European Sport Management Quarterly,
Vol. 6, No. 1, 23–34, March 2006

Routledge
Taylor & Francis Group

ARTICLE

Are Voluntary Salary Cap Agreements Self-Enforcing?

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ABSTRACT In 2002 the leading European football clubs reacted to the increasing player salaries by signing a voluntary agreement to limit player salaries to 70% of revenues. We analyse under which conditions a voluntary salary cap agreement is self-enforcing. Based on a simple model of a league with two profit-maximising clubs, we show that the self-enforcing character of salary caps increases with the clubs' valuation of future profits and the importance of competitive balance. In European football leagues salary cap agreements are not likely to be self-enforcing because (1) promotion and relegation as well as limited transfer windows reduce the clubs' discount factor; and (2) competitive balance is less important in order to activate fan interest than in US Major Leagues.

Introduction

In almost any European football league annual growth rates of player salaries exceeded annual growth rates of revenues during the last decade. In the English Premier League the wage/turnover ratio increased from 50% in 1995 to 62% in 2001. During the same period, it rose from 57% to 90% in Italy's Serie A (Jones & Boon, 2003). In order to keep up with this general trend, a lot of clubs were forced to increase their liabilities. The accumulated debt of all Italian Serie A clubs, for example, increased to approximately €2.5 billion. This compromised profitability. Italian teams generated a cumulated loss of €1.2 billion between 1995–1996 and 2002–2003. French teams lost €0.3 billion in the same period (Jones & Boon, 2004). Several clubs, for example Fiorentina, Servette Geneva, SW Bregenz, Lausanne Sports, and FC Lugano went bankrupt and numerous other clubs, such as Leeds United, FC Sevilla, Borussia Dortmund, AS Rome, AC Parma, and Lazio Rome are or were close to bankruptcy. Bohemians Prague could only be bailed out because fans donated more than €100,000.

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ISSN 1618-4742 Print/ISSN 1746-031X Online
DOI: 10.1080/16184740600799071

Whitney (1993) suggests that the labour market for professional sports athletes is subject to 'destructive competition' which drives some participants out of the market even though this is inefficient for the league as a whole. In association football as in other sports contests, rewards are largely determined by relative performance. Any action (e.g. buying a star player) that increases one contestant's chances of winning must necessarily reduce the chances of others. Positional externalities lead to 'rat races' (Akerlof, 1976) or 'positional arms races' (Frank, 2003) in which the economic agents exhibit a tendency to over-invest. Over-investment does not imply that clubs will necessarily go bankrupt. It is well-known that some European clubs like Manchester United or Bayern Munich are rather profitable. Theoretically, over-investment only means that clubs will deviate from joint profit-maximisation in the Nash equilibrium[1] emerging in unrestricted contests (Dietl, Franck, & Roy, 2003; Dietl, Franck, & Lang, 2005). In this sense, over-investment may contribute to the financial troubles of many clubs. They would be better off financially if they invested less than in the Nash equilibrium.

In November 2002 the leading European football clubs, organised as the so-called G-14, reacted to the increasing player salaries by signing a voluntary agreement to limit (annual) salaries to 70% of (annual) revenues (Késenne, 2003). Salary caps are a novelty in Europe. In the US, where the first salary cap was introduced in 1984 by the National Basketball Association, clubs and leagues have more experience with salary caps. In the US case the existing salary cap agreements are backed up by some form of centralised enforcement mechanism. There is evidence that these enforcement mechanisms are not perfectly effective in practice because clubs still succeed in circumventing the imposed limitations, for example through deferred or unreported payments (Fort & Quirk, 1995; Staudohar, 1998). Salary caps may be considered as incomplete contracts. A breach of an incomplete contract is observable by insiders but cannot be verified by a court of law (Hart, 1988).

In contrast to the US case, the G-14 did not foresee any kind of enforcement mechanism at all, but decided to entirely rely on self-enforcement instead. The G-14 salary cap agreement raises different questions. Firstly, since it is not a collective bargaining agreement it may not hold under European competition law (Heermann, 2004). Secondly, the G-14 represents only a small fraction of all European football clubs. The effectiveness of the G-14 salary cap is in danger of becoming corrupted by other clubs which did not commit themselves to limit their salaries. Thirdly, since European football clubs compete at an international level, salary caps necessarily have to be Europe-wide. However, any Europe-wide system would face the obstacle of diversified living conditions, tax rates and administrative systems (Szymanski, 2003).[2] In addition to these and other practical obstacles the G-14 salary cap agreement faces a rather general challenge. Will self-enforcement be effective? This question would still remain, even if the other practical obstacles could be overcome. Our paper focuses entirely on the exploration of the preconditions for self-enforcing salary caps. If the probability of self-enforcement turns out to be very low given the specific situation of European football, it will not pay to invest anything in the solution of the more practical issues raised so far.

We develop a simple model of a professional sports league with two profit-maximising clubs competing for an endogenously determined league prize. Based on our model, we show that the self-enforcing character of salary caps increases with (1) the clubs' valuation of future profits; and (2) the importance of competitive balance. The application of these findings to the situation encountered in European football leagues leads to the conclusion that the clubs are unlikely to honour a salary cap agreement.

The remainder of the paper is organised as follows. Section 2 presents the existing literature on salary caps. Section 3 explains the model. Subsequently, the results are discussed in Section 4. Section 5 concludes.

Related Literature

Staudohar (1998, 1999) explores the history of salary cap agreements in four US Major Leagues and points to numerous loopholes in the agreements which made them soft in reality. Fort and Quirk (1995), Vrooman (1995, 2000), and Késenne (2000) illustrate different salary cap regulations in a Walrasian fixed-supply conjecture model (Szymanski, 2004). Looking at different cross-subsidisation schemes, Fort and Quirk (1995) identify payroll caps in combination with a revenue sharing arrangement as an effective instrument for improving competitive balance in a league. However, since salary caps are inconsistent with league-wide revenue maximisation, enforcement problems arise. In practice, creative accounting and deferred or unreported payments undermine salary cap agreements. Vrooman (1995, 2000) also uses a Walrasian model, however, with imperfect competition in the labour market. Therefore, salary caps may help the league to maximise the combined profits of all its teams at the expense of less competitive balance within the league. Késenne (2000) distinguishes between a payroll cap defined as a fixed percentage of the total league revenue divided by the number of teams and an individual cap. He shows that only the payroll cap increases competitive balance. In his model of asymmetric clubs, both salary cap regulations decrease total league revenue by impeding a market clearing remuneration and equal marginal player productivity. However, Késenne (2000) mentions that potential negative externalities would make salary caps necessary in order to maximise total league revenue.

Although the effects and the enforcement of salary caps have been recognised as important issues in the literature, they have never been analysed in a Contest-Nash model. Since, in contrast to the Walrasian model, the supply of players is not fixed in the Contest-Nash model, it better fits the real situation in European football where several national leagues compete for the most talented players.[3] While clubs are price takers in the Walrasian model (i.e. clubs cannot influence the salary level), in the Contest-Nash model they choose independently how many players to hire and how much to pay them (Szymanski, 2004). However, in the Nash equilibrium clubs do not maximise joint profits. The reason is that each team fails to internalise the externality of reducing its rival's revenue by winning. If honoured, voluntary salary caps would allow the clubs to correct these negative externalities. In this paper we analyse under which conditions a voluntary salary cap agreement is self-enforcing. Our theoretical approach is based on Telser (1980) and Bull (1987). They declare that non-contractual agreements are enforceable in a repeated game-theoretic setting if the short-term gain from reneging[4] does not exceed the associated long-term loss.

The model

Our model consists of two identical profit-maximising[5] clubs, A and B. Each club decides how much to spend on player talent. In order to keep our model simple, we assume that each unit of money buys one unit of playing talent. Consequently, $x_A(x_B)$ denotes the total amount of player salaries as well as the playing strength of club A (B). Both clubs decide simultaneously and non-cooperatively. The investment decisions of both clubs determine the league's total revenue R according to the revenue function:

$$R(x_A, x_B) = \lambda_1 \sqrt{x_A + x_B} - \lambda_2 (x_A - x_B)^2, R(x_A, x_B) \geq 0 \tag{1}$$

λ_1 and λ_2 are parameters that indicate the relative importance of the league's total investments in player talent and of competitive balance, respectively. λ_1 and λ_2 have positive values. According to this revenue function total league revenue increases if (1) on an aggregate level teams spend more on player salaries and if (2) playing talent is more evenly distributed among teams.

The investment levels x_A and x_B do not only determine total league revenue. They also determine the probability that club A (or B) will win the league's championship. In particular, we assume that the winning probability of club A is given by the following logit contest function:

$$P_A(x_A, x_B) = \frac{x_A}{x_A + x_B} \tag{2}$$

The winning probability of the competitor B is:

$$P_B(x_A, x_B) = 1 - P_A(x_A, x_B) = \frac{x_B}{x_A + x_B} \tag{3}$$

The profit function of club $i \in \{A,B\}$ is given by:

$$\Pi_i(x_A, x_B) = \alpha \cdot P_i(x_A, x_B) \cdot R(x_A, x_B) + (1 - \alpha) \cdot (1 - P_i(x_A, x_B)) \cdot R(x_A, x_B) - x_i \tag{4}$$

$\alpha \in [0.5,1]$ represents the portion of league revenue received by the winning club. While $\alpha = 1$ describes a "winner-takes-all" league, $\alpha = 0.5$ denotes perfect revenue sharing.

Firstly, we compute the league optimum (LO) which is the maximum of the aggregated profits $\prod_A$ and $\prod_B$. The league optimum (x_A^{LO}, x_B^{LO}) is given by the following first-order condition:

$$\frac{\partial \Pi_i(x_A^{LO}, x_B^{LO})}{\partial x_i} = \frac{\lambda_1}{2\sqrt{2x_i}} - 1 = 0 \tag{5}$$

Note that the second-order condition is negative:

$$\frac{\partial^2 \Pi_i(x_A^{LO}, x_B^{LO})}{\partial^2 x_i} = -\frac{\sqrt{2}\lambda_1}{8\sqrt{x_i^3}} < 0 \tag{6}$$

The optimal salary levels are therefore:

$$x_i^{LO} = \frac{\lambda_1^2}{8} \tag{7}$$

In the league optimum each club generates an expected profit of:

$$\Pi_i^{LO}(x_A^{LO}, x_B^{LO}) = \frac{\lambda_1^2}{8} \tag{8}$$

Next, we compute the non-cooperative Nash solution in a one-shot interaction. Solving for the symmetric Nash equilibrium (x_A^{NE}, x_B^{NE}) we get:[6]

$$x_i^{NE} = \frac{\lambda_1^2}{32}(4\alpha - 1)^2 \tag{9}$$

In the symmetric Nash equilibrium each club generates an expected profit of:

$$\Pi_i^{NE}(x_A^{NE}, x_B^{NE}) = \frac{\lambda_1^2}{32}(-16\alpha^2 + 24\alpha - 5) \tag{10}$$

Comparing the Nash equilibrium with the league optimum, we derive the following results: In a non-cooperative setting, the league optimum will only be attained if $\alpha = 0.75$. If $\alpha > 0.75$, the winning club receives more than three quarters of the league revenue. This 'winner-takes-most' regime creates strong incentives for both clubs to increase their winning probability by investing more in playing talent, i.e. attracting better players by paying higher salaries. As a result, both clubs will over-invest compared to the league optimum.

If, on the other hand, $\alpha < 0.75$, a large portion of the league revenue is shared regardless of field success. In this revenue sharing regime each club has strong incentives to free-ride on the other club's talent investment. As a result, both clubs will under-invest compared to the league optimum.

If European football clubs face an over-investment problem, the model needs to have an $\alpha > 0.75$. In this case, both clubs would benefit if they agreed to invest x_i^{LO} instead of $x_i^{NE} > x_i^{LO}$. Such a salary cap agreement, however, is highly unstable. Each club has strong incentives to unilaterally break the agreement. In fact, in a one-shot interaction breaking the agreement strictly dominates honouring the agreement: regardless of what the other club does, breaking the agreement always results in higher expected profits than honouring the agreement. Formally, if club B honours the salary cap agreement, the optimal deviation investment level of club A (x_A^{DEV}) is determined by the following equation:

$$\frac{\partial\Pi_A(x_A^{DEV},x_B^{LO})}{\partial x_A}=(2\alpha-1)\frac{\lambda_1^2/8}{(x_A+\lambda_1^2/8)^2}\left[\lambda_1\sqrt{x_A+\lambda_1^2/8}-\lambda_2(x_A-\lambda_1^2/8)^2\right]$$
$$+\frac{\alpha x_A+(1-\alpha)\lambda_1^2/8}{x_A+\lambda_1^2/8}\left[\frac{\lambda_1}{2\sqrt{x_A+\lambda_1^2/8}}\right.$$
$$\left.-2\lambda_2\sqrt{(x_A-\lambda_1^2/8)^2}\right]-1=0 \quad (11)$$

Given that $\alpha>0.75$, x_i^{DEV} exceeds x_i^{LO} and the deviation profit (Π_i^{DEV}) exceeds Π_i^{LO}. In a one-shot interaction both clubs will always cheat on the salary cap agreement and invest more than x_i^{LO}.

Can the league optimum be attained in a repeated setting? To answer this question we analyse whether the following trigger strategy constitutes a Nash equilibrium of the infinitely repeated game: honour the salary cap in the first period and continue to honour the agreement as long as the other player honoured the agreement in the previous period. If the other player deviated in the previous period, never honour the agreement in any future period.

Suppose that club B follows this trigger strategy and honours the salary cap agreement by choosing x_B^{LO} in the first period. Club A then faces the following dilemma: It can maximise its first-period profit by deviating, i.e. by choosing x_A^{DEV}. If club *A* deviates in the first period, however, club *B* will never honour the agreement in any future period. The agreement will break down and both clubs cannot do any better than repeatedly play the non-cooperative one-shot game. Club *A* has to trade off the short-term gain from deviating ($\Pi_A^{DEV}-\Pi_A^{LO}$) against the long-term loss of realising Π_A^{NE} instead of Π_A^{LO} in all future periods. Figure 1 highlights this trade off.

Given that future profits are discounted by the factor δ, salary cap agreements are self-enforcing if the following condition holds:

$$\Pi_i^{LO}\frac{1}{1-\delta}\geq\Pi_i^{DEV}+\Pi_i^{NE}\frac{\delta}{1-\delta} \quad (12)$$

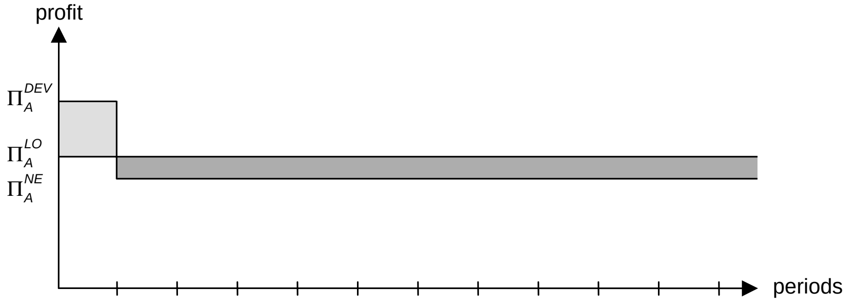

Figure 1. Profits with and without honouring the salary cap agreement if $\alpha>0.75$

The left hand side of inequality (12) represents the present value of a club's future profits given that both clubs honour the agreement. The right hand side is the sum of the singular profit from deviating and the present value of a club's future profits given that both clubs will no longer honour the agreement once deviation has happened.

By rearranging (12) we conclude that in repeated interaction salary cap agreements are self-enforcing if the discount factor δ is sufficiently high.

$$\delta \geq \frac{\Pi_i^{DEV} - \Pi_i^{LO}}{\Pi_i^{DEV} - \Pi_i^{NE}} \tag{13}$$

Discussion

The discount factor δ can be interpreted in three different ways: Firstly, the discount factor $\delta = 1/(1+r)$ is the present value of a money unit to be received one period later, where r is the interest rate per period. Secondly, δ can be used to reinterpret what is called an infinitely repeated game as a repeated game that ends after a random number of repetitions (Gibbons, 1992). The probability of future interactions, therefore, influences the discount factor. The likelihood of an interaction's end may be affected by different factors like the financial health of the clubs, the strictness of the licensing procedure, or the openness of the league for example. Thirdly, δ is influenced by the frequency of interaction. A more frequent interaction between A and B corresponds to an increase in δ (Tirole, 1988).

A low discount factor translates into a low likelihood of self-enforcing salary caps. In the following sections we will illustrate how the discount factor δ may be influenced by two peculiarities of European football leagues.

In European football leagues the best teams from a lower league are promoted to the next higher league, while the weakest teams in the latter are demoted to the former. The composition of an open league changes annually through promotion and relegation. Promotion and relegation decrease the probability of future interaction resulting in a stronger devaluation of future profits (lower δ). Self-enforcing salary caps are ceteris paribus less likely in open leagues than in hermetic leagues.

A second peculiarity that influences the discount factor δ is the restriction of transfer windows. The threat of punishment will only be effective if the punishment comes fairly soon after the deviant behaviour. Theoretically, punishment might be delayed for two reasons: Firstly, clubs may notice the rival's breach of agreement with a lag. Secondly, infrequent interaction delays the punishment and makes current deviation more attractive (Tirole, 1988). In professional team sports the second reason may be more important. The frequency of interaction is determined by the regulations governing transfer periods. European football leagues have introduced two transfer periods: one in the winter and one in the summer break. This implies that clubs can only change their rosters twice a year. If a club realises that the competitor has broken the salary cap agreement in the winter break, it has to wait until the end of the championship race to increase its investments in player talent too. This infrequent interaction corresponds to a low δ, which makes self-enforcing salary caps less likely.

A third factor affecting the self-enforcing aspect of salary caps is the impact of competitive balance on league revenue. The uncertainty of outcome hypothesis (Rottenberg, 1956)—an increase of fan interest through even contests—is a well disputed issue (Szymanski, 2003; Borland & MacDonald, 2003). Our revenue function considers the controversy of the uncertainty of outcome hypothesis by introducing an undefined parameter λ_2. If competitive balance strongly influences league revenue, λ_2 is high. A low λ_2, however, represents a league whose fans do not care about even contests. The higher λ_2 is, the stronger the deviation profit Π_i^{DEV} declines towards Π_i^{LO} holding everything else equal. The fraction in inequality (13) decreases with an increase of λ_2 because Π_i^{NE} and Π_i^{LO} are not affected by the parameter λ_2. Therefore, the stronger the influence of competitive balance on league revenue is, the lower the minimal discount factor for self-enforcing salary caps becomes. The self-enforcing character of salary caps increases with the importance of competitive balance. But how important is competitive balance for demand in European football?

All in all the empirical evidence in favour of the uncertainty of outcome hypothesis is far from convincing in European football as the cases treated in the review of Szymanski (2003) show. On purely theoretical grounds European football leagues should be able to deal with a greater imbalance of their teams than typical US Major Leagues without losing fan interest. Due to the fact of promotion and relegation European leagues may capture fan interest by presenting two competitions simultaneously. Less endowed teams at the bottom of the league may activate fan interest by competing with each other against being relegated. At the same time the top teams compete to qualify for promotion to the next higher league or to international club competitions like the Champions League or the UEFA Cup. By providing several focal points for fan interest, European football leagues are less likely to become boring even if competitive imbalance is high. Since competitive balance is less important for European fans due to this peculiarity, λ_2 is lower and self-enforcing salary caps are less likely.

Conclusion

Voluntary salary caps have to be self-enforcing in order to be effective in limiting player expenses. A repeated game-theoretic contest model with two identical profit-maximising clubs indicates that the self-enforcing character of salary caps increases with the clubs' discount factor and the importance of competitive balance.

A voluntary salary cap agreement is unlikely to be self-enforcing in European football for several reasons: Promotion and relegation decrease the probability of future interactions and, therefore, complicate self-enforcing contracts. Moreover, restricted transfer windows reduce the frequency of interaction, which translates into delayed punishments for cap breakers. Finally, simultaneous competitions in European football leagues provide entertainment even if imbalance within a league is high. Low importance of competitive balance for fan interest fosters deviant behaviour.

Assuming identical profit-maximising clubs, we built our model as a best-case scenario for self-enforcing salary caps. Since our result that European salary caps are unlikely to be self-enforcing is derived from a best-case model, the prediction seems even more plausible when additional difficulties for self-enforcement are considered. As is shown in Appendix 2, differences in club productivity or cost functions make the establishment of self-enforcing salary caps even more difficult. Moreover, since European clubs are rather seen as winning-percentage-maximisers than profit-maximisers (see Fort, 2000; Sloane, 1971), they often do not mind paying high salaries and transfer fees as long as these expenditures promise field success.

Notes

1. See Appendix 1 for the definition of the Nash equilibrium.
2. We want to thank anonymous referees for raising these issues.
3. We want to thank an anonymous referee for raising this issue.
4. To renege means to fail to keep an agreement.
5. We assume profit-maximisation as a best-case scenario for self-enforcing salary caps.
6. In the Appendix 1 the symmetric Nash equilibrium of equation 9 is explained in more detail.
7. The following model is an adapted version of the model presented by Dietl *et al*. (2003).
8. If a club honours the salary cap agreement and invests nothing, the optimal deviation investment level leads to winning probability of 1 regardless of the club's productivity.

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Appendix 1: Nash equilibrium in a one-shot interaction

The Nash equilibrium is the combination of strategies in a game such that neither player has any incentive to change strategies given the strategy of his opponents. Each player's choice is a best response to the strategies actually played by his rivals (Mas-Colell, Whinston, & Green, 1995).

Given the expenditure of club B (x_B), the profit-maximising salary level of club A (x_A) is determined by:

$$\frac{\partial \Pi_A(x_A^{NE}, x_B^{NE})}{\partial x_A} = (2\alpha - 1)\cdot\frac{x_B}{(x_A + x_B)^2}\cdot R(x_A, x_B) + \frac{\alpha x_A + (1-\alpha)x_B}{x_A + x_B}\cdot\frac{\partial R(x_A, x_B)}{\partial x_A} - 1 = 0 \qquad \text{(A1)}$$

The chosen salary level of club B is analogous:

$$\frac{\partial \Pi_B(x_A^{NE}, x_B^{NE})}{\partial x_B} = (2\alpha - 1)\cdot \frac{x_A}{(x_A + x_B)^2}\cdot R(x_A, x_B) + \frac{\alpha x_B + (1 - \alpha)x_A}{x_A + x_B}\cdot \frac{\partial R(x_A, x_B)}{\partial x_B} - 1 = 0 \quad \text{(A2)}$$

Both equations (A1 & A2) can only be solved simultaneously if x_A^{NE} equals x_B^{NE}. Since we have identical clubs, the Nash equilibrium is symmetric.

Appendix 2: Asymmetric clubs

Asymmetries among the economic agents complicate self-enforcing agreements in repeated interaction (Tirole, 1988). In the following we prove under additional simplifying assumptions that productivity differences hamper self-enforcing salary caps.[7]

Let two clubs (A and B) compete for an exogenous league revenue R. Since R does not depend on the league's total investment in player talent, the league optimum is given by $x_i^{LO} = 0$. In this simplified case every expenditure level above zero can be seen as an over-investment which reduces the club's profits. Since the winning probability of club $i \in \{A,B\}$ is not defined in the case of $x_i = 0$, we assume that both clubs receive an equal share of R in the league optimum and generate a profit of:

$$\Pi_i(x_A^{LO}, x_B^{LO}) = \frac{R}{2} \quad \text{(A3)}$$

To introduce club asymmetries, we formulate the winning probability of club A more generally:

$$P_A(x_A, x_B) = \frac{g(x_A)}{g(x_A) + h(x_B)} \quad \text{(A4)}$$

$g(x_A)$ and $h(x_B)$ denote how efficiently club A and club B transform money into playing talent. So far we have assumed the easiest case in which $g(x_i) = h(x_i) = x_i$. Now, we analyse different transformation efficiencies. We define that $g(x_A) = kx_A$ and that $h(x_B) = x_B$. The winning probability of club A is therefore:

$$P_A(x_A, x_B) = \frac{kx_A}{kx_A + x_B} \quad \text{(A5)}$$

Analogous to our main model, the profit function of club $i \in \{A,B\}$ is given by:

$$\Pi_i(x_A, x_B) = \alpha\cdot P_i(x_A, x_B)\cdot R + (1 - \alpha)\cdot(1 - P_i(x_A, x_B))\cdot R - x_i \quad \text{(A6)}$$

In a non-cooperative one-shot interaction the profit-maximising expenditure level of club A (x_A) is determined by the following first-order condition:

$$\frac{\partial \Pi_A(x_A^{NE}, x_B^{NE})}{\partial x_A} = [\alpha R - (1-\alpha)R] \cdot \frac{kx_B}{(kx_A + x_B)^2} - 1 = 0 \tag{A7}$$

The optimal salary level of club $B(x_B)$ is determined in the same way:

$$\frac{\partial \Pi_B(x_A^{NE}, x_B^{NE})}{\partial x_B} = [\alpha R - (1-\alpha)R] \cdot \frac{kx_A}{(kx_A + x_B)^2} - 1 = 0 \tag{A8}$$

Both equations (A7) and (A8) can only be solved, if $x_A^{NE} = x_B^{NE}$. The Nash equilibrium is therefore:

$$x_A^{NE} = x_B^{NE} = [\alpha R - (1-\alpha)R] \cdot \frac{k}{(1+k)^2} \tag{A9}$$

The salary level in the Nash equilibrium is maximised if k equals 1. Therefore, the over-investment is comparably lower and the club's profit higher, if club productivity is asymmetric (which means $k \neq 1$). Given that Π_i^{LO} and Π_i^{DEV} are not influenced by club asymmetries,[8] we conclude that under the presented assumptions salary caps are less likely to be self-enforcing if club productivities differ.