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# Inferring sporting ambition from competitive balance

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**Abstract**

This paper is the first to assess empirically the relative competitive balance between large and small market clubs in professional football and provide an interpretation of the relative objectives of the owners between profit maximisation and sporting success. The paper shows how an economic model of professional sports leagues can be used to infer changes in the relative sporting ambition of large and small clubs and provides an empirical example with League Two, the fourth tier in the hierarchy of leagues, of the English Football League for the period from 1994 to 2014. An understanding of the relative sporting ambition of the clubs is important as an indicator of exuberance on the part of the owners which, if taken too far, can cause financial distress for clubs, the league competition and the wider social and economic community.

## 1. Introduction

Quirk and Fort (1992) introduced an economic model of professional sport leagues which Szymanski (2004, p. 112) referred to as providing the "… standard approach to modelling equilibrium in a sports league …" It was designed to show the theoretical effect on the equilibrium wage rate, profit and competitive balance between teams in a league with clubs in different size markets under various regulatory schemes. To give the model the characteristics of the leagues for Major League sports in North America it was originally assumed that the clubs owners would have the objective of maximising the profits of their clubs and that there was no migration of talent from or to clubs outside the league. Rascher (1997) provides one of the first attempts at directly incorporating non-profit maximizing owner objectives into a sports league model by assuming the objective of owners can be expressed as a linear combination of the aims of maximising profits and achieving sporting success.

Subsequent literature has shown how the original model of Quirk and Fort (1992) can be applied to include 'win maximisation' as an alternative objective for the club owners (Késenne, 2003) and an unrestricted supply of talent for the league (Szymanski, 2004) to characterise professional football leagues in Europe (and elsewhere) and show the effect of regulation under these alternative assumptions.

This paper provides an original contribution to the literature by incorporating the idea of Rascher (i.e. that the objective of owners can be expressed as a linear combination of the aims of maximising profits and achieving sporting success) with the model of Quirk and Fort (1992) incorporating the modifications introduced by Késenne (2003) and Szymanski (2004) relating to professional football leagues. To the extent that the wage expenditure that owners make on their clubs goes beyond the point where profits would be maximised there is a range for objectives reflecting a trade-off between profit maximising and win maximising preferences along a 'win-profit spectrum'. When this is recognised the model provides additional insights into the owner objectives.

Whilst Rascher (1997) assumes that the relative preference of owners remains constant over time, Terrian et al (2017) extend the idea of 'hybrid' objectives by allowing for each club to change their relative preference each year which, they contend, clubs do in response to changing circumstances.

The incentives for football clubs to spend money to achieve sporting success have been extensively analysed in the sports economics literature. The mechanism that induces clubs to spend increasingly

large sums of money on talent to achieve sporting success has been likened in the literature to that of an 'arms race' for talent (Szymanski, 2012). Whitney (1993) uses the term "destructive competition" for "… a competitive process which drives some participants from a market even though it is inefficient for them to leave." (ibid., p. 100). This process of "destructive competition" is evident in light of football club insolvencies.

The cause of insolvency of football clubs is the subject of ongoing research by Beech et al (2008 and 2010). Szymanski (2012) uses data for 37 seasons from 1973/74 to 2009/10 to test the hypothesis of exuberant spending or demand shock as alternative causes of insolvency of English football clubs and finds support for the latter. This research was extended by Scelles et al (2016) to examine insolvency in the top three divisions in France which also found that demand (attendance) shocks can account for insolvency to a significant degree.

However, it is notable that empirical studies have not considered the fundamental theoretical basis of the "standard approach to modelling equilibrium in a sports league", namely that the symmetry between the teams is broken by the assumption that clubs differ in their market size.

A particular difficulty in directly assessing the relative weight that owners give to winning games relative to making a profit is that the relationship between sporting performance and profit is potentially ambiguous. An increase in profit could result from either an increased relative weight given to making a profit or to an increased relative weight given to winning games. A more successful team may be expected to produce more revenue but if the success is associated with an increase in wage expenditure the change in profit will depend on the relative magnitude of the increase in revenue and cost. To circumvent this difficulty, this paper adopts an indirect approach to assess the relative weight that owners give to winning games relative to making a profit with the original use of the economic model of professional sports league originally presented by Quirk and Fort (1992).

Section 2 provides a review of the literature relating to the objectives of sports club owners, models of professional sports leagues and competitive balance. Section 3 reproduces the Quirk and Fort (1992) model, with the assumptions relating to professional football leagues, to summarise the theoretical implications of differing objectives both within clubs and between clubs in differing market sizes. As the largest number of instances of insolvency occurred in the Tier 4 league[1] of professional football in England (see Table 1), in section 4 the paper uses revenue data from the financial accounts of clubs in this league from 1995 to 2014 to provide an empirical example of additional insights into the resultant competitive balance and objectives of club owners in the league. The conclusions from the paper are summarised in section 5.

[1] There are four hierarchical professional leagues in England. When the Premier League was formed separately from the English Football League (EFL) for the 1992/93 season, the other three professional leagues remained within the EFL and were renamed in hierarchical order as Divisions One, Two and Three. For the 2005/06 season the second tier league (hitherto called Division One) was renamed The Championship and the third and fourth tiers were renamed as League One and League Two (respectively). For convenience, this paper will refer to the four leagues throughout the period as Tier 1 to Tier 4 with the latter being the lowest in the Football League in England.

Table 1: Instances of insolvency in English professional football leagues, 1995-2014

| League | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tier 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| Tier 2 | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 2 | 2 | 1 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 15 |
| Tier 3 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 3 | 3 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 15 |
| Tier 4 | 1 | 0 | 2 | 1 | 1 | 0 | 2 | 4 | 1 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 0 | 1 | 1 | 0 | 19 |
| Total | 1 | 0 | 4 | 1 | 4 | 1 | 4 | 10 | 6 | 2 | 1 | 1 | 3 | 2 | 4 | 2 | 1 | 2 | 2 | 0 | 51 |

Source: Deloitte (2015)

## 2. Literature review

There are three bodies of literature relating to this paper and each of these are briefly reviewed in this section.

### 2.1 Owner objectives

In England, the Football Association (The FA), formed in 1863 with the primary aim of defining a standard set of rules for the regulation of the game of football and sought to develop the sport with an amateur ethos. When clubs became limited companies in the late nineteenth century (mainly to protect the owners from personal liability resulting from professionalism and the cost of building new or enhancing existing grounds) The FA responded by imposing Articles of Association to prevent profiteering. These included Rule 34 which imposed a maximum permissible dividend and barred payment to the club's directors. As Conn (1997, p. 139) states "These rules provided a neat bulwark against people coming into football looking just to make money for themselves."

In the literature of sports economics a wide range of objectives have been attributed to owners of professional sports clubs. Cairns et al (1986, p.7) note that "… economists have most commonly held the objective of clubs to be the maximisation of profits, although this is not without its critics. Most of the American literature assumes either profit or wealth maximisation …" In this case it is mostly assumed that leagues are managed for the collective benefit of clubs owners and that they seek to maximise their profit directly from their ownership of a sports club (rather than indirectly via other interests).

Sloane (1971) argues that owners of EFL clubs aim to maximise their utility, which is a function of several factors including playing success, average attendance, the health of the league and recorded profits, subject to a club security constraint of financial viability. Gratton and Lisewski (1981) argue that professional football clubs in England have the characteristics of a public good because they generate both local and national benefit externalities and can be likened to a charity as the owners voluntarily may provide financial support for their club despite the 'free rider' problem. Zimbalist (2003, p. 510) concludes that "… it is almost a certainty that different owners give different weights to the variety of arguments in their objective functions." This idea is developed by Terrian et al (2017) who analyse financial data for 35 Ligue 1 clubs for the period 2005/2015 and find that the utility function of club owners could also be maximized under inter temporal budget function in order to adjust the weight between win and profit according to the opportunities in the environment.

It must also be recognised that the preferences of owners may not be aligned with those who are responsible for implementing them. In the case of football clubs there is a form of principal-agent moral hazard whereby the manager of the team may have the opportunity and personal incentive to give greater weight to winning relative to the financial objectives of owners (Vöpel, 2011). Consequently, observed outcomes actually may be a hybrid of the owners' objectives and those of the club's management.

There have been several different approaches proposed in the literature to empirically assess particular hypothesis for the objectives of club owners. Noll (1974) estimated the elasticity of ticket prices for major league baseball and basketball games in the USA with the hypothesis that, if the demand (measured by attendance) was inelastic, owners would be shown not to be maximising profits as they could increase their revenue and hence profit by raising prices. He concluded[2] that "The pricing policies of teams do not appear to be motivated by any goal other than profits" (ibid., p. 154). Fort (2004) provides a review of empirical results for estimates of the elasticity of demand for sports games and whilst he finds that "Inelastic ticket pricing for team sports has been a recurrent empirical finding for nearly thirty years" (ibid., p. 92) he derives theoretical conditions where, he argues, inelastic pricing can happen as a result of profit maximization[3]. Porter (2007) claims to refute this analysis and holds that inelastic ticket pricing is inconsistent with profit maximisation. He argues that the result obtained by Fort (2004) is the profit maximising condition for the acquisition of talent rather than for the attendance ticket price. However, the different results are due to different assumptions about the second source of revenue (i.e. in addition to 'gate' revenue from attendance). The Fort (2004) conclusion is reached if the second source is a function of attendance, and hence attendance ticket price, such as onsite sales of match-day scarfs, food and drink whereas the Porter (2007) conclusion is reached if the second source is not a function of attendance, such as broadcast revenue. In any event, Késenne (2006) provides several reasons why the price elasticity is an unreliable indicator of a club's objectives.

An alternative empirical approach is to assess whether owners pay players below their marginal revenue product. The hypothesis is that if this were the case it would indicate that owners are seeking, at least in the labour market, to maximise profits. Most of this literature is aimed at establishing whether, and if so by how much, players are exploited as a result of financial regulation operating in a league (see, for example, Scully, 1974). However, as Rottenberg (1956, p. 253) recognised, "… the process by which salary is fixed assumes the characteristics of bargaining, and the level at which it falls is a function of the shrewdness and guile of the parties in devising their bargaining strategies".

Szymanski and Hall (2003) compared the profits reported by clubs before and after they acquired a stock exchange listing in the mid 1990's. The hypothesis was that after floatation they would be required to maximise profits and hence the objective of the owners in the period before could be assessed by comparison. They evaluated the difference for sixteen clubs and found no evidence of any shift in the direction of increase profit maximisation. They conclude that "While it is not

[2] His conclusion is based on his finding that tickets prices do have inelastic demand but that the elasticity is not significantly different to one (and even closer if allowance is made for other factors considered) so the hypothesis of profit maximisation cannot be rejected.

[3] This is based on his argument that "There is a particular relationship between individual team local TV revenues, the marginal cost of talent and the average of the rest of the teams' local TV revenues that can lead to inelastic pricing at the gate." (ibid., p. 92).

impossible to construct alternative stories to explain the data while maintaining the conventional view that football clubs are utility maximiser, at the very least the explanations seem somewhat strained. The alternative view that football clubs have always been profit maximisers, in England at least, deserves some consideration." (ibid., p. 19). Garcia-del-Barrio and Szymanski (2009) used data on the performance of football clubs in the top two leagues in both England and Spain over the period 1994-2004 to estimate whether their behaviour is better approximated by profit maximisation or win maximisation. They found "… that choices in both the Spanish and English leagues seem to closely approximate win maximisation subject to a zero profit budget constraint". (ibid., p. 64).

Dimitropoulos et al (2016) question whether the response by club owners to financial regulation could have an effect on the quality of the accounts published by the clubs. They argue that European football clubs are known for an institutionalised management culture which prioritises sporting success over financial performance. In a study of European football clubs they found that compliance with the financial regulation introduced by UEFA, which is required to enable access to UEFA competitions and related incomes, occurs "at the expense of accounting quality" (ibid., p. 459) with an effect both on the reported results and on the choice of auditor.

### 2.2 Theoretical models of professional sports leagues

Whilst the Fort and Quirk (1992) model appears to have become the "… standard approach to modelling equilibrium in a sports league …" there are other notable alternatives in the literature which have been proposed to analyse different aspects of professional sports leagues.

El-Hodiri and Quirk (1971) provides the first mathematical model of a professional sports league to examine the justification of the exemption of some policy interventions in Major US sports leagues from some aspects of antitrust statutes. This model included inter-temporal dependencies (with a 'depreciation' of talent and new talent joining teams via the 'draft' system) and more recently there has been a section of literature which has returned to dynamic models of sports contests to incorporate a game theoretical analysis of decision making. For example, Madden (2011, p. 407) "… proposes a new "strategic market game" (SMG) approach to modelling strategic interactions between clubs in professional team sports leagues, and generalizes a basic framework used in previous literature … to allow variable talent supply and club revenues that depend on absolute (and relative) team qualities … [and] incorporates club talent market power (duopsony), overlooked by existing approaches …".

Szymanski and Smith (1997) provide a model designed to explain how rents are competed away through the maximising behaviour of club owners subject to production constraints and estimate the equations of the model with data from clubs in the English Football League from 1974 to 1989. Szymanski (2001) provides a model which recognises difference between the utility gained by 'committed team fans' and 'spectators with no particular loyalty to a team' (so called, "couch potatoes") to show the relationship between the financial inequality between teams, competitive balance and attendance.

### 2.3 Competitive balance in professional sports leagues

Zimbalist (2002, p. 112) comments that "[t]here are almost as many ways to measure competitive balance as there are to quantify the money supply." Fort and Maxcy (2003) state that the empirical literature on competitive balance can be characterised along two distinct lines. One they call "the

analysis of competitive balance (ACB) literature itself" (ibid., p. 155). They describe this as the literature which "… focuses on what has happened to competitive balance over time or as a result of changes in the business practices of pro sports." (ibid., p. 155). Within this literature two aspects of competitive balance can be identified (Evans, 2015). One relates to the level of competitive imbalance due to the dominance of a particular team, or of a specific group of teams. This is the extent to which the same team, or small number of teams, persist in winning over a number of seasons (i.e. level of dominance). The other relates to the concentration of teams in a league season as revealed by the outcome of their sporting contests. This is the extent of the closeness between teams in a league in a season (i.e. level of concentration).

There are a range of measures of competitive balance related to the concentration of teams in a league proposed in the literature which are based on the end of season overall results of each club in the league. These include the Herfindahl-Hirschman Index (adapted by Michie and Oughton, 2004; modified by Depken, 1999 and normalised by Owen et al, 2007), relative entropy (Horowitz, 1997) and "excess tail frequencies" (Quirk and Fort, 1992). However, the measures of competitive balance which are most often applied in the literature are based on the standard deviation statistic. This was applied by Quirk and Fort (1992) to the North American major sports leagues and the measure was subsequently developed for football leagues to incorporate the draw outcomes and different scoring systems applied to those leagues in a line of literature (Goosens, 2006; Owen, 2010).

Several measures proposed combine both the concentration and dominance aspects of competitive balance. These include, ANOVA-type measures such as variance decomposition proposed by Eckard (1998) and the Competitive Balance Ratio proposed by Humphreys (2002) which Eckard (2003) shows to be a version of variance decomposition based, instead, on standard deviations. Other combinational measures employ mobility gain functions as proposed by Lenten (2009) and Markov models as proposed by Hadley et al (2005).

The second line of literature on competitive balance follows Cairns, Jennett and Sloane (1986) and addresses the effect of competitive balance on fans and tests the 'uncertainty of outcome' hypothesis. In this line the focus is on measures of the effect that the uncertainty of outcome of the sporting contests has on the demand function of spectators rather than on the competitive balance of the sports league 'per se'. The uncertainty of outcome hypothesis has also assumed a greater importance as it forms part of the "competitive balance defence" (Szymanski, 2009, p. 74) which was used by the owners of professional baseball clubs who, at hearings of Congress in 1951, argued to preserve regulation which restricted the free movement of players between clubs, despite its prima facie violation of antitrust law, as being necessary for the interest of the audience for the competition. Pawlowski (2013) provides a summary of the literature on the impact of the uncertainty of outcome hypothesis in professional football.

Budzinski and Pawlowski (2017) review the literature on behavioural economics in the context of sports demand. They identify the following concepts, namely:

1. Reference-dependent preferences and loss aversion
   These concepts provide "… a plausible theoretical explanation for the common empirical finding that fan interest is maximised when either the home or away team is favoured." (ibid., p. 113)

2. Threshold effects and satisficing utility
   These concepts explain why the perceived imbalance might need to exceed certain thresholds in order to become relevant for consumption behaviour.
3. Framing effects
   This concept recognises "… that the context of a perception or a decision situation matters more for interpretation and action" (ibid., p. 115) and, as such, that changes in competitive balance are more relevant as an influence on fan demand than levels of competitive balance.
4. Attention level effects
   These occur when the valuation of goods (or services) by individuals is a positive function of the attention that is more generally given to them. As such, measures of mid-term competitive balance (with related media attention) better reflect perceived competitive balance than more global indicators, i.e. consumers attention focuses on important sub-competitions and not so much on overall league suspense.

An implication of this literature is that the validity of 'the competitive balance defence' for restrictive practices and policies applied to sports leagues is not ubiquitous.

It can be seen from this review that the literature has not provided a focus on the competitive balance that results from clubs being in different size markets.

## 3. Theory

In this section the theoretical Quirk and Fort (1992) model is represented with the modifying assumptions applied to include 'win maximisation' as an objective for the club owners (Késenne, 2003) and an unrestricted supply of talent for the league[4] (Szymanski, 2004) to characterise professional football leagues. The model of the league assumes:

(i) The revenue functions of the teams are of the form: $TR_i = a_i w_i - b_i {w_i}^2$
Where:
$TR_i =$ Total Revenue for team $i$ $TR_i > 0$
$w_i =$ Win proportion for team $i$ $0 \leq w_i \leq 1$
$a_i =$ Market size for team $i$ $a_i > 0$
$b_i =$ Sensitivity of total revenue for team $i$ to its own win proportion $b_i > 0$

Szymanski (2004, note 2) points out that $w$ in this model can be interpreted either as the win rate expected by consumers or as the outcome of repeated trials. The parameters $(a_i \text{ and } b_i)$ are assumed to be constant for all periods. This is a useful assumption to facilitate the identification and representation of a steady state equilibrium. However, the predictions of the model do not depend on this assumption.

The assumption that the revenue function is concave so that demand declines ($b_i > 0$) over the relevant range of output is explained by Késenne (2007, p. 6) who states that:
"… a club's total revenue increases as the club becomes more successful, but the revenue function is assumed to be concave in the number of talents. It decreases if the club becomes too strong and public interest fades because of a lack of uncertainty of outcome." However, this assumption is open to question when the output of the product market is taken to be the win proportion of the team (or

[4] The adaptation affects the marginal revenue curves of the teams and the derivation of these for the case with an unrestricted supply of talent is given in Appendix A and the theoretical difference to competitive balance from assuming a fixed (i.e. 'closed' labour market) is shown in Appendix B.

a measure of talent employed) in a sporting competition. It may be expected that, in at least some relevant range of output, consumers will be willing to pay more for an incremental quantity of output (i.e. win proportion) if that increment has a greater sporting significance, such as winning a title. Hence, an increase in the win percentage of a team would cause its demand (and marginal revenue) curve to slope upwards in that range, reflecting consumers' willingness to pay a higher average price per win proportion (i.e. unit of output) for a marginally more successful team.

It is also noted that a peculiar economic feature of a sporting contest is that price is determined before the outcome of the sporting contest is known. Hence, it relates price to the output expected by consumers. The model assumes that the outcome they expect is identical to the actual outcome.

(ii) The following conditions hold: $\frac{\delta TR_i}{\delta a_i} > 0$ $\frac{\delta TR_i}{\delta w_i} > 0$ $\frac{\delta^2 TR_i}{\delta {a_i}^2} < 0$

These conditions impose the assumptions on the model that the revenue of a team varies positively with the size of the market for the team, although at a declining rate, and with the competitive success of the team (as represented by the proportion of games won).

In graphical form the model is presented for a league with two teams[5]. It is assumed that the output of both teams is represented by the proportion of games they win in the league which consequently results in a combined total output of one. As the total output is fully shared between the two teams, it enables both teams to be represented on the same graph with one team (team 1) from the left axis and the other (team 2) from the right axis. In the illustrative analysis below the two teams are identified by the suffix subscripts 1 and 2.

To show the effect of the differing assumptions of the relative preference of owners for profits[6] or sporting success on the equilibrium of the model it is assumed that team 1 has a higher level of demand than team 2. This is shown in the model by $a_1 > a_2$. Initially the analysis assumes that there is no other difference between the teams (i.e. $b_1 = b_2$). It is also assumed that the relative preferences of the large and small market teams remain constant. This seems to be a reasonable assumption as there is no indication that the regulation was intended to affect either large or small market clubs in particular.

There are four possible theoretical combinations of owner objectives to consider (see Figure 1)[7].

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[5] The conclusions of the analysis can be generalised algebraically to the case with more than two teams (see, for example, Dobson and Goddard, 2011, chapter 2.2) but the restriction in the text facilitates a graphical representation. In the two-team case each team can be thought of as representing several clubs with the associated characteristics.

[6] It is important to distinguish here between a preference to maximise profit (relative to the attainment of sporting success) and retained profit 'per se' which is subject to a range of other factors. It is assumed that clubs operate financially efficiently regardless of the owner's preference so other, more direct, ways of affecting reported profits are not available to them.

[7] The results depend on both the assumed form of the revenue functions and the assumption that marginal revenue declines at the same rate for both teams. Demand for team 2 is more elastic than for team 1 (i.e. fans are more loyal, less sensitive to team success) and the difference is relatively small (i.e. $b_1 - b_2 < a_1 - a_2$), the league is more balanced (than when $b_1 = b_2$) regardless of owner objectives as the dominance of team 1 is reduced. It is assumed that this is the applicable situation for clubs in the Tier 4 league and hence the model is a reasonable representation of the league. However, as the difference increases, there is a critical point for the difference in elasticity of demand (at $b_1 - b_2 = a_1 - a_2$) where if the difference is further increased team 2 becomes

a) Both teams are profit maximisers

Equilibrium occurs with a share of talent[8] which results in a win proportion where the teams equate their marginal revenue (shown at point A) and the resultant competitive balance is shown at point A'.

b) Both teams are win miximisers

Equilibrium occurs with a share of talent which results in a win proportion where the teams equate their average revenue (shown at point B) and the resultant competitive balance is shown at point B'.

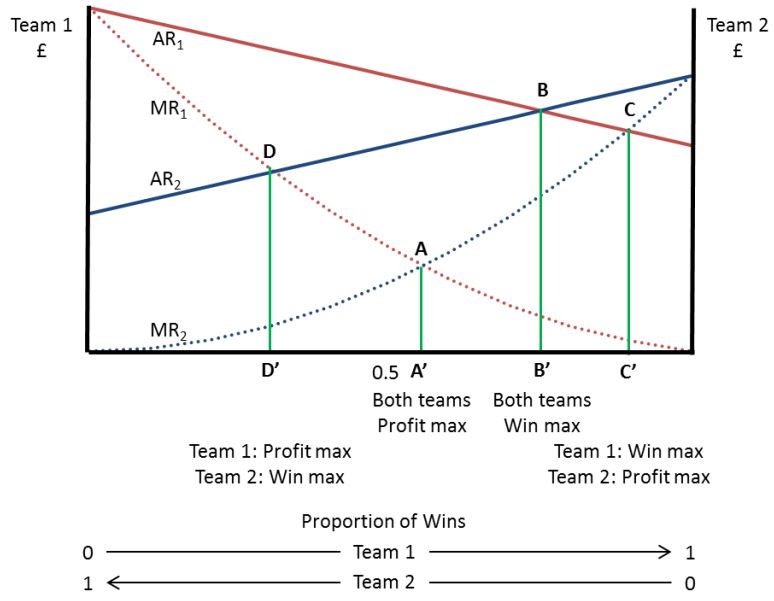
c) Team 1 win maximises whilst team 2 profit maximises

Equilibrium occurs with a share of talent which results in a win proportion where the average revenue for team 1 is equal to the marginal revenue for team 2 (shown at point C) and the resultant competitive balance is shown at point C'.

d) Team 1 profit maximises whilst team 2 win maximises

Equilibrium occurs with a share of talent which results in a win proportion where the marginal revenue for team 1 is equal to the average revenue for team 2 (shown at point D) and the resultant competitive balance is shown at point D'.

Figure 1: Competitive balance with profit maximising and win maximising club objectives in an 'open' labour market league




It can be seen from Figure 1 that the only scenario in which the large market team (i.e. team 1) does not have more competitive success than the small market team (i.e. team 2) is where team 1 profit

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dominant if the owners are profit maximising and, if the difference is sufficiently large (i.e. $b_1 - b_2 > 2(a_1 - a_2)$), a further critical point is passed where the difference in elasticity of demand is so large that team 2 becomes dominant even if the owners are win maximising.

[8] Each player is associated with a certain amount of talent and the competitive strength of a team is assumed to be the sum of their playing talent. As Quirk and Fort (1974, note 4) point out, this assumption bypasses the complexities associated with both the diverse skills of players and the inter-relationships of players and positions on the team.

maximises whilst team 2 win maximises. The most domination by the large market team occurs when it seeks the most competitive success whilst the small market team seeks to maximise profits.

The intuition of this model is that if owners are more inclined to 'win at all cost' then those with relatively more resource will have relatively more competitive success and this is apparent from the diversification of the results of the clubs.

However, Szymanski (2004, p. 117-118) points out that "The idea that each team can independently choose win percentage makes no sense in equilibrium, however many teams there are. If there are $n$ teams, at most $n-1$ teams can choose win percentage, so that the choice of the $n$th team is fixed due to the adding up constraint. The implication is that only one team can be decisive in equilibrium. Interpreting the model as a non-cooperative game, this cannot be a Nash equilibrium. … If we define a game in which each team is able to choose some variable independently of all other teams, then it is possible to find a unique Nash equilibrium. The natural way to achieve this is to model team choice in terms of a target quantity of talent or a level of financial investment in talent, which then jointly determines the relative share of talent and hence winning percentage." In a footnote (ibid., note 8) Szymanski notes that this problem is avoided if teams choose a value from a potentially unrestricted range, such as a spend amount for talent ($Z$), and that (in the two-team model) the talent acquired by each team is then given by:

$$t_1 = \frac{Z_1}{Z_1+Z_2}, \text{ and } t_2 = \frac{Z_2}{Z_1+Z_2}$$

Winfree and Fort (2012) incorporate this idea in the model by including an investment variable. Talent is then made a function of investment and purchased in proportion to relative investment. The modification does not affect the conclusion of the model in the simplified form presented in the text.

## 4. Empirical example

To provide an empirical example, revenue data was taken from the statutory financial accounts filed at Companies House for the clubs in the Tier 4 league in each season from 1995 to 2014. It was not possible to obtain the revenue data for all clubs as a few did not file accounts and the filed accounts for other clubs did not include a profit and loss account (reporting revenue)[9]. In some of these cases revenue data was obtained instead from the Deloitte reports[10]. Table 2 shows the number of clubs in the league and the number with available revenue data for each season. It can be seen that revenue data was obtained for a more than 75% of the clubs in the league in most seasons before the introduction of the 2006 Companies Act but that this reduced to approximately 50% of the clubs in the league each season in the following period.

[9] The 2006 Companies Act enabled small and medium size businesses to file abbreviated accounts which meant that whilst they must continue to file a balance sheet, the requirement to provide other financial statements, including the profit and loss account, is reduced or eliminated.

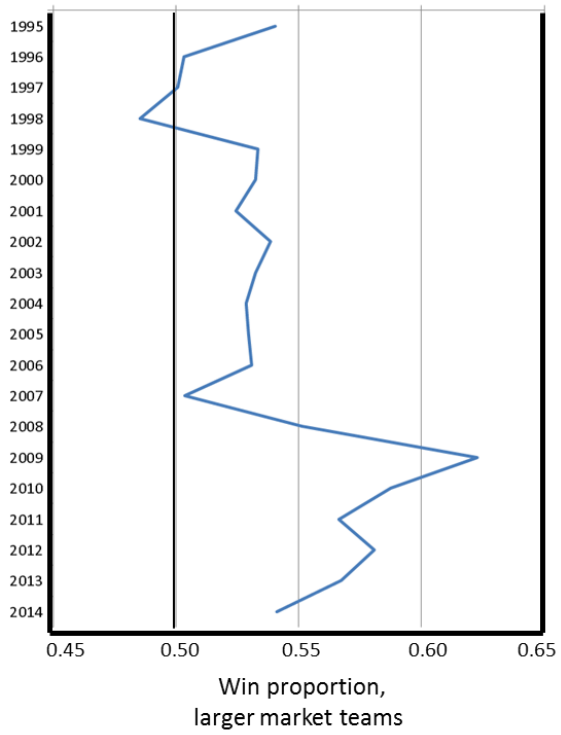
[10] The reference to Deloitte reports is taken generically to refer to an Annual Review of Football Finance published by Deloitte (since 2004) and previously by Deloitte & Touche which followed from an annual Survey of Football Club Accounts first published by Touche Ross (in 1992).

Table 2: Clubs with revenue data, 1995-2014

| Source | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| League | 22 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 478 |
| Accounts | 16 | 19 | 18 | 12 | 17 | 17 | 16 | 16 | 16 | 14 | 15 | 12 | 11 | 8 | 7 | 9 | 11 | 11 | 11 | 10 | 266 |
| Deloitte | 0 | 1 | 3 | 4 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| Available | 16 | 20 | 21 | 16 | 18 | 18 | 18 | 16 | 16 | 14 | 15 | 12 | 11 | 8 | 7 | 9 | 11 | 11 | 11 | 10 | 278 |
| - % league | 73 | 83 | 88 | 67 | 75 | 75 | 75 | 67 | 67 | 58 | 63 | 50 | 46 | 33 | 29 | 38 | 46 | 46 | 46 | 42 | 58 |

The clubs with available data were ranked in descending order of revenue for each season. Those in the top half were classified as 'large market' clubs (i.e. corresponding to team 1) and those in the bottom half were classified as 'small market' clubs (i.e. corresponding to team 2)[11]. The win proportion for the large market teams was then calculated as the average number of points from the final league table for the season for the large market clubs relative to the average of the large market clubs plus the average of the small market clubs. Figure 2 shows the win proportion for the large market teams over the study period.

Figure 2: Win proportion, larger market teams, Tier 4 league, 1995-2014

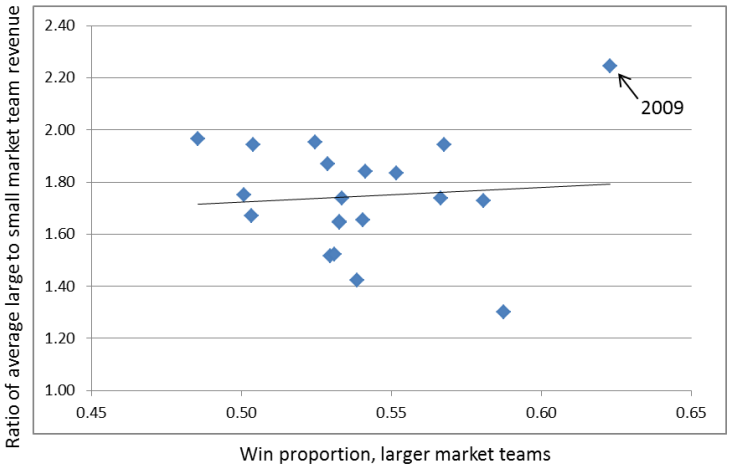



The data suggests that from 1996 to 1998 the large market clubs were relatively more profit oriented whereas the small market clubs gave relatively more weight to sporting success as the competitive balance was approximately equal between the two groups. From 1999 to 2006 the balance shifted as the large market teams had more sporting success. In 2009 there was a notable change in the competitive balance and from 2009 to 2013 the larger market teams achieved more sporting dominance over the small market teams.

[11] In seasons with an odd number of clubs in the ranking the middle club was excluded.

It may be argued that this effect was a result of an increase in the revenue differential between the large market and small market teams rather than a change in relative preferences. The large market clubs could be winning more either because they have changed their preferences or because they can just afford to spend more. To test this alternative possibility the ratio of the average revenue of the large market teams to the small market teams was compared to the win proportion of the large market teams for each year in the study period. Figure 3 provides a scatter diagram relating the relative average revenue difference to the competitive balance and includes a linear trend line of best fit.

Figure 3: Scatter diagram relating the relative average revenue of large to small market clubs to the competitive balance between them, Tier 4 league, 1995-2014




It can be seen from Figure 3 that the largest win proportion for the large market teams (in 2009) corresponded to the largest relative average revenue for those teams suggesting that the effect cannot be attributed to a change in relative preferences. However, more generally, there is no significant statistical relationship between the relative average revenue of the two groups of teams and the competitive balance between them.[12]

Consequently, over the study period, the evidence suggests that the large market teams increased their relative sporting ambition from a level where there was approximate equality of sporting outcome to a level of some sporting dominance over the small market teams.

## 5. Conclusion

This paper has argued that by comparing the sporting success of 'large market' teams with 'small market' teams the resultant competitive balance can be interpreted with an economic model of a professional football league to provide an insight into the relative weight, in each case, that the owners give to maximising profits relative to the attainment of sporting success.

The theoretical prediction is that as the large market clubs become relatively more intent on winning games, or the small market clubs become relatively more intent on profit maximisation relative to sporting success, the large market clubs will increasingly dominate the small market clubs in the sporting contest. The paper has assessed, empirically, the relative competitive balance between large and small market clubs in professional football in the Tier 4 league in England with sporting

[12] $R^2 = 0.01$

results and data from the financial accounts of the clubs in the league and provided an interpretation of the relative objectives of the owners in the period from 1995 to 2014. It found that the large market teams increased their relative sporting ambition from a level where there was approximate equality of sporting outcome to a level of some sporting dominance over the small market teams. This shows a tendency of increased exuberance on the part of the owners of the large market clubs which, if taken too far, can cause financial distress for clubs, the league competition and the wider social and economic community.

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**Appendix**

**A. Marginal revenue functions and the availability of talent**

The derivation of the marginal revenue of talent functions for an 'open' (i.e. unlimited talent availability) league is shown in five stages as follows:

(1) It is assumed in the model with two teams that the teams choose a quantity of talent with a logit form contest success function (producing the win proportion) given as follows:

$$w_1 = \frac{t_1}{t_1+t_2} \quad , \quad w_2 = \frac{t_2}{t_1+t_2}$$

Where:

$w_i =$ Win proportion for team $i$ $\quad (0 \leq w_i \leq 1)$

$t_i =$ Quantity of talent employed by team $i$ $\quad (t_i > 0)$

And, $\quad w_1 + w_2 = 1$

(2) The effect of the talent choice on the win proportion for say, team 1 $\left(\frac{\partial w_1}{\partial t_1}\right)$ is given by the partial differentiation of $w_1$ with respect to $t_1$ (i.e. on the assumption that $t_2$ is held constant).

$$\frac{\partial w_1}{\partial t_1} = \frac{t_2 - t_1\left(\frac{\partial t_2}{\partial t_1}\right)}{[t_1 + t_2]^2}$$

This shows how the effect of the talent choice by team 1 on the win proportion $\left(\frac{\partial w_1}{\partial t_1}\right)$ depends on the talent choice of team 2 $\left(\frac{\partial t_2}{\partial t_1}\right)$. This is known as the conjectural variation.

(3) If the total talent supply is normalised so that: $\quad t_1 + t_2 = 1$

And the total quantity of talent is unlimited (i.e. a change in the talent quantity for one team is not equated to a change in the talent quantity for the other team)

Then, $\quad \frac{\partial t_2}{\partial t_1} = 0$

And, $\quad \frac{\partial w_1}{\partial t_1} = (1 - w_1)$

Or equivalently, $\quad \frac{\partial w_1}{\partial t_1} = w_2 \quad$ (Since, $w_1 + w_2 = 1$)

(4) Finally, note that since:

$$\frac{\delta TR_i}{\delta t_i} = \frac{\delta TR_i}{\delta w_i} \times \frac{\delta w_i}{\delta t_i}$$

Where:

$$\frac{\delta TR_i}{\delta t_i} = MR^t{}_i \qquad \frac{\delta TR_i}{\delta w_i} = MR^w{}_i$$

And:

$MR_i{}^t =$ Marginal revenue from talent for team $i$

$MR_i{}^w =$ Marginal revenue from winning for team $i$

It follows that:

$$MR^t{}_i = MR^w{}_i \times \frac{\partial w_i}{\partial t_i}$$

(5) Then the marginal revenue of talent function (with the unrestricted availability of talent assumption) is:

$$MR^t{}_1 = MR^w{}_1 \times w_2$$

The equivalent results for team 2 can be obtained by symmetry.

**B. Effect of 'closed' (i.e. fixed) supply of talent on competitive balance**

Figure 4 reproduces Figure 2 with the addition of marginal revenue curves on the assumption that the labour market for the league is 'closed' (i.e. a change in the quantity of talent for one team is equal and opposite to the change in the quantity of talent for the other team). Dashed vertical lines denote the closed market equilibrium for each of the four scenario of combination of objectives for the two teams and horizontal arrows denote the shift from the open market equilibrium with the same scenario.

Figure 4 shows that in scenario B there is no difference to the competitive balance in equilibrium. However, in scenarios A and D the large market team has more sporting success in equilibrium but in scenario C the small market team has more sporting success in equilibrium. Consequently the range of equilibrium outcomes is smaller if the supply of talent is fixed to the league overall (i.e. in the case of 'closed' leagues).

Figure 4: Comparison of competitive balance equilibrium with profit maximising and win maximising club objectives between 'open' and 'closed' labour market leagues