Preliminary Draft

Not for Quotation

Incentives and Institutions: The Case of Nippon Professional Baseball

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Abstract

In the setting of Nippon Professional Baseball (NPB), this paper examines the effect of two different policies, creating more competitive labor markets and wage dispersion, on economic outcomes. While free agency, which ostensibly reduces monopsony power in the labor market, brings large increases in salary in most professional sports, we find that it does not do so in NPB. Moreover, different performance measures affect salary in MLB and NPB. We are able to examine the effect of wage dispersion on team success because rich baseball data allow us to hold team ability constant, which most previous studies have been unable to do. Thus, given ability, we show that wage dispersion in NPB has a positive impact both on the winning percentage and attendance of a team. Our results confirm previous results from NPB and contradict results from MLB, thus showing that that the institutional setting in which one implements a policy affects economic outcomes.

Introduction

Economists agree that basic economic principles are universal, but they recognize that the behavior based on those principles takes place in specific institutional and cultural milieus. As a result, a given policy could have disparate impacts when implemented in different settings. This paper focuses on two specific policies, the termination of monopsony power and using rank order tournaments to determine salary structure within a firm.

Standard theory predicts that making labor markets more competitive should raise wages. Firms can undermine this increase, however, if they are able to manipulate the terms under which workers sell their services. Similarly, the wage dispersion resulting from using tournaments to determine pay could have very different effects. While all workers could strive harder and work more effectively to attain the big prize, the pay disparity could undermine cooperation within the firm or even lead workers to sabotage one another.

Previous research has evaluated both of the above policies in the context of Major League Baseball (MLB) because baseball provides access to data on pay and performance that is not available elsewhere. These studies have found that free agency has dramatically increased salaries and that team performance declines when salaries become more widely dispersed. These findings have been used to argue that workers benefit from free markets but that firms should take care to keep market-driven differences in pay from getting too large. What works – or doesn't work – in the US, however, may or may not apply in different economies. In Japan, for example, workers' pay is more closely managed by firms. One result is that pay disparity within Japanese firms is smaller than the disparity found in the US. Using data from Nippon Professional Baseball (NPB), we show that free agency has failed to improve player salaries. We also find that NPB team performance improves when salaries vary more widely, suggesting that payrolls are too even. Although our results strongly indicate a positive role for pay disparities in NPB, they are only a first step, as this version of our paper includes only “offensive” statistics.

We add to the literature in two ways. First, we explicitly account for the role played by institutional factors in economic decision making. Institutional differences affect salary determination in Japan and the US. In our context this means that some performance measures are more highly valued in NPB than in MLB and that Japanese baseball players are less able to exploit free agency. The differences also affect how workers respond to pay differentials in the workplace. Our second contribution is methodological. We separate a team's disparity in pay from its disparity in ability. To do this, we build upon DeBrock et al.'s (2004) simulating ability using team-year-specific results from a salary equation.

The remainder of the paper proceeds as follows. The next section briefly reviews the theory of rank order tournaments and the debate over whether they increase or reduce team productivity. It also shows how previous researchers have tested the impact of salary disparities using data from Major League Baseball (MLB). Section 3 provides a brief introduction to the labor market for Nippon Professional Baseball (NPB) players and shows how it differs from that for MLB. Section 4 sets out our estimation strategy and describes the data we use. Section 5 presents our results. A conclusion follows.

Literature Review

Paying workers their marginal revenue product (MRP) results in the Pareto efficient allocation of resources, but such a reward mechanism requires that employers observe the productivity of their workforce. Since this is largely impossible, employers seek alternative ways to motivate their workers. Lazear and Rosen (1981) first developed the notion of Rank Order Tournaments (ROTs) as optimal labor contracts that do not require precise monitoring.

Lazear and Rosen show that, under fairly general conditions, one need only observe the relative productivities of workers. Employers can then separate their workforce into "winners" who are paid more than their MRP and "losers" who are paid less than their MRP. By manipulating the spread in pay appropriately, employers can generate the same degree of effort that would occur under a piece rate system that pays workers their MRP. This model has been extended to settings ranging from corporate hierarchies (Bognanno, 2001 and Kale et al., 2009) to professional golf (Ehrenberg and Bognanno, 1990). The extensions support the notion that ROTs are an efficient reward system in a variety of settings.

At the same time, a parallel literature has arisen that warns of the potentially harmful incentives that arise when large differences in pay arise from small differences in performance. O'Keeffe et al. (1984) note that workers participating in uneven contests may give up entirely and exert no effort. Lazear (1989) points out that pay disparities encourage a firm's best workers but can create disharmony among the broader workforce. Akerlof and Yellen (1991) posit that effort by the labor force declines when workers are not paid what workers regard as a "fair wage" and note the implications of such a negative incentive for the overall unemployment rate. Levine (1991) proposes that firms pay their lowest-paid workers an efficiency wage to raise the cohesiveness of the workforce. He points out that cohesiveness is particularly important in the presence of mobility restrictions, as is the case in the Japanese labor market. Levine concludes that the compression of salaries among Japanese firms is an efficient response to labor market conditions there. More recently, Bose et al. (2010) claim that equalizing pay reduces sabotage by workers even when the affected workers perform different tasks within the firm.

The firm thus faces a trade-off. Tournaments might encourage workers to provide the optimal level of effort without having to resort to intrusive and costly monitoring. However, they could also promote unproductive – or even destructive – behavior by workers who see themselves as unjustly penalized by the skewed rewards ROTs generate. The question is which effect dominates.

With its rich data on reward and performance, professional team sports provide an excellent milieu in which to evaluate the impact of pay disparities. Studies of pay disparity in Major League Baseball (MLB) have found that, holding the quality of the team (as measured by its payroll) constant, greater disparities in pay result in worse team performance. Depken (2000) applies the Herfindahl Hirshman Index to MLB teams' salaries from 1985 to 1998. Annala and Winfree (2011) use the Gini coefficient and data from 1985 to 2004. Jewel and Molina (2004) do not analyze the impact of pay disparity on wins per se. Instead, they use Gini coefficients in a stochastic frontier analysis to find that disparity leads to greater inefficiency in generating wins.

Kamada and Katayama (2014) come to a very different conclusion regarding the impact of pay disparity on professional baseball in Japan. Using data for NPB from 1999 to 2010, they find that pay disparity actually improves team performance. They conclude that the incentive effect pay disparities dominates because of the high inherent cohesiveness of Japanese teams. They also find that their measure of team quality (payroll) has no impact, which raises questions about the validity of their findings.

All of the above applications to professional baseball suffer from one common flaw. They use salary disparities to reflect differences in reward while – at the same time – using salary levels to reflect the amount of talent on a team. If salary reflects talent, however, then disparities in payroll could reflect disparities in player abilities. Thus, finding that pay disparities harm or help team performance could reflect either incentives or technology. Specifically, it could show that teams with a few superstars and a weak supporting case performs worse (or better) than a team with players with relatively equal abilities.

DeBrock et al. (2004) is the one study that explicitly attempts to separate the impact of disparities in performance from the impact of disparities in pay. It does so with a two-stage model in which the first stage consists of estimating a salary equation and using the predicted salaries to construct a proxy for each team's overall level of talent. In the second stage, it constructs HHIs for both team salaries and their proxies for talent. Using MLB data for 1985 through 1998, it finds that pay disparity does not have a statistically significant impact on performance but that it reduces attendance, a variable indicative of team success.

In explicitly modeling ability, DeBrock et al. encounter a problem that other papers do not. In using salary as a proxy for ability, previous papers could combine the offensive statistics of hitters with the defensive statistics of pitchers. Without salary as the common yardstick for ability, one must confront the fact that the two sets of players are judged by completely different criteria. DeBrock et al. use a single salary equation with separate performance measures. They then raise or lower the expected value of salaries of each player to account for the fact that some teams pay unusually high salaries while others pay unusually low salaries. These premiums (or discounts) are revealed in the team-year dummy for each player. DeBrock et al. take the average of the adjusted expected values for all the players in each team-year category as the average level of talent on the team.

In their first-stage estimation, DeBrock et al. use the salaries of all players. This could result in biased estimates, as multi-year, guaranteed contracts are now the norm in MLB. Year-to-year changes in performances thus have no impact on base pay except when a player's contract comes up for renewal. (See Krautmann, 1999.) In NPB, however, multi-year contracts are rare, as players are treated as independent contractors whose employment is to be renewed every year. (Kelly, 2006) Thus, year-on-year pay changes are much greater in NPB than in MLB.

There have been few studies of salary determination in NPB. Ohkusa (1999) focuses on salary as a motivating factor. Consistent with the "career concern hypothesis" (e.g., Gibbons and Murphy, 1992), he finds that players require greater monetary incentives as they approach retirement. While this implies an upward trend in salaries, *cet. par*., it does not speak directly to the impact of free agency. Ramseyer and Nakazato (2007 and 2008) focus on the bonuses that Japanese players receive. They show that players receive relatively large signing bonuses and that teams recoup these initial "investments" by paying players relatively low salaries. Although free agency is not a central concern, they find that free agency has much less effect on salaries in NPB than in MLB.

Leeds, von Allmen, and Sakata (2012) explicitly consider the impact of free agency in NPB. They find that "domestic free agency," the ability to sign with other NPB teams but not with teams outside Japan, has no impact on salaries. They do find, however, that international free agency has a small, positive effect. Using a more recent sample, Leeds and Leeds (forthcoming) find that both forms of free agency have small positive effects but that both impacts are dwarfed by the impact of free agency on salaries in MLB.

Differences between Major League Baseball and Nippon Professional Baseball

On the surface, there appears to be little difference between MLB and NPB. In both leagues teams have monopsony power over their players for the first several years of their careers. Eventually, however, players become free agents who are able to sell their services on the open market. Below the surface, however, several important differences affect both the empirical specifications we use and the expectations we have for our estimates.

Free agency eliminates the monopsony power that teams exercise early in players' careers. Since the introduction of free agency, salaries in MLB and the other major North American professional sports have risen considerably. (See, for example, Krautmann et al., 2009.) Any estimate of salary determination in MLB must therefore account for whether the player is eligible for free agency. There is, however, strong reason to believe that free agency has not affected salaries in NPB to the same degree.

Free agency came to NPB in 1993, 18 years after MLB. More importantly, Japanese players did not win free agency through the courts or at the bargaining table. Instead, it was granted to them by the owners at the behest of the Yomiuri Giants, who have dominated NPB since the dawn of professional baseball in Japan in 1936. The Giants saw free agency as a way to sign players away from less financially-secure teams. As a result, free agency in NPB comes with many more restrictions than one sees in MLB. (Whiting, 2004, and Kawai and McDonald, 2012)

The most obvious restriction is that NPB players reach free agency in two stages. After seven years of experience (as opposed to six in MLB), players can become domestic free agents and sell their services to other NPB teams. After two more years, they can become international free agents and move to teams outside Japan. Moving overseas is also possible through the posting system, in which NPB teams sell the rights to negotiate with specific players to MLB teams. Though the posting system is outside the scope of this paper, it is worth noting that it allows NPB teams to auction off exceptional players to MLB at any time during their careers. The best NPB players are thus unlikely to reach international free agency.

While complete free agency comes three years later than in MLB and therefore benefits fewer players, it places no restrictions on player movement. In contrast, domestic free agency comes with many strings attached. The most serious is that any team that signs another team's free agent cannot pay him a higher salary in his first year than he received in his last year with his old team. In addition, teams that sign one of another team's top ten players must provide compensation, either in the form of cash or cash plus a player. The compensation is higher if they sign one of another team's top three players. Finally, players who switch teams as domestic free agents must wait four years, rather than two, before becoming international free agents. (Ota, 2014, and Kawai and Nichol, 2015)

Another limit on free agency is the general reluctance of players to leave their original teams. One former team executive noted that players think it "a sin to leave" a team just to make more money. (Kobayashi, 2015) As a result of the external and internal barriers facing Japanese players, relatively few of them opt for domestic free agency. As of 2012, only 29 NPB players had changed teams as domestic or international free agents. (Kawai and Nichol, 2015) In contrast, over 100 MLB free agents changed teams prior to the 2016 season alone. (Sportrac, 2016) Free agency thus affects few players and is likely to have a small impact on salaries.

Kelly (2006) claims that salaries are far more compressed in NPB than for MLB. This finding is consistent with Levine's (1991) statement about the Japanese economy as a whole. Pay disparities thus take place in a setting in which pay equality is far more pronounced in Japan than in the US. (Dabschek, 2006)

Observers of the Japanese economy have long noted the emphasis that employers have traditionally put on experience. (See, for example, Kwon, 2004.) The original Mincer (1970) model and virtually all labor market studies since have included experience as a proxy for human capital accumulation. When one can control for actual performance, there is little reason to control for experience. At best, it serves as a catch-all for omitted measures of performance. In Japan, however, experience *per se* can assume great importance. Under the *sempai-kohai* (senior-junior) system, workers are honored and rewarded for their experience. Fitts (2005) points out that, in NPB, this system has historically affected factors ranging from pay to access to baths after a game.

Others, particularly Whiting (1977 and 2009), have emphasized that strategic and cultural differences have led NPB teams to weigh some performance measures much more heavily than MLB teams do. Because home runs have historically been less common in Japan, NPB teams place greater emphasis on advancing runners and playing for one run at a time. This leads us to expect such performance measures as stolen bases and sacrifice bunts to be much more valuable in NPB than in MLB. Whiting also points out that sacrifice bunts in particular resonate with the emphasis that Japanese culture places on forgoing individual gain so that the group may prosper.

Empirical Model and Data

Like DeBrock et al. (2004), we estimate the impact of pay disparity in a two-stage process in which we first construct a proxy for ability. We then use this proxy in regressions estimate the impact of dispersion in pay and dispersion in ability on a team's winning percentage and attendance. To compare our results with the rest of the literature on pay disparity, we also estimate a set of regressions that uses the average salary of players in our sample to proxy for ability.

The first stage of our two-stage process builds on an earlier model of salary determination in NPB. (Leeds and Leeds, forthcoming) It starts from the premise that the natural logarithm of a player's pay (*S*) in year *t* reflects his performance (*P*) in year *(t-1)*, his experience (*EXP*), and a set of controls (see below). Because most wage and salary equations show experience to have a positive but diminishing (and, finally, perhaps a negative) impact on pay, we include a quadratic term. The size of the impact of experience (holding performance constant) and the length of time over which experience adds to pay provides a test of whether the *sempai-kohai* system remains important in NPB. Our control variables consist of measures of a player's access to free agency (*DFA*) and dummy variables that indicate the team for which he will play in year *t* (*DTMYR*).

$$\ln(S_{it}) = \sum_k \beta_k P_{i,t-1,k} + \gamma_1 EXP_{it} + \gamma_2 EXP_{it}^2 + \sum_r \delta_r \, DFA_{itr} + \sum_s \theta_s \, DTMYR_{its} + \varepsilon_{it} \quad (1)$$

Salary is reported in units of 10,000 Japanese yen. We adopt this unit of measurement in part because units of 10,000 are a common Japanese measure. In addition, the smaller measures that result reduce the decimal places of the coefficients to a level that is easier to read and interpret.

The standard measure of offensive performance (*P*) in baseball is OPS, a player's on-base percentage plus his slugging average. OPS has been used since the 1980s to summarize the offensive performance of players in MLB. The first component of OPS, on-base percentage, is the number of times a player reaches base divided by the number of plate appearances. Slugging average complements the likelihood of reaching base safely with a measure of a player's "power." It is the number of total bases a player achieves divided by his number of at-bats.[1] While an average MLB player has an OPS of about 0.7, top players have values above 0.9 but rarely above 1.0.[2]

Even though home runs appear implicitly in OPS, we also include them separately. We do so because they are such a crowd-pleasing event that teams may place extra value on them. We also include two performance variables that would not ordinarily appear in regressions involving MLB players. As noted above, both team strategy and the Japanese ethos of self-sacrifice lead us to include stolen bases and sacrifice bunts in this equation.

While we expect experience to have a strong impact on pay, the appropriate measure of experience is not obvious. Years of experience do not necessarily have the same value in NPB as they do in the labor market as a whole. This is largely because a player can meet our threshold of 50 plate appearances, and be only a marginal contributor to a team. As seen in Table 1, some players have participated in as few as 13 (out of 144) games. We therefore measure experience using the number of games played rather than the number of years a player has been in NPB. Using years of experience did not significantly change our

[1] Formally, on-base percentage is (Hits + Walks + Hit by Pitch)/(At Bats + Walks + Hit by Pitch). Technically, when a player walks or is hit by a pitch, he is credited with a plate appearance but not an at-bat. When computing slugging percentage, total bases equals the number of singles plus two times the number of doubles plus three times the number of triples plus four times the number of home runs.

[2] Babe Ruth holds the MLB record for career OPS with a value of 1.164.

results, though the goodness of fit was much lower than for games played. These results are available on request.

To be consistent with DeBrock et al. (2004), we added dummy variables to indicate the team and year for which a player had signed a contract. Many of these dummy variables had statistically insignificant coefficients and were deleted from subsequent regressions. We do not show these regression results, but they are also available upon request.

In several preliminary regressions, we also included dummy variables that indicated whether a player was a catcher (the only field position that was clearly identified) or batted left-handed. We had thought that such players might be particularly valuable to their teams and might be paid more conditional on performance. The coefficients on these variables were consistently statistically insignificant, so we do not include these variables here.

We estimate Equation (1) using performance data for 2009-2014 and salary data for 2010-2015 in a player fixed effects model. To find the predicted ability of each player in our sample, we compute the predicted value of his salary from the regression. We then use the team-year dummies to reduce our measure of ability for teams that overpay their players (a positive, significant team-year dummy) and increase our measure of ability for teams that underpay their players (a negative team-year dummy). Thus, we effectively net out the team-year dummy effects. We compute the arithmetic mean of this measure for all players on a given team in a given year to estimate the team's level of offensive talent. We then use the individual ability levels to compute a Herfindahl-Herschman Index to measure how evenly spread the talent on each team is. We also compute an HHI index to measure the spread of salaries for all 72 team-year combinations in our sample.

In the second-stage regressions, we use these ability and salary measures to estimate our team performance equation. Like DeBrock et al. (2004), we measure the performance of team *i* in year *t* (Y_{it}) using winning percentage and attendance. We use both measures because Japanese teams are so dependent on gate revenue, attendance is a particularly good proxy for the economic performance of a team.

$$Y_{it} = \beta_0 + \beta_1 AA_{it} + \beta_2 PI_{it} + \beta_3 AD_{it} + \beta_4 DPL_{it} + \varepsilon_{it} \qquad (2)$$

We expect both team performance measures to be positively affected by the average ability (*AA*) of its players. We use two measures of ability. The first measure, which we use to benchmark our results against previous research, is a normalized measure of team pay in which we take the ratio of the players for each team-year to the average level of salaries for all teams in that year. We normalize the averages to eliminate any question of stationarity of salaries over time as well as any need to account for inflation or deflation in Japan's economy. The second measure of ability is our computation from the first stage.

If previous studies of MLB are correct, our measure of pay inequality (*PI*) should have a negative impact on team success; if Kamada and Katayama's (2015) findings for NPB are correct, then the reverse is true. The impact of ability dispersion (*AD*) is an open question, and we have no prior expectation as to its impact. Finally, we include a dummy variable for whether the team plays in the Pacific League (*DPL*), which, along with the Central League, make up NPB. The impact of this dummy may show no systematic pattern, as it essentially reflects the results of interleague play. We do expect the dummy variable to have a negative coefficient in the attendance equation, as Pacific League teams are generally weaker financially and have lower attendance than Central League teams.

Our data come from three sources. Performance data and the number of games played come from the baseball-reference.com website. Data on salary, team changes, and country of origin come from the *Japan Pro Baseball Fan Handbook and Media Guide,* which is compiled annually by Wayne Graczyk. We identify free agents using listings from the website *Yakyubaka.com.*

As noted above, we use only players who have at least 50 plate appearances in a season. We set this limit because players with too few appearances could yield misleading predictions. For example, a player who gets a single in his only plate appearance of the year will have an OPS of 1.0, which matches the performance of the very best players. Setting a higher limit of 100 plate appearances did not appreciably change our results. We also delete all foreign players[3] because preliminary regressions (not shown here) indicate that the reward structure for foreign players is very different from that of Japanese players.

Means of the key variables appear in Table 1. Salaries average a little over 6800 (which corresponds to ¥68,000,000 or about $680,000) and range from 630 to 60,000. The average OPS 0.656, roughly what the average MLB OPS would be. The range of OPS also conforms to expectation, with a minimum of 0.241 and a maximum of 1.061. Home runs are a bit lower than one would expect in MLB, averaging only 4.75, while stolen bases and especially sacrifice bunts are higher, averaging 4.90 and 7.16. The range of games played in a season is as expected, going from 13 to all 144 games, with an average of 87.43. Total games played over a career up to the year in question range from 18 games to 2991 games and average 627.46. The maximum number of games is astonishing, as it is equivalent to playing every game of the season for almost 21 years. In general, the distribution of

[3] NPB teams are permitted to have up to four foreign players, of whom no more than three can be pitchers and no more than three can play other positions.

experience in NPB has a very long upper tail, with 21 non-pitchers having spent over 20 years in the league.

Our first measures of team quality, the relative size of the team payroll, ranges from 0.438 (less than half the average team pay for that year) for the 2015 DeNA BayStars to 1.853 (more than 85 percent higher than the average team pay) for the 2012 Yomiuri Giants. The Giants also had the highest computed team quality, though this came in 2011. The lowest computed team quality came for the 2015 Nippon Ham Fighters.

Results

The results of the salary equation appear in Table 2. The F-statistic shows that the regression is statistically significant and the individual coefficients are generally in accord with our expectations. Our standard performance measures – OPS and home runs – positively impact salary. In addition, stolen bases and sacrifice bunts, which no study of MLB has even bothered to include, have the expected, positive impact on pay in NPB.

Our measure of experience has a strong and lasting positive impact on salaries, even when holding performance constant, thus confirming our expectation that the *sempai-kohai* system remains strong in NPB. Total games played has a positive and declining effect up to a turning point at 1667 games played. That corresponds to a little over 11 full seasons. Because most players average far fewer than the full 144 games per season, the turning point corresponds to many more seasons for most players. In our sample, 79 player-year observations out of 1067 represent players beyond their "peak" year.

Turning to our key institutional variables, we see that the coefficients on the free agency variables show that free agency has a very different impact in NPB than in MLB.

Becoming a domestic free agent has an insignificant impact on salary, as does changing teams as a domestic free agent. Being an international free agent also has no impact on salary. Moreover, changing teams as an international free agent has a strongly negative impact. This seemingly paradoxical effect comes from our focus on pay in NPB. A player who changes teams moves from one NPB team to another, so we are missing players who move abroad as free agents. We also exclude players who move to MLB through the posting system before reaching free agency. As a result, players who change teams as free agents are essentially cast-offs, players who are not desired by the teams they had played for previously. This is consistent with the "adverse selection" model of job changing in which outside employers attribute low abilities to workers who change firms. (See, for example, Carillo-Tudela and Kaas, 2015.)

The results for the second-stage regressions appear in Table 3, with the winning percentage as the dependent variable, and Table 4, in which we use attendance. In both of these tables, the second column shows the results for our regressions that use pay to capture ability and estimating the impact of pay dispersion on team success. The third column shows our results when using our computed measure of ability and the dispersion of both pay and our estimate of ability. The differences between these two sets of regressions are striking.

When we use the normalized average salary for each team-year combination to measure team ability, we find that the impact of this variable is as expected. Better teams win more games and draw more fans. However, unlike all the studies that use pay to measure ability in MLB, the dispersion of observed salaries has no impact on either winning percentage or attendance in NPB. Teams in the Pacific League win no more or less than teams in the Central League, but, as expected, they draw fewer fans. (See Column 2.)

When we use our computed level of talent, the quality of the team has a strong, positive impact on both winning and attendance. In these equations, however, our dispersion measures have a strongly significant impact on both measures of success. Like Kamada and Katayama (2014), we find that teams with more widely-spread salaries win more games than teams that, all else equal, pay more even salaries. This supports the claims in the popular press that "Japan's problem may be too little income inequality, not too much." (Schlesinger, 2015; see also *The Economist*, 2015). We suspect the impact of pay disparity on attendance reflects the greater effort by star players, which could attract fans.

The dispersion of our measure of ability has a strong impact has a large but barely significant negative effect on performance. Its negative impact on attendance is also large and is strongly significant. Pacific League teams now have a slight but significant advantage in winning and strongly lower attendance.

Conclusion

In this paper, we answer two important questions and in the process make three important contributions to the literature. We examine the impact of two different policies, the reduction of monopsony power and wage dispersion, on economic outcomes. Previous literature on this subject had seemingly reached a consensus on their effect. We show, however, that their impact depends on institutional arrangements that vary by country and time and setting. We employ the setting of Japanese professional baseball to estimate the impact of free agency on player wages and the impact of wage inequality on team success.

We find that free agency in Japan is free agency in name only because the league has succeeded in restricting players' ability to negotiate wages. Thus the leap of salaries as players become free agents that is so apparent in all team professional sports in North America and in

Europe is effectively nonexistent in NPB. Player salaries are almost fully determined by player experience and performance measures with free-agent status having little impact. The impact of experience given player performance is larger and longer-lasting than in North American sports. This also reflects a particularly Japanese institution, the deference shown to more senior employees.

We next inquire about the impact of salary dispersion on the success of the enterprise. Sports in general, and baseball in particular, is a very appropriate setting to examine the effect of pay differentials. In a typical firm, the talent of the workforce is hard to measure, and thus the role of pay inequality is hard to ascertain, as differences in pay may or may not be justified by differences in performance. In contrast, given the many performance statistics available for baseball players, we can control for players' talent and can thus disentangle the difference between a dispersion of talent and dispersion of pay in baseball.

Our ability to hold talent constant allows us to generate a major contribution to the literature. We find that teams with more evenly distributed talent are employing a superior technology. Given the technology employed, NPB teams with greater pay inequality are more successful. The incentives provided by economic contests more than offsets any disharmony that pay differentials create. This result contradicts the findings for MLB teams precisely because pay differentials are so much smaller in NPB – and Japan as a whole – to begin with.

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Table 1: Descriptive Statistics

Variable	Mean	Minimum	Maximum
Salary	6834.78	630	60,000
Games Played in a Season	87.43	13	144
Total Games Played to Date	627.46	18	2991
OPS	0.657	.241	1.061
Home Runs	4.83	0	48
Stolen Bases	4.93	0	60
Sacrifice Bunts	7.28	0	62
Relative Team Pay	1.02	0.43	1.85
Team Ability	6291.57	2824	11159
HHI for Pay	0.07	0.015	0.15

Table 2: Salary Equation

Variable	Coefficient
OPS	0.4231*** (3.39)
Home Runs	0.0228*** (7.98)
Stolen Bases	0.0127*** (5.91)
Sacrifice Bunts	0.005*** (3.18)
Total Games Played	0.0035*** (24.08)
Total Games Played – Squared	-1.05(10)-6*** (-15.64)
New Domestic Free Agent	0.0730 (1.44)
Changed Teams as Domestic Free Agent	-0.0318 (-0.29)
International Free Agent	0.0789 (1.62)
Changed Teams as Int'l Free Agent	-0.4121*** (-3.82)
Number of Observations	1067
F-Statistic	25.48***

t-statistics in parentheses

Team-year dummies not shown

Table 3: The Determinants of Winning Percentage

Variable	Using Pay to Measure Ability	Using an Estimate of Ability
Relative Team Pay	0.1002*** (4.99)	N/A
Estimate of Ability Level	N/A	0.0171*** (4.18)
HHI of Team Pay	-0.0061 (-0.02)	0.5414** (2.11)
HHI of Team Quality	N/A	-0.7404* (1.97)
Team in Pacific League	0.0203 (1.56)	0.0262* (1.95)
Adjusted R^2	0.3081	0.2672
Number of Observations	72	72

Table 4: The Determinants of Attendance

Variable	Using Pay to Measure Ability	Using an Estimate of Ability
Relative Team Pay	15328.74*** (8.93)	N/A
Estimate of Ability Level	N/A	2599.865*** (7.07)
HHI of Team Pay	11868.3 (0.56)	94766.58*** (4.11)
HHI of Team Quality	N/A	-109787.8*** (-3.24)
Team in Pacific League	-4807.268*** (-4.33)	-3920.19*** (-3.24)
Adjusted R^2	0.6553	0.5951
Number of Observations	72	72