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JEL Codes:

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Profit vs. win maximization in a league: a paradox ^{*}

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Abstract

The paper studies a very simple game-theoretical model of sports competition such as the European football leagues. In this oligopoly-type context, the Cournot-Nash equilibrium reveals a paradoxical differentiation between clubs: those that include not only profit but also sporting performance in their objectives end up generating more profit than others who purely maximize profit.

Keywords: Cournot-Nash equilibrium, oligopoly, sports economics, football.

1 Introduction

According to the English sociologist Richard Giulianotti (1999), football has gone through four periods in its history: the traditional period, from the establishment of the rules at the end of the 19th century until the First World War; early modernity, between the wars; late modernity, from the 1950s to the 1980s; and finally the postmodern period, over the last 30 years. At the beginning of the 2020s, we are at the dawn of a new era that we call “hypermodernity”. Four elements characterise this period.

The first concerns the economic inequalities, that have grown significantly in the post-modern era, both between clubs in the same league and between different

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leagues, with the result that national and international competitions are systematically dominated by a few teams that are much richer than the others. The second factor is the arrival of new types of investors in football: private and public investment funds and American investors, who often already own sports franchises in the United States. This change in ownership can have important consequences for the way the post-modern football economy works: football will have to be financially profitable and funds are taking stakes in various teams, which is leading to the formation of more and more 'galaxies' of clubs. The third factor relates to the globalisation strategy of the major clubs, which provides them with increasingly substantial commercial revenues. Finally, the fourth factor is the arrival of new broadcasters (the GAFANs), the proliferation of broadcasting platforms (OTT) and new modes of consumption.

Excluding transfers, clubs' income comes from four main sources: broadcasting rights, ticket sales, merchandising and sponsorship. These revenues have grown significantly since the 1970s, and the relative importance of the different sources has changed considerably over time: ticket sales, which were essential fifty years ago, have gradually lost ground to TV broadcasting rights and sponsorship for the top European clubs.

The economics of football are very specific. Until recently, it produced little or no profit for its shareholders. The objective of the clubs was not solely financial, as owners often bought teams for reasons other than the financial return on their investments. The non-pecuniary reasons for owning a football club did not mean that the search for profitability was absent. However, the recent arrival of new, more 'rational' economic agents could have changed the landscape of economics of football. As Garcia-Del-Barro and Szymanski (2009) suggest: "Is it possible that this group of new owners, driven by the quest for profit, will influence the others, who are more concerned with the number of victories".

So it is fair to say that much work has been devoted to the issue of the actual objectives of football clubs from the empirical point of view. But notice that standard Economics has been early handling this issue at the theoretical level. In particular, micro-economic theory has noticed that nonprofit-maximizing firms acting in an oligopoly may enjoy more profits than their standard profit-maximizing competitors (Fershtman and Judd, 1987). This paper will provide a striking example of this phenomenon. In an extremely simple model of sports competition of the type of European soccer leagues, we will show that clubs that include in their objective not only profit but also sporting performance end up generating more profit than the others, for whom profit by itself is the sole objective.

2 The objectives of football clubs

The standard (neo-classical) hypothesis of the theory of the firm postulates that its main objective is to maximize profit. Thus, sports economists most often consider that in North America, owners of professional sports franchises maximize their profit (Rottenberg, 1956, Fort and Quirk, 1995). In European football, however, this assumption is much more controversial.

2.1 The financial situation of European clubs

According to the UEFA report (2023), of the major European leagues only the top three leagues (England, Germany and Spain) have generated overall profits on their current operations over the last ten years. In 2022, of the twenty richest clubs, half were generating a profit margin. When player transfers and taxes are taken into account, even though the financial situation (probably due to Financial Fair Play and the growth in TV rights, particularly in the Premier League) has improved since the 2010s (see Figure 1), only 55% of European clubs were profitable in 2019. In 2022, after the Covid crisis, only 45% of teams were profitable.

Over the long term, football clubs were on a break-even trend, generating neither profits nor losses. Since the introduction of Financial Fair Play, the number of European teams with loss-making accounts has fallen with losses of nearly 1.7 billion gradually giving way to positive results overall. This turnaround is mainly due to the increase in revenues in the five biggest leagues. Operating profits – essentially revenues before transfers and taxes – have been positive since 2013. Net effective losses after transfers fell by 81% between 2011 and 2016. In 2017, an exceptional year in terms of total results, of the 55 leagues managed by UEFA, 29 showed positive results against 26 still in deficit, including less than ten with a deficit margin of more than 20% of overall income. In 2011, when the profitability of European football was at its lowest, there were 9 profitable leagues and 44 in deficit, including 16 with a negative margin of more than 20%.

There are obviously differences between countries that are generating profits, England, Germany and Spain in particular, and those that continue to experience difficulties, Italy, Turkey and Greece for example. Looking at the 98 clubs in the Big 5, in 2019, 70 teams (including the 20 in the Premier League) made a surplus on current operations (before player transfers) and 69 clubs made a net profit (including transfers). But the “good performers” are not the same in both cases: while all the richest clubs are usually to be found among those making the highest margins before transfers, other much less wealthy clubs are to be found among

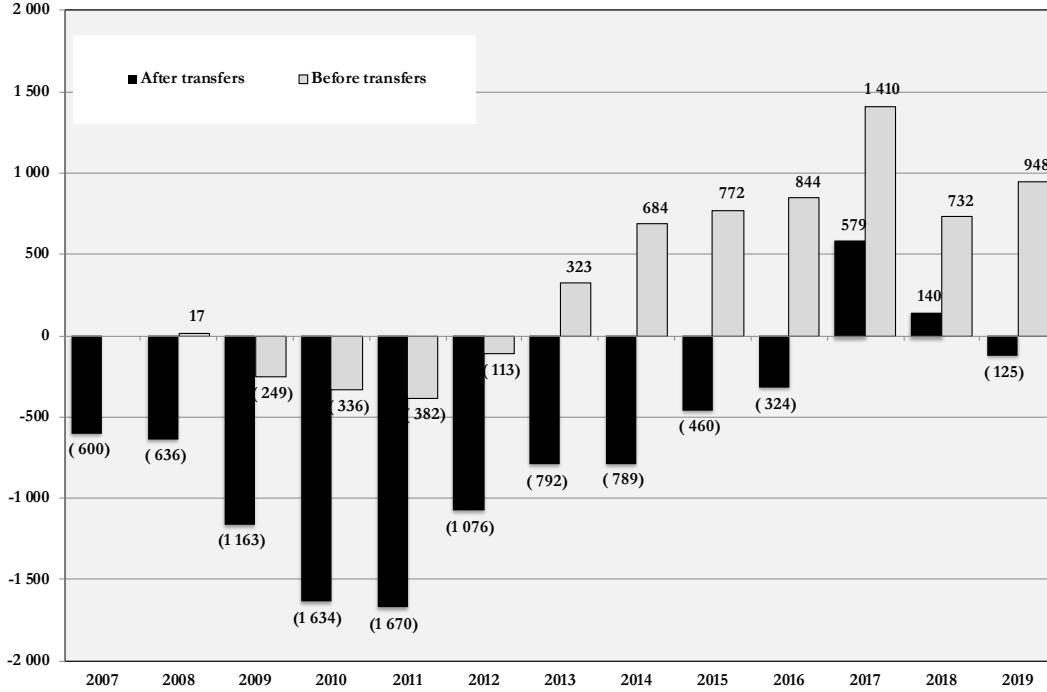


Figure 1: Cumulative net result of Europe's main leagues (millions of Euros). Source: UEFA

the teams making the highest profits. However, making the highest profit before transfers enables the richest clubs to hire the best players to win titles.

2.2 Theory

It is therefore clear that most European football clubs, even the biggest, are not always profitable. Economic analysis then proposes possible alternatives: maximization of the company's sales (Baumol, 1959), maximization of its growth (Marris 1964), satisfaction behaviour (Simon 1956) or maximization of a utility (Williamson 1985). All these hypotheses imply, to varying degrees, limits to the pure pursuit of profit in football (Sloane, 1971).

For football clubs, it seems clear that objectives other than profitability need to be considered. A club could thus "maximize a utility function" whose arguments are a whole set of objectives that may vary from one club to another: the number of victories for glory, stadium attendance for atmosphere, the reputation of players

for ratings and popularity, competitive balance for suspense... with a constraint on the rate of profit (which may be zero). There are several approaches to the objective function to be adopted. What they have in common, however, is the victory-profit trade-off (Fort, 2015).

Quirk and El Hodiri (1974) propose a (dynamic) model based on a profit-victory trade-off depending on the club's preferences and constrained by the relative quality of the squad. Kesenne (1996) postulates that maximizing the club's revenues ultimately amounts to maximizing the utility of its victories, provided that it reaches its break-even point. Rascher (1997) assumes that clubs maximize an additively separable (weighted) utility function between wins and profits.

Vrooman (1997) assumes that the club maximizes a utility function that depends on the value of the membership and its performance. Dietl et al (2011) adopt the same additively separable utility function as Rascher (1997) without relatively weighting the two arguments.

Finally, Madden and Robinson (2012), present the most complete specification: the club's maximization problem retains an additively separable utility function between profits, winning and stadium attendance. Their model writes as follows the objective U_i of club i :

$$U_i = \lambda_{i,\pi}\pi_i + \lambda_{i,v}v_i + \lambda_{i,F}F_i$$

where π_i is the profit, v_i the sport achievement (victories), and F_i the satisfaction of the fans. The clubs maximizes this utility under the constraint that the profit is non-negative, by deciding the wages of its players and its ticketing policy, and given the other club's wage. This model has the same structure than the one that we will use in the present paper, and is also solved using Nash equilibrium,¹ but we will neglect the F_i term and the ticketing policy; an issue that is studied in Arrondel et al. (2023).

Terrien et al (2017) synthesize the theoretical literature by defining three objectives for football clubs: 1) maximizing profit under a sporting constraint of wins; 2) maximizing wins under a 'hard' budget constraint; 3) maximizing wins under a 'soft' budget constraint.

This last notion of a "soft" constraint is inherited from the work of the economist J. Kornai (1980) on Soviet economies, which highlighted the fact that companies incorporate into their behaviour the possibility of being bailed out in the event of losses. This logic was proposed for football clubs by Andreff (2007), where the "lender of last resort" could be the shareholder, a bank or the local authorities.

¹There are only two clubs in the model of Maiden and Robinson.

2.3 Empirics

To empirically settle this debate between the two logics, profit objective vs. victory objective, P. Garcia del Barro and S. Szymanski (2009) analyzed the accounts and rankings of English and Spanish clubs over the period 1994-2004. There are two very strong statistical relationships between a club's income and its sporting performance (in order to increase its income, it must win), and between its performance and its wage bill (in order to win, the team must be the best it can be). As in any competitive environment, these relationships depend on the strategy of the other teams: if the other clubs seek to maximize their profits, the incentive to invest in players diminishes, since the return on investment will then be lower; if the other clubs maximize their wins, all the profits will be used to improve the team's ranking and therefore to sign better-performing players.

Since club profits are mainly determined by the difference between revenues and the wage bill, it is then possible to identify a relationship between the expected level of profit and the position in the league rankings conditional on the choice of all the other teams in the competition. By comparing each club's observed ranking, the one that would enable it to maximize its profit (for a given performance) and the one that would enable it to maximize wins (for zero profit), we can conclude that one or other of the hypotheses tested is correct. The authors show that it is the objective of maximizing victories that best describes the behaviour of the Spanish and English clubs studied: glory is preferred to money.

However, a few years later, Szymanski seems to be going back on this hypothesis, at least for the English case (Leach and Szymanski, 2015). In this new empirical study, he looks at the changes in strategy that the IPO (Initial Public Offering) of many English clubs in the 1990s should have brought about for owners. Indeed, the listing of teams should have led to an increased pursuit of profit. However, the authors find no evidence of any change in the clubs' financial results before and after the flotation of the English teams. In their view, this conclusion would be consistent with the hypothesis that these clubs are ultimately more profit-oriented than is generally accepted.

Leach and Szymanski (2015, pp. 25—26) also note that there are numerous empirical and theoretical studies on the debate between profit maximization and victory maximization, but that this "literature does not offer a clear-cut conclusion and does not clearly establish empirical evidence supporting one hypothesis over another".

To explain this lack of conclusion, Terrien et al. (2017) argue that the three possible objectives already mentioned can coexist within the same league for different clubs, but also for a given club over a given period: teams in the same

league would not have the same objectives, and the same team could have different objectives over time. We put forward another possible explanation, based on a paradoxical pattern that emerges when comparing objectives and results at the equilibrium of an oligopoly game.

2.4 Illustration of recent changes

The economic context of European football means that some owners anticipate that, in the medium term, top football clubs will be profitable: by making profits, players trading or capital gains on resales. This is probably the gamble and the economic logic of the investment or private equity funds that are interested in football. Figure 2 presents the correlation between the ranking of the Top 20 club revenue and their wage to revenue ratios and Figure 3 presents the correlation between the ranking (the UEFA coefficient) of the Top 20 club revenue and their wage to revenue ratios, on average between 2013 and 2019.² Both illustrate the recent transformation of the economics of football: Top clubs are interested in revenue (hence profit) and sporting success.

3 An oligopoly model of a league

3.1 Wages and wins

We consider a k -player game, a model of a league of k professional football clubs. The result of the sport competition among these clubs is captured by a variable that we denote v_i for club i akin to a probability of victory or a ranking.

This result solely depends on the wages w_i payed to the players of team i compared to the wage in the other teams. Let

$$W = \sum_{j=1}^k w_j$$

denote the total payroll paid by the clubs. We consider the simple model:

$$v_i = \frac{w_i}{W}.$$

²Because of ex aequo in the number of points between two teams in a given year, we have dropped the two last means in Figure 2 because there were too few observations.

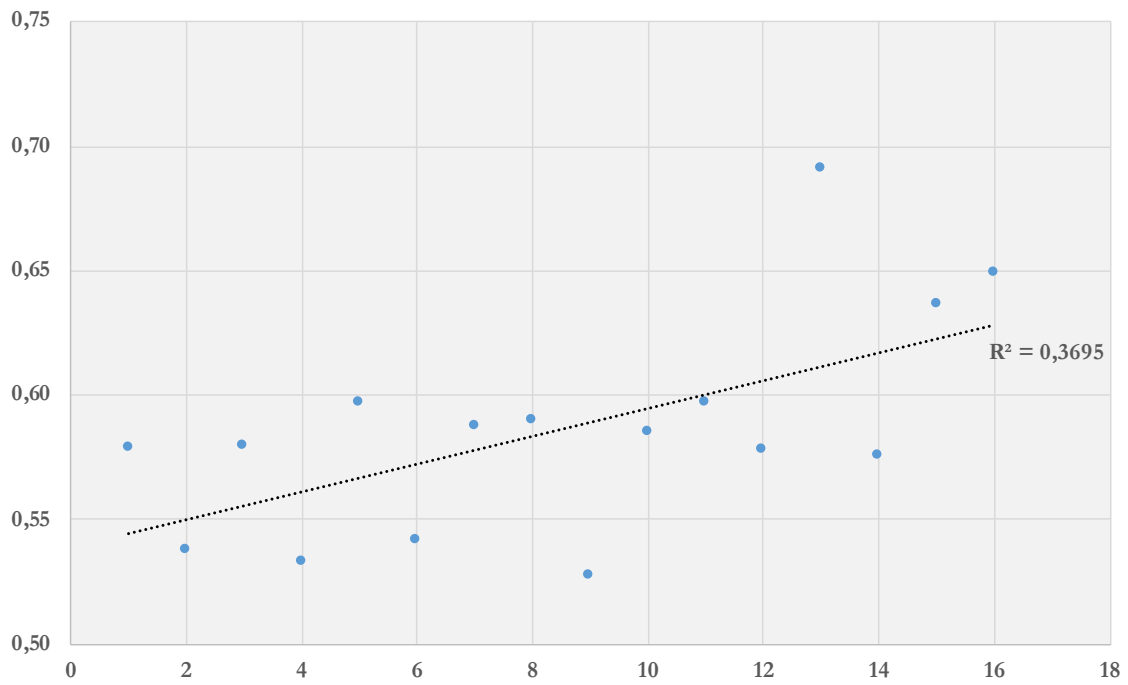


Figure 2: Correlation between Top 20 UEFA club revenue and wage to revenue ratios (on average, 2013-2019)

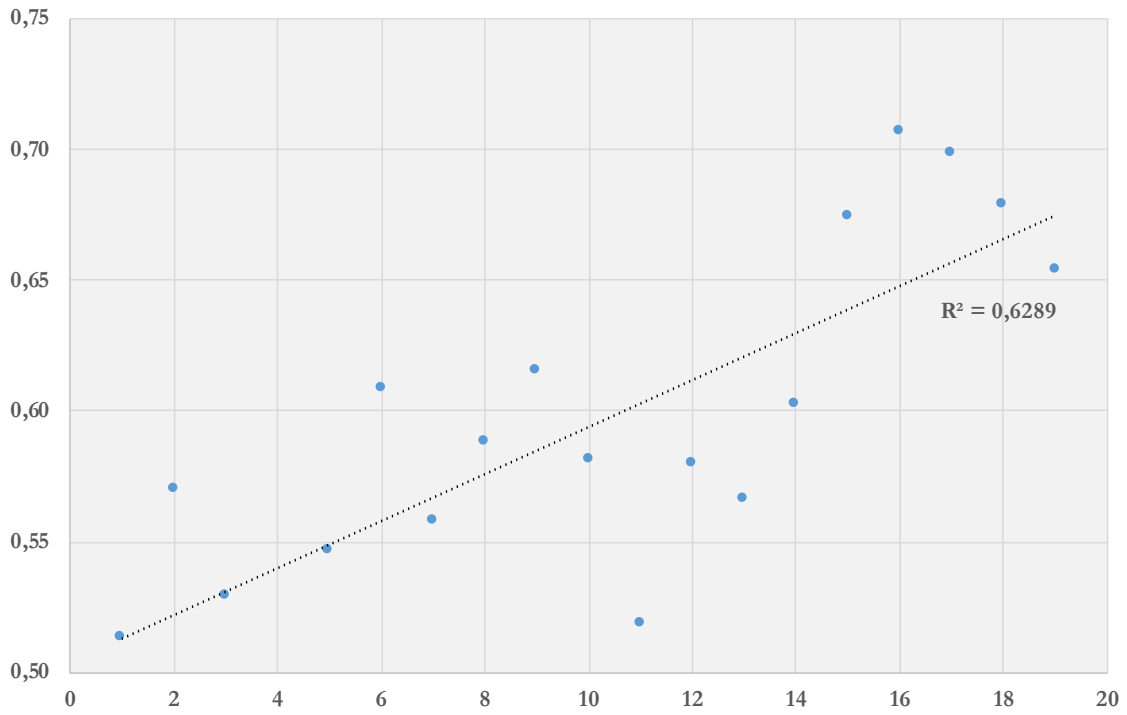


Figure 3: Correlation between Top 20 UEFA club ranking coefficients and wage-to-revenue ratios (on average, 2013-2019)

The victory measure varies between 0 (the team always loses, which happens if $w_i = 0$) and 1 (the team is the only winner).

The sports revenue r_i depends on the success and we will assume that it is strictly proportional to it. There is therefore a total windfall M such that:

$$r_i = Mv_i,$$

and the profit of club i is:

$$\pi_i = r_i - w_i.$$

The parameter M can be interpreted, for instance, as an amount of TV rights if that is the only source of revenue for clubs in the league, and M is distributed according to a formula³ that follows exactly the sport results v .

Note that the potential for collusion is obvious in such a model: If all clubs cut their wages w_i by two, the ranking r is unchanged and all their profits increase.

3.2 Mixed objective

We will study what happens if each club is interested in both profit and sporting success itself. Let the objective of club i be a mix of these two objectives:

$$\Omega_i = \pi_i + \alpha_i v_i.$$

The parameter α_i may differ from one club to the other and we will suppose, without loss of generality that the clubs $i = 1, 2, \dots, k$ are ordered according to the interest they attach to victory itself, the club $i = 1$ being the one for which profit is the most important:

$$0 \leq \alpha_1 \leq \alpha_2 \leq \dots \leq \alpha_k.$$

Note that the previous remark about the potential for cooperation is still valid: If all clubs cut their wages by two, the ranking is unchanged, all profit increase and the value of the objective Ω_i increases for all i . This means that, in the considered setting, collusion (cooperation among clubs) has the potential to drive the wages to zero. But we will study the non-cooperative case where each clubs takes as given the other clubs' behavior.

The only decision to be taken by i is its wage w_i , and we shall consider only two constraints. The first one is just $w_i \geq 0$. The second one is that profit be positive:

³A sizable body of literature is devoted to the question of choosing the redistribution formulas; see Bergantinios and Moreno-Ternero (2023). The simple proportional rule is sufficient for our purposes.

$\pi_i \geq 0$. The second constraint means that the wage does not exceeds the revenue r_i and, since $r_i = Mv_i = M\frac{w_i}{W}$, if we use the notation

$$W_{-i} = W - w_i$$

for the total wage bill of the other clubs, we can state the profitability constraint as an explicit constraint on w_i :

$$\pi_i \geq 0 \iff w_i \leq r_i \iff w_i \leq M\frac{w_i}{w_i + W_{-i}} \iff w_i \leq M - W_{-i}.$$

This can be written in a simpler but less explicit manner as:

$$W < M \tag{1}$$

One can then proceed to the maximization of the club's objective Ω_i for $w_i \in [0, M - W_{-i}]$. Writing Ω_i as a function of w_i , it comes:

$$\begin{aligned} \Omega_i &= Mv_i - w_i + \alpha_i v_i \\ \frac{d\Omega_i}{dw_i} &= (M + \alpha_i) \left[\frac{1}{W} - \frac{w_i}{W^2} \right] - 1 = (M + \alpha_i) \frac{W_{-i}}{W^2} - 1 \\ \frac{d^2\Omega_i}{dw_i^2} &= (M + \alpha_i) \frac{-W_{-i}}{W^3} < 0. \end{aligned}$$

Since the second derivative is negative, three cases are possible: $w_i = 0$, $w_i = M - W_{-i}$, or an interior solution.

The maximum is at 0 if and only if $\frac{d\Omega_i}{dw_i}|_{w_i=0} \leq 0$. But for $w_i = 0$, $W_{-i} = W$, so that the first necessary condition for an interior maximum is simply:

$$M + \alpha_i \geq W$$

and one can see that this condition is redundant with condition (1).

Hence the maximum is at $M - W_{-i}$ if and only if the derivative $\frac{d\Omega_i}{dw_i}$ is positive at that point. We shall later check whether this condition holds or not.

3.3 Cournot-Nash equilibrium

For an interior solution the first order condition is:

$$(M + \alpha_i)W_{-i} = W^2 \tag{2}$$

so that the best response function is:

$$w_i = \sqrt{(M + \alpha_i)W_{-i}} - W_{-i}.$$

One can then compare what happens, at equilibrium, to the various clubs. For $i < j$, that is if j places more importance on winning than i , $\alpha_i < \alpha_j$ and the results are as follows.

- For wages: in view of (2), $M + \alpha_i < M + \alpha_j$ implies $W_{-i} > W_{-j}$ and therefore:

$$w_i < w_j.$$

- For profits: writing $\pi_i = (\frac{M}{W} - 1)w_i$, one immediately gets

$$\pi_i < \pi_j.$$

This last result is particularly remarkable since it indicates that, paradoxically, the clubs most interested in profit are those that make the lowest profits.

4 Examples

We will now give some examples and each time verify that the first order conditions are compatible and do provide an interior equilibrium. These examples highlight the mechanism at work and, although they do not pretend to mimic an existing league, they show that the paradox does not vanish for 20 clubs.

4.1 Example with two clubs

Take $\alpha_1 = 0$ and $\alpha_2 > 0$. The system of first order conditions (see (2)) can be solved analytically:

$$\begin{aligned} Mw_2 &= (w_1 + w_2)^2 \\ (M + \alpha_2)w_1 &= (w_1 + w_2)^2 \end{aligned}$$

yields, after some computation:

$$\begin{aligned} w_1 &= \frac{(M + \alpha_2)M^2}{(2M + \alpha_2)^2} \\ w_2 &= \frac{(M + \alpha_2)^2 M}{(2M + \alpha_2)^2} \end{aligned}$$

hence

$$W = \frac{M(M + \alpha_2)}{2M + \alpha_2}.$$

So the condition $W < M$ is satisfied, hence the above wage values form an interior equilibrium. Now observe that, at equilibrium, $Mw_2 = (M + \alpha_2)w_1$, hence $w_2 > w_1$. This means that club 2, which is relatively more interested in victory is paying a higher wage, and is thus winning more often. Profits are:

$$\pi_i = Mv_i - w_i = M \frac{w_i}{W} - w_i = \left(\frac{M}{W} - 1 \right) w_i,$$

so that the club that is more interested by profit ($i = 1$) makes the smallest profit.

4.2 Examples with more clubs

For more clubs the analytic solution seems out of reach in general but a good software such as Math ematica can compute the exact numerical solution up to $k = 5$ clubs. To fix ideas and without loss of generality we set $M = 100$.

4.2.1 If all clubs only care for profit

First note, for a benchmark, that if all parameters α_i are nil, the wages are all the same. For $k = 5$, $w_i = 16$ and the profit of each club is 4. The total payroll is 80 so that, overall in the industry, the wages capture 80% of the manna M .

4.2.2 One club is looking for victory

One club, out of five has a strictly positive value of α . Take for instance:

$$\alpha = \{0, 0, 0, 0, 40\}$$

Then the wages decreases compared with the benchmark except for the club aiming directly at victory. One gets

$$w = \{12.9, 12.9, 12.9, 12.9, 33.4\}$$

and the total payroll increases at

$$W = 84.9.$$

The profit decreases for the first four clubs and increases for the last one, following the paradoxical pattern mentioned earlier.

$$\pi = \{2.30, 2.30, 2.30, 2.30, 5.97\}.$$

4.2.3 An example with different objectives

Suppose that all clubs are more or less interested in their ranking. Take for instance:

$$\alpha = \{0, 2, 4, 6, 8\}.$$

The wages are then:

$$w = \{14.0, 15.4, 16.7, 17.9, 19.1\}$$

and the total payroll:

$$W = 83.13.$$

and profits:

$$\pi = \{2.84, 3.1, 3.38, 3.64, 3.89\}.$$

From these computations it seems that variations in the objective (the parameter α) induces important variations among clubs but that the variation of the total payroll is not so large. One is tempted to suppose that, in aggregate, what share of the manna is consumed by the wages is mainly determined by k , the number of competitors. The next example will confirm this intuition.

4.2.4 An example with twenty clubs

Suppose now that there are $k = 20$ clubs, that replicate four times the previous parameters α . Take $M = 400$ to compare. With respect to the previous example we just cloned each club into four copies. This has the effect of increasing the wages:

$$w = \{15.6, 17.4, 19.2, 21.0, 22.8\}$$

and to decrease the profits:

$$\pi = \{0.66, 0.74, 0.81, 0.89, 0.96\}.$$

The total payroll $W = 383.8$ is now 96% of M .

5 Conclusion

The above result may be counter-intuitive. Since all clubs are identical except in their objectives, they have the potential to imitate each other, so if one club, say i , places relatively more emphasis on profit than another club, j , which puts more emphasis on sporting success, one might think that they would end up with a situation in which i made more profit and j was more successful. If this were

the case, it would be possible to directly deduce behavior and objectives from (sporting and financial) results.

But this line of reasoning fails to take into account the oligopolistic nature of the competition between clubs: when one club changes its wage policy, all the others are affected. It follows that the comparison between the results obtained by different clubs at a given equilibrium should not be confused with the different results a club would obtain, in a fixed environment, if it had other objectives. This paper noted that this distinction can be qualitative: clubs that place less weight on profit in their objective are, at equilibrium, those that are observed to achieve higher profits. Such a result, which has its origins in the complex interactions involved in equilibrium, may be counter-intuitive, and may explain why it is difficult in practice to identify a club's objectives from observations, as the empirical literature has experienced.

These game-theoretic effects are particularly important when the number of players is low, and they tend to disappear in a large market. This is unsurprisingly the case in the examples provided above. In reality, sport leagues are sectors in which the number of actors is relatively small and the atomistic hypothesis of purely competitive markets may be less relevant than an oligopolistic, game-theoretical perspective.

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