THE
QUARTERLY JOURNAL
OF ECONOMICS

Vol. CV August 1990 Issue 3

CUSTOMER RACIAL DISCRIMINATION IN THE MARKET FOR MEMORABILIA: THE CASE OF BASEBALL*

CLARK NARDINELLI AND CURTIS SIMON

Because consumer discrimination can reduce productivity, it is often impossible to tell whether differential productivity is the effect of discrimination or of differential ability. Detailed data for the sports labor market make it possible to separate consumer discrimination from ability. We use a unique approach to determine whether the entertainment value of baseball players is related to their race: we examine whether race directly affects the value of a player in the market for baseball cards. In contrast to studies that use salaries, there is no room for owner or coworker discrimination. Our evidence supports the hypothesis of consumer discrimination.

I. INTRODUCTION

Economists have long attempted to explain the persistent wage gap between blacks and whites. The usual practice is to specify an empirical model that relates earnings to individual characteristics, such as education, training, experience, and age, in an attempt to control for productivity differences across individuals. Remaining differences in earnings between races are attributed to discrimination.[1] If the residual wage gap between races is accepted as evidence of racial discrimination in labor markets, the question arises: what type of discrimination? Becker [1971] identified three principal sources of discrimination: discrimination by employers,

*We acknowledge the helpful comments of William Dougan, Lawrence M. Kahn, Raymond Sauer, John Warner, and an anonymous referee. We alone are responsible for all errors and omissions.

1. For an exception see Kamalich and Polachek [1982]. For a criticism of Polachek's approach, along with a reply, see Blau and Kahn [1985] and Kamalich and Polachek [1985].

discrimination by fellow workers, and discrimination by consumers. Employer discrimination, often discussed in the popular press, is highly unlikely to persist in competitive labor markets. If workers are mobile in the long run, self-sorting by workers will cause coworker discrimination to disappear in the long run.[2]

A more likely source of the continuing wage gap, then, is consumer discrimination. Empirical studies indicate that such discrimination exists. Yinger [1986] found that it led to racial discrimination in Boston housing markets. The study of consumer discrimination in labor markets, however, faces a serious problem: consumer discrimination is difficult to measure. A key assumption in Becker's model is that blacks and whites are equally productive. Yet, consumer discrimination can directly reduce productivity, making it impossible to tell whether differential productivity is the effect of discrimination or of differential ability to do the job. For example, if black realtors sell fewer houses than white realtors, is it because black realtors know less about houses, or is it because house buyers and sellers discriminate against blacks? Unless ability can be measured, this question cannot be answered.

Although ability is nearly impossible to measure in most labor markets, there is an important exception: the sports labor market. The appeal of sports for studies of discrimination is that it is possible to separate consumer discrimination from ability to do the work. Professional sports firms produce entertainment. The entertainment value of a sport is directly related to players' abilities and to the way consumers repond to those abilities. The detailed data on individual athletic performance permit the separation of consumer response from other measures of performance.[3]

For example, in a recent study of the National Basketball

2. Arrow [1972] argued that nonconvexities in the cost of adjusting the firm's labor force could cause wage differentials arising from employer or coworker discrimination to persist in the long run. That is, if there is a capital cost associated with the addition of a worker to the labor force, employers may try to avoid replacing white workers by black workers (and vice versa). A recent study by Lindsay and Maloney [1988] empirically tested for the existence of coworker discrimination against women. They pointed out that the costs of sorting vary inversely with labor market size. Their empirical tests gave no support to the coworker discrimination hypothesis against females. Another possible source of discrimination is imperfect information. If individual data (education, experience, and so on) do not communicate productivity perfectly, information on race and sex may enable the employer to predict productivity more precisely. If this is the case, otherwise identical individuals of different race or sex may be paid differently. McCall [1972] and Spence [1973] were among the first to develop models of statistical discrimination.

3. What is crucial, is that omitted variables that measure players' abilities be uncorrelated with race. In most studies using data from other (nonsports) labor markets, this is usually not the case. This issue will be addressed below in Section IV.

Association, Kahn and Sherer [1988] find a 20 percent wage gap between blacks and whites, holding constant measures of performance. Kahn and Sherer reject employer or coworker discrimination as the source of the wage gap, because buy-outs by nondiscriminators or segregation by firm should reduce these sources of discrimination. Furthermore, Kahn and Sherer find strong circumstantial evidence that the wage gap results from customer discrimination: basketball attendance is strongly and positively related to the proportion of team members who are white, holding constant other factors.

Kahn and Sherer's evidence of consumer discrimination is suggestive, but indirect. Other evidence, although casual, suggests that discrimination indeed exists in the sports labor market. For example, it is widely believed that white sports heroes receive far more offers for endorsements than black sports heroes of equal ability.[4]

In this paper we use an unusual approach to determine whether the entertainment value of baseball players is related to their race. Previous studies, such as that of Kahn and Sherer and recent work on discrimination in baseball [Raimondo, 1983; Hill and Spellman, 1984], focus primarily on salaries. By contrast, we examine whether race directly affects the entertainment value of a player in the market for baseball cards. We ask whether a player's race affects the price consumers pay for a given card. Advantages of studying this market rather than players' salaries are as follows: (1) the data are readily available; and (2) in contrast to players' contracts, which are often complex documents containing performance clauses, the prices of baseball cards are measured with comparatively little error. In contrast to studies of salaries, the link between consumer racial attitudes and the price of baseball cards is direct. There is no room for owner or coworker discrimination.

II. THE BASEBALL CARD MARKET

The defining characteristic of collectors is a serious interest in baseball. The market for baseball cards has long ceased to be the domain solely of children. Most serious collectors are adults.

4. An unnamed individual quoted in a recent *Wall Street Journal* [October 18, 1988] argued that "black athletes must be more famous, more accomplished, and more personable than their white counterparts to make it in the endorsement business."

Children have not bid the price of a near-mint 1952 Mickey Mantle Topps baseball card to $6,000 and the price of a near-mint 1952 Willie Mays Topps baseball card to $900.[5] Although baseball cards are still sold in bubble gum packages, they are also sold in large packages, often as complete sets or as subsets. There are thousands of full- and part-time dealers, clubs, and conventions.

Although some small regional price differences persist, the market for used and new cards is national. Beckett's *Official 1989 Price Guide to Baseball Cards* has set the standard for price guides in the hobby, and was therefore chosen as our source for prices.[6] The supply of a particular card is a fixed quantity. In general, the older the card, the rarer the card. For old cards this rarity is a combination of smaller initial production and greater deterioration of the existing stock of cards. Indeed, it is difficult to find top-condition cards for some years. For more recent cards the scarcity is primarily caused by depreciation.

We analyze the determinants of the 1989 price of the complete set of mint Topps baseball cards issued for individual players in 1970, as reported in the 1989 edition of Beckett's price guide. Although four companies, Topps, Fleers, Donruss, and Score issued full sets of cards in 1988, Topps had a virtual monopoly on bubble gum cards from 1956 to 1980. Our need for an older card set (for reasons discussed shortly) required the use of Topps cards. Before we discuss the reasons why we chose the year 1970, we provide some background information on the baseball card market.

The value of a player's card is determined largely by two factors: (1) career performance; and (2) the scarcity of the card, which is related to the age of the card and the number originally printed. Art counts for very little.[7] A player's lifetime performance is the primary determinant of the demand for a player's card. If the differences in ability are sufficiently large, it is virtually certain that the card featuring the better player is more valuable. Henry Aaron (755 career home runs) is invariably more valuable than teammate Hawk Taylor (16 career home runs). Older cards are scarcer, and therefore more valuable. The player's performance in the year the

5. Our source for these prices was the Beckett [1989] price guide, described below.

6. Other publications that serve the hobby include *Baseball Cards* and *Baseball Card Price Guide Monthly*. The differences in prices between Beckett and these other guides are small.

7. Artistic design affects the value of a card only to the extent that it affects card longevity. For example, cards with colored borders (e.g., Topps, 1962 and 1971) physically deteriorate more rapidly than others.

card was issued is largely irrelevant. A 1957 Topps Willie Mays ($100) is more valuable than a 1965 Topps Willie Mays ($40) because it is older and rarer, not because Mays had better years in 1956–1957 (71 home runs in the two years) than 1964–1965 (99 home runs).[8]

We chose the year 1970 to avoid having to account for differential information about young and old players. There is a brisk speculative demand for the cards of young players because dealers and collectors attempt to forecast the future superstars of the game. A young, but promising, player will therefore often sell for more than a better, but older, player who has already established a level of performance below superstar level. By choosing 1970 cards, we have no young players (as of 1989). Nearly all the players in the sample were retired by 1988, and those who had not yet retired (Sutton, Carlton) had already established their career performance levels.

Cards before 1974 were issued in series, each of which was made available to the public sequentially throughout the baseball season. Because interest in baseball cards waned toward the end of the season, Topps produced fewer cards for series later in the set. Cards issued later in the season therefore sell at higher prices, other things equal.

A curious aspect of the market is the peculiar attraction of certain players. All else the same, Mickey Mantle (who is not in our sample) is always the most valuable card in a set. Other favorites include Pete Rose and Carl Yastrzemski. Although it is not surprising that such great players are highly regarded by card collectors, it is surprising that they are so much more highly valued than other great players. The 1963 Topps Stan Musial sells for $35, and the 1963 Topps Yastrzemski sells for $50. Yet, Musial is considered much the greater player in 49 of the 50 states and most foreign nations.[9]

8. The value of a card issued in a particular year may be related to events in a player's life in that year, such as winning the Most Valuable Player award. We have not undertaken a systematic study of such effects, however, because career performance explains most of the demand for a player's card.

9. Comparisons involving Mantle are even more striking. Even accounting for relative scarcity, Mantle cards are *always* more valuable than those of any other player—in some years his cards are more than double the price of the second most valuable card. The Mantle phenomenon is probably related to his charisma. Mickey Mantle, Pete Rose, and Reggie Jackson had it; Stan Musial, Henry Aaron, and Warren Spahn did not. The charisma of players, which is not measurable by the researcher, is one component of the error term.

III. Measuring Player Performance

The appeal of sports for tests of the discrimination hypothesis is that performance is more easily measured than in other occupations. Baseball probably generates more data on performance than any other sport.[10] Despite the wide array of useful and often sophisticated measures, it is difficult to compare the performance of different players. A long list of small factors affects a player's numbers.

For example, ball parks have different dimensions and surfaces, not to mention aerodynamics, complicating comparisons between players. A hitter who played his entire career in a pitcher's park such as Los Angeles's Dodger Stadium will have lower performance statistics than if he played in a hitter's park such as Chicago's Wrigley Field. Park differences pose similar problems for pitchers.[11] Although park adjustments have been devised, it is infeasible for us to use them. Few players spend their entire career in one park; individual players change clubs; and whole teams commonly (in our sample) moved to new parks. Park adjustment calculations would therefore be exceedingly time-consuming. Another reason we do not make the adjustment is more easily justified: park illusion exists. Most followers of baseball truly believe that the Boston Red Sox and the Chicago Cubs have consistently good hitting, though often (especially in Chicago) the belief is pure park illusion.[12] If we are studying consumer preferences, the unadjusted numbers tell the story.

We also decided against putting in a variable for team location or team performance. Players switch teams, and teams themselves fluctuate in quality. Such differences will tend to wash out over time. It is possible, however, that individuals who played in

10. Although no one source includes all data of interest, the Macmillan *Baseball Encyclopedia* is an extraordinary compendium of data; *The Sports Encyclopedia: Baseball* is nearly as complete. Other important sources include the *Sporting News Official Baseball Guide* and other *Sporting News* publications, the *Elias Baseball Analyst*, the *Great American Stat Book,* and publications of the Society for American Baseball Research. Countless other publications, large and small, produce an array of new and interesting numbers. For a survey of various statistical and other sources, see Chapter 3 of Tomlinson [1987].

11. The problem may be smaller, however, because many of their performance measures (wins, losses, possibly strikeouts, and walks) are less likely to be affected by the home park of the pitcher; both the home team and visiting team pitchers pitch under the same conditions.

12. In 1970 the Los Angeles Dodgers and their opponents combined scored 625 runs in Dodger Stadium, but they and their opponents scored 807 runs in games played away from Dodger Stadium. The Chicago Cubs and their opponents scored 865 runs in Wrigley Field, Chicago, but 620 runs away.

postseason (playoff and World Series) games received greater attention and therefore are in higher demand by collectors. We therefore controlled for the number of postseason games played by hitters and the number of postseason innings pitched by pitchers.

Comparisons over time are even more problematic, even when performance according to the numbers is comparable. Consider two players with seemingly comparable statistics: Ken Williams in 1922 (39 home runs, 159 runs-batted-in, .332 batting average, .627 slugging average) and Billy Williams in 1972 (37 home runs, 122 runs batted in, .333 batting average, .606 slugging average). Because of numerous factors, including the trend of ballparks to become less favorable to hitters, possible changes in the ball, and advances in the "science" of pitching, Billy Williams faced much tougher competition than did Ken Williams.[13] Although formulas have been developed for comparing players of different eras, these formulas use a single index approach.[14] Such adjustments do not serve our purpose because—as explained below—we reject the single index approach to measuring performance.

The problems that arise when comparing players from different eras are reduced by including in our sample only players active in 1970. Index problems still arise—1955–1972 is not the same as 1969–1986—but errors arising from this source should be comparatively small. The most important problem that arises is that, holding constant the number of cards originally printed, the remaining stock of cards of players may differ systematically with a player's age. If a young player had not yet established himself as a star in 1970, collectors might not have saved as many of his cards as those of an already established star. The then-young player's card may now have a higher value than the older player, all else the same. In preliminary regressions not reported below, we entered each player's year of debut as a control variable. We expected year of debut to positively affect the card price. Because there were no cases in which debut year was either significant or caused our other results to change materially, we dropped this variable from the analysis.

Despite the errors in the measurement of player performance, the estimates of the effect of race on card price will be unbiased as

13. The league batting and slugging averages were .284 and .397 for Ken Williams, but only .248 and .365 for Billy Williams.

14. For example, the batting performance of two players in different years can be compared by comparing the ratio of each player's average to the mean batting average in that year.

long as these errors are uncorrelated with race. None of the factors discussed above should affect players of one race more than another.

A wide variety of measures of performance can be used as explanatory variables. Summary measures that attempt to rank players by using a single number are computed from basic statistics such as singles, doubles, triples, home runs, walks, and so on. Because these indexes impose econometric restrictions that may be rejected by the data, we rejected the single-index approach in favor of entering each of the rudimentary statistics as explanatory variables. This procedure allows the data to speak as to how card collectors value a given measure of performance. The raw statistics are collected from the Macmillan *Baseball Encyclopedia* (seventh edition).

IV. Empirical Framework

A. The Common Player

Although the price of baseball cards is related to the entertainment value of a player, most baseball cards sell at what is called the "common player" price. The price of the common player is the minimum value a card can take, and is unrelated to the performance of the player. Even the worst player's card commands a positive price because it has intrinsic value as a card.

As we mentioned earlier, card sets issued before 1974 were issued in series throughout the baseball season. Later series, issued when interest in baseball cards had waned, therefore tend to be rarer and command higher prices. Table I shows the common player prices and frequencies in our sample. Six series of cards were issued in 1970. Common player prices range from \$0.20 to \$1.50. About 70 percent of the hitters and 80 percent of the pitchers sell at the common player price, which introduces a censored dependent variable problem. The next section shows how we correct for this problem.

B. The Model

Assume that the utility that fans receive from a player's lifetime performance, V, is linearly related to a vector of the player's characteristics, X:

$$V = \beta' X, \quad (1)$$

TABLE I
PERCENT COMMON PLAYERS AND COMMON PLAYER PRICES (IN DOLLARS)

Player ID	Number of players	Percent common players	Common player price	Maximum card price	Mean card price
A. Hitters					
1–132	61	72.1	0.20	18.00	0.538
133–263	67	73.1	0.25	35.00	1.095
264–459	93	64.5	0.30	18.00	0.813
460–546	34	64.7	0.35	18.00	1.221
547–633	44	65.9	0.60	75.00	3.210
634–720	45	71.7	1.50	75.00	4.054
B. Pitchers					
1–132	41	78.0	0.20	2.50	0.328
133–263	43	83.7	0.25	11.00	0.721
264–459	63	81.0	0.30	25.00	0.852
460–546	28	75.0	0.35	4.50	0.639
547–633	29	79.3	0.60	1.50	1.062
634–720	29	85.7	1.50	45.00	3.160

Note. Player ID is the Topps card number. The number of observations is smaller than the total number of cards because many cards are not of individual players. Percent common players is the fraction of players who sold at the common player price.

where the vector X includes both the player's performance and race. We wish to determine whether V is significantly affected by the player's race. It is not possible to observe V, and so estimate (1) directly. Although one alternative is to replace V with the player's card price, there is no observable effect of player's performance on card price for the players who sell at the common player price, despite significant performance differences. Rather than conclude that V is the same for these players, we assume that each card has a positive intrinsic value, and that the value of the card is not related to performance at low levels of performance.[15]

Let P be the log dollar price of a baseball card. We assume that P is equal to the sum of two independent components:

$$P = P_c + P_p, \quad (2)$$

where P_c is the log price of the common player and P_p is the component of log price that is related to player performance and

15. Cards featuring minor players have intrinsic value for collectors who desire a complete set and to collectors who specialize in acquiring all cards ever issued for a particular team.

race characteristics. We estimate equation (1) by defining V as a latent variable that is related to P_p in the following way:

$$P_p = \max\,[0,V]. \tag{3}$$

Combining equations (2) and (3), we have

$$P = P_c + \max\,[0,V]. \tag{4}$$

The situation is illustrated in Figure I for the case of two series of cards. Because different quantities of cards were printed in the two series, their common player prices, P_{c1} and P_{c2}, differ. At low performance levels, $V < 0$, and cards sell at the minimum, common player price P_c. As performance rises, V increases at the rate β, eventually, becoming positive, at which point P includes a positive performance premium of P_p. Otherwise identical players who are issued as part of different series will sell for different prices equal to the difference between P_{c1} and P_{c2}.

Rearranging equation (4) and substituting in equation (1) gives

$$P - P_c = \max\,[0,\beta' X]. \tag{5}$$

Equation (5) can be estimated using the well-known tobit technique. The left-hand side is the adjusted log card price. The right-hand side is a linear function of player characteristics.

The determination of the price of baseball cards differs for pitchers and hitters. We begin with the hitters.

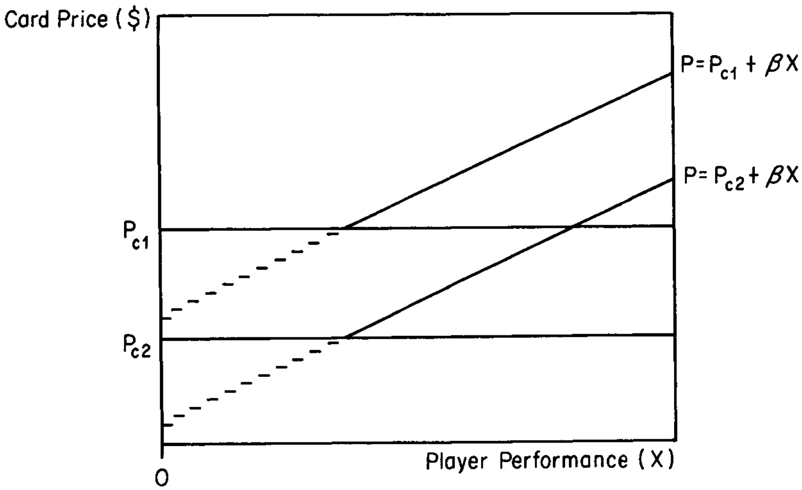

FIGURE I

C. Hitters

We specified the following basic model:

$$
\begin{aligned}
(6)\quad P - P_c = {} & \alpha_0 + \overset{(+)}{\alpha_1}\,\text{HITS} + \overset{(+)}{\alpha_2}\,\text{DOUBLES} + \overset{(+)}{\alpha_3}\,\text{TRIPLES} \\
& + \overset{(+)}{\alpha_4}\,\text{HOME RUNS} + \overset{(+)}{\alpha_5}\,\text{WALKS} \\
& + \overset{(+)}{\alpha_6}\,\text{STOLEN BASES} + \overset{(-)}{\alpha_7}\,\text{AT BATS} \\
& + \overset{(-)}{\alpha_8}\,\text{SEASONS} + \overset{(+)}{\alpha_9}\,\text{POSTSEASON GAMES} \\
& + \overset{(?)}{\alpha_{10}}\,\text{BLACK} + \overset{(?)}{\alpha_{11}}\,\text{HISPANIC} \\
& + \text{POSITION DUMMIES} + \text{error term.}
\end{aligned}
$$

Position dummies were entered for first base, second base, third base, shortstop, and catcher; the omitted category was outfield.[16] Expected signs on the coefficients are shown in parentheses. Summary statistics for hitters' statistics appear in Table II.

The estimated coefficients on race will be unbiased indicators of consumer discrimination as long as the race variables are uncorrelated with omitted variables that measure the athletic prowess of the players. The variables included in equation (6) include most variables considered to be important by fans and analysts of baseball. We believe that it is unlikely that there are any important omitted variables that are correlated with race.

Two omissions may provoke some controversy: runs scored and runs-batted-in. These measures are redundant because players who have many walks, singles, doubles, triples, and home runs will score and bat in large numbers of runs. Runs-batted-in and runs scored are highly correlated with singles, doubles, triples, and home runs. Holding constant these other variables, more runs-batted-in and runs scored indicate principally the quality of the hitters surrounding the player in the lineup. We did not, therefore, include those variables in our basic measure of player quality.[17]

16. The expected signs on the position dummies are as follows: first base (−); second base (+); shortstop (+); third base (+); and catcher (+), all relative to the omitted category, outfield. The position dummies partly measure the effect of fielding ability. We lacked sufficient degrees of freedom to undertake a full analysis of the contribution of fielding ability to card prices.

17. Some observers believe that runs-batted-in are a good indicator of "clutch" performance, and that players with large totals are those who come through in

We estimated equation (6) using tobit, reported in column 1 of Table III.[18] The coefficients all entered as expected. Players with more hits, doubles, triples, and home runs sold for higher prices. Holding hitting performance constant, the more at-bats or seasons that it took to accomplish the feat, the lower the price of the card. Stolen bases entered positively, but not significantly.[19]

We first estimated a version of equation (6) in which we combined blacks and Hispanics into a single category, NONWHITE. The resulting tobit regression is reported in column 1 of Table III. Approximating the normal distribution Φ with the sample proportion of cards that sold for more than the common price (31.4 percent), its coefficient implied that nonwhites sold for about 10 percent less than whites of comparable ability.[20] It is noteworthy that the differences in card prices due to race were in the same range as racial differences in earnings found using variations of the log earnings model.

When separate dummy variables were defined for blacks and Hispanics, the results of the tobit model indicated that cards featuring blacks sold for about 6.4 percent less, and Hispanics about

important situations. Performance in pressure situations often varies over a career for any one player. Career runs-batted-in is therefore unlikely to measure clutch performance over a lifetime. Moreover, runs-batted-in is a function of opportunities as much as of ability. Lou Gehrig set the American League record for runs-batted-in in 1931 (184) partly because the man batting in front of him, Babe Ruth, reached base safely 327 times. Although it is possible to measure the number of what Bill James [1985, p. 308] calls victory-important runs-batted-in, we do not have such a measure for our sample. And although our rudimentary measures of performance do not record the importance of the player's contribution in the clutch, it is not clear that clutch performance can be adequately defined or measured independently of the other measures of performance. As an example, Reggie Jackson is often cited as a great player in important games. Evidence offered to support this hypothesis is that in 27 World Series games Jackson hit 10 home runs, batted in 24 runs, and compiled batting and slugging averages of .357 and .755, well above his career performance levels in the regular season. Consider, though, that in 45 League Championship Series games, Jackson hit 6 home runs, batted in 20 runs, and compiled batting and slugging averages of .227 and .380—all figures well below his career regular season levels. The evidence that Jackson was a big-game player is mixed at best, and, to us, unconvincing. Other anecdotal evidence that this or that player was better in important situations is open to similar criticisms.

18. Results for the tobit model also include SIGMA, the estimated standard error of the regression.

19. This coefficient is consistent with Pete Palmer's [Thorn and Palmer, 1984] estimate of a relatively small contribution of stolen bases to runs scored. In regressions with team runs as the dependent variable, a stolen base was approximately one fifth as productive as a home run. Furthermore, unsuccessful attempts to steal have a negative coefficient about twice as large in absolute value as stolen bases. The small coefficient on stolen bases may therefore also pick up the negative effect of being caught stealing.

20. Note that coefficients in the tobit regression do not measure $\partial(P - P_c)/\partial X$, but $\partial V/\partial X$. Rather, $\partial(P - P_c)/\partial X = \Phi(\beta X)\, \partial V/\partial X$, where $\Phi(\ )$ is the value of the cumulative normal distribution function, which is the probability that a player sells for more than the common player price.

TABLE II
MEANS (STANDARD DEVIATIONS) OF VARIABLES FOR HITTERS

	All races	White	Hispanic	Black
Card price*				
$P - P_c$	0.341	0.237	0.291	0.237
	(0.826)	(0.669)	(0.769)	(0.669)
EXP ($P - P_c$)	3.45	2.67	2.77	6.06
	(12.64)	(10.97)	(8.61)	(17.84)
STAR	0.314	0.271	0.229	0.487
Lifetime performance				
SEASONS	6.9	6.2	7.5	8.7
	(4.5)	(4.2)	(4.5)	(4.9)
AT BATS	3,598.0	3,079.7	4,034.7	4,778.0
	(2754.8)	(2453.7)	(2810.5)	(3121.2)
HITS	943.7	780.4	1,092.4	1,308.6
	(789.0)	(678.6)	(808.0)	(923.5)
DOUBLES	149.2	124.1	167.8	208.0
	(133.1)	(116.0)	(134.0)	(156.7)
TRIPLES	26.4	19.7	32.4	41.2
	(26.8)	(19.6)	(31.0)	(34.2)
HOME RUNS	94.8	77.5	71.6	157.5
	(119.8)	(95.6)	(89.3)	(167.6)
WALKS	358.8	326.2	283.5	496.0
	(329.3)	(307.4)	(222.7)	(401.0)
STOLEN BASES	58.8	27.1	82.0	133.1
	(106.4)	(40.4)	(125.1)	(165.9)
Race				
BLACK	0.227	0.000	0.000	1.000
HISPANIC	0.140	0.000	1.000	0.000
Obs.	344	218	48	78

*$P - P_c$ is the log card price minus the log price of the common player. EXP ($P - P_c$) is the unlogged card price divided by the price of the common player. STAR is the proportion of players with a card price greater than the price of the common player, that is, with $P - P_c > 0$.

17 percent less, than otherwise comparable white players. The null hypothesis of equal coefficients could be rejected at about the 7 percent level using a log likelihood (chi-square) test, with a chi-square of 3.38.

One worry with respect to the empirical findings in Table III is the role of outliers. A glance at Table I indicates that several players sell for tremendously high prices. The question arises whether customer discrimination is pervasive throughout the ability distribution or whether the results are driven largely by the superstar end of the market. We therefore also estimated a probit model in which the dependent variable was whether a player sold for more than the

TABLE III
LOG PRICE TOBIT REGRESSIONS AND PROBIT REGRESSIONS FOR HITTERS

Dependent variable:*	$P - P_c$		STAR	
Estimation method	Tobit		Probit	
	(1)	(2)	(3)	(4)
NONWHITE	−0.3188	—	−0.8389	—
	(2.4)		(2.8)	
BLACK	—	−0.2029	—	−0.3892
		(1.4)		(1.2)
HISPANIC	—	−0.5516	—	−2.0647
		(2.9)		(3.8)
HITS	0.0030	0.0031	0.0066	0.0084
	(4.5)	(4.7)	(2.9)	(3.4)
DOUBLES	0.0008	−0.0008	−0.0066	−0.0044
	(0.5)	(0.4)	(1.1)	(0.7)
TRIPLES	0.0021	0.0016	0.0132	0.0134
	(0.6)	(0.5)	(1.1)	(1.1)
HOME RUNS	0.0032	0.0030	0.0095	0.0084
	(4.4)	(4.0)	(2.8)	(2.4)
WALKS	0.0004	0.0003	−0.0013	−0.0019
	(1.2)	(0.9)	(1.2)	(1.7)
STOLEN BASES	0.0002	0.0000	0.0026	0.0018
	(0.3)	(0.1)	(1.1)	(0.7)
AT BATS	−0.0004	−0.0004	−0.0012	−0.0017
	(1.7)	(1.8)	(1.7)	(2.2)
SEASONS	−0.1417	−0.1336	0.0872	−0.0510
	(1.7)	(1.6)	(0.5)	(0.3)
POSTSEASON GAMES	0.0262	0.0262	0.0515	0.0538
	(6.0)	(6.0)	(4.0)	(3.9)
First base	0.0597	0.0693	0.1939	0.1386
	(0.4)	(0.4)	(0.5)	(0.4)
Second base	−0.0474	−0.0328	−0.2694	−0.2622
	(0.2)	(0.2)	(0.6)	(0.5)
Third base	0.4496	0.4970	0.7988	1.0389
	(2.4)	(2.7)	(1.9)	(2.3)
Shortstop	−0.0839	−0.0699	−0.0203	0.0212
	(0.4)	(0.4)	(0.0)	(0.0)
Catcher	0.1402	0.1602	0.0670	0.1439
	(0.8)	(0.9)	(0.2)	(0.4)
CONSTANT	−1.2845	−1.3116	−2.0219	−2.1714
	(6.3)	(6.4)	(5.3)	(5.4)
SIGMA**	0.6445	0.6421	—	—
	(14.8)	(14.8)		
Log likelihood (Slopes = 0)	−421.95	−421.95	−224.05	−224.05
Log likelihood	−154.18	−152.49	−88.88	−83.06

Note. 334 observations. Asymptotic t-ratios are in parentheses.

*$P - P_c$ is the log card price minus the log price of the common player. STAR is the proportion of players with a card price greater than the price of the common player, that is, with $P - P_c > 0$.

**SIGMA is the estimated standard error of the regression.

common price. The probit results cannot be driven simply by the tremendous prices commanded by a couple of players. The explanatory variables were identical to those in equation (6).

The results are reported in columns 3 and 4 of Table III.[21] The dependent variable was STAR, where STAR equals one if the player's card sold for more than the common player price, and zero otherwise. The regression with nonwhites combined into a single category indicates that nonwhites sold for significantly less than otherwise comparable white hitters. We next divided nonwhites into blacks and Hispanics. The race coefficient for Hispanics was significantly less than zero. Although the race coefficient for blacks was negative, it was not significantly different from zero at conventional levels of statistical significance ($t = 1.2$).[22] It was, however, easy to reject the null hypothesis of equal race coefficients at better than the 1 percent level (chi-square = 11.64).

D. Pitchers

We specified the following equation for pitchers:

$$(7) \quad P - P_c = \beta_0 + \overset{(+)}{\beta_1}\,\text{WINS} + \overset{(-)}{\beta_2}\,\text{LOSSES} + \overset{(+)}{\beta_3}\,\text{SAVES}$$
$$+ \overset{(+)}{\beta_4}\,\text{COMPLETE GAMES}$$
$$+ \overset{(-)}{\beta_5}\,\text{EARNED RUNS} + \overset{(+)}{\beta_6}\,\text{STRIKEOUTS}$$
$$+ \overset{(-)}{\beta_7}\,\text{WALKS} + \overset{(?)}{\beta_8}\,\text{INNINGS PITCHED}$$
$$+ \overset{(-)}{\beta_9}\,\text{HITS} + \overset{(+)}{\beta_{10}}\,\text{POSTSEASON INNINGS}$$
$$+ \overset{(?)}{\beta_{11}}\,\text{BLACK} + \overset{(?)}{\beta_{12}}\,\text{HISPANIC}$$
$$+ \text{error term.}$$

Most of the expected signs are self-explanatory. INNINGS PITCHED represents longevity. Although for a given level of STRIKEOUTS and COMPLETE GAMES, more innings pitched

21. Note that the estimated coefficients from this probit model are consistent estimates of the coefficients of the tobit model up to a factor of proportionality. See Maddala [1983, p. 159].

22. The effect of race on the marginal probability of being a STAR is given by $\Phi'\beta_r$, where Φ' is the density function of the standard normal distribution and β_r is the estimated race coefficient.

implies a lower performance level, the opposite is true for WALKS, HITS, and EARNED RUNS. The net effect of INNINGS PITCHED is therefore ambiguous.

Summary statistics for pitchers appear in Table IV. As with hitters, nonwhite pitchers had better overall statistics measured by career wins, saves, earned runs, complete games, and strikeouts. Nonwhites also pitched far more innings on average over the span of their careers.

Tobit estimates of equation (7) are reported in Table V. The

TABLE IV
MEANS (STANDARD DEVIATIONS) OF VARIABLES FOR PITCHERS

	All races	White	Hispanic	Black
Card Price*				
$P - P_c$	0.241	0.230	0.336	0.334
	(0.692)	(0.680)	(0.770)	(0.831)
EXP$(P - P_c)$	2.28	2.29	2.23	2.30
	(6.76)	(7.07)	(3.60)	(3.46)
STAR	0.193	0.188	0.308	0.154
Lifetime performance				
WINS	82.9	79.1	99.7	126.8
	(73.2)	(71.6)	(90.2)	(69.4)
LOSSES	77.2	75.0	81.2	109.2
	(58.8)	(58.4)	(66.6)	(51.5)
SAVES	27.4	28.4	19.7	18.2
	(46.8)	(48.7)	(28.4)	(25.3)
COMPLETE GAMES	45.1	40.9	70.5	85.9
	(60.3)	(55.6)	(87.4)	(81.9)
HITS	1,318.6	1,271.9	1,490.9	1,890.1
	(1,065.0)	(1,054.6)	(1,240.6)	(935.3)
EARNED RUNS	543.0	523.6	617.8	777.8
	(420.7)	(415.3)	(503.5)	(309.9)
STRIKEOUTS	891.7	846.8	1,011.5	1,487.5
	(796.2)	(776.0)	(892.9)	(828.6)
WALKS	490.9	470.7	545.8	741.9
	(796.2)	(364.2)	(452.7)	(284.6)
INNINGS PITCHED	1,415.7	1,360.6	1,609.4	2,100.5
	(1,157.4)	(1,140.9)	(1,355.8)	(1,057.2)
Race				
BLACK	0.056	0.000	0.000	1.000
HISPANIC	0.056	0.000	1.000	0.000
Obs.	233	207	13	13

*$P - P_c$ is the log card price minus the log price of the common player. EXP $(P - P_c)$ is the unlogged card price divided by the price of the common player. STAR is the proportion of players with a card price greater than the price of the common player, that is, with $P - P_c > 0$.

TABLE V
LOG PRICE TOBIT REGRESSIONS AND PROBIT REGRESSIONS FOR PITCHERS

Dependent variable:*	$P - P_c$		STAR	
Estimation method	Tobit (1)	Tobit (2)	Probit (3)	Probit (4)
NONWHITE	−0.6848	—	−1.9097	—
	(2.7)		(2.0)	
BLACK	—	−0.822	—	−3.3976
		(2.2)		(0.8)
HISPANIC	—	−0.592	—	−1.5605
		(1.9)		(1.3)
WINS	0.02364	0.023	0.02762	0.02770
	(2.7)	(2.7)	(1.2)	(1.2)
LOSSES	−0.00625	−0.0060	−0.01341	−0.01388
	(0.8)	(0.8)	(0.6)	(0.6)
SAVES	0.00832	0.0083	0.02054	0.01989
	(4.8)	(4.7)	(3.1)	(3.0)
COMPLETE GAMES	0.00883	0.0088	0.04948	0.04821
	(2.6)	(2.6)	(2.8)	(2.7)
HITS	−0.00047	−0.00044	0.00163	0.00189
	(0.5)	(0.5)	(0.5)	(0.6)
EARNED RUNS	−0.00139	−0.0015	−0.00330	−0.00387
	(0.9)	(1.0)	(0.7)	(0.8)
STRIKEOUTS	0.00006	0.00068	0.00010	0.00024
	(0.2)	(0.3)	(0.1)	(0.2)
WALKS	0.00007	0.00068	0.00365	0.00356
	(1.4)	(1.4)	(1.7)	(1.6)
INNINGS PITCHED	0.00007	0.00006	−0.00301	−0.00305
	(0.1)	(0.0)	(0.8)	(0.8)
POSTSEASON INNINGS	0.00209	0.00216	0.01446	0.01422
	(0.8)	(0.8)	(1.1)	(1.0)
CONSTANT	−2.1318	−2.126	−3.7673	−3.7066
	(2.0)	(8.4)	(5.0)	(5.0)
SIGMA**	—	0.528	—	—
		(9.5)		
Log likelihood (Slopes = 0)	−244.20	−244.20	−114.34	−114.34
Log likelihood	−55.60	−55.4	−33.73	−33.54

Note. 233 observations. Asymptotic t-ratios are in parentheses.
*$P - P_c$ is the log card price minus the log price of the common player. STAR is the proportion of players with a card price greater than the price of the common player, that is, with $P - P_c > 0$.
**SIGMA is the estimated standard error of the regression.

estimated coefficients all had the expected signs, with the exception of WALKS, which entered positively and marginally significantly.

The estimated coefficients on the race variables were all negative. We look first at the results in column 1, where blacks and

Hispanics were combined into a single category, NONWHITE. The results indicated that nonwhites sold for 13 percent less than otherwise comparable whites, where we approximated Φ with the sample mean (19 percent of pitchers sold for more than the common price). The results in column 2 indicated that cards featuring blacks sold for about 16 percent less, and those featuring Hispanics for about 12 percent less, than otherwise comparable white pitchers' cards. Despite the considerable differences in the point estimates of the effect of race, a log likelihood test did not reject the null hypothesis of equal race coefficients for blacks and Hispanics at conventional levels of statistical significance.

To determine whether the negative effect of being black or Hispanic existed throughout the ability distribution or only at the superstar end of the market, we ran probit regressions for the pitchers, where the dependent variable was STAR (which is equal to one if a card sold for more than the common player price, and zero otherwise). When blacks and Hispanics were combined into a single category, NONWHITE, the estimated coefficient on NONWHITE was statistically significant at the 5 percent level ($t = 2.0$). When blacks and Hispanics were separated, the t-statistics on each of the race variables were insignificant at conventional levels (0.8 and 1.3 for blacks and Hispanics). In contrast to hitters, statistically significant differences in consumer attitudes toward black versus Hispanic pitchers were visible only at the superstar end of the market: we could not reject the null hypothesis of equal race coefficients. The lack of statistical significance on the individual probit race coefficients is not surprising, given that there were only 13 black and 13 Hispanic pitchers.

The effect of being nonwhite on the card price of pitchers was somewhat greater than for hitters (13 percent versus 10 percent). The stronger effect of race in the pitcher regression seems plausible. The pitcher is central and the most visible player in a baseball game. As Becker [1971] suggested, customer discrimination against nonwhites should be greater, the greater the degree of personal contact with customers. We suggest that discrimination may be greater, the more visible the player.

V. Comparison with Studies of Salary Discrimination

There are few studies of salary discrimination in sports. The most recent is Kahn and Sherer's [1988] careful study of professional basketball. They find that blacks were paid about 20 percent less than otherwise comparable white players. The evidence of discrimination from previous studies of baseball salaries is mixed. The most recent empirical analyses of baseball salaries found no wage gap between whites and blacks [Raimondo, 1983; Hill and Spellman, 1984]. By contrast, Scully's [1974] study found strong evidence of discrimination in major league baseball for the late 1960s.[23]

In results not reported here, we found that functional form and the choice of explanatory variables may be important determinants of the sign and significance of race variables in studies of discrimination. Because single index measures of player performance impose econometric restrictions, they must be chosen with care.[24] In the absence of strong theoretical reasons for imposing restrictions on the importance of each component of performance, we thought that it was preferable to "let the data speak." In the course of our investigation, we found evidence, albeit indirect, that the restrictions imposed by the use of single-index measures of performance may have contributed to others' failure to find discrimination among hitters.[25] Future research is necessary to resolve this issue.

23. Raimondo and Hill and Spellman concluded that the introduction of free agency in baseball led to the difference between their results and Scully's; according to them, free agency caused racial discrimination in baseball to vanish within a decade. The implicit assumption in recent explanations for the disappearance of racial discrimination in baseball is that salary differences were caused by employer discrimination. Scully's earlier study, however, implied that consumer discrimination was the factor driving baseball players' salaries. Scully reported that, prior to integration, "Baseball management was concerned that attendance would decline with the introduction of Negro players" [p. 231]. Indeed, Scully found evidence that fans discriminated according to player color: "an average of 1,969 fewer fans attend[ed] games pitched by blacks than those pitched by whites," despite the fact that "black pitchers ha[d] significantly better pitching records than whites" [p. 233].

24. Although Scully's study was based on only 107 observations, Raimondo and Hill and Spellman had enough degrees of freedom to experiment with functional forms using more basic measures of performance, at least for the hitters. Raimondo's sample included 209 hitters, but only 34 pitchers. The sample of Hill and Spellman contained 326 hitters and 190 pitchers. Scully measured fielders' offensive performance by slugging average and batting average, alternatively. Hill and Spellman used runs scored per year as the sole explanatory performance variable. Raimondo used a player's lifetime batting average for infielders and slugging average combined with a dummy indicator that assumed a value of 1 if a player had a career slugging percentage below average and a career batting average above average, and zero otherwise.

25. Certain indexes, such as SLUGGING AVERAGE and RUNS CREATED PER SEASON, did a comparatively poor job of explaining variation in card prices compared with the specifications reported here. We did find, however, two single-index measures, TOTAL BASES and RUNS CREATED, that explained nearly as much of the variation in card prices as did our unrestricted models in which each component of performance entered separately, suggesting that the restrictions they impose are minor and can be ignored. TOTAL BASES is defined as HITS + DOUBLES + (2 × TRIPLES) + (3 × HOME RUNS). RUNS CREATED is defined as [(HITS + WALKS) × TOTAL BASES]/(AT BATS + WALKS). It is not surprising that these indexes performed nearly as well as our specification; they are basically

VI. Conclusion

Our results indicate that consumer discrimination exists in the market for baseball cards. Among hitters, the cards of nonwhites sell for about 10 percent less than the cards of white players of comparable ability, whereas among pitchers, there is a 13 percent discount on nonwhites. We admit that this is a small market and that baseball cards are not a commodity purchased by most households.[26] Sports, however, are an important part of the entertainment industry. The collector of baseball cards is part of the larger group of sports fans and, if anything, is better informed than the typical fan. We therefore believe that our results do have some implications for the general problem of consumer discrimination. The lack of personal contact in the market is also significant. Race enters only as a picture on a piece of cardboard, and should, therefore, have minimal effect. The absence of personal contact should reduce the potential for consumer discrimination. That it does not eliminate it may be our most important result.

Becker predicted that racial consumer discrimination would be more likely in markets where personal contact is prevalent. In such markets the effects of discrimination often cannot be measured separately from the pure capability of the worker. If such measurements were possible, we believe that they would show that consumer discrimination makes race a more important contributor to the continuing wage gap than the studies of employer and coworker discrimination imply.

Department of Economics, Clemson University

References

Arrow, Kenneth J., "Models of Job Discrimination," Anthony H. Pascal, ed., *Racial Discrimination in Economic Life* (Lexington, MA: Lexington Books, 1972), pp. 83–102.

Becker, Gary M., *The Economics of Discrimination* (Chicago, IL: University of Chicago Press, 1971).

Beckett, James, *Official 1989 Price Guide to Baseball Cards* (New York, NY: The House of Collectibles, 1989).

Blau, Francine D., and Lawrence M. Kahn, "On Estimating Discrimination in the Economy: Comment," *Southern Economic Journal*, LI (1985), 1221–26.

linear combinations of our offensive explanatory variables. James [1988] developed several forms of the variable RUNS CREATED. We used the simplest version, due to data limitations. For a useful discussion of the various new performance measures, see Fong [1985].

26. A recent news article reports that there may be 500,000 serious collectors [*Greenville News*, February 25, 1989, p. 2B]. An article in the *New York Times* [May 14, 1989, pp. 1 and 26] suggests that the baseball memorabilia business surpasses one billion dollars per year.

Fong, Bobby, "Counting Stats, New Stats: An Assessment," *Baseball Research Journal,* XIV (1985), 37–40.
Hill, James Richard, and William Spellman, "Pay Discrimination in Baseball: Data from the Seventies," *Industrial Relations,* XXIII (1984), 103–12.
James, Bill, *The Bill James Baseball Abstract 1985* (New York, NY: Ballantine Books, 1985).
——, *The Bill James Baseball Abstract 1988* (New York, NY: Ballantine Books, 1988).
Lindsay, Cotton M., and Michael Maloney, "A Model and Some Evidence Concerning the Influence of Discrimination on Wages," *Economic Inquiry,* XXVI (1988), 645–60.
Kahn, Lawrence M., and Peter D. Sherer, "Racial Differences in Professional Basketball Players' Compensation," *Journal of Labor Economics,* VI (1988), 40–61.
Kamalich, Richard F., and Solomon W. Polachek, "Discrimination: Fact or Fiction? An Examination Using an Alternative Approach," *Southern Economic Journal,* IL (1982), 450–61.
——, and ——, "On Estimating Discrimination in the Economy: Reply," *Southern Economic Journal,* LI (1985), 1227–29.
Maddala, G. S., *Limited Dependent and Qualitative Variables in Econometrics* (Cambridge, England: Cambridge University Press, 1983).
McCall, John J., "The Simple Mathematics of Information, Job Search, and Prejudice," in *Racial Discrimination in Economic Life,* Anthony H. Pascal, ed. (Lexington, MA: Lexington Books, 1972), pp. 82–102.
Raimondo, Henry J., "Free Agents' Impact on the Labor Market for Baseball Players," *Journal of Labor Research,* IV (1983), 183–93.
Reichler, Joseph L., ed., *The Baseball Encyclopedia,* 7th ed. (New York, NY: Macmillan Publishing Company, 1988).
Scully, Gerald W., "The Economics of Discrimination in Professional Sports: The Case of Baseball," R. G. Noll, ed., *Government and the Sports Business* (Washington, DC: Brookings Institution, 1974).
Spence, Michael A., "Job Market Signaling," *Quarterly Journal of Economics,* LXXXVII (1973), 355–74.
Thorn, John, and Pete Palmer, *The Hidden Game of Baseball* (Garden City, NY: Doubleday and Company, 1984).
Tomlinson, Gerald, *The Baseball Research Handbook* (Cooperstown, NY: Society for American Baseball Research, 1987).
Yinger, John, "Measuring Racial Discrimination with Fair Housing Audits: Caught in the Act," *American Economic Review,* LXXVI (1986), 881–93.