

Sports Economics – What's the Score?

Simon Medcalfe

Lehigh University

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1. Introduction

It is almost fifty years since Rottenberg's (1956) seminal paper on the baseball player's market initiated research into the economics of sport. Since then there has been an increasing interest in sports economics both to investigate economics concepts and theories, and to satisfy interest in sport itself. The subject is now taught at many universities at the undergraduate level, as well as provides the basis for more specialized graduate programs. There are currently three textbooks on the economics of sport (Li, Hofacre, and Mahoney, 2001; Leeds and von Allmen, 2002; Fort, 2003) as well as a dedicated journal and professional association.

The sports industry does however seem to attract attention out of proportion to its size (Fort 2000). The baseball industry in the US had revenues of \$2.8bn in 1999 (Blue Ribbon Report, 2000), and the aggregate income of all clubs in the top divisions of European soccer was €6.6bn for 2000/01, with the English clubs generating £1.3bn. Including all leagues and European competitions it is likely that football in Europe generates about €10bn. Spanish football (including pools receipts, licenses, TV deals etc.) is worth around €3bn or 0.9% of Gross Domestic Product, and employs over 47,000 people. The richest football club, Manchester United, had revenues of £146m in 2002. Cricket in the U.K. has a total income of only £66m in 2001, whilst rugby union generated £47m, and rugby league £31m. The richest clubs in each of those sports were Surrey, (income of £9.1m), Leicester Tigers, (£7.8m), and St. Helens, (£3.9m). Sports

economics is nevertheless a legitimate field of economics, but what have we learned over the last half century and what do we still need to know?

Professional sports are organized in different ways in Europe and the U.S. This paper will draw on European and U.S. research and data to examine the economics of the different structures. Specifically, we examine the industrial organization, labor markets, and regulation of European and U.S. sports. The next section considers the industrial organization of professional sports. Team sports in Europe are organized hierarchically with promotion and relegation between divisions. U.S. leagues are closed to new entrants unless voted on by the current members. The main question posed in section 2 is whether it is possible to determine which setup is best in an economic sense. Section three considers the state of knowledge in the sports labor market. Are players paid their marginal product? What is the extent of labor market discrimination? Why are strikes in U.S. sports more common than in Europe? Teams in the U.S. and Europe are increasingly financed and regulated in different ways. The consequences are considered in section 4. Section five considers the contributions of sports data to the empirical testing of various economic theories. The final section considers the possible direction of future research.

2. Industrial Organization

Professional team sports are organized very differently in the U.S. than in Europe. In the U.S. major league sports are organized as closed leagues in that new members are only

admitted at the invitation of the current members. The last expansions were in 1995 for the National Football League (NFL) when Charlotte, NC and Jacksonville, FL gained teams. The last expansions in Major League Baseball (MLB) were in 1998, when Arizona gained a team, subsequently winning the World Series in 2001. In November 2001, MLB announced it was looking at reducing the number of franchises, although any reduction was postponed in the new 2002 collective bargaining agreement.

In Europe, by contrast, teams can gain access to a particular league based on performance. Leagues are organized in tiers, and at the end of each season the worst performing teams in each league, or division, are replaced by the best performing teams from the division below. For example, in the English soccer league the top-flight division (the Premiership) the bottom three sides are relegated to Division 1, whilst three teams from Division 1 are promoted. The top two teams are promoted automatically, whilst the next four sides (who finished in position 3 through 7) play off for the final promotion spot. This pattern is repeated through the rest of the leagues (the number of promotions and relegations varies), so that in theory it is possible for a side in the lowest division to gain promotions until it is in the Premiership. In practice this is rarely accomplished, though there are examples of sides moving through many divisions in a short period of time. For example, Wimbledon was elected to the Football League in 1977 after winning the Southern Conference and was subsequently playing in the top flight (the old Division 1) in the 1986/7 season. Fulham were playing in the lowest division in 1996/7 season, but are now in the Premiership.

The professional leagues of the U.S. have much fewer teams than European soccer leagues. For example in the NFL there are 32 teams, the National Basketball Association (NBA) has 29, the MLB has 30, whilst the National Hockey League (NHL) has 30 teams. There are about 100 professional soccer clubs in England (92 in the top four divisions). For purposes of comparison, England is about the size of Georgia with a population of roughly 50 million. An argument is made that expanding the U.S. leagues would result in lower quality and/or competitive balance.

Unfortunately there is no universally acceptable definition of competitive balance. Measures used in the past have included the standard deviation of win percent, the standard of win percent compared to the ideal (Quirk and Fort, 1992, Scully 1989), the Gini coefficient (Schmidt and Berri, 2001), variance decomposition results, Herfindahl index (both Eckard 2001), and the coefficient of variation (Ross and Lucke, 1997). Indeed there is an intense debate in sports economics over which is the most appropriate measure. Utt and Fort (2003) argue that using winning percentage Gini coefficients for the analysis of within-season competitive balance cannot account for unbalanced schedules, interdivisional play, and interleague games. Eckard (2001) uses a variance decomposition result to account for season to season turnover in relative standings that the simple standard deviation fails to pick up. A requirement for the variance decomposition result is that the league should consist of the same teams throughout the sample period. Clearly this will not be the case in European leagues with promotion and relegation. To illustrate, the number of teams in the English Division 1 in 1992/3 that were also there five years later is 33%, and 29% in 2002/3. This instructive debate over

measuring competitive balance should continue. There need not be a single measure of competitive balance that materialises, as there is no single definitive concentration measure in the industrial organization literature.

Turning next to the issue of which league structure is “better” consider the following model based on Noll (2002). Assume that teams face a revenue function $R(q)$ that has diminishing returns to quality, q . Teams also face a cost function that is simply the wage multiplied by quality, wq . In a closed league, such as the US leagues, then teams aiming to maximize profits with respect to quality will solve

$$\text{Max } R(q) - wq \quad (1)$$

which yields the first order condition:

$$R' - w = 0. \quad (2)$$

In a league with promotion and relegation this year’s decision about quality affects the league in which the team will play next year. Assume that the probability of being promoted is p , and that this probability of being promoted is increasing in quality ($p' > 0$). The probability of being relegated is r , which is decreasing in quality ($r' < 0$), and t is the rate of time preference. The team aiming to maximize profits will solve

$$\text{Max } R(q) - wq + (1-t)\{p[R^p(q^p) - wq^p] + r[R^r(q^r) - wq^r] + (1-p-r)[R(q^*) - wq^*]\}, \quad (3)$$

where q^p , q^r , and q^* are respectively optimal team quality if the team is promoted, relegated or remains in the same league. The first order condition is:

$$(R' - w) + (1-t)\{p'[R^p(q^p) - wq^p] + r'[R^r(q^r) - wq^r] - (p' + r')[R(q^*) - wq^*]\} = 0. \quad (4)$$

If playing in higher leagues is more profitable then the second term is positive, and the quality level that solves equations 1 and 2 is too small to solve equations 3 and 4 and leagues with promotion and relegation should have higher quality competition than closed leagues.

The contention can be tested empirically in several ways. First, is playing in a higher division more profitable? All soccer clubs in England are limited companies that file annual accounts. Deloitte and Touche have been publishing this data for the past 11 years in their *Annual Review of Football Finance*. The data on pre-tax profits for the past three years is given in table 1.

Table 1: Average pre-tax profit (loss) for English soccer clubs (£000's).

<i>Division</i>	<i>2001</i>	<i>2000</i>	<i>1999</i>
Premiership	(137)	(1,725)	684
Division 1	(4,983)	(3,341)	(1,547)
Division 2	(1,095)	(728)	(1,217)
Division 3	(501)	(519)	(410)

The figures reveal some evidence of higher profits in higher leagues. The Premiership clubs always have on average higher profits (or lower losses) than teams in Division 1, and in two of the last three years have better financial results than teams in division two and three.

Since quality is an illusive concept, is there a greater degree of competitive balance in European soccer leagues than in US sports leagues? Buzzacchi, Szymanski, and Valletti (2001) present data on the number of different teams that had the highest win percentage for the MLB, NFL, and NHL in the U.S. This data is supplemented with the number of teams which have won the top soccer division in England, Italy, Germany, and Spain and is shown in table 2.

The NFL could be classified as the most competitively balanced in terms of having the greatest number of teams over the fifty-year period having the best win percentage. The English soccer league could similarly be classified as the most competitively balanced European league. There have only been six winners of the Spanish in the fifty years between 1950 and 1999, though RC Deportivo added their name to the list in 2000.

Since 1960, all the open European leagues are less competitively balanced than all of the U.S. closed leagues. When considering the number of teams who have entered the top five the picture changes somewhat. The data is presented in table 3.

Table 2: Number of teams that had the highest winning percentage or were winners of the league championship.

<i>Period</i>	<i>MLB</i>	<i>NFL</i>	<i>NHL</i>	<i>England</i>	<i>Italy</i>	<i>Germany</i>	<i>Spain</i>
50-99	16	20	13	16	12	15	6
60-99	16	18	13	13	12	11	6
70-99	14	14	12	9	10	8	6
80-99	12	9	10	7	7	6	5
90-99	6	7	7	5	4	5	3

Source: Buzzacchi, Szymanski, and Valletti (2001); World Football Yearbook 2002-3.
 Note: Records for German prior to 1964 are for West German league.

Table 3: Number of teams that entered the top five.

<i>Period</i>	<i>MLB</i>	<i>NFL</i>	<i>NHL</i>	<i>England</i>	<i>Italy</i>	<i>Germany*</i>	<i>Spain</i>
51-00	28	31	21	34	19		24
61-00	28	30	21	27	18	22	24
71-00	28	29	21	24	18	19	19
81-00	28	28	21	22	14	16	16
91-00	23	26	18	16	12	15	16

Source: Buzzacchi, Szymanski, and Valletti (2001); rssf.com
 * Germany data from 1963 onwards.

In the last ten years, the NFL is still the most competitively balanced U.S. league (as it is for the whole period). The English and Spanish leagues are the most balanced European leagues in the last ten years, but for the whole period the English league is. Further, over the fifty years the English league exhibits more competitive balance than any of the North American leagues. Obviously, the number of teams in the league limits the number of

teams that can enter the top five in the U.S. As a percentage of teams, the North American leagues are still more competitively balanced than European ones.

The above data is however a flawed measure of competitive balance between an open and closed league since we are not comparing like with like. It is not just the threat of relegation and the incentive of promotion that is different between the leagues. For example, revenue sharing, salary caps, and the draft system are designed in some U.S. leagues to ensure competitive balance whilst they are absent or of a modified form in Europe. The true test of competitive balance would be a closed league that became open, *ceteris paribus*, the English soccer and cricket leagues provide two natural experiments.

The English soccer league was in effect a closed league until 1986/7. Up to this season the lowest four teams in division 4 had to apply for re-election to the Football League. Rarely were they denied, since the creation of Division 4 in 1958 until automatic promotion was introduced in 1986/7 only 5 clubs had managed to gain election to the Football League at the expense of a professional club¹.

Table 4 presents data from Division 4 in England. If an open league is more competitively balanced we would expect to find an increase in the number of draws, a decrease in the goal difference, an increase in the points total of the bottom side, and a smaller points spread between the top and bottom side.

¹ The clubs were Peterborough (in 1960), Cambridge United (1970), Hereford United (1972), Wimbledon (1977), and Wigan (1978).

Table 4: Average number of draws, goal difference, points of last placed side, points difference between first and last place, and standard deviation of points for the English Division 4.

<i>Period</i>	<i>Draws (Ties)</i>	<i>Goal Difference (home games only)</i>	<i>Average Points of last placed side</i>	<i>Average Points difference between first and last place</i>	<i>Standard deviation of points</i>
81-86	148	311	36	62	15.34
87-91	151	273	40	49	12.78

The two five year periods around the change in the league structure show a more competitive division after the implementation of promotion to and relegation from the Football League. Whilst the points earned by the last placed side increase the points of the first placed team fall. This may be due to the introduction of a playoff system at the same time to determine one of the promoted teams increasing incentives at the top of the league as well as the bottom. An alternative example from cricket is free from this complication.

There are two forms of domestic cricket competition in England; a one-day game and a four-day game. In the four day game it is difficult to distinguish between a draw due to

competitive balance and a draw due to inclement weather. The analysis here will therefore relate to the one-day game.

Until 1998 there was one league of eighteen counties (seventeen until Durham joined in 1992). Each team played the others once. There was a minor counties league, but there was no promotion or relegation between the two. There was no way for a minor county side to gain admittance to the division based on performance on the field. The 1998 season was played as before, but at the end, the top nine teams formed Division 1 in the following year, with the bottom nine teams making up Division 2. Each team now only played the teams in its division twice, home and away. At the end of the season three teams were relegated, and three teams promoted. There was still no way for minor county sides to gain admittance based on athletic ability. A win was worth four points; a tie or no result was worth two points. No points were awarded for a loss. The effect on competitive balance is presented in table 5.

The figures suggest that there may be some improvement in the team who comes in last place. The figures also suggest that there is a smaller gap between the first and last placed team. It is interesting that the first division sees a bigger improvement in competitive balance than does the second division. This reflects the lack of incentive to avoid relegation from the second division. Perhaps the cricket authorities should promote minor league teams to increase incentives.

Table 5: Average points per game of last placed side, average points per game difference between first and last place, standard deviation of win percent for English one day cricket.

<i>Year (and division where applicable)</i>	<i>Average points per game of last placed side</i>	<i>Average points per game difference between first and last place</i>	<i>Standard deviation of win percent</i>
1993-1997	0.7766	2.306	0.1715
1999-2002	1.0938	1.8438	0.1439
Division 1			
1999-2002	0.9375	2.0938	0.1808
Division 2			

Note: Points per game difference between first and last place is calculated as the points of the champions minus the points of the team in last place, divided by the number of games played. Since there were 17 games played in the old division, and sixteen in each of the two divisions a points per game system needs to be used.

An article in the *Wall Street Journal* (2/21/03) advocated switching to a form of promotion and relegation for baseball. In January 2003, Italian (soccer) league chairman Adriano Galliana proposed reorganizing the Italian league into a single top flight of 40 teams divided into two divisions, with the winner of each division paying for the championship. As of February 2003, the Women's National Basketball Association and the Women's United Soccer Association are considering what the next step is for their single entity leagues. The fact that such leagues are considering reorganization suggests that it is important that further research analyses different league structures to determine the best format in an economic sense.

It is not just the structure of the leagues that differ between Europe and the US: sports leagues have different revenue sharing agreements, for example the NFL splits gate revenue 60-40, whilst English soccer has no division of gate revenue. How do these arrangements affect competitive balance? The theoretical contribution of Fort and Quirk (1995) find that under a profit maximization assumption gate sharing has no effect on competitive balance in the absence of local TV. Kesenne (2000) however shows that the inclusion of some measure of absolute quality of teams (he uses win percentage) improves the competitive balance under revenue sharing. It has been argued that English soccer clubs pursue objectives other than profit maximization (Sloane, 1971), yet use of a utility-maximizing hypothesis with revenue sharing still results in an improved competitive balance (Kesenne, 2000). Palomino and Rigotti (2002) using a dynamic model of strategic interaction between a sports league, teams, and broadcasters find that full revenue sharing is optimal if the difference in wealth between teams is not too large.

Fort and Quirk (1995) stated “we do not have any real-world experiments involving substantial changes in gate or local TV revenue sharing rules to test the theory.”

However, different European soccer leagues do have different revenue sharing schemes that may be utilized in future research. For example, in the English Premiership half of the TV rights are split between all clubs (against 83% in France), 25% is split according to league position (10% in France), and 25% is split according to TV coverage (7% in France). In Spain the home games of Real Madrid, Atletico Madrid and Barcelona are sold individually by the respective clubs. Additionally, some leagues (particularly the French where Olympique Marseille is taking the French League to court over the

distribution of TV rights) are under pressure to restructure their revenue sharing agreements, especially over the increasingly important TV revenues. Moreover, the European Commission feels that TV contracts that are sold collectively by the clubs in England and Germany are restrictive and anti-competitive. Any ruling that would make such collective sales illegal would provide the “substantial change” we are looking for.

The evidence presented in this section suggests that there may be some improvement in competitive balance by changing US style leagues into European type leagues with promotion and relegation although more specific econometric analysis would be helpful. Theory suggests that further improvement could be attained by the introduction of a revenue sharing scheme though we await empirical analysis.

3. Labor Market

Labor markets, like the league structure, are organized very differently on either side of the Atlantic. On the American side football and basketball use a reverse order draft system to allocate the most promising college talent to teams. There is no such system in Europe, where soccer clubs compete for the signing of youngsters from high school. Basketball and football have some form of salary cap in the U.S., in European soccer there is no formal agreement to restrict salaries though a group of the richest clubs has an informal agreement to hold team salaries to less than 70% of team turnover. Football league chairmen in England proposed a salary cap of 60% of turnover in January, but without a collective bargaining agreement with the Professional Footballers Association

it is unlikely it would satisfy European law (specifically Article 81 of the Treaty of Rome which sets out the rules applicable to restrictive agreements). Both forms of rugby in the UK have salary caps, £1.8 million per squad in union and 50% of income in the league version.

There has been a long history in the U.S. of analysing the professional sports labor market. This has been possible due to the widespread publication of players' statistics, salaries, race, and attendance figures. This has allowed economists to examine the labor market for signs of exploitation by monopsonistic employers and discrimination by employers and fans. There has been less opportunity to do so in Europe because of the lack of data on player productivity and pay.

Pay and performance

The pioneering research investigating monopsony exploitation of professional sportsmen originated with Scully (1974). The methodology involves two steps: the first step estimates how various measures of player performance influence their teams win percentage. The second step, estimates the contribution of the win percentage to team revenue. A player's (net) marginal revenue product is then estimated by multiplying his contribution to the win percentage by the impact of winning on revenue and subtracting costs. In his original article Scully uses team slugging average, team strike-to-walk ratio, dummies for pennant or divisional winners, national league teams, and teams with no chance of winning a division to determine win percent. Team revenue is determined by

the win percent from the first step, size of local market, intensity of fan interest, the percentage of black players on the team, and dummies for national league teams and older stadiums. Using data from the 1968 and 1969 seasons he finds star players are paid only 15 percent of their marginal revenue product, whilst average players receive 20 percent (see table 6). Subsequent studies also summarized in table 6 have utilised Scully's methodology. Both Zimbalist (1992) and Scully (1989) find salaries in baseball held below marginal revenue product in the late 1980's which they attribute this to collusion.

Table 6: Summary of studies of exploitation in sports.

<i>Study</i>	<i>Sport</i>	<i>Season(s)</i>	<i>Results</i>
Scully (1974)	Baseball	1968,	Star player paid 15% of MRP
		1969	Average player paid 20% of MRP Mediocre player paid 150-200% of MRP
Medoff (1976)	Baseball	1972-	Star player paid 41-49% of MRP
		1974	Average player paid 36-51% of MRP Mediocre player paid 30-55% of MRP
Scully (1989)	Baseball	1985-	Free agents earn 29% of MRP
		1986	Non-free agents earn 45% of MRP
Zimbalist (1992)	Baseball	1986-	Apprentices, without arbitration
		1989	rights paid 16-25% of MRP

			Journeyman, with arbitration right and imminent free agency paid 50- 64% of MRP
			Masters, with free agency paid 123- 140% of MRP
MacDonald and Reynolds (1994)	Baseball	1986- 1987	Experienced hitters earn of MRP Pitchers earn 126% of MRP
Atkinson, Stanley, and Tschirhart (1988)	Football	1980, 1981	Rushing units paid seven times of MRP
Brown (1993)	College football	1988-89	Premium player generates \$500,000 in excess of scholarship.
Scott, Long, and Somppi (1985)	Basketball	1970- 1980	Non-free agents earn between 17% and 71% of MRP Free agents earn between 66% and 133% of MRP.

Scully's model has been criticised in several ways. Medoff (1976) changes some of the variables that measure productivity and finds the rate of exploitation is less than suggested by Scully (1974). He also argues that some of the excluded variables from the win percent equation, such as managerial quality, stadium capacity and fan enthusiasm, will affect team revenues. But then the two error terms are serially correlated and OLS estimates which are biased and inconsistent are replaced with two-stage least-squares

estimates. MacDonald and Reynolds (1994) also show that small changes in the measures of performance have large effects on the estimated MRP. They find that experienced players are generally paid their marginal products, but rookies who do not have free agency are paid less than their marginal products. The study by Atkinson et al. (1988) also suggests that the methodology is flawed since it is unlikely that a profit maximising team could continue to pay players seven times their worth. Their explanation is that football teams are not profit maximisers, though this explanation goes against the generally held view that US sports teams maximize profit (Fort and Quirk, 1995).

There has been no work to my knowledge measuring the marginal revenue product of European players. This is due to two reasons: until 1996 there were no published productivity figures for soccer players. In 1996 Opta Index Ltd. started collecting and publishing playing performance data on English soccer players. Available data included pass completion rate, shots to goals ratios, percentage of tackles won, amongst many others. Secondly, data on player's pay in Europe is much harder to find than in the US.

This may be changing; Lucifora and Simmons (2003) use salary data for the 1995-96 soccer season that was published in *Il Giornale* to investigate the "superstar effect". Their ability to control for player productivity is limited to goals, assists, appearances, age, and international caps which they admit may lead to omitted variable bias. Nevertheless, they find strong evidence of superstar effects in that salaries are highly convex in terms of measures of goals scored per games played, and assists.

Another recent study of European soccer estimated the returns to schooling for Portuguese players using the traditional Mincer earnings equation. Barros (2001) finds that controlling for education, experience and experience squared only, that the returns to schooling are (insignificantly) negative. Including controls for union membership, professional/amateur status, divisional level of play, and a player's subjective evaluation of his own performance makes the return to schooling positive, but still insignificant. The market for footballers in Portugal at least is driven by ability not schooling. This raises the question are U.S. students wasting time in four year colleges if the extra schooling doesn't add to their earning potential? They may not be if their earnings after their short professional career are higher than if they hadn't attended college. Also, many players in Europe leave school at sixteen, so there may be returns to college education not picked up in Europe (though education seems to exhibit diminishing returns (Psacharopoulos, 1994)). Research on this subject in the U.S. would be illuminating.

It seems likely that further studies along this line will become more prevalent in Europe as the data becomes available. Given the greater competition in soccer (both in Europe and worldwide) and the less restrictive labor market I would have thought that the results would show that soccer players are paid their marginal product. Any future research on this subject on either side of the Atlantic will have to incorporate the increasing significance of non match day receipts, especially media revenue. In the English Premiership broadcasting revenues now make up the single largest revenue stream (39% of total income); TV rights represent 52% of revenues for French Ligue 1 clubs. Additionally, soccer players are signing over their image rights to clubs which will have

to be acknowledged. For example, when Luis Figo signed a €4.5m contract with petrol company Galp, over 60 percent went to his club Real Madrid.

Discrimination

The same data problems that have plagued the relationship between pay and performance have meant that most of the research into discrimination has been carried out in the US. Becker (1957) identified three types of discrimination: employer, co-worker, and customer. Evidence of co-worker discrimination is anecdotal in that some white baseball players refused to play with, or against, Jackie Robinson. Evidence of employer and customer discrimination has been more specific.

Competition should eliminate employer discrimination. A firm that does not discriminate is able to hire equally productive labor at a lower cost than one that does, thereby increasing profit and market share at the expense of the firm that discriminates. Evidence from baseball confirms this result. Teams that integrated quicker won more often. For the period 1950-1955, an additional black player on a major league team resulted in an additional 3.75 wins per year on average after controlling for team performance at the beginning of the period (Gwartney and Haworth, 1974). Moreover, the best teams (as measured by number of games out of first place) were the first to integrate suggesting they better understood the opportunities available due to their better management and coaching (Goff, McCormick, and Tollison, 2002).

Studies of employer discrimination have usually considered whether equally productive minorities are paid less than the majority group. Earnings equations that control for performance and market-related variables find that black players in the NBA earned 21-25% less than their equally productive white teammates and opponents in the mid 1980's (Kahn and Sherer (1988)). By the mid-1990's this difference seemed to have disappeared (Hamilton, 1997), although whites in the 75th and 90th salary percentile earned an 18% and 19% premium over their equally productive black colleagues. Kahn (1992) finds that white players in the NFL earned 1-4% more than their equally productive black footballers in 1989. However, by 1996 white players earned 10 percent less than African-American players (Gius and Johnson, 2000). Studies rarely find evidence of earnings discrimination in baseball.

Other forms of employment discrimination have been researched. For example, black and Hispanic baseball players have been found to be discriminated against in terms of promotion from the minor (AAA) to the major leagues. Bellamore (2001) found that black players were on average 8.7% less likely to be promoted than an equally productive white player in the 1960's, 70's and 90's. Hispanics were 7.5% less likely to be promoted than whites. Interestingly, the degree of discrimination is insignificant in expansion years as the Becker model would predict. There is no evidence that blacks are drafted later in the NBA (Kahn and Sherer, 1988), but may be in the NFL (Conlin and Emerson, 2002). Whites are overrepresented in certain positions in football (Kahn, 1992), and in baseball (Christiano, 1988). Black players in the NBA have shorter careers than white players' *ceteris paribus* (Hoang and Rascher, 1999).

In the 1950's each black baseball player on a team raised attendance by up 30,000 per year after controlling for games won and initial team performance at the beginning of the decade (Gwartney and Haworth, 1974). Recently, there seems to be persistent, but declining, customer discrimination against black baseball players. Hanssen (1998) finds that each additional black player on a team cost the team almost 10,000 fans per year between 1954 and 1972. In the 1972-1991 period Irani (1996) finds that an additional black starter, who plays in 150 games a season, reduced attendance by less than 3000 fans. Further, Nardinelli and Simon (1990) found that white baseball card sold at a 16% premium over equally productive black players and 12% over Hispanic players in the 1980's, although this premium seemed to have disappeared by 1994 (McGarrity, Palmer and Poitras, 1999).

In the NBA, each white player added up to 13,000 fans per year between 1980 and 1986 (Kahn and Sherer, 1988), but this seems to have disappeared in the 1987-1993 period (Dey, 1997). There is no evidence of customer discrimination in the market for basketball cards in 1993 confirming the disappearance of racial discrimination (Stone and Warren, 1999). However, a recent study found that every additional white player on the home basketball side raised the Nielson TV rating by 0.54 points (0.21 points for the visiting team) after controlling for quality of teams, time of the game, and local market variables (Kanazawa and Funk, 2001). This suggests that whilst there may no longer be discrimination by fans at games, there is by those watching at home on television. Interestingly, the increase in Nielson ratings attracts advertising revenues roughly equivalent to the racial salary gap found by Kahn and Sherer (1988).

Since there is little available data on individual pay and productivity in European soccer there has been much less research into discrimination. However, an innovative paper (Szymanski, 2000) proposed an ingenious market test of discrimination in English football. The regression model took the following form:

$$P_{it} = a_i + \beta_1 \text{Div}_{jit} + \beta_4 (w_{it} - \text{avg}w_t) + \beta_5 (\text{play}_{it} - \text{avgplay}_t) + \beta_6 (\text{black}_{it} - \text{avgblack}_t), \quad (5)$$

where the subscripts i and t represent the club and season. The dependent variable is the log odds of position, and the independent variables are dummies for division and wages, aggregate number of player used, and the percentage of total appearances by black players all minus the average for that season. In the sample of 39 clubs the coefficient on the share of black players used was -0.014 ($SE = .010$) in 1978-85 and -0.136 ($.049$) in 1986-93. On average, clubs that used a higher than average proportion of black players, achieved higher league positions. The evidence is consistent with discrimination by owners, or alternatively, that owners are merely responding to fan discrimination.

This latter hypothesis is tested in a separate paper (Preston and Szymanski, 2000). They run regressions of average attendance and team revenue on a measure of local prejudice, the share of black players in total appearances, league position, divisional dummies, and time effects. The coefficient on black appearances is always negative in the attendance regressions, and occasionally significant. The coefficient in the revenue equations is sometimes positive and sometimes negative, though never significantly. The authors

therefore conclude that discrimination against black players is not the result of fan discrimination. This leaves us with the uncomfortable result that the discrimination is by football club owners, or clubs do not aim to maximize profits. If the discrimination is by the owners, then why has it not been competed away? With eighteen English clubs currently publicly traded on a stock market it seems unlikely that they would be allowed to pursue a utility maximising approach by their shareholders. A re-examination of this issue utilizing data from the last five years would help to clarify this puzzle.

Whilst individual salary data are hard to come by in the UK, transfer fees paid by clubs buying players are generally widely available in the national press and *Rothmans Football Yearbook*. Reilly and Witt (1995) regress transfer prices on various performance indicators such as appearances, goals, division of play, field position, international recognition and age. They find that being black had a negative effect on a players transfer price but not significantly. Their regression may suffer from omitted variable bias, and a re-examination of this issue with Opta data would be illuminating (although Opta is due to close in 2003 because it is not generating enough revenues).

There has been very little examination of gender discrimination in sports since men and women rarely compete against each other. In the one major field of professional sport where they do compete, thoroughbred horse racing, women are found to have significantly fewer mounts than their male competitors after controlling for performance and experience (Ray and Grimes, 1993). Being female reduces the number of mounts ridden by almost one half. Shmanske (2000) finds that the female golfers may even be

paid more than male golfers after controlling for skill level. As women compete in the same sports as men (though not necessarily against them) future studies may analyse gender differences in sports such as soccer and basketball.

Kahn (1991) suggests that there is evidence of gender discrimination at Wimbledon. He cites the fact that in 1988 the women's final on the Saturday drew 4.4% of households with televisions in the US whilst the men's final on the Sunday drew only 3.2%. The men's champion (Edberg) won 1.1 times as much money as the women's champion (Graf). The problem with this analysis is that *ceteris paribus* does not hold: Graf was playing an American (Navratilova) whilst Edberg was playing a German (Becker) which would naturally increase viewing figures in the US. The women were seeded one and two, whilst the men were seeded three and six possibly suggesting that the women's game would be of higher quality. Additionally, Grand Slam tennis is a global game, and viewing figures for other major countries would be needed to better assess the extent of discrimination. Richer studies along the lines of Kanazawa and Funk (2001) that utilize Neilson ratings but also control for other factors would be interesting.

There has been a decline in the incidence of salary discrimination in the U.S. though not necessarily in discrimination overall. There are still instances where minorities suffer discrimination in hiring and retention and positional segregation which are harder to detect than salary discrimination. This may also be the case in Europe where African footballers in Italy have shorter outstanding contract length but do not earn lower salaries, *ceteris paribus*. Future research concentrated on these aspects would probably be more

fruitful than earnings regressions. There are other puzzles to be solved in the area of discrimination; the absence of salary discrimination in baseball even though there is much evidence of customer discrimination, is positional segregation the subject of pre-labor market discrimination, and why has discrimination not been competed away in Europe?

Union Relations

There have been sixteen strikes or lockouts in American major league sports since 1970 (see table 7). Baseball has suffered the most industrial action of the major sports, including the longest strike in professional sports: the 232-day 1994/1995 strike that led to the cancellation of the 1994 World Series.

By contrast, labor disputes have been rare in European soccer. There were threats of strikes in England in 1922 and the 1950's over the maximum wage but no industrial action resulted. In November 2001 99 per cent of Professional Footballers Association (PFA) members voted to boycott televised games. The dispute was over how the TV money is distributed. The PFA has always received some money from TV deals that it uses to fund schemes for retired and injured players. The new TV contract is worth about £675m per year, up from £175m (a 286% increase). Originally the League offered to increase it's funding of the PFA schemes from £8.85m to about ten million (a 13% increase). In November 2001, the PFA settled for a 75% increase in contribution. Spain

suffered the first football strike in their history in January 2003 when players of third division Logrones went on strike over unpaid wages.

Table 7: Industrial action since 1970 in the four major league sports in the U.S.

<i>Year</i>	<i>Industrial Action</i>
1970	20 day strike and lockout of training camp (football)
1972	13 day strike over benefit plan (baseball)
1974	42 day strike of training camp (football)
1975	Strike of training camp (football)
1976	Owner lock players out of training camp for 17 days (baseball)
1980	8 day strike (baseball)
1981	50 day strike over the recently negotiated free agency (baseball)
1982	57 day strike (football)
1985	2 day strike over TV money (baseball)
1987	24 day strike over free agency (football)
1990	32 day lockout (baseball)
1992	10 day strike (hockey)
1994/5	232 day strike (baseball)
	103 day lockout (hockey)
	Basketball lockout
1999	191 day strike (basketball)

The higher incidence of strikes in U.S. sports is all the more puzzling given that strikes are in general more common in Europe. In 2000 there were 966 strikes and lockouts in Italy, 750 in Spain, 212 in the U.K. and only 39 in the U.S.² (International Labor Organization website). To understand why the incidence of strikes in sports is higher in the U.S. we must first try to determine why these strikes occur. To do so, I utilize Ashenfelter and Johnson's (1969) model of strike action.

The median voter model of union wage determination incorporates a principal agent problem: union rank and file have different objectives to the union leadership. Hill and Groothuis (2001) describe the union position in the 1998-1999 basketball negotiations as being dominated by "a few superstars" (p36). Scott, Long and Somppi (1983) suggest that the union managers in the football union "pursue interests inconsistent with members' interests" (p263).

Ashenfelter and Johnson's (1969) model incorporates the principal agent problem. They suggest that the objectives of the union leadership are the survival and growth of the union and the personal political survival of the leaders. If the union rank and file has wage expectations much greater than management offers union leaders can sign an agreement much less than their membership desires, or incur a strike. The latter is preferable to the former. The likelihood of a strike depends on the size of the union demand and management's perception of how quickly workers resistance will decline as the strike progresses.

² These figures are not directly comparable since the U.S. data excludes work stoppages involving fewer than 1,000 workers and lasting less than a full day of shift. U.K. data includes stoppages involving fewer than 10 workers or lasting less than one day if 100 or more workdays not worked.

The probability of a strike can be shown to be:

$$p(s_t) = \beta_0 + \beta_1 y_{0t} + \beta_2 D_t + \beta_3 T, \quad (6)$$

where $p(s_t)$ is the probability of a strike in period t , y_{0t} is the minimum wage increase acceptable to the union rank and file, D_t is the ratio of profits to wage costs, and T is a time trend. The minimum wage increase desired by the union membership is negatively correlated with the unemployment rate (U_t), negatively related to a moving average of previous changes in real wages Δw , and positively related to firm's profits (approximated by D_t). Equation (6) therefore becomes:

$$p(s_t) = \beta_0 + \beta_1 U_t + \beta_2 \Delta w + \beta_3 D_t + \beta_4 T. \quad (7)$$

It is hypothesized that $\beta_1 < 0$ because the cost of striking to workers is less when unemployment is low and alternative employment opportunities are plentiful. There is evidence that strike frequency is pro-cyclical and therefore negatively related to the unemployment rate. The higher past increases in real wages have been the less militant workers will be in demanding high wage increases in this period, so β_2 should be negative. It is hypothesized that $\beta_4 < 0$ since strike activity in general has been declining. The sign of β_3 is indeterminate since higher profits would mean the union is more likely to demand high wage increases, but management is more likely to give in.

To model the incidence of industrial action in US professional sports using the Ashenfelter-Johnson model I use the national unemployment rate which is readily available from the *Bureau of Labor Statistics*. However the national unemployment rate may not accurately represent the alternative employment opportunities of professional athletes; therefore a dummy variable is included for expansion years and when competitor leagues were in operation.

Baseball salaries are published annually in the national press, but wage information is harder to come by for other sports. Fort (2003) lists the average salary for the sports we are considering. By multiplying the average salary by the squad size of each sport it was possible to gain a total salary figure. Simple calculation produced a percentage change that was then adjusted for inflation.

Whilst salary information is relatively easy to obtain, profit information for franchises is akin to the Holy Grail. In the 1990's (the now defunct) *Financial World* gave estimates of franchises accounts including revenues, operating income and expenses. This data confirms a positive correlation between operating income and attendance (for example in baseball the correlation was 0.45). To proxy for the ratio of profits to cost I therefore use player costs divided by attendance. The results of the regressions are presented in table 8. Since the national unemployment rate may not be a good indicator of alternative employment opportunities for professional sportsmen, the second column for each sport omits this variable.

Table 8: Ordinary Least Squares results (standard errors in parentheses)

	<i>Baseball</i>	<i>Baseball</i>	<i>Football</i>	<i>Football</i>	<i>Basketball</i>	<i>Basketball</i>	<i>Hockey</i>	<i>Hockey</i>
Intercept	.08164 (.4977)	.29109 (.18817)	.48824 (.71217)	.44582 (.25823)	.03724 (.47047)	-.05911 (.14867)	-.04548 (.84834)	.00862 (.13003)
Cost-attendance ratio	.00903 (.01333)	.00891 (.01311)	.00420 (.00412)	.00407 (.00341)	.00416** (.00149)	.00423*** (.00142)	.00531 (.00312)	.00538 (.00284)
Real change in salary	-.00305 (.00747)	-.00177 (.00680)	-.00233 (.00518)	-.00231 (.00497)	.00537 (.00601)	.00495 (.00554)	.00810 (.00668)	.00830 (.00574)
Unemployment rate	.03272 (.07178)		-.00577 (.08986)		-.01095 (.05058)		.00636 (.09858)	
Expansion	-.19381 (.30016)	-.20112 (.29474)	-.44528* (.22882)	-.44754* (.21726)	-.05095 (.11472)	-.05026 (.11176)	.25511 (.24316)	.26453 (.18803)
Time	-.02066 (.02877)	.02099 (.29474)	-.09069 (.59213)	-.0879** (.03984)	-.01523 (.01405)	-.01405 (.01262)	-.05351 (.04951)	-.05591 (.03044)
R-Squared	.07	.06	.45	.45	.43	.43	.30	.30
Number observations	29	29	18	18	24	24	20	20

*** significant at 1 percent level, two tail test. ** significant at 5 percent level, * significant at 10 percent level.

The cost to attendance ratio is always positive, and significant at the five percent level or better for basketball and hockey. The real change in salary is correctly signed for baseball and football but is not significantly different from zero. The national

unemployment rate is never significant and is the wrong sign for baseball and hockey. However, expansion is correctly signed for three sports, and significant at the 10 percent level for football implying that strikes are 45% less likely in expansion years. The time variable is negative as expected and significantly so for football when the national unemployment rate is excluded.

These results suggest that there is some evidence that expansion reduces the chance of a strike. It is noteworthy that a strike in baseball was averted in 2002 by a decision to *not contract* by eliminating two franchises. The analysis is limited by the number of strikes and lockouts in professional sports, and by the restrictions of using a linear probability model (see Wooldridge, 2000) but it does suggest that European sports have suffered fewer strikes because the industry is less concentrated, leagues expand by admitting new members without the need for the consent of existing members as in US sports. The anecdotal evidence of increased labor unrest in Europe highlighted earlier coincides with increasing wage to revenue ratios as predicted by the US model. The wage to turnover ratio has increased from 47% in 1995/96 to 60% in 2000/01 for English Premiership clubs, and from 76% to 101% for Division 1 teams.

4. Finance/Regulation

Strangely, it is the European Union that pursues a more competitive line than the U.S. regulatory authorities. America places numerous constraints on market forces: shared TV

rights (and gate revenue in the NFL), salary caps, reverse order drafts, and less ownership restrictions. Further, baseball has enjoyed exemption from federal antitrust laws since a unanimous 1922 Supreme Court decision. The Justice Department has traditionally taken a hands-off approach to other professional sports leagues (Quirk and Fort, 1999). As recently as October 2002 the United States Supreme Court refused to review a Boston federal jury decision that Major League Soccer had not unlawfully conspired with the United States Soccer Federation to monopolise the market for players' services.

Any attempt to implement a salary cap in Europe will have to satisfy Article 81 of the Treaty of Rome that sets out the rules applicable to restrictive agreements. Exceptions can be obtained if the interested parties can prove wider benefits to the consumer or other affected groups. The European commission is currently investigating the collective selling of broadcasting rights to see if they break any laws. No such activity is being conducted in the U.S. where Congress exempted league-wide television contracts from antitrust prosecution for all sports in 1962. There are restrictions on media ownership of sporting clubs in the UK following the Mergers and Monopolies Commission's report into the attempted take over of Manchester United by News Corporation. In the U.S. there is no problem with News Corporation owning the L.A. Dodgers. The European Court of Justice was responsible for the "Bosman" ruling that brought greater freedom of movement to European footballers. These issues will be discussed in greater detail below.

Since Tottenham Hotspur listed on the London stock market in 1983 there has been an increasing number of clubs pursuing this method of financing. There are currently 37 football clubs publicly traded on a stock exchange in Europe, whilst no major U.S. professional sports team is listed on a stock market as a single entity. The European phenomenon has raised the potential for takeovers. In the U.K. however, when BSkyB, a subsidiary of the News Corporation, tried to buy Manchester United for £623m (over \$1bn) in 1999 the Mergers and Monopolies Commission blocked the deal. The commission concluded, “the merger may be expected to reduce competition for the Premier League rights with ...consequential adverse effects” (Bose p321/2).

English Premiership regulations forbid any single individual or organization from holding more than a ten percent share in any one club. The European Commission in June 2002 upheld UEFA’s multi-ownership rule according to which a company or individual cannot directly, or indirectly control more than one club participating in European competition on the ground that such a rule is justified by the need to maintain the integrity of the competitions. The reasoning is that if an owner had a large stake in two or more clubs, they may have incentives to manipulate results, however it is not certain that keeping shareholdings below 10 percent will achieve this aim (Sloane, 2002). Contrast this to the U.S. situation where Anschutz Entertainment Group controls six Major League Soccer teams.

Also in 1999 the Restrictive Practices Court (RPC) ruled that the collective selling of Premiership television rights was important in the process of maintaining competitive

balance. In the UK 50 percent of TV revenues are split equally, with 25 percent paid on the number of TV appearances (with minimum appearance guarantees), and 25 percent on final league position. Additionally, teams relegated from the Premiership receive “parachute” payments for two years. The European Commission noted that the RPC decision was not based on European Community law and is currently investigating the collective selling. In June 2002 the European Commission took a favourable view towards new UEFA rules on the sale of broadcasting and other media rights to the Champions League. Instead of selling the rights as a bundle to only one broadcaster per country, UEFA will now sell the rights in several packages for shorter periods of time.

In 1995, the European Court of Justice ruled in favour of Jean-Marc Bosman. He wanted to leave Liege in Belgium for Dunkerque in France. Under Belgian law Liege could set a fee for the transfer. Dunkerque could not afford the fee and the deal fell through. The European Court found that the system was in contravention of the Treaty of Rome in that it restricted the free movement of people. The ruling applied specifically to transfers between countries, but was interpreted to apply to transfers within countries as well. Since the ruling's implementation in 1998 clubs cannot request a fee for an out of contract player over 24 years of age. If the player is younger a fee may be negotiated that reflects the investment and training the club has made in the player. Players now sign longer contracts since clubs can still demand a fee for a contracted player. This may encourage beneficial longer term planning at clubs though the increased liabilities may mean smaller clubs going out of business. Smaller clubs are also hindered by a loss of transfer revenue.

In 1996/7 2nd and 3rd division clubs had a net inflow of transfer fees of four million pounds. Players are the main beneficiaries as wages have sky rocketed.

The Bosman ruling only applied to out of contract players. The European Commission argued that player should be able to break a contract with a term of notice as in most other industries. In September 2001 new rules were announced after negotiations with UEFA. Contracts cannot exceed five years. A player must respect the contract for the first three years (two if over 28 years of age) and can be suspended for up to 6 months if he breaks the contract. He is free to leave if treated unfairly (FIFA Regulations for the Status and Transfer of Players).

What does all this say about the regulation of sports on both sides of the Atlantic? The US has benefited from a relatively settled competition policy since the 1922 Supreme Court ruling whilst Europe is in the middle of defining its competition policy toward sports. Europe is still trying to determine the correct policy for broadcasting rights, labor market regulation, and the role of sport in society in general.

5. What has sports economics done for you lately?

Data from sports has allowed economists to empirically test theories that would otherwise have been difficult to validate there being extensive data on players' actions, strategies, and compensation. Scully's (1974) paper was one of the first to directly test the marginal productivity hypothesis. Another early study to utilize performance and compensation

data from sports was Ehrenberg and Bognanno's papers (1990a, b) on golf. Tournament theory as developed by Lazear and Rosen (1981) suggested that the effort put forth by workers should increase with the prize spread between winning and losing. They estimated the following equation for total score and final round score for the USPGA and European tour:

$$S_{ji} = a_0 + a_1 \text{PRIZE}_i + a_2 \mathbf{x}_i + a_3 \mathbf{y}_j + a_4 \mathbf{z}_i + u_{ji}, \quad (8)$$

where s_{ji} is the score of golfer j in tournament i , PRIZE is the total prize money awarded in the tournament, \mathbf{x}_i is a vector of variables to control for the difficulty of the course, \mathbf{y}_j is a vector of proxies for player j 's ability, \mathbf{z}_i is a vector of variables to control for the quality of other players in the tournament, and u_{ji} is a random error term.

They find that player's final scores are negatively related to the total prize money awarded in PGA tournaments after controlling for the difficulty of the course, weather conditions, player ability, and the quality of other competitors. Specifically, increasing the prize money by \$100,000 lowers each player's score by 1.1 strokes on average.

Using final-round scores they find that players who had a greater marginal return to effort one standard deviation above the mean marginal return would score 1.0-1.7 strokes fewer in the final round of the tournament. Using data from the 1987 European Men's tour they find that increasing the prize money by the equivalent of \$100,000 lowers each player's score by three strokes on average indicating that European golfers are more responsive to changes in prize levels.

Corporate data sets that have allowed direct testing of tournament theory have recently become available (Eriksson, 1999; Bognanno, 2001). Nevertheless, there is still interest in examining the implications of tournament theory within the context of sports. For example, Maloney and McCormick (2000) use data from 1426 foot racers in 115 races between 1987 and 1991 to find a negative relationship between the average prize and average race times. They attribute this to the participation effect: higher average prizes attract better athletes. Additionally, there is a negative relationship between the prize spread and average race times; if the prize spread doubles, the average time falls by 3.9 percent. Further research in this area would be valuable in terms of determining optimal incentives.

A second area that has recently started to utilize sports data is game theory. Previous attempts to empirically test the predictions have relied on laboratory experiments. These attempts have had mixed results since behavior in such situations may not perfectly replicate real life decisions. There is a lack of market forces ensuring optimizing behavior in the lab, and there is no guarantee that participants are maximizing their monetary reward (Chiappori, Levitt, and Groseclose, 2002).

Results from data on penalty kicks from the French and Italian soccer leagues more closely corroborate the predictions of a mixed strategy equilibrium than previous laboratory experiments (Chiappori et al. 2002). Based on conversations with professional goalkeepers, they make the following assumptions: first, if the kicker knew with certainty

which way the keeper would dive, he would kick in the other direction. Second, if the keeper jumps to one side, the probability of scoring is greater by kicking to the other side rather than the middle. Third, the penalty taker kicks better to his natural side (left for a right footed player), and these shots are harder to save. Under these assumptions they show that there exists a unique mixed strategy equilibrium. The data confirm this prediction: only 16 out of 91 kickers play a pure strategy of always kicking in the same direction, with similar results for goalkeepers.

Using tennis data from the championship match of ten grand slam and masters tournaments Walker and Wooders (2001) found evidence that players do play mixed strategies. They were unable to reject the hypothesis that the server's winning probabilities were the same for left and right serves in 38 out of 40 point games³. Less convincing evidence is presented for serial independence, i.e. the players switch service sides at random. In two out of the forty cases the player involved changed service side too often. In three cases they changed too rarely. This is in contrast to the penalty kick data that found no serial correlation. A likely explanation is that the penalty kicks are taken too far apart in time.

With the increasing number of football clubs listed on a stock exchange it has been possible to examine the Efficient Market Hypothesis (EMH). The advantage of using sporting events is that match results, and their possible effects on profitability through

³ There are four point games in a tennis match, distinguished by which player is serving, and whether they are in the ad or deuce court.

share prices, are easily observable. Using share price information on 13 English clubs from July 1997 to July 1999 Dobson and Goddard (2001) find some evidence to support the theory. They regress the daily logarithmic return in each clubs share price on dummy variables for each match played in the period if it meant relegation or promotion, or elimination from the F.A. Cup or European competition. They control for general movements in the FTSE 100 share index and the expected result.

They find that winning a game a club was expected to lose raised the share price the next day by about 1.5 percent, but winning a game it was expected to win raised the share price by only 0.5 percent. The football share market does not seem to be strong form efficient since that implies that only unexpected information would changes share prices. If a result led to relegation or the failure to secure promotion then the share price fell by about 16 percent the next day, but rose by 2.6 percent on the second day after the game, followed by further declines over the next three days. If a result led to a promotion or the avoidance of relegation, then the share price the next day rose almost 25 percent the following day, with no significant change over the next four days (see table 10).

Elimination from the F.A. Cup results in share prices fall by 1.6 percent the next trading day, with a further fall of about one percent the following day. Elimination from European competition is more detrimental, share prices falling by two percent on the next trading day and over three percent on the following day. These results suggest that the full adjustment process is fairly quick, usually taking about two days.

Table 10: Percentage change in share price of thirteen English clubs due to match result.

<i>Number of trading days after game was played</i>	<i>Team was relegated or failed to gain promotion due to match result</i>	<i>Team was promoted or avoided relegation due to match result</i>	<i>Team was eliminated from F.A. Cup due to match result</i>	<i>Team was eliminated from European competition due to match result</i>
One	-15.59*	22.48*	-1.62*	-1.97*
Two	2.59*	-2.20	-0.91*	-3.19*
Three	-0.11	-1.27	0.21	-1.43
Four	-2.49*	-1.18	0.40	0.31
Five	-0.62*	-2.91	0.18	0.17

Source: Dobson and Goddard (2001), p387.

* Significant at the 10 percent level or better for two tail test.

A second strand of the literature looking at the EMH utilizing sports data concerns the betting market. Betting markets offer readily observable expectations and outcomes. Early studies regressed outcomes on point spreads (the difference between the winning team's score and the loser's score) and found that they could not reject efficiency because of weak statistical power. Economic tests in the form of betting strategies have had mixed results. Zuber, Gandar, and Bowers (1985) find there are profitable opportunities in the NFL gambling market in 1983, though Sauer, Brajer, Ferris, and Marr (1988) find that this opportunity had disappeared by 1984. A later study by Gandar, Zuber, O'Brien, and Russo (1988) found that whilst following technical rules was unprofitable, rules that took into account bettor behaviour were profitable for the 1980-85 NFL seasons. Golec

and Tamarkin (1991) add dummy variables for home teams and favourites and with these more powerful tests find that there are small profitable opportunities depending on transaction costs. Gray and Gray (1997) using probit regressions as opposed to Ordinary Least Squares find that there are some profitable strategies, but that these dissipate over time. Paul and Weinbach (2002) find skewness in the forecast errors which invalidates the early tests of the 1980's. Using a log likelihood ratio test they are able to generate a simple profitable strategy though they doubt it will be long lived. Results from other US sports have had equally mixed results (see table 11).

In England bookmakers set the odds for soccer games many days in advance of the game, and do not adjust these odds as bets are placed. Dobson and Goddard (2001) find profitable betting strategies but they are not enough to cover betting duty. Other studies of the UK betting market (Pope and Peel, 1989; Dixon and Coles, 1997) also find that there are profitable betting strategies, though they rarely cover the betting tax. The European studies only cover one year. In the light of the evidence from the US that excess returns are eliminated it would be of interest to see if the same held in Europe. Indeed, with the spread of internet betting, do profitable rules still exist, and if so are they for shorter periods of time? Additionally, it would be interesting to replicate the UK research now that the government has abolished betting duty.

Table 11: Tests of market efficiency using the gambling market.

<i>Study</i>	<i>Sport</i>	<i>Years</i>	<i>Profitable rule</i>
Zuber et al. (1985)	NFL	1983	If the predicted point spread (from model)

			minus Las Vegas gambling line was greater than some constant. Bet on home side if difference is positive.
Sauer et al. (1988)	NFL	1984	Above rule no longer profitable.
Gandar et al. (1988)	NFL	1980-85	Bet the underdog against the favored team that, as a favourite in the previous week, covered the spread by at least 10 points.
Golec and Tamarkin (1991)	NFL	1973-1987	Bet on the home team. Bet on the underdog.
Badarinathi and Kockmann (1996)	NFL	1984-1993	Bet on the underdog when the spread exceeds five points.
Gray and Gray (1997)	NFL	1976-1994	Bet on home team underdog. Bet on teams with probit probability of success exceeding 57.5%.
Paul and Weinbach (2002)	NFL	1979-2000	Betting unders when totals get very high.
Woodland and Woodland (1994)	MLB	1979-1989	Bet the underdog (excluding commissions).
Brown and Abraham (2002)	MLB	1996-2000	Bet that a streak of five or more games will continue (profitable in 1997 only).
Woodland and Woodland (2001)	NHL	1990-1996	Bet on heavy underdogs, especially those on the road.
Johnson and	NBA	1986-	No speculative abnormal returns.

Pawlukiewicz		1989	
(1992)			
Pope and Peel	English	1982	Betting on the consensus of six newspaper
(1989)	Football		tipsters.
Dixon and Coles	English	1995-	Bet on outcomes in which the ratio of the
(1997)	Football	1996	model's probabilities exceeds the bookmakers
			by 20%.
Dobson and	English	1999	Bet on draws with short odds and away wins
Goddard (2001)	Football		with long odds.

Other fields of economics may well benefit from utilizing the available information from sports. The diffusion of football from European countries to African colonies varied between European countries. France, and to an extent Belgium, relied on direct control and the imposition of French culture, political and economic systems. Britain used more indirect control, and did not deny the existence of local traditions. In all cases football was used as an instrument of cultural imperialism which in some cases completely destroyed Africa's deep rooted sporting traditions. Interestingly, when football reached the labouring classes it became an opportunity to protest colonial rule. In the last two decades of European rule it became an instrument of resistance and a resurgence of national aspirations (Darby, 2002). Do these different methods of colonialism, reflected in sport, help illustrate economic development? Do they explain why French speaking African countries such as Senegal and Cameroon have been successful at recent football world cups?

6. Conclusion

If there is a “peculiar economics of professional sports” (Neale, 1964) then an important job of the sports economist is to develop economic theory that corresponds to that peculiarity. To date most of the research has been empirical. In a review of the content of the first ten issues of the *Journal of Sports Economics* it was found that almost 95 percent of the articles were empirical (Mondello and Pedersen, 2003). The field would benefit greatly by the development of rigorous theoretical models that could then be econometrically tested rather than the *ad hoc* specifications that are common.

The research that has been conducted so far has important policy implications, but economists are poor at communicating those implications to the relevant authorities. For example, it has been almost universally agreed that public funding of stadiums provides no economic benefit to the community, yet public funding is still popular (slowly admitted by the general economic weakness and poor state finances). There is some evidence of customer discrimination in the US, yet no policies such as the UK’s “Kick Racism out of Football” to combat it. With the current debate by league owners/organizers about restructuring economists must get involved to influence the outcome based on their research. We must communicate our research better, so that appropriate policy can be formulated.

The increasing availability of other sports besides the major US leagues and European soccer should allow for further comparative research. For example, Deloitte and Touche

has started publishing a *Comparative Review of Sports Finances* that covers Scottish and English football, cricket, rugby union and rugby league. Since these leagues have implemented different organizational structures and rules it will allow fertile research into their effects. Past research in the area of sports economics has concentrated on labor economics, but there are many other areas of economics that can be applied to sports economics.

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