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The Increasing Competitive Balance in Major League Baseball

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Abstract. This paper explores the changing competitive balance in Major League Baseball through the relative-entropy measure of information theory. It is shown that while competitive balance in both leagues has been on an upward path during the 20th century, the path has had numerous detours that resulted from some on-the-field and some off-the-field changes that Major League Baseball has undergone during the past 75 years. The most important detours occurred in the wake of the Black Sox scandal of 1919, Jackie Robinson's breaking the color barrier and the concurrent spread of television and erosion of the minor leagues, franchise moves and major league expansion, and free agency.

Key words: Major league baseball, competition, economic models.

I. Introduction

With Rottenberg (1956) writing the seminal paper, interest in the economics of Major League Baseball was initially stimulated by questions about the effects of (1) the reserve clause that forever bound players to the teams with which they initially signed, in tandem with (2) differences in the teams' market size and drawing power. That interest has proved to have legs, particularly with respect to whether the real-world consequences of free agency and the *dissolution* of the reserve clause were what economic theory would have predicted (see, e.g., Hylan et al., 1996).

Among other considerations that have to be factored in when judging any package of rules established by a sports league is that of their impact on "competitive balance". Doubtless there are exceptions of which I am unaware, but as a general principle *all* sports leagues, whether professional or amateur, profess a desire to "maintain competitive balance". Indeed, maintaining league balance in the major leagues was an expressed goal of the 1903 National Agreement that provided the blueprint for the modern major leagues (Davis, 1974, p. 363). Nonetheless, the assertion often becomes an appealing *raison d'être* for the more egregious sins that a cartel's rules commit against the players and/or the public (see, e.g., Defendant's Closing Argument Brief, 1984, pp. 14–15).

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Particularly with respect to professional sports leagues, the notion that maintaining competitive balance is critical for sustaining both fan interest and thence member profits has considerable intuitive appeal. More careful consideration of the issue, however, leads to recognition of the following contravening facts: (1) imbalances may occur because of differences in both franchise drawing potentials, and owners' utility functions that may have both profits and winning as their arguments (Quirk and El Hodiri, 1974); (2) a league with teams of equal strength is not necessarily welfare enhancing (Canes, 1974); and (3) even when all owners are profit maximizers there may be an optimal level of team dominance, a level at which the major league cartel may have operated prior to free agency (Hunt and Lewis, 1976).

Through glance analysis, both the more casual and the most serious students of the game (e.g., James, 1986) have detected a tendency towards increased competitive balance within the major leagues. That tendency has been verified through more exacting research (Scully, 1989; Quirk and Fort, 1992). Some specific explanations proffered for this increase are the "beneficial effects of franchise moves . . . into profitable new markets" (Quirk and Fort, 1992, p. 248) and the related "narrowing of the size of the market in which teams compete" (Scully, 1989, p. 97), the "introduction of a reverse-order-of-finish rookie free agent draft in 1964" (Quirk and Fort, 1992, p. 248), and the "disappearance of sales of star players for cash since the 1950s" (Quirk and Fort, 1992, p. 248). By the same token, it can be argued that replacing the reserve clause with a free agency system that threatens to allow the rich to get richer (Daly and Moore, 1981), and periodic major-league expansion that initially creates some truly dreadful teams (Scully, 1989, p. 92; Quirk and Fort, 1992, p, 248), would have precisely the reverse affect on competitive balance. More recent work suggests that depending upon how one analyzes the issue, either the "narrowing of market sizes", "free agency", and "compression of talent" explanations for the observed increase in competitive balance are *all* unsupported by the data, or *none* are supported by the data (Butler, 1995).

The purpose of this paper is to further explore the changing-competitive-balance issue, to do so through a somewhat different approach than was used in the earlier studies, and to offer a somewhat different perspective on the factors that may have helped to effect those changes that *have* occurred. In particular, measuring competitive balance through the relative-entropy measure of information theory, it is shown that while competitive balance in both leagues has indeed been on an upward path during the 20th century, the path has had numerous detours. These detours resulted from some on-the-field and some off-the-field changes that Major League Baseball has undergone over the past 75 years. The most important detours occurred in the wake of the Black Sox scandal of 1919, Jackie Robinson's breaking the color barrier and the concurrent spread of television and erosion of the minor leagues, franchise moves and major league expansion, and free agency.

II. The Basic Approach

To measure competititve balance, Scully (1989) and Quirk and Fort (1992) relied on variance-based measures using annual won-lost percentages for both individual teams and the leagues overall. Quirk and Fort (1992) also looked at the Gini Coefficient as a measure of concentration of league championships. The exclusive focus of the present paper is on trends in the annual dispersion of win percentages among teams within each league, relative to the maximum achievable degree of dispersion for that number of teams.

In information theory, entropy is a measure of uncertainty defined by $H = -\Sigma_i p_i \log_2 p_i$, where p_i is the probability of occurrence of the ith event. In the present context, p_i is the proportion of the league total victories that are accounted for by the ith team.[1] Until 1961 when the American League expanded into Los Angeles and Washington, and the Washington Senators moved to Minneapolis, each major league comprised eight teams. Each team played 22 games against the other seven teams. Under this round-robin schedule, the greatest competitive balance, and the greatest uncertainty as to which team might have won a randomly-selected game played during that season, is achieved when each team wins and loses 77 games of the 616 games that are played. Then, p_i = 1/8 and the maximum entropy is

$$HM = -8(1/8)\log_2(1/8) = 3.$$

Similarly, the minimum entropy or uncertainty about which team might have won a game selected at random from the schedule, is achieved when the best team wins all of its 154 games, the second-best team wins 132 games, and so on down the line in 22-game increments. This dominance at one extreme and ineptitude at the other results in a minimum entropy of

$$\begin{aligned} H_m \;=\; & -(154/616)\log_2(154/616) - (132/616)\log_2(132/616) \\ & - \cdots - (0) = 2.61. \end{aligned}$$

Between 1903 and 1961 the entropies in the two leagues ranged from the National League's 1909 low of 2.9361, to its 1915 high of 2.9944.[2] Thus, relative to the maximum and minimum achievable entropy levels, parity rather than disparity seems to have been the rule. Indeed, only the exceptional team either wins or loses

[1] For an exposition of entropy in an industrial organization context with the p_i interpreted as market shares, see Theil (1967).

[2] Various issues of *The Baseball Encyclopedia* (Reichler, 1988) are the sources for all but the most recent data, which were obtained from *The World Almanac*. Unattributed facts are from various issues of the *New York Times*, Reichler (1988), Neft and Cohen (1988), and James (1986). Attributions for the various quotes from Major League Baseball people can be found in Nelson (1984) and Dickson (1992).

more than two thirds of its games.[3] At the extremes, the National League's 1906 Chicago Cubs won 116 games and had a winning percentage of 76.3; the American League's Philadelphia Athletics won only 36 games in 1916 and had a 23.5 winning percentage.

Relative entropy, $R = H/H_M$, measures the degree of uncertainty about which team might have won a randomly-selected game, relative to the maximum uncertainty possible. In the case of an eight-team league, $1 \geq R \geq .87$. Thus, R is necesssarily confined to a narrow band. In empirical fact, between 1903 and 1995 the lowest R was the National League's 1909 figure of 0.9787, and the highest R was the American League's 0.9985 figure of 1974.

An on-going decrease in disparity among the teams within each league translates into the hypothesis that R is systematically and asymptotically approaching its upper bound of unity. To test this hypothesis, let R_{tL} denote the relative entropy in year 19t (t = 03,. . . , 95) for league L (N = National; A = American), let α_L and β_L denote regrssion parameters whose estimates are a_L and b_L, respectively, and let μ denote a random-error term with the usual normality properties. The *initial* hypothesis is that

$$R_{tL} = [1 + \exp\{\alpha_L + \beta_L t + \mu\}]^{-1},$$

where $\beta_L < 0$ so that

$$dR_{tL}/dt = -\beta_L[\exp\{\alpha_L + \beta_L t + \mu\}][1 + \exp\{\alpha_L + \beta_L t + \mu\}]^{-2} > 0,$$

and $d^2R_{tL}/dt^2 < 0$ (for all α_L and β_L). That is, R_{tL} is increasing at a decreasing rate. The desired parameter estimates are obtained by running the regression

$$Y_{tL} = \text{Ln}[1/R_{tL} - 1] = \alpha_L + \beta_L t + \mu.$$

III. The Empirical Results

1. The Initial Estimates

The initial parameter estimates for the two leagues are remarkably similar. For the National League, $a_N = -4.3728$ and $b_N = -0.0147$. The adjusted multiple correlation coefficient (AdjR_L^2) is AdjR_N^2 = 0.4024, and both parameter estimates have SAS-computed minimum "p values" of 0.0001. Similarly, for the American League, $a_A = -4.3087$, $b_A = -0.0149$, and Adj$R_A^2 = 0.4507$. The good news, then, is that the hypothesis of R_{tL} increasing at a decreasing rate is borne out by the estimated regression parameters ($b_L < 0$). The balancing bad news is that the

[3] When Casey Stengel managed the New York Yankee from 1949 through 1960, they won ten pennants and seven World Series. The only Series' they lost went the full seven games. The Yanks were the dominant team of that era. Nevertheless, Stengel knew that "The Yankees don't pay me to win every day – just two out of three".

respective Durbin-Watson statistics of DW_N = 1.323 and DW_A = 1.390 suggest autocorrelated residuals.

The DW_L values would *seem* to support Scully's finding of autocorrelated residuals in individual-team win percentages. He attributes that finding to the "widespread phenomenon" of momentum in sports (Scully, 1992); or, neither Rome nor the Atlanta Braves' current pitching staff was built in a day, and one seems as likely as the other to remain intact through the 20th century. The momentum phenomenon, however, is not *necessarily* the cause of the autocorrelation in the R_{tL} residuals. Factors such as free agency and expansion, rather than the mere passage of time, may have effected the observed trend towards increased competitive balance. The remainder of the paper is devoted to the import and impact of these factors.

2. Some Additional Considerations

Baseball guru Bill James has remarked that "[T]he change between the baseball that was played in the teens and the baseball of the twenties is the most sudden and dramatic of this century" (James, 1986, p. 124). Reichler (1988, p. 18) also remarks on "baseball's great change in 1920". Among other things: (1) in 1920 baseball got its first strong commissioner, Judge Kenesaw Mountain Landis, as the owners' response to the Black Sox World Series scandal of 1919; (2) in 1920 Babe Ruth joined the New York Yankees and hit 54 home runs, which prompted the introduction of the lively ball and, in effect a new game, when it was discovered that the fans were attracted to the long ball; (3) and in 1920 each team could designate two spitball and/or "emory ball" pitchers, with the ban on these pitches extended in 1921 to all but 17 hurlers who were grandfathered in for the rest of their careers; (4) during the previous decade (a) the players were receptive to unionization through the Baseball Players Fraternity, and (b) the rival Federal League was born (1914) and died (1916), while (c) "[O]ver the years 1920–45, organizational movements by major league players were at a standstill" (Voigt, 1991, pp. 108–110); and (5) after the minor leagues broke off relations with the major leagues in 1919, the majors agreed to raise the prices paid in the minor-league draft *and* to make it "a more effective tool for equalizing strengths" by drafting in reverse order of finish (Davis, 1974, p. 364). Whether these fundamental changes had any impact on competitive balance, and if so in which direction, is only resolvable as an empirical issue. Changes that fundamentally alter the game both on and off the field may give the "haves" a previously unavailable opportunity to catch up with the "have nots". One may therefore hypothesize that such changes will effect greater competitive balance, and then subject this hypothesis to the empirical test.

A second watershed period for the major leagues came with the end of World War II and the return to civilian life of some of the great players who served in the military. Hank Greenberg was released from service midway through the 1945 season, slugged 0.544 over 78 games, and helped the Detroit Tigers win the pennant by a 1.5-game margin over the second-place Washington Senators (who

had finished dead last in 1944). The Tigers went on to win a seven-game World Series from the Chicago Cubs, with Greenberg rising to the occasion and slugging 0.624. In 1946, Stan Musial and Enos Country Slaughter returned to the St. Louis Cardinals, Ted Williams resumed his rightful place in Fenway Park's left field, and the Cards won a seven-game World Series from the Boston Red Sox.

But *every* team enjoyed the benefits of returning veterans. There were, however, two other events of historical note occurring at this time. Although still in its infancy, television was now a factor, and televised major league baseball was starting to spread to the hinterlands where minor league teams had heretofore flourished, and the demise of the minor leagues as they had previously been constituted was imminent.[4] The effects on the minor leagues would be exacerbated within a decade, when air travel would make it feasible for major league franchises to be located west of the Mississippi, in some prime minor-league locations. As a result, it would soon no longer be possible for teams such as the New York Yankees and the Cardinals to scout, sign, inventory, and nurture future major-league stars down on the farm, calling them up to "The Show" as needed. And Jackie Robinson joined the Brooklyn Dodgers in 1947.

It is scarcely a coincidence that when Robinson became the first black to play in the major leagues, the National League Dodgers went on to win their first pennant since 1941 (which had been their first pennant since 1920). After the Boston Braves won the 1948 pennant by relying on Spahn and Sain and praying for rain, two other blacks, pitcher Don Newcombe and catcher Roy Campanella, joined the Dodgers for the 1949 season, and the Dodgers returned to the Series. Robinson and Campanella also played for the Dodgers in the 1952, 1953, 1955, and 1956 World Series', and Newcombe pitched in the 1955 and 1956 Series, after completing his military service during the Korean conflict.[5]

[4] Over the years there were a series of changes in the *minor-league* draft rules under which major-league teams could draft players "owned" by minor-league teams. Two such changes in 1957 made "any minor leaguer with four years' service . . . subject to the draft", and renewed "the limit on the number of players that could be drafted from a single team" (Davis, 1974, p. 366). The changes helped sound the death knell for the larger farm systems. For a discussion of this series of events, see Davis (1974, pp. 363–368).

[5] Campanella was with the Dodgers for half of the 1948 season. The Dodgers finished a distant third and fired manager Leo Durocher halfway through the season, replacing him with Burt Shotten. Their greatest rival, the hated Giants, seized the opportunity to let go of their manager, Mel Ott, and replaced him with Durocher.

The Dodgers' of the Jackie Robinson era were an even greater team than their run of post-season appearances suggests. As a result of having beaten the Philadelphia Phillies, the one-year-wonder Whiz Kids, in the penultimate game of the 1950 season, they trailed the Phils by one game. The season's finale was at Ebbets Field. The Dodger starter was Newcombe, who two weeks earlier, having hurled a 2-0 shutout in the opening game of a double header against the Phils at Shibe Park, tired and was "only" able to make it through the 7th inning of the nightcap of a Dodger sweep. The Phils starter was Robin Roberts. With none out and the game tied at one in the bottom of the 9th, Cal Abrams, trying to score the pennant-tying run from second on a single to center, was cut down by Richie Ashburn. After loading the bases, Roberts retired Carl Furillo and Gil Hodges, who were not exactly chopped liver. The Phils clinched the pennant on Dick Sisler's 10th-inning home run.

With not quite as great a flair, Larry Doby, who was up for the proverbial "cup of coffee" with the Cleveland Indians in 1947, became the first black to play in the American League. Joined by the Negro Leagues' greatest pitcher, the aging Satchel Paige, Doby helped the Tribe win the 1948 pennant and World Series.[6] The Yankees managed to renew and maintain their pre-war dynasty without any black players, until Elston Howard joined the team in 1955. The Yankees, however, had their reknowned pipeline to the Kansas City Athletics, who in the fifties behaved as their surrogate farm team (Cohen, 1987, pp. 648, 651; Veeck, 1962, p. 269).

Fate was not as kind to the Red Sox. Their first black player, Pumpsie Green, appeared in a total of 327 games for them, in a four-year stint that began in 1959. The Red Sox won in 1946, lost the 1948 pennant in a playoff with the Indians, and by dropping the final two games of the season in Yankee Stadium contrived to lose the 1949 pennant by a game to the erstwhile Bronx Bombers. Yet, they did not contend again until winning the 1967 pennant.

Beyond the social ramifications, the introduction of blacks into the major leagues helped to negate the import of an existing farm system: the black players of the Negro Leagues now became a potential and viable alternative to the white players of the minor leagues. Moreover, the *sources* of talent to stock what remained of the minor leagues would be forever altered, as black players from the South, the Caribbean, and the inner cities now became a feasible option for teams willing to take advantage of it, and the Negro Leagues soon met the same fate as the minor leagues. The traditional network for discovering and signing talent was no longer

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The following season the Dodgers lost the third playoff game and the pennant to Durocher's Giants on Bobby Thomson's 9th-inning Polo Grounds' "shot heard round the world". Once again Newcombe was the Dodger's starter. He entered the fatal inning with a 4-1 lead, but eventually left in favor of the ill-fated Ralph Branca. The Giants, who on August 12 trailed the Dodgers by 13-1/2 games, had won 16 straight to get back into the race. Thomson's opportunity to hit that game- and pennant-winning home run was in large measure due to the season-long performances of two black players who had joined the team in 1949, Hank Thompson and Negro League veteran Monte Irvin, as well as that of a rookie, Willie Mays. Like Big Newk, Mays joined the service early in the 1952 season. He rejoined the Giants, Thompson, and Irvin in time for the 1954 season, hit 41 home runs, and led the league in triples (13), batting (.345), and slugging (.667). The Giants, with Durocher still at the helm, but Thomson playing in Milwaukee, finished five games ahead of the Dodgers, and swept the Cleveland Indians in the World Series in which Mays made his famous catch on a ball hit by Vic Wertz. Later asked to evaluate his various catches, Mays replied "I don't compare 'em, I just catch 'em".

Mays played in two more World Series, the last being in 1973 with the New York Mets. Mays had a refreshing and salient view of baseball and how he became an on-the-field and off-the-field success. In the former regard: "They throw the ball, I hit it; they hit the ball, I catch it"; and, in the latter regard, "Everytime I look at my pocketbook, I see Jackie Robinson".

Robinson retired after the 1956 season and the Milwaukee Braves won the 1957 and 1958 pennants with an all-black outfield of Wes Covington, Billy Bruton, and all-time home run leader Hank Aaron.

[6] Like Doby, the aforementioned Hank Thompson made a brief 1947 appearance in the American League, playing for the St. Louis Browns.

Paige, whose back-door admission to the Hall of Fame turned him "from a second-class citizen into a second-class immortal", was at least 42 years old when he made his major league debut. He pitched 73 innings, and had a 6-1 won-lost record to go with a 2.48 ERA. Perhaps most remarkably, he threw three complete games in seven starts. When asked about his age, Paige was wont to reply: "I've said it once and I'll say it a thousand times, I'm 44 years old".

the *only* network for discovering and signing talent. In combination, these changes may be hypothesized to have given the weaker clubs an opportunity to catch up with the established clubs, by enabling them to gain greater access to an enhanced pool of playing talent.

Thanks in no small measure to the advances made in air travel, during the 1950s Major League Baseball changed in another fundamental way: franchises began to be relocated. In 1953 the Braves moved to Milwaukee. In 1954 one of the American League's perennial dormats, the St. Louis Browns, moved to Baltimore and became the Orioles. In 1955 another of the league's perennial dormats, the Philadelphia Athletics, moved to Kansas City. And in 1958 the truly unthinkable happened: the New York Giants moved to San Francisco and the Dodgers moved to Los Angeles. These moves set the stage for the first of the major-league expansions, when in 1961 the American League's Washington Senators moved to Minneapolis and became the Minnesota Twins, and new franchises were established in Los Angeles (to eventually become the California Angels) and Washington (relocated in 1972 as the Texas Rangers). The National League got into the expansion act the following year: New York was compensated for its loss of the Giants and Dodgers with Casey Stengel's Amazin' Mets, and Houston got the Astros.[7]

The leagues expanded jointly and internationally in 1969: the National League added the Montreal Expos and the San Diego Padres; the American League added the Kansas City Royals and the Seattle Pilots. Kansas City needed a franchise, because the previous year the Athletics moved again, to Oakland. In 1977, the American League expanded further to its current 14-team format, adding the Toronto Blue Jays and the Seattle Mariners (the short-lived Pilots having moved to Milwaukee in 1970). The most recent expansion took place in 1993: the National League went to 14 teams, adding the Colorado Rockies (Denver) and the Florida Marlins (Miami/Ft. Lauderdale). These franchise moves and expansions resulted in (1) the narrowing of market sizes that has been hypothesized to ameliorate any tendency for dominant teams to emerge in the larger markets, (2) the dissolution of talent that has been hypothesized to narrow the differences between the top and the bottom clubs, and (3) the further erosion of the already weakened minor leagues.

In the latter regard in particular, before the Braves and Browns initiated the franchise-shifting process, there were AAA teams – the highest minor-league rating – in Baltimore, Montreal, and Toronto of the International League, and in Milwaukee, St. Paul, Minneapolis, and Kansas City of the American Association. The two leagues paired off at the end of the season to play the Little World Series. It

[7] When hired as the Mets' first manager, a year after being fired by the Yankees, Stengel remarked that "The Mets are gonna be amazin' ". In fact the Mets *did* manage the amazing feat of winning only one fourth of their games. Their first baseman was Marvelous Marv Throneberry, who when questioning Stengel about why he had not been given a birthday cake was told "we figured you'd drop it". The Mets' principal catcher was Chris Cannizzaro, about whom Stengel remarked "I knew he couldn't hit, but no one told me he couldn't catch either". Seven years later, Throneberry was long-since retired, Cannizzaro was with the expansion San Diego Padres, and the Mets won the World Series from the Baltimore Orioles.

was perhaps inevitable that these cities would eventually be awarded major league franchises (St.Paul and Minneapolis in tandem) to the detriment of these leagues. The most serious impact of the shifting/expansion process, however, was felt by the Pacific Coast League, which was often referred to as "the third major league" (Adelson et al., 1995, p. 45).

Like the modern major leagues, the Pacific Coast league began operations in 1903 with franchises in Los Angeles, Oakland, San Francisco, Seattle, Sacramento, and Portland. The West Coast's favorable climate permitted the league an extended season that resulted in some unique individual achievements (Adelson et al., 1995, p. 45). By 1952, the six founding cities had been joined by Hollywood and San Diego in an eight-team league. None of these cities has a team in the league's current incarnation. There are, however, two major league franchises in the Los Angeles area, and one each in Seattle, Oakland, San Francisco, and San Diego.

Two other changes that might be hypothesized to have impacted on competitive balance are the 1964 introduction of a reverse-order rookie draft, and free agency in 1976. Each of these changes might be expected to have given teams at the bottom of the ladder the opportunity to acquire the talent to move up a rung or two. A less obvious feature of the entire post-war period is the changes in franchise ownerships.

Lance Davis has documented "the lack of business acumen of the owners" that characterized Major League Baseball prior to World War II (Davis, 1974, p. 363). Subsequent behavior of the cartel over the next twenty years made it "difficult to believe that the cartel acted effectively from the point of view of long-term industry profits" (Davis, 1974, p. 375). But as Davis also observed, "not all members are profit maximizers. Some owners view baseball as largely a sporting activity, with profitability at most a secondary concern. Even today, teams like the Red Sox and the Cubs behave quite differently from teams like the Dodgers" (Davis, 1974, p. 356). "Today", however, was more than twenty years ago and both the Red Sox and Cubs have since been sold to owners who do anything but view baseball as largely a sporting activity. As Arnold Hano wrote in a 1966 memo to new baseball commissioner William Eckert, "This game of baseball has again become a tool of the club owner. Not a gambling tool, as it once was, but a tax-break tool".[8]

[8] In 1967, former baseball commissioner A.B. (Happy) Chandler was quoted as saying "I thought baseball was a sport when I became a commissioner. I was mistaken. The semi-bandits own it". Eight years later, Chandler went even further: "Baseball is operating from Justice Holmes' interpretation ... as not being a business. But that was in 1922. Baseball is a tremendous business now and is subject to trust and antitrust laws".

The Yankees acquired Babe Ruth when Red Sox owner, theatrical producer and sportsman Harry Frazee, held a fire sale, one of the many such that he held over more than a decade, to get the funds to help him back a Broadway show, "No, No, Nanette" (Cohen, 1989, p. 649). In 1933 another sportsman with deeper pockets than Frazee, Tom Yawkey, purchased the club and over the next four decades spent liberally in an effort to bring pennants to Boston. By 1988 the team was owned by a group of partners, one of whom, Managing Partner Haywood Sullivan, sold his son, catcher Marc Sullivan to Houston (Cohen, 1988, p. 650). Like the Red Sox, the Chicago Cubs were owned by a millionaire sportsman, Phil Wrigley. Wrigley also spent liberally, and during the depression, in his effort to buy pennants, and his effort was rewarded. The Cubs won thrice between 1929 and 1935.

Now, it is widely felt that fan interest and attendance is enhanced by close pennant races. Further, there is empirical support (Knowles et al., 1992) for the contention that a cartel of profit-maximizing club owners would seek to narrow the differences in playing talent among the clubs, with each one wanting his/her team to be more likely to win than to lose a home game (Quirk and Hodiri, 1974; Hunt and Lewis, 1970). This leads to the hypothesis that as franchise ownerships have shifted from sportsmen to businessmen, the cartel has either worked for or permitted greater on-the-field equality.

To the extent that any *one* of these post-War factors impacts on the competitive-balance issue, it is likely to be difficult to separate that impact from that of any one of the *other* post-War factors that impacts on that issue. In the present attempt to do so and to isolate the pre-1920 period from the later period, a series of dummy variables are introduced into the basic equation. These dummy variables allow us to distinguish the short-term impact of an event from its longer-term impact.

3. The Final Estimates

Six intercept-shifting dummy variables are incorporated into the basic regression equation. These are as follows:

a. D_1 = 1 for $t \geq 20$, and 0 otherwise;
b. D_{2L} = 1 for $t \geq 47$ and $L = N$, and 0 otherwise; and D_{2A} = 1 for $t \geq 48$ and $L = A$, and 0 otherwise;
c. D_{3L} = 1 for $t \geq 62$ and $L = N$, and 0 otherwise; and D_{2A} = 1 for $t \geq 61$ and $L = A$, and 0 otherwise;
d. D_4 = 1 for $t \geq 69$, and 0 otherwise;
e. D_5 = 1 for $t \geq 77$, and 0 otherwise;
f. D_6 = 1 for $t \geq 76$, and 0 otherwise.

Six slope-shifting variables, $d_k = D_k t$ are also incorporated into the equation. Thus, the estimated regression coefficients for the D_k, in conjunction with those for d_k, isolate the immediate, short-term consequences of an event, whereas the estimates for the d_k speak to the event's long-term consequences.

The D_1 and d_1 variables distinguish the pre-1920 period from its successor. The D_{2L} and d_{2L} variables distinguish between the periods before and after blacks were permitted in the respective leagues. The D_6 and d_6 variables isolate the free-agency period, and the remaining variables deal with expansion years. The most recent National League expansion is ignored, because of its recency. The reverse-order draft is ignored, because any impact of this change could only be felt after an indeterminate number of years.

The Cubs of the current era, who are now owned by the Chicago Tribune, are perhaps most notable for having allowed baseball's best pitcher and an almost certain Hall of Famer, Greg Maddox, to slip away to the Atlanta Braves.

Table I. The parameter estimates and their t-ratios

Variable	Estimate (NL)	t-Ratio	Estimate (AL)	t-Ratio
Intercept	−3.7600	−14.262	−4.5869	−50.420
t	−0.0765	−3.493		
D_1	−1.5845	−3.560		
d_1	0.0933	3.837	−0.0064	−1.914
D_{2L}			3.4606	4.887
d_{2L}	−0.0134	−2.715	−0.0601	−4.802
D_{3L}	10.9615	2.707		
d_{3L}	−0.1708	−2.736		
D_4				
d_4	0.0130	1.867	0.0058	1.738
D_5				
d_5			0.0082	3.088
D_6	−10.2442	−2.386		
d_6	0.1421	2.425		

As one would anticipate, because several of the variables are highly intercorrelated, when all are thrown into a single pot their effects are distributed among them and their estimated coefficients lose any statistical significance (and, more critically, whatever real meaning) that they might otherwise have. A maximum-R^2 stepwise regression procedure was invoked to deal with this situation. The parameter estimates for the equations yielding the highest AdjR_L^2, where all the estimates are statistically significant at the 0.10 level, together with their t-ratios, are displayed in Table I.

The adjusted multiple correlation coefficients are now AdjR_N^2 = 0.4945 and AdjR_A^2 = 0.5657. More importantly, the Durbin-Watson statistics of DW$_N$ = 1.584 and DW$_A$ = 1.711 allow us to reject the hypothesis of autocorrelated residuals (at the 0.05 level).

One might anticipate only a few of the shift variables to be statistically significant. For the National League, however, *eight* of those variables pass the test: in one instance the p value is 0.0654 (d_4), with the highest p value for the other seven cases being 0.0193 (D_6). For the American League, *five* shift variables pass the test: d_1 passes at a p value of 0.0589 and d_4 passes at p = 0.0858. The only p value for the other three variables that exceeds 0.0001 is for d_{5A} (0.0027). Further, when the shift variables are included, t is dropped from the American League equation.

IV. The Interpretation of the Estimates

Subject to the caveat that there may be many interrelated factors at work here, and bearing in mind that the direction in which dR_{tL}/dt moves in response to the

inclusion of a particular dummy variable is the opposite of the sign of that variable, the following inferences may be drawn from the parameter estimates.

1. Early on, the National League tended to be less-balanced than the American League ($[1 + \exp\{-3.7600 - 0.0765(3)\}]^{-1} = 0.9818 < [1 + \exp\{-4.5869\}]^{-1} = 0.9899$; the actual 1903 figures are 0.9862 and 0.9908, respectively). Until 1920, whereas the National League trend gave increased balance (-0.0765), on average American League balance was unchanged; that is, t drops out of the equation for the American League. As a result, by 1920 the National League was the more balanced league ($[1 + \exp\{-3.7600 - 0.0765(19)\}]^{-1} = 0.9946 > 0.9899$; the actual figures are 0.9879 and 0.9857, respectively).

2. The post-1919 changes had the short-term effect of reducing competitive balance in the National League ($-1.5845 + 0.0933(20) = 0.2815$), as well as reversing the long-term trend to that of a reduction in balance (0.0168). In the American League, they gave rise to a long-term increased-balance trend (-0.0064).

3. Jackie Robinson's breaking of the color barrier in Major League Baseball, in conjunction with the other events taking place in his era, had the effect of ameliorating the trend towards reduced competitive balance in the National League (-0.0134), although not totally negating that trend ($-0.0134 + 0.0168 = 0.0034$). In the American League, the short-term impact was a strong reduction in competitive balance ($3.4606 - 0.0601(48) = 0.5758$), with the New York Yankees managing to maintain their dynasty, although the long-term trend towards increased competitive balance now became quite pronounced ($-0.0064 - 0.0601 = -0.0665$). It would take an estimated ten years for the trend effect to compensate for the immediate impact ($0.5758 - 0.0601(10) = -0.0252$).

4. Perhaps surprisingly, the initial expansions did not have any effect, short-term or otherwise, on competitive balance in the American League. In the National League, however, the short-term impact was to decrease competitive balance ($10.9615 - 0.1708(62) = 0.3719$). Over the long haul, expansion effected a sufficiently great increase in competitive balance (-0.1708) that the immediate future would see an upward trend ($-0.1708 + 0.0034 = -0.1672$). In both leagues, however, the second expansions marginally reduced the trend towards increased competitive balance (0.0130 and 0.0058).

In sum, entering the period of free agency, the intercept terms in the estimated regressions stood at 7.2015 for the National League, and at -1.1263 in the American League. In compensation for this large difference in the intercepts, the estimated slope coefficient for the National League was $-0.1410 < -0.0607$ for the American League. Moreover, the American League's 1977 expansion further weakened the long-term upward trend (0.0082), reducing it to a level of -0.0505.

5. Although free agency does not appear to have impacted on competitive balance in the American League, both in the short term ($-10.2442 + 0.1421(76) = 0.5554$) and the long term (0.1421), the impact of free agency on competitive balance in the National League seems to have been distinctly negative. Indeed subsequent to free agency, the trend in competitive balance in the National League

stood at a negligble 0.1421 − 0.1410 = 0.0011. Moeover, the two leagues have in fact come perilously close to the asymptote; in 1995 the *actual* relative entropies for the two leagues were .9975 and .9952, for the National and American League, respectively.[9]

V. Conclusions

Competitive balance in league sports is an intuitively appealing *desideratum* that loses much of its appeal when it becomes a euphemism for mediocrity. There is no doubt that over time both major leagues have become better balanced. As we draw ever closer to the alleged nirvana of perfect balance, important questions arise as to how we reached this point in the first place, and whether this trend will continue or abate. This paper has attempted to answer some of these questions.

Hindsight permits an explanation for each of the results obtained in this paper. Prior to 1920, the balance issue is a matter solely of empirical fact, and the differences between the two leagues in the subsequent period feed off those facts. The same set of four teams won prior to 1920, but after the Red Sox sold Babe Ruth to the Yankees and Shoeless Joe Jackson and seven other members of the pennant-winning White Sox were banned from baseball, the league strode down the path to becoming *better* balanced.[10]

Although it is not apparent why the trend in the National League would have reversed itself as a result of the changes in 1920, one explanation that emerges is Branch Rickey's association with the St. Louis Cardinals and the fact that he made the Cards notable for their farm system. The Giants, who had already won six pennants and were considered to be a dominant team under legendary manager John McGraw, were able to maintain that status throughout much of the next two decades and won seven more pennants. Now, however, the Cards chipped in with five before the Second World War, and added four more before Jackie Robinson debuted and brought the Dodgers to the fore.

It seems plausible that over the long haul the breakdown of the color barrier, the spread of television and availability of air travel, and the disappearance of the farm system as it had previously been known, would lead to greater competitive

[9] The fact that there is only one-year between the third American League expansion and the inception of free agency, makes it tempting to suggest that a one-year lagged effect of free agency, rather than the expansion, produces the reduced-balance trend effect, a result comparable to that for the National League. Yielding to the temptation, and replacing d_5 with d_6 in the regression, *does* result in a parameter estimate (0.0069) with a p value of 0.0171. This estimate is quite close to its predecessor. Now, however, the 0.1354 p value for d_4 violates the 0.10 signifiance criterion. In any event, the result(s) contradict those of Fort and Quirk (1995, p. 1275).

[10] The Red Sox, Athletics, and Chicago White Sox won 14 of the 17 American League pennant races prior to 1920; the Detroit Tigers won in 1907, 1908, and 1909. Thus the league was relatively unbalanced over all of this period, but the degree of imbalance was stable. As of 1920 there were new kids on the block getting into the pennant-winning act: Cleveland won in 1920, the Yankees won three straight pennants, starting in 1921, and won three more in 1926 through 1928; Washington won in 1924 and 1925, and the Athletics returned to glory with three straight pennants, starting in 1929. The Tigers got back into the act by winning the 1934, 1935 and 1940 pennants.

balance, in both the short term and the long. Franchise drawing power remains critical, insofar as it generates the revenues that support the players. Equally critical, however, is the inability to gain and maintain an inventory of the cream of a comparatively small stock of major-league-quality aspirants.

One might expect expansion to reduce competitive balance in the short term, and to enhance it in the long term, as it makes it more difficult and less profitable for any one of many teams in like-sized markets to harvest a dominant core of good players. To the extent this has happened, it's been to a very minor extent, and then only in the National League. In fact, the second expansions reduced the upward trend in balance in both leagues, as did the American League's third expansion. Free agency also seems to have reduced the National League's upward trend in competitive balance, and may have done so in the American League as well (see fn. 9).

An overriding issue in *all* of this is why there should be *any* trend in competitive balance and why, in particular, would the overall trend be one in which the leagues are asymptotically approaching *perfect* competitive balance? The answer may well be in the change that has taken place over the past half century in the composition and goals of the club owners. Major League Baseball has steadily become less of a sport and more of a business. The modern-day profit-oriented owners who, unlike long-time baseball executive and owner Bill Veeck, do not "think that winning is the only thing" may have supported those changes that they perceived would enhance competitive balance and, as an outgrowth of greater competitive balance, their profits as well. Assuredly, some of the changes, such as free agency, were thrust upon the owners, and integration of the sport was inevitable. The owners, however, solely for business purposes, embraced expansion and allowed their lust for broadcast-rights revenues to hasten the erosion of the minor leagues and their farm systems. The end result, or at least the result at this point in time, calls to mind another trenchant bit of Veeckian wisdom: notably, "[I]t isn't the high price of stars that is expensive, it's the high price of mediocrity". Reading the sports pages of a daily newspaper suggests that the owners are now paying that price.

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