Racial Integration as an Innovation: Empirical Evidence from Sports Leagues

By Brian L. Goff, Robert E. McCormick, and Robert D. Tollison*

This paper treats racial integration as an innovation in economic process in which economic entities find it advantageous to utilize potentially more productive inputs previously unavailable due to law, custom, or managerial discretion. Data on the racial integration of Major League Baseball and Atlantic Coast Conference basketball are employed to address this issue. The central question examined is which type of team integrated first—losers or winners? The results strongly support the idea that entrepreneurship trumps competitive rivalry; that is, winning teams led the process of racial integration. (*JEL* L1, J7)

One of the watershed events in U.S. history is the struggle to achieve a racially integrated society. While the civil rights laws and court rulings in the 1950's, 1960's, and 1970's are among the major changes in public policy that gradually led to a breakdown of Jim Crow rule in the American South, other changes in law and custom also motivated the process of racial integration across time and place. Indeed, segregation was not limited to the South but was a prominent feature of many national organizations and markets. Despite the extensive commentary on these events from various perspectives, there has been very little economic analysis of the actual process of racial integration.[1] Economists have focused their efforts on the economics of discrimination while the actual process by which individuals, firms, and other entities shifted from segregated to integrated states of operation has not been studied carefully.[2]

In this paper we treat racial integration as an innovation in economic process. Like other innovations, at some point in time firm and individuals find it advantageous to incorporate additional and potentially more productive inputs previously unavailable due to law, custom, or managerial discretion. With innovation, owners can potentially rearrange their operations in a more profitable fashion. So the basic questions are: what type of firm takes advantage of an innovation early and why?

We address these questions in a study of the racial integration of two U.S.-based sports: Major League Baseball (MLB) and Atlantic Coast Conference (ACC) basketball. What type of teams integrated first? There are two primary hypotheses in this regard: worst-first and best-first. On the one hand, the worst teams might have integrated first because they would have had the most to gain from the recruitment of a larger pool of talent that included black athletes. This hypothesis begs the question of why these same teams were not doing well in the segregated state of competition. On the other hand, the best teams could have been the ones to integrate first since they were better managed and coached, and hence would have better understood the profit opportunities offered by in-

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[1] See, however, Gavin Wright (1999).

[2] See Glen G. Cain (1986) and Joseph G. Altonji and Rebecca M. Blank (1999) for surveys of the former literature.

tegration. Seeing the profit opportunity, they were quicker to seize the moment. In other words, a hypothesis based on competitive rivalry predicts a different empirical result than a hypothesis based on managerial capability and entrepreneurship.

Sports leagues present a setting for assessing this question. First, we analyze data from 1947 to 1971 on the integration of baseball, starting in 1947 with Jackie Robinson of the Brooklyn Dodgers and Larry Doby of the Cleveland Indians.[3] This initial integration expanded through the 1950's, when the Boston Red Sox in 1959 were the last organization to field an all-white team, and then through the 1960's as the use of black players became commonplace in baseball.

Second, we examine the experience of the ACC in college basketball where the first black player in the league was Billy Jones at the University of Maryland in the 1965–1966 season. This was nine years after Jackie Robinson retired from baseball, and the same year that Texas Western University won the National Collegiate Athletic Association basketball championship with an all-black starting lineup (beating an all-white Kentucky team). After the 1965–1966 season, additional black players were recruited by ACC schools that gradually desegregated the teams at ACC schools in a process that took nearly 20 years.

These data allow us to examine the process of racial integration in different settings with overlapping but different time frames. The baseball data provide information from a for-profit environment where firms were geographically dispersed among large urban areas primarily in the North, Midwest, and West. The basketball data provide information from a not-for-profit environment where the firms operated in primarily Jim Crow states and were dispersed across both urban areas (College Park, Maryland) and small cities (Clemson, South Carolina).

I. Innovation and Integration

Some of the earliest contributions to the economics of innovation were the empirical analyses of Zvi Griliches (1957) and Edward Mansfield (1968). They showed how innovation tends to be diffused in the form of a logistic function where the new resource or technology is first adopted at an increasing rate by actors in the economy and then exhibits diminishing returns and an end point at a partial or full diffusion. The form of these logistic functions implies that the most profitable uses of the innovation are deployed first and that competition among users facilitates this result. Hybrid corn took hold in Illinois and Iowa on the most fertile corn land and spread out from there towards the low-rent margin in less fertile growing areas, or in our terminology, the best farms(ers) innovated first.

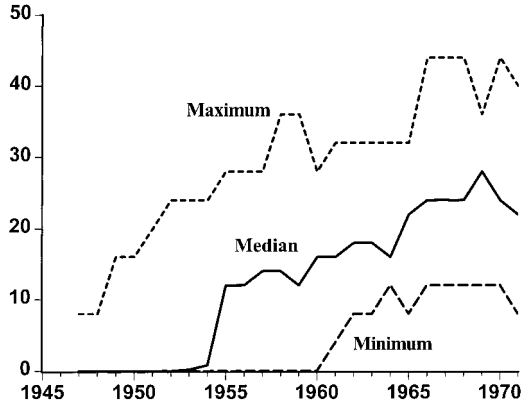

FIGURE 1. PERCENTAGE OF BLACK PLAYERS ON MLB TEAMS, 1947–1971

Note: Left-hand side is in percentages.

The process of racial integration in baseball and basketball followed this same general pattern. Figure 1 depicts the process of integration in baseball showing the median, maximum, and minimum ratios of black players for 1947–1971.[4] The figure indicates that the diffusion of black athletes followed the typical logistic shape and that by the mid-1960's the median ratio leveled off. However, there were considerable differences across teams in the

[3] Latin players participated in Major League Baseball from 1900 forward; see Peter C. Bjorkman (1994).

[4] This ratio is the number of black players on a team's roster during a given year divided by a roster size of 25. Data are available only on a sporadic basis for years after 1971. The mean percentage of black players is 30 percent in 1975, 27 percent in 1980, and 25 percent in 1985. These additional years are from Gerald Scully (1974) and Jules Tygiel (1997).

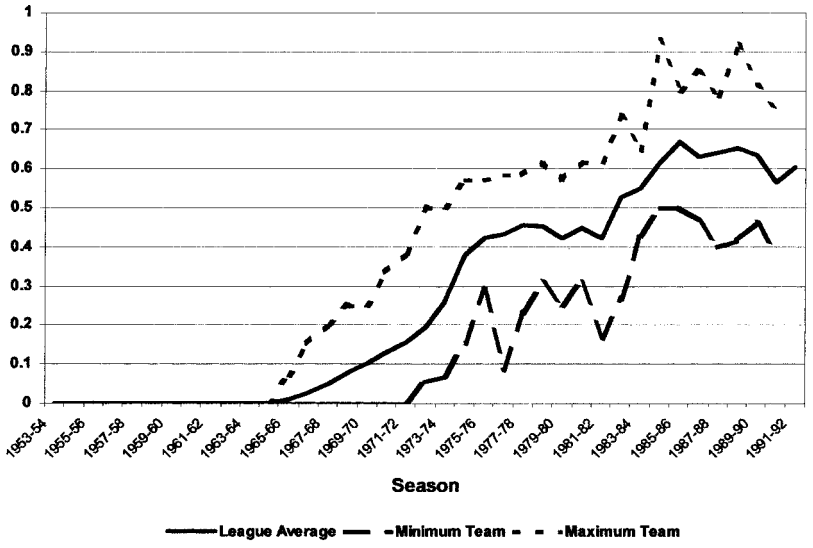

FIGURE 2. THE PACE OF INTEGRATION IN ATLANTIC COAST CONFERENCE MEN'S BASKETBALL

Note: Left-hand side is in percentages.

speed of adaptation to racial integration. The teams that used black players most intensively early on, such as the Brooklyn/Los Angeles Dodgers and New York/San Francisco Giants, reach near-maximum levels before some teams, such as the Detroit Tigers and Boston Red Sox, ever began to use any black players. Into the late 1960's and early 1970's, large disparities existed between the ratios of teams at the maximum (about 40-percent black players) and minimum (about 10-percent) levels.

Figure 2 depicts the path of racial integration in ACC basketball. The minimum and maximum percentages are the envelopes of all teams in the league. While the pace across schools was quite similar, the cross-sectional levels are distinctly different. Table 1 lists the team-average and league-average black player to total team ratios by decade. The asterisk rows are statistically significant. In all three decades Duke is below the mean. Clemson, Maryland, and North Carolina State are above the mean more than the rest of the teams. The University of North Carolina at Chapel Hill is below the mean in the 1990's (the 1989–1990 through 1991–1992 seasons in these data). Again, the process of racial integration in basketball followed a logistic-type pattern quite similar to innovations in general.

The first issue we address is the relative importance of competitive rivalry as an incentive to innovate versus the alternative managerial alertness hypothesis. The external incentive hypothesis predicts that poorer performing teams will innovate earlier so that past success will be inversely related to the early use of black players. The farther a team is back in league standings, the more likely it is to be a leader in integration. Alternatively, the managerial alertness hypothesis predicts that past excellence in performance depends on managerial skills, so that past success will be positively related to the earlier use of black players.[5] According to this view, teams with the best winning records and better management are more likely to be leaders in the integration process.[6]

[5] Note that the managerial hypothesis encompasses more dimensions than have been investigated in studies of the "technical efficiency" of sports managers. See Robert C. Clement and McCormick (1989) and John Ruggiero et al. (1996) for examples of this kind of work.

[6] The competitive advantage of using black baseball players was apparent to contemporary observers. Chester Washington of the *Pittsburgh Courier* sent a telegram in 1937 to the manager of the Pirates: "Know your club needs players. Have answers to your prayers right here in Pittsburgh. Josh Gibson catcher Buck Leonard first base S. Paige pitcher and Cool Papa Bell all available at reasonable figures. Would make Pirates formidable Pennant contenders"

TABLE 1—TEAM AND LEAGUE AVERAGES OF BLACK PLAYERS BY DECADE

School	Decade	Average Black to Total Ratio	Number of Observations	League Average	League STD	*t*-test
Clemson	70	27.8	10	29.3	18.8	−0.255
Clemson	80	63.7	10	55.7	15.8	1.595
Clemson	90	78.8	3	60.1	14.3	4.140*
Duke	70	15.8	10	29.3	18.8	−2.271*
Duke	80	39.2	10	55.7	15.8	−3.316*
Duke	90	43.4	3	60.1	14.3	−3.710*
Georgia Tech	80	60.2	10	55.7	15.8	0.899
Georgia Tech	90	55.9	3	60.1	14.3	−0.929
Maryland	70	44.4	10	29.3	18.8	2.541*
Maryland	80	59.8	10	55.7	15.8	0.817
Maryland	90	72.1	3	60.1	14.3	2.644*
NC State	70	32.9	10	29.3	18.8	0.608
NC State	80	67.9	10	55.7	15.8	2.442*
NC State	90	65.5	3	60.1	14.3	1.177
North Carolina	70	27.6	10	29.3	18.8	−0.288
North Carolina	80	49.2	10	55.7	15.8	−1.303
North Carolina	90	49.1	3	60.1	14.3	−2.452*
South Carolina	70	4.2	2	29.3	18.8	−4.234*
Virginia	70	19.9	10	29.3	18.8	−1.581
Virginia	80	54.1	10	55.7	15.8	−0.326
Virginia	90	54.6	3	60.1	14.3	−1.216
Wake Forest	70	41.7	10	29.3	18.8	2.092*
Wake Forest	80	51.7	10	55.7	15.8	−0.808
Wake Forest	90	61.7	3	60.1	14.3	0.345

Notes: Average Black to Total Ratio, League Average, and League STD columns are percentages. Asterisks denote statistical significance.
Source: See footnote 12.

There is a second issue concerning the process of integration. Essentially, Ricardian logic suggests that the first black athletes in baseball and basketball should have been comparatively more productive relative to their white counterparts than their later arriving black teammates. We expect this productivity difference to show up in performance statistics. An integrated equilibrium will be reached where the marginal black and white players on each team possess comparable abilities, that is, have equal marginal revenue products.[7] We expect to observe such productivity differences and patterns in the data on baseball and basketball players. Once racial integration is complete, there should not be any residual performance differences associated with skin color.

(Geoffrey Ward and Ken Burns, 1994 p. 247). Dizzy Dean said of Satchel Paige in the mid-1930's that he was "... the best pitcher I ever saw" (Tygiel, 1983 p. 27).

As for the entrepreneurial hypothesis, the evidence is mixed. Not all baseball people shared an enthusiastic view of the capabilities of black players. In 1947, Bobby Feller, a star pitcher for the Cleveland Indians, who had played many barnstorming games against black players, thought that of the players he had seen, only Satchel Paige and Josh Gibson might qualify for the Majors. Of Jackie Robinson, Feller said he "could not foresee any future ... in big league baseball" (Tygiel, 1983 p. 76). Ironically, Feller and Robinson were later elected to the Baseball Hall of Fame in the same year (1962). In addition to evaluating black player skills, entrepreneurship in bringing blacks to the Majors also involved political skills by MLB general managers. For example, Branch Rickey's plan to bring Jackie Robinson to the Brooklyn Dodgers was so veiled that another black player whom Rickey had approached, Roy Campanella, thought the overture to Robinson related to the Negro League's Brooklyn Brown Dodgers (Tygiel, 1983 p. 77).

[7] The marginal revenue products of athletes as entertainers are determined by various output prices (tickets, merchandise, media rights) and the marginal product of players. Players produce relevant outputs such as attendance both by helping teams win and by entertaining fans with performances not perfectly correlated with winning. The 1998 home run record chase by Mark McGuire and Sammy Sosa stands as an example; Dennis Rodman's off-court antics another?

II. Data Analysis: Integration in Major League Baseball

The general framework for our empirical model of baseball is:

$$\text{(1)} \qquad \text{BLACK}_{it} = \boldsymbol{\alpha}_t + x_{it}\boldsymbol{\beta} + e_{it},$$

where BLACK_{it} = number of black players on team i in year t. The model includes year as a fixed-effect vector, $\boldsymbol{\alpha}_t$, to account for changes over time in the legal and social framework that would have impacted on the incentive of baseball management to use black players. Over the time frame, 1947–1971, several landmark court and legislative changes were made which influenced the political environment in which managerial choices were made, such as the 1964 Civil Rights Law. Beyond particular laws the 1950's and 1960's were a time of sweeping change with regard to the broader integration of African-Americans into society at large. Including the time variable allows the effect of these events on the pace of integration to be estimated. We expect the effect of time to be negative at the outset and to move toward zero over the time period.

The values for x measure variables across each team and over time that are related to management's perception of the marginal revenue product from using additional black athletes. Equation (2) presents the specific set of variables we have chosen to include in x:

$$\begin{aligned}\text{(2)} \quad & \text{BLACK}_{it} \\ &= \boldsymbol{\alpha}_t + \beta_0 + \beta_1 \text{ Games Back}_{it-1}, \\ &\quad + \beta_2 \text{ Median Family Income}_{it} \\ &\quad + \beta_3 \text{ Percentage Nonwhite}_{it} + e_{it},\end{aligned}$$

where

Games Back_{it-1} = number of games out of first place by team i in year $t - 1$;

$\text{Median Family Income}_{it}$ = median family income (in 1950 dollars) for team i in year t; and

$\text{Percentage Nonwhite}_{it}$ = percentage of population that is nonwhite in year t for team$_i$.

Games Back is a measure of relative team performance such that $\beta_1 > 0$ if the worst teams integrated first and $\beta_1 < 0$ if the best teams integrated first. Beyond the fact that it is the most common means of tracking performance for teams trying to win division titles and pennants, Games Back offers an advantage over other measures of team performance in baseball, such as winning percentage. Winning percentages, though correlated with relative performance, do not measure relative performance as accurately as Games Back because MLB teams are split into two leagues over the entire time frame and into two divisions within each league for 1969–1971.

Since no direct measures of customer willingness to pay to see black versus white players exist, we include Median Family Income and Percentage Nonwhite as possible indicators of differences in customer discrimination across teams and over time. The rationale for Median Family Income is the common association of higher levels of discrimination with lower levels of income. If customer discrimination is negatively associated with real income, then $\beta_2 > 0$. Percentage Nonwhite accounts for the possibility that a larger Percentage Nonwhite population (reflecting mostly African-Americans at this time for the cities in our sample) may have a marginal preference for black players; hence $\beta_3 > 0$. Some historical accounts attribute the early use of black players by the Brooklyn Dodgers to such a local influence.[8]

[8] The number of black players per team for 1947–1959 was derived from performance records of black players from this time period presented in Larry Moffi and Jonathan Kronstadt (1994). For 1960–1971, we rely upon Scully (1974 pp. 234–35). Scully's data list the percentage of black players, which we convert to number of black players by multiplying by the typical roster size of 25. Games back data are from John Thorn et al. (1997). Demographic and income data are from U.S. Department of Commerce, Bureau of the Census, *City County Data Book* (various issues). MFI annual values between Census years are linear interpolations. For Percentage Nonwhite, Census-year data are used until the midpoint of a decade, and then data from the next Census are used.

TABLE 2—ESTIMATES OF MAJOR LEAGUE BASEBALL INTEGRATION, 1947–1971

Variable	Coefficient/*t*-ratio			
Intercept				7.49
				(7.96)
Games Back				−0.03
				(−4.64)*
Median Family Income				−0.16
				(−1.32)
Percentage Nonwhite				−0.01
				(−0.32)
Year Effects	1947 = −5.88	1948 = −6.08	1949 = −5.79	
	(−7.74)*	(−8.12)*	(−7.85)*	
	1950 = −5.67	1951 = −5.09	1952 = −4.85	
	(−7.78)*	(−7.10)*	(−6.09)*	
	1953 = −4.70	1954 = −3.58	1955 = −3.06	
	(−6.73)*	(−5.18)*	(−4.50)*	
	1956 = −2.08	1957 = −2.66	1958 = −2.19	
	(−4.19)*	(−4.02)*	(−3.38)*	
	1959 = −2.05	1960 = −2.34	1961 = −1.90	
	(−3.20)*	(−3.79)*	(−3.00)*	
	1962 = −1.69	1963 = −1.19	1964 = −1.23	
	(−2.80)*	(−2.03)*	(−2.11)*	
	1965 = −0.68	1966 = −0.05	1967 = −0.24	
	(−1.18)	(−0.04)	(−0.40)	
	1968 = 0.26	1969 = 0.84	1970 = 0.59	
	(0.45)	(1.47)	(1.08)	
R^2	0.58			
F-statistic	21.10			

Source: See footnote 8.
* Significant at the 0.05 level or lower.

Table 2 reports the estimated ordinary least-squares coefficients for equation (2) for 1947–1971. Overall, the equation explains about 58 percent of the variation in the number of black players on each team. The estimated coefficient for Games Back is negative and significant (at better than the 1-percent level). The coefficients on Median Family Income and Percentage Nonwhite are not significant. The year coefficients are negative and significant at better than the 5-percent level from 1947 through 1964. After 1964, the coefficients are not significantly different from zero. The largest increases in the year coefficients occur between 1953–1954 (1.1), 1965–1966 (0.7), 1950–1951 (0.6), 1962–1963 (0.5), and 1964–1965 (0.5).

The negative and significant coefficient on Games Back is insensitive to several alternative empirical methods and specifications. These include: estimating equation (2) by treating Games Back as endogenous and using predicted values for lagged games back; including a dummy variable for southern cities; including city-based fixed effects; narrowing the time frame; and eliminating the insignificant independent variables. In these alternative specifications the coefficients on Games Back range from −0.03 to −0.07 and are significant at or below the 1-percent level.[9]

In addition to these variations, we also substituted lagged winning percentage for games back along with fixed effects for year.

[9] In the two-stage least-squares (2SLS) version we estimated predicted values for Games Back with the prior two years' games back, a city-based fixed effect, and the number of black players as the instruments. The first stage has an R^2 of 0.45, and all the independent variable coefficients are statistically significant at or below the 5-percent level. The 2SLS estimated coefficient for Games Back, using both year and city effects, is −0.07 (t = 5.41), and the R^2 is 0.57. The only significant city effects are for Atlanta and Houston (both positive). With southern cities included, Games Back is −0.039 (t = 4.54); Games Back is −0.03 (t = 2.97) for the shorter time period, 1947–1959; and excluding insignificant regressors, Games Back is −0.03 (t = 4.90). Other than year effects, the other variables in the 2SLS versions are insignificant.

Although Games Back is a more precise measure of relative performance in baseball, it is highly correlated with winning percentage. The overall explanatory value of the equation is nearly identical (0.57), and the coefficient on lagged winning percentage is positive (4.6) and significant at the 1-percent level—winning teams integrated earlier. The effect is similar in magnitude to using Games Back. One game back is equal to about a 0.006 reduction in winning percentage.

Within Major League Baseball the experiences of the National League (NL) and American League (AL) differed considerably. The NL had nearly achieved a steady level of black players by 1960, with a league average of 22-percent black players and no team having fewer than 16 percent of its roster made up of black players. In contrast, no AL team had more than 16 percent of black players in 1960. AL teams had 9-percent black players on average, and this figure did not rise above 20 percent until 1968. Moreover, the magnitude of the effect of lagged games back in the regression equation is influenced by AL teams, but not the sign or significance. For example, dropping all of the AL teams increases the magnitude of the coefficient slightly from -0.03 to over -0.04, while the coefficient for the AL only sample is -0.02. An AL dummy variable indicates, on average, that AL teams used about 1.7 fewer black players each year than their NL counterparts. This finding suggests that competition in the NL, led by the Brooklyn Dodgers, forced other NL teams to integrate rapidly or lose, while absent Branch Rickey in the AL, the overall pace of integration was slower.

III. Data Analysis: Integration in Atlantic Coast Conference Basketball

Consider now the model of racial discrimination in the context of college basketball. Discrimination limits the pool of talent. Those that first tap the expanded pool of talent will be more successful. The willingness to integrate is also a function of the local environment. We express this model formally as:

$$B = \beta_0 + \beta_1 W + \beta_2 \mathbf{D}, \tag{3}$$

where W is the overall team winning percentage in a given year; B is the fraction of the players on the team who are black; and $\mathbf{D}$ is a vector of local demographic characteristics, respectively.

During the period of innovation or diffusion, if the first-best hypothesis is correct, $\beta_1 > 0$. If the worst teams integrate first, this coefficient will be negative. The null is, of course, no relation between winning and team integration.[10] We estimated the parameters of this model using annual data for each team in the ACC during the period 1961 through 1984 by the technique of ordinary least squares.[11] The results of several different specifications are reported in Table 3.[12] The winning percentages are lagged one year. That is, we inquire whether games won or lost last year affects racial composition in the subsequent season.

The results are robust with respect to the best-first hypothesis. The winning percentage variable is strongly positive in all specifications. Overall team-winning percentage is a strong predictor of which schools integrated first. Income, black, and rural population appear to

[10] The relation between blacks and winning should eventually dissipate when innovation or diffusion is complete. Hence, the test of the parameter, β_1, is only conducted over the period of diffusion. As shown earlier, this is approximately 1961–1984. See Figure 2.

[11] The results we report below are not sensitive to the exact period chosen. Similar results obtain if we add or delete years on the front end, or delete years on the back end. We do not think it is appropriate to add years past the point of full diffusion on the back end.

[12] It has been suggested that we use more local values for demographic information. While this is possible, we think the state data are more appropriate as most of these schools are state schools, and the politics of integration and related issues were, in our opinion, more clearly determined by overall state politics.

Also, the University of South Carolina was a member of the ACC until 1972. They are excluded from the estimation process here. Including the University of South Carolina does not alter the results.

Data on black players were collected by examining team photographs year by year, provided by the Atlantic Coast Conference offices in Greensboro, North Carolina. Black population, rural population, and per capita income are from U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States* (various years). Winning percentage and attendance are from the *Atlantic Coast Conference Fact Book* (various years). Female/male ratio is from *Clemson University Men's Basketball Guide* (various years).

TABLE 3—ORDINARY LEAST-SQUARES ESTIMATES OF THE BASKETBALL INTEGRATION EQUATION (DEPENDENT VARIABLE: RATIO OF BLACKS TO NUMBER OF PLAYERS ON TEAM, ANNUALLY, 1961–1984 IN ACC)

Variable	Coefficient/*t*-ratio[a]				
Intercept	0.0411	−0.05639	−0.5541	−0.7791	−0.7791
	(−0.76)	(−9.12)	(−6.18)	(−7.51)	(−7.49)
Overall team annual winning percentage lagged one year	0.3561	0.179	0.1826	0.1966	0.1953
	(4.07)	(2.74)	(2.63)	(2.94)	(2.80)
State real income per capita where school located		0.000093	0.000092	0.000085	0.000085
		(12.69)	(10.47)	(9.84)	(8.64)
Percentage of population rural in state where school located			−0.013	−0.466	−0.4665
			(−0.15)	(−3.26)	(−3.25)
Black percentage of state population in state where school located				2.0334	2.0392
				(3.90)	(3.85)
Ratio of females to males at school					−0.0037
					(−0.07)
R^2	0.0839	0.5165	0.5166	0.5546	0.5546
F-statistic	16.58	96.15	63.76	55.4	44.07
Number of observations in regression	183	183	183	183	183

Note: Teams: Clemson, Duke, Maryland, NC State, UNC-Chapel Hill, Virginia, Wake Forest. See footnote 12.
[a] *t*-ratios listed in parentheses under coefficient estimate.

impact the process of integration in a predictable fashion, while university-specific gender ratios are unrelated to the integration process. The latter result suggests that segregation was not a male-driven phenomenon. The model explains about 50 percent of the variation in the process of racial integration, depending on specification.

Numerous other specifications were estimated, including versions that controlled for stadium size, private versus public institutions, and other variables.[13] These other variables do not appear to matter in the process of integration, nor did they alter the results on the model of winning percentages.[14]

The results in Table 3 say that good teams were first to adopt the new innovation, that is, to integrate. The managerial alertness hypothesis is supported with these data, and we conclude that, as before in the case of baseball, good managers are the first adopters of new, improved technology.

IV. Productivity Results: Major League Baseball

We have assembled evidence to investigate the proposition that the first black players were more productive relative to their white counterparts and that this productivity advantage tapered off over time, so that after diffusion and innovation marginal players, black or white, were of the same talent.

We first computed slugging averages for black and white players at three-year intervals from 1948 to 1999, and then computed quartiles for each group.[15] Slugging average is a commonly used summary measure of offensive

[13] We also estimated the integration equation simultaneously with a winning equation where games won and black players are endogenous. The results are comparable to the ones we report in Table 3.

[14] We also regressed the year that teams incorporated their first black player on overall team winning percentages in the 1960's and average state real income per capita during the 1960's. There is a strong negative and significant relationship between winning and year of the first black player in this regression, a result supporting the evidence reported in Table 3.

[15] This data set was constructed using player performance data in The Baseball Archive Baseball Database at www.baseball.com. Assignment of race was done using Moffi and Kronstadt (1994), as well as the authors' knowledge augmented by that of several colleagues. We included players who appeared in at least 120 games (approximately 75 percent) in a given year. This excludes players who were injured for substantial periods as well as less-known, part-time players with limited at bats for whom racial classification was difficult.

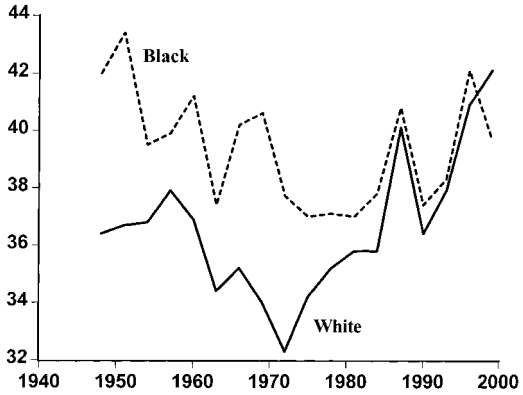

FIGURE 3. MEDIAN SLUGGING PERCENTAGES OF BLACK AND WHITE MLB PLAYERS AT THREE-YEAR INTERVALS, 1948–1998

Notes: Black players include black Latinos. White players include Hispanic Latinos. See footnote 16. Left-hand side is in percentages.

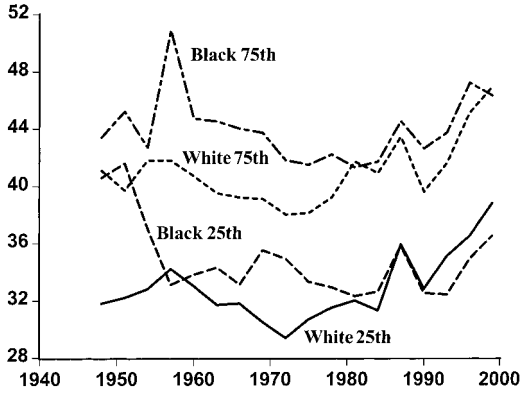

FIGURE 4. 75TH AND 25TH PERCENTILES FOR SLUGGING PERCENTAGES OF BLACK AND WHITE MLB PLAYERS AT THREE-YEAR INTERVALS, 1948–1998

Note: See Figure 3.

production. It is computed by dividing total bases by total plate appearances (at bats, bases on balls, sacrifices).

Figure 3 displays the median slugging averages for black and white players at three-year intervals, and Figure 4 displays the 25th and 75th percentiles.[16] At the median black players' slugging averages ranged from 4 to 8 percentage points higher than those for white players throughout the 1950's and 1960's. The averages began to converge during the 1970's and differed by only small amounts throughout the 1980's and 1990's. The results for the 75th percentiles are similar to the median results. The 25th percentiles exhibit smaller differences after the mid-1950's, even converging for a brief period during the late 1950's.[17]

Awards in baseball such as Most Valuable Player and Rookie of the Year indicate similar kinds of productivity differences at the high end of player performance. These awards are summarized by decade and race in Table 4. For instance, starting with Jackie Robinson in 1947, black players won six of the next seven Rookie of the Year awards. Dominance of black players in winning these awards began to subside in the 1960's with the AL significantly lagging behind the NL in its recognition of black talent.

V. Productivity Results: Atlantic Coast Conference Basketball

The productivity hypothesis says that black players will perform better relative to white players during the period of innovation/diffusion than during the post-diffusion era. To examine this question in basketball we estimated the relation between games won and black percentage of team, providing separate estimates of the relation between black proportion on the team and winning for each year during the innovation era.[18]

Table 5 reports these individual estimates,

[16] Blacks in the sample include blacks from Latin America, and whites include Hispanics from Latin America. As is always the case, designation of race by external observers based on subtle differences in skin color can be arbitrary. We estimated but do not report results for only African-Americans and whites born in the United States. These results are nearly identical to those including Latin American players.

[17] We also estimated regressions of the number of black players on team winning percentage for three-year rolling intervals, starting with 1947–1949 and continuing until 1971. The coefficient values reach a maximum for 1948–1950, and then decline. The median coefficient value for 1947–1959 is 0.016 while for 1960–1971 the median value is 0.007. For a similar approach with the same results, see Andrew Hanssen (1998).

[18] We also controlled for team talent using coaching experience, shooting percentages, and rebounding, and estimated this equation simultaneously using two-stage least squares.

TABLE 4—AWARDS TO BLACK MAJOR LEAGUE BASEBALL PLAYERS

	MVP		Rookie of the Year	
	NL	AL	NL	AL
1950–1959	8/10	0/10	9/13*	0/13[a]
1960–1969	6/10	2/10	2/10	2/10
1970–1979	4.5/10	6/10	3/10	3/10
1980–1989	3/10	1/10	3/10	3/10
1990–1999	6/10	5/10	1/10	1/10

[a] Data for 1947–1959.

TABLE 5—YEARLY ESTIMATES OF THE RELATION BETWEEN BLACK PROPORTION OF TOTAL TEAM AND WINNING (DEPENDENT VARIABLE: ANNUAL TEAM OVERALL WINNING PERCENTAGE, 1961–1984, ACC SCHOOLS, EXCLUDING SOUTH CAROLINA)

Year	Coefficient Estimate on Black Proportion of Total Team	t-ratio	Probability $\lvert t\rvert > 0$
Pooled estimate	0.2176	3.61	0.0004
1966	−0.724	−0.740	0.463
1967	−0.453	−0.640	0.524
1968	0.588	1.130	0.260
1969	0.599	1.370	0.173
1970	0.360	1.030	0.302
1971	0.613	1.930	0.055
1972	0.466	1.840	0.068
1973	0.469	2.200	0.029
1974	0.251	1.600	0.111
1975	0.294	2.150	0.034
1976	0.224	1.640	0.103
1977	0.198	1.470	0.144
1978	0.151	1.110	0.269
1979	0.277	1.910	0.058
1980	0.300	2.190	0.030
1981	0.322	2.260	0.025
1982	0.165	1.350	0.178
1983	0.196	1.670	0.096

Source: See Table 3.

and they are plotted in Figure 5. The estimates are consistent with the Jackie Robinson hypothesis. During the period of innovation, the impact of additional black players on winning was bigger and more significant than during the post-diffusion period. Note that the relation is not significant in the first year that Maryland integrated, but is significant in subsequent years, and, moreover, that the relation declines in value as the innovation diffuses into the league. We also estimated the parameters of the integration and winning equations for the post-diffusion era only, that is, for 1985 forward. The parameter on black percentage in the winning equation is *not* significant in this case in contrast to the diffusion period.[19]

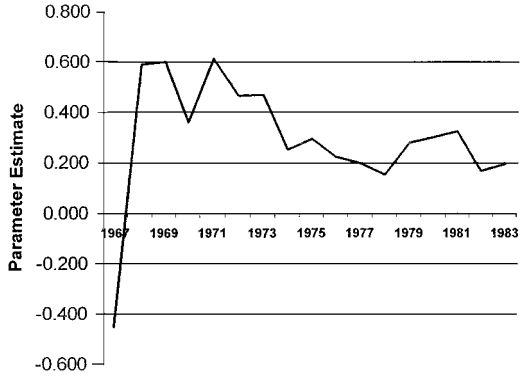

FIGURE 5. RELATION BETWEEN WINNING AND BLACK PERCENTAGE OF TOTAL TEAM SIZE OVER TIME

VI. Concluding Remarks

Racial integration spread across professional baseball teams and the basketball schools along Tobacco Road in a fashion similar to other innovations in economic process. Previously successful entrepreneurs figured out how to obtain black athletic talent and to use it to their

[19] We also addressed the issue of the relative productivity of black to white players in the ACC in other ways. We assembled data (Ron Morris, 1988) on the black/white ratio of the All-Atlantic Coast Conference Team and compared it to the black/total players ratio leaguewide. The data are from 1965–1992, several years beyond the point at which an integrated equilibrium had been reached in the Conference. This analysis reveals that in the ACC there is a greater fraction of black players who are all-stars than there are black players represented on their teams.

Also, looking at individual performance data, such as points scored, we find that the black players score more and rebound more than their white counterparts. We decomposed these individual player performance statistics by decade from 1960 through the early 1990's, and we find that it persists. Black basketball players are better than their white counterparts, but they are disproportionately underrepresented on their teams. The persistence of a difference on average, by race, calls for further analysis. We are working on answering the question of whether this is due to lingering discrimination or simply to the fact that, at the margin, the quality of play is the same across race but not on average.

teams' advantage, that is, to continue to win and to garner additional revenues and recognition. The process of integration took about 20 to 25 years to complete in both sports, that is, to move from a segregated to an integrated equilibrium. The degree of competition in college basketball and baseball may have had something to do with the relative speed of adjustment; without comparable examples from other venues, we cannot say whether 20 to 25 years is a long time or not. However, this length of time corresponds roughly to the turnover of nearly all of the managers and owners from the segregated era. Once the coaches and managers in these leagues were drawn from individuals who had played during the integrated era, the process of integration reached its fruition.

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