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# LABOUR MARKETS IN PROFESSIONAL SPORTS*

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Important elements of supply and demand are starkly observable in professional athletics. Demand affects how pay varies with personal productivity, racial discrimination, the nature of factor substitutions, and player mobility. Property rights affect the supply of athletic talent, arms races and incentives to restrict competition. In sports, excess incentives to win can create negative externalities. Collective agreements such as reverse-order drafts, payroll caps and revenue sharing constrain these forces, but redistribute rents from talented players to owners because they punish success. The European approach–promoting better-performing teams and relegating those with the poorest records–punish failure.

If one of the attractions of spectator sports is to see occasionally universal aspects of the human struggle in stark and dramatic forms, their attraction to economists is to illustrate universal economic principles in interesting and tractable ways. Simon Rottenberg (1956) wrote the first serious economic analysis of labour markets in professional sports more than 40 years ago, and set the research outline for most subsequent work. Focusing on American baseball, Rottenberg reviewed its industrial structure and contractual arrangements; discussed the implications of the reserve rule and player drafts on the distribution of playing talents, competitive balance, monopsonist exploitation and investments in training; and speculated about outcomes under alternative institutional arrangements, such as free agency for players and revenue sharing among owners.

The sporting world has changed a fair bit since then. What was always a business has now become a much bigger business, with players' salaries, franchise values, and stadium costs all shifted by orders of magnitude. Free agency and revenue sharing in varying degrees have come to professional team sports in the United States and elsewhere, as have players' agents and associations (unions), strikes and lockouts, restrictions on players' salaries, and methods to constrain competition and improve competitive balance among teams.[1] Broader media considerations, especially television but also endorsements and product licensing, have become the tail that wags the revenue dog for professional team league sports, individual sports such as tennis and golf, the Olympic games and, in the United States, college athletics. In addition, more attention has been paid in recent years to other labour market issues, such as racial discrimination and drug use among athletes.

Whenever a baseball star or soccer player is traded from one team to

* We are indebted to Gary Becker, Stanley Engerman, Daniel Hamermesh and the referees for criticism of an initial draft.

[1] Salary/payroll ceilings, revenue sharing and draft systems among teams are ubiquitous in North American team sports; promotion and relegation between major and minor leagues, which are designed to provide competitive balance incentives, are more prevalent in European leagues. See discussions below. Szymanski (2000) and Hoehn and Szymanski (1999) discuss these geographical institutional differences in detail.

another, or signs a multi-year contract in excess of $10 million a year, or a golfer or race driver closes a multi-million dollar endorsement deal with a well-known corporate entity, economists immediately recognise scarcity rents, but media attention is naturally focused on the reverse question of why these athletes make so much money. The alleged impact that high salaries have on the ticket prices and/or the public financing of new facilities that are allegedly needed to generate sufficient revenues to pay huge salaries surface as important issues to fans and non-economists. And sceptics question the underlying societal values that condone and implicitly advocate such payments in light of pressing public needs for education, health care, eradication of poverty, and other social needs. In addition to the issue of player pay itself is the complementary matter of the distribution of talent or 'competitive balance' across teams in a league, brought to the forefront of discussion every time a team with the highest payroll, or an owner with the deepest pockets wins a championship, as in the case of the New York Yankees in baseball or Manchester United in soccer.

Many basic elements of supply and demand are very clearly seen in sports labour markets. Many can and have been empirically investigated. Sport is an outstanding forum for applied economics, but unusual and interesting twists of technology and institutional arrangements complicate analyses in various ways. We use traditional demand, supply and market equilibrium analyses to analyse some problems in the economics of sports in what follows.

One other notable 'supply side' effect is the increasing interest of economists, legal scholars, and other social scientists, especially in the last decade, in labour-management relations in sports. Such newsworthy things as strikes, lockouts, or the level of players' salaries turn one way or another on battles for control of the labour market between interest groups and the social institutions needed to keep them in check. These struggles are often between owners and players over the disposition of revenues, but they can also be between two groups of players–veterans versus rookies, for example. Legal restrictions and property rights are central components of sports economics today.

## 1. The Demand for Labour

As Marshall pointed out, the demand for labour is derived from the demand for the ultimate goods and services that labour is used to produce. Since customers are willing to pay more for higher quality athletic competition, the demand for players' services depends on their marginal contribution to product quality. Personal contributions in sports are relatively easy to observe and can be measured from a variety of data on past performances. The simplicity of production functions in sports and the plethora of data indexing personal productivity in many of them help make the economic analysis of sports labour markets so interesting. Professional sport is one of the few empirical cases where the marginal product of a player can be directly assessed. No signalling here.

But performance statistics are not the only determinants of value. In the

entertainment services of which sports are an increasing part, production is labour intensive and the final product is not easily separated from the people who render the service. Economic 'output' often includes direct valuation of the inputs themselves. Some star athletes develop personal followings that go well beyond their contribution to the quality of specific competitions. 'Star quality' is often elusive and harder to extract from simple statistics, but fans apparently recognise it when they see it. It can have enormous effects on sports revenues (Hausman and Leonard, 1998).

Professional sports have an additional characteristic that is essential to their value: Consumers value direct interactions among purveyors, not each one on its own account. Head-to-head athletic competition ultimately determines the quality of teams or individuals within prescribed skill classes. Observing skilled performance and the noncooperative, competitive struggle to win is what makes sports so interesting to most people. Sports outputs are not simply additive in the number of teams. Instead, the distribution of inputs and their interactions across firms (teams) are important technological aspects of production and require special economic analysis. For example, if one dimension of 'output' is victories, it is impossible to reallocate resources in a sports league to increase the number of wins because a win for one team is always a loss for its opponent.

The contest aspects of sports imply that the value of one player depends on the services rendered by others. Two kinds of interactions must be distinguished. *Within* team complementarities are easy, *between*-team complementarities are harder to deal with.

The fact that one player's value depends on the talents of other members of a given team is no different from the usual problem of bundling complementary goods. The quality of a meal, for example, depends on how well the individual courses are coordinated. Just as restaurant owners choose their menus to cater to customer tastes for meals, team composition is efficiently chosen by the self-interests of team owners and players working through standard market forces.

The harder question is how complementarities *between* teams affect allocations of talent. This has no counterpart in conventional supply analysis because in sports supply decisions among relevant units jointly determine consumer values. Since demand depends on the nature and quality of competition among groups of producers, there is a sense in which the league is the natural 'firm' in organised sports (see Neale (1964) for an early statement). The quality of players on rival teams affects the marginal product of a player on any given team. If a league configured teams geographically and allocated players among them to maximise its total revenue, between-team complementarities would be efficiently internalised (like those within-teams).

But the industrial organisation of sports is not well described by economic competition for consumers among leagues. Usually one or two leagues account for the lion's share of the business and have some degree of monopoly power. And leagues are more loosely organised around separate ownership of teams that compete against each other on the playing field and in the labour market

for talent. Owners (and fans) of individual teams are selfish, even though they share some common interests. Since the competitive struggle and uncertainty of outcomes are crucial to spectator interest, surely commercial interest and demand would be smaller if teams in leagues were commonly owned and directly coordinated. Among other things, the outcomes might appear to be 'fixed' or 'rigged'.[2] Thus interactions between teams to some extent present common pool externality problems. The ways in which between-team externalities are coordinated by the business organisation of sport and the nature of property rights give these activities a unique economic character.[3] (See Gilbert and Flynn (2000) for a discussion of leagues as joint-production ventures.)

Sporting contests inevitably are hierarchical. Contests among poorly matched competitors are of little interest. The outcome is hardly in doubt and the quality of play is poor when one contestant is much better than the other. Perhaps due to the difficulties of establishing market price mechanisms for efficiently decentralising the allocation of teams to each other, or due to adverse selection arising from the fact that lower quality competitors tend to free-ride on higher quality rivals unless given incentives not to do so (Lazear and Rosen, 1981), virtually all sports rely on entry exclusions or external rules that assign competitors to mutually exclusive quality categories or leagues.[4] When leagues establish ceilings on player compensation, they usually set minimum compensation or floors as well, which serve to discourage free-riding by weaker franchises. Teams in the premier, top-rated professional league generate the most fan interest because they represent the highest quality of play. Both relative and absolute quality of athletic contests determine their spectator value.

Total revenue in many sports is highly concentrated among the top contestants. But the contestable quality of sport itself does not explain this fact. High concentrations of business among small numbers of sellers are commonly observed in many entertainment services. Think of artists, writers, musicians and actors; or of computer software and patent drugs for that matter. Economies of scale account for why business tends to be so concentrated in these activities. The cost of production (a performance, or the basic invention) is largely independent of the size of the audience; most of the costs are up-front, so average cost is decreasing in consumed output. Large venues and various media allow many paying spectators to observe a sporting event simultaneously, while at the same time enabling teams to exclude nonpaying customers. Few sellers are need to serve the entire market. Television has

[2] This is also why wagering by players, managers/coaches, or owners poses such a threat to the integrity of the game–and its ticket revenues–and is so severely punished.

[3] Periodically, beginning early in the 20th century, proposals that would in effect have one single-entity ownership structure, with players then allocated across teams by the league itself have come–and gone. The MSL (Major Soccer League) in the United States is currently organised in this fashion but has not been very successful up to now.

[4] One of the most interesting self-regulating mechanisms for efficient sorting of competitors is claims races ('selling plates' in England) in horse-racing. Since any horse in a claims race can be purchased at the stated, advance claiming price, owners are deterred from putting 'ringers' in the race (Hall, 1990a). Nonetheless, such races impose past-performance conditions that ration entrants as well.

increased the scope of these activities in recent decades. An event like the World Cup championship match attracts a remarkably large audience all over the world. Men's professional basketball, a major sport in North America in recent years, consists of 29 teams with no more than 12 players per team. The top leagues in the four major sports in the United States, with a total of 118 teams, only employ about 3,000 professional athletes.

Because sports are so labour intensive, scale economies are what make potential earnings so large. However, they do not guarantee high salaries. Scarcity of the most talented players is necessary for rents to be observed, else wages would be driven down to opportunity costs (e.g., the average production worker wage in expected present value). The marginal revenue product of a particular player is the extra price that a spectator is willing to pay times the number of people who are attracted, either in person or on television. What we tend to see in professional sports markets (and in other entertainment services such as movies, as well as in patent drugs, computer software and investment banking) is that the audience-quality gradient is very steep and heavily concentrated on the best contestants, but the unit price-quality gradient is relatively flat. One of the ways that top performers attract such large audiences is by not gouging on unit price. Instead, they get the lion's share of rents by attracting most of the customers. Lower quality sellers get small pickings because market competition effectively prices them out of the market (Rosen, 1981).

Before getting to the productivity evidence, a perennial popular confusion between the social value of sports and the enormous salaries paid to some well-known athletes is worth noting. How can it be that a soccer star earns a hundred times more than a school teacher? Isn't teaching far more important to society than playing recreational games for money?[5] Certainly it is. This is proven by the fact that total spending on professional sports in a modern economy is extremely small compared to the amounts spent on education and most other things. A typical fan values education many times more than any sport is valued. Many parents in the United States routinely spend $15,000–$20,000 per year to send their children to private schools. Hardly anyone pays anything near that amount to observe sporting events.

The explanation for the salary differences lies in a 'personal scale of operations' effect in sports compared to teaching and most other jobs (Mayer, 1960). A teacher's income is bounded by the small number of students who can be taught in one classroom. Though the unit value per student is very high, the possibility of earning a large income is small because the scale of a teacher's personal business is sharply constrained. In sports, unit values of each customer are tiny, but that is more than offset by the huge personal

[5] In 1929, Babe Ruth, the greatest American Baseball player, earned $70,000. The sum was well publicised and far in excess of any other player. An indignant reporter asked Ruth to justify how he could possibly be worth substantially more than what the President of the United States earned. Ruth is reported to have said: 'I had a better year'. Reflating his salary to dollars in 2000, the result would be modest by comparison to the $10M or more annual salaries paid to superstars today, even though few of them have had better years than Ruth did in 1929.

volume of business that a player generates from the scale economy. A star player is worth only a few dollars more per spectator than an ordinary player. There are lots of spectators. Since the total market value is divided among a very small number of players, the stars make their fortunes on 'low mark-ups' but 'high volume'. The total revenue generated by a typical American baseball team (the national pastime, at least at one time) is about the same as that of a moderate sized department store–not the entire chain, but just one store! (Noll, 1974) But in sports the value-added is almost equal to total revenue and most of the cost is player compensation. Except for the capital costs of a stadium or arena, purchased material inputs are trivial. There is no anomaly here. It is all in the technology.[6] When and if teachers use the Internet and other media to personally teach millions of students at one time, star teachers will earn at least as much as star athletes. Some writers of elementary texts are rumored to approach star royalty status already.

## 2. Factor Substitutions

Opportunities to substitute other factors of production for labour in sports are more limited than in most other industries, but they are not non-existent. While there always have been, and will likely continue to be, nine players on a side in baseball, for example, the use of a 'designated hitter' in one of the two league divisions both in the United States and Japan has changed inputs slightly, as has more reliance on 'middle relievers'–baseball pitchers who are, on average, less expensive than either starters or 'closers'.[7] Modifications in American football from time to time change the strategic value of (and hence the demand for) place kickers relative to runners, receivers and/or quarterbacks. The advent of the three-point shot in basketball and the strictness with which fouls are called changes the relative importance and worth of extremely tall, muscular players relative to their smaller, more agile perimeter shooters. In marathon races, it is not uncommon for paired entries to set a strategy where one contestant sets the early pace to prepare the other for the final kick. Professional boxing could, following the Olympics, require headgear, which would reduce injuries to and prolong the careers of participants if boxing talent were considered truly scarce. The classic speed and close teamwork of traditional ice hockey have been replaced with more bruising defence and individual styles of offence in the modern game.

In other instances, 'non-player' inputs are complementary. In road racing there is only one driver per car, but the difference between winning and losing can depend on the quality of the entire team, including mechanics, engineers, and pit crews. In addition to players on the field or court, team sports employ

[6] The high-salaries-societal-values conundrum in sports is a contemporary example of the age-old water-diamond paradox: prices (or wages) are determined at the margin, while value is, at a minimum, price times quantity.

[7] Some substitutions are derived from technology and periodic changes in strategies, such as reliance on power versus speed (or *vice versa*); these are changes in what players do, rather than substitutions in the usual sense.

coaches/managers, scouts, and trainers; given intricate and sophisticated salary-cap and payroll-cap rules that apply in many North American team sports, a good accountant and savvy general manager can be worth several victories a year. And golfers, skiers, cyclists, tennis players and runners look for any possible advantage with the latest innovations in equipment.

As incomes rise and the line between sports and entertainment blurs, the quality of a stadium's amenities–including an array of upscale refreshments, promotional items, mascots and cheer leaders, museums and displays, gift shops, instant-replay features on scoreboards and more comfortable seating–takes on more importance and the contest itself less. The group and social aspects of fan participation reduce the demand for the players relative to the set of complementary activities inside the arena.

## 3. Pay and Marginal Value Product

Wage regressions are used to study how a person's pay is related to personal skill and human capital. Most wage data do not contain direct information on performance. Instead, personal productivity is approximated by education, work experience, IQ, family connections and the like, measures that largely affect wages by influencing occupational choice. Studies of interpersonal wage differences within occupations are few and far between for that reason. Sports are almost unique in affording the opportunity to measure specific work performance on a narrow set of jobs. Empirical studies inevitably find that better performing professional athletes earn more money. Most of the work to date has used US data.

Still, the economic issues are complicated by the legal organisation of labour markets in professional sports. It is elementary that a person's pay is proportional to marginal productivity in a competitive, open market for labour services. But sports labour markets traditionally have been neither competitive nor open. Until relatively recently, US professional teams where salaries have been studied made long-term, exclusive contracts with players and they alone had the legal right to transfer performance rights of players to other teams. In modern American labour experience, this system (called the 'Reserve Clause' in baseball or 'option clause' in other sports) was almost unique to sports. Giving teams exclusive property rights to the human capital of workers is unconstitutional in most other activities, but baseball was exempted by a Supreme Court ruling in 1922 (and reaffirmed by later Courts, in 1953 and 1972; see footnote 19).[8] One of the few other areas where exclusive contracts were the norm was also in the entertainment services. In the early Hollywood Star system, movie studios made exclusive, long-term contracts with a repertory of actors for movie performances, ostensibly for similar reasons (see below). Court challenges eliminated the Star System in the 1940s.

[8] Soccer and other North American team sports do not enjoy baseball's legal exemption, though in most cases each league has a basic labour agreement that is negotiated and approved by players and owners; it covers collective bargaining and other job-related issues.

Rottenberg (1956) described the reserve contract system in American baseball as a form of monopsony. And so it was. That a player could only negotiate with the team that owned his contract did not entirely eliminate the player's bargaining power, but greatly constrained it. The initial signing of a player was open and competitive, but signing bonuses typically were (and remain) heavily discounted by initial uncertainty about a player's long-term talent and potential. From then on the player's market opportunities in the sport were restricted to his current team or to the team to which his contract was transferred.[9] Bargaining leverage could only come from threatening to shirk or to quit the game. A team would be rash to make a good player unhappy, and even more rash to make a very good player unhappy. These agency considerations help explain why wages were related to performance, but surely wages would be higher in a contract system where players owned their contract rights and could negotiate freely with all teams in the league. Recent history has proven this point many times over.

There is another prescient insight in Rottenberg's paper, though perhaps more implicit than overt, that the ownership of player performance rights would have no effect on the allocation of player talent to teams.[10] The logic follows the general economic principle that unrestricted markets transfer resources to their highest valued uses. When teams own the contracts, a player's services are sold for a capital sum to the highest bidder–the team that puts the largest value on the player. When players own their contracts, they go to the same teams via the usual route of direct salary competition, because the team with the highest value is willing to pay the highest annual wage. Therefore, to a first approximation contract property rights have to do with who gets the rent on talent, not with who plays for whom. To the extent that the Coase theorem (Coase, 1960) applies to sports, the real, dead-weight cost misallocations of monopsony relative to player allocation are eliminated. There has been much less work on how changes in contract ownership rights have affected player allocations across teams, than on how their wages were affected.

All evidence points to remarkably large effects of contract ownership rights on player salaries. The evidence is of two kinds. One is qualitative evidence on the effects of greater inter-league competition in a particular sport (Sanderson and Siegfried, 1997). The other is quantitative estimates of what happens to salaries of individual players before and after an exogenous change in contract law for athletes.

North American football and basketball are examples of the first kind. The premier National Football League (NFL) was slow to expand the number of teams when television first made an impact on increasing the demand for the sport in the early 1960s. A rival and independent American Football League (AFL) was created and successfully competed for talent and paying customers,

[9] As a predictable byproduct, the reserve clause increased competition among teams for new talent. Competition resulted in escalating signing bonuses for new players, a problem that was 'solved' when the league adopted an amateur draft system about 50 years ago.

[10] The point is formally proved in El Hodiri and Quirk (1971) and Quirk and El Hodiri (1974).

particularly television viewers.[11] Within a matter of years, the quality of play in the new league was as good as in the old one. Competition for talent between rival leagues drove up the salaries paid to players in both. In their fundamental wisdom to rein in 'ruinous competition', the rival leagues merged. Competition for new talent was tightly controlled by a unified draft (in which a new player could only bargain with the single team that drafted him, no longer with separate teams in rival leagues). Salaries stopped rising and may have fallen. A similar story applies to the rival American Basketball Association (ABA) and veteran National Basketball Association (NBA). At its inception, the well-financed ABA recruited many star college players and produced many innovations in the game. Merger of the two leagues controlled competition at the draft entry point and salaries stopped rising so rapidly for a time. Similar patterns have been observed in European football when leagues within countries removed restrictions on the number of foreign players allowed on teams and court decisions restricted transfer fees among teams.

Detailed statistical studies of how competition changed the relation between pay and performance of individual players provide more quantitative evidence. These studies usually focus on performance statistics, but are not exclusively confined to them. Personal characteristics of players, especially race, have been an important emphasis of these studies in the United States and will be considered separately. But these studies also discovered important outliers in the data–a class of players whose salaries were way out of proportion to their performance statistics. Extreme positive outliers were identified as 'stars'. This raises interesting issues about the true determinants of personal productivity because the consumer value embodied in stars cannot be described precisely. Most of the statistical specifications are linear or semilog, so these effects might reflect nonlinearities in the mapping of performance statistics to productivity. For instance, sometimes a little edge can have large effects on winning. However, they also likely reflect some players' personal followings built up over a career for reasons that are difficult to measure in performance data. For instance, memories of past performances attract fans to see the aged stars, not only their current productivity on the team. A recent study presented evidence that these capital goods elements are important for many older players (Horowitz and Zappe, 1998). The effects of race are also suggestive that there is more to it than just abstract notions of playing performance.

A major innovation in these studies was made by Scully (1974), who devised a neat way to impute marginal products in baseball. Scully's method postulates winning team performance as the product output valued by consumers. There is a very close correlation between win percentages in baseball and total team revenues, so this is a reasonable approximation. Team output (win percentage over the season) is related to team performance measures in a production function. Wins are regressed on offensive statistics (such things as batting

[11] Cave and Crandall (2001) provide a more detailed treatment of broadcasting issues in professional sports.

averages and runs scored per game) and defensive statistics (such as fielding averages and runs allowed per game). The production function implies estimates of the marginal products of these offensive and defensive 'inputs'. The relationship between wins and revenues implies estimated marginal revenue products (MRP) for these team statistics. Finally, assuming the usual addivitity in the relationship between team and individual performance statistics in the win-production function, a marginal revenue product can be estimated for each player. These imputed marginal revenue products are compared to actual wages paid, usually by another regression.

The relationship between actual and estimated marginal products before the reserve clause was eliminated showed that actual wages were deeply discounted relative to marginal revenue product (Scully, 1974). The extent of the discount is slightly disputed, but wages were somewhere between 20-to-50% of MRP in those days. Wages were greatly compressed and much of the ability rent of star players was transferred to owners. After the reserve clause was eliminated, the relationship changed markedly (Scully, 1989; MacDonald and Reynolds, 1994). The salary-quality gradient increased substantially and stars received their full rents. The data now show very close correspondence between wages and estimated MRP for experienced players who have achieved free agency status and can bargain with a variety of teams. There is no discount at all for them. However, pay falls short of estimated MRP for very inexperienced players (rookies). This is related to the well-known labour market observation that variation in starting wages in a profession is much smaller than variation in wages of more experienced workers. Not only are latent talent differences hard to identify among new entrants, but players also differentiate themselves by their work ethic and abilities to learn. Players who have established themselves, but who have not yet reached free agent status lie somewhere in between.[12]

Only a few studies so far have examined inter-team mobility of players. The strong Coase theorem prediction of no effect is somewhat disputed by the evidence. Quirk and Fort (1999) begin to examine evidence on patterns of relative baseball team final standings in league rankings before and after the reserve clause. They find no differences. Krautmann and Oppenheimer (1994) examine player mobility directly. While their evidence is not overpowering, there is some evidence that free agency has been associated with greater mobility of players among teams. Hylan *et al.* (1996) find stronger evidence for certain position players. The issue is complicated by the fact that endorsements and future career prospects out of sports or in allied activities such as broadcasting now play a significant role in total compensation for many players. An imputation must be made for player preferences for teams

[12] While the percentage of players who move across teams each year in the United States is greater now than when there were more restrictions, there appears to be less trading of players in North America than in Europe, where the transfer market is quite active each season. Each North American league, as a result of bargaining between owners and players, has 'stages' of free agency, based on years of service or age. See Sanderson and Siegfried (1997). Partly as a reaction to Oakland A's owner Charles Finley's selling his star players in the 1970s, there are prohibitions, or at least customs, against selling players for cash in the United States, but not in Europe.

and added to total rent to invoke the Theorem properly in this instance. The allocation of players among teams should maximise total team rents plus consumer surplus of players. For instance, if a player is worth more to team *A* than to team *B* on revenue account but the player prefers city *B* to city *A*, a trade from *B* to *A* should only occur in the old contract system if the player is willing to pay the owner of team *B* the difference in revenue by working for a lower wage. With costless bargaining, the rent maximising solution is always attained irrespective of the property right. The player preference component of rent probably increased after free agency was established, and this 'outside cause' could have affected player mobility even if legal contract forms had not been changed. However, much more work on this issue remains to be done.

## 4. Wage Discrimination in Sports

An important application of the pay-productivity relationship in sports with broader applications to other labour markets is how salaries vary by race. This American dilemma is of broad economic interest because sports are increasingly international, with players arriving at the big markets from far-flung and unfamiliar places. Two aspects of the question have been prominent in the labour economics of sport in the United States. First, to what extent have nonwhite American athletes been paid less than whites with the same record of performance? Most studies of race (or sex) discrimination rely on gross indicators of human capital such as education and age, and these can differ among groups for reasons unrelated to discrimination. Sports labour markets allow more precise inferences and raise deeper questions about the determinants of personal productivity from the point of view of team revenues. Second, why have minorities been excluded from big-league sports in the past? Sports typically are held up as paragons of meritocracy, personal accomplishment and freedom of entry. 'May the best player win' has not always applied in sports. Colour and nationality bars sometimes have been blatant.[13]

Generally speaking, the colour bar in American sports was broken after World War II. Prior to that time most professional team sports were totally segregated, and the top leagues were exclusively white.[14] Of all the sports, accounts of integration of American baseball have been the most extensive (e.g., Tygiel, 1983). Baseball was entirely segregated until 1947. Today, whites are a minority relative to their numbers in the US population, and large numbers of Latin-American players are among the biggest stars in the game.

[13] A third aspect of discrimination has considered segregation by position. Allegedly minority athletes have been under-represented, relative to their overall proportions on teams, at what are deemed the 'skill' positions, such as quarterback in football or pitcher and infielders in baseball. A related issue of considerable debate in the United States currently is the relative lack of minorities in coaching and 'front office' management positions, especially in leagues such as basketball and football where African-Americans constitute two-thirds to 80% of all active players. See Scully (1989, 1995) for more on position segregation and managers in baseball.

[14] Professional boxing was integrated much earlier, though racial considerations played a large role in marketing the sport in the United States. Boxing is not a team sport, but other individual sports such as golf and tennis only have begun to exhibit substantial minority participation in relatively recent times, well after most team sports were integrated.

Asians are starting to appear in significant numbers. How these changes came about is a complex story, but there is little doubt that the development of extraordinarily talented minority players, whose market opportunities were severely limited by segregation or few opportunities abroad had something to do with it. Similar considerations apply to the increasing international character of some sports teams in Europe. There is evidence to support the idea that minority players who first integrated American professional sports were significantly better than the marginal, if not the average majority players (Scully, 1989). Today the same things appears to be true in English football. To summarise broadly from the large number of empirical studies in what is perhaps the most intensively researched empirical area in the economics of sports, wage discrimination among US athletes was easily detected in the initial studies of the 1960s and 1970s, but had mostly disappeared by the 1990s.[15] The basic method uses performance measures to adjust wage differences for differences in talent, and then adds dummy variables for race and their interactions with performance to detect discrimination. It is difficult to find a negative regression coefficient on race in US data these days. Relative proportions of minority athletes in the major sports follow these wage trends very closely. Relative supply clearly responds to financial incentives: minorities tend to avoid activities where wage discrimination is common because returns on human capital investments are lower than in areas where discrimination is less common.

What are the sources of past discrimination in sports? Wage discrimination results from tastes for discrimination by employers, employees, or customers (Becker, 1971). Wage differences appear as the natural market response to tastes (or more properly, distastes) because a worker's personal characteristics cannot be detached from the rendering of services and must be valued in assessing total personal productivity. Wage discounts are an equalising difference necessary to compensate discriminators for the disutility they suffer in dealing with people they do not like. Undoubtedly all three sources have been involved in sports at one time or another, though players and owners alike could and have argued that final customers were the ultimate source. If fans disliked the idea of integrated teams they would pay smaller ticket prices to see them play and integration would reduce profits unless wages of minorities were sufficiently small. Otherwise, segregation would dominate the general market equilibrium outcome.

Scale economies inherent in the conveyance of sporting events to fans make consumer tastes for discrimination an especially severe problem for minorities. Only a little taste for discrimination by each customer can eliminate entirely a minority athlete's market. For although each fan is willing to pay only a trivial discount if a minority player is present, it is the total discount attributed to all fans as a group that must be compensated by wage differences in order for the

[15] Well known studies for baseball include Gwartney and Haworth (1974) and Scully (1974, 1989). These and others are surveyed by Kahn (1992). Kahn (1991) presents a comprehensive survey for basketball and other sports.

derived demand for minorities to be positive. When the number of fans is large, as it is in the big sports, there is no feasible wage cut that a minority player can take to compensate owners and other players for the revenue loss at the gate.

Yet racial or national preferences are only part of the story. Fans like to see their team win, so for given wages, a minority player can compensate for discriminatory preferences by being sufficiently more talented to outweigh racial preferences. The black players who integrated baseball in the 1950's were by and large major talents who proved themselves many times over. Today, the equal opportunity, meritocracy myths cherished by the sports community are more or less a reality in the United States.[16] Similar issues apply to the international players who crossed national boundaries to play for European teams. Using on-field results and data on investor returns from English League soccer, Szymanski (2000) found evidence for racial discrimination by demonstrating that teams with higher proportions of black players enjoyed higher levels of performance after controlling for payroll expenditures.

## 5. Supply

Labour supply in professional team and individual sports is determined by the usual list of suspects: given one's natural talents, attitudes toward risk and personal discount rate, occupational choice is determined by career prospects in a field and nonpecuniary aspects of a particular job relative to other career options. Individual choices between work and leisure, and thus how much labour to provide to a market at various wage rates; the nature of training and how much education or training to acquire, and who pays for it; and, finally, post-retirement options are also important. But like many aspects of demand, in sports some of these issues manifest themselves in bold relief compared to other labour markets. Moreover, the competitive technology of sports raises externality issues akin to 'arms races' that have few counterparts in the general labour market.

### 5.1. *Sources of Supply and Training*

An athlete's potential begins to show and needs to be developed at very young ages. But there is also great uncertainty in outcomes. Large financial risks are inevitable, given the small number of top players who provide most of the services to customers. Think of the thousands of seriously talented amateur

[16] Two interesting studies support the idea of customer discrimination in the United States. Kahn and Scherer found that attendance at basketball games was negatively affected by the percentage of black players on a team, *ceteris paribus*, and that the loss of gate receipts was a remarkably accurate predictor of black/white salary differences. Nardinelli and Simon (1990) examined the market for baseball cards collected and traded by fans, and found evidence that cards of star black players traded for a discount relative to comparable whites. More recent studies of markets in later years find that these discounts have disappeared along with salary differences (Bodvarsson and Brastow, 1999; Gabriel *et al.*, 1995).

club or school athletes who reach maturity each year and the remarkably small number of players employed in the top leagues of all sports. In the United States perhaps 30 new players are talented enough to make it into the 320 player roster of the NBA in a year, and those 30 players started out as more than 10,000 high school seniors who then became less than 1,000 freshman players at Division I universities. Some go to the European leagues, etc., but even those slots are few and far between. High risk is not specific to sports. It is common in other forms of entertainment talent such as musicians, and in many nonhuman capital investments, such as research and development, all for similar reasons. Most attempts to break into the top echelons in such professions result in failure. In sports it is even more risky because playing careers are so short – less than five years for most athletes. Among those who are successful and make it all the way to the top, it is rare for a big league athlete to earn as much as, say, $10 million over a playing career. Data are not available to calculate meaningful success probabilities for a potential entrant, but they are vanishingly small – so small as to make the expected present value of potential entrants look like a pittance.

Does this mean that people who attempt to enter these professions are giddy risk lovers with unrealistic assessments of themselves? Perhaps, but not necessarily. It is instructive to analyse entry into such risky activities as a sequential search or stopping problem. Entrants receive continuous feedback based on their past performance. Information on their prospects changes over time and allows them to reassess their chances at each stage. When the record gets sufficiently unfavorable, they quit and do something else. Therefore, the small chance for a big prize at the end lends a certain 'option value' to entry (much like the standard value of an option in finance), because the loss is truncated by the option to quit and walk away (Rosen, 1986). Less talented people usually are weeded out quickly in sports and other high risk occupations. They have time to switch to more realistic careers and do not expose themselves to great income risk. Many who continue longer have successful careers in ancillary activities such as coaching. (Filer (1986) presents the most complete evidence for artists and musicians.)

In the United States, the supply of athletic talent for professional sports comes from two main sources: minor league 'farm' systems or tours (as in tennis and golf) and colleges and universities. From their outset, professional sport leagues (and, in the United States, in college athletics as well) have instituted a variety of restrictions among owners that affect the employment of players and their distribution across teams and impact the supply side of labour markets. Contracting institutions that restrict player mobility initially through a draft and/or later through some type of reserve system, have implications for whether the employer or the employee pays for the investment in an athlete's skill development.

Before the advent of free agency (see below) in baseball, owners had substantial incentives to underwrite the development and training of new talent. They supported extensive scouting systems to find players and maintained elaborate minor-league training systems to develop their skills. As in the

Hollywood star system, where the studios developed unknown talent, lost money on most prospects, but made it up by signing long-term exclusive contracts that limited payments to the successes, an important rationale for the reserve system in North American baseball was to give owners economic incentives to invest in training. The main skills in sports are general to the game, not specific to a team. Yet under a reserve system, running minor league teams at a loss is effectively a team-specific investment if the owner has exclusive rights to contract with successful players and can hold down their wage rates. When free agency came along and monopsony power was reduced, owners' training investment incentives fell drastically. Human capital investments became general rather than firm-specific, so players bore more of these costs and earned more of the benefits. There was less financial support for minor-league teams, players' salaries in the training leagues were lower, and/or the costs were shifted elsewhere. Intercollegiate athletic programmes serve as the primary training grounds for professional baseball, basketball and football, and increasingly for ice hockey in North America today.

### 5.2. *The Quality of Labour Supplied: Investments and Arms Races*

Although journalists and fans frequently complain about the quality of today's professional athletes, there is ample evidence that players and the quality of play are better than in the past. Swimming and track and field records continue to be broken, and qualifying times for Olympic events and marathons are more stringent each year. Team sport athletes are bigger, stronger, and faster than their predecessors and they are in better physical condition. Technology, in the form of equipment, training facilities and knowledge of human body mechanics, has improved athletes' efficiency.

Given restrictions on the supply of teams, as a percentage of the underlying population, however measured, today's professional athletes also represent a smaller percentage of the potential labour pool, which also suggests a higher average quality.[17] In addition, a variety of data suggest that variation in quality has also declined. All this is consistent with rising supply price of athletic talent. Weaker competitors have been weeded out as higher salaries, produced by a combination of increased demand and fewer restrictions on salaries, have induced more athletically-inclined youths to consider careers in professional sports – and allowed employers to be more selective. Their new property rights as free agents have increased the incentives for players to develop their skills, increase their playing life and stay in shape. The opportunity cost of not being in shape – and getting replaced by someone else – has risen dramatically.

Yet certain relative aspects of supply are important in sports. If the average quality of talent is higher than ever before, what also matters to fans is the relative quality of play among competitors. Surely both absolute and relative

[17] The skill level required also means that there is much more specialisation from earlier and earlier ages, which reduces the labour pool to some extent. As a matter of practical impossibility, athletes can no longer engage in more than one activity at a time, as Roger Bannister was able to accomplish in 1954 when he broke the four-minute-mile barrier while a full-time medical school student.

quality are important. On the one hand, spectators want to see high quality performances and pay a large premium to do so in the major leagues compared with the minors. On the other hand, they want their favorite team to win. This relative performance aspect of output, though not unique to sports, is very important to it. Part of the demand for sport is the resolution of uncertainty about who is best and, for many fans, the desire to be associated with a winning team.

Rank order considerations that determine outcomes can create excessive personal incentives to improve one's skills: a player with greater skills imposes negative externalities on rivals because others must react defensively to preserve their relative ranking. In most other labour market contexts, the decision of one person to acquire more human capital has only pecuniary externalities on others: personal decisions are properly internalised by market prices. In sports, the attempts of one player to gain a competitive advantage puts direct pressure on rivals to keep up. Since each contestant does not value the extra costs imposed on others, there is much 'rat race' potential in sport (Akerlof, 1976). An extreme case is when the customer value of the contest is completely relative and depends exclusively on rank of contestants (Frank and Cook, 1995), that is, on who wins irrespective of skill or quality of play. In this case any attempt by contestants to improve their skills is a pure arms race and socially wasteful. Arms limitations treaties are necessary to avoid excess build-up of skill. Of course when absolute quality considerations totally dominate value, these investments are socially efficient (Lazear and Rosen, 1981) and arms limitation is unwarranted. In sports the truth usually lies somewhere in-between. Lately some economists have stressed the rank and relative aspects of competition rather than the skill or quality of performance aspects, but empirical evidence on the extent of overinvestment is lacking. Nor has anyone spelled out how it could be ascertained.

The most frequently cited example of excessive competition today is the use of performance-enhancing drugs. These may have longer run negative side effects on athletes and often are thought to lend unfair advantage compared to enhancing performance in more traditional ways. Well-publicised accounts of athletes' alleged use of drugs are used to illustrate the traditional opposition to unnatural advantages: runners Mary Decker Slaney and Ben Johnson; 1996 Olympic swimming medalist Michelle Smith; 1998 and 1999 Tour de France winners, Marco Pantani and Lance Armstrong, respectively; home-run champion Mark McGuire. There is a problem here, but it is hard, if not impossible, to draw the line or define what constitutes excessive competition versus a 'level playing field' for developing athletic skills and performance, where the margin of victory, and thus the difference between financial riches and bare existence, can be measured in hundredths of seconds, inches or one less golf stroke out of nearly 300.

Some runners train at high altitudes; others are children of professional athletes and have an inherent head start, encouragement, and access to more in-house coaching; many athletes with the financial resources to do so employ their own conditioning and/or psychological trainers. More than a few success

stories hinge on overbearing parents who nevertheless provided their children with an early start, a factor of immense benefit in sports, entertainment and many other professions. Some have lower opportunity costs and practice for longer hours, while others are more impervious to pain; and discount rates, personal values and risk preferences vary across competitors.[18] In each of these cases, one athlete's attempt to gain an advantage over another requires competitors to follow suit in one way or another, yet no test-ban treaties are invoked to limit them. Also some contestants must depend on medical treatments to compete at all, though this too presumably imposes costs on other competitors who would otherwise take their place on the court or fields of play. The incentive to gain competitive advantage is a major source of innovation in sports, but has not been studied very much. The economic issues are most closely related to patent races in economics, but raise many interesting new issues. The problem has interesting and suggestive parallels in evolutionary biology and survival of the fittest.

## 6. Unionisation, Collective Bargaining, and Free Agency in Sports

Prior to the 1970s in the United States, there were significant restrictions on athletes' mobility across teams in the major professional sports leagues. Until the December 1995 Bosman ruling against the transfer system and limits on foreign players by the European Court of Justice, the same was true in Europe. One can date the beginning of player freedom with the appointment of a talented, assertive executive director of the players' association in baseball in 1966, their first collective bargaining agreement in 1968, the advent of limited salary arbitration in 1970, and the untested decision of two players to play the 1975 season without a contract, which ultimately led an arbitrator to rule, and the courts to uphold that decision, that the two were free to sign with any other club.[19]

Unlike most other unions, players' associations in North America and Europe do not negotiate salaries for their individual members. That is handled by the player himself, generally through an agent. The associations do bargain collectively over working conditions, pension benefits and insurance, grievance procedures and, in North America but much less so in Europe, league-wide

[18] Some drug use, such as Olympic snowboarders in Nagano, Japan, in 1998 and among professional basketball and football players in the United States, does not enhance performance but is merely recreational. Nevertheless, governing officials tend to disqualify athletes who use these substances as well.

[19] Baseball had instituted a reserve system (termed an 'option clause' in some other sports) in the 1870s, whereby players were bound to one team for as long as that team chose to offer them another in a series of one-year contracts. In the Federal Baseball case in 1922, the US Supreme Court affirmed baseball's antitrust exemption and corresponding legality of its contractual arrangement with players. In 1953, deciding for a club and against a player in the Toolson vs. New York Yankees case, the Court reaffirmed that exemption, though with less enthusiasm; a 5-4 vote in the 1972 case of Flood vs. Kuhn, upheld the exemption, though by then association efforts were well underway to create free agency through other means. The Curt Flood Act of 1998 guarantees that baseball players have the same bargaining rights as other professional athletes under the antitrust laws.

arrangements such as a minimum salary, any direct restrictions on total payrolls or individual salary caps, or owners' incentives to compensate players ('luxury taxes' in baseball). Players' associations have generally opposed plans by owners to cap payrolls, and owners have, especially after the dissolution of reserve systems, proposed various schemes to restrict open bidding for players: the NBA instituted a payroll cap for the 1983–4 season (and beyond); football (the NFL) followed suit in 1993; Major League Baseball's unsuccessful attempt to force a cap in 1994 ultimately led to the players' strike of 1994–5, and it ended with the owners nevertheless getting a second-best outcome, a ('luxury') tax on payrolls that exceeded specified levels. Associations have also generally opposed widespread revenue sharing among owners. Reducing the incentive to win decreases the value of players and thus would, as demand for their services declines, lead to lower average salaries.

Basic labour agreements in each sport, which generally run for three to seven years and are then renegotiated, require players and owners to bargain freely over salaries (baseball owners' failure to abide by this agreement, when they colluded not to bid for veteran free agents in 1986–8, ended with a $280 million fine). Breakdowns in negotiations have led to periodic strikes by players–most recently in 1987 in the National Football League and 1994–95 in Major League Baseball–or lockouts by the owners and leagues–1994 in ice hockey (NHL) and 1998–99 in basketball (NBA).

For the last thirty years sports unions have been largely successful in their bargaining with owners. The short careers of players and smaller numbers and more homogeneity among owners tilt negotiations toward management. Interests of rookies and established stars over salary caps and other restrictions often conflict and can weaken player solidarity. However, unions benefit from the relatively inelastic supply of highly skilled athletic talent coupled with the nature of the games, which greatly limit normal substitutions of other inputs for labour. Of course, they also benefit from the presence of and increase in monopoly profits these sports cartels generate, which creates the spoils over which they can then attempt to bargain. One area in which player unions have not been successful, in negotiations or in court, is the elimination of draft systems (which originated in the professional football in the 1930s to prevent competition among owners for star players). In a draft, the initial property rights to a player reside with one team and one team only for a set number of years. This postpones competition for that player's services and can function almost as a quasi-monopsony in some instances because playing careers are so short (that is, a player may never reach the free-agency stage of his career before being replaced by a new, younger, non-free agent substitute).

## 7. Wages and Competitive Balance

A variety of restrictive agreements recently struck among team owners in the major North American sports restrict salary escalation of top players. Perhaps it is coincidence that league attempts to restrain salaries have come at a time when the demand for sport and players' salaries have grown so much. Salary

caps impose ceilings on wages paid to individual players. Payroll limitations restrict total wage expenses per team, but do not directly constrain the wage of any particular player. Luxury taxes impose surcharges on teams whose payrolls exceed a certain amount while distributing the proceeds to teams with smaller payrolls. In no other labour markets are employers collectively allowed to impose restrictions on payments to workers.

Economic thinking on this issue has changed over the years. The reserve option contract in sport was widely recognised by owners and others as a mechanism to restrict salaries. It was claimed that an open market for player services would allow 'rich' teams in the large markets to grab all the talented players, leaving little left over for the 'poor' teams and their fans in smaller markets. Athletic competition allegedly would degenerate into groups of 'haves' and 'have nots'. Games would be unfair and boring, and fan interest would wane unless these forces were contained. As discussed above, viewing this claim in terms of the Coase Theorem proves that it seriously flawed. Though player mobility may have increased to some extent after free agency was established, other market forces also contributed to greater mobility. Most importantly, there has been no overwhelming change in the structure or persistence of team inequality in final team standings over time. Many sports franchises sell for huge sums today, in spite of their large payrolls.

Perhaps one day Political Economy will sort out how franchise owners have managed to impose reserve option restrictions in the past and salary limitation treaties today. The main intellectual interest in the topic currently does not so much stress the political struggle for property rights as the problem of externalities among teams. We have flirted with the issue at various points in this paper. The new argument is another variant of the Arms Race — a manifestation of the curious combination of cooperation and competition that is inherent in professional sports. If there are returns to beating other teams, each owner's private demand for talented personnel may be excessive because each wants to get the winning edge. Presumably, private bidding would escalate star salaries above their social products. This particular form of 'cut-throat' competition can be controlled by salary caps, etc.

The economic issues revolve around the fact that consumer demand depends on interteam competition and rivalry. A self-interested team would never acquire so much talent as to make its games predictable and dull: this is just an example of the fact that the marginal value of one team's quality depends on the quality of other teams. In a sense there is nothing unusual here. After all, the marginal product of labour in a neoclassical production function depends on the amount of capital, and conversely. Market prices and competition for labour and capital ensure that social and private margins are equated and that decentralised decisions are efficient. In sports it is useful to think of the contest as output and teams as inputs that produce the output. Efficient decentralisation dictates that the teams themselves compensate each other for the joint value they collectively add to the game. Externalities arise when the prices faced by teams for services rendered are set improperly; creating inefficient incentives for individual teams to gain a competitive edge

in the talent market. Efficient transfer prices among teams would eliminate the inefficiency.

One-off sports like boxing illustrate efficiency of contract. Shares of the gate are individually negotiated for each match, depending on the relative strengths, reputations and drawing power of opponents. Promoters often offer big name boxers minimum payment guarantees. The nature of contracting is much more complicated in team sports, because regular competitive trials are scheduled over an entire season and transfer prices must be set in advance among all teams in the league. This challenging economic problem has not been fully analysed, but it seems probable that the efficient solution gives greater compensation to stronger teams based on their record (e.g., standings last year or, after the season is along, standings to date). Details might be expected to vary depending on the nature of the game. Gate sharing arrangements differ wildly among professional team sports, but we are unaware of systematic analysis of their efficiency properties. Given the concerns that are often voiced about balance issues, some current arrangements might well be inefficient.[20]

In a sense, salary cap and other treaty-like solutions 'solve' sports externality problems in much the same way as prohibitions and quotas 'solve' environmental externalities. But tariffs are economically superior to quotas. Until some progress is made on more thoroughly understanding the larger decentralisation problem, it is difficult to analyse these arrangements. For example, luxury taxes reduce team incentives to stockpile talent, but reward teams for weakness. The efficient arrangement has to achieve the proper balance between these two forces. Salary and payroll caps reduce the market demand for superior talent, as does the unified draft system. All schemes used in the United States punish excellence in one way or another. The European football approach punishes failure by promoting excellent minor league teams to the majors and demoting (relegating) poor performing major league teams back down to the minors. The revenue loss from a potential demotion to a lower class of play is severe punishment for low quality—severe enough that salary treaties, league sharing arrangements, and unified player drafts are so far thought to be unnecessary, even though star salaries are enormous. It is an interesting economic question as to which system achieves better results.

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[20] See Fort and Quirk (1995) for a general discussion of these issues. Vrooman (1996) presents a slightly different view.

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