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MANAGERIAL OBJECTIVES: A RETROSPECTIVE ON UTILITY MAXIMIZATION IN PRO TEAM SPORTS

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Abstract

*This is an essay review of the literature on utility maximization as a managerial objective in pro team sports. It ends up that there is a heretofore-unrecognized parallel development of the idea, in English football by Sloane [Scottish Journal of Political Economy (1971), **17**, 121] and in North American pro sports by Quirk and El Hodiri, presented in that same year but not published as a conference proceeding until 1974. I review these works and place the rest of the extant literature chronologically, noting their level of generality along a couple of dimensions. I also observe a lack of a clear reference lineage in this literature and suggest one. Adopting it should aid future researchers who are trying to place their work in the context of this literature. [It would have helped me, for example.]*

I Introduction

In this paper, the goal is to track the development of the literature on one form of managerial objective in pro team sports, namely, utility maximization. In the literature, I could find, the original application to pro sports is solely attributed to Sloane (1971). However, joint work by James Quirk and Mohammed El Hodiri presented at a Brookings conference in that same year 1971, but not published until later (1974), exhaustively formalized utility maximization as a managerial objective in pro team sports, in a general dynamic model.[1] This seems to be an interesting case where great minds really were thinking alike, and quite independently one from the others. In reviewing all of the subsequent literature, I will refer to this as the Sloane/Quirk and El Hodiri formulation, or S/Q-EH for short.

Table 1 shows a curious turn of events concerning the S/Q-EH formulation in the subsequent literature. Directly following the line of utility maximization as a managerial objective in pro team sports, the two original works are not

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[1] Others need not agree, but it is clear to me that Quirk and El Hodiri (1974) was in progress contemporaneous to Sloane (1971) also evidenced by the publication of their other, profit maximization piece at exactly the same date (El Hodiri and Quirk, 1971).

consistently recognized as such. Most likely this was just an artifact of accessibility, extended gaps between publication dates, and the fact that once a literature begins to build it is unlikely to look back.

But in this case, the failure to look back misses some important developments in sports economics and relative to social science in general.[2] First, Quirk and El Hodiri (1974) is a full-blown dynamic treatment, all the way to league equilibrium results, that is not to be found anywhere in the subsequent literature.[3] Second, it ends up that they use a contest success function that they had formally introduced in their earlier profit maximization paper (El Hodiri and Quirk, 1971) a few years prior to its common attribution in social science to Tullock (1980).[4] The contest success function is 'the industry standard' in modern game theory equilibrium models of the interaction of team owners/club directors through their leagues. On the basis of these two findings, bringing this neglected work back into the mainstream is my most important contribution to this special edition.

After presenting Sloane (1971) and Quirk and El Hodiri (1974) (in that order for reasons I make clear) in the next two sections of the paper, the rest of the literature explicitly using utility maximization as a managerial objective

Table 1
Citations comparison

	S	Q-EH	K	R	V	DGL	MR
Sloane (1971)	.						
Quirk and El Hodiri (1974)	.	.					
Kesenne (1996)	x	x	.				
Rascher (1997)	0	0	c	.			
Vrooman (1997)	0	x	c	c	.		
Dietl *et al*. (2011b)	x	0	x	x	x	.	
Madden and Robinson (2012)	x	0	x	x	0	c	.

Note: Dietl *et al*. (2011b) do not cite Vrooman (1997) or Vrooman (2000) where the 'sportsman' owner is reprised, but they do cite his later work (Vrooman, 2007, 2009) where the 'sportsman' owner also appears. Dietl *et al*. (2011b) and Madden and Robinson (2012), do not cite Kesenne (1996) directly but they do cite Kesenne's various later works that employ the win maximization model, especially his overview of that theory in Kesenne (2007). 0 = no citation, x = citation, c = contemporary publications (no citation should be expected).

[2] And this is not the first time. In another retrospective, Fort (2006a) points out that Rottenberg (1956) had independently deduced and utilized the *simplest* version of a theorem used by Coase (1960) (Sanderson and Siegfried, 2006, note this but spend no time on it). Rottenberg used it to develop what is now referred to as the 'invariance principle' while Coase used it as a straw man concept to set up the problems plaguing the handling social costs.

[3] Rascher (1997) provides a dynamic notation but then does nothing with it. There also are two other articles employing dynamic analysis but were deemed too far afield from the pro team focus here. Maxcy (2004) models long-term contracting with expected utility analysis. Fort (2006b) uses expected utility analysis to model the basics of inter-temporal carrying of talent from the minor league to the major league.

[4] Skaperdas (1996) traces the use of contest success functions, *per se*, to Tullock (1980) but notes they are similar to 'probabilistic choice functions' used a few years earlier in other applications.

in pro team sports is organized chronologically in a separate section. As they are presented, their generality in relation to preceding works is noted along the lines of (1) capturing the S/Q-EH utility maximization framework and (2) general theoretical treatment of the utility function, itself, and (3) treatment of the contest success function. The other usual dimension of generality in economics – from dynamic to static – doesn't matter as there is no dynamic treatment after Quirk and El Hodiri (1974). Literatures typically evolve in the other direction, from restricted static to dynamic, but that is just another interesting thing that distinguishes the literature on utility maximization as a managerial objective in pro team sports. The most general treatment actually came before the less general. The penultimate section is about the lack of a clearly stated lineage in this literature and a suggestion to remedy that in the future. Conclusions round out the paper.

II The Football Club As a Utility Maximiser

I begin with Sloane (1971) because his was a completely non-mathematical presentation and the utility maximization idea was motivated by factors distinct to English football compared to North American pro leagues. Sloane's (1971) article title is in two parts: 'The Economics of Professional Football' and 'The Football Club As A Utility Maximiser'. While the focus in this special issue is on the latter, lest we forget, Sloane (1971) did for English football what Rottenberg (1956) did for baseball, namely, cover a multitude of league-specific labor, industrial organization, and regulation topics. I heartily recommend the entire Sloane (1971) paper to all readers with the caution that each paragraph is loaded with significant content.

Sloane cites his inspiration as the early utility maximization approaches of Williamson (1963) and Marris (1964).[5] Sloane (1969) had already bridged the gap from the more general 'managerial' economics to sports economics a bit earlier. So, there is a nice smooth flow from management objectives from general economics to their application in sports economics in Sloane (1971).

As with all seminal ideas, eventually they become textbook stuff. There is this in the textbook by Downward and Dawson (2000, p. 28), 'Sloane recognized the possibility that divorce between ownership and control in association football might permit managers to pursue non-profit goals, for instance, utility maximization (subject to minimum profit).' Sloane (1971) gave careful consideration to the types of managerial objectives extant in the literature at the time. While rejecting profit maximization outright for English football, there are self-professed elements of security maximization (Rothschild, 1947) and sales maximization (Baumol, 1957) included in his utility maximization framework. For Sloane (1971), the following could come to govern managers under situations that might characterize English football clubs as opposed to individually owned teams in North America –

[5] Sloane also notes that Rottenberg (1956) puzzled over management objectives before settling on profit maximization for Major League Baseball.

In the choice of talent level, club directors might maximize (Sloane, 1971, p. 136):

$$U[P, A, X, (\pi_R - \pi_0 - T)], \text{ subject to } \pi_R + F_x \geqslant \pi_0 + T \quad (1)$$

U is the club director's utility function, P the playing success, A the average attendance, X the health of the league, π_R the recorded profit, F_x the external club financial resources, π_0 the minimum after-tax profit, T is the taxes.

Sloane (1971) offers nothing in terms of any specification of U, perhaps because he doesn't do anything with expression (1) except specify it as a guide. P translates most directly to winning. A is self-explanatory, although the specification of attendance relative to winning, and its role in different places in the specification, are not and Sloane offers nothing on these except that they relate to revenue maximization. X, the 'health' of the league, had already been set up in the earlier part of the paper on two dimensions. 'Mutual independence' is the requirement of the survival of all clubs in the league (he cites Rottenberg, 1956; Neale, 1964; Jones, 1969). But it is Rottenberg's (1956) 'uncertainty of outcome' hypothesis that sticks with the rest of Sloane's (1971) formulation, as well as with the works that followed (p. 136), 'Utility is derived from the health of the league because it is better to win a keenly fought competition than to win easily.'

A portion of this specification would also play a large role in future work and Sloane (1971) wrestled with this one a bit. Surely, potential investors had to be given some signal of team vitality. Further, club directors would not bankrupt their private wealth position pursuing this utility. So Sloane (1971) arrived at the idea of 'acceptable' profit, that is, recorded actual profit net of some required minimum level and taxes. Later works sometimes adjust this part of the specification to a simpler break-even constraint.

Of course, the most famous distinction in Sloane (1971) is the utility maximization framework offered as most fitting for English football. However, an element in Sloane (1971) that would endure and drive different paths in the literature on sports teams and leagues was his immediate observation that the managerial objective shoe must fit the wearer (p. 1); 'Whilst several North American contributions on the economics of sports exist... there appears to have been no attempt to apply economic theory to the particular case of British professional football...' The different treatment of management objectives in different league structures in different countries, now commonplace, was the opening observation in Sloane's (1971) seminal work.

Again, Sloane (1971) really only uses the formulation in expression (1) as a descriptive organizer; he does not perform the optimizing calculus or push the formulation to an equilibrium specification. Sloane (1971) also spends nearly no time on some of the problems with this formulation. Attendance, performance, and outcome uncertainty all appear as independent arguments in the utility function based on his earlier sorting through the managerial objectives literature. But surely they are also the primary determinants of 'recorded profit', a component of acceptable profit that also appears in the utility function.

And what are the determinants of the mysterious F_x term, that is, 'external club financial resources'? It is easy to think he was just leaving room for a consumption-oriented club manager to put in their own personal wealth, as well as the contributions of other fans (rather than dues) or investors. But this raises an important issue. If people with suitable means are also fans, then isn't the champion of the league simply the club whose fans have the largest F_x?

Neither does Sloane (1971) address the question of competition among organizational structures, available to him as it reaches back in economics to Alchian (1950). At the very least, there is a debate about whether anything but profit maximization can survive against other management objectives. But no paper can do everything and others ably carried that part of the later literature.[6]

For example, early on, Dabscheck (1975) took a completely detailed look at the actual behavior of Victoria Football League in Australia (now Australian Rules Football) and just argued forcefully that it could not be construed in any way to resemble an organization interested in profit maximization, especially in the characteristic overpayment of talent. This, of course, was right up Sloane's utility maximization alley as he started there as well and noted that utility maximization would lead to plowing back what would otherwise be profit into the primary factor that generated wins, namely, players. A bit later, empirical estimates of pay dramatically in excess of marginal revenue product (MRP) were taken as evidence contrary to profit maximization (Cairns *et al*., 1986; and Szymanski, 2003).

I do not wish to stray too far afield, but it is worth noting two things about the MRP 'controversies'. First, utility maximization is not the only model that leads to talent investment in excess MRP. Baumol (1957) showed long ago that revenue (sales) maximization would do the same thing. Indeed, in his justification for including attendance, Sloane (1971) himself recognized that this had an element of sales maximization to it.

Second, while pay in excess of MRP is consistent with owner motivations other than profit, it is also consistent with ineffective measurement of MRP. There is just as much controversy over the estimation of MRP as there is over anything else. A player's MRP is not just their gate contribution, or even their gate plus TV revenue contribution. In the modern context of sports, the MRP avenues are varied and far-reaching. For example, a share of the revenue from a college football game played in an NFL stadium (as are all college national championship games in the United States.) can easily be traced to NFL football players. The NFL owner might not have even obtained the stadium without the value of their NFL affiliation and players, as well as owners,

[6] Cairns *et al*. (1986) detail the issue and the early empirical work that was bound to ensue on profit maximization vs. other managerial objectives. Szymanski (2003) and Garcia-del-Barrio and Szymanski (2009) catch that literature pretty much up to date and the latter is aimed at comparing two management objectives, empirically. Fort and Quirk, 2004, also take up this same issue with the win maximization version of the S/Q-EH formulation, detailed below.

contribute to the creation of that 'NFL value'. It poses an interesting measurement challenge, but NFL player MRP includes some of that revenue generated by a college football game.

III The Economic Theory of a Professional Sports League

Quirk and El Hodiri (remember, presented 1971, published 1974) admit early on in their formulation that profit maximization may not fit North American pro sports team owners very well (p. 42):

> The assumption that the actions of franchise owners are motivated solely by profits from operation of their franchise is admittedly somewhat unrealistic. Owning a major-league franchise carries with it prestige and publicity, and a wealthy owner might view it simply as a type of consumption; for such a 'sportsman'-owner, winning games rather than making money might be the motivating factor.

As noted at the outset in the previous section, this opinion is based on specific reasoning relevant to what Quirk and El Hodiri (1974) observed in North American pro sports rather than the separation of ownership and control that Sloane (1971) observed in English football. In addition, Quirk and El Hodiri (1974) provide both a dynamic specification and the mathematical rigor absent in Sloane (1971).

Where Sloane's (1971) specification in expression (1) was really just a device to organize the elements of his specification, Quirk and El Hodiri (1974) provide the calculus of dynamic decision making, along the lines in capital theory covering optimal (inventory) control. Talent is the inventory and profits depend on talent through winning. After a full profit maximization treatment, Quirk and El Hodiri (1974) moves on to utility maximization. For their dynamic version of utility maximization, in their choice of increments to talent over time, team owners:

$$\text{Max}\,\phi\left[\sum_t U^i(C_t^i, p_t^i)(1+\rho)^{-t}, \sum_t \pi_t^i(1+\delta)^{-t}\right] \tag{2}$$

subject to:

$$I_t^j - I_{t-1}^j = \sum\nolimits_{j\neq k} x_t^{jk} + x_t^{jN} - \alpha I_{t-1}^j, \pi_t^i \geqslant 0, W_t^i \geqslant 0, I_t^j \geqslant 0$$

U^i is the utility function of the owner of team i, C_t^i the Consumption of other goods (than the probability of winning), time t, p_t^i the vector of probabilities that team i wins against the rest, time t, ρ the positive rate of subjective discount, π_t^i the net cash flow from operating team i, period t, δ the market rate of interest per period, I_t^j the inventory of playing skills, team j, time t, x_t^{jk} the units of playing skill purchased from team k by team j, time t, x_t^{jN} the units of playing skill drafted by team j, time t, α the rate of talent inventory depreciation, W_t^i the wealth of the owner of team j, period t, not including the team.

Quirk and El Hodiri (1974) utilize the function ϕ to set up a marginal rate of substitution between utility from winning (which will have its own marginal rate of substitution with consumption of other goods) and profit. For example, if ϕ is independent of U^{i} then only profit matters again. There are no restrictions at all on the form of the utility function. There are specified constraints on ρ and wealth is specified as a difference equation in this dynamic model. Profit depends on attendance revenues from playing skills (winning) and playing skills are dynamically adjusted (purchased and drafted) to augment previous inventory, minus the costs (including depreciation of skill).

Clearly, Quirk and El Hodiri (1974) are on the same wavelength as Sloane (1971). All of Sloane's (1971) elements are there – playing strength, attendance through the profit function, and non-negativity in both wealth and profit in the tradeoff in (2). Finally, outcome uncertainty is handled via the determination of winning probabilities incorporating relative team talent choices. This last deserves special attention.

Quirk and El Hodiri (1974) incorporate explicitly that the probability of winning is driven by the ratio of a given team owner's own choice (inventory) of talent relative to the talent choices of each and every opponent (all accounted for in the derivation of their equilibrium among $n > 2$ teams). The probability of team i winning a game against team j, in period t, is specified as (p. 59):

$$p_t^{ij} = \frac{I_t^i}{I_t^i + I_t^j} \tag{3}$$

Expression (3), which also appears in their earlier profit maximization version (El Hodiri and Quirk, 1971), is literally the contest success function a few years before it appeared in Tullock (1980).[7] So, as with Rottenberg and Coase (see footnote 1), it would seem that economists working on sports had preceded the generally accepted attribution of the contest success function.

There are, of course, differences in the distribution of talent across the league and the impact of some league policy impositions between profit maximization and utility maximization in the dynamic Quirk and El Hodiri (1974) specification. Those are left to the interested reader, with this preview from Quirk and El Hodiri (1974, p. 76):

> In general, once the utility function contains as an element the probability of winning as a source of satisfaction distinct from its effect on profits, any earlier assertions about the relationships between the distribution of playing strengths and the drawing potentials of franchises must be severely qualified. In principle, a sufficiently wealthy owner concerned with 'winning

[7] Again, see Skaperdas (1996) for both the history and the treatment of much more general specifications of the contest success function. Fort and Winfree (2009) also offer some simple numerical examples of the impact of different choices of the form of the contest success function.

at all costs' could attain his objective even if he owned a franchise in a small city, simply by spending enough money.

IV Subsequent Work

In this section, the subsequent work explicitly using utility maximization as a managerial objective, subject to some form of profit constraint, in pro team sports is organized chronologically and compared on some different aspects of the generality of their treatments.[8] There are no dynamic treatments in this part of the pro sports team literature after Quirk and El Hodiri (1974) so the generality criteria cannot include the usual static/dynamic comparison. My attempt at comparison settled on generality of the utility function treatment and capture of the essential elements of the S/Q-EH formulation.

Kesenne (1996) states that his win maximization framework is a simple variety of utility maximization where only wins matter, subject to the club manager breaking even. This is not entirely clear to this reader as Kesenne's (1996) formulation *can* be a simple statement that utility equals winning, but going all the way back to Baumol (1957), it *can* also be simple revenue maximization (market share) in an oligopoly setting with the value of winning set equal to unity. If it is utility maximization, it is surely the most restrictive 'utility' function in the literature. If it is sales maximization, perhaps it offers heretofore-unexplored implications and insights about the pursuit of market share among pro sports leagues.

In any event, the win maximization problem in Kesenne (1996) is not formally stated but matches[9]:

$$\text{Max } L \text{ subject to } R(M,L) - WL \geqslant 0 \tag{4}$$

L is the units of playing talent for the team, relative to the talent in the rest of the league, R the team revenue, M the team market size, W the talent cost per unit.

As wins follow directly from L, he simply maximizes talent subject to the clear break-even constraint. The impact of attendance is subsumed (but not formally treated) in the revenue function. There is only the hint about contest success in that units of talent for the team are 'relative' to the talent in the rest of the league but no formal contest success function appears

[8] In their review article, Cairns *et al*. (1986) also cite a later monograph by Sloane (1980) but I could not obtain a copy. It is worth noting that there are other works that utilize utility maximization, but were deemed too far afield for the topic at hand of team owner/club director utility maximization as a management objective (see also footnote 2). Gamrat and Sauer (2000) compare utility maximization in the ownership of racehorses to a 'pure finance' alternative. Leeds (2002) and Leeds *et al*. (2004) cast college athletic directors as maximizing 'prestige' subject to a break-even budget constraint.

[9] In the subsequent win maximization literature (reviewed in Kesenne, 2007), things are only a bit more general: $\text{Max} W_i + g_i(P_i^0 - R_i + CL_i)$. That is, maximize winning explicitly and the break-even requirement is in terms of a required profit level, P_i^0 in the Lagrange constraint. Everything from Kesenne (1996) of course carries through.

(but it is incorporated in subsequent work in this literature, see Kesenne, 2007).

Baumol's (1957) lesson, for those who remember, holds here. Kesenne (1996) chooses to demonstrate this graphically: The talent (win, revenue) maximizer chooses L to equate the *average* revenue from winning, rather than the *marginal* revenue from winning, to the cost of talent, W. Thus, talent investment is larger in the win-maximizing league than under profit maximization. Kesenne (1996) also shows that revenue sharing will increase competitive balance in this framework (and all manner of other league-imposed policies are investigated in the subsequent win maximization literature; again, see Kesenne, 2007).

Rascher (1997) sets up utility maximization with an additively separable utility function in winning and profit:

$$\text{Max } U_i = \alpha_i \text{Win}_i + (1 - \alpha_i)\pi_i \tag{5}$$

α_i is the proportion that owner i trades off winning and profit in their utility function, Win_i the wins for team i, π_i the profits from winning, required non-negative.

Comparing back to the S/Q-EH specification, this utility function is more restrictive than the general Q-EH utility function both in its content (no 'other consumption') and in its form (linear in winning and profits). Kesenne (1996) is contained as a special case where $\alpha_\text{i} = 1$ (along with the non-negative profit requirement). Attendance makes its way through the profit function. All-in-all, this specification captures the essentials of the S/Q-EH formulation, albeit in a restricted way.

Rascher (1997) also explicitly employs a contest success function, oblivious to its previous development in either Quirk and El Hodiri (1974) or Tullock (1980). Specifically, in Rascher's (1997) expression (3):

$$\text{Win}_i = g(T_i, T_j) = \sum_{j \neq i}^{n} \left(\frac{T_i}{T_i + T_j} \times \text{pctgam}_{ij} \right) \tag{6}$$

T_i is the Talent choice by team i, pctgam_{ij} the Percent of team i's games against team j.

As Rascher (1997) missed the entire S/EQ-H specification in his references, as well as being essentially contemporaneous with Kesenne (1996), it is no surprise that there is a significant amount of repetition of the findings in those earlier works and there is no real need to reprise them here.

However, Rascher (1997) is the first work where an added task for empirical assessment appears. It is challenging enough to get an empirical handle on the estimation of marginal effects dictated by utility maximization, but in addition, there is now the added empirical task of measuring and estimating α_i, the owner's personal parameter governing the tradeoff between wins and profits. Some of the results in Rascher (1997) hinge on the size of that parameter and any future empirical work would need to account for it.

Utility maximization is just one part of Vrooman (1997), an extensive treatment of all ownership, labor, and industrial organization topics for Major League Baseball. Vrooman (1997, starting on p. 598) refers to it as joint maximization of team value and satisfaction from winning by the 'sportsman' owner.[10] The explicit listing of first-order conditions, and the graphical demonstration, backtracks to an optimization problem of the form:

$$\text{Max } S(V(w), w) \text{ subject to } V > V^0 \tag{7}$$

S is the sportsman owner's satisfaction function, V the market value of the team, w the winning percentage.

The 'satisfaction' function is clearly a utility function, right down to the graphical treatment of indifference curves between team value and winning percentage. The constraint is a minimum acceptable V to remain in the endeavor, the market's determination of the profitability of the team, essentially the S/Q-EH constraint. Attendance is not formally included but clearly is subsumed in the idea of just how revenues are generated. The utility function underlying the analysis is completely general and the essence of the 'sportsman owner' tradeoffs is here (although the other usual marginal rate of substitution between winning and other consumption, in Quirk and El Hodiri, 1974, is not).

Vrooman's (1997) aim with utility maximization is to show the changes that such an assumption makes on owner choices. The value function is the constraint and *team value* is maximized at marginal value (the slope of the team market value function) equals zero. However, as indifference curves between value and winning have negative slope, *satisfaction* is maximized at a lower team value and a higher winning percentage. In an equilibrium of sportsman owners, their convex tradeoff between team value and winning leads to lower franchise values than would occur under profit maximization as all attempt to increase winning relative to profit maximization but cannot do so simultaneously, driving up the price of players. He labels the difference in team value the 'sportsman effect'. Vrooman (1997) also shows that sportsman owners would tend to operate in a league that is more competitively balanced than under profit maximization.

Vrooman (1997) extends the analysis of the sportsman owner's tradeoffs in novel ways. First, he extends to the case of syndication (he names it the 'Steinbrenner Effect'). Second, echoing the earlier observation on the mysterious F_x in Sloane (1971), he covers the use of 'other people's money', that is, financial leverage by the sportsman owner (his 'Predators' Ball Game). The results of both of these extensions are beyond the ambition in this review and left to the interested reader.

Dietl *et al.* (2011b) adopt the same additively separable utility function approach in Rascher (1997), but do not split their parametric weight between

[10] Vrooman (1997) cites Quirk and El Hodiri (1974) throughout his paper, but not on the 'sportsman owner' (see the offset quote, above). He does not cite Sloane (1971), either but then his explicit focus is Major League Baseball.

profit and winning. Instead, they simply put a 'win preference' weight parameter on the winning component:

$$\text{Max } u_i(x_i, x_j) = \pi_i(x_i, x_j) + \gamma_i w_i(x_i, x_j), \tag{8}$$

x_i is the talent investment by club owner $i = 1, 2$, π_i the profits, required non-negative, γ_i the win preference, or the weight that the club owner puts on winning, w_i the contest success function.

In terms of generality relative to the S/Q-EH formulation, the observations about restrictiveness are identical to those made about Rascher (1997). There is also an explicit specification and use of the contest success function with attribution (both Tullock, 1980; and the overview in Skaperdas, 1996).

The impact of competitive balance is introduced parametrically through the revenue portion of profits is $R_i(x_i, x_j) = m_i w_i(x_i, x_j) - \frac{b}{2} w_i(x_i, x_j)^2$, where $b > 0$ is the effect of competitive balance on club revenues and $m_i > 0$ drawing potential (sometimes referred to as market size). If talent were measured so that it creates one more win, the derivative is $\text{MR}_i = m_i - b$; a suitably large competitive balance 'cost' can wipe out any marginal revenue gains from market size. The authors then derive both observations and implications for their model equilibrium relative to profit maximization in the choice of talent level, profits, as well as for the impacts of revenue sharing. For example, if $b > m_i + m_j$, then revenue sharing produces more competitive balance.

But, as with the comments on Rascher's (1997) specification, above, crucial results depend on the size of parameters. Dietl *et al.* (2011b) add parameters for competitive balance impacts and market size to a parameter on the club manager's weighting of winning vs. profits. Once again, for empirical work, these would need to be measured and estimated.

The final work covered extensively in this section is Madden and Robinson (2012). They cast the most complete (and in my opinion the most general and elegant) static specification and analysis of the S/Q-EH formulation. They cite Sloane (1971) and formulate the manager's maximization problem as additively separable in profits, winning percentage, and attendance but this last in a very formal way detailed directly:

$$\text{Max } U_i(Q_i, Q_j, p_i) = \lambda_{i\Pi}\Pi_i(Q_i, Q_j, p_i) + \lambda_{iW}W_i(Q_i, Q_j, p_i) + \lambda_{iF}F_i(Q_i, Q_j, p_i) \tag{9}$$

subject to:

$$\Pi(Q_i, Q_j, p_i) \geqslant 0.$$

where, U_i is the club manager utility function, Q_i the spending on talent by club i, p_i the ticket price for club i, $\lambda_{i\Pi}$ the club manager's utility weight on profit, Π_i the club profit, λ_{iw} the club manager's utility weight on winning percentage, W_i the contest success function, λ_{iF} the utility weight on attendance (fan surplus), F_i the Fan surplus from attendance.

It is easy to see the generality by the inclusion of the F_i part in expression (9), and that becomes even more apparent below. As with all works to the time of their writing, they do not include 'other consumption'. Their treat-

ment of the contest success function is thorough and leads to a choice that is a bit different than the usual, e.g., expression (3) or (6) (but theoretically justified for their specification).

The 'attendance' portion of expression (9) is derived from the aggregate utility of the club members. That is, club managers include the utility of club members from their observed demand[11]:

$$F_i(Q_i, Q_j, p_i) = \int_0^{v(Q_i,Q_j)-p_i} \mu_i[v(Q_i, Q_j) - p_i - x]\mathrm{d}x = \frac{\mu_i[v(Q_i, Q_j) - p_i]^2}{2} \quad (10)$$

$v(Q_i, Q_j)$ is the maximum willingness to pay by fans of club i, μ_i the fan base (number of fans) of club i, x the fan heterogeneity parameter uniform over the unit interval.

Fans feel an exogenous affinity to either club, but not both. They also vary in their willingness to pay, by the parameter x. So a fan will demand a ticket as long as $x \leqslant v(Q_i, Q_j) - p_i$. That way, a fan's attendance is μ_i $[v(Q_i, Q_j) - p_i]$, generating gate revenues in the profit function. Fan base is assumed to exceed stadium capacity.

The authors make the relevant assumptions that put their analysis on European clubs, as opposed to individually owned clubs, and there are a number of very well presented and careful assumptions that allow the authors to perform the optimization in expression (9). Club decisions on talent and spending are analyzed exhaustively and there is an extension to social welfare. But, as with the static works before it, there is an added burden on any subsequent empirical work by the additional parameters specified, in this case, both the club manager weight on fan utility and the fan heterogeneity parameter.

The fan welfare component of the club manager objective function in Madden and Robinson (2012) appears in both Madden (2012, forthcoming). Madden (2012) offers it up as an alternative club manager utility function with comparisons to profit and win maximization outcomes. Madden (forthcoming) uses the same idea (the club manager's utility is a function of only the utility of club members) and focuses the rest of the specification on heterogeneous preferences for team consumption, owner financial injections, and the impact of imposing financial fair play in European football. Using only the expression (10) as the form of the utility function is restrictive in completely obvious ways relative both to Madden and Robinson (2012) and the S/Q-EH formulation. So, there is really no need for any lengthy treatment of either of these works.

V Standing on Big Shoulders (A Hopefully Helpful Observation)

The work covered in the last section exhibits no clearly stated lineage, as detailed in Table 1. For example, recognition of the S/Q-EH formulation after

[11] As Madden and Robinson (2012) note, this specification comes directly from Madden (2012). Readers familiar with the work on social optimality in sports league talent outcomes will recognize this as the consumers' surpluses part of those analyses. Madden and Robinson (2012) also provide some welfare analysis of league equilibria in their Section IV relevant to the growing literature in that area. See Madden (2012) or Fort and Quirk (2010, 2011), and the references in Dietl *et al.* (2011a).

Kesenne (1996) is spotty at best. Undeniably, a literature that proceeds successfully knows its own origins. If nothing else, we would coach our junior colleagues to carefully place their work in the context of a relevant literature to enhance chances for publication.

The clear implication for the future is that all roads here lead back to the seminal S/Q-EH formulation and any future work will owe a debt to some combination of the other five papers covered in the last section. In particular, (1) Quirk and El Hodiri (1974) offer the most general and comprehensive treatment because it is the only dynamic treatment in the literature and (2) Madden and Robinson (2012) offer the most general (and elegant) static treatment. Along the way, it would be fitting to acknowledge the first appearance of the contest success function in the profit maximization version in El Hodiri and Quirk (1971), carried forward in the utility maximization version in Quirk and El Hodiri (1974).

VI Conclusions

All said and done, I liken the efforts that went into this paper to an archeological expedition, spurred on by the original insights from Sloane (1971), which ended up uncovering Quirk and El Hodiri (1974) in the same sedimentary layer. Of course, it isn't the archeologist but what the archeologist found that matters. It is those discoveries that can help future researchers move in the direction of testable hypotheses about owner objectives. It is gratifying to bring the dynamic analysis in Quirk and El Hodiri (1974) back to the light of the present. The additional discovery that they appear to be the first to use a contest success function (in their earlier 1971 piece) in any economics literature is especially satisfying.

The Sloane (1971) and Quirk and El Hodiri (1974) originals have the power of usual marginal analysis behind them, plus the generality of dynamics. Except for Vrooman (1997), the rest of the literature goes down a path with two characteristics. First, utility functions are additively separable and linear in some combination of winning, profits, and fan welfare (attendance). I'm not a theorist and deviations from the fundamental axioms of utility analysis are for others to deal with. Second, the rest of the literature develops by adding parameters to cover utility weights on winning, profits, and fan welfare (attendance), as well parameters to represent drawing potential and the impact of the level of competitive balance on fans. These parameters make the models mathematically tractable, but produce a challenge to empirical work in both measurement and estimation. But then there are all manner of really smart people out there and it will be fun to see how they handle this challenge.

Finally, while the work detailed here subsequent to S/Q-EH does not recognize its lineage, there is one that is quite easy to follow after the fact. Hopefully, the details of that lineage identified here will aid the development of future work in the area.

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References

Alchian, A. (1950). Uncertainty, evolution and economic theory. *Journal of Political Economy*, **58**, pp. 211–21.

Baumol, W. J. (1957). *Business Behavior, Value and Growth*. New York, NY: Macmillan.

Cairns, J., Jennett, N. and Sloane, P. J. (1986). The economics of professional team sports: a survey of theory and evidence. *Journal of Economic Studies*, **13**, pp. 3–80.

Coase, R. H. (1960). The problem of social cost. *Journal of Political Economy*, **3**, pp. 1–44.

Dabscheck, B. (1975). Sporting equality: labor market versus product market control. *Journal of Industrial Relations*, **17**, pp. 174–90.

Dietl, H., Fort, R. and Lang, M. (2011a). International sports league comparisons. In L. Robinson, P. Chelladurai, G. Bodet, P. Downward (eds), *Routledge Handbook of Sport Management*. New York, NY: Routledge, pp. 388–404.

Dietl, H. M., Grossman, M. and Lang, M. (2011b). Competitive balance and revenue sharing in sports leagues with utility-maximizing teams. *Journal of Sports Economics*, **12**, pp. 284–308.

Downward, P. and Dawson, A. (2000). *The Economics of Professional Team Sports*. New York, NY: Routledge.

El Hodiri, M. and Quirk, J. (1971). An economic model of a professional sports league. *Journal of Political Economy*, **70**, pp. 1302–19.

Fort, R. (2006a). The golden anniversary of 'the baseball players' market'. *Journal of Sports Economics*, **6**, pp. 347–58.

Fort, R. (2006b). Talent market models in North American and world leagues. In P. Rodriguez, S. Kesenne and J. Garcia (eds), *Sports Economics after Fifty years: Essays in Honour of Simon Rottenberg*. Oviedo, Spain: University of Oviedo Press, pp. 83–106.

Fort, R. and Quirk, J. (2004). Owner objectives and competitive balance. *Journal of Sports Economics*, **5**, pp. 20–32.

Fort, R. and Quirk, J. (2010). Optimal competitive balance in single-game ticket sports leagues. *Journal of Sports Economics*, **11**, pp. 587–601.

Fort, R. and Quirk, J. (2011). Optimal competitive balance in season ticket leagues. *Economic Inquiry*, **49**, pp. 464–73.

Fort, R. and Winfree, J. (2009). Sports really are different: the contest success function and the supply of talent. *Review of Industrial Organization*, **34**, pp. 69–80.

Gamrat, F. A. and Sauer, R. D. (2000). The utility of sport and returns to ownership: evidence from the thoroughbred market. *Journal of Sports Economics*, **1**, pp. 219–35.

Garcia-del-Barrio, P. and Szymanski, S. (2009). Goal! profit maximization versus win maximization in soccer. *Review of Industrial Organization*, **34**, pp. 45–68.

Jones, J. C. H. (1969). The economics of the national hockey league. *Canadian Journal of Economics*, **2**, pp. 1–20.

Kesenne, S. (1996). League mangement in professional team sports with win maximizing clubs. *European Journal for Sport Management*, **2**, pp. 14–22.

Kesenne, S. (2007). *The Economic Theory of Professional Team Sports—An Analytical Treatment*. Cheltenham, UK: Edward Elgar.

Leeds, M. A. (2002). Collegiate athletic directors as entrepreneurs. *Journal of Entrepreneurial Finance*, **7**, pp. 33–43.

Leeds, M., Suris, Y. and Durkin, J. (2004). College football and title IX. In J. Fizel and R. Fort (eds.), *Economics of College Sports*. Westport, CT: Praeger, pp. 137–52.

Madden, P. (2012). Fan welfare maximization as a club objective in a professional sports league. *European Economic Review*, **56**, pp. 560–78.

MADDEN, P. (Forthcoming). Welfare economics of 'financial fair play' in a sports league with benefactor owners. *Journal of Sports Economics*. Published online, November 23, 2012. DOI:10.1177/1527002512465759.

MADDEN, P. and ROBINSON, T. (2012). Supporter influence on club governance in a sports league; a 'utility maximization' model. *Scottish Journal of Political Economy*, **59**, pp. 339–60.

MARRIS, R. (1964). *The Economic Theory of "Managerial" Capitalism*. London, UK: Free Press of Glencoe.

MAXCY, J. (2004). Motivating long-term employment contracts: risk management in major league baseball. *Managerial and Decision Economics*, **25**, pp. 109–20.

NEALE, W. C. (1964). The peculiar economics of professional sports: a contribution to the theory of the firm in sporting competition and in market competition. *Quarterly Journal of Economics*, **78**, pp. 1–14.

NOLL, R. G. (1974). *Government and the Sports Business*. Washington, DC: The Brookings Institution.

QUIRK, J. and El HODIRI, M. (1974). The economic theory of a professional sports league. In R. G. Noll (ed.), *Government and the Sports Business*. The Brookings Institution: Washington, DC, pp. 33–80.

RASCHER, D. A. (1997). A model of a professional sports league. In W. Hendricks (ed.), *Advances in the Economics of Sport*, Vol. **2**. Greenwich, CT: JAI Press Inc, pp. 27–76.

ROTHSCHILD, K. W. (1947). Price theory and oligopoly. *Economic Journal*, **57**, pp. 299–320.

ROTTENBERG, S. (1956). The baseball players' labor market. *Journal of Political Economy*, **64**, pp. 242–58.

SANDERSON, A. R. and SIEGFRIED, J. J. (2006). Simon rottenberg and baseball, then and now: a fiftieth anniversary retrospective. *Journal of Political Economy*, **114**, pp. 594–605.

SKAPERDAS, S. (1996). Contest success functions. *Economic Theory*, **7**, pp. 283–90.

SLOANE, P. J. (1969). The labour market in professional football. *British Journal of Industrial Relations*, **7**, pp. 181–99.

SLOANE, P. J. (1971). The economics of professional football: the football club as a utility maximiser. *Scottish Journal of Political Economy*, **17**, pp. 121–46.

SLOANE, P. J. (1980). *"Sport in the Market?" Hobart Paper #85*. London, UK: IEA.

SZYMANSKI, S. (2003). The economic design of sporting contests. *Journal of Economic Literature*, **XLI**, 1137–87.

TULLOCK, G. (1980). Efficient rent seeking. In J. Buchanan and G. Tullock (eds), *Toward A Theory of the Rent Seeking Society*. College Station, TX: Texas A&M Press, pp. 97–112.

VROOMAN, J. (1997). A unified theory of capital and labor markets in major league baseball. *Southern Economic Journal*, **63**, pp. 594–619.

VROOMAN, J. (2000). The economics of american sports leagues. *Scottish Journal of Political Economy*, **47**, pp. 364–98.

VROOMAN, J. (2007). Theory of the beautiful game: the unification of European football. *Scottish Journal of Political Economy*, **54**, pp. 314–54.

VROOMAN, J. (2009). Theory of the perfect game: competitive balance in monopoly sports leagues. *Review of Industrial Organization*, **31**, pp. 1–30.

WILLIAMSON, O. E. (1963). Managerial discretion and business behavior. *American Economic Review*, **53**, pp. 1032–57.

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