By the Numbers

The Newsletter of the Statistical Analysis Committee of the Society for American Baseball Research

Volume 2, Number 1 **January, 1990**

COMMITTEE NEWS

Correction. In the last issue of By the Numbers, Pete DeCoursey was incorrectly identified as the editor of The Philadelphia File; he is actually the editor of the Philadelphia Baseball File. My apologies to Pete.

SABR Convention. Evan Meyer, a member of the Statisitcal Analysis Committee who is involved in planning for the SABR Convention in Cleveland writes: "One of the presentations set for the convention is a debate on the worth of the new baseball statistics...We already have someone to take the 'against' position, so our Chapter President, Morris Eckhouse, asked me to get in touch with you to see if anyone on the Statistical Analysis Committee would take the 'for" position." I've volunteered, but if you are interested, let me know and write Evan at 8253 Brecksville Road, Brecksville, OH 44141. Also, if you're planning to attend the convention, keep this in mind and try to attend the debate. It could be interesting.

Upcoming Issues. The March issue will contain the third part of Rob Wood's long piece on statistical significance and its importance in statistical analysis of baseball. We will have the list of key words for the committee bibliography project described in the August, 1989 issue of the newsletter. (A new description of the project will also appear.) I will be printing a complete list of committee members to date. The September issue will be devoted, I hope, to the research using statistical analysis to be presented in Cleveland. I don't know what is going to be in the June issue at this point.

What You Can Do. We need material for upcoming issues. This material can be of several types. First, you could write an article using statistical analysis. Second, if you have any comments on material which has appeared in the newsletter, write it up and send it to me. Third, you could write a review of a book which uses statistical methods to deal with baseball. Fourth, if you have research interests or data needs (or data sets) which you wish to share with other committee members, let me know. Fifth, if you read an article in a non-SABR publication which applies statistical methods to baseball, let me know the publication information (or send me a copy, or write a brief summary of it).

A Reminder. We are sponsoring a research presentation session in Cleveland. If you would like to make a presentation, please send me a one-page outline of the presentation (or the topic) so I can develop the program, by March 31.

The Remainder of This Issue. The University of Chicago Press recently published a book (The Business of Major League Baseball) by a respected economist (Gerald W. Scully) dealing with major league baseball. The book was briefly (and fovorably) mentioned in the most recent SABR Review of Books. My reading of it (undertaken in order to write a brief review for a professional economics journal) suggested a number of problems, as well as a number of accomplishments. What follows is essentially the first draft of my review. In many ways, you will find it easier to follow this review-essay if you have read Gerald Scully's book. In any event, I think you will find the book interesting and informative and encourage you to read it, my critical comments notwithstanding.

Donald A. Coffin
Division of Business and Economics
Indiana University Northwest
3400 Broadway
Gary, IN 46408
219/980-6646

THE BUSINESS OF MAJOR LEAGUE BASEBALL, By Gerald W. Scully

Reviewed By Donald A. Coffin

Gerald Scully was one of the first economists seriously to apply economic analysis to baseball as an industry. From his early papers on "Pay and Performance in Major League Baseball," to his more recent work on "Measuring Managerial Efficiency" (written with Philip K. Porter), he has set standards of insight and rigor which have helped make the study of baseball academically respectable. It was with with great interest, therefore, that I approached his book-length treatment of the issues, The Business of Major league Baseball.

In this book, Scully revisits and brings up to date much of his earlier work, attempting (at the same time) to make the work accessible to people without much formal training in statistical methods. The analytical framework, and the consistency and clearness of his approach are a model for the profession. He develops a simple model and then applies it to a range of interesting empirical issues, presenting the results in a form which makes it relatively easy for the statistically sophisticated reader to follow. Readers without much statistical background will have to take much on faith.

The Business of Major League Baseball is divided into three sections. Part I (Chapters 1-4) treats "The Rules of Baseball and Their Effects." Part II (Chapters 5-7, "The Business of Baseball") deals with output demand and team revenue and profit issues. Part III (Chapters 8-10) focuses on "The Baseball Players' Market," salary, arbitration, and discrimination issues.

His analysis and conclusions in Parts I and II are straightforward and often useful. Unfortunately, in Part III, he adds little to what we can learn from his earlier work, and he all too frequently repeats what seem to me to be errors of analysis in that earlier work. While I find myself in general agreement with his conclusions about many of the issues he addresses, I do not think the analysis he uses to reach these conclusions is as strong as it might be. As a result, our confidence in some of these conclusions is vitiated and the value of the book is reduced.

I. Baseball's Rules and Their Development

Rules in major league baseball serve a number of purposes. They govern the way the game is played on the field, which is necessary in order for the games to be played. They regulate relations between teams (player transfers; territorial franchise rights; etc.). And they continue to govern the relations between teams and players.

Indeed, as Scully notes (p. 5), "Until recently nearly everyone in and out of baseball subscribed to the view that the collusive practices in baseball were reasonable and utterly necessary for equalization of playing strength on the field. In 1887, the players themselves had been so convinced of this that they agreed to the stipluation of the reserve clause in their contracts." While the reserve clause was the main restrictive practice in player-owner relationships, it was not the only one.

Scully traces and summarizes the restrictive agreements reached by owners of major league baseball teams through the years, focusing on two aspects of these restrictions: Product market restrictions and labor market restrictions.

A. Product Market Restrictions. Major league baseball is a cartel, within the economist's meaning of the term, and Scully makes this quite clear. The existing teams, acting jointly, control new entry (at the major league level) and can apparently strongly influence the creation of new teams even at the minor league level. Furthermore, each existing team has some territorial rights (extending even to minor league baseball), for which compensation--set by the existing teams--is due if expansion occurs.

Within some limits, the existing teams engage in revenue sharing. Broadcast revenues from national (network) contracts are shared equally by all teams, while ticket revenues are divided (unequally) between

home and visiting team. Such revenue sharing allows teams in smaller markets a greater opportunity to survive than they would have without revenue sharing. Presumably, the survival of these teams is in the interests of the owners collectively.

Because it takes two teams to produce the game which is sold, the teams must cooperate in establishing playing and scoring rules. Furthermore, although Scully does not make this point, some continuity in these rules is essential in generating continuing fan interest. Cartelization shows up in the establishment of playing-scoring rules because the rules committee is composed solely of representatives of the owners, with no player representation.[1] Scully implies that changes in the rules have often been selected more with an eye to the revenue impacts of the changes than with concern for the effect on the long-term quality of the game. (The designated hitter rule comes to mind here as a rule change adopted to increase offense--and thus attendance--by the American League at a time when both offense and attendance were lagging seriously behind the National League.)

Scully discusses roster size rules as a part of the product market rules, although it coould equally have been discussed as a part of the restrictions on the players' labor market. He notes that roster size has not been a constant, and that there used to be substantial variation in roster sizes among teams even in a single season. The expansion of rosters since the early 1900s has, he notes, allowed the development of "a much wider array of specialized playing skills...improved player performance and added to the quality of the game" (p. 19). He also notes that the size of the major league roster is not necessarily an effective constraint on access to talent. Teams can trade or purchase the contracts of players; that can also shuttle players from the minor leagues to the major league roster, an activity that the New York Yankees have become famous for. One major function of roster limits, according to Scully, is "to reduce team salary costs" (p. 19).

B. Labor Market Restrictions. In addition to trying to restrict salary costs by restricting roster sizes, Scully argues that "Owners have sought to reduce the cost of talent by imposing constraints on themselves which restrict competition for that talent" (p. 21). Over time, these restrictions have included the reserve clause, the "bonus baby" rules of the 1950s, the amateur draft, and rules governing player transfers among teams.

The reserve clause needs no extensive discussion here.[2] Scully is clear that his opinion is that the reserve clause has primarily served to redistribute income from players to owners, an opinion which is shared by many, but not all, economists.[3]

1. Although any rules changes which are permanent and which affect playing conditions must be negotiated with and approved by the Major League Baseball Players' Association.

2. For a complete discussion of the development of the reserve clause, see James Dworkin, Owners versus Players, Auburn House Publiching Company (Boston, MA: 1981), and Lee Lowenstein and Tony Lupien, The Imperfect Diamond: The Study of Baseball's Reserve Clause and the Men Who Fought to Change It, Stein and Day (New York, NY: 1980).

3. Scully notes the analysis of Mohamed El-Hodiri and James Quirk ["An Economic Model of a Professional Sports League," Journal of Political Economy, Vol. 79, No. 6 (November-December, 1971), pp. 1302-1319], in which they argue that profit-maximizing behavior under a reserve clause promotes player movement from weak to strong franchises and thus undermines on-filed equality. Earlier, Simon Rottenberg ["The Baseball Players' Labor Market," Journal of Political Economy, Vol. 64, No. 2 (June, 1956), pp. 242-258] argued that the reserve clause merely held down player salaries and left unchanged the distribution of talent. A contrary view is presented by William Holahan ["The Long-Run Effects of Abolishing the Baseball Player Reserve System," Journal of Legal Studies, 1978, pp. 129-137.] Scully outlines his argument as follows: Under the reserve system,

The other restrictions have similar purposes: To restrict competition for player talent and thus to reduce player costs.

The amateur draft does this by assigning "rights" to players to a single team; the player may sign with that team or re-enter the "draft" a year later. Prior to the institution of the amateur draft in 1965, teams competed with each other to sign amateur talent. (In fact, for many of these players, the competition between teams to sign them to their initial contracts was probably the only time they were in a more-or-less competitive labor market.) If the amateur draft had the desired effect, we should observe that the average signing bonus received by amateurs fell after 1965. (Unfortunately, the data are not available to determine whether this happened.) If bonuses did fall, then the interaction of the reserve clause and the draft acted to reduce (expected) lifetime compensation for players.

The use of a uniform player contract, and the restrictions on performance incentives, also act to restrict the ability of teams to compensate players. By preventing teams from offering contracts to some players which contain non-standard clauses, the owners probably restricted the form and amount of compensation.[4] Since performance incentives are restricted to such things as awards or playing time, teams are prohibited from rewarding exceptional performance with bonuses. This also probably reduces total compensation.

These rules, as Scully notes in Chapters 3 and 4, have implications for the absolute and relative quality of play.

C. Quality of Play. Absolute quality is very difficult to measure in team sports, in which there are components of both offense and defense. If both improve at the same rate, the absolute quality of play will increase, but it will not be reflected in the statistics we use to measure quality. Nonetheless, Scully argues (in Chapter 3), we have strong reasons for believing that the absolute quality of play in major league baseball has improved over time. There are also some reasons for suspecting, he suggests, some deterioration in the absolute quality of play.

We know, and Scully presents the data (on p. 45), that performance in individual athletic events (e.g., track and field events in the Olympics) has improved substantially. To believe that it has not improved in baseball requires a leap of faith. The improved performance, he argues, has three sources:

(1) Contemporary players are physically superior. This is a result of improved nutrition and of improved training techniques.

(2) Contemporary players have the advantage of learning by observing the actions of the best athletes of the past.

(3) Contemporary players have the advantage of improved equipment, both individual (fielding and batting gloves, protective equipment for catchers, etc.) and team (better lighted and maintained playing fields, padded walls, etc.).

However, he continues, there are two countervailing tendencies which might have led to a reduction in absolute quality of play. First, long term contracts, he argues, have "severed the connection between pay and performance" (p. 24), thus reducing the incentives for higher levels of performance.[5]

Second, he argues that the resources devoted to player development have declined, thus reducing skill acquisition and player skills. Training slots have declined as the minor leagues have declined, from

---

one source of income for weaker franchises was the development and sale of talent to strong franchises. Absent the ability to sell talent, some of the weaker franchises are likely, long-run, to fail.

4. Based on some of the contracts signed in the past decade (George Brett, Dan Quizenberry, and Willie Wilson come to mind), the restrictions of the uniform player contract seem to have become easier for the creatrive legal mind to circumvent.

5. He presents no evidence, here or later, that players signing long-term contracts perform less well than players who operate with, e.g., annual contracts.

about 9000 minor league players in 1950 to about 3500 minor league players today. Combined with expansion, he argues, the number of "promotions" from the minor leagues to the major leagues has increased from about 0.6% to 0.8% in the early 1950s to about 2.6% to 3.4% today. He concludes (p. 48): "Simply put, there is insufficient seasoning of playing talent in the minor leagues before promotion to the major league circuit."

I think he overstates the difficulties here for three reasons, one of which he recognizes. First, as Bill James demonstrated[6], there is no evidence that the number of minor league games played before promotion to the major leagues has declined, since at least 1940. If there is no decline in minor league experience, then it is more difficult to argue that there is a decline in skill acquisition unless the teams are doing a worse job of training people in the minor leagues.

Second, the growth in college baseball (both in the number of programs and in the average quality of programs) can substitute for minor league experience. In effect, college programs represent an amateur expansion of training opportunities.[7] What is relevant, therefore, is not simply minor-league experience, but minor-league plus college experience.

6. The Bill James Baseball Abstract, 1987, Ballantine Books (New York, NY), pp. 55-60.

7. I suspect, incidentally, that the growth in college baseball is a result of the amateur draft. If I am correct is concluding that the amateur draft reduced signing bonuses, then it also reduced the incentive to sign a professional contract (relative to the alternative of attending college). As a result, the quantity and quality of players available for college programs increased. This then has a feedback effect on player decisions. As the quality of college programs improves, players can acquire more skills in college, improve their draft position (and signing bonus?), so more (and better) players attend college.

Third, and recognized by Scully, the shrinkage of the minor leagues probably improved the quality of competition in the minor leagues. This increased the rate of skill acquisition, and thus (to some extent) could compensate for any reduced minor league experience.[8] He argues, however, that (pp. 49) "entry into the minor leagues is based much more on player potential than on performance. There is simply no way of knowing whether a high school star will prove to be major league material..." He suggests, in other words, that the large pool of minor league players was necessary in order to uncover players who would be, or are, missed with the contraction of playing opportunities.

I would suggest, however, that some of this screening is now being done, at no charge to major league baseball, by the colleges. I do not think Scully has provided us with any reason for believing that the absolute level of play has declined, or will decline in the near future.

What effects have the rules adopted by major league baseball had on the absolute quality of play? Scully explicitly examines the effects of expansion and roster size and playing rules.

Increased roster size, he noted in Chapter 2, allows greater specialization and probably therefore increased absolute quality of play. However, the optimal roster size in unclear, involving as it does a balance between the benefits of improved quality and increased cost. Expansion will reduce quality, at least temporarily. When expansion occurs, teams will have to move deeper into the talent distribution and therefore will have to use players whose talents would not have been sufficient to allow them places on major league rosters prior to expansion (see p. 50). However, if expansion of teams occurs along with expansion of the relevant population, this talent dilution need not occur--the quality of play will simply rise more slowly.

When expansion occurred major league baseball in 1961-1962, it followed 60 years of stability in the number of teams and 40

8. Keep in mind that there was no reduction in minor league experience.

years or so of stability in roster sizes. The relevant population had expanded as US population had grown and as racial segregation ended following World War II. As teams did a more and more aggressive job of scouting Latin America, the relevant population continued to expand faster than the US population as a whole. I find it hard to believe that the net effect was to reduce the absolute level of player quality.

Playing rules probably do not in general have much effect on absolute quality. Scully notes that teams can come to have vested interests in certain rules (those from which they benefit as a result of the distribution of talent on their teams), and so will seek to defend those rules. As it takes only a (small) minority to prevent rules changes, such changes will tend to occur only infrequently and in response to major events.

Oddly enough, Scully does not discuss here one major rules change which probably did have an effect on the absolute quality of play, and which also probably did result from a major event. Bill James discussed this in his history of the beanball, and it was the decision to keep a clean ball in play. This was probably a result of the death of Ray Chapman; it probably resulted in a reduction in serious injuries; and it probably also was responsbile for some of what has been called the "lively ball" era.

Scully's discussion of offensive and defensive performance is really, to my mind, a discussion of relative, not absolute performance levels. It is also one of the best discussions of the long-term trends in performance I have ever seen (see pp. 53-74). Not surprisingly, reductions in offense have been coupled with improvements in defense throughout the period. If one looks at the data carefully, however, one can see a tendency for defense to dominate--for runs scored per game to decline modestly over time. It is perhaps for this reason that many of the major changes in the rules (changes in the strike zone; altering the height of the mound; the DH) have been designed to increase offense.

The most interesting part of Scully's discussion here is his discussion of runs scored per game (pp. 69-74). He models runs scored over the 1947-1986 period using the following equation:

$$RS = 4.1 + 30.6*BA - 0.25*KTW,$$

where RS is runs scored per game, BA is team batting average, and KTW is the team's ratio of strikeouts-to-walks (while batting).[9] Over this period, RS averaged 4.1. This equation suggests that a one-point increase (from .250 to .251) in team batting average would increase RS by 0.03 runs per game; that an increase in KTW of 0.1 (say, from 1.5 to 1.6) would reduce runs scored per game by 0.025.

Scully looks at the rules changes which have occurred and indicates whether they would be expected to increase or reduce runs scored; he suggests that the rules changes (and the associated performance changes) between 1947 and 1986 account for the changes which we observe in runs scored per game. Scully never makes it clear what KTW is supposed to measure, nor why BA is selected rather than some other offensive measure.

Furthermore, later in the book, Scully examines offensive (and defensive) performance in another context--to explain team winning percentage. When he does that, he does not use team batting average as an offensive measure, so it is unclear to me why he does so here. My analysis (of the 1962-1988) period suggests that a better model of runs scored, using even less information, models runs scored (and runs allowed) as

$$RS = \underset{(-24.94)}{-941.07} + \underset{(42.83)}{4999.58}*OBA \qquad R^2 = 0.806$$

$$RA = \underset{(-25.87)}{-811.36} + \underset{(47.40)}{4689.31}*OBA \qquad R^2 = 0.836$$

where OBA is team on-base percentage (and t-statistics for the coefficients are in parentheses). The issue of the best method

9. See p. 71. This regression has a R^2 of about 0.75--it explains about 75% of the variation in RS. Scully does not report t-statistics on the coefficients.

of modeling offense (and defense) will become critical later.

Again, Scully argues, and it is worth emphasizing, that many of the rules changes adopted have had the effect of increasing offense.

Relevant to the issues Scully will take up in Chapters 5 to 7, however, is the balance of playing strength among teams. Teams are selling their output--games--and, as Scully says (p. 75), "uncertainty of outcome is a necessary feature of competitive team sports, and this uncertainty is largely determined by the relative playing strengths of teams...The relative playing strength of a team depends on the financial strength of the team and its owner..."

It is necessary, therefore, to examine the effects of league rules on relative quality, which, for Scully, is measured largely by team winning percentage (and its variance among teams). Scully begins by arguing that teams seek to increase their revenues, both from ticket sales and from local broadcast rights; they can do so by, at least in part, increasing their winning percentages.[10] Other revenue enhancing activities (increased national broadcast revenues, for example) are largely outside the control of the team.

By adjusting ticket price for team quality, and creating a quality price [= (TPRICE)/(1000*WPCT)], he can then examine the effects of changes in quality on team reveunes and costs. Given the presence of population in his attendance equation, the marginal revenue derived from increased quality will be larger in larger cities, while (given a competitive labor market) the marginal costs of additional quality will be identical across cities. The result is that we should expect (other things equal) a correlation between team quality and market size. (See pp. 77-79.)

When he attempts to test this proposition later, using rank-order-correlations between team winning percentages and market (population) size, he finds no relationship--city size and team winning percentage are (apparently) uncorrelated (see p. 95-97). Oddly enough, he does not then return to the theoretical analysis to suggest what additional factors may need to be considered in order to explain the discrepancy between our theoretical expectations and the empirical results. His only suggestion is that the distribution of city (market) sizes has narrowed, which should narrow the distribution of winning percentages--but the theoretical argument, that there should be a relationship--remains.

Other parts of his discussion do serve to explain, at least in part, this anomolous result. Because national broadcast revenues (and major league licensing fees) are shared equally, and because national broadcast revenues (and licensing fees) have been growing more rapidly than other revenue sources, revenues have been becoming less unequal between teams. (See pp. 80-82.) This will tend to weaken the expected correlation between winning percentage and population.

What is clear is that the dispersion of team winning percentages is narrowing. This can be measured quite precisely by examining the standard deviation of team winning percentages (since the mean is fixed at .5). Both in the National League and in the American League the standard deviation of winning percentage has declined steadily over time (see the graphs on p. 90).

In many ways, this discussion is simply a preliminary to looking at the cost and revenue conditions facing teams in major league baseball. Once the nature and effects of the rules of the game have been established, we are prepared to examine the demand for games (revenue) and the costs of producign games. This examination will permit us to reach conclusions about "optimal" quality levels, about whether ticket pricing policies are "rational, etc. To those issues--and to the question of team profitability--we now turn.

10. Scully's model of attendance is
ATT = F(POP, WPCT, TPRICE),
where ATT is attendance, WPCT is current (and lagged) winning percentage, and TPRICE is average ticket price.

II. Revenue, Costs, and Pricing Decisions

Chapters 1 to 4 in many ways constitute an elaborate stage-setting for the meat of the analysis in Chapters 5 to 7 and 8 to 10. Only after establishing the rules of the game is it possible to go on to an analysis of the behavior of owners and players. Scully's careful attention to institutional detail in Chapters 1 to 4 prepares us for the analysis to follow.

Part II of The Business of Major League Baseball deals with the profitability of teams. As Scully puts it (p. 126): "Whining about the lack of profit from owning a baseball club had been a sacred tradition among owners from time immemorial." One of the consequences of his analysis is that it will be harder for anyone to take that whining at face value in the future.

For an economist, an analysis of profitability starts with an analysis of revenues and costs. Chapter 5 deals with the demand for attendance, and Chapter 6 presents a formal analysis of both revenues and costs. Chapter 7 concludes the analysis by looking explicitly at profitability.

A. Attendance. In Chapter 5, Scully examines the trends in attendance (there is a marked upward time trend in attendance starting in the late 1960s--see pp. 102-105)) and ticket prices (mostly down in real terms, although there was a 7.6% real increase in ticket prices between 1980 and 1986--see pp. 105-107). These two factors interact to determine one major source of team revenue (ticket sales) and strongly influence two others (concessions and parking). Based on attendance, Los Angeles was the strongest team, and Cleveland the weakest, over the 1969-1984 period.

Interestingly, and unremarked by Scully, the coefficient of variation[11] in attendance by team is higher now than it was in the early 1970s, in both leagues. This suggests that annual attendance may now be more sensitive to the underlying factors affecting it than it used to be. The range of ticket prices seems to have narrowed somewhat between 1980 and 1984.

Broadcast revenues have also climbed dramatically, with a sharp upward jump in 1984. The average annual (compound) rate of growth between 1960 and 1987 is 16.5% for national broadcast rights and 8.7% for local rights. (See Table 5.5, p. 108.) National rights have become more important, for most teams, than local broadcast rights. National league teams received, on average, slightly more for local broadcast rights than did Americal League teams in 1987 ($6.1 million compared to $5.8 million) (p.109). By 1986, broadcast revenues amounted to about 52% of team revenues (derived from Table 5.5, p. 109).

Individual teams do not have much control over national broadcast revenues, although they may have substantial ability to affect local broadcast revenues.[12] Nor do individual teams have any control over their market size, since movement between cities is regulated by the league. However, teams can undertake actions which can affect attendance. For example, teams could reduce ticket prices (and might be inclined to do so if it would increase revenues). Alternatively, teams might be able to raise their winning percentages, either by acquiring better talent, or by deploying their existing talent more effectively.[13] This provides teams with "levers" to affect revenue.

Scully models this process using a simple attendance equation, which he estimates (using data for 1984) as

$$ATT = -882 - 172*TPRICE + 3485*WPCT + 2858*WPCT_{-1} + 0.18*POP$$

11. Standard deviation of annual attendance by team divided by average annual attendance.

12. Indeed, there appears to be a fairly strong relationship between local broadcast revenues and (winning percentage and population).

13. It is impossible for all teams to increase their winning percentages simultaneously. However, each individual team may be able to engage in actions which will lead to that team having a higher winning percentage than it would have had had it done nothing.

where ATT is attendance (in thousands), TPRICE is ticket price, WPCT is winning percentage (current and lagged one year) and POP is the population (in thousands) of the metropolitan area in which the team is located (divided by the number of teams in the area) (see p. 112). Again, Scully does not present t-statistics for his coefficients, although all are statistically significant; the R^2 is 0.68.[14]

For the analysis of team ticket-pricing decisions, we want to know whether teams have selected the ticket price which seems to maximize profits. On the (reasonable) assumption that most of the costs of presenting a game are fixed, this would require that teams maximize ticket revenues. For an economist, this means that one measure of demand--the price elasticity of demand--should equal -1.

The point estimate of price elasticity of demand from Scully's attendance demand equation is -0.63. Given the restricted sample size (and consequent standard error of the estimate of elasticity), Scully argues that we cannot conclude that price elasticity of demand is unequal to -1. Scully's conclusion (p. 113) is, therefore, "there is no evidence that owners charge ticket prices any different from that which will maximize club revenues."

While it is true (in a statistical sense) that price elasticity of demand may be equal to -1 (and that teams may, on average, be setting ticket prices so as to maximize ticket revenue), it is also true that the point estimate suggests that demand is inelastic. This suggests that raising ticket prices would, in fact, raise revenue. Scully makes a valid point about this. He points out that the total "price" of attending a baseball game exceeds the ticket price, including such factors as transportation (and parking) and concessions. As a result, a 10% increase in ticket prices causes the total price of attending a game to rise by less than 10%, so demand is more elastic than this point estimate suggests. Scully suggests that ticket prices may be as little as 1/3 of total fan outlay on attending games, which would mean that the actual price elasticity of demand estimates from this equation is more like -1.9 than -0.63 (p. 113). If demand is price-elastic, then reducing the price would raise revenue.

Suppose, then, a team reduced ticket prices by 10%. This would cause the total price of attending a game to fall by 3.3%; with an elasticity of -1.9, attendance would rise by 6.3%, and ticket revenue would fall. Whether total team revenue would rise would depend on the team's share of parking and concession revenues. If parking and concession revenue is linearly related to attendance, then these revenue sources would rise by about 6%, while ticket revenue would fall by about 4%. Concession and parking revenue would have to be 1/3 or more of total ballpark revenue for total revenue to rise.

Conversely, suppose the team raised ticket prices by 10%. The total price of attending a game would rise by 3.3% and attendance would fall by 6.3%, as would parking and concession revenues. But ticket revenue would rise by about 4%. Again, concession and parking revenue would have to be about 1/3 of total ballpark revenue for total revenue to fall. Data presented by Scully for a representative team for 1984 (Table 6.1, p. 118) suggests that concession revenue is only about 25% of total ballpark revenue. Based on the point estimate of price elasticity of demand, we could conclude that higher ticket prices would generate additional revenue.

Scully also presents evidence which suggests teams have recognized this. Following a decade of declining real (inflation-adjusted) ticket prices (1970-1980), real ticket prices have increased by 7.6% between 1980 and 1986 (p. 105). In nominal terms, average ticket prices rose by nearly 48% (an annaul 6.7% rate). Clearly, teams saw an opportunity to raise ticket prices and have been taking advantage of it.

I am, parenthetically, unclear why Scully restricted his analysis of attendance to a single year. Expanding the analysis to additional years would allow a more precise estimation of elasticity and, therefore, a potentially stronger conclusion about club ticket-pricing behavior.

14. He also presents two other formulations of the demand equation; neither differs in important respects from this one.

The only possible explanation for using only 1984 data is that only 1984 data were available to him when he did his study; I find this extremely unlikely, given the wealth of data he presents in Chapter 6 on revenues and costs.

Other factors (per capita income; population characteristics) had no consistent effect on attendance, and were therefore not included in his final analysis.

Note that larger cities will have larger attendance. Other things equal (ticket prices, winning percentage), a team in a city with 1 million more residents will attract 180,000 more in paid attendance. A better team will attract more fans. An increase in winning percentage equivalent to winning one more game (from, e.g., .500 to .506) will increase attendance by about 21,000 fans. Also, there is substantial carry-over from last-year's record. Raising average ticket prices by $0.50 (e.g., from $6.00 to $6.50) will reduce attendance by 86,000.

Attendance is, therefore, sensitive to factors which are in the control of the team. By improving team quality, a team will attract larger crowds and thus additional revenue. Decreases in ticket prices will also increase attendance, but the effect on revenue is less clear; in fact, reduced ticket prices need not lead to higher revenue at all, on the basis of Scully's estimates.

B. Revenues and Costs. Scully then proceeds to the analysis of team revenue and costs, using detailed data, by club, for the 1980, 1982, and 1984 seasons. He restricts his formal analysis to the 1984 season (presumably for consistencty with his attendance estimates, but that is not made clear). Expanding his sample to the full data set available to him would roughly triple his sample size and thus allow him greater precision in estimating the factors affecting revenues and costs.

His revenue model parallels his attendance model, and is estimated as (p. 122):

$$REV = -12298 + 2.92*POP + 28884*WPCT + 26070*WPCT_{-1}$$

where REV is revenue (in thousands of dollars), and POP and WPCT are as before. Once again, t-statistics for the coefficients are not presented (although all coefficients are statistically significant) and the R^2 is 0.75.

One additional win is worth $173,000. A team in a larger city will take in more revenue (holding WPCT and $WPCT_{-1}$ constant, an additional 1 million population is "worth" nearly $3 million). Clearly, teams may have an incentive to increase their winning percentages.

Costs are harder to estimate, since teams sign player contracts before the season begins and thus may incur costs for players who perform a a level below expectations, who are hurt, etc. As a result, Scully suggests, "cost is more associated with ex ante or planned quality than with ex post or realized quality" (p. 125). One consequence may be that costs will be more closely associated with past than with current winning percentages, and so Scully finds (see p. 122). Furthermore, many of the (non-player) costs of a team may be quasi-fixed in nature, and thus not very responsive to current variations in winning percentage.

When Scully relates both total costs and total revenue to quality (holding population constant), he discovers that both rise at about the same rate as quality increases (with costs rising slightly faster). One problem with the graph in which he presents thses data is that it suggests that profits would be maximized (the gap between total revenue and total cost is greatest) when winning percentage is 0.000. This is clearly unlikely and suggests that the true revenue and cost functions must be non-linear with respect to quality. It may take expanding the sample size to include more years than 1984 to be able to capture this non-linearity.

C. Profits. Major league baseball teams, in the course of their negotiations with the Major League Baseball Players Association, have frequently made public (and less frequently private) claims that running a baseball team is not a profitable business. In many ways, Scully explodes that claim in Chapter 7. As he says (p. 126), "...there is a monumental paradox here. Why does the value of the franchise rise in the face of perennial financial losses? Since the 1950s

and 1960s, average franchise values have increased by" a factor of 10. The recent sale of the Seattle Mariners for about 5.5 times the price paid by George Argyros reinforces this point.

According to financial statements analyzed by Scully, the average major league baseball team reported larger and larger losses between 1974 and 1983. In 1984, Ernst and Whinney made forecasts of revenues and costs for major league baseball, which showed losses of nearly $7 million per team by 1988 (p. 127). So how can one dispute the claim of losses? Perhaps franchise purchasers believe they can do it better. Or perhaps they are not motivated solely by profits (which would still not explain the increases in franchise values).

Scully's answer is two-fold. First, the peculiar tax treatment of professional sports allows team owners to claim losses for tax purposes which are really substantial profits. Second, the accounting principles used by team ownership either understate the revenue flows or overstate the costs. This tends to occur most frequently when a team is owned as a part of a larger corporate enterprise.

The principal tax treatment which allows owners to show losses while earning profits is the depreciation of player contracts coupled with the expensing of player development costs. The notion of depreciation is that fixed assets wear out over time and that firms which expect to remain in business need to treat that wearing out as a cost of doing business. (Fixed assets are not expensed because, in a balance-sheet sense, the purchase of such an asset--say, a machine tool--leaves the value of the firm's assets unchanged.)

In major league baseball, player contracts are treated as fixed, but depreciating assets.[15] The costs of acquiring such assets take two forms: purchase of a team and player development Standard tax treatment would therefore suggest that if player contracts are depreciable, player development costs are equivalent to capital purchase costs and thus are not expenses for tax purposes. Based on Scully's data, player development costs averaged about $2.2 million per team in 1983 and depreciation of player contracts averaged about $2.3 million per team in 1983 (Table 6.1, p. 118). This suggests that reported team profits were understated by about $2 million per year in 1983, which was roughly equal to the average reported losses from baseball operations in 1983.

The ownership structure of baseball accounts for most of the other problems in interpreting reported team profits. As Scully points out, most baseball teams are part of larger corporate entities. In many cases, these larger entities have some direct financial link to the baseball club. The most important example is the sale of local broadcast rights.

In the mid-1980s, at least five teams were wholly or partly owned by the firm which also provided local television broadcasts for the team (Chicago Cubs, Chicago White Sox, Atlanta Braves, California Angels, Texas Rangers). Unless the sale of broadcast rights is conducted as an "arms-length" transaction, the team may receive less than a fair market price for these rights. This will inflate the profitability of the broadcast wing, and reduce the profitability of the baseball wing, of the corporate entity.[16] Based on Scully's data on local broadcast rights (Table 5.6, p. 107), only the White Sox received payments in excess of the major league average--and the White Sox received more than twice as much as did the Cubs. This, he argues, reduces reported baseball profits substantially.

In several cases, Scully finds examples of "General and Administrative Expenses" which seem out of line with those incurred by other teams [White Sox, Yankees, Oakland (where Scully comments that "some expenditures appear bizarre compared to other clubs"), Mets, Los Angeles]. These also

15. As Scully notes, this is due to the ingenuity of Bill Veeck, who first sought this tax treatment.

16. The other link of note was the ownership of the St. Louis Cardinals by Anheuser-Busch. Busch Stadium is owned by another subsidiary of A-B, and it is the stadium subsidiary which receives all parking and concession revenues. (See p. 139.)

appear to be disguised profits, as large as $1 million per year in the case of the Yankees.

Finally, Scully includes Roger Noll's observation that another way to disguise profits is to take them as interest payments on loans from the owner to the corporate structure. This works as follows: A group of investors establishes a corporation for the purpose of purchasing a team. They then lend the corporation (the bulk of) the funds required to purchase the team and pay themselves interest on these loans. Two examples: The Yankees paid George Steinbrenner $2.4 million in interest in 1982; the Oakland As (the "least profitable" team in Scully's time frame) paid $1.4 million in interest to the team's owners (p. 138). These simply appear to be disguised profits.

Following these adjustments, team ownership appears to be a profitable activity. The profits would appear to have averaged about $0.8 million per team in 1982 (Table 7.2, p. 136); with the increased broadcast rights to be received in the 1990s, team profitability seems likely to rise, if anything. The rash of large, long-term contracts teams have offered to free-agents this winter reinforces this view. Nonetheless, these small profit levels could not support or justify purchase prices such as those we have observed; the returns would average about 2% per year at this level. Clearly, in addition to the current profitability of major league baseball, current purchasers expect franchise values to continue to rise.

Another potential channel for team profits is for them to be shared with players, in the form of salaries which are larger than player productivity would justify. If that is the case, then the real pofitability of teams is even larger than suggested above. We can investigate this by looking at player salaries and performance.

III. Labor Market Issues in Major League Baseball

A. Player performance and Salaries. In "Pay and Performance in Major League Baseball," Scully developed the model for the analysis of player salaries which he uses in this book. This is a two-equation model which permits the estimation of marginal revenue product for individual players. The first equation is a revenue equation, in which team revenue is a function of team winning percentage and the population of the city in which the team is located. (See the discussion in Section II above.) For 1984, the most recent year for which revenue data are available for this book, the estimated equation (R^2 = 0.69) is[17]

REV = -1877 + 31696*(WPCT)
+ 3.31*(POP)

where all variables are measured for 1984.

The second equation accounts for player performance inputs into team winning percentage, and is, in effect, a production function for winning. Developing this equation requires consideration of the process by which teams generate wins and identifying the principle player performance inputs into that process. Winning a game involves scoring more runs than the opposing team and thus has two components: scoring runs (offense) and preventing runs (defense). A model of winning percentage thus must consider both these aspects of player performance.

Scully argues that "[p]erformance is best measured by the slugging average and the strikeout-to-walk ratio" (p. 154), the same variables he used in his 1974 paper. The model[18] is estimated, using 1984 data,

17. See p. 205, n. 11 of the book. Standard errors for the coefficients are not provided. Note also that this differs from the revenue equation presented earlier, in that the prior year's winning percentage is not included. No explanation for this alteration is provided.
18. The regression is not presented in the text or in the endnotes; I have estimated it from 1984 data in Bill

as (t-statistics in parentheses; R^2 = 0.284):

$$WPCT = -0.04 + 0.64*SA + 1.114*(KTW)$$
$$\qquad\qquad (1.36) \qquad (2.74)$$

This seemed to me when I first read "Pay and Performance in Major League Baseball" and seems to me now a mistake, both in its implicit analysis of offense and in its implicit analysis of defense.

In order to carry out a simple analysis of team offense, we want to identify the characteristic of team offense which is most closely associated with scoring runs. Using data from the 1984 season,[19] we can calculate the simple correlation coefficients between various indicators of team offense and runs scored:

Indicator	Correlation With Runs Scored
Slugging Average	0.879
On-Base Average	0.926
Batting Average	0.755

If these correlations are consistent over time (and other research suggests they are), then the "best" indicator of team offense is not team slugging average, but team on-base percentage.

Furthermore, combining information on on-base percentage and power (measure as slugging average minus batting average, to avoid effectively double counting batting average) provides even better information about team offense. This suggests Scully could have improved the efficiency of his estimates by using slightly different indicators of team offense.

The analysis of defensive performance can also be improved. Defense involves preventing runs, so a search for a simple defensive indicator involves looking for measures which are closely correlated to runs allowed. Using data, again, for 1984,[20] we can calculate the correlations between indicators of team defensive (pitching) performance and runs allowed:

Indicator	Correlation With Runs Allowed
Slugging Average*	0.604
On-Base Average*	0.843
Batting Average*	0.806
K-to-W Ratio	0.554

*Measured as opponents' slugging average, etc.

The strikeout-to-walk ratio is the worst of these indicators. Once again, (opponents') on-base average is the best. This suggests modeling winning percentage not as Scully has done, but using team's and opponents' on-base percentage. (In the regression, in order to estimate a pitcher's contribution positively, opponents' on-base percentage has been subtracted from one; a higher value of (1-OOBA) is therefore a better performance and should lead to a higher winning percentage.) When we do, we estimate the following equation (t-statistics in parentheses; R^2 = 0.51):

$$WPCT = -2.43 + 3.29*OBA + 2.77*(1-OOBA)$$
$$\qquad\qquad (3.96) \qquad (3.70)$$

Not only are both coefficients estimated with greater precision, the explanatory power of this regression is nearly twice as great as Scully's, yet requires no additional information. Second, this approach is theoretically more satisfying, since it suggests that the same factors affect runs scored and runs allowed.[21] Finally, this equation can be used in precisely the same way as Scully's to estimate player marginal revenue products.

James, The Bill James Baseball Abstract: 1985, Ballantine Books (New York: 1985).

19. Data from Ibid.

20. From Ibid.

21. I never understood why, if the strikeout-to-walk ratio was the best measure of defense--of runs allowed--it was not also the best measure of offense--runs scored.

Consider, for example, the Most Valuable Players in the National League (Ryne Sandberg) and in the American League (Guillermo Hernandez) in 1984--one batter and one pitcher.

Sandberg's OBA was 0.367; he had 11.4% of his team's plate appearances, a contribution to team OBA of 0.042 (0.367*0.114). This raises team winning percentage by 0.138 (3.289*0.042) and thus generates approximately $4.4 million in team revenue, based on the coefficients in Scully's revenue equation shown on p. 11 above.[22]

Hernandez allowed 24.8% of the batters he faced to reach base (OOBA = 0.248); he pitched to 8.9% of the batters his team faced. His contribution to (1-OOBA) was 0.067; the contribution to winning percentage was 0.185 (0.067*2.765). Based on Scully's revenue equation presented on page 11 above, this was worth about $5.9 million.

Because Scully's MRP calculations are flawed, the equations he uses to examine player salary are also flawed. He uses career statistics [slugging average for non-pitchers and strikeout-to-walk ratio for pitchers; (the log of) career length; and percentage of team at-bats or innings pitched over the career] to explain (the log of) player salaries. His results for 1986 salaries are (from p. 158; he does not present significance information on the coefficients; R^2 = 0.78 for hitters and 0.60 for pitchers)):

$$\ln(SAL) = 10.06 + 1.9*SA + 0.56*\ln(YRS) + 17.56*PCTAB - 0.29*(FA85)$$

$$\ln(SAL) = 10.53 + 0.23*(KTW) + 0.60*\ln(YRS) + 10.02*PCTIP - 0.99*(FA85)$$

My difficulties here begin with the difficulties noted above in his examination of marginal revenue products. Clearly, if slugging average and strikeout-to-walk ratio are incorrect measures of offense and defense, they should not be used here. Second, some provision should be made for salary (eventually) to turn down with experience. We know, for example, that as player skills erode, players frequently are able to remain in major league baseball only by accepting salary cuts near the ends of their careers. Third, Scully examines the effect of free agency on 1986 salaries only by looking at the effect of free agency between the 1985 and 1986 seasons. Yet players who were free agents prior to 1985-86 may have some "carry-over" effect on their salaries which will be missed in this estimation. Finally, this salary equation misses a potential "arbitration" effect for players in years 4-6 of their careers--eligible for salary arbitration, yet ineligible for free agent status. Work by Lawrence Hadley suggests that these are not merely academic concerns.

What has happened here, and the reason I have spent so much time on this issue, is that Scully seems not to have reconsidered his analysis of the determinants of player salary and marginal revenue product. As a result, earlier analyses which really did break new ground have been left to stand without bringing to bear on them new data, or new insights into the production and salary determination process. For anyone who has read "Pay and Performance in Major League Baseball," Chapter 8 of The Business of Major League Baseball provides no new insights.

B. Arbitration. His discussion of the effects of arbitration raises one interesting issue which he does not pursue enough. He notes that "weak" franchises--which seems to mean franchises in smaller markets--have had a disproportionately large number of cases proceed to arbitration. His explanation, which is almost thrown away, is that these teams have the most to gain from arbitration if they win and can trade the players if they lose.

22. This is probably an over-estimate of Sandberg's MRP, since it implicitly assumes that his team would have been forced to replace him with a player with an OBA of 0.0 had he been lost (e.g., to injury). The "correct" procedure is to look at the increase in OBA provided compared to a "replacement" level player, available, e.g., at the major league minimum salary. A smiliar argument holds for estimating the effect of pitchers; the calculation assumes that Hernandez would have been replaced by a pitcher with an OOBA of 1.0.

Surely this could be subjected to a statistical test. Is the "spread" between final positions larger for weaker franchises? Do these teams, if they lose, actually trade these players more often? Based on his earlier analysis of team profitability, three teams sustained large losses in 1982 and 1984 (Oakland, Montreal, and Pittsburgh), with two other teams (Seattle and Texas) sustaining losses in both years (see p. 124). In 1986-87, these five teams accounted for 10 (five "wins"; five "losses") out of 61 arbitration cases (Seattle accounted for six of these; see pp. 163-164). The median spread for all players in arbitration in these two years was about 35%; 5 of the ten players involved from these teams were above the median. Only Seattle had more arbitration cases than "expected." Seattle won three and lost three. Of the five Seattle players involved (Phil Bradley went to arbitration two straight years and won both times), only one (Alvin Davis) is still with the team.[23] This seems tentatively, but not strongly, to support Scully's position, but the quality and quantity of the data are poor.

Scully also argues that arbitration outcomes are closer to random than to determined by the merits of the cases, in part because the probability of winning is about 50%, both for the player and for the club:

> There is some evidence to support the conclusion that the decisions in arbitration are not based on merit but on an even splitting among adversaries. Most observers of the decision-making process in arbitration suggest that arbitrators split the difference where they can; even if they cannot split the difference between salary demand and salary offer..., arbitrators can split the number of decisions between players and owners and thereby emerge with a reputation of fairness...Of the fraction of player repeats in arbitration a very substantial number obtain just the opposite ruling a year later, despite the fact that changes in their performance data were not dramatic...(p. 162).

It is worth noting that when James Dworkin examined arbitration outcomes for the first eight years in which final-offer salary arbitration was available to players, he came to precisely the opposite conclusion[24]:

> Using the very simple model...above, one is able to correctly classify 84 percent of the arbitration cases. That is, based on the predictions of the model, 80 percent of the hitters' and 90 percent of the pitchers' cases can be properly predicted as to whether it is most likely that the club or the player will prevail at arbitration.

C. Free Agent Salaries and Owner Collusion. Scully's examination of the effects of free agency on player salaries (pp. 165-170) is an extension of his work on salary determinants discussed above. Because player MRPs, for a given level of performance, tend to be higher on teams located in larger cities, he predicts movement, on balance, from teams in smaller cities to teams in larger cities.[25] This does appear to have occurred, although Scully does not present any formal analysis of the movement of free agents.

It is also the case, although Scully does not mention it, that players of a given quality level will (presumably) add more the winning percentages of (and thus have higher MRPs on) worse teams. So movement of free agents among teams seeking to maximize proftis should be from better to worse teams. This also appears to have happened.

Scully uses his analysis of free agent performance and salaries to examine whether owner collusion seems to have had an effect

23. Mike Moore left as a free agent; Phil Bradley was traded; Ken Phelps was traded; Bill Kearney was released.

24. Dworkin, op. cit., p. 171.

25. Controlling for team composition. A player with a given set of performance characteristics will add less to a team with more "stars" than to a team with fewer "stars," and so movement need not be solely from smaller cities to larger cities.

on free agent salaries. His conclusion is that collusion has depressed salaries of 1986 free agents by around $120,000 per year for position players and by around $270,000 per year for pitchers (the effects are even larger in 1987). This effect on salaries shows up despite the fact that there is no fall-off in performance by free agents (p. 168). Note that his conclusion is based on the effects on salaries of players who were free agents between the 1985 and 1986 (or 1986 and 1987) seasons.

D. Discrimination by Race in Major League Baseball. Before 1947, there had been no black players in major league baseball for over 50 years. Today, around 25% of players are black. This leads Scully to comment (p. 171) that "[b]aseball has taken on the appearance of a white man's game which employes well-paid black gladiators," all the more so because blacks (and Latins) are almost completely missing from administrative and managerial roles. Scully estimates (p. 172) that, "[i]n 1987, there were a total of 84 Latin and black professional employees in the front offices in the major leagues, or on the coaching staffs in the majors or minors," about 5% of such positions.

Why, Scully asks, is this the case? And does it accompany salary discrimination as well? After a brief review of the history of employment discrimination in major league baseball (pp. 172-175)[26], Scully addresses entry barriers and continuing discrimination. After 1947, employment discrimination may continue to appear in the form of higher performance requirements for black players than for white players, an issue first raised, as Scully points out, by Aaron Rosenblatt. Scully outlines the evidence that exists for this proposition, and notes that the ratio of black-to-white batting averages has consistently been greater than 1.0, but has declined since the mid-1970s (pp. 175-176). Data I have developed for 1986 suggest that the performance differential in favor of blacks, however, persists.

A concomitant of the greater performace for blacks is that blacks in the major leagues are more likely to be regulars. In 1986, again based on my analysis, about 25% of all position players were US-born blacks, while nearly 40% of the regular players (those with 400 or more at-bats) were blacks. This suggests teams are much more likely to use whites rather than blacks to fill the "fringe" player positions.

Scully discusses two arguments for the historically greater productivity of black players (p. 175). The first is that the distribution of abilities is different among blacks and whites, suggesting that blacks are more highly represented among players with higher abilities and less highly distributed among "fringe"-skill players. This involves highly arbitrary assumptions about these distributions, and, as Scully notes: "there is no evidence whatsoever to support it."

The second argument suggests that wage discrimination in society as a whole leads to different supply elasticities to baseball by race. However, Scully notes that this cannot explain performance differentials (p. 175):

> The superior financial opportunities in baseball would attract mediocre as well as superior black players, so that the net effect on racial performance differentials is unclear. The supply of players at any given ability level is determined by the elasticity at that level of ability. Given societal wage discrimination the supply of black players will be greater than that of whites. So, the higher fraction of black players is expected. However, as one goes up the ability distribution, the baseball-nonbaseball wage differential widens and the supply elasticity declines. At the level of "star" the supply of talent of both races is perfectly inelastic with respect to salary, which is to say that

26. The interested reader will also wish to consult Robert Peterson, Only the Ball Was White, Prentice-Hall (Englewood Cliffs, NJ: 1970); Donn Rogosin, Invisible Men: Life in Baseball's Negro Leagues, Atheneum Publishing Company (New York, NY: 1983); and Jules Tygiel, Baseball's Great Experiment: Jackie Robinson and His Legacy, Oxford University Press (New York, NY: 1983), among others.

owners cannot produce additional stars simply by raising salary. If ability distributions are racially invariant, the proportions of "stars" are racially invariant.

We are left, Scully notes, with discrimination by race as an explanation of the performance differentials.

Blacks also, apparently, face additional discrimination. Blacks in the major leagues are disproportionately positioned in the outfield; further, the proportion of blacks in the outfield has been growing over time (in 1960, 1/3 of all outfielders were black; in 1986, 70% were black--see p. 177). Scully's discussion of potential explanations for this phenomenon (unavailability of coaching, etc.), leads him to conclude that discrimination by race also has affected player position assignments.

There is not, however, any remaining salary discrimination in major league baseball. In conventional earnings regressions, the coefficient on a dummy variable for race invariably takes on a value indicating lower salaries for blacks. This is not the case for baseball salaries (see p. 178), although Scully did find evidence of salary discrimination as recently as 1968-69. As Scully notes, the average black player in 1986 earned $81,000 more than the average white player--compensating black players for their higher performance levels and greater playing time.

Blacks, then, face entry and position barriers in major league baseball, although they are no longer receiving lower salaries than their performance calls for. Does this explain the under-representation of blacks in managerial positions in baseball? Scully suggests it does. Recall that blacks have been, disproportionately, assigned to the outfield. Managers have come, disproportionately, from three positions--catcher, second base, and shortstop (approximately 2/3 of the 88 major league managers in the 1947-1967 period played one of these positions--see p. 179). This distribution of managers by position continued in 1986; of 35 people who served as managers, 19 played one of those three positions either in the major leagues or in the minor leagues (see p. 180). If managers serve playing apprenticeships in specific positions, and if blacks are excluded from those positions, then blacks will wind up being excluded from managerial positions.

E. Managerial Quality in Major League Baseball. As major league baseball has expanded from 16 teams in 1960 to 26 teams today, people frequently have lamented the decline in player talent which has accompanied additional teams. Very few people, however, have also commented on the potential this has had for declining managerial quality. After, all, there are 10 major league managers (and general managers, and directors of player development and...) today who couldn't have had jobs before expansion.

Gerald Scully pioneered the examination of managerial quality.[27] He updates and revisits his earlier analysis in Chapter 10. His argument is simple: A more efficient (effective) manager will achieve a greater winning percentage from a given set of player inputs than will a less efficient (effective) manager. This requires, Scully says, that "the efficiency of a manager must be measured independently of the level of team playing strength."

I think Scully goes too far here. By implying that a manager merely takes the talent made available to him and tries to deploy it as well as possible, Scully overlooks the responsibility of a manager for helping to select that talent. Both in the final selection of players to be on the team's roster (at the conclusion of srping training) and in identifying a team's talent deficiencies and gaps, a manager has--or ought to have--a great deal of responsibility for team composition and talent.

The difficulty of identifying efficient or effective managers remains. Scully's approach is to estimate what are called "frontier" production functions for winning percentage, using performance variables in addition to specific dummy variables for each manager. In a frontier production function, all the observations lie on or

27. Philip K. Porter and Gerald W. Scully, "Measuring Managerial Efficiency: The Case of Baseball," Southern Economic Journal, January, 1982, pp. 642-650.

below the estimated function--no one is allowed to be more productive than the estimated function. By identifying specific managers in the estimation process (each manager is identified by a dummy variable), he is able to estimate the contribution of managers to winning percentage.

When he does this, he discovers that the two key determinants of managerial efficiency are experience (efficiency peaks at about 12-13 years of managerial experience) and tenure with a single team (changing teams reduces estimated managerial efficiency by, on average, five percentage points). The first of these findings is, perhaps, predictable. The relationship between efficiency and experience is estimated from a time-series/cross section regression of annual managerial efficiency estimates (see. fn 2, p. 186). Because of sample selection bias and censoring, inefficient managers are unlikely to obtain much experience, so the estimated coefficient on experience will be positive, even if no individual manager improves his efficiency over time. Team changing means a manager will have to devote more effort to learning the strengths and limitations of his players, so this effect is also somewhat predictable.

Because the longevity effect cannot be taken to "explain" managerial efficiency (in fact the causation probably is from-managerial efficiency to longevity). we do not know what attributes of managers make them efficient, or whether there is a set of attributes common to those managers whom Scully identifies as the most efficient. This remains an interesting area for further work. In any event, his estimates of managerial efficiency are probably biased and, therefore, incorrect. Scully uses team slugging percentage and team strikeout-to-walk ratios as his performance variables. I argue above that this incorrectly specifies the production process and therefore the use of these variables probably biases his identification of managerial efficiency.

When Scully looks at managerial efficiency by team, an interesting result emerges. Teams with higher winning percentages also have more efficient managers (see Table 10.2, p. 187); the simple correlation between winning percentage and efficiency in 0.952. This means that teams with high winning percentages--and therefore, on average, higher performance levels--also use their resources more effectively. This is not a priori implausible, in fact it makes a great deal of sense, but it does contradict Scully's suggestion that managerial efficiency be measured independently of team playing strength and it also lead to an interesting question.

Are we actually measuring on-field managerial efficiency here, or a more general ability of certain teams to acquire and develop talent? If the former, then the aspects of managerial decision-making which affect player performance need to be studied. If the latter, then the contributions of individual managers may well be more a result of their abilities as evaluators or acquirers of talent than anything else.[28] Our answer to this question, if we can find one, may tell us a great deal about the real importance of managerial performance.

This is important, because Scully uses his rankings of managerial efficiency to discuss managerial contribution to team winning percentage and thus to team revenue. If his estimates are correct, then the best managers are "worth" much more than they are paid. He calculates that, on average, Earl Weaver was "worth" about $2.5 million per year more than the average manager. Unfortunately, we cannot determine what the average manager is "worth," since the average manager adds, on average, nothing to team winning percentage in this analysis.[29]

28. In this respect, it is worth noting that Scully assigns little or no resposnibility to the manager for the composition of the team (p. 183): "...the efficiency of a manager must be measured independently of the level of team playing strength."

29. It also suggests that Don Zimmer--who was about 3% less efficient at San Diego, Boston, and Texas than the "average" manager has a negative MRP of about $600,000 per year.