BASEBALL IN JAPAN AND NORTH AMERICA:

SAME GAME, SAME RULES, SAME RESULTS?

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Japanese and North American professional baseball players play the same game. The rules are virtually identical. Rule changes initiated by North American baseball leagues have been quickly followed by virtually identical rule changes in Japanese baseball. This parallel structure of rules and rule changes raises the possibility of comparing behavioral responses across the two baseball regimes to determine whether there is much cross-cultural variation in the response to rule changes. Understanding such effects has an importance beyond understanding the power of incentives in sports, as it is frequently alleged that differential cultural environments condition responses to changes in incentives.

In this paper we investigate how two rule changes that occurred in both North American and Japanese baseball changed player and team behavior; and compare the processes by which black players in the case of North America and foreign players in the case of Japan were gradually employed by baseball teams. First, we investigate how a change in the rules for signing new players affected competitive balance in each of the two Japanese and two North American baseball leagues. In 1965-1966 both North American and Japanese baseball moved from a bidding to a draft system for allocating new players. Our empirical findings indicate similar responses in "competitive balance" in both North America and Japan to the rule change. Second, in the 1970s, one league in Japan and one league in North America adopted the designated hitter rule, which allows another player to bat for the pitcher. We investigate how this rule changed incentives for pitchers to hit batters. Our results reveal initial increases in hit batters in leagues with designated hitters in both countries. The increases were eventually reversed in both countries, albeit with differences in timing. We explain the differences in timing by appealing to endogenous rule changes that the increases in hit batsmen prompted in both countries. Finally, we compare the process of integrating North American baseball with black

players with the process of integrating Japanese baseball with foreigners—Black, Caucasian, Korean, Taiwanese, and foreign-born Japanese players. In North American baseball, teams with the best records integrated more quickly than teams with poor records. By contrast, in Japanese baseball, teams with poor records integrated foreign players into their rosters more quickly. We conclude with a discussion of how cross-country differences in behavior can be resolved.

I. Competitive Balance in Japanese Baseball

Simon Rottenberg's (1956) classic analysis of baseball's reserve clause (formalized by Mohamed El Hodiri and James Quirk [1971]) showed that the rules governing player allocation among major league baseball (MLB) teams do not affect their final allocation if transaction costs of exchanging player contracts are zero. Thus, it should not matter whether promising young players are allocated among teams via a player draft or by open bidding. Teams will exchange players to ensure that they are allocated to the teams for which they generate the highest marginal product. If, however, it is costly for teams to exchange players, the initial allocation is more likely to persist over time. Then the "competitive balance" should improve both within a given season and over time under a draft regime where player talent is initially allocated more evenly across teams.[1]

Empirical studies have used performance data from North American Major League Baseball (MLB) to analyze whether changes in the rules for allocating rookies among teams affect competitive balance. Fort and Quirk's study (1995) found that MLB's change in 1965 from an open-bidding to a draft regime for allocating new players increased competitive balance in the American League and had little effect on competitive balance in the National League. The power of statistical tests conducted with the MLB data is, however, severely limited due to the small number

[1] In general, a league shows more competitive balance if teams are more closely clustered around the league performance mean (always .50) within a single season; individual teams exhibit more mobility in the standings over time; and league pennants and last-place finishes are less concentrated among a few teams.

of observations from the draft regime period. Our analysis uses a larger data set from Japanese professional baseball to examine the same rule change that economists have analyzed for MLB. Remarkable as it may seem, Nippon Professional Baseball (NPB) adopted the same rule change (from an open-bidding regime to a draft regime for new players) in the same year (1965) as major league baseball.[2] Our goal is to examine how the NPB rule change affected competitive balance in two leagues—the Central and Pacific Leagues, each with six teams—and to compare the outcomes in these two remarkably similar experiments in two very different cultures.

We examine the NPB's adoption of the same regime change (from an open-bidding regime to a draft regime for new players) in the same year (1965) as MLB's regime change. Compared to MLB data, NPB data have several advantages. First, the number of teams in each of the NPB's two leagues remained constant over the entire sample period, 1958-1993, while MLB had increases in the number of teams in 1961, 1962, and 1969. Second, the structure of competition in the NPB has remained remarkably constant. While both the National and American Leagues switched to divisional play in 1969, neither Japanese league has ever used divisional play. The only change in the structure of NPB competition during the draft period was relatively minor, the Pacific League's experiment from 1973 to 1982 with a split-season format (see Section IIIA). Third, the rules for allocating players among NPB teams did not change throughout the sample period, except for the implementation of the new player draft in 1965. NPB veteran players were bound by the reserve clause over the entire sample period, 1958-1993. By contrast, free agency for veteran players in MLB began in 1976, severely restricting the maximum number of observations in the draft regime to 11 without a transition period and 4 with a transition period. Finally, since the NPB's new player

[2] See La Croix and Kawaura (1999) for a brief historical account of professional baseball in Japan.

draft was in effect for 28 years prior to NPB free agency, we can specify a 7-year transition period and still have 21 observations covering the draft regime.

An important weakness of NPB data is that the open-bidding sample is relatively short, lasting only 8 years (1958-1965). This reduces the power of statistical tests examining differences in competitive balance between the two regimes and limits the strength of any conclusions drawn from the analysis. Despite this problem, NPB data are generally superior to MLB data because they were generated within a more stable institutional environment. Observed changes in competitive balance are more likely to be directly related to changes in the regime for allocating rookie players.

Player Allocation in the NPB

Until 1951, individual teams were free to compete for both veteran and rookie players in Japan. In June 1951, the NPB issued a rule granting to each team the exclusive right to negotiate future contracts with players already under contract. In effect, this rule established the reserve clause of North American MLB in Japan. The reserve clause remained in place until after the 1993 season when free agency for veteran players was introduced. NPB teams are allowed to exchange players through trades.[3] Cash sales of players are allowed, although they rarely involve highly productive players. For example after the 1992 season, we identified three exchanges of very marginal players for cash.[4]

[3] Fort and Quirk (1995) documented that 55% of player transactions in the American League involved cash between 1965 and 1974. Since 1976 sales of players for cash have been banned. To substitute for cash sales, MLB teams have devised other mechanisms to transfer their players to teams where they are more highly valued. These include unbalanced trades (where one team sends high-salaried, high-talent players to a second team in exchange for low-salaried, low-talent players) and exchanges of players for draft choices.

[4] The three players traded for cash were reserve players. One was the Hawks' third-round draft pick in 1981; he pitched only 20 innings with an earned run average of 15.00 in the combined 1991 and 1992 seasons. A second pitcher, the firth-round pick of the Braves in 1984, did not pitch at all in the 1990, 1991, or 1992 seasons. The third player (a fielder), the first-round pick by the Swallows in 1987, did not have any at bats in 1992.

Open bidding for rookies continued until the introduction of the draft recruit system in 1965. The first draft conference was held on November 17, 1965. Since then, the NPB has held one annual draft in mid-November.[5] A player cannot be drafted until he graduates from high school. Teams are granted exclusive rights to negotiate with the draftee for one year from the date of the draft conference and are not allowed to exchange draft rights for players or cash.[6] NPB draft rules are somewhat complicated and changed twice between 1965 and 1993. Since the practical differences in player allocation across the three regimes are small, we do not differentiate between them in our empirical analysis.

Competitive Balance in the Two Regimes for Allocating Rookies

In an open-bidding regime, rookies sign with the teams for which they generate the highest marginal product. The best talent signs with a team in a city that has a high demand for winning games. By contrast, in a draft regime, the best rookie players are often initially allocated to a team in a city with a low demand for winning games.[7] El Hodiri and Quirk (1971) showed that if teams are allowed to engage in cash sales or unbalanced trades, then new talent will be reallocated to maximize team profits, i.e., the distribution of talent will ultimately be the same as in the open-bidding regime. If there are obstacles to exchanging players, such as high transaction costs, adverse fan reaction to unbalanced trades and cash sales of star players, and unwritten league rules against

[5] In 1966 two drafts were held, one in September and one in November.

[6] In the early years of the draft, many draftees rejected team offers and did not join professional teams. Since the late 1970s teams have signed most of their draftees (La Croix and Kawaura, Table 2). The lower level of signings in the 1960s and early 1970s may have been due to NPB controls on signing bonuses paid to new recruits. The bonus regulations were repealed in 1974. The number of draftees is relatively small in Japan (La Croix and Kawaura, Table 2). This is because NPB teams have not developed the extensive layers of minor league teams observed in North American MLB. In Japan, those players who do not make the major league team roster play together on a single minor league team affiliated with the NPB team.

[7] Economic rents are assigned differently in the two regimes, with players assigned the rents under an open-bidding regime and teams assigned more of the rents under a player draft. Competition between teams ensures that players receive all rents in an open-bidding regime. Under the player draft, the player may "hold out" until he is assigned a portion of the rents.

certain types of transactions, we should observe a more even distribution of players across teams both over time and within a season in the draft regime. More formally, this implies that teams should be more closely clustered around the league performance mean (which always equals .50) within a single season; individual teams should exhibit more mobility in the standings over time; and league pennants and last-place finishes should be less concentrated, i.e., shared by more teams.

It is important to note that team performance is unlikely to be equalized in the short and medium runs even under a player draft regime that prohibits cash transfers of rookies and veteran players. Player injuries, management mistakes in evaluating rookie talent, variable player depreciation rates, and the limited supply of talent available to a team in each draft all lead to significant differences in team performance in the short and medium runs. Other non-player inputs including the team general manager, field manager, coaches, conditioning trainers, team physicians, and scouts are allocated in the open market; the highest quality talent will sign with the teams in cities that have a high demand for winning.[8] Team performance is also influenced by the presence of foreign players. The NPB limits the number of foreign players on each team's roster and has adjusted the cap periodically (Table 6).[9] There is open bidding for new foreign players, and the player is bound by the NPB reserve clause for veterans after signing.[10] The open market for foreign players implies, once again, that the highest quality foreign talent will sign with the teams which most value winning and those teams will have a competitive edge.

Given the open market for foreign players and non-player inputs, we cannot expect team performances to be equalized even in a player draft regime with restrictions on player transfers.

[8.] See Kahn (1993), Porter and Scully (1982), and Clement and McCormick (1989) for discussions of the contribution of non-player inputs to team performance.

[9.] Beginning with the 1994 season, each NPB team was allowed to have 3 non-Japanese players on its roster.

[10.] On most teams foreign players are paid significantly more than Japanese players. Despite their higher pay, foreign player performance has varied widely.

Thus, our comparison of team performance across regimes focuses on whether the draft regime generates *more* competitive balance than the open-bidding regime.

Competitive Balance Within Each Season

Quirk and Fort (1992, p. 244) noted that competitive balance "is actually a catchall term that refers to a number of different aspects of competition on the playing field, but in essence there is more competitive balance within a league when there is more uncertainty of outcome in league games and pennant races." Competitive balance can be measured using a variety of statistics from the distribution of team performances. Following Fort and Quirk (1995), we examine three statistics measuring the spread of a distribution to compare changes in league competitive balance within a given season. We calculate separate statistics for the Central and Pacific leagues for the open-bidding, adjustment, and post-draft periods. The transition period is specified to end in 1973, as 1974 is the first year in which a majority of Japanese fielders are draft recruits.[11]

The first statistic of competitive balance within a single season is the percentage share of actual records in the league's winning percent distribution which fall outside a range of two and three standard deviations, calculated under an assumption of the maximum degree of competitive balance within a given year. The maximum degree of competitive balance occurs when each team has a 50 percent chance of winning each game. A Japanese baseball league playing a 130-game schedule under conditions of the maximum degree of competitive balance would generate a standard deviation for the season-long winning percentage of $(.5)/(130)^{.5}$, or .0439. The two-standard deviation interval for winning percent is .4122-.5878 for the distribution with the maximum degree of competitive balance. Only 4.6 percent of realized winning percents would be beyond this interval if there were maximum competitive balance. In the Central League we observed "excess tail frequency," with 22.9 percent of the observations outside of this interval

[11] See La Croix and Kawaura (1999) for results with alternative adjustment periods.

during the open bidding period and 30 percent outside the interval during the draft period (Table 2). The results indicate that the Central League was far from maximum competitive balance in either period and that competitive balance worsened under the player draft. We also observed excess tail frequency in the Pacific League, with 50.0 percent of the observations outside of this interval during the open bidding period and 25.8 percent outside the interval during the draft period. The results indicate that the Pacific League was far from maximum competitive balance in either period but, in contrast to the Central League, competitive balance improved under the player draft.

The second statistic measuring competitive balance within a single season is the range of winning percentages, i.e., the difference between the highest and the lowest winning percentages in each league in a given season. The range has limited information content, as it only incorporates information on the performance of two (the best and the worst teams) of the 6 teams in each league. Table 2 reports the average range for each league during the three sample periods. In the Central League, the average range increased by 10 percent, from .199 in the open-bidding period to .221 in the draft period.[12]

The third statistic measuring competitive balance within a single season is the standard deviation of the distribution of winning percent. The standard deviation is generally considered a better measure of competitive balance than the range, as it incorporates information on the winning percent of all teams in the league. Table 2 reports the average standard deviation for each league during the three sample periods. In the Central League, the average standard deviation increased by 12 percent, from .067 in the open-bidding period to .075 in the draft period. In the Pacific League, the average range decreased by 25 percent, from .101 in the open-bidding period to .076 in the draft period.

[12] See La Croix and Kawaura (1999) for additional regression analysis.

Competitive Balance Across Seasons

Our first measure of competitive balance across seasons is the concentration of pennant winners in each period. We calculate Hirschman-Herfindahl indeces (HHI) for both leagues. The Central League experienced a decline from .469 to .238 and the Pacific League a smaller decline from .344 to .340. Statistical tests for the equality of HHI statistics show there are no statistically significant differences between the HHIs in either league across the open-bidding and draft periods.

A second measure of competitive balance across seasons is the concentration of cellar dwellers in the opening bidding period compared to the draft period. The Central League experienced a decline (from .313 to .210) and the Pacific League a larger decline (from .781 to .240). Since statistical tests show that the realigned distributions cannot be distinguished, we conclude that there are no statistically significant differences between the HHIs in either league across the open-bidding and draft periods.

A third measure of competitive balance over time is the change in the performance of individual team after the change to the draft regime. If there were few obstacles to player exchange, then team performance should be the same in both regimes. If, however, there were significant obstacles to player exchange, then we would observe more competitive balance during the draft period. This means that teams with winning percentages below .50 in the open-bidding period registered increases in their winning percent, while teams with winning percents above .50 registered decreases in their winning percents. To examine this proposition, we compare the mean of each team's winning percent in the open-bidding period with the mean of each team's winning percent in the transition period and in the player-draft period. Table 3 reports each team's mean winning percentage in each of the three periods, the differences in means between (a) the open-bidding period and the adjustment period and (b) the open-bidding period and the draft period, and

t-statistics examining the null hypothesis of no difference in mean winning percent across the three periods.

The results broadly support the proposition that the draft affected competitive balance in both leagues. First, the differences in the means between the open-bidding and draft periods had the predicted signs for 5 of the 6 teams in both leagues. Both differences in means with "wrong" signs were statistically insignificant from zero. Second, in the Central League, two teams, the Tigers and the Carp, had differences in means that were statistically different from zero at the 5 percent level. Third, in the Pacific League, four teams had differences in means statistically different from zero at the 5 percent level, while one team had a difference in means statistically different from zero at the 10 percent level. In sum, 7 of 12 teams had statistically significant changes in performance during the draft period. All changes in both leagues were in the direction of more competitive balance—teams with losing records in the open-bidding period improved during the draft period and teams with winning records during the open-bidding period declined during the draft period.

Conclusion

Empirical analysis using NPB data provide limited evidence that changes in the rules for assigning property rights to new baseball players changed the allocation of players among teams and affected competition within the two leagues. Our empirical results support the proposition that competitive balance over time increased in both leagues under the player draft regime. Empirical results for competitive balance within a given season are less conclusive, as competitive balance increased substantially in the Pacific League but exhibited no statistically significant change in the Central League.

Our results for the NPB are virtually identical to Fort and Quirk's (1995) results for North American MLB. They found that the concentration of league pennants among one or a few teams

fell after the MLB introduced the rookie draft in 1965. They also found a statistically significant decrease in the standard deviation of winning percent in the American League during the draft period but failed to find a statistically significant change in the National League data. The virtually identical empirical results for the NPB and MLB are particularly interesting because the New York Yankees dominated the American League and Yomiuri Giants the Central League (Table1). The decline of both teams in the draft era was the driving force behind the improvement in competitive balance in both the National and the Central Leagues.

II. Incentives and the Designated Hitter Rule

In the sport of baseball, pitchers have typically been an "easy out" when they bat due to their specialization in pitching rather than batting skills. To improve team offensive production, the American League (AL) of North American Major League Baseball (MLB) adopted a designated hitter (DH) rule in 1973.[13] The designated hitter's sole role is to bat and run the bases in place of the pitcher; he does not play in the field. An initial study [Goff, Shughart and Tollison (1997), hereafter GST (1997)] of the DH rule hypothesized that it increased the incentives of AL pitchers to throw intentionally at batters, as they no longer faced potential retaliation at the plate from opposing pitchers. GST (1997) regression results supported this moral hazard theory of pitcher behavior, but subsequent studies [Trandel, White and Klein (1998), hereafter TWK, and Levitt (1998)] found little support for the theory. GST (1998) replied that the contradictory results were due to improper regression specifications and to the expansion in the number of teams in MLB's National League during the mid-1990s.

We investigate whether the DH rule affected pitcher behavior in Japanese professional baseball. In 1975, one of Japan's two baseball leagues, the Pacific League, adopted the DH rule,

[13] The second MLB league, the National League, never used the DH rule until inter-league play began in 1997 and in World Series games.

while the Central League did not. The parallel institutional structure in Japanese baseball—the same as that observed in MLB—allows for a new empirical test of the effects of the DH rule on pitcher behavior. Equally important, we argue that empirical tests of the DH rule using Japanese data are arguably superior to tests using MLB data, as there have been fewer changes in the institutional structure of Japanese baseball that could bias statistical estimates of the impact of the DH rule.

Brief Literature Survey

GST (1997) argued that the DH rule increased the incentives of pitchers either to hit batsmen with pitches or to aim pitches very close to batsmen because they would no longer personally face retaliation at the plate from opposing pitchers. GST (1997) provided a number of reasons for the increased incentives, ranging from orders from the manager to hit a particular batsman; increased utility to a pitcher from hitting a batsmen; and optimal changes in pitching strategies which rely on more inside pitches. GST (1997) found support for their moral hazard theory in a regression analysis of the DH rule's effects. Using ordinary least squares, they regress the difference in hit batsmen in the American and National Leagues (ΔHB_t) on a dummy variable (DH_t) equal to one from the beginning of the designated hitter rule in 1972 and on the difference in at-bats in the American and National Leagues (ΔAB_t).[14]

(1) $\Delta HB_t = \beta_0 + \beta_1 DH + \beta_2 \Delta AB_t + \varepsilon_t$

Estimated β_1 and β_2 were both positive and statistically significant for the 1901-1990, 1920-1990, and 1947-1990 sample periods. An estimated 10-15 percent more batsmen were hit in the American League relative to the National League due to implementation of the DH rule.[15]

[14] At-bats may differ across leagues because of differential offensive production and a different number of teams in each league.

[15] Additional control variables for differences in offensive production (slugging average and home runs), pitcher

Trandel, White and Klein [1998], hereafter TWK, updated the GST (1997) sample by adding seven seasons from 1991 to 1997. Using GST's regression specification with their extended sample period (1947-1997), TWK (p. 682-83) found that the estimated coefficient on the DH_t variable was no longer statistically significant.[16] In response to these criticisms, Goff, Shughart and Tollison [1998, hereafter GST (1998)] acknowledge that the DH effect disappears when the data are extended through the 1990s. They hypothesize that the NL expansion in 1993 may have diluted NL pitching and led to more hit batsmen in the NL, thereby diminishing the size and statistical significance of the estimated DH coefficient.[17]

Summary Statistics

Figure 1 displays two series: (1) normalized hit batsmen for the Pacific and (2) the Central Leagues. The two series exhibit substantial variation, yet move closely together, with some divergence between 1977 and 1989. We note that the number of hit batsmen in the Pacific League declines between 1979 and 1993 despite the adoption of the DH rule by the Pacific League. Our conclusion is a common statistical process is driving variation in both series. Focusing on the differences between the two normalized series allows us to focus on factors differentiating the two series.

Figure 2 displays (1) the normalized difference in hit batsmen [$\Delta HBN_t=(PHB_t/PPA_t)-(CHB_t/CPB_t)$] between the Pacific and Central Leagues and (2) between the American and

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control (strikeouts and bases on balls), competitiveness of games (standard deviation of winning percentage), relief pitching (saves), and financial rewards of winning (attendance) were added to the regression; only saves and attendance were statistically significant, both with positive estimated coefficients.

[16] TWK also introduced a new regression specification and found that the DH variable was statistically insignificant in their revised regression specifications using the extended sample period.

[17] Levitt (1998) also cast doubt on GST's moral hazard explanation by offering evidence that NL pitchers were rarely hit by pitches while batting. We note, however, that even a small threat of retaliation against a pitcher may have reduced managerial incentives to order closer pitching or beanballs—pitches directed at batters' heads. Removal of this opportunity for retaliation—while leaving in place opportunities to retaliate against other hitters—should increase the aggregate number of hit batsmen.

National Leagues since 1958, where PPA_t and CPB_t are plate appearances in each league. We initially divide the sample into two periods by the Pacific League's adoption of the DH rule in 1975. In both leagues, the number of hit batters per at-bat increased in the post-DH period. The increase in the Pacific League outstripped that in the Central League, resulting in a widening inter-league ΔHB_t of 7.0 in the post-DH period, compared with ΔHB_t of 4.9 in the pre-DH period. The null hypothesis that the average HB rates are equal across leagues is rejected by a *t*-test at the 5 percent significance level for the DH period, while pre-DH data fail to reject the same hypothesis.

ΔHB_t are not, however, uniformly high in the post-DH period in Japan. Between 1975 and 1987, ΔHB_t in Japan averaged 17.3; between 1988 and 2000, they averaged –3.4. Remarkably, the MLB data follow a similar pattern, albeit with some differences in timing and magnitude. Between 1973 and 1993, the ΔHB_t in North America averaged 10.8; between 1994 and 1997, they averaged –5.4.

GST (1998) argued that the increase in the relative number of hit batsmen in the National League (NL) in 1996 and 1997 may have been due to expansion in the number of NL teams a few years earlier. We note the potential problems in MLB data analysis due to sporadic expansions in both the AL and NL over the last four decades. Operating with 8 teams between 1901 and 1960, the AL expanded to 10 teams in 1961, 12 teams in 1969, and 14 teams in 1977. Also operating with 8 teams between 1901 and 1960, the NL expanded to 10 teams in 1962, 12 teams in 1969, 14 teams in 1993, and 16 teams in 1998. By contrast, the number of teams in Japan's Central League (6) and Pacific League (6) has not changed since 1958. The fixed number of baseball teams in Japan should serve to improve the reliability of regression estimates

of the DH's impact on relative number of hit batsmen, as variations in ΔHB_t cannot be due to changes in the number of teams.

Since league expansion cannot explain the pattern in the post-DH Japanese hit batsmen data, are there any other candidates? We argue that the change may have been due to the endogenous response of Pacific League authorities to the historically high normalized hit batsmen rates between 1971 and 1986, i.e., to the new rules the authorities issued to increase penalties on pitchers and managers throwing intentionally near to or directly at batters. In 1982, the Acting Chairman of the Pacific League issued a relatively vague memorandum to the league umpires, stating that "dangerous balls" should not be tolerated.[18] More specific action was taken in 1989 when the Pacific League adopted a four-pronged guideline to umpires concerning the treatment of "dangerous balls".

> 1. When umpires judge that a pitcher has thrown intentionally to a batter, the pitcher and his manager should be immediately removed from the game. This applies even when the ball did not actually hit the batter.
>
> 2. When the ball hits the batter after players in the dugout verbally instigate their team's pitcher to throw at batters, the pitcher and his manager should be immediately removed from the game. This applies even when the ball did not actually hit the batter, if umpires judge that the pitcher has been engaged in dangerous pitching.
>
> 3. Warning is declared for a game when a ball hits the batter on the head regardless of umpires' judgment whether the pitch was intentional. After the warning, any pitcher who hits batters on the head should be immediately removed from the game.
>
> 4. Umpires have the authority to give warnings to any pitchers that they judge dangerous, in which case the above (3) applies.

We note that the timing of the new rules is consistent with the precipitous drop (1987-1990) in the normalized ΔHB_t series. While other events causing the drop cannot be ruled out, it is notable that the new NPB rules directly addressed the incentives of both pitchers and managers.

[18] We haven't seen the "dangerous balls" memo. Also, the NPB created a new clause on dangerous balls in their rule book in 1989—thereby applying tougher rules to both leagues.

Regression Analysis of Japanese Data

Our regression analysis focuses on three questions. First, we replicate GST's (1997) original regression specification (our equation 1) for the sample period 1958-2000. Second, we rerun the original GST specification and include a second dummy variable that represents changes in the rules governing penalties for hitting a batter:

(2) $\Delta HB_t = \beta_0 + \beta_1 DH + \beta_2 DH_2 + \beta_3 \Delta PA_t + \varepsilon_t$

Third, we conduct the same analyses for TWK's revised regression specification:

(3) $\Delta HBN_t = \beta_0 + \beta_1 DH + \varepsilon_t$,

(4) $\Delta HBN_t = \beta_0 + \beta_1 DH_1 + \beta_2 DH_2 + \varepsilon_t$

where DH_1 is a dummy variable to cover the 1975-1988 DH period with the prior hit batsmen rules; and DH_2 is a dummy variable to cover the DH period with the new hit batsmen rules. TWK (pp. 680-82) introduced the revised specification, as Figure 1 indicates that there have been substantial changes over time in the ratios of HB_t to AB_t in each league. Specifying a linear relationship between the two variables—as equation one does—would yield inconsistent coefficient estimates.

OLS regression results with the GST (1997) specification are presented in Table 4, columns 1 and 2, with column 2 results corrected for serial correlation. The estimated coefficients of the DH dummy are not statistically different from zero regardless of correction for serial correlation; this is inconsistent with the hypothesis that the DH rule would increase the number of hit batsmen in the Pacific League. Next, we report results using two dummy variables to model the DH period—DH1 for the DH period with the original hit batsmen rules, and DH2 for the DH period with new hit batsmen rules. Column three reports results uncorrected for serial correlation. The estimated coefficient on DH1 is positive and statistically significant,

while the estimated coefficient on DH2 is negative and statistically significant. Column four reports results corrected for serial correlation. The estimated coefficient on DH1 is positive and statistically significant, while the estimated coefficient on DH2 is negative and statistically insignificant. OLS regressions with the TWK specification are presented in Table 5. Our results mirror those in Table 4. All results are consistent with the hypothesis that the DH rule produced increased normalized hit batsmen rates until new hit batsmen rules changed incentives for pitchers and their managers.

Conclusion

Patterns of hit batsmen are similar in NPB and MLB. We argue that the changing patterns in the Pacific League hit batsmen data can be explained by a change in the penalties imposed by the League on pitchers who intentionally throw at batters. Can similar changes in hit batsmen rules explain the change in MLB normalized hit batsmen rates after 1994? [A few sentences on whether similar rule changes occurred in American League in mid-1990s will be added in second draft.]

III. Integrating Foreign and Black Players into NPB Baseball

Goff, McCormick, and Tollison (2002), hereafter GMT (2002), modeled the racial integration of black players into North American Major League Baseball (MLB) between 1947 and 1971 as an innovation in economic process. They investigated the characteristics of baseball teams that choose to integrate earlier than other teams. Their study yielded two main results: (1) the diffusion pattern of black players among MLB teams followed a logistic distribution; and (2) the better MLB teams were more likely to hire black players than the poorer MLB teams.

Our study considers additional evidence from Japanese professional baseball with respect to the integration and performance of foreign players into NPB baseball teams between 1958 and

2000. The rosters of NPB teams were predominately filled by Japanese players from the beginning of professional baseball in Japan through the 1940s. The number of foreign players began to expand in the 1950s, and many teams added the maximum number of allowed players during the 1970s and 1980s. This expansion was facilitated by a relaxation of the rules limiting the number of foreign players on the roster and the field. Both leagues began to limit the number of foreign players in 1952. Initially limiting each team to three foreign players, the leagues lowered the cap to two foreign players from the 1966 through the 1993 season.[19] Since 1996, teams have been able to hire an unlimited number of foreign players for their full roster (including their minor league team) but can only register three players—and since 1998 four players—per game. Changes in NPB rules over time are summarized in Table 6.

Data and Econometric Model

GMT (2002, p. 17) found that the pattern of integration of black players into MLB teams generally took the form of a logistic function, with black players initially added at an increasing rate and then at a decreasing rate. We inquire whether NPB integration of foreign players to team rosters followed the same process. Figure 3 provides data on the minimum, maximum, and average number of foreign players per NPB team from 1958 to 2000. Teams added foreign players at an increasing rate through the mid-1960s, but the average number of foreign players per team actually declined in the late 1960s. The number of foreign players converged towards the 3-player cap in the 1970s, but the increase to a 4-player cap in the 1980s was accompanied by 5 years of decreases in the average number of foreign players per team during the early 1980s. Since the early-1990s, the average number of foreign players on team rosters roughly doubled—from 3 to 6 players—in response to the removal of the cap on foreign players on team rosters.

[19] Although teams were permitted to have three foreign players starting in 1981, they could only register two of them for a game until 1993.

Our econometric analysis of team choices to add foreign players to their rosters uses a variation of the GMT (2002) fixed effect model to analyze the number of foreign players on each team i in year t:

(5) $FOREIGN_{it} = \alpha_t + \eta_i + \beta_1 GAMES_{it-1} + \beta_2 INCOME_{it} + \varepsilon_t$

The model includes a fixed effect time vector α_t to capture changes in social attitudes towards foreign players over time as well as changes in the maximum number of foreign players allowed on a team's roster. We also include a fixed effect team vector η_i to capture differences in team attitudes toward foreign player that are not captured by the independent variables. We incorporate two independent variables that are plausibly "related to management's perception of the marginal revenue product from using additional black [in our case, foreign] athletes"—average per capita income in the team's prefecture (INCOME) and the number of games back of the league winner in the previous season (GAMES).[20] GAMES is included to test the proposition that relative team performance will affect the hiring of foreign players. GMT (p. 20) argue that GAMES is superior to other measures of relative team performance because a given winning percentage in one league may lead to higher relative performance than the same winning percentage in the other league.[21] INCOME is included because lower-income individuals are more frequently associated with xenophobic attitudes than higher-income individuals.[22] We also report results without the team fixed effect vector. This allows long-run differences in team performance to be reflected in the estimated coefficient on GAMES.

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[20] See GMT, p. 20.

[21] GMT find virtually identical results using winning percentage as a measure of relative performance rather than games back.

[22] In their MLB study, GMT also include the percentage of the population of a team's metropolitan area that is nonwhite. In Japan, this percentage is extremely small and is unlikely to be associated with variation in the number of foreign players. Thus, we do not include this variable in our regressions.

Econometric Results

Table 7 reports reports estimated OLS coefficients for four variations of equation 5. Column one reports panel data results for all teams using GAMES. Column two reports panel data results for all teams using an alternative measure of relative performance, winning percentage (WINPERCENT). Column three and four replicate the two previous specifications using a data set which drops the Giants baseball team. We drop the Giants since they are an outlier with respect to winning percentage (very high) and use of foreign players (very low). Dropping the Giants from the sample does not affect the regression results in any significant manner.

Our regressions display two consistent results. First, INCOME in all four specifications has a positive estimated coefficient and is statistically significant at the one percent level. This provides some support to the common notion that higher income areas are less xenophobic; or that higher income areas have a higher demand for a winning team, regardless of the player composition. Second, the relative competition variable, whether GAMES or WINPERCENT, is statistically significant and has a sign consistent with poor-performing teams adding foreign players.

[The next version of this paper will revise the econometric specification to take into account left censoring of the dependent variable.]

Conclusions

Our results are the opposite of those found for MLB, where high-performing teams were more likely to add black players than poor-performing teams. We note, however, that NPB teams adding foreign players may be qualitatively different from MLB teams adding black players. First, most foreign players on NPB teams had better opportunities—MLB—than black

players on MLB teams—other occupations or black baseball leagues. Second, life in Japan and on a Japanese baseball team proved difficult for many baseball players from the United States. Finally, the NPB leagues did not pay as well as MLB leagues, and this may have led to player selection problems. Were the players opting to play in Japan "lemons" or good talent overlooked by U.S. teams?

V. Conclusion

Economists have extensively studied North American MLB, partly due to an intrinsic interest in the sport and partly due to the massive array of team and player performance data that are publicly available for analysis. In contrast, Japanese professional baseball has, to our knowledge, been largely ignored by economists. (See, however, Ohtake and Ohkusa, 1994.) This is unfortunate, as the massive and comprehensive data compiled for Japanese baseball players and teams could provide economists with a significant opportunity to determine whether their findings using MLB data are robust. In our case, using NPB data is preferable, as the change in the NPB regime for allocating new players comes close to being a "natural experiment" against the background of an unchanging institutional environment. More generally, the NPB data allows us to examine whether the same "game" played within a different cultural setting generates the same behaviors.

Our empirical results for the two cases where rules change are remarkably similar for the NPB and MLB, leaving little variation for "culture" to explain. On the other hand, integration of foreign and black players into team rosters proceeded along different lines in both countries. Poor teams in Japan were more likely to use foreign players, while good teams in the United States were more likely to use black players. Whether culture can resolve these differences or whether they are due to different constraints faced by teams in each country is still an open question.

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TABLE 1

Pennant Winners and League Attendance, 1958-2001

	Central League		Pacific League	
Year	Team	Attendance	Team	Attendance
1958	Giants	5,299,100	Lions*	3,585,100
1959	Giants	4,769,065	Hawks*	3,729,916
1960	Whales*	5,304,159	Orions	2,800,302
1961	Giants*	5,241,800	Hawks	3,476,790
1962	Tigers	5,706,009	Fighters*	3,894,277
1963	Giants*	5,883,375	Lions	3,847,918
1964	Tigers	6,270,820	Hawks*	3,418,935
1965	Giants*	6,251,500	Hawks	2,501,361
1966	Giants*	6,108,850	Hawks	2,709,571
1967	Giants*	5,610,150	Braves	2,744,593
1968	Giants*	6,069,900	Braves	2,847,350
1969	Giants*	6,578,400	Braves	3,018,472
1970	Giants*	6,542,750	Orions	3,069,300
1971	Giants*	6,021,200	Braves	2,584,500
1972	Giants*	6,195,500	Braves	2,536,100
1973	Giants*	7,650,800	Hawks	4,060,200
1974	Dragons	7,595,200	Orions*	3,501,300
1975	Carp	9,479,500	Braves*	3,201,900
1976	Giants	9,070,000	Braves*	3,344,600
1977	Giants	9,114,000	Braves*	4,114,000
1978	Swallows*	9,988,000	Braves	4,114,500
1979	Carp*	10,752,000	Buffaloes	5,220,000
1980	Carp*	10,322,000	Buffaloes	5,797,500
1981	Giants*	10,110,000	Fighters	5,546,300
1982	Dragons	10,928,500	Lions*	4,817,200
1983	Giants	10,477,000	Lions*	4,991,000
1984	Carp*	11,010,000	Braves	5,162,300
1985	Tigers*	11,413,500	Lions	4,727,500
1986	Carp	11,367,000	Lions*	6,323,700
1987	Giants	12,061,500	Lions*	6,947,000
1988	Dragons	12,239,000	Lions*	8,271,500
1989	Giants*	12,048,500	Buffaloes	8,768,000
1990	Giants	12,020,000	Lions*	8,609,000
1991	Carp	12,391,000	Lions*	9,474,000
1992	Swallows	13,841,000	Lions*	9,522,000
1993	Swallows*	13,440,000	Lions	9,291,000
1994	Giants*	13,140,000	Lions	9,560,000
1995	Swallows*	12,345,000	Blue Wave[a]	9,646,000
1996	Giants	12,223,000	Blue Wave*	8,877,000
1997	Swallows*	13,483,500	Lions	10,012,500
1998	BayStars*[a]	13,004,000	Lions	8,660,500
1999	Dragons	13,339,500	Hawks*	9,071,000
2000	Giants*	12,873,500	Hawks	9,567,500
2001	Swallows*	12,799,500	Buffaloes	10,124,000

Notes: * indicates the winner of the Japan Series.

[a] "Baystars" used to be named "Whales," and "Bluewaves" used to be named "Braves."

TABLE 2

Measures of Competitive Balance

		Pre-draft 1958-65	Adjustment Period 1966-73	Post-draft 1974-93
Average range of W/L percentage				
Central		.199	.210	.221
Pacific		.290	.245	.216
Average standard deviation of W/L percentage				
Central		.067	.071	.075
Pacific		.101	.085	.076
Percent of Observations Beyond ±2 Standard Deviations from the Mean[a]				
Central		22.9	27.1	30.0
Pacific		50.0	41.7	25.8
Concentration of pennant winners/cellar dwellers[a]				
Central	(W)	.469	1.000	.238
	(T)	.313	.406	.210
Pacific	(W)	.344	.469	.340
	(T)	.781	.313	.240

Notes:
a. With equal competition, concentration indices are .188 for the pre-draft and adjustment periods and .170 for the post-draft periods.

TABLE 3

Impact of the Player Draft on Team Winning Percentage

Team	Mean			Difference in Means	
	1958-65	1966-73	1974-93	(1958-65)-(1966-73)	(1958-65)-(1974-93)
Central League					
Giants	.5735	.603	.5627	-.0295 (1.13)	.0108 (0.38)
Tigers	.5281	.535	.4708	-.0069 (0.33)	.0573 (1.93)**
Dragons	.5229	.5005	.511	.0224 (0.74)	.0119 (0.43)
Swallows	.4438	.4298	.4722	.014 (0.41)	-.0284 (1.02)
Carp	.4554	.4563	.5374	-.0009 (0.04)	-.082 (3.53)**
Whales	.4754	.475	.4491	.0004 (0.01)	.0263 (1.04)
Pacific League					
Lions	.5368	.4296	.5379	.1072 (2.80)**	-.0011 (0.03)
Buffaloes	.3464	.4683	.5299	-.1219 (2.77)**	-.1835 (6.11)**
Fighters	.5231	.4549	.4807	.0682 (2.10)**	.0424 (1.64)*
Hawks	.6105	.524	.434	.0865 (3.06)**	.1765 (7.45)**
Braves	.4656	.5808	.5502	-.1152 (2.93)**	-.0846 (3.12)**
Orions	.5199	.5415	.4678	-.0216 (0.58)	.0521 (1.86)**

The *t*-statistic testing the differences between the means is in parentheses; ** denotes statistical significance at the 5-percent level; * denotes statistical significance at the 10-percent level.

TABLE 4

OLS Regressions: Pacific-Central League Hit Batsmen Difference (HB_C-HB_P)

Independent Variables	(1)	(2)	(3)	(4)
DH Dummy (1975-2000=1)	10.66	12.41		
	(.80)	(.61)		
DH Dummy (1975-1988=1)			37.48	36.94
			(3.25)***	(2.64)***
DH Dummy (1988-2000=1)			-21.06	-18.10
			(1.76)*	(1.24)
AB_C-AB_P	.013	.01	.013	.013
	(1.54)	(1.49)	(1.93)*	(1.86)*
Constant	9.57	7.12	9.77	8.44
	(.86)	(.4)	(1.13)	(.80)
rho		.57		.23
R^2-adj	.06	.06	.40	.29
D-W	.86	2.01	1.53	1.85
Number Observations	43	42	43	42

t-statistics are in parentheses.

TABLE 5

OLS: Normalized Pacific-Central League Hit Batsmen Difference

Independent Variables	(1)	(2)	(3)	(4)
DH (Dummy 1975-2000=1)	.20 (.52)	.37 (.54)		
DH1 (Dummy 1975-1988=1)			1.12 (3.21)***	1.11 (2.48)**
DH2 (Dummy 1988-2000=1)			-.87 (2.39)**	-.75 (1.60)
Constant	.49 (1.64)	.32 (.55)	.49 (2.10)	.44 (1.41)
Rho		.58		.25
R^2-adj	.01	.01	.41	.29
D-W	.83	2.04	1.50	1.85
Number Observations	43	42	43	42

t-statistics are in parentheses.

Table 6

Regulations on Number of Foreign Players in Nippon Professional Baseball

	Team Roster[a]	Registration for a Game
1952-1965	3	3
1966-1980	2	2
1981-1993	3	2
1994-1995	3	3[b]
1996-1997	No Restrictions	3[b]
1998-2000	No Restrictions	4[c]

Notes:

[a] Team roster includes both major and minor league players.

[b] The three-player limit can only be reached by a combination of fielders and pitchers, i.e., teams are not allowed to register three fielders, or three pitchers for a game.

[c] The four-player limit can only be reached by a combination of two fielders and two pitchers, i.e., teams are not allowed to register three fielders or three pitchers for a game.

TABLE 7

OLS: Estimates of NPB Integration of Foreign Players

Independent Variables	W/Giants	W/Giants	w/o Giants	w/o Giants
	(1)	(2)	(3)	(4)
INCOME	.001 (5.32)***	.001 (5.35)***	.001 (3.66)***	.001 (3.68)**
WINPERCENT		-1.14 (2.20)**		-1.12 (2.08)**
GAMES	.009 (2.23)**		.008 (2.11)**	
Constant	-1.18 (2.07)**	-.52 (.85)	.97 (2.20)**	1.62 (3.43)***
R^2-adj	.58	.58	.55	.55
Number Observations	492	492	451	451

t-statistics are in parentheses.

Figure 1: Pacific League and Central League Hit Batsmen

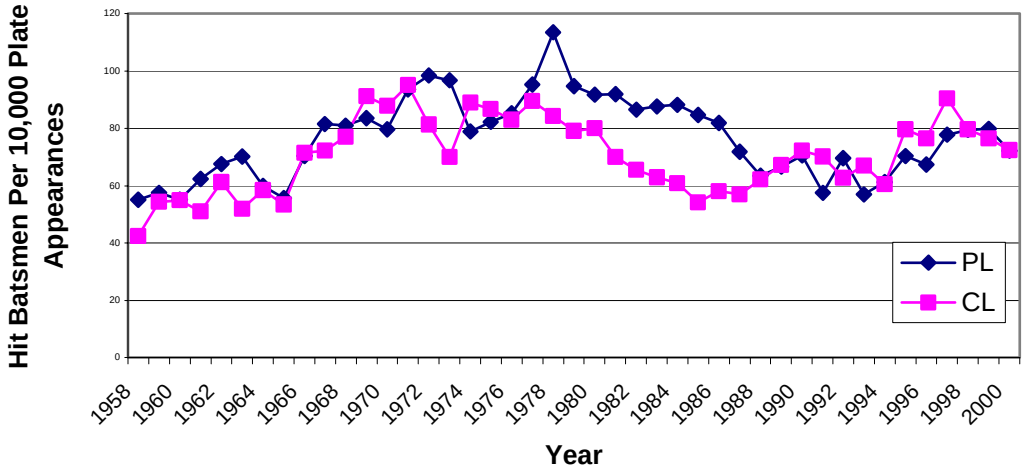

Figure 2: Normalized Differences in NPB and MLB Hit Batsmen

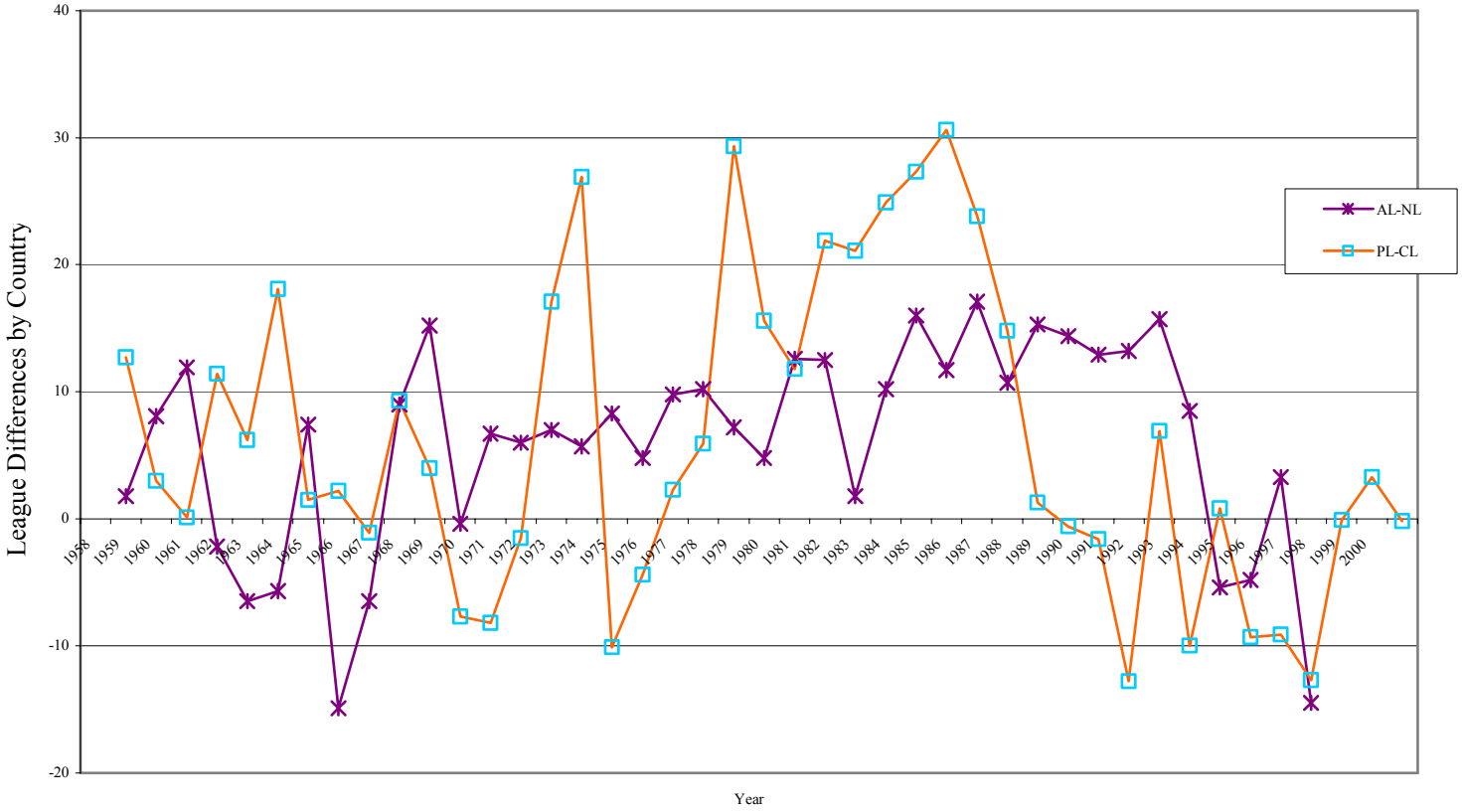

Figure 3: Foreign Players By Team in NPF