggregate consumer (fan) surplus, aggregate player salaries and aggregate club profits. Aggregate consumer (fan) surplus as shown in the Appendix is given by

$$CS = \frac{q(x_1, \dots, x_n)}{8}.$$

Note that consumer surplus is maximized when quality is maximized, i.e. if the league authority follows (7). Aggregate club profits and player salaries are given as follows. From the clubs' maximization problem, we know that, facing the salary cap constraint, clubs will choose the maximal amount of talent  $x_i = \delta R_i(x_1, \dots, x_n)$  which they are allowed to invest in equilibrium. As a consequence, aggregate player salaries are given by

$$PS = \sum_{i=1}^n x_i = \frac{\delta}{4} q(x_1, \dots, x_n) \text{ and aggregate club surplus is given by}$$

$$\Pi = \sum_{i=1}^n (1 - \delta) R_i(x_1, \dots, x_n) = \frac{(1 - \delta)}{4} q(x_1, \dots, x_n).$$

Note that club surplus always increases through a salary cap and that the league authority can maximize club profits by setting a salary cap of  $\delta^\Pi = \frac{8}{4+\theta} < 1$ , which is a tighter salary cap than maximizing fan surplus would call for. Moreover, players always suffer from the

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<sup>10</sup> This is similar to the current situation in European soccer, where the UEFA demands a balanced budget (UEFA'S club licensing system).

introduction of a salary cap.<sup>11</sup>

The objective function (social welfare) of the governing league body is now given by

$$W(\delta) = \gamma\Pi(\delta) + (1 - \gamma)[CS(\delta) + PS(\delta)] \quad (8)$$

We assume that the weight the league authority puts on club profits depends on the financial situation of the league and is increasing in the degree of financial distress. We denote this weight with  $\gamma \in [0, 1]$ . Given the optimal choice of the clubs, social welfare in equilibrium is given by

$$W^*(\delta) = \frac{n^2(1 + \gamma + (1 - 2\gamma)2\delta)(\theta\delta - 4)}{2\delta^2(m_s - m_w)^2}. \quad (9)$$

By analyzing the optimal choice by the league authorities in stage 1, we derive the following results:

**Proposition 2**

(i) *Social welfare can be increased for all  $\gamma \in (\gamma^{\min}, 1)$  through the implementation of a salary cap if financial distress (the weight on aggregate club profits) is sufficiently high, i.e.*

$$\gamma > \gamma^{\min} := \frac{16 - \theta}{\theta + 8}. \quad (10)$$

(ii) *In stage 1, the league authorities will set the following social welfare maximizing salary cap*

$$\delta^W = \begin{cases} \frac{8(1+\gamma)}{16\gamma-8+\theta(1+\gamma)} & \text{for } \gamma \in [\gamma^{\min}, 1] \\ 1 & \text{for } \gamma < \gamma^{\min} \end{cases}$$

*which is always in the interval of feasible salary caps, i.e.  $\delta^W \in (\delta^{\min}, 1]$ .*

**Proof:** See Appendix B.

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<sup>11</sup>That is, even if quality is increased through a tighter salary cap (in case of a high  $\theta$ ), the decrease in  $\delta$  overcompensates for the increase in quality and thus always results in a decrease in aggregate player salaries.

According to condition (5), we know that  $\theta > \theta^{\min}$  and therefore deduce that  $\gamma^{\min}$  is always smaller than unity. As a consequence, there will always exist a weight  $\gamma < 1$  such that social welfare can be increased. Moreover, if the fans' preference for aggregate talent is sufficiently high, i.e.

$$\theta > \theta'' := 16$$

then  $\gamma^{\min}$  is negative, which leads to the following corollary:

### **Corollary 1**

*If the fans' preference for talent is sufficiently high, i.e.  $\theta \in (\theta'', 1)$ , then a salary cap will always increase social welfare irrespective of the weight attached to clubs' profits.*

What is the intuition behind these results? Recall that the welfare function is composed of three components: on the one hand, consumer surplus and players' salaries weighted by  $(1 - \gamma)$  and, on the other hand, club surplus weighted by  $\gamma$ . Also recall that aggregate player salaries always decrease and club surplus always increases through a tighter salary cap. The respective effect on consumer surplus, however, depends on the fans' preference for aggregate talent. If fans have a relatively low preference for aggregate talent, i.e.  $\theta \in (\theta^{\min}, \theta')$ , then we know from (7) that quality and thus also consumer surplus decrease through the implementation of a salary cap. In this case, the weight  $\gamma$  in the welfare function attached to club surplus must be sufficiently high, i.e.  $\gamma > \gamma^{\min}$ , in order to guarantee an increase in social welfare. If the fans' preference for aggregate talent now increases above  $\theta'$ , i.e.  $\theta \in (\theta', \theta'')$ , then quality and therefore also consumer surplus will increase. However, the increase in quality does not overcompensate for the loss in aggregate salaries since there must still be a sufficiently high weight attached to club surplus in order to increase social welfare. Note that the critical weight  $\gamma^{\min}$  decreases in  $\theta$ . If the fans' preference for

aggregate talent increases above  $\theta''$ , i.e.  $\theta \in (\theta'', 1)$ , then the increase in consumer surplus outweighs the decrease in aggregate player salaries. As a consequence, social welfare increases irrespective of the weight attached to clubs' profits.

#### IV. CONCLUSION

Salary caps evolved in an organizational and legal island: the North-American major leagues. The organizational and legal peculiarities of this island include the institution of collective bargaining, the absence of promotion and relegation, cooperative-like league organization, clubs which are organized and managed like profit-maximizing firms, and almost complete league autonomy.

European football, as most major team sports around the world, is organized completely differently, which has important consequences for the feasibility of a salary cap system.

First, a salary cap system must take into account that in many European countries a majority of football clubs are still members' clubs in the classical sense, which means that profit-maximization as a general club goal should be substituted by win-maximization in the absence of genuine residual claimants.

Second, a salary cap system has to take into account the significant market heterogeneity within the European football pyramid, which encompasses all national and Pan European competitions through a system of promotion and relegation. The American system of an absolute capped salary amount applicable to all clubs will not work in the European football pyramid since the revenue differentials between clubs of a certain division in different countries are significant. Taking into account that the cost of administering a specific absolute cap for every league in the European football pyramid would be prohibitive, the only workable solution in the European context seems to be a percentage-of-revenue cap.

Third, the association-governed model of European football is not compatible with the American labour relations approach. Associations are not one side of a labour market, but sports governing bodies. Representing all the stakeholder groups of a particular sport, they perform regulatory functions normally reserved to the state. Since the scope for autonomous regulatory activity by the sports governing bodies is limited by national and EU law, it is a priori unclear if a particular salary cap mechanism in European football falls under the margin of discretion granted to the associations by the European Union. Judging from the previous interferences of EU institutions into the regulatory activities of FIFA and UEFA it seems likely that the football governing bodies will have to prove that their proposal of a salary control system is increasing social welfare instead of, for example, just improving the financial situation of clubs and/or players.

Therefore this paper has tried to analyze the welfare effect of a percentage-of-revenue salary cap in a European context with win-maximizing clubs. The governing body of the league distributes league revenues to the clubs and decides whether to implement a percentage-of-revenue salary cap. Our analysis has shown that a percentage-of-revenue salary cap will increase competitive balance and decrease the overall salary payments in the league, therefore contributing to financial stability. The effect on social welfare depends on two factors: fans' preferences and the weight league authorities put on financial stability in the welfare function. A percentage-of-revenue cap will increase social welfare if the weight on aggregate club surplus in the welfare function is sufficiently high. Additionally, if fans' preferences for aggregate talent are sufficiently high then the percentage-of-revenue cap will always increase social welfare, no matter how much weight the league puts on financial stability.

## A. APPENDIX: DERIVATION OF LEAGUE REVENUE AND CONSUMER SURPLUS

League demand depends on the quality of the league  $q$  and is derived as follows:<sup>12</sup> we assume a continuum of fans that differ in their willingness to pay for a league with quality  $q$ . Every fan  $k$  has a certain preference for quality that is measured by  $\omega_k$ . The fans  $\omega_k$  are assumed to be uniformly distributed in  $[0,1]$ , i.e. the measure of potential fans is one. The net-utility of fan  $\omega_k$  is specified as  $\max\{\omega_k q - p, 0\}$ . At price  $p$  the fan that is indifferent between consuming the league product or not is given by  $\omega^* = \frac{p}{q}$ . Hence, the measure of fans that purchase at price  $p$  is  $1 - \omega^* = \frac{q-p}{q}$ . The league demand function is therefore given by  $d(p, q) := 1 - \frac{p}{q}$ . Note that league demand increases in quality, albeit with a decreasing rate, i.e.  $\frac{\partial d}{\partial q} > 0$  and  $\frac{\partial^2 d}{\partial q^2} < 0$ . By normalizing all other costs (e.g. stadium and broadcasting costs) to zero, league revenue is simply  $LR = pd(p, q)$ . Then, the league will choose the profit-maximizing price  $p^* = \frac{q}{2}$ .<sup>13</sup> Given this profit-maximizing price, league revenue depends solely on the quality of the league. As standard, total league revenues depend only on the quality of the contest:

$$LR(x_1, \dots, x_n) = \frac{1}{4} q(x_1, \dots, x_n). \quad (11)$$

Aggregate consumer (fan) surplus corresponds to the integral of the demand function  $d(p, q)$  from the equilibrium price  $p^* = \frac{q}{2}$  to the maximal price  $\bar{p} = q$  which fans are willing to pay for quality  $q$ ,

$$CS = \int_{p^*}^{\bar{p}} d(p, q) dp = \frac{q}{8}. \quad (12)$$

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<sup>12</sup>Our approach is similar to Falconieri et al. (2004) but we use a different quality function.

<sup>13</sup>Note that the optimal price is increasing in quality, i.e.  $\frac{\partial p^*}{\partial q} > 0$ .

## B. APPENDIX: PROOFS

### Proof of Proposition 2

ad (i) Evaluating the derivative of (9) with respect to  $\delta$  at  $\delta = 1$  yields

$$\frac{\partial W^*(\delta)}{\partial \delta} \Big|_{\delta=1} = \frac{n^2(16 - \theta - \gamma(8 + \theta))}{2(m_s - m_w)^2} < 0 \Leftrightarrow \gamma > \frac{16 - \theta}{\theta + 8}.$$

This proves the claim.

ad (ii) The first part of (ii) is straightforward. For the second part, we have to show that

$$\delta^W \in (\delta^{\min}, 1]:$$

$$(a) \quad \delta^W = \frac{8(1+\gamma)}{16\gamma - 8 + \theta(1+\gamma)} < 1 \Leftrightarrow \gamma > \frac{16 - \theta}{\theta + 8}. \text{ Fulfilled for all } \gamma \in [\gamma^{\min}, 1].$$

$$(b) \quad \delta^W > \delta^{\min} \Leftrightarrow 8 + \theta > \gamma(16 - \theta):$$

Case  $\theta > 16$ . In this case,

$$\delta^W > \delta^{\min} \Leftrightarrow \gamma > \frac{\theta + 8}{16 - \theta} = \frac{1}{\gamma^{\min}}. \quad (13)$$

Since  $\theta > 16$  we know that  $\gamma^{\min} < 0$  and therefore (13) is fulfilled for all  $\gamma > 0$ .

Case  $\theta < 16$ . In this case,

$$\delta^W > \delta^{\min} \Leftrightarrow \gamma < \frac{\theta + 8}{16 - \theta} = \frac{1}{\gamma^{\min}}. \quad (14)$$

Since  $1 > \gamma^{\min} > 0$  we derive  $\frac{1}{\gamma^{\min}} > 1$  and thus (14) is fulfilled for all  $\gamma < 1$ .

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