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Markus Sass

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Verantwortlich für diese Ausgabe:

Markus Sass
Otto-von-Guericke-Universität Magdeburg
Fakultät für Wirtschaftswissenschaft
Postfach 4120
39016 Magdeburg
Germany

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Markus Sass

University of Magdeburg, Faculty of Economics and Management, Chair of Economic Policy (VWL3), Postbox 4120, 39106 Magdeburg, Germany,
Tel.: +49-391-6718801, Fax: +49-391-671297, markus.sass@ovgu.de

Abstract

This paper analyzes the long-term development of competitive balance in a professional team sports league with win-maximizing clubs facing a strict break-even constraint as imposed by UEFA's new Financial Fair Play Regulations. A classical model of professional team sports leagues is employed to calculate seasonal competitive balance, which solely depends on the market size of clubs. In the multi-period version of the model, a market size function, which captures the empirical fact that a club's revenue potential is positively affected by its historic success, is introduced. The model shows that there is only one long-term steady-state equilibrium, in which big clubs totally dominate small clubs and competitive balance is maximally uneven. The intuition is that a club, which becomes more successful, is able to attract more and more spectators yielding higher revenue and leading to the club being able to afford more playing talent. This in turn leads to greater success, which in turn attracts even more spectators and so forth. Since small clubs are no longer allowed to overspend and thereby invest their way to a greater market size in the future, the model predicts a negative trend in competitive balance to be the result of the new UEFA Financial Fair Play Regulations.

Keywords: Sports Economics, Professional Team Sports, Competitive Balance, UEFA Financial Fair Play
JEL: L83

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1. Introduction

In recent years, many teams from professional European football leagues have suffered severe financial losses. Some teams, most notably perhaps Chelsea FC and Manchester City in England, have been taken over by very wealthy new owners, who spent huge amounts of private money to strengthen their teams. This subsequently led other teams to overspend on their budgets in order to compete for the best players in the market.

To stop this rat race and to guarantee the long-term financial survival of the clubs, Europe's football governing body UEFA decided to introduce the so called *Financial Fair Play Regulations*, which forces clubs to live within their means. As of 2015, clubs have to break-even over a three years period or face exclusion from UEFA's prestigious international competitions, the UEFA Champions League and UEFA Europa League.

The aim of this paper is to analyze the long-term consequences on competitive balance caused by the introduction of a strict break-even constraint. In section 2, a classical model of professional team sports leagues is employed to calculate seasonal winning percentages of clubs. Competitive balance in such a model is typically solely dependent on the market size of clubs, a variable summarizing a club's revenue potential.

In section 3, the single-period model is adapted to a multi-period framework that introduces a market size function, which accounts for the empirical fact that a club's revenue potential is positively dependent on its historical success (the *glory hunter phenomenon*).[1] If a club becomes more successful, it is able to attract more and more spectators, which increases market size and guarantees even greater success in the future. The model predicts that there is only one long-term steady-state equilibrium of competitive balance, in which big clubs totally dominate small clubs and competitive balance is maximally uneven. Section 4 concludes.

[1] For example, German clubs 1.FC Kaiserslautern and Borussia Mönchengladbach originate from rather small towns/metropolitan areas, but today have many supporters and thus a high market size, presumably because of the clubs' historical success in the 1950s and 1970s respectively.

2. The single-period model

This chapter replicates the basic framework of common single-period team sports models, which will later be adapted to the multi-period model. Typically a league with only two clubs ($i = 1, 2$) is considered (see, e.g., Quirk and Fort 1992, Vrooman 1995, Szymanski 2004, Kesenne 2006). The clubs differ with respect to their potential revenue from selling match tickets, merchandise, and broadcasting rights as well as sponsorships, which are indicated by a club's market size m_i. In the single-period model the market size is assumed to be exogenous and cannot be influenced by the club. Revenue is also affected by a club's winning percentage w_i, which has a positive but decreasing marginal effect up until a certain level of success at which the club becomes too dominant to keep spectators interested in the competition and revenue begins to decline (*uncertainty of outcome hypothesis*, (Rottenberg 1956)). In the following concave revenue function R_i, the preference for the uncertainty of outcome is reflected by β, with $1 \leq \beta \leq 2$:

$$R_i\left(w_i, m_i, \beta\right) = m_i w_i - \frac{m_i}{\beta} w_i^2 \tag{1}$$

such that

$$\begin{aligned} \frac{\partial R_i}{\partial w_i} &> 0 \text{ for } w_i < \frac{\beta}{2} \\ \frac{\partial R_i}{\partial w_i} &= 0 \text{ for } w_i = \frac{\beta}{2} \\ \frac{\partial R_i}{\partial w_i} &< 0 \text{ for } w_i > \frac{\beta}{2} \end{aligned} \tag{2}$$

Perfectly divisible units of playing talent are available to the clubs on the professional players labor market at constant marginal costs of $c > 0$ (*flexible talent supply*, see, e.g., Szymanski 2004). A team's winning percentage depends both on the number of own playing talents T_i and also on the number of playing talents T_j of the competing club. The following simple Tullock contest success function is assumed:

$$w_i = \frac{T_i}{T_i + T_j} \tag{3}$$

Clubs choose their number of playing talents under the assumption of win-maximizing behavior and subject to a seasonal budget constraint that does not allow for losses:

$$\max_{T_i} w_i \text{ s.t. } R_i - cT_i = 0 \tag{4}$$

Since the acquisition of an additional unit of playing talent causes an external effect on the competing club's winning percentage, the two clubs find themselves in a strategic rent seeking game. Rewriting (4) yields the clubs' reaction functions:

$$T_i = \frac{-\frac{m_i}{\beta} + m_i - 2cT_j + \sqrt{\left(m_i - \frac{m_i}{\beta}\right)^2 + \frac{4cm_iT_j}{\beta}}}{2c} \tag{5}$$

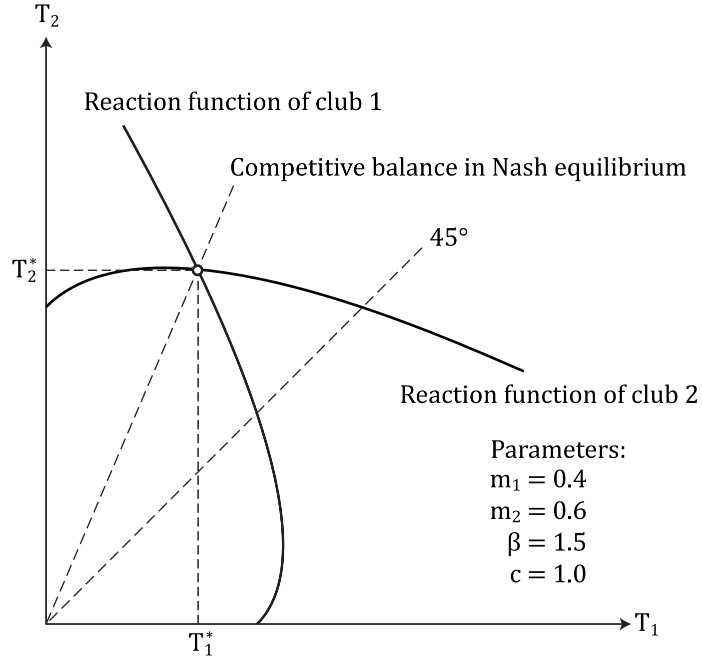

Figure 1: Reaction functions and competitive balance in Nash equilibrium

The Nash equilibrium is found graphically at the intersection of the two reaction functions (see Figure 1). The ratio of the amount of talent units hired by the clubs in equilibrium measures competitive balance, which is solely dependent on market size.

Since in equilibrium both clubs spend as much money as possible on playing talent without generating losses, the budget constraints in (4) strictly hold for both clubs and thus club i's winning percentage can easily be calculated:

$$m_i - \frac{m_i}{\beta} w_i^* = m_j - \frac{m_j}{\beta} (1 - w_i^*) \Leftrightarrow w_i^* = \frac{\beta (m_i - m_j) + m_j}{m_i + m_j} \tag{6}$$

Without loss of generality, it is assumed that $m_i + m_j = 1$. In order to have winning percentages ranging between 0 and 1, the following conditions must hold:

$$\frac{\beta - 1}{2\beta - 1} \leq m_i \leq \frac{\beta}{2\beta - 1} \tag{7}$$

Since $1 \leq \beta \leq 2$ and $m_i + m_j = 1$, $1/3 \leq m_i \leq 2/3$ is sufficient to guarantee a valid solution with respect to the winning percentages regardless of β. Therefore, let $m_i^{max} = 2/3$ and $m_i^{min} = 1/3$ denote the maximal and minimal market sizes required for the model to work. If the two clubs are assumed to originate from equally big cities and market size is interpreted as the share of inhabitants interested in their local club, m_i^{min} represents the amount of unconditionally loyal supporters, who never lose interest in their team, while m_i^{max} represents the greatest amount of people that could become interested in the club. It follows that $w_i^{max} = (\beta + 1)/3$ and $w_i^{min} = (2 - \beta)/3$.

The model is set up such that the club operating in the bigger market can generate a higher revenue than the smaller club at any given level of winning percentage and can subsequently afford more talent units and thus outperforms the small market team on the playing field. In this sense, the model is well-behaved and does not allow for the rather implausible outcome of the smaller club dominating the bigger club, which cannot be ruled out if no additional assumptions are made on the clubs' revenue function beyond concavity and club owners' objectives (see Fort and Quirk 2004, Kesenne 2006).

3. The multi-period model

The theoretical framework from the previous section is now adapted to model the long-term development of competitive balance in professional team sports leagues. An infinite time horizon and a discrete time scale is assumed, with each period representing a single league season. Clubs again only differ with respect to market size, but market size is no longer exogenous but instead assumed to be positively dependent on a club's historical success. This idea is motivated by what is known as the infamous *glory hunter phenomenon* amongst sports fans: clubs enjoying a spell of increasing success attract spectators who previously had no strong connection to the club but are now keen to associate themselves with a winning team. Obviously this effect also works in the opposite direction, so if a club's success declines, the glory hunters jump ship and market size decreases.

To model the endogeneity of market size, a recursive symmetric market size function is considered, which simply assumes market size of club i in season t to be dependent on winning percentage in season $t-1$:

$$m_i^t = m_i^t(w_i^{t-1}) \text{ with } m_i + m_j = 1 \tag{8}$$

Club i's revenue R in season t is then given by:

$$R_i^t[w_i^t, m_i^t(w_i^{t-1}), \beta] = m_i^t(w_i^{t-1})w_i^t - \frac{m_i^t(w_i^{t-1})}{\beta}w_i^{t2} \tag{9}$$

The characteristics of the revenue function (9) with respect to the critical level of success that triggers decreasing seasonal revenue are the same as those of the single-period model's revenue function. In each season perfectly divisible units of playing talent are available on the players labor market at constant marginal costs $c > 0$. Units of talent hired in a previous period do not persist into the next period, thus a club is not constrained in its decision on the amount of talent units in season t other than through its budget. In each period, clubs are assumed to maximize winning percentage under a seasonal break-even constraint as imposed by new UEFA Financial Fair Play Regulations. Note that under these regulations, clubs cannot use savings from previous seasons to balance out an operating loss in a later season without infringing the break-even constraint. Thus for clubs maximizing winning percentage it is a strictly dominant strategy to break even by spending their entire seasonal revenue on player salaries. It follows that winning percentages in equilibrium in season t are calculated in the same way that winning percentages were calculated in the single-period model (6) and competitive balance is solely dependent on market sizes in t:

$$w_i^{t*} = \frac{\beta\left(m_i^t - m_j^t\right) + m_j^t}{m_i^t + m_j^t} \tag{10}$$

Assume now a market size function with the following properties:

$$\begin{aligned} m_i^t &= m_i^{min} \text{ for } w_i^{t-1} \leq w_i^{min} \\ m_i^t &= m_i^{max} \text{ for } w_i^{t-1} \geq w_i^{max} \\ \frac{dm_i^t}{dw_i^{t-1}} &> 0 \text{ for } w_i^{min} < w_i^{t-1} < w_i^{max} \\ \frac{d^2 m_i^t}{d{w_i^{t-1}}^2} &> 0 \text{ for } w_i^{min} < w_i^{t-1} < 1/2 \\ \frac{d^2 m_i^t}{d{w_i^{t-1}}^2} &= 0 \text{ for } w_i^{t-1} = 1/2 \\ \frac{d^2 m_i^t}{d{w_i^{t-1}}^2} &< 0 \text{ for } 1/2 < w_i^{t-1} < w_i^{max} \end{aligned} \tag{11}$$

In order to get valid equilibrium solutions, market size at any point in time should neither exceed m_i^{max} nor fall below m_i^{min}. For convenience it is assumed that $m_i^t = m_i^{min}$ for $w_i^{t-1} \leq w_i^{min}$ and $m_i^t = m_i^{max}$ for $w_i^{t-1} \geq w_i^{max}$. Between w_i^{min} and w_i^{max} market size monotonically increases. For $1/2 < w_i^{t-1} < w_i^{max}$ the market size function is concave, so the marginal effect on market size decreases as it becomes increasingly difficult for the club to attract new spectators. From symmetry it follows that $m_i^t(\frac{1}{2}) = \frac{1}{2}$. Figure 2 illustrates the aforementioned properties of the market size function.

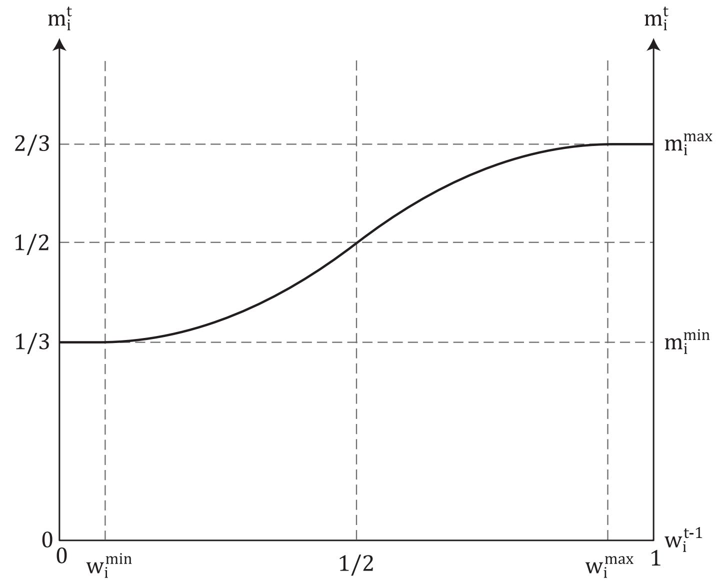

Figure 2: Properties of the market size function

There are two possible long-term equilibria:

$$w_1^* = w_2^* = m_1^* = m_2^* = 1/2 \tag{12}$$

and

$$\begin{aligned} w_1^* = w_i^{max}; m_1^* = m_i^{max} \\ w_2^* = w_i^{min}, m_2^* = m_i^{min} \end{aligned} \tag{13}$$

From $m_i^t(\frac{1}{2}) = \frac{1}{2}$ it follows that (12) represents a long-term equilibrium. Without any external shock to either winning percentage or market sizes, both clubs will forever be locked in a perfectly balanced competition. This equilibrium is not stable though. Any shock to either market size or winning percentage will start a convergence that leads to the steady-state equilibrium represented by (13). The intuition behind this is rather simple. A club becoming more successful in t will attract more spectators in $t+1$ and therefore enjoy a greater market size in $t+1$. This yields an increase in club revenue, allowing the club to afford more talent units, which in turn will lead to a higher winning percentage in $t+1$ than previously in t, increasing market size even further in $t+2$ and so forth. The growth of the market size slows down over time until the steady-state equilibrium in (13) is reached. The model predicts that big clubs will become bigger and bigger over time, totally dominating smaller clubs in the long-term equilibrium, in which competitive balance is maximally uneven. Figure 3 illustrates the development of market sizes and winning percentages over time.

Figure 4 illustrates the impact on winning percentages and market sizes through a sudden break-in of the bigger club's winning percentages during the convergence to the long-term steady-state equilibrium. In the short-term, this shock leads to a period of lesser success on the playing field, but in the long-term the club will exceeds its previous market size and enjoy greater success.

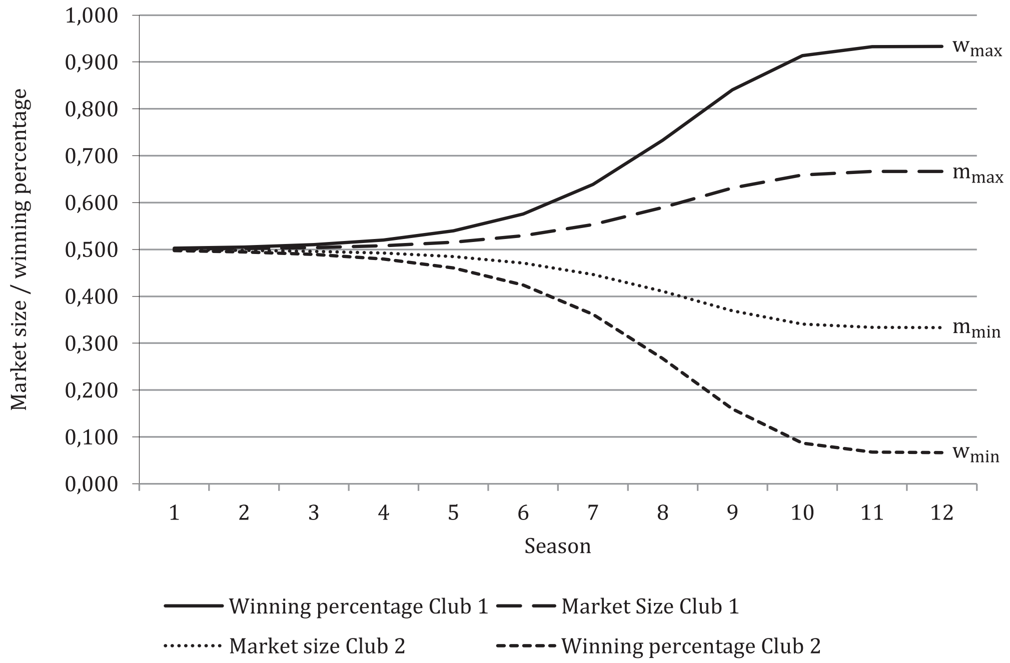

Figure 3: Market sizes and winning percentages in the long run

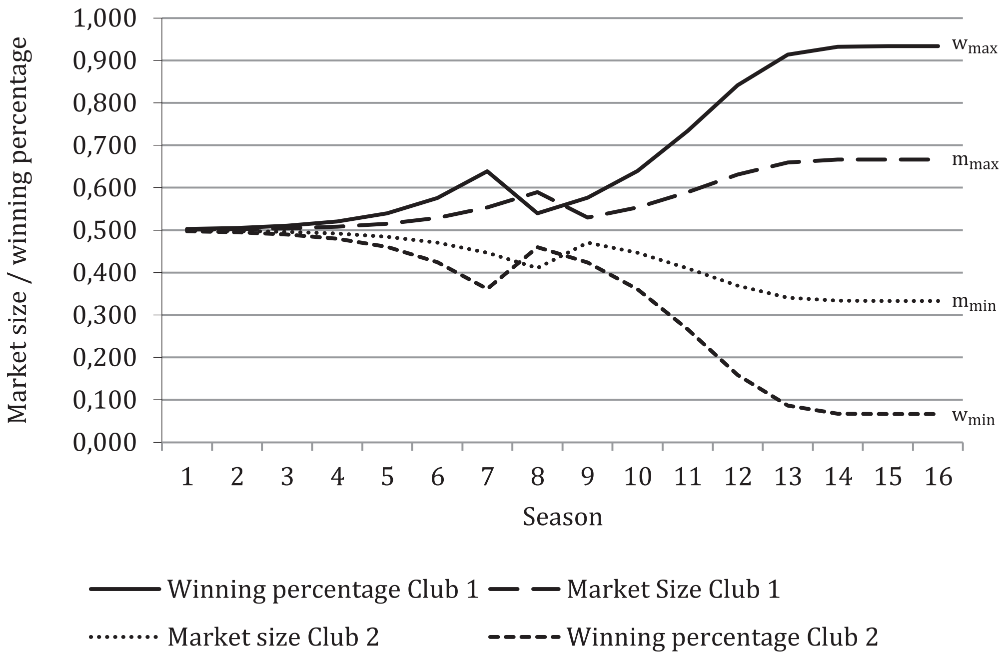

Figure 4: External shock to club 1's winning percentage

4. Conclusion

The object of this paper was to analyze the long-term consequences on competitive balance in a professional team sports league with win-maximizing clubs, that follow from the introduction of a strict break-even constraint as intended by UEFA's new Financial Fair Play Regulations.

The model presented accounts for the empirical fact, that a club's revenue potential or market size is positively dependent on its historical success, caused by the glory hunter phenomenon: If a club becomes more successful, it is able to attract more and more spectators, which increases the club's market size and future success, which in turn increases market size even further.

Since under the break-even constraint small clubs cannot overspend or invest in a greater market size for the future, they are unable to stop this process and a maximally uneven competitive balance in the long run, where big clubs totally dominate small clubs, is the resulting outcome.

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Otto von Guericke University Magdeburg
Faculty of Economics and Management
P.O. Box 4120 | 39016 Magdeburg | Germany

Tel.: +49 (0) 3 91/67-1 85 84
Fax: +49 (0) 3 91/67-1 21 20

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