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INTRODUCTION

In sports, especially baseball, there is a lot of talk about contract year performance. Beginning in spring training and continuing throughout the season, sports journalists and fans converse about how players in the last year of their contract will perform. Experts in the media, often ex-baseball players themselves, speculate contract year players will have break-out seasons in order to secure a better contract in upcoming contract negotiations. This leads to the question: do baseball players increase their effort and performance during their contract year to increase the value of their next contract?

This question implies potential opportunistic behavior by players, a topic studied by labor economists examining performance and incentives in contracts. As utility-maximizing players facing profit-maximizing team owners negotiate contracts, both sides understand incentives affect performance and performance impacts pay. The labor market for sports teams offers empirically robust economic data to investigate opportunistic behavior given the publicly available player performance indicators, contract clauses and salary compensation. Researchers using different theories, variables, data sets and time periods find, unsurprisingly, a variety of results. Discerning whether opportunistic behavior occurs can help teams and players craft more efficient contracts.

Our study focuses on position players (non-pitchers) in baseball because we wish to isolate individualistic performance as opposed to performance dependent upon teammates. Pitching performance is more greatly affected by team defensive capabilities, thus excluded in our analysis. For hitters, the type of pitch a hitter faces may depend in part on the hitters adjacent to him in the line-up, but we dismiss this as a reason for changes in batting efficiency from one year to the next, since players tend to bat in similar slots in the line-up throughout their careers. The offensive statistics slugging percentage (SLG), on-base percentage (OBP) and on-base percentage plus slugging percentage (OPS) all measure a hitter's output independently from his teammates' contributions and are frequently used in contract year studies.

The salary structure in Major League Baseball (MLB) provides fertile ground for contract year, opportunistic behavior. The current collective bargaining agreement (CBA) between the 30 MLB teams and the Major League Baseball Players Association (MLBPA) dictating employment conditions began on December 26, 2006, and remains active until the end of 2011 season. The CBA set the minimum MLB salary at $400,000 compared to a minimum minor league salary for players with MLB experience at $65,000 with expenses paid and $20 per day for food on the road (MLBPA, 2010). However, the average MLB salary for the 2009 season was $2,996,106. As is the case with most jobs, pay is determined by performance in MLB, so players are motivated to perform better to increase their pay. Unlike most jobs, however, current contracts in MLB are guaranteed and teams are obligated to pay the agreed upon amount no matter how the player performs during the contract's length. Thus there is a large financial incentive to leave the minor leagues, land a MLB guaranteed contract, and not be demoted back to the minors.

Making it to the majors, however, can be just the beginning of high salaries. Once a player signs his first contract with a team, he accepts the team's salary offer for his first two years of service. He can, however, potentially increase his initial salary through arbitration as described in Section 6.F paragraph 1 of the CBA. A player with two years of service, but less than three, is eligible for salary arbitration if the following conditions are met: the player has accumulated at least 86 days of service in the immediate preceding season, and the player ranks in the top 17% in total service time in the class of players who have at least two years of service, but less than three years of MLB experience (mlbplayers.mlb.com Section 6.F paragraph 1). A player with three or more years of MLB experience, but not more than six years, is eligible for salary arbitration.

Salary arbitration revolves around high versus low salary offers. In January of a given year, an player eligible for arbitration and his team both submit a proposed salary to a three-person panel of professional arbitrators, and a final-offer hearing takes place between the 1st and the 20th of February. If the player and team do not agree on a salary prior to the arbitration panel's decision, the panel's choice becomes the new one-year guaranteed salary. In deciding whether to award the player the higher or lower salary offer, the panel considers the following criteria: the player's contribution to the team in terms of performance and leadership, the team's record and attendance, all the awards won by the player, all-star games in which the player appears, postseason performance, and the salaries of comparable players with the same service-time. The two sides cannot talk about the team's finances or previous negotiations (James Ray, 2008). For example, following a superb 47 home run season and a trip to the World Series, in 2008, Ryan Howard asked for $10 million in arbitration and the Phillies countered with a $7 million offer. Howard won arbitration and increased his salary to $10 million, a substantial increase from his 2007 salary of $900,000 (Jason Stark, 2008).

Besides arbitration, there are two other avenues for a player to seek more money and more years on a contract. First, a player can renegotiate with his team to change his current contract before expiration of the contract, i.e., seek a contract extension. In February 2009, as a World Series winner and runner-up in the National League MVP award, Ryan Howard with three years of arbitration eligibility remaining with the Phillies signed a 3-year, $54 million contract. In 2010, Howard extended his contract again to five years for $125 million. Alternatively, players may be eligible for free agency, the ability to shop their talents to any team.

Article XX.B of the CBA discusses free agency. Players with six seasons of service may enter free agency. Players who have at least three years of MLB experience and are sent down to the minor leagues also have the option to decline this demotion and enter free agency. Players declaring free agency must do so within the 15 day period beginning on October 15th or the day after the last game of the World Series, whichever is later.

If a player chooses to leave his current team via free agency, his departing team may be compensated for his departure. Players ranking in the top 20% of their position group are classified as Type A free agents, whereas Type B free agents are players ranking in the next 20% of their position pool. Article XX.B paragraph 4 says that teams that lose type A or type B free agents are entitled to compensation through the draft picks. Teams losing Type A free agent players are given a draft pick from the amateur draft from the signing team and an additional draft pick. Teams are compensated for losing Type B free agents by receiving an additional draft pick in the amateur draft.

MLB's salary arbitration, contract extensions and free agency all provide avenues for better contract conditions for players. Players' past and current performances serve as predictors for future performance, which team owners scrutinize when negotiating new contracts. With so much money at stake, are players more likely to boost their effort and performance to secure their financial future? While opportunistic behavior may occur during salary arbitration-eligible years, this paper focuses only on MLB free agents, since free agency is associated with the greatest financial gains for players as teams bid for players' services.

PREVIOUS RESEARCH FINDINGS

Previous researchers have tested for contract year performance in sports. The majority of the work relates to MLB (Joseph Harder, 1991; Lawrence Kahn, 1993; Michael Dinerstein, 2007; Joel Maxy, Rodney Fort, and Anthony Krautmann, 2002; Anthony Krautmann and Thomas Donley, 2009), although Kevin Stiroh (2007) used National Basketball Association (NBA) data, since both sports leagues have guaranteed player contracts. Given publicly available performance indicators, salaries and contract length of players, an empirical analysis of incentive theory is feasible using MLB or NBA player data. If performance varies from year to year, one explanation is that effort has changed from one year to the next due to performance-enhancing incentives in one year compared to another. Alternatively, players may exhibit random fluctuations around an unknown average performance level. Jim Albert and Jay Bennett (2001) found a .088-point range in OBP when simulating 100 seasons for a player with an average OBP of .380. While random fluctuation is feasible, it is unlikely that above average performances occur randomly during the contract years for a large group of players.

Maxcy, Fort and Krautmann (2002) develop several performance measures using the deviation between the current year and a three-year moving average of particular statistics. For hitters, they used the difference in current year SLG and the 3-year moving average of the hitter's SLG as a dependent variable to measure a hitter's deviation in offensive performance, while controlling for skill levels across players. Performing above expectation or average is noted by a positive deviation. Controlling for age and field position, there was no statistically significant increase in hitters' performance deviations during the last year of their contracts. For pitchers, the deviation in performance, measured by strikeouts to walks, did not indicate contract year opportunistic behaviors. Opportunistic contract year behavior using deviations in playing time and durability, however, did suggest ex ante opportunistic behavior. For both hitters and pitchers, there was statistically significant evidence of less time spent on the disabled list (4.9 and 8.65 fewer days for hitters and pitchers, respectively) and more playing time (24.28 more at bats for hitters and 23.53 more innings pitched for pitchers) during the contract year. Thus, the choice of dependent variable matters in testing for opportunistic behavior.

Two less well-known but comprehensive measures are Wins Above Replacement Player (WARP) and R27, used by Dayn Perry (2006) and Phil Birnbaum (2002), respectively. Perry (2006) found evidence of boosted contract year performance for 212 top free agents from 1976-2000. WARP captures offensive and defensive capabilities and the number of games played. As Jake Fisher (2009) points out, since managers dictate playing time, players have less control over their WARP than their OPS, thus OPS is preferred. Birnbaum (2002), using R27, did not find evidence of higher contract year performance. Fisher (2009) contends Birnbaum's results may be due to failing to eliminate players with too few playing performances, leading to unstable R27 values.

The choice of the econometric technique affects results. Maxcy, Fort and Krautmann (2002) used ordinary least squares (OLS) to test for opportunistic behavior. Their sample sizes of 1,160 and 812 for hitters and pitchers, respectively, covered 213 hitters and 140 pitchers with more than three years of experience. Multiple observations per player due to many years of experience yielded the large sample sizes. We note that OLS does not provide the best econometric method available for panel data since it fails to address omitted variable bias and differences across players and over time. Kahn (1993) addressed these concerns by using a fixed effect regression model with his 1987-1990 longitudinal data of MLB hitters and pitchers when estimating salary arbitration and free agency effects on salaries and contract lengths. Kahn found free agency positively affected salary and contract length, two desired outcomes for players.

Over time, the MLB labor market and CBA change, implying newer data sets are needed to re-examine opportunistic behavior. Dinerstein (2007) used 1,330 hitter-years from 2001-04. More importantly, he not only examined contract year performance by hitters, but also whether teams create incentives that lead to contract year behavior. Using seemingly unrelated regression (SUR) and controlling for three years of lagged SLG, age, year and average bases, he found contract year increased SLG by .0095 (2 tailed, p-value =.115) and an equivalent of $138,813 on a free agent's contract. Interestingly, from the teams' perspectives, when making a salary offer to a free agent, consistency in a player's SLG and other player attributes mattered more than the most recent SLG. This finding suggests teams are not creating the contract year incentive and that players acting rationally would aim for hitting consistency, ceteris paribus. As players and their agents digest this undervalued contract year effect, players may aim for steady hitting performances, which will reduce uncertainties in player evaluations.

Greater contract year performance may also be due to expectancy theory, which entails two expectations: a player expects greater performance will lead to a desired outcome (higher salary) and that increased effort is expected to the enhance performance. This implies the free-agent hitter understands which offensive measure is associated with higher income. Harder (1991) ran OLS models on data from 106 hitters (17 free agents) from 1977-1980 and found home runs were more generously rewarded than batting average, yet no evidence of increased home run production in the contract year. He attributed the statistically significant decline in batting average during the contract year to equity theory, that hitters felt underappreciated with high batting averages and therefore reduced their effort therein. David Ahlstrom, Stephen Si and James Kennelly (1999) used data on 172 free-agent hitters from 1976-1992 who changed teams and examined five offensive measures of performance: batting average, slugging percentage, RBI's, home runs and at-bats. They found no statistically significant improvement any performance measure during the contract year.

Knowing the link between performance and pay is necessary before any opportunistic behavior can occur. Stiroh (2007) used a composite performance rating that captures points, rebounds, assists and blocks for 263 NBA players to test for contract year performance and post-contract year declines in performance (shirking), since both suggest opportunistic behavior. He first showed that better historical and contract year performances increased salary and contract length. Specifically, a one point increase in the historical and contract year composite performance ratings increased salaries by 13% and 8%, respectively. Second, given the 8% contract year incentive, he used 2,077 player-years for 349 players with multi-year contracts from 1988-2000 to test the contract year effect on the composite rating and points scored using fixed effects and first difference modeling. He found evidence of improved performance during the contract year, followed by a decline in performance after the contract is signed. One would expect higher post-contract performance if players are steadily improving based on their ability and effort, which is what teams' owners hope is the case.

ECONOMIC THEORY

The economic theory behind the contract year phenomenon is well stated by Stiroh (2007). A moral hazard exists given asymmetric information between the agent (player) and the principal (team owner) due to the uncertainty of a player's future performance. Performance, demanded by owners, depends on a player's effort and ability. Ability differs across players and is not easily measured or distinguishable from effort. A player's ability is assumed to be relatively constant over time, but effort can change from season to season leading to different performance levels. As a professional athlete, baseball players are constantly judged on their performance by their statistics, so it is unlikely effort changes much during a game. However, off-season effort and effort between games during the season can vary because these efforts are largely unobservable and are not subject to scrutiny of the public unless the media uncovers aberrant behavior. Owners can see differences in performances across players, but it is not clear how much is due to innate ability or effort intensity.

Assuming ability is predetermined, players choose to exert a certain amount of effort to maximize their utility by equating the marginal benefit of higher income and team success from effort to the marginal cost of less leisure commensurate with effort. Meanwhile, team owners craft contracts to maximize profits by paying players according to their performance, which yield wins for the team.

With guaranteed contracts, the disconnect between contemporaneous performance and pay leads to a moral hazard in that poor performance after signing a contract does not lead to a pay cut. This makes it imperative that owners weigh players' past performances and players' other traits wisely when predicting future productivity, and that they try to segregate effort from ability. Players, on the other hand, seeking a series of contracts prior to retiring, will choose effort to maximize their present discounted utility of their current and future contracts. Players alter their effort according to how they perceive owners will reward them. If players believe owners weigh a player's most recent performance the most, this incents the player to bolster his contract year performance to ensure a better future contract. Hence, players increase their effort and performance during their contract year. If, however, general managers value consistency by weighing all past performances equally when crafting a new contract and a player perceives this, then boosting performance in the contract year is unlikely. Thus the player's effort and performance depend on his perception of the owner's algorithm for using past performance to predict future performance.

When a player intends to retire at the end of the contract cycle, the incentive to perform to garner another contract is gone. Intended retirement is expected to reduce effort and performance during all years of the final contract, including the last year. Effort and performance during the "contract year" for a retiring player will not be expected to be as high as a player desiring another contract.

Based on the above, two testable hypotheses follow. First, if most recent performance yields a better contract, meaning the contract year incentive exists, then we expect to witness such opportunistic behavior. Second, the contract year performance for players intending to retire will be less than the others.

POPULATION REGRESSION FUNCTION

The dependent variable for the study is OPS, a commonly used offensive statistic for hitters. Jonah Keri (2006) contends it ably measures a player's offensive abilities more than hitting components such as RBIs, at bats (AB), batting average (BA) and home runs (HR). Also, OPS is not dependent upon playing time, which is determined by the manager. Albert and Bennett (2001) found OPS is a better predictor of scoring runs, the chief goal of a team's offense, than its two components OBP and SLG separately. OBP measures a player's ability to get on base, which is necessary to ultimately score a run. SLG measures power hitting because each additional base earned is weighted more, meaning home runs have a weight of four compared to singles with weights of one, in constructing SLG. Thus, OPS is a more diverse offensive measure because it accounts for both power and reaching base frequently. A player with a high OPS reaches base often and hits extra-base hits, which contribute to his team's runs scored. Barry

Bonds is the single-season record holder for OPS at 1.4217 in 2004. His SLG was .812 and his OBP was .609. During that season he was typically walked or hit a home run during a plate appearance, explaining why he had such a high OPS.

The population regression model for the OPS for player i in season t is

$$(1)\ OPS_{i,t} = \beta_0 + \overset{(+)}{\beta_1}*AGE_{i,t} + \overset{(-)}{\beta_2}*AGE2_{i,t} + \overset{(?)}{\beta_3}*GAMES_{i,t} + \overset{(+)}{B_4}*PLAYOFF_{i,t}$$

$$+ \overset{(?)}{\beta_5}*POSITION_{i,t} + \overset{(+)}{\beta_6}*RETIRE_{i,t} + \overset{(+)}{\beta_7}*CONTRACTYR_{i,t} + a_i + v_t + \mu_{i,t},$$

where AGE is the player's age; AGE2 is the square of a player's age; GAMES is the number of games the player played; PLAYOFF is a dummy variable, equal to 1 when the player's team made the playoffs; POSITION uses dummy variables for the hitters' field positions; RETIRE is a dummy variable for whether a player retired the next season (=1) or did not (=0); CONTRACTYR is a dummy variable for whether season t was a contract year (=1) or not (=0). The signs above each coefficient denote the partial derivative's impact on OPS.

The stochastic error is presumed to have three terms: a_i is the unobserved player effect representing all non-changing factors affecting a player's OPS that cannot be measured or observed, such as innate ability, work ethic and family background; v_t represents immeasurable time-variant player characteristics, such as risk tolerance and personal/familial events; and μ is the stochastic error term.

The model uses a quadratic model to represent the age of the player during free agency. AGE2 is expected to have a negative coefficient, implying OPS increases at a decreasing rate as a player ages until it reaching a threshold, then falling due to the depreciation of the player's body from wear and tear.

Two variables are used as control variables to mitigate potential bias. The first, GAMES accounts for playing time and its predicted sign is unclear. An oft-injured good player plays in fewer games but can still have a high OPS. However, playing more games may help a player gain confidence behind the plate and raise his OPS. The second, POSITION, uses catchers and outfielders as the control group relative to other fielding positions. The expected sign on PLAYOFF is positive. If a player's team makes the playoffs, we expect an increase in his production because playing for a championship gives a player incentive to perform better. Also, playoff teams pay their players a share of the playoff revenue, providing a financial incentive to perform better.

We hypothesize MLB players engage in opportunistic behavior and increase their performance during the contract year, thus $\beta_7 > 0$. This presumes team owners value the most recent performance as a solid indicator of future performance, which is why this opportunistic behavior occurs. The expected sign on RETIRE is negative because players who are expected to retire are most likely going to have a decline in their OPS because they do not have an incentive of signing another contract. Although ideally we want the ex ante retirement intention, we use the ex post retirement as a proxy at this time.

DATA

Data were collected on 227 MLB free agent hitters from 2004-2008 who had one or more contract years between those dates. The 2004 and 2005 data are from "Baseball Free Agents" from stevetheump.com. The 2006-2008 data are from "MLB Baseball Free Agent Tracker" from ESPN.com. The players' names, years they were a free agent, and whether they retired were taken from these sites. The Baseball Reference website provided the performance measures, players' ages, and the number of games played each season.

Two data sets were created: one balanced and one unbalanced. The balanced set uses data for a player for two-year periods with the second year always being the contract year. Each player-contract cycle is given a code number. To further understand the data sets, examine the balanced data set in Table I.

Table I: Balanced Data Set

Player	Code	Yr	Year	Team	Playoff	Age	ContYr	OPS	Games	Retire
Abreu, Bobby	1	0	2007	Yankees	1	33	0	0.814	158	0
Abreu, Bobby	1	1	2008	Yankees	0	34	1	0.843	156	0
Alomar, Sandy	308	0	2003	White Sox	0	37	0	0.689	75	0
Alomar, Sandy	308	1	2004	White Sox	0	38	1	0.606	50	0
Alomar, Sandy	309	0	2004	White Sox	0	38	1	0.606	50	0
Alomar, Sandy	309	1	2005	Rangers	0	39	1	0.364	46	0
Alomar, Sandy	310	0	2006	White Sox	0	40	0	0.672	46	0
Alomar, Sandy	310	1	2007	Mets	0	41	1	0.318	8	1

The first player is Bobby Abreu, given an identification code of 1. Over 2004-2008, he was only a free agent in a contract year once, in 2008, at 34 years of age. In 2008, his contract year and the year prior, he was a member of the Yankees. The Yankees made the playoffs in 2007 but not in 2008. Abreu had an OPS of .814 and played in 158 games in 2007 and an OPS of .843 in 156 games in 2008. He did not retire after the expiration of his contract.

The second player is Sandy Alomar, Jr with identification codes of 308, 309 and 310, depending on the particular two-year contract status. Alomar was in a contract year with the White Sox in 2004 at age 38 when he had an OPS of .606 in 50 games played. He signed a one year contract for the 2005 season with the Rangers, making 2005 a contract year as well. The 2004-05 contract status requires a different identification code (309) than the 2003-04 code (308), and the 2004 data is duplicated. Alomar returned to the White Sox in 2006 with a two year contract, but was traded to the Mets in 2007 at age 41, shown by code 310. He retired after the 2007 season. In his final season, another contract year, he only played in 8 games with a .318 OPS.

Table II presents the format of the unbalanced data set for the same two players. It is unbalanced because players do not have identical numbers of contract years. The interpretation of the data in the Table II is the same as it was for Table I, but there are potentially more entries per player and these players have the same identification code throughout the unbalanced data set. The variable YR is used to create dummy variables for the years of data for a given player. For example, when YR is 4, this is the fourth year observation for a player.

Table II: Unbalanced Data Set

Player	Code	Yr	Year	Team	playoff	Age	contractyr	Ops	Games	retire
Abreu, Bobby	1	1	2007	Yankees	1	33	0	0.814	158	0
Abreu, Bobby	1	2	2008	Yankees	0	34	1	0.843	156	0
Alomar, Sandy	2	1	2003	WhiteSox	0	37	0	0.689	75	0
Alomar, Sandy	2	2	2004	WhiteSox	0	38	1	0.606	50	0
Alomar, Sandy	2	3	2005	Rangers	0	39	1	0.634	46	0
Alomar ,Sandy	2	4	2006	WhiteSox	0	40	0	0.672	46	0
Alomar, Sandy	2	5	2007	Mets	0	41	1	0.318	8	1

In Table II, we see Bobby Abreu was only a free agent once over the time period, thus his entry exactly replicates the data in the other Table II. Sandy Alomar, Jr., however, has five years of data associated with his player code of 2. Alomar's data in the Table I showed three separate contract year sets, each with a different player code despite being the same player. In Table II, the duplicated 2004 year is eliminated, leading to five years of data for Alomar.

The result is a larger sample size in Table I, but by treating each contract year set separately it precludes allowing for changes across time for individual players because different identification codes prevail for one player. The unbalanced data set permits the examination of a player's behavior over time, knowing it's the same player, but leads to a smaller sample size.

The two data sets have relatively similar descriptive statistics for OPS, age, and games played, as shown in Tables III and IV. The larger sample size of 730 for the balanced data set shows 11.23% (82 players) retired. The 82 retirees represent 12.95% of the smaller sample size from the unbalanced data set. Since some of the players may have had one year contracts, the percentage of contract years exceeds 50% for the balanced data set, as shown in Table I. Sixty-three percent of the observations in the balanced set are contract years compared to 57.98% in the unbalanced set.

Table III: Descriptive Statistics from Balanced Data Set

VARIABLE	N	MEAN	STD. DEV.
OPS	730	0.7331	0.1331
ContractYr	730	0.6301	0.4831
Playoff	730	0.3178	0.4659
Age	730	33.14	3.347
Games	730	104	39.41
Retire	730	0.1123	0.315

Table IV: Descriptive Statistics from Unbalanced Data Set

VARIABLE	N	MEAN	STD. DEV.
OPS	633	0.7314	0.1314
ContractYr	633	0.5798	0.494
Playoff	633	0.3254	0.4689
Age	633	33.1	3.417
Games	633	104.4	39.8
Retire	633	0.1295	0.336

Sorting the data by contract year, interesting results appear. In the balanced data set, the average OPS for contract year is .7267, which is less than the average OPS for non-contract year at .7440. For the unbalanced data set, the average OPS for the contract year is .7219 compared to .7445 for the non-contract year. If one were to ignore multiple regression analysis and rely on differences in means, it would suggest players underperform in their contract year, contrary to expectations. We suspect this is being influenced by retiring players pulling down the average for contract year.

ECONOMETRIC TECHNIQUES

Given panel data, estimation of the model via OLS and pooled OLS are inappropriate due to omitted variable bias, which occurs because immeasurable player characteristics in the error term are potentially correlated with some regressors. OLS fails to utilize the fact that there are several observations on each player. Pooled OLS addresses yearly changes, but still ignores the cross-sectional player effects. The econometric techniques used in this study are fixed effects (FE) and random effects (RE). Since the unobserved player effects are accounted for by including player and year dummies in FE and RE models, the omitted variable bias is addressed, but at the expense of reduced degrees of freedom relative to OLS or pooled OLS estimation.

Both FE and RE models are estimated using one-way and two-way error term cases. The one-way method assumes a_i in the error term prevails and v_t does not; the differences in players' abilities, backgrounds, etc., matter, while the unobserved time-variant characteristics do not. A two-way method assumes both the a_i and v_t affect OPS. A FE model presumes the immeasurable effects are correlated with the other regressors. In a RE model the explanatory variables are assumed to be uncorrelated with the unobserved player effects. A Hausman test helps determine whether a FE model or a RE model better estimates the model.

It is expected that the Hausman test will show that FE is the most appropriate technique because there is an expected correlation between some independent variables and the unobserved player effects. A player's ability is expected to be positively correlated with the number of games played. Also, if a player is retiring, we expect it to be attributed to a family decision or health factor, accounted for in the unobserved player effect, thus suggesting suspected correlation. Similarly, we expect correlation between being in the contract year and unobserved risk tolerance in that more risk-averse players will seek longer contracts, hence have fewer contract years between 2004-2008 and receive less pay, as shown by Krautmann and Oppenheimer (2002). Additionally, if a player has high ability, he will contribute more to his team success, increasing the team's chances of making the playoffs, implying another positive correlation.

RESULTS: UNBALANCED DATA SET

Unsurprisingly, OLS and pooled OLS estimation of (1) led to positive coefficients for the contract year, but they were statistically insignificant at p=.64 and p=.18, respectively. Estimating a two-way random effect model using the unbalanced data set led to the Hausman test rejecting the random effects model with $p<.0001$. Per expectations, we estimated a two-way fixed effects model, leading to the following:

$$\widehat{OPS} = .-1.2138 + .1054*AGE - .0014*AGE2 + .0007*GAMES - .0967*RETIRE$$
$$(.0369) \quad (.0430) \quad (<.0001) \quad (<.0001)$$

$$+ .0210*PLAYOFF - .2258*FIRSTBASE - .0181*SECONDBASE$$
$$(.0532) \quad (.0041) \quad (.8246)$$

$$- .2434*THIRDBASE - .1041*SS + .0401*CONTRACTYR \text{ with } R^2=.67 \; N=633.$$
$$(.0140) \quad (.2478) \quad (.0511)$$

The p-values listed below the coefficients are for two-tailed hypothesis tests. The various field positions are compared to the control group of catchers and outfielders. All coefficients, except SECONDBASE and SS, are statistically significant and have the expected signs. Per expectations, PLAYOFF has a statistically significant positive effect on OPS. A player on a playoff team is expected to have .021 higher OPS than a player not on a playoff team, ceteris paribus. The quadratic age effect indicates OPS increases at a decreasing rate as players age, reaching a peak at 37.6 years. Each additional game played is expected to increase OPS by .0007.

Our two hypotheses regarding contract year performance are confirmed. The OPS of a free agent player in his contract year is expected to be .0401 greater than his OPS in a non-contract year. Additionally, a player who retired after the contract year season was expected to have .0967 decline in his OPS, ceteris paribus. Given the average OPS of .731, the contract year and ex post retirement impacts represent 5.5% and 13.2% of the mean, respectively.

Additional estimated FE and RE models, whose full sets of results are not shown, reinforced our choice of the model specification and error term form. Failure to include retirement in the model led to an insignificant (p=.52) contract year coefficient of .01, which is not surprising since its exclusion leads to a negative bias. Excluding the positions, while keeping retirement in the model, still led to a statistically significant coefficient of .04 for the contract year but the R^2 fell slightly to .657. We estimated a one-way fixed effects model incorporating only the cross sectional effects for the above model specifications. All one-way FE models yielded insignificant contract year coefficients. Despite the overall good fit of $R^2 = .65$, the contract year coefficient of .014 was insignificant at p=.179 for the model that included both retirement and positions. Thus time varying unobservable effects should be included via a two-way FE model. This claim was also reinforced by a non-zero variance component for time series when the two-way RE model was estimated.

RESULTS: BALANCED DATA SET

In the balanced data set, very few players change positions during their two-year contract period. Therefore positions are not included in the model. Again, the Hausman test rejected the random effects model with p=.009. The two-way fixed effects model estimation is

$$\widehat{OPS} = -3.6706 + \underset{(.2394)}{.1504*AGE} - \underset{(.4245)}{.0010*AGE2} + \underset{(.0343)}{.0004*GAMES} - \underset{(<.0001)}{.0827*RETIRE}$$

$$+ \underset{(.0254)}{.0271*PLAYOFF} + \underset{(.0864)}{.0308*CONTRACTYR} \text{ with } R^2 = .6917 \text{ and } N=730$$

Only the age variables are insignificant. The remaining variables are statistically significant and their magnitudes are similar to the unbalanced data set results. Players who retired showed a .0827 decrease in their expected OPS, ceteris paribus, or an 11.3% decline from the .7331 average OPS. The expected increase in contract year OPS is .0308, a 4.2% increase from the mean.

The CONTRACTYR coefficient in the unbalanced data model is larger and more statistically significant than in the balanced data model. One might have expected the opposite result for the level of significance since the sample size is much smaller in the unbalanced set. However, perhaps the unbalanced data set is able to provide a more robust result because a more complete profile of the player is used. With the balanced data set a player with numerous contract years appears more often, thus raising the sample size, but the multiple contract years are not recognized as emanating from the same player.

CONCLUSIONS

This study focuses on 227 MLB free agent positional players from 2004-2008 to determine whether MLB players engage in opportunistic behavior in their contract year. Our results lead us to believe players increase their effort to boost their performance in their contract year. This increase in effort leads to an increase in performance, which draws interest from teams around the league and increases the probability that a given player will sign another contract. Ceteris paribus, this performance increase in OPS is between 4.2 - 5.5%. Players who retired had no financial incentive to increase their effort though they may have had a desire to go out on top. Our results suggest the former as the decrease in OPS among ex post retired players is between 11.2 - 13.2%. The average non-contract year OPS was higher than the contract year OPS due in large part to retired players.

The results from both data sets are similar, which makes for more confidence in our findings. Past studies showed mixed findings on the presence of opportunistic behavior in MLB; however, these studies may have used biased econometric techniques not well suited for the panel data sets or neglected the retirement issue.

There are several caveats that should be addressed in future research. First, ex ante retirement should be used rather than ex post. Currently, we cannot distinguish between players who wanted to retire versus those who were forced to retire. A player intending to retire may show a decline in OPS but a player whose OPS declined may have been forced to retire. Using a self selection variable in FE or RE modeling is needed. Second, the data set should span one CBA since the incentive structure is fairly constant within each CBA. We desire to expand the data set to cover 2006-2011. Third, no historical performance measures are used in the model. Previous studies have used lagged performance measures to show the difference in contract year to non-contract year performance. Lastly, if boosting contract year performance actually increases future salaries or contract lengths and players perceive this, then such opportunistic behavior is feasible. We have assumed this, based on past research, but primary evidence using this data set should be examined.

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