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Integration of  
North and South American Players in Japan's  
Professional Baseball Leagues

by  
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**INTEGRATION OF  
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IN JAPAN'S PROFESSIONAL BASEBALL LEAGUES**

By

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Abstract

Teams in Japan's two professional baseball leagues began to add foreign players to their rosters in the early 1950s, with the average number of foreign players per team reaching 5.79 in 2004. One reason for their increased use of foreign players was that foreign hitters substantially outperformed Japanese hitters. We show that the pace of team integration with African-American, Latino, and Caucasian players varied substantially across teams, a pattern also observed in North American professional baseball leagues. Using team data for the 1958-2004 seasons, econometric analysis shows that good teams that experienced a poor season played foreign players more frequently in the next season's games.

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## I. Introduction

From the 1940s through the 1970s, professional baseball teams in North America integrated with minority players, and professional baseball teams in Japan integrated with foreign players. In North America, this initially meant adding Latino players (from 1933)<sup>2</sup>, African-American players (from 1947) and Asian players (from 1995)<sup>3</sup> to team rosters. In Japan, this initially meant signing Japanese-American players who grew up in Hawaii; subsequently Caucasian, African-American, and Latino players from North and South America; and finally players from other Asian countries. Economists, social scientists, and popular writers have intensively studied the history of racial and ethnic integration by Major League Baseball (MLB) teams whereas they have generally ignored the parallel history of racial integration by Nippon Professional Baseball (NPB) teams. A notable exception is Robert Fitts's book, *Remembering Japanese Baseball*.<sup>4</sup> The lack of attention paid to integration of NPB teams with foreign players is unfortunate, as NPB integration was, like many aspects of Japanese professional baseball, both very similar to and very different from MLB integration.

The integration of Caucasian, Latino, and African-American players from North and South American countries into the professional sports teams of an ethnically homogeneous country that, just a few years earlier, had been defeated and occupied by American military

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<sup>2</sup> Fifty-five mostly light skin tone Latinos from the Spanish-speaking Americas played for MLB teams prior to 1947 (Burgos, 2007, ch. 9). See Burgos (2007) for a history of the integration of Latino players in Major League Baseball.

<sup>3</sup> Masanori Murakami was the first Japan-born Japanese player in MLB, pitching successfully for the San Francisco Giants during the 1964/1965 seasons. Thirty years elapsed before an MLB team would sign a second player from Japan, pitcher Hideo Nomo.

<sup>4</sup> The addition of a veteran U.S. baseball player to an NPB team was the subject of a popular 1992 movie, *Mr. Baseball*, featuring Tom Selleck as the U.S. baseball player.

forces, is an interesting story in its own right. An empirical study of racial integration in Japanese baseball also allows us to place studies of Northern American baseball in comparative perspective, as professional baseball leagues on both sides of the Pacific Ocean share a common institution: The Rules of Play of the Game of Baseball. It's three strikes and you are out wherever baseball is played. The MLB and NPB rules of play have been almost identical in every post-WWII season, with rule changes initiated by MLB quickly adopted by NPB.<sup>5</sup> The common institution of the "Game of Baseball" provides the ideal setting for comparative analysis, as it allows researchers to identify how differences in markets for players, competition among league teams, league rules, and cultures affected choices of NPB and MLB teams and players.

There are several substantial differences in the economic and social environments in Japan and the United States that could have affected both the timing of a team's initial integration of foreign players and the team's decisions to play them in games in subsequent seasons. First, Japan did not have the same history of racial animus against African-Americans or Latinos as the United States. Second, African-American and Latino players on MLB teams were usually paid less than Caucasian players, whereas foreign players on NPB teams were paid more than Japanese players. Third, in Japan, NPB rules limited the number of foreign players per team, whereas MLB rules did not explicitly constrain the number of African-American or Latino players per team after Jackie Robinson's debut with the Brooklyn Dodgers in 1947. Finally, NPB teams are typically owned by large Japanese

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<sup>5</sup> Consider, for example, the parallel resolution in Japan and North America of the early 1970s controversies regarding the designated hitter rule (which allows a designated player to bat for the pitcher): The American League adopted the rule, while the National League balked. Two years later, the same debate went on in the NPB, and the same split-decision was adopted: The Pacific League adopted the rule and the Central League politely declined.

corporations, while MLB teams are typically owned by wealthy individuals and families.<sup>6</sup> We discuss these differences and others more fully below.

We begin our analysis with a discussion of the data sets that we use in our empirical analysis. We follow with a short history of NPB team integration and briefly compare experiences of NPB and MLB teams. Our empirical analysis focuses on four main questions: (1) When did NPB teams initially integrate with players from North and South America and what factors affected team decisions? (2) How did teams' use of foreign players and use of players from specific racial and ethnic groups change over time? (3) How well did foreign players perform compared to Japanese players, and how did their presence on NPB team rosters affect team performances? And (4), what factors are associated with changes in team decisions to play foreign players in games over time?<sup>7</sup> We conclude with a discussion comparing the different yet similar paths of integration taken by MLB and NPB teams.

## **II. Data for NPB Teams, Japanese Players, and Foreign Players**

Economists have extensively analyzed player and team performance in North American MLB because of the close correspondence between a hitter's marginal team product and his measured hitting performance as well as the availability of comprehensive data on player and team characteristics and performances over 136 seasons. There has been much less scholarly attention paid to Japanese professional baseball, and this may be partly

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<sup>6</sup> A few exceptions: The Seattle Mariners are owned by the American subsidiary of a Japanese corporation, Nintendo. Three other MLB teams—Toronto Blue Jays (Rogers Communications), Chicago Cubs (Tribune Corp.) and Atlanta Braves (Liberty Media)—are owned by corporations.

<sup>7</sup> We identify foreign players as those players defined as foreign by NPB.

due to shorter time series for the two Japan professional baseball leagues (which are generally available only from 1958) and the lack of a comprehensive database with relevant data on player and team characteristics and performances. Our analysis of NPB team integration uses data on players and teams for the 1958-2004 baseball seasons collected from multiple sources (listed separately in the Appendix) that enable us to cross-check and resolve data discrepancies, particularly with respect to player race, ethnicity, and national status. We follow the NPB's rule for designating a player as a foreigner: Was the player born outside of Japan? We then classify foreign players into four different ethnic and racial categories: African-American, Latino, Caucasian, and Others, with Others being a residual category consisting almost entirely of players with Asian ancestries who were not born in Japan.<sup>8</sup> We classify a player as Latino if they were born in the Caribbean, Central America, or South America. We classify a player who was born in the United States or Canada as African-American on the basis of available biographical information on the player and, when necessary, by examining publicly available pictures of the player.<sup>9</sup>

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<sup>8</sup> Classification of players into racial and ethnic categories is inherently problematic for numerous reasons: Race and ethnicity are both dubious scientific categories; players, journalists, and scholars are not always well informed about a player's ancestry when they make classifications; and criteria used by fans, owners, or teammates to make racial or ethnic classifications can vary with the identity of the person making the classification.

<sup>9</sup> Our rules for classifying players into racial and ethnic groups differ across racial and ethnic groups: we classify players as Latino based on their place of birth and as African-American based on their ancestry and, in limited cases, on the authors' evaluations of a player's skin color. This classification has been used by most studies of racial and ethnic discrimination in MLB because it is capable of implementation. If, however, Japanese baseball fans and the player's teammates are categorizing players as African-American or Latinos using different criteria, for example by darkness of skin tone, then our categorization of players will be problematic for Latinos with darker skin tones who might be classified as African-American and for lighter skin tone African-Americans who might be classified as a separate "more acceptable" group. See Goldsmith et al. (2006) for an econometric study of the effect of skin tone on wages of African workers in U.S. labor markets.

See the Appendix for a list of sources providing player biographical information and pictures.

Classification of players into national and ethnic categories yields counts of players in each category that are useful for analyzing some research questions, e.g., team decisions to add their first foreign or minority player and changes in the composition of minority players on a team's roster. Studies of the integration of MLB teams with Latino and African-American players have used count data in econometric analyses of such questions. However, other research questions, e.g., the impact of foreign players on team performance or subsequent decisions by teams to hire and to play foreign players, could be analyzed more precisely with a measure that combines both the presence of a foreign players on a team's roster and his use by the team at the plate and on the mound. We develop a new measure of a team's use of foreign players in its games that fortuitously allows aggregation of foreign hitters and foreign pitchers. We define a team's offensive and defensive plays for a season as the sum of (1) the number of plate appearances by the team's batters (offensive plays) and (2) the number of opposing teams' plate appearances against the team's pitchers (defensive plays). We then calculate the proportion of offensive and defensive plays [ $ODPlays_{it}$ ] made by foreign, non-Japanese, Latino, African-American, and Caucasian players on each team for the 1958-2004 seasons and name the corresponding variables  $NonJpn-ODPlays_{it}$ ,  $Latino-ODPlays_{it}$ , and so forth.

Table 1 provides summary statistics for the six panel data samples used in our

[Table 1]

econometric studies. Each of the six panels is complete and balanced, with twelve cross-

section units. We provide additional discussion of other variables used in our econometric analysis in the sections discussing these models and estimation results.

### **III. Integration in the Nippon Professional Baseball Leagues**

While the rosters of NPB teams were predominately filled by Japanese players from the beginning of professional baseball in Japan in 1936 through the 1940s, foreign players were an accepted part of Japanese professional baseball in the 1930s.<sup>10</sup> Fitts (2009, p. 80) reports that “[p]rior to World War II, sixteen Nisei [Japanese-American players born in Hawaii], two Caucasians and an African-American [Jimmy Bonna] had joined the league.” The first foreign players to play for a professional baseball team in Japan were Harris McGaillard (also known as “Bucky Harris”), a U.S. catcher who played for Nagoya in 1936, Yoshi Takahashi, a second-generation Japanese-American from Hawaii, and Herb North, another Nisei from Hawaii. Victor Starffin, a Russian pitcher, joined the Tokyo Giants in 1936 and became the first pitcher in Japanese professional baseball to win 300 games. Other foreign players also impressed, including the Hawaii-born Nisei and Baseball Hall of Fame player, Bozo Wakabayashi.

The expansion of hostilities between Japan and its neighbors in the late 1930s and early 1940s brought this era to an end, as most, but not all, foreign players left Japan. Amazingly, NPB play continued through the war years, with games only suspended from June 1945.<sup>11</sup> When play resumed in 1946, some Hawaii-born Japanese Americans with

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<sup>10</sup> Material for this section draws from Fitts (2005 and 2009). We also used data from a website providing lists of foreign players on team rosters in the 1950s and 1960s: [http://noboruota.blogspot.com/2010\\_01\\_01\\_archive.html](http://noboruota.blogspot.com/2010_01_01_archive.html) (last access on 31 August 2011).

<sup>11</sup> Personal communication with Robert Fitts.

joint U.S.-Japan citizenship played for NPB teams, but other foreign players from the coalition of countries that defeated Japan were not to be found on NPB rosters.

The second influx of foreign players clearly starts in the 1951 season when Wally Yonamine, a Hawaii-born Japanese American without dual citizenship, began his Japan Hall-of-Fame career as an outfielder with the Tokyo Giants.<sup>12</sup> Eleven other players from Hawaii and the mainland United States came to play in Japan in 1952, including the first two Caucasian players to play in Japan since the war, Marion O’Neil and Billy Wyatt for the Lions,<sup>13</sup> and the first two African-American players to play on an NPB team, pitcher Jimmy Newbury and infielder John Brittian for the Braves. The Braves hired four other African-American players over the next four years, including pitcher Rufus Gaines and infielder Larry Raines.

The Braves (now the BlueWaves) were pioneering in their use of African-American players during the 1950s, but other NPB teams were much slower to add African-American players, perhaps in part because the Braves finished as high as second place only once during the 1950s. It would take until 1962 for a second team, the Dragons, to add African-American players to its roster, and until 1966 for a third to act (Table 2). The process of

[Table 2 here]

integration was considerably dragged out, with the Tokyo Giants adding their first African-American player only in 1980.<sup>14</sup> Figure 1 reveals three distinct periods over which

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<sup>12</sup> Three other Japanese-Americans (Jyo Furutani, Isao Odate, and Isamu Uchio) were on NPB team rosters in Japan prior to Yonamine but either had very short stints or were back-up players who rarely played in games.

<sup>13</sup> Wyatt and O’Neil both served in the U.S. military in Japan prior to playing on NPB teams.

<sup>14</sup> One reason for the extended integration of African-American players into NPB teams may have been the small number of African-American players on rosters of North American minor league

[Figure 1 here]

the average number of African-Americans per team increased over time: Between zero and one player per team between 1958 and 1967; roughly one player per team between 1969 and 1995; and roughly two players per team from 1997.

The pace of integration of teams with Caucasian players was remarkably different in each league. While five Pacific League teams had 15 Caucasian players on their rosters during various seasons in the 1950s, there were no Caucasian players on Central League teams until the Tigers added Mike Solomko to their roster for the 1960 season. It would be another 15 seasons before the last Central League holdout, the Tokyo Giants signed its first Caucasian player.

Latino integration proceeded much more slowly than African-American and Caucasian integration. The first team to add a Latino player to its roster in the post-war era was the pioneering Braves who signed the Cuban infielder Roberto “Chico” Barbon in 1955 (Table 2). Seven more NPB teams added Latino players to their rosters by the 1972 season, but the four remaining teams moved at a very slow pace. It would take another 14 years (1986) for the Giants, an additional 9 and 10 years (1995 and 1996) for the Fighters and the Hawks, respectively, and another 3 years (1999) for the Dragons to add a Latino player to their rosters.

What explains the differences between the faster integration pace observed for African-American and Caucasian players relative to Latino players? One factor may be that the African-American and Caucasians hitters provided slugging performances that were, with all due respects to the great Sadaharu Oh and other big-time Japanese sluggers, far better than those provided by most competing Japanese players. By contrast, Latino

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teams during the late 1950s and early 1960s.

players, often known for their specialization in defensive skills and contact hitting, may not have been significantly better than many of their Japanese competitors. A significant skill advantage would have been important, as teams were free to compete for foreign players. In addition, some players from North and South America would have had higher reservation wages due to opportunities in North American professional baseball.

#### **IV. Performance of Foreign Players and their Teams in Post-War Japan, 1951-1962**

Did foreign hitters hired by NPB teams perform better than Japanese hitters?<sup>15</sup>

Figure 2 compares the end-of-season slugging average for all Japanese players and all foreign players on NPB team rosters during the 1958-2004 seasons.<sup>16</sup> Over the 1958-1961

[Figure 2 here]

seasons, the slugging averages of the two groups were similar, but a large gap favoring foreign players opened in 1962, as teams experimented with signing power hitters already seasoned with MLB experience. Over the 1963-1982 seasons, the slugging average of foreign players (.455) exceeded the slugging average of Japanese players (.374), an astounding gap of 19.6 percent. The gap narrowed during the 1981-1983 seasons, but emerged at an even higher level—24 percent—during the 1984-2004 seasons.<sup>17</sup>

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<sup>15</sup> Gwartney and Haworth (1974, Table 3, p. 878) found that the average annual slugging average of African-American players added to MLB team rosters exceeded those of “all players” by .095 in 1950 and .055 in 1955.

<sup>16</sup> A player’s slugging average is defined as number of hits weighted by number of bases divided by player’s at-bats:

$$SA = [(4 \times \text{homeruns}) + (3 \times \text{triples}) + (2 \times \text{doubles}) + (\text{singles})] / \text{player at-bats.}$$

<sup>17</sup> Slugging averages increased for both foreign players (.584) and Japanese players (.457) over the 1983-2004 seasons.

Did NPB teams with more foreign players on their rosters perform better than teams with fewer foreign players during the early seasons of NPB integration, 1951-1962? In their classic study of the integration of MLB teams with African-American players, Gwartney and Haworth (1974, Table 2) found that MLB teams that added more African-American players to their rosters in the early seasons of MLB integration, 1950-1959, achieved more wins. We investigate Gwartney and Haworth's question for the early seasons of integration for NPB teams, 1951-1962, and examine two different measures of team performance each season: the percentage of games in regular season  $t$  won by team  $i$  ( $WinPercent_{it}$ ) and whether team  $i$  won the pennant in its league during season  $t$  ( $Penannt_{it} = 1$  if team won pennant, 0 otherwise). We estimate separate regressions for the Pacific and Central Leagues, as there was no interleague play during our sample period and foreign players on a team in the Central League could not have influenced the performance of teams in the Pacific League. Running separate regressions for each league also allows for the estimated effect of a foreign player on his team performance to differ across leagues.<sup>18</sup>

Consider a parsimonious regression specification, in this instance using  $WinPercent_{it}$  as the measure of team performance:

$$(1) \quad WinPercent_{it} = \beta_0 + \beta_1 WinPercent_{it-1} + \beta_2 PropForeign_{it} + \varepsilon_{it},$$

where  $WinPercent_{it-1}$ , the percentage of games won by team  $i$  in the previous season, is included to control for domestic talent on team  $i$ ; and  $PropForeign_{it}$  is the proportion of the league's foreign players (including Japanese-Americans) on the roster of team  $i$  in season

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<sup>18</sup> We could have estimated a single regression equation using samples from both leagues by including an interaction variable of  $League_i$  with  $Foreign_{it}$ . Proper interpretation of estimated coefficients and standard errors for an interaction variable in a non-linear panel regression is, however, fraught with difficulties. We avoid this problem by estimating separate regressions for each league, albeit at the cost of smaller sample sizes for each of the league regressions.

$t$ .<sup>19</sup> We use scale our count of a team's foreign players by the overall number of foreign players on all team rosters to obtain a measure of competitive advantage realized by the team from adding a foreign player. If only one team adds a high-performing foreign player, it gains a competitive advantage over other teams and  $PropForeign_{it}$  for team  $i$  increases. If, however, each league team adds a high-performing foreign player to its roster, then no team gains a competitive advantage and  $PropForeign_{it}$  does not change.

We first estimate *WinPercent* regressions for each league using pooled OLS with team dummy variables. Regressions results for each league are reported in Table 3, column

[Table 3 here]

1. In the Central League regression, the estimated coefficient on  $WinPercent_{it-1}$ , is positive and statistically significant at the 5 percent level, indicating substantial persistence in team talent and performance across seasons (Table 3, Panel B, column 1). The estimated coefficient on  $PropForeign_{it}$  is positive and statistically significant at the five percent. By contrast, in the pooled OLS regression for the Pacific League, the estimated coefficient on  $WinPercent_{it-1}$  is positive but not statistically significant at the ten percent level (Table 3, Panel A column 1). The estimated coefficient on  $PropForeign_{it}$  is positive but not statistically significant at the ten percent level. Addition of season dummies to pooled OLS regressions fails to appreciably change regression results in either league.

Because unobserved time-invariant factors specific to each team could be biasing the pooled OLS estimates, we experiment with random effects and fixed effects panel estimators. As results using both panel specifications are broadly similar, we focus on

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<sup>19</sup> In this analysis, we count the number of foreign players by classifying a player as foreign if he was born outside of Japan. This differs somewhat from the NPB count of foreign players, as the NPB's cap on the number of foreign players on a team's roster exempted foreign players who joined Japanese baseball prior to 1952, e.g., Wally Yonamine.

results from the random effects regressions (Table 3, column 2). For the Central League, the estimated coefficient on  $WinPercent_{it}$  more than doubles, increasing from .29 in the pooled OLS regression to .64 in the random effects regression, and is estimated with much more precision. The estimated coefficient on  $PropForeign_{it}$  is once again positive (albeit falling from .12 to .09) and remains statistically significant at the five percent level. For the Pacific League random effects regression, there is a substantial change in the estimated coefficient on  $WinPercent_{it}$ : its magnitude increases substantially, rising from .16 to .66, and it is estimated with more precision, becoming statistically significant at the five percent level. However, the estimated coefficient for  $PropForeign_{it}$  is now negative and remains statistically insignificant at the ten percent level.

Now consider the same regression specification with  $Pennant_{it}$  substituted for  $WinPercent_{it}$  as the measure of team performance:

$$(2) \quad Pennant_{it} = \beta_0 + \beta_1 WinPercent_{it-1} + \beta_2 PropForeign_{it} + \alpha_i + \varepsilon_{it}$$

We estimate regressions for both leagues using pooled logit. Results are reported in Table 3, column 3. A comparison of estimated coefficients on  $PropForeign_{it}$  in the Pacific and Central League regressions shows that while both are statistically significant at the five percent level, the Central League estimate is positive (5.99) while the Pacific League estimate is negative (-9.27).

The results from the *Pennant* regressions reinforce those from the *WinPercent* regressions: an additional foreign player on one Central League team is associated with better team performance, while an additional foreign player on a Pacific League team is associated with either no change or a decline in team performance. How do the regression results correspond to the actual competition between league teams during the initial years

of team integration? The lack of impact—or even negative impact—of foreign players on team performance in the Pacific League stems in part from the poor performance of the Braves, who had the most foreign players on their roster in the early and mid-1950s. With the Braves failure to win a pennant or a large percentage of their games, other Pacific League teams responded by reducing the number of foreign players on their rosters. The number of foreign players in the Pacific League declined from 10 in 1952 and 15 in 1953 to 6 in 1954 and to just 5 from 1955 to 1958. And on the winning side of the ledger, the Lions and the Braves, two teams that won ten Pacific League pennants over the 1951-1962 seasons, had no foreign players on their rosters during their glory years. By contrast, the positive impact of a foreign player on team performance in the Central League can be traced to the astounding success of the Tokyo Giants. The Giants won 9 of 12 Central League pennants over the 1951-1962 seasons and used more foreign players—primarily Japanese-Americans born in Hawaii—than any other Central League team over this period.

The increase in the number of foreign players on NPB teams in 1951 and 1952 led both leagues to impose a rule during the 1952 season that restricted each team's game-day roster to include no more than three foreign players selected from its full player roster (Table 4). In 1955, the two leagues imposed another rule limiting the number of foreign players on a team's full roster, i.e., a combined roster of players assigned to either the major league team or affiliated minor league teams.<sup>20</sup> Initially limiting each team to three foreign players on its full roster, the NPB reduced the cap to two foreign players

[Table 4 here]

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<sup>20</sup> Fitts (2009, p. 189) argues that the NPB Commissioner's Office established the three-player roster cap for foreign players in May 1955 when the Giants had six foreign players on their team and were dominating Central League play.

in 1966 and raised it to three in 1981.<sup>21</sup> In 1996, the NPB eliminated restrictions on the number of foreign players on a team's full roster.

There have also been substantial changes in the rules regulating the number of foreign players from a team's full roster who can be registered by the team for a particular game. For the 1952-1965 seasons, a team was allowed to register three foreign players for a game. The NPB reduced the registration cap to two players in 1966, and this ceiling survived until 1994 when the NPB increased it to three players. Since 1998, teams have been allowed to register four foreign players for a game. Changes in NPB rules over time—which are somewhat more detailed than described above—are summarized in Table 4.

Was the cap on the number of foreign players on a team's full roster binding? Figure 3 presents data on the number of foreign players on the full team roster of the teams with the smallest and largest number of foreign players and the average number of foreign

[Figure 3]

players on the full team rosters of all NPB teams over the 1958 to 2004 seasons. Inspection of the maximum number of players on an NPB team shows that the roster cap was binding for at least one team in every season from 1958 to 2004, as the largest number of players on a team equaled or exceeded the roster cap.<sup>22</sup> Inspection of the smallest number of foreign players on an NPB team shows that the roster cap was not binding for at least one NPB team during the 1958-1975 and 1981-1995 seasons, as the smallest number of foreign

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<sup>21</sup> Although teams were permitted to have three foreign players on their full rosters from the 1981 season, they were allowed to register only two foreign players for each game until the 1993 season.

<sup>22</sup> Our measure of the number of foreign players on a team full roster sometimes exceeds the foreign player roster cap, as we do not differentiate between foreign players who are on a team's full roster for a fraction of a season and those on the full team roster for the full season.

players on an NPB team was less than the roster cap. However, the roster cap was binding for all teams during the 1976-1980 seasons, as the smallest number of foreign players on a team equaled to the roster cap.

Inspection of the average number of foreign players on all team rosters yields another measure of how much team roster caps constrained team choices: whether the average number of foreign players on all team rosters exceeded the roster cap. This occurred in the 1975-1980 seasons (already identified above) and the 1990, 1992, 1994, and 1995 seasons.<sup>23</sup> At the end of each episode, the NPB adjusted its roster cap, increasing it to three foreign players in 1981 and eliminating it in 1996. Teams responded to the cap's elimination by doubling the average number of foreign players over the next five seasons, from 3.17 players in 1995 to 6.25 in 2000. We note that the change to an unlimited number of foreign players on team rosters came just a season after Hideo Nomo, one of the NPB's superstar pitchers, left Japan to play for an MLB team, the Los Angeles Dodgers. The change in the roster cap allowed NPB teams to offset the loss of some of their best players to MLB teams over the next decade with an inflow of new talent from outside Japan.

## **V. Econometric Analysis of MLB Integration and Extensions to NPB Integration**

Our analysis of NPB's integration with foreign players builds on the literature analyzing MLB's integration with African-Americans and Latino players after 1946. We briefly review the economics literature on MLB integration and then identify some broad similarities and differences between the two integration episodes.

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<sup>23</sup>During the 1990s seasons, at least one NPB team used fewer players than allowed by the league roster cap.

Gwartney and Haworth (1974) found that teams in North American baseball that were the first to add African-American players performed better than other teams. They concluded that the superior team performance of first-adopters was primarily due to the superior performance of the first African-American players. Contrary to Gary Becker's assertion that market competition would tend to gradually erode discrimination, Gwartney and Haworth found little evidence that under-performing baseball teams that were slow to add their first African-American player subsequently integrated more fully. Hanssen's (1998) re-examination of these issues concluded that the slow pace of integration by many American League teams could be attributed to persistent discriminatory preferences of fans in American League cities. By contrast, Lanning (2010) attributes the slow pace of integration to discriminatory preferences of teammates and team owners.

Goff, McCormick, and Tollison (2002) changed the discussion from discrimination by owners, players, and fans to how differences in team characteristics could affect their integration decisions. They posited that team integration is most profitably viewed as a risky innovation that would be pursued either by winning teams with excellent, forward-looking management or by losing teams with management desperate to identify and implement organizational and technological innovations capable of generating more team wins. Their regression results show that MLB teams with better win-loss records were more likely to hire African-American players than teams with worse win-loss records. Hanssen and Meehan (2009) used new econometric specifications that incorporated past contributions of African-American players to a team's performance into management's decision to adjust the number of African-American players on the roster, a factor neglected by Goff et al. In general, Hanssen and Meehan's regression results do not support a

statistically significant association between team performance and counts of African-American players on team rosters.

Coyne, Isaacs, and Schwartz (2010) criticize econometric methodologies employed by Goff et al. (2002) and Hanssen and Meehan (2009) for failing to account for the large share of observations equal to zero in their dependent variables and to use regression techniques more suitable for “count data” dependent variables, such as zero-inflated panel estimators. From their panel regressions of MLB teams for the 1947-1956 seasons—the period during which most MLB teams integrated, they conclude that a team’s use of African-American players increases the likelihood that the team will contend for a pennant and, vice versa, that teams in contention are more likely to add African-American players to their rosters.

Finally, Coyne, Isaacs, Schwartz, and Carilli (2007) argue that team integration is likely to depend not just on the competitive performance of individual teams but also on the competitive balance within the team’s league. In other words, a team that is just a few wins behind the league’s best team, is more likely to add minority players than a team with the win-loss record and player talent that is far behind the league’s best team.

There are some obvious similarities and differences between the MLB and NPB integration episodes. Consider these similarities. Both MLB and NPB team owners took risks when they decided to integrate, as they were unsure how the new players would perform, how Caucasian fans would respond to African-American players, and how Japanese fans would respond to foreign players so soon after World War II. In both Japan and North America, it quickly became clear that the average foreign player (in Japan) or minority player (in North America) performed better than the average Caucasian player on

an MLB team or the average Japanese player on an NPB team. And with superior performances from a new group of players, a team might plausibly expect to win more games if it integrated before other teams in its league (Gwartney and Haworth, 1974).

Now consider these differences. In MLB, teams integrated with African-American players who faced discrimination from both fans and teammates, while in NPB, teams integrated first primarily with Japanese-American players from Hawaii and California. In Japan, many players from North and South America found it difficult to adapt to a complex extremely different cultural environment, social isolation, language barriers, daunting training sessions, and the very different strategies employed in the Japanese game.<sup>24</sup> Perhaps the most striking difference is that for MLB teams, African-American players could be hired through the 1970s at a discount to Caucasian players, whereas for NPB teams, foreign players were paid a premium compared to Japanese players.<sup>25</sup>

Despite these differences, the same questions posed for MLB integration are central for NPB integration: Which factors affected team decisions to add their first foreign player? Which factors affected team decisions to play more foreign players in games in the seasons following the initial period of integration? We address both questions below.

## **VI. Discrete-Time Hazard Analysis of First Foreign Players on NPB Team Rosters**

Our econometric analysis of NPB teams' choices to add their first Caucasian, African-American or Latino player to their rosters uses a piecewise-constant proportional

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<sup>24</sup> See Whiting (1989), and Fitts (2005; 2009) for great histories and stories of professional baseball in Japan.

<sup>25</sup> Possible sources of higher salaries paid to foreign include the absence of a NPB draft assigning rights to a foreign player to a specific team and the higher reservation wages of U.S. players, particularly during the 1950s and 1960s when Japan's economy was rebuilding.

hazard model commonly used to analyze grouped duration data (Wooldridge, 2010, 1010-1017). In this model the hazard rate at time  $t$ ,  $h_{it}$ , varies across each time interval (but not within the interval) and has a single time-invariant covariate and a single time-varying covariate:

$$(3) \quad h_{it} = \left[ 1 + \exp(-(\alpha_t + \beta_1 League_i + \beta_2 WinPercent_{it-1})) \right]^{-1}$$

where  $\alpha_t$  is a time dummy variable,  $League_i$  is a time-invariant dummy variable indicating the team's league (Pacific League=1 and Central League=0), and  $WinPercent_{it-1}$  is the percentage of games won by team  $i$  in season  $t-1$ .<sup>26</sup> Transforming to the logit specifications yields:

$$(4) \quad \log it(h_{it}) = \log \left( \frac{1-h_{it}}{h_{it}} \right) \alpha_t + \beta_1 League_i + \beta_2 WinPercent_{it-1} + \varepsilon_{it}$$

We have used a parsimonious specification of covariates, just two variables, due to limited degrees of freedom. We include  $League_i$  in the hazard regression specification because previous research on MLB and NPB has found distinct differences in the competitive environment within each of the two MLB leagues and NPB leagues. Coyne, Issacs, Schwartz, and Carilli (2007) found that teams in the National League were more likely to add an African-American player to their roster because of the relative competitive balance in the National League vis-à-vis the American League during the 1946-1960 period. La Croix and Kawaura (1999) found that the Pacific League had greater competitive balance than the Central League over the 1958-1974 period.<sup>27</sup>

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<sup>26</sup> No NPB team has ever switched leagues.

<sup>27</sup> The difference in competitive balance across the two professional baseball leagues in North America and the two leagues Japan is mostly due to the dominance of one team in one league in each country: the New York Yankees in the American League and the Tokyo Giants in the Central League.

Following Goff, McCormick and Tollison (2002) and Hanssen and Meehan (2009), we include a measure of the team's success in the previous season to determine the source of innovation in roster composition. As discussed above, adding the first foreign player from a particular ethnic/racial group to a baseball team composed almost entirely of Japanese players is a risky and expensive action that could trigger changes in attendance at team games, coordination of player actions on and off the field, and team performance.

Our three basic specifications for the logit regression are:

$$(5) \quad First\_Ethnic_{it} = \beta_1 WinPercent_{it-1} + \beta_2 League_i + \alpha_t + \varepsilon_{it},$$

where *First\_Ethnic* equals one in the season *t* in which team *i* hires its first player of a particular ethnicity and 0 in earlier seasons. We use variants of this variable for three ethnicities: *First\_Caucasian*, *First\_African-American*, and *First\_Latino*.  $\alpha_t$  is a vector of baseball season dummy variables employed to estimate duration-dependent baseline hazard rates, and  $\varepsilon_{it}$  is an iid error term.

Results from logit regressions for each ethnic group are reported in Table 5. The

[Table 5 here]

results are broadly consistent across ethnic groups. The estimated coefficients on *League<sub>i</sub>* are positive in each regression but are not statistically significant at the ten percent level in any of the three regressions. Its magnitude is largest in the *First\_Caucasian* regression, perhaps in part because five of the first six Caucasian players joined Pacific League teams (Table 2). The estimated coefficient on *WinPercent<sub>it-1</sub>* is negative in all three regressions. It is statistically significant at the five percent level in both the *First\_African-American* and *First\_Caucasian* regressions and just misses being statistically significant at the ten percent

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level in the *First\_Latino* regression ( $p=.14$ ). Taken together, the three regressions provide support for the hypothesis that struggling NPB teams were more likely to experiment with adding their first players from particular racial/ethnic groups than successful NPB teams.

## VII. Use of Foreign Players by Japanese Teams Over 37 Seasons: 1958-2004

Our analysis of NPB team use of foreign players departs significantly from earlier analyses of MLB team use of African-American and Latino players. Rather than analyze counts of the number of foreign players on NPB team rosters, we instead analyze a composite measure of the share of offensive and defensive plays by a team's foreign players, *Foreign\_OD-Plays<sub>it</sub>*. (See section II for a full discussion of this variable.) The new composite measure is more informative for our purposes because it measures how often a particular group of players actually played and, therefore, how often they were seen by their team's and opposing teams' fans. From a human capital perspective, *Foreign\_ODPlays<sub>it</sub>* provides a direct adjustment for the team's utilization of the player in games and an indirect adjustment for the player's quality because a team is only allowed to have 9 players from its 25-player game roster in action on any given play.<sup>28</sup> Use of our composite measure also enables us to bypass econometric problems associated with estimating regressions with a dependent variable that takes the form of count data.

Our econometric model is a variation on the basic model specified by Hanssen and Meehan (2009) to investigate how prior performance of an NPB team affects the team's willingness to add minority players to its roster:

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<sup>28</sup> A player who leaves a baseball game and is replaced by another player cannot return later to the game, as in soccer and unlike in basketball or American football.

$$(6) \quad \begin{aligned} \text{Ethnic\_ODPlays}_{it} = & \beta_0 \text{Ethnic\_ODPlays}_{it-1} + \beta_1 \text{WinPercent}_{it-1} + \beta_2 \text{WinPercent}_{it-2} \\ & + \beta_3 \Delta \text{Income}_{it} + \beta_4 \text{TeamCap3}_t + \beta_5 \text{TeamCap4}_t + \eta_t + \alpha_i + \varepsilon_{it} \end{aligned}$$

The estimated coefficients on the one- and two-period lags of  $\text{WinPercent}_{it}$  are the main focus of this regression, as they are the only team characteristics specified in our regression model. We note that  $\text{WinPercent}_{it}$  is measured without error and is pre-determined (albeit not strictly exogenous) to the dependent variable due to being lagged one period.

$\text{Income}_{it}$ —real GDP per capita of the prefecture in which the team’s stadium is located,<sup>29</sup>  $\text{TeamCap3}_t$ , and  $\text{TeamCap4}_t$  are control variables.<sup>30</sup>  $\text{Income}_{it}$  is included as a control because lower-income individuals are more frequently associated with xenophobic or racially-biased attitudes than higher-income individuals.<sup>31</sup> We include two dummy variables for the years in which the team player registration cap was three foreign players ( $\text{TeamCap3}_t=1$  for the 1958-1965 and 1994-1997 seasons) and four foreign players ( $\text{TeamCap4}_t=1$  for the 1998-2004 seasons). Estimated coefficients for the two registration cap dummies should provide indications of whether NPB ceilings on player registration for each game were binding.<sup>32</sup>

Our model differs from Hanssen’s and Meehan’s model in two ways. First, we use our composite measure of a team’s utilization of non-Japanese foreign players— $\text{Non-Jpn\_ODPlays}_{it}$ —as the dependent variable, primarily because this enables us to incorporate

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<sup>29</sup> Prefecture income data are from Department of National Accounts, Economic and Social Research Institute, Cabinet Office, Government of Japan.

<sup>30</sup> All regressions with season dummy variables are estimated without a constant to allow inclusion of all season dummies.

<sup>31</sup> In their MLB study, Goff et al. 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.

<sup>32</sup> As always, they could be picking up other phenomena affecting NPB teams during these periods.

more dimensions of a foreign player's contributions to his team rather than just counting his place on the team roster. Second, we pay close attention to whether the time series used in our panel regressions have unit roots. Because our sample has a smaller number of cross-section units ( $n=12$  NPB teams) and a larger number of time periods ( $t=45$  seasons), panel regression estimates do not have the asymptotic properties that exist when the number of cross-section units is large. In the case of a relatively small panel in which there are more time-periods than cross-section units, it becomes important to ensure that the data panels used in the regression are stationary in order to obtain consistent unbiased estimates of coefficients.

Table 6 reports the results of panel unit root tests for each variable panel. We use the panel unit root test proposed by Breitung and Das (2005) because their test (1) is robust to relatively small samples, in our case just 45 time periods and 12 cross-section units; (2) yields consistent results when there are far more time-periods than cross-section units; and (3) is robust to cross-sectional correlation. The Breitung-Das unit root test rejects a unit root in the levels of all but two of the variable panels: *Non-Jpn\_ODPlays<sub>it</sub>* and *Income<sub>it</sub>*. Differencing *Income<sub>it</sub>*, we test again for a panel unit root and find that the null-hypothesis is rejected. Consequently, we use  $\Delta Income_{it}$  in all panel regressions estimated below. For *Non-Jpn\_ODPlays<sub>it</sub>*, a panel unit root is rejected at the five percent level of statistical significance but not at the ten percent level. Differencing *Non-Jpn\_ODPlays<sub>it</sub>*, a panel unit root is rejected at the one percent level.<sup>33</sup> Since all relevant variables—the dependent variable, the independent variable that tests our hypothesis, and the control variables(s)—

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<sup>33</sup> *WinPercent<sub>it-1</sub>* is unlikely, a priori, to have a panel unit root, as its panel mean is, by definition, 50 percent in each time period. *Gamesback<sub>it-1</sub>* could conceivably have a unit root if the league is becoming more (less) competitive over time, i.e., the annual standard deviation of *WinPercent<sub>it</sub>* is becoming smaller (larger) over time.

are stationary series, we can apply standard panel inference methods to interpret the regression's estimated coefficients.

Results from the difference specification of the fixed effect panel regressions are

$$(7) \quad \Delta Non - Jpn\_ODPlays_{it,it-1} = \beta_1 WinPercent_{it-1} + \beta_2 WinPercent_{it-2} + \beta_3 \Delta Income_{it} + \beta_4 TeamCap3_t + \beta_5 TeamCap4_t + \eta_t + \alpha_i + \varepsilon_{it}.$$

easier to interpret because the dependent variable, the two variables ( $WinPercent_{it-1}$  and  $WinPercent_{it-2}$ ) used to test our main hypothesis, and the control variable ( $\Delta INCOME_{it}$ ) are all stationary. Standard errors are clustered by team, as annual errors are likely to be correlated due to, among other things, multi-season contracts with team players and coaches.

We also estimate a dynamic panel specification that uses  $Non-Jpn\_ODPlays_{it}$  as the dependent variable and includes a lagged dependent variable. While GMM estimators are often the preferred choice for this type of specification, the small number of cross-section units (12 teams) and the longer number of time periods (45 seasons) indicates that the bias-corrected least squares dummy variable (LSDV) estimator is likely to perform better than GMM estimators with respect to bias and root mean squared error criteria (Bruno, 2005). We use a parametric bootstrap procedure to calculate standard errors.

Table 7 reports results for fixed effects panel regressions on  $\Delta Non-Japanese\_ODPlays_{it}$  using the equation 7 specification, and for dynamic panel regressions on  $Non-Japanese\_ODPlays_{it}$  using the equation 6 specification; both specifications are run using the two alternate measures of team performance,  $WinPercent_{it}$  and  $GamesBack_{it}$ .<sup>34</sup> In all four specifications (Table 7, columns 1-4), estimated coefficients on  $\Delta Income_{it}$  are small

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<sup>34</sup> In Tables 7 and 8, we multiply all estimated regression coefficients and standard errors by 100 to facilitate reporting and discussion of results.

in magnitude and statistically insignificant at the ten percent level. Estimated coefficients on the two variables controlling for NPB caps on the number of foreign players that can be registered by a team for each game ( $ForeignCap=3_t$  and  $ForeignCap=4_t$ ) are positive, relatively large in magnitude, and statistically significant at the five percent level in all specifications. The consistent pattern of results for these two variables provides strong evidence that the registration cap of two foreign players per team per game was a binding constraint for NPB teams during the 1966-1980 seasons.

The main focus of our *ODPlays* regressions is to test the hypothesis that a team's decision to use foreign players more frequently in its games is related to team performance over the previous two seasons. An important finding is that the signs, magnitudes, and statistical significance of the estimated coefficients for both measures of team performance are broadly consistent. In all four specifications, the estimated coefficient on the lagged team performance variable has a consistent sign (i.e., negative for  $WinPercent_{it-1}$  and positive for  $GamesBack_{it-1}$ ) and is statistically significant at the five percent level. Following this pattern, the estimated coefficient on the two-period lag of the team performance variable again has a consistent sign (i.e., positive for  $WinPercent_{it-2}$  and negative for  $GamesBack_{it-2}$ ) in all four specifications and is statistically significant at the ten percent level in three of the four specifications.

These results are somewhat different from those in either Goff et al. (2002) or Hanssen and Meehan (2009), both of whom studied how an MLB team's performance in the previous season affected the number of African-American players on a team's roster in the current season.<sup>35</sup> Our results differ primarily because we find that the relationship

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<sup>35</sup> Our dependent variable, the share of foreign players in offensive and defensive plays, differs from the dependent variable used in other studies, counts of foreign players on rosters, and this may

between use of foreign players and team performance goes back at least two seasons rather than one, and that the estimated coefficient for the second season is the opposite of that for the first season, thereby diminishing the overall impact of team performance on foreign player share of offensive and defensive plays. The largest impact on the share of foreign players in team offensive and defensive plays occurs for teams that were successful (unsuccessful) two seasons earlier, but saw their performance fall off (improve) in the previous season. Thus, *good teams gone bad* were the most likely to utilize more foreign players while *bad teams gone good* were the most likely to shed them.

Do we obtain similar results when we estimate *ODPlays* regressions for Caucasian, African-American, and Latino players? Since *ODPlays* is stationary in levels for Caucasian, African-American, and Latino players, we estimate the same dynamic panel specifications in the levels of *ODPlay* for each racial and ethnic group as we did earlier for *NonJpn-ODPlays* (equation 3, as reported in Table 7, columns 1 and 3). Table 8 reports results for six specifications using the same two alternate measures of team performance for each of the three ethnic groups. The estimated coefficient on the lagged dependent variable is less than 100 in all specifications and is statistically significant at the five percent level. Estimated coefficients for the team performance measures are similar to those reported in Table 7 for all non-Japanese players. In all four specifications, the estimated coefficient on the lagged team performance variable has a consistent sign (again, negative for *WinPercent<sub>it</sub>* and positive for *GamesBack<sub>it-1</sub>*) but only one coefficient (*WinPercent<sub>it-1</sub>* in the Caucasian regression) is statistically significant at the five or ten percent level. Signs for the estimated coefficient on the two-period lag of the team performance variable again follow those in Table 7 for the Latino and Caucasian

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account for some of the differences in results.

regressions, but are reversed for the African-American regressions. Only one coefficient,  $GamesBack_{it-2}$  in the Caucasian regression, is statistically significant at the five or ten percent level. While the overall pattern of the estimated coefficients in the *ODPlays* regressions for the three ethnic/racial groups resembles that observed in the *Non-Japanese\_ODPlays* regressions, coefficients are estimated with less precision.<sup>36</sup> We conclude that our econometric results for all foreign players do not readily extend to the smaller samples of Latinos, Caucasian, and African-American players. Interpretation of these results is not obvious: the statistically insignificant result could be due to the reduced precision of estimates using the smaller sample sizes of the respective player groups or, alternatively, could indicate that the relationship does not exist for the particular racial/ethnic group of players.

### **VIII. Understanding Differences in Behavior Across MLB and JPL Teams**

NPB's integration with foreign players and MLB's integration with racial and ethnic minorities both took place during the two decades after World War II, and we found many similarities between the two processes. First, initial integration of teams took a surprisingly long time to complete in both Japan and the United States, with the Boston Red Sox only adding an African-American player in 1959 and the Tokyo Giants only adding a Latino player in 1986. Second, during the initial decades of integration, NPB foreign players had higher slugging averages than NPB Japanese players, and MLB minority players had higher slugging averages than Caucasian players. Third, MLB

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<sup>36</sup> We note that the sign of the estimated coefficient on  $ForeignCap=3_t$  is negative in the African-American regressions and positive in the Caucasian regressions, thereby indicating some tendency for teams to replace African-American players with Caucasian players as the team cap on foreign players registered per game increased from two to three.

National League teams that added minority players and NPB Central League teams that added foreign players were more likely to win pennants than other teams.

There were also notable differences in how MLB and NPB team characteristics affected their play of foreign players in games after the initial period of integration. Goff et al. (2004) found that better-performing MLB teams were more likely to add minority players to their rosters; Hanssen and Meahan (2007) found weak support for the opposite proposition; and Coyne et al. (2007, 2010a, 2010b) found that winning teams within striking distance of a pennant were more likely to add minority players. For NPB teams, we identified a more nuanced relationship between team performance and the team's play of foreign players: *Good teams gone bad* were more likely to play foreign players, while *Bad teams gone good* were less likely.

One factor that might explain this pattern in Japan's professional baseball leagues is that teams are typically owned by large profit-maximizing Japanese corporations. Corporate owners of a team with a history of good performance that experiences a bad season may be worried that more embarrassing performances would tarnish their corporation's image. A quick, but expensive, solution (due to the higher salaries paid to foreign players) is for the team to enter the market for foreign players who, unless they are already under contract to another NPB team, are not "reserved" for particular teams.<sup>37</sup> Vice-versa, an NPB team with a history of less than stellar performance that experiences a rare good season may drop expensive foreign players when the team's performance surge comes primarily from the less expensive Japanese players on its roster. Other factors may also be operating, such as the relatively short median tenure of foreign players (varying

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<sup>37</sup> In a rare expansion of MLB's reserve clause beyond U.S. and Canadian borders, the Minnesota Twins sold their player contract with Greg "Boomer" Wells to the Hankyu Braves in 1983 (Fitts 2005, 152-153). See Sanderson and Siegfried (2006) for a retrospective on MLB's reserve clause.

between one and two seasons) or the less specialized management of NPB teams relative to MLB teams. Sorting out these explanations as well as investigating the influence of MLB's use of Japanese players on the NPB's use of foreign and Japanese players is beyond the scope of this paper and forms the basis for future research on NPB player markets.

## Appendix

### 1. Names of Foreign Players on NPB Team Rosters during the 1958-2004 Seasons.

“Chimu-betsu Gaikokujin-senshu Nenpyo (A chronological table of foreign players by team)”, *Besu-boru Magajin* (Baseball Magazine), Vol. 20, No. 4, Autumn 1996, pp. 94-97.

“Chimu-betsu Zaiseki-Gaikokujin Nenpyo (A chronological table of foreign players by team)”, *Besu-boru Magajin* (Baseball Magazine), Vol. 24, No. 4, Autumn 2000, pp.130-136.

Puro-yakyu Rekidai Gaikokujin-senshu (Past foreign players in professional baseball)  
<http://kiwi.s3.xrea.com/dat/sukett.htm> (last access on 30 September 2011).

### 2. Pictures and country of birth of foreign players.

“Gaikokujin Touroku-senshu Shashin Meikan (Name/picture directory of foreign players)” *Besu-boru Magajin* (Baseball Magazine), Vol. 24, No. 4, Autumn 2000, pp. 88-129.

Besu-boru Magajin-sha, *Kettei-ban Nippon Puro-yakyu Gaikokujin-senshu Taikan (Encyclopedia of Foreign Players in Japan's Professional Baseball)*, Tokyo: Besu-boru Magajin-sha, 2002.

Nippon Yakyu Kikou (Nippon Professional Baseball), *Nippon Puro-yakyu Kiroku Dai-hyakka (Official Baseball Encyclopedia 2004)*, Tokyo: Besu-boru Magajin-sha, 2004.

Wayne S. Graczyk, *Japan Pro Baseball 2002: Fan Handbook & Media Guide*. Tokyo: Soho Printing, 2002.

### 3. Offensive and defensive plays by foreign and Japanese players; team and player performance data.

Nippon Yakyu Kikou (Nippon Professional Baseball), *Nippon Puro-yakyu Kiroku Dai-hyakka (Official Baseball Encyclopedia 2004)*, Tokyo: Besu-boru Magajin-sha, 2004.

“Kojin Nendo-betsu Seiseki (Season records for individual players)”, *Besu-boru Magajin* (Baseball Magazine), Vol. 24, No. 4, Autumn 2000, pp. 138-149.

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Figure 1. African-American Players per NPB Team: 1958-2004

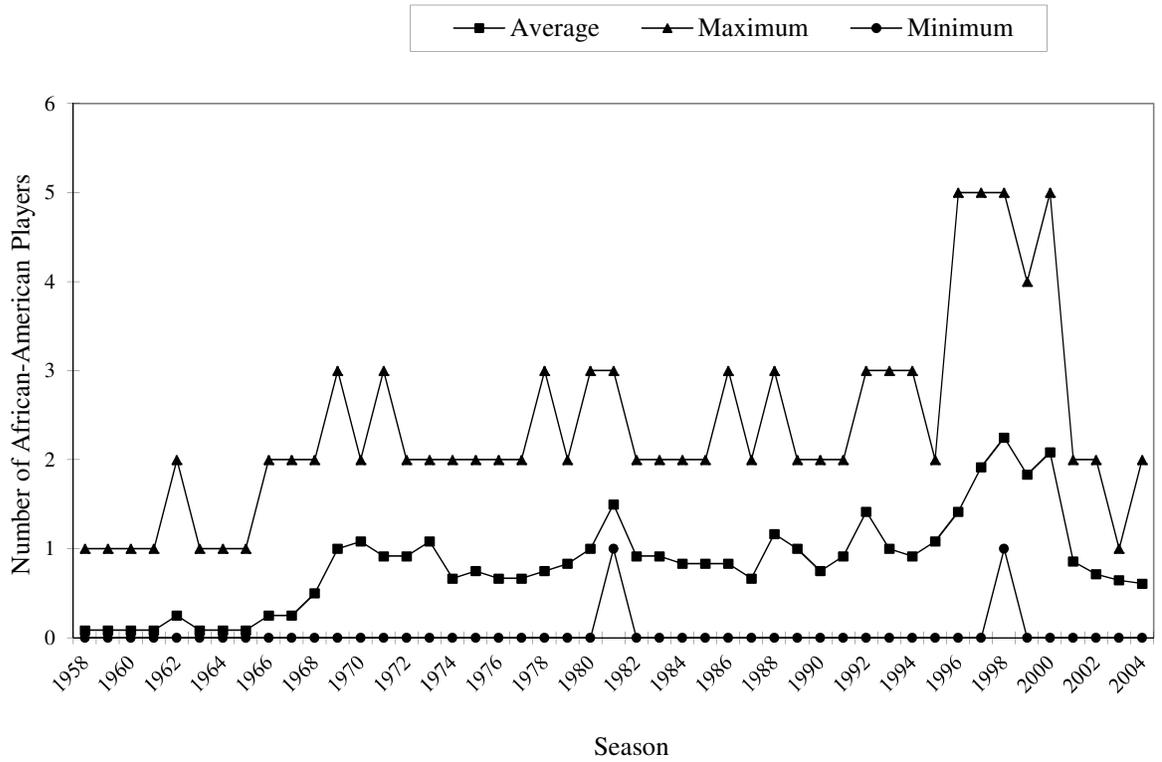


Figure 2: Slugging Average of Japanese and Foreign Players in NPB, 1958-2004

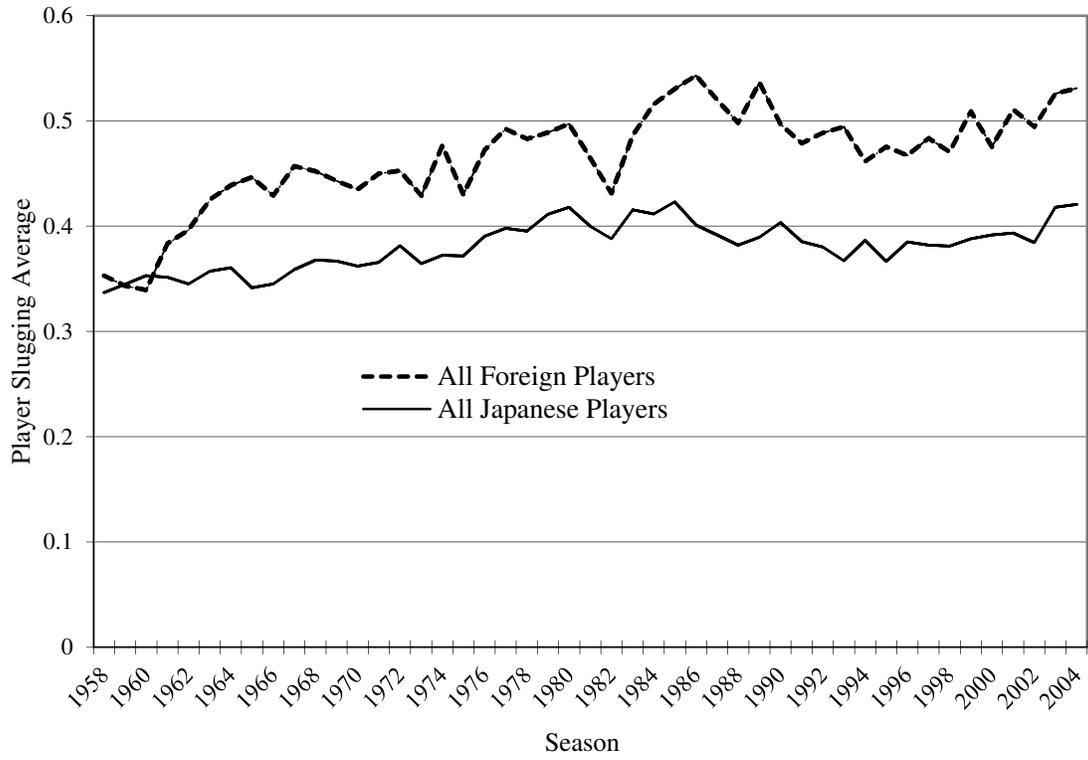


Figure 3. Foreign Players per NPB Team: 1958-2004

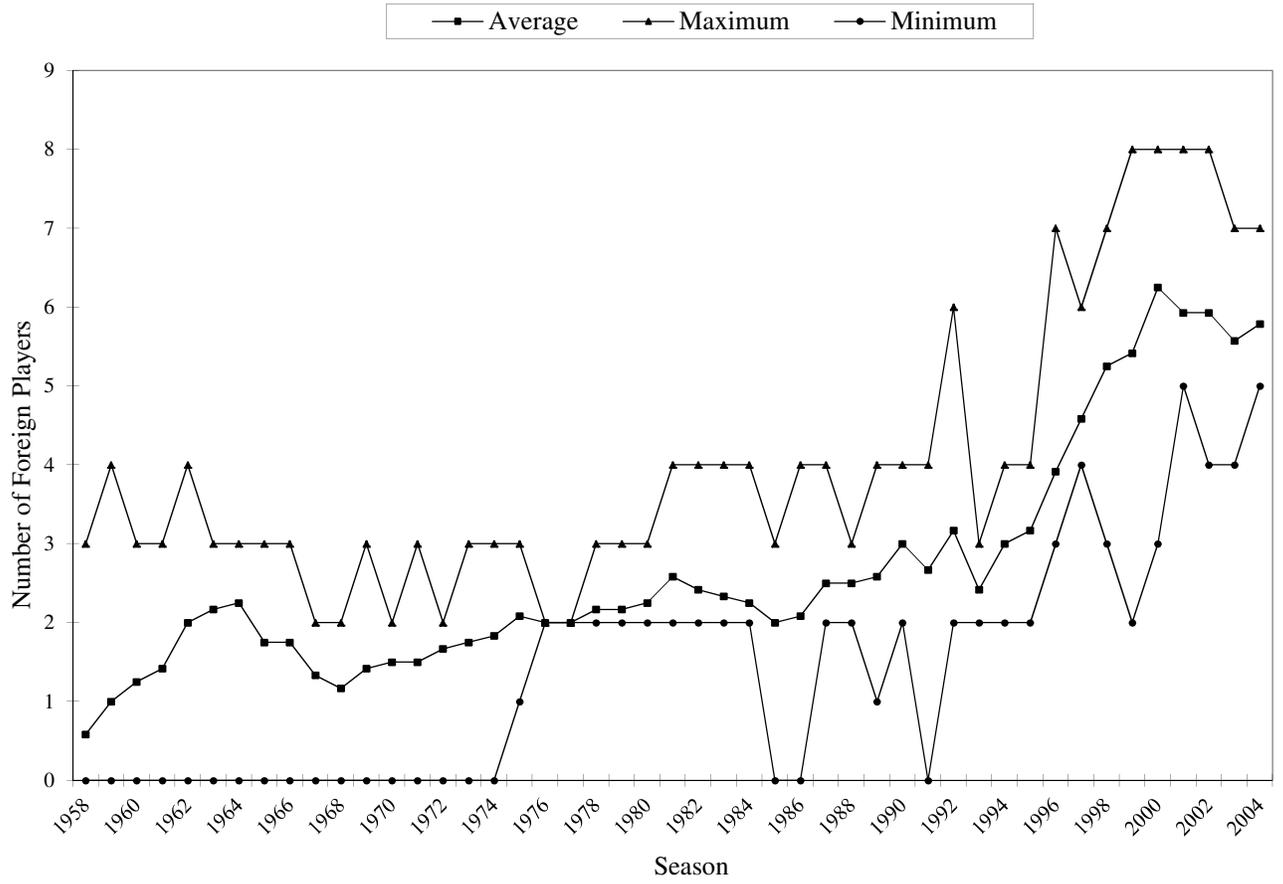


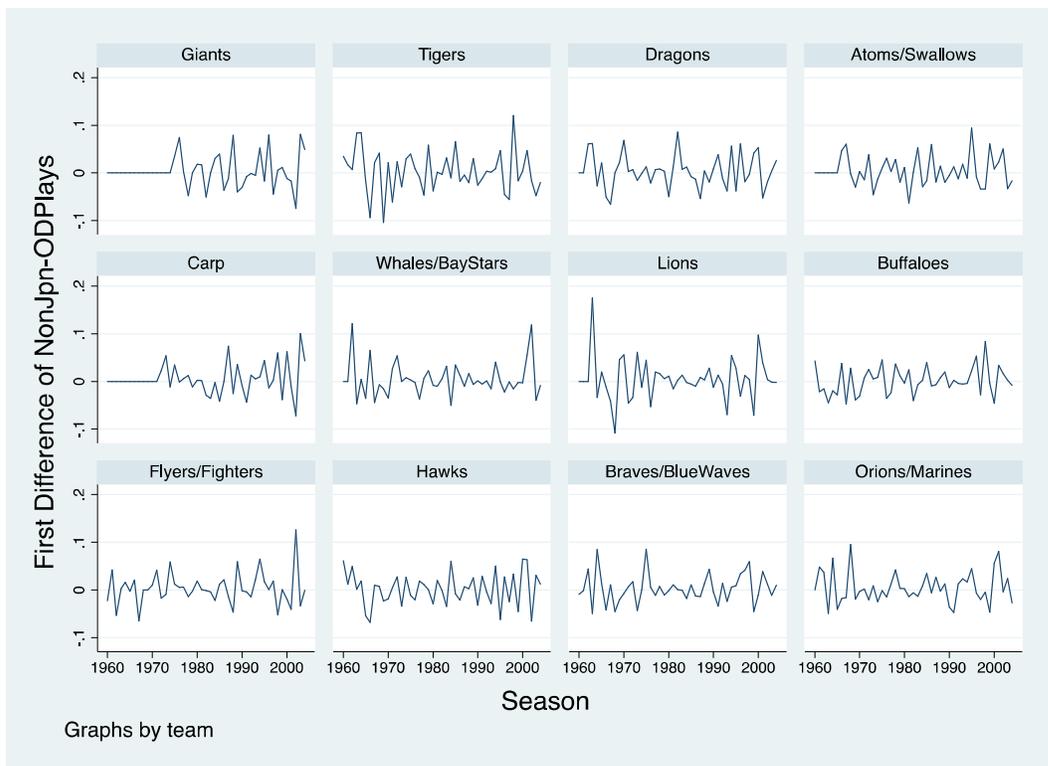
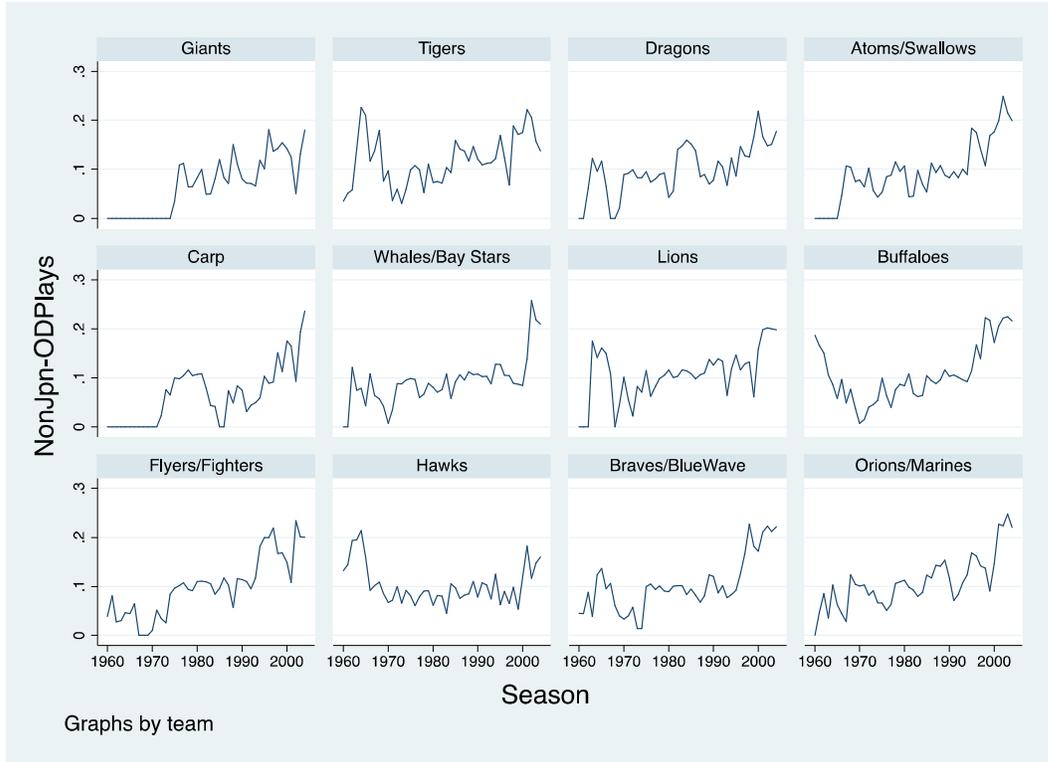
Figure 4: Level and First Difference of  $NonJpn-ODPlays_{it}$  by Team $_i$ , 1958-2004

Table 1. NPB Summary Statistics for Panel Data Samples Used in Econometric Analysis

*Panels 1-2: 1951-1962 for 12 teams*

| Variable                            | mean | s.d. | min  | max  |
|-------------------------------------|------|------|------|------|
| <u>Pacific League</u>               |      |      |      |      |
| <i>Pennant<sub>it</sub></i>         | 0.17 | 0.38 | 0.00 | 1.00 |
| <i>WinPercent<sub>it-1</sub></i>    | 0.51 | 0.11 | 0.23 | 0.75 |
| <i>Foreign Players<sub>it</sub></i> | 1.42 | 1.37 | 0.00 | 5.00 |
| <u>Central League</u>               |      |      |      |      |
| <i>Pennant<sub>it</sub></i>         | 0.17 | 0.38 | 0.00 | 1.00 |
| <i>WinPercent<sub>it-1</sub></i>    | 0.50 | 0.11 | 0.24 | 0.73 |
| <i>Foreign Players<sub>it</sub></i> | 0.99 | 1.35 | 0.00 | 6.00 |

*Panels 3-5: 1951-1965 for 12 teams*

| Variable   | mean | s.d. | min  | max  |
|--|------|------|------|------|
| <u>African-American First Players, 1951-1980</u> |      |      |      |      |
| <i>FirstAfricanAmer<sub>i</sub></i>              | 0.11 | 0.31 | 0.00 | 1.00 |
| <i>WinPercent<sub>it-1</sub></i>                 | 0.51 | 0.09 | 0.26 | 0.68 |
| <u>Latino First Players, 1951-1999</u>           |      |      |      |      |
| <i>FirstLatino<sub>i</sub></i>                   | 0.06 | 0.24 | 0.00 | 1.00 |
| <i>WinPercent<sub>it-1</sub></i>                 | 0.50 | 0.08 | 0.26 | 0.68 |
| <u>Caucasian First Players, 1951-1975</u>        |      |      |      |      |
| <i>FirstCaucasian<sub>i</sub></i>                | 0.19 | 0.40 | 0.00 | 1.00 |
| <i>WinPercent<sub>it-1</sub></i>                 | 0.49 | 0.09 | 0.26 | 0.68 |

*Panel 6: 1960-2004 for 12 teams*

| Variable  | mean  | s.d.  | min  | max   |
|---|-------|-------|------|-------|
| <u>Foreign Players' Share of Team Offensive and Defensive Plays (ODPlays)</u> |       |       |      |       |
| <i>Foreign-ODPlays<sub>it</sub></i>   | 0.10  | 0.06  | 0.00 | 0.26  |
| <i>NonJpn-ODPlays<sub>it</sub></i>  | 0.10  | 0.06  | 0.00 | 0.26  |
| <i>Cauc-ODPlays<sub>it</sub></i>  | 0.05  | 0.05  | 0.00 | 0.23  |
| <i>AfrAmer-ODPlays<sub>it</sub></i>   | 0.03  | 0.03  | 0.00 | 0.13  |
| <i>Latino-ODPlays<sub>it</sub></i>  | 0.01  | 0.02  | 0.00 | 0.15  |
| <u>Other Variables</u>  |       |       |      |       |
| <i>WinPercent<sub>it-1</sub></i>  | 0.50  | 0.08  | 0.23 | 0.68  |
| <i>GamesBack<sub>it-1</sub></i>   | 13.34 | 10.92 | 0.00 | 51.50 |
| <i>PreIncome<sub>it</sub></i>   | 2665  | 910   | 675  | 4594  |
| <i>ForeignCap=3<sub>t</sub></i>   | 0.22  | 0.42  | 0.00 | 1.00  |
| <i>ForeignCap=4<sub>t</sub></i>   | 0.16  | 0.36  | 0.00 | 1.00  |

Table 2: Year in Which First Foreign Player on NPB Team Roster, By Ethnicity and Race

| Team                         | Caucasian | African-American | Latino | Japanese-American |
|------------------------------|-----------|------------------|--------|-------------------|
| <i>Central League</i>        |           |                  |        |                   |
| Giants                       | 1975      | 1980             | 1986   | 1950              |
| Tigers                       | 1960      | 1968             | 1965   | 1952              |
| Dragons                      | 1963      | 1962             | 1999   | 1961              |
| Swallows (formerly Atoms)    | 1973      | 1966             | 1966   | 1963              |
| Carp                         | 1975      | 1973             | 1972   | 1953              |
| Bay-Stars (formerly Whales)  | 1962      | 1969             | 1969   | 1961              |
| <i>Pacific League</i>        |           |                  |        |                   |
| Lions                        | 1952      | 1969             | 1971   | 1952              |
| Buffaloes                    | 1953      | 1966             | 1965   | 1952              |
| Fighters (formerly Flyers)   | 1958      | 1970             | 1995   | 1957              |
| Hawks                        | 1959      | 1970             | 1996   | 1956              |
| Blue-Waves (formerly Braves) | 1962      | 1952             | 1955   | 1950              |
| Marines (formerly Orions)    | 1950      | 1968             | 1968   | 1950              |

Table 3. Panel Regressions on NPB Team Performance by League, 1951-1962

*A. Pacific League*

| Dependent Variable               | (1)<br><i>WinPercent<sub>it</sub></i> | (2)<br><i>WinPercent<sub>it</sub></i> | (3)<br><i>Pennant<sub>it</sub></i> |
|----------------------------------|---------------------------------------|---------------------------------------|------------------------------------|
| Estimate                         | pooled<br>OLS                         | random<br>effects                     | pooled<br>logit                    |
| <i>WinPercent<sub>it-1</sub></i> | 0.16<br>(0.12)                        | 0.66*<br>(0.09)                       | 17.92**<br>(4.64)                  |
| <i>PropForeign<sub>it</sub></i>  | 0.03<br>(0.05)                        | -0.01<br>(0.06)                       | -9.27**<br>(1.41)                  |
| Constant                         | 0.49**<br>(0.07)                      | -0.18**<br>(0.05)                     | -10.79**<br>(2.80)                 |
| Observations                     | 72                                    | 72                                    | 72                                 |
| Team dummies                     | yes                                   | no                                    | no                                 |
| F-Statistic                      | 16.27                                 | -                                     | -                                  |
| Prob > F                         | 0.00                                  | -                                     | -                                  |
| Wald X <sup>2</sup> (2)          | -                                     | 60.78                                 | -                                  |
| Prob > X <sup>2</sup> (2)        | -                                     | 0.00                                  | -                                  |
| Log Likelihood                   | -                                     | -                                     | -19.61                             |
| R <sup>2</sup>                   | 0.62                                  | 0.47                                  | 0.40                               |

*B. Central League*

| Dependent Variable               | (1)<br><i>WinPercent<sub>it</sub></i> | (2)<br><i>WinPercent<sub>it</sub></i> | (3)<br><i>Pennant<sub>it</sub></i> |
|----------------------------------|---------------------------------------|---------------------------------------|------------------------------------|
| Estimator                        | pooled<br>OLS                         | random<br>effects                     | pooled<br>logit                    |
| <i>WinPercent<sub>it-1</sub></i> | 0.29**<br>(0.09)                      | 0.64**<br>(0.07)                      | 4.72<br>(4.41)                     |
| <i>PropForeign<sub>it</sub></i>  | 0.12**<br>(0.05)                      | 0.09*<br>(0.04)                       | 5.99**<br>(2.04)                   |
| Constant                         | 0.38**<br>(0.06)                      | 0.16**<br>(0.03)                      | -5.64**<br>(2.28)                  |
| Observations                     | 72                                    | 72                                    | 72                                 |
| Team dummies                     | yes                                   | -                                     | no                                 |
| F-Statistic                      | 29.40                                 | -                                     | -                                  |
| Prob > F                         | 0.00                                  | -                                     | -                                  |
| Wald X <sup>2</sup> (2)          | -                                     | 582.79                                | -                                  |
| Prob > X <sup>2</sup> (2)        | -                                     | 0.00                                  | -                                  |
| Log Likelihood                   | -                                     | -                                     | -20.35                             |
| R <sup>2</sup>                   | 0.71                                  | 0.63                                  | 0.62                               |

Table 4. Regulations on Number of Foreign Players on NPB Team Roster

|           | Full Team Roster <sup>a</sup> | Registration for a Game |
|-----------|-------------------------------|-------------------------|
| 1952-1954 | No Restriction                | 3                       |
| 1955-1965 | 3                             | 3                       |
| 1966-1980 | 2                             | 2                       |
| 1981-1993 | 3                             | 2                       |
| 1994-1995 | 3                             | 3 <sup>b</sup>          |
| 1996-1997 | No Restriction                | 3 <sup>b</sup>          |
| 1998-2001 | No Restriction                | 4 <sup>c</sup>          |
| 2002-2011 | No Restriction                | 4 <sup>d</sup>          |

*Notes:*

<sup>a</sup> The team roster includes both major and minor league players.

<sup>b</sup> Three-player limit is restricted to a combination of fielders and pitchers, i.e., team is not allowed to register three fielders or three pitchers for a game.

<sup>c</sup> Four-player limit is restricted to two fielders and two pitchers.

<sup>d</sup> Four-player limit is restricted to a combination of fielders and pitchers, i.e., team is not allowed to register four fielders or four pitchers for a game.

Table 5. Discrete-Time Hazard Regressions: First Ethnic Players on NPB Teams

| Dependent Variable               | <i>First_Caucasian Player</i> | <i>First_African-American Player</i> | <i>First_Latino Player</i> |
|----------------------------------|-------------------------------|--------------------------------------|----------------------------|
| <i>League<sub>i</sub></i>        | 1.05<br>(1.54)                | 0.90<br>(0.89)                       | 0.46<br>(0.74)             |
| <i>WinPercent<sub>it-1</sub></i> | -17.53**<br>(6.09)            | -11.83**<br>(5.04)                   | -5.69<br>(3.59)            |
| Estimator                        | Logit                         | Logit                                | Logit                      |
| Year dummies                     | Yes                           | Yes                                  | Yes                        |
| Observations                     | 68                            | 49                                   | 67                         |
| Wald $\chi^2$                    | 21.69                         | 14.08                                | 21.97                      |
| Prob > $\chi^2$                  | 0.22                          | 0.12                                 | 0.04                       |
| Log likelihood                   | -15.26                        | -17.94                               | -29.01                     |

Table 6. Breitung-Das Panel Unit Root Tests for 1958-2004 Panel

| Variable                           | Level     |            | First-Difference |            |
|------------------------------------|-----------|------------|------------------|------------|
|                                    | $\lambda$ | $p$ -value | $\lambda$        | $p$ -value |
| <i>Income<sub>it</sub></i>         | 1.38      | 0.92       | -5.55            | 0.00       |
| <i>NonJpn-ODPlays<sub>it</sub></i> | -1.59     | 0.06       | -12.43           | 0.00       |
| <i>Cauc-ODPlays<sub>it</sub></i>   | -4.32     | 0.00       | -13.75           | 0.00       |
| <i>AfrAm-ODPlays<sub>it</sub></i>  | -6.00     | 0.00       | -24.33           | 0.00       |
| <i>Latino-ODPlays<sub>it</sub></i> | -6.05     | 0.00       | -17.73           | 0.00       |
| <i>WinPercent<sub>it-1</sub></i>   | -5.28     | 0.00       |                  |            |
| <i>GamesBack<sub>it-1</sub></i>    | -5.38     | 0.00       |                  |            |

Table 7. Panel Regressions: Share of Non-Japanese Foreign Players in Offensive and Defensive Plays on NPB Teams, 1960-2004

| Dependent Variable       | $\Delta NonJpn-ODPlays_{it}$ | $NonJpn-ODPlays_{it}$ | $\Delta NonJpn-ODPlays_{it}$ | $NonJpn-ODPlays_{it}$ |
|--------------------------|------------------------------|-----------------------|------------------------------|-----------------------|
|                          | (1)                          | (2)                   | (3)                          | (4)                   |
| $NonJpn-ODPlays_{i,t-1}$ |                              | -18.29**<br>(4.57)    |                              | -18.17**<br>(4.56)    |
| $WinPercent_{i,t-1}$     | -6.74**<br>(1.59)            | -5.93**<br>(2.41)     |                              |                       |
| $WinPercent_{i,t-2}$     | 3.83**<br>(1.67)             | 2.70<br>(2.70)        |                              |                       |
| $GamesBack_{i,t-1}$      |                              |                       | 0.04**<br>(0.01)             | 0.034**<br>(0.017)    |
| $GamesBack_{i,t-2}$      |                              |                       | -0.03**<br>(0.01)            | -0.02<br>(0.02)       |
| $\Delta Income_{it}$     | -0.001<br>(0.001)            | -0.00<br>(0.00)       | -0.001<br>(0.001)            | -0.001<br>(0.001)     |
| $ForeignCap=3_t$         | 0.96**<br>(0.28)             | 1.19**<br>(0.42)      | 0.97**<br>(0.28)             | 1.21**<br>(0.42)      |
| $ForeignCap=4_t$         | 0.91**<br>(0.23)             | 0.99*<br>(0.52)       | 0.89**<br>(0.23)             | 0.97*<br>(0.53)       |
| Constant                 | 1.51<br>(1.03)               |                       | 0.10<br>(0.23)               |                       |
| Estimator                | f.e.                         | lsdvc                 | f.e                          | lsdvc                 |
| Cluster s.e. (team)      | Yes                          | No                    | Yes                          | No                    |
| Observations             | 540                          | 540                   | 540                          | 540                   |
| F-statistic              | 14.02                        | na                    | 14.68                        | na                    |
| (p-value)                | 0.0002                       | na                    | 0.0002                       | na                    |
| $R^2$                    | 0.04                         | na                    | 0.03                         | na                    |

f.e. = fixed effects estimator. lsdv = bias corrected least squares dummy variable estimator.

Table 8. Bias Corrected Least Squares Dummy Variable Regressions: Share of Caucasian, Latino, and African-American Players in Team Offensive and Defensive Plays, 1960-2004.

| Dependent Variable:<br>Share of Ethnic<br>Players in $ODPlays_{it}$ | Caucasian         | Caucasian          | African-<br>American | African-<br>American | Latino            | Latino            |
|---|-------------------|--------------------|----------------------|----------------------|-------------------|-------------------|
| <i>One Season Lag,<br/>Dependent Variable</i>                       | 64.00**<br>(4.21) | 64.00**<br>(4.21)  | 63.79**<br>(4.65)    | 64.10**<br>(4.63)    | 54.61**<br>(4.64) | 54.45**<br>(4.67) |
| <i>WinPercent<sub>it-1</sub></i>                                    | -5.18<br>(2.33)   |                    | -1.99<br>(1.68)      |                      | -1.17<br>(1.17)   |                   |
| <i>WinPercent<sub>it-2</sub></i>                                    | 6.06<br>(4.71)    |                    | -1.07<br>(1.88)      |                      | 0.84<br>(1.31)    |                   |
| <i>GamesBack<sub>it-1</sub></i>                                     |                   | 0.026<br>(0.016)   |                      | 0.01<br>(0.01)       |                   | 0.01<br>(0.01)    |
| <i>GamesBack<sub>it-2</sub></i>                                     |                   | -0.033*<br>(0.017) |                      | 0.01<br>(0.01)       |                   | 0.00<br>(0.01)    |
| <i><math>\Delta Income_{it}</math></i>                              | -0.002<br>(0.002) | -0.000<br>(0.000)  | 0.000<br>(0.001)     | 0.000<br>(0.001)     | -0.001<br>(0.001) | -0.001<br>(0.001) |
| <i>ForeignCap=3<sub>t</sub></i>                                     | 2.96**<br>(0.72)  | 1.70**<br>(0.40)   | -0.66**<br>(0.31)    | -0.63**<br>(0.31)    | 0.27<br>(0.21)    | 0.28<br>(0.21)    |
| <i>ForeignCap=4<sub>t</sub></i>                                     | 3.64**<br>(0.98)  | 2.09**<br>(0.56)   | -0.05<br>(0.38)      | -0.07<br>(0.39)      | 1.37**<br>(0.28)  | 1.37**<br>(0.29)  |
| Estimator   | lsdv              | lsdv               | lsdv                 | lsdv                 | lsdv              | lsdv              |
| Observations  | 540               | 540                | 540                  | 540                  | 540               | 540               |