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How can Small-Market Teams Survive in Today's Major League Baseball?

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I. Introduction

Major League Baseball (MLB) is the most prominent organization of professional baseball, the oldest of the four major sport leagues in the United States and Canada. Baseball was founded during the mid-1800's, most likely during or shortly before the American Civil War. Teams began organizing in the 1870's and played professionally in semi-organized leagues until the creation of the National and American Leagues, formed in 1876 and 1901, respectively. Both leagues served and operated as separate entities until they were merged into a single organization, Major League Baseball, in 2000. Major League Baseball, as of 2016, is composed of thirty franchises located in major cities across the United States and Canada, with fifteen in both the National League and American League. These thirty teams each play 162-game schedules, starting in the spring and ending in early October, followed by several weeks of what is known as the "postseason", ultimately completed by the World Series, a best-of-seven games championship series between the best team in each league. "America's Pastime", as it is known, is the most popular sport in the United States in terms of annual attendance. It is beloved by many, from the youngest of children, to the oldest of fans; winning the World Series is paramount for these fans. To the owners of these thirty franchises, winning the World Series is the objective for each season, however, there is one goal that is sought after slightly more: profits.

Owners of these franchises are more than just fans of baseball, they are investors in it. In a game that has been the pinnacle of American life for over a century, the sport is now beginning to see players make annual amounts that only Jay Gatsby knew of when the game's popularity first took off in the Roarin' Twenties. The easiest way for an MLB franchise to make revenues is to draw crowds; teams located in large markets such as New York City, Los Angeles, Boston and

Chicago have no trouble with ballpark attendance, regardless of team win-loss records and number of championships. Franchises located in cities outside of these large markets, such as Oakland, Tampa Bay, Cleveland, Kansas City, and Minneapolis all require consistent winning to maintain respectable attendance numbers.

Winning consistently in Major League Baseball is much harder, especially for smaller market teams, than it is in other professional sport leagues. This is because Major League Baseball is the only of the four major sports to lack a salary cap and salary floor. A salary cap is a competitive balance restriction that forces franchises to spend below a fixed dollar amount every year on their roster. Most leagues use what is known as a "hard-cap", which restricts teams from spending any amount over the agreed upon limit. Major League Baseball, however, implements what is known as a "luxury tax", or competitive balance tax. Similar to a "soft-cap", there is an agreed upon "cap" each year that teams are allowed to spend up to for their players' salaries. If a club spends above this threshold, they are faced with a tax on the amount in which they exceed. This tax rate increases if a team violates the cap regularly; first time offenders in a five-year stretch pay 22.5% of the excess, second time offenders pay 30%, and third time offenders pay a massive 50%. The luxury tax is an incentive to most teams in Major League baseball to not spend over the cap, however, that does not stop some teams. Lucrative franchises such as the New York Yankees, Boston Red Sox, and Los Angeles Dodgers have violated the soft-cap multiple times from 2003-2014, twelve times, six times, and two times, respectively. A salary floor is a minimum amount that must be spent on the team as a whole; the only requirement in Major League Baseball is that teams pay individual players at least the league minimum.

The lack of a salary cap is important in baseball, especially as salaries increase exponentially. After each season concludes, players with expired contracts become free agents. Free agents are, as the name suggests, free and independent from a team. This allows these players to sign with whichever team offers them a contract prior to the next season. Players, naturally, almost always sign with the highest bidder. This allows teams like the Yankees, Red Sox, and Dodgers to remain competitive almost each and every year, as they can spend the top dollar on the best available player(s) and have little to no fear of being outbid. There is one piece in particular which helps somewhat balance free agency known as the qualifying offer.

A qualifying offer is a one-year contract set every year to an amount equal to the average of the top 125 annual salaries in baseball. These can be offered to players with newly expired contracts only by the team who the player had just played for prior. The exception to this is if a player is traded midseason; a player traded midseason is not eligible to receive a qualifying offer the following offseason. If accepted, the player remains with the club for another year and gets paid the set amount. If declined, the player becomes a free agent and can sign with any club who offers a contract. However, if the player signs with any team besides the one they had played for the prior year, the signing team forfeits its first round pick in the upcoming draft and the team losing said player receives a compensation pick sandwiched between the first and second round. This pick is significant as the first and second round are where the majority of the best young, amateur talent is drafted, thus placing a high value on these picks. This is important because teams typically do not offer qualifying offers except to the players they deem worth keeping at the set amount. If the player accepts, the team keeps the player. If the player declines, the team can still either negotiate a contract with the free agent or be compensated in the upcoming draft.

This process helps smaller market teams who have trouble keeping their top players due to salary limitations.

Before a player can play in a game, he must be drafted in the First-Year Player Draft, held every June. There is an exception to this, however, as some players can be signed immediately without being drafted if they have played professionally internationally. Most typically, these players come from Asian and Latin American countries, most notably Japan, Cuba, and the Dominican Republic. In the draft, the thirty clubs of Major League Baseball select amateur players in reverse order of won-loss records from the previous regular season (the team with the worst record from the prior season selects first, followed by the team with the second worst record, and so on). After thirty selections, the "round" ends. The next round begins with teams selecting in the same order as the prior round. The First-Year Player Draft has up to forty rounds, with teams selecting in the same order round after round barring compensation picks or competitive balance picks. Competitive balance picks are picks granted to the ten smallest market teams or ten smallest revenue pools; these picks are placed after either the first or second rounds. These picks are the only picks in the draft that may be traded.

The First-Year Player Draft is the primary way amateur players (high school, college, and non-professional baseball clubs) are assigned to its teams. To be eligible for the draft, the players must be a resident or have attended an educational institution in the United States, Canada, or a United States territory such as Puerto Rico. Other players, as mentioned above, are not subject to the draft. Players also must not have signed a major league or minor league contract to be eligible. High school players are only allowed to be drafted after graduation and before attending college, while college players are only eligible three years after initial enrollment; junior and community college players are eligible at any time. A player who is eligible to be selected in the

draft but is passed over by every club ultimately becomes a free agent, allowing them to sign with any club until said player enters or returns to college.

Upon the completion of the draft, teams retain the rights of their selected players until either the player enters/returns to college or August 16. A player who is drafted but does not sign may be drafted again whenever they are eligible. When signed, players agree to a rookie contract; the monetary value of these contracts are typically close to league minimum salaries. Many players, typically those drafted in the first ten rounds, receive "signing bonuses". These bonuses are essentially incentives for the player to sign with the team. Typically, the earlier a player is selected, the higher their signing bonus. However, the total amount teams can spend on signing bonuses per draft is on a budget. Each draft selection has its own "bonus slot", with the value of these individual slots priced as a recommendation of what that pick deserves. Teams can spend more or less on these individual picks, however the total amount must stay in budget. This forces teams to be flexible yet creative with the amounts they give out as signing bonuses to certain players.

Once the player is signed, the team has five years to call the player up to the Major Leagues from the Minor Leagues; if a player is not on a Major League roster within five years from being drafted, the player becomes a free agent. Once the player is called up, the "rookie contract" officially begins, starting a figurative clock until the player is eligible for free agency. On this rookie contract, the player essentially belongs to the club that drafted him for six years. The first half of the rookie contract is known as "pre-arbitration" years. In the pre-arbitration years of the player's contract, the player receives a near league-minimum salary.

Once a player plays through his pre-arbitration seasons, he then becomes eligible for salary arbitration. If a player chooses to go to salary arbitration, an impartial third party

ultimately decides what they will earn for the next season. This process is somewhat complicated, but essentially the team submits an amount they want to pay the player while the player decides what they deem they are worth. The arbitrator then decides which of the two salaries the player is worth and ultimately will be paid.

Going to arbitration is simply a right a player has; the player is in no way forced to go through this process. Going to arbitration is usually a last resort when the player and team struggle to negotiate a deal. This process continues every season until the player hits free agency, unless the player and team come to an agreement before going to arbitration is needed. Teams can often "settle out of court" as well and sign players to a three-year contract to avoid arbitration altogether for the last remaining years before free agency. A player is "non-tendered" if cut from the team while on their rookie contract. When a team does this, they simply owe the player the money previously agreed upon for the rookie contract. If another team signs the player after they are cut, they also inherit the player's arbitration status.

As mentioned previously, when a player's contract expires at the conclusion of a season, he becomes a free agent. As a free agent, the player is eligible to sign a contract with whichever team makes him an offer; these contracts have no maximum limits to their length or annual salary. Typically, players sign with whichever team offers the most money, however, some players are more attracted to longer contracts. Some players may also give what is called a "hometown discount", meaning they sign a contract for less money because they like the organization, the city, etc.; these scenarios are somewhat rare, however. Due to the fact that many free agents simply seek the most money, many small market teams have trouble signing significant players and even struggle to retain their own free agents. This difficulty is a harsh reality to these teams and is evident through their activity at what is called the trade deadline.

The trade deadline, July 31 each season barring exceptions, is the final day in which teams can trade their players to other teams, most likely for other players or sometimes even salary relief. The return these teams often receive are prospects, typically players who have yet to reach the Major Leagues but are projected to someday reach that level. During July, many teams determine if they will be in playoff contention that season, and if not, often trade players on expiring contracts to teams in contention in hopes to receive prospects who can help in their future. Small market teams often practice this, as they are well aware they cannot afford their players once they hit free agency. By trading their players for prospects, they gain affordable players who can someday help them hopefully compete.

This process is often a cycle for teams: the team drafts a player, develops them in the Minor Leagues and then keeps them while their contract is cheap for several years once they reach MLB, and ultimately trade them months before their contract expires and acquire younger, cheaper players to restart the same cycle. Due to this, drafting players is a crucial aspect to many team's successes, especially those considered "small market". Stellar drafting can help these teams develop talent into covetable assets to sell off to other desperate teams in return for valuable players to restart the process.

II. Literature Review

Research has been done over the past two decades to help tackle the issue of large-market teams essentially hoarding the majority of talent in Major League Baseball. From 1995 to 2001, teams with above-average payrolls won 98% of all postseason games (Krautmann, 2009). Although there hasn't been a statistical outlier like that since, it is no coincidence that teams with above-average payrolls immediately have an advantage before even stepping on the field. In

order to control the problem, Major League Baseball has attempted to put numerous forms of competitive balance into place. Unlike the NFL, NBA, and NHL, MLB does not have a hard salary cap. Instead, Major League Baseball employs a luxury tax, essentially a slap on the wrist for large-market teams exceeding the cap.

In 2002, Schmidt and Berri investigated the effect that competitive balance had had on Major League Baseball up to that point. In the late 1990's, the Blue Ribbon Panel of Major League Baseball was asked to investigate this very question and concluded that competitive balance had deteriorated in the preceding years, meaning small-market teams were well aware going into the season that they had very little chance of truly competing. However, several economists were asked around the same time and believed the opposite was true: competitive balance was serving its purpose, allowing any and every team the equal chance to compete. To test these claims, Schmidt and Berri began by examining what defines a market size. The two believe there are several factors to help define market sizes: market population, income per capita of the market, and team payrolls. Team payroll was the factor they decided to narrow the most attention to. This is because teams that are able to afford a larger payroll are those that accumulate larger revenues and/or incomes.

After reaching this conclusion, Schmidt and Berri began testing to see if there is a relationship between team wins and any of the factors. Population and income per capita were found to have no link, however, team revenues were linked to team wins. Despite this discovery, the relationship was found to not be truly consistent, meaning there could be other factors to examine in the future. Managerial ability is one factor to be considered, though this is a factor that is difficult to quantify (Schmidt and Berri, 2002). Following on this, Brown and Jepsen decided to examine what individual player statistics teams pay for and if certain teams pay more

for these players. Through their models, they discovered that players' individual characteristics are significant predictors of pay. As expected, better players earn more money. Not surprisingly, teams with larger payrolls more often than not are the ones paying these players. However, Brown and Jepsen suggest that teams do not pay differently for these individual characteristics and statistics. Furthermore, they discover that arbitration eligible players receive greater salary increases when playing for wealthier teams. This is because arbitrators are not naïve and are well aware that these teams with larger payrolls can afford these players' salary increases. In turn, arbitrators understand small-payroll teams may struggle to pay larger salaries, resulting in less of an increase for players employed by these teams. It is also uncovered that high revenue teams do not pay more per statistical unit than small revenue teams, however, they simply pay more of these players. This finding shows that small-market teams often have an equal chance of signing certain individual talent, though large-market teams ultimately end up with more of these players (Brown and Jepsen, 2009).

In 2010, the effects of the luxury tax on competitive balance were tested by Dietl, Lang, and Werner. The luxury tax was intended to slow the growth of players' salaries and ultimately prevent large-market teams from dominating. They found that higher luxury taxes induced small-market clubs to increase their salaries (Dietl et al., 2010). Three years earlier, Solow and Krautmann found similar results, suggesting competitive balance slowed the growth of salaries. Their main focus was on revenue sharing, a competitive balance concept that essentially takes money from the richest teams and shares it with the poorest teams, attempting to equalize spending possibilities for all teams. Solow and Krautmann found that revenue sharing left teams mostly unaffected, however this redistribution did reduce salaries (Solow and Krautmann, 2007).

Lee and Fort examined the structure of competitive balance across the history of Major League Baseball. They look at different events that may have helped balance the league or shape the current concept of competitive balance. They found that certain events did in fact help competitive balance, such as access to international talent, television game diffusion, and the equalization of population centers. African Americans, Latin and Caribbean players, and Asian players were unable to play in Major League Baseball until the late 1940's, the 1960's, and mid-1970's, respectively. Access to these talents has aided competitive balance as teams are able to sign and play players from around the world. Television game diffusion has helped, albeit less significantly, as people across the country and world are able to view their favorite teams without being present at the game. Teams located outside of massive metropolitan areas such as New York, Los Angeles, and Chicago benefit as home-market populations are less important in determining viewership. Other possible factors that have assisted competitive balance are team relocations and expansion teams. Team relocations allow teams to reach untapped markets and gain fandom and viewership, while keeping a remaining fan-base in its prior home-city. Adding new franchises to the league through expansion creates more competition (Lee and Fort 2005).

III. Theory and Hypothesis

Competitive balance is an issue in every major sport, though Major League Baseball struggles significantly due to the lack of a salary cap. Understandably, the players' union disagrees and refuses to allow a salary cap, as player salaries would most likely not only be slowed but halted altogether. Major League Baseball contrasts this as perfect competition is preferred though unrealistic. Prior research indicates that competitive balance measures such as the luxury tax and revenue distribution are somewhat effective, though they still do not completely solve the issue plaguing the league, specifically small-market teams.

If small-market teams are truly disadvantaged because of the lack of money, they must discover a way to gain ground. With a stalemate between the league and players' union, these teams appear destined for failure year in and year out. Research can continue looking into competitive balance and different methods, however history has shown that the current methods put in place have little to no affect. One aspect in which teams are on a level playing field is through the draft.

Small-market teams can attempt to compete with large-market teams simply by drafting better. This concept is obviously easier said than done, as some potential "can't miss" players may injure themselves or simply never live up to their hype, while other lesser known players may emerge suddenly, therefore making the draft mostly unpredictable. What is fairly predictable though is that players selected earlier in the draft are more talented and therefore more likely to succeed, while the reverse is true for players selected in later rounds. The draft is designed knowing this fact, as the team with the worst record the previous season gets the first selection followed by the team with the second-worst record, so on and so forth.

Besides skill and talent, there are other quantifiable factors that may help teams determine to choose certain players over others. Drafting a position player or pitcher is one possible determinant for teams. Handedness, whether it be for pitching or hitting must be considered, as well as if the player is being drafted out of high school or college. Certain scouts and front offices may hold preferences to these specific players and may draft accordingly. It is undeniable that team revenues and payrolls are significant to an extent in determining a team's success. However, how a team drafts and uses their selections is more important in determining a team's success. Accordingly, it is hypothesized that a team that trends to select certain players because

of certain factors such as position, handedness, and age (high school or college) will find greater draft success.

IV. Data and Methodology

The software that will be used to these hypotheses is Microsoft Excel 2016. The data that will be used for these hypotheses will be from the 2003-2008 Major League Baseball First-Year Player Drafts. These years were used as they are relevant to the league's current structure. 2003 was chosen as the first year to test as Michael Lewis' *Moneyball* focused on Billy Beane and the 2002 Oakland Athletics which revolutionized the way front offices evaluate talent. 2008 was used as the last draft to test players from because players with significant time in the Majors was preferred. Assuming it takes player two to three years to graduate to the Majors, these players would have reached MLB around 2010 or 2011. If this is the case, these players have an ample amount of experience and therefore data to test.

Data from the 2005-2014 seasons will also be used to test team performances. Every team's payrolls from these years will also be used to examine the effect of team payrolls on performance. The other variable that will be used to examine team performance is the cumulative games per season from each team's drafted players selected from 2003-2008. Each team's respective games per season is derived through several calculations. First, the amount of games played by each individual player will be divided by the number of seasons each respective player has played in MLB. To negate the fact that pitchers appear in less games per season than position player, a weight is multiplied to the pitchers' games per seasons to equalize the value with position players. The weight that was used was *2*.468071; this number was calculated by dividing the average of all 2003-2008 drafted position players' games per season by the average

of all 2003-2008 drafted pitchers' games per season. These weighted numbers were totaled for every team. When testing team performance, one variable to often use is win-loss record. Although this is the most indicative way to measure a team's performance, it does not entirely account for all factors. Instead, run differential for every team for each of the 2005-2014 seasons is used to quantify team annual performances. Run differential is more telling of how a team is performing over a long period of time; even though wins are the ultimate goals of teams, wins and losses are determined somewhat randomly. Run differential helps to better capture the underlying quality of teams. The thirty Major League teams and their respective run differentials per season, payroll per season (represented in millions), and games per season from drafted players is seen below.

Team	Run Diff. Per Year	Payroll Per Year	Games/Season
Arizona Diamondbacks	-38.8	$ 75.91	2494.20147
Atlanta Braves	64.6	$ 94.79	2295.693983
Baltimore Orioles	-70.5	$ 87.59	1478.649431
Boston Red Sox	84.1	$ 155.51	2749.039583
Chicago Cubs	-36.1	$ 114.85	1958.580948
Chicago White Sox	-5.7	$ 103.82	1707.961262
Cincinnati Reds	-4.4	$ 82.55	2225.548174
Cleveland Indians	6.1	$ 67.67	1592.150738
Colorado Rockies	-24.5	$ 75.63	1598.545632
Detroit Tigers	49.9	$ 125.05	1802.894247
Houston Astros	-99	$ 80.85	1407.151476
Kansas City Royals	-96.2	$ 67.42	2111.254454
Los Angeles Angels	64.8	$ 129.66	1789.818118
Los Angeles Dodgers	43.1	$ 142.08	2233.650226
Miami Marlins	-47.3	$ 46.90	1573.771613
Milwaukee Brewers	-0.3	$ 84.46	1667.027986
Minnesota Twins	-17.8	$ 81.81	2028.989707
New York Mets	9.6	$ 118.99	1552.538328
New York Yankees	116.6	$ 218.53	1998.510626
Oakland Athletics	49.6	$ 67.92	1690.016165
Philadelphia Phillies	56.7	$ 137.11	2132.603088
Pittsburgh Pirates	-89.1	$ 53.39	1942.003211
San Diego Padres	-29	$ 63.39	2468.706311
San Francisco Giants	-8.6	$ 113.22	1865.601795
Seattle Mariners	-69.3	$ 97.90	1369.41214
St Louis Cardinals	70.8	$ 106.31	2397.251745
Tampa Bay Rays	4.4	$ 55.17	1405.785195
Texas Rangers	34.5	$ 98.98	2455.936929
Toronto Blue Jays	24.4	$ 91.18	1507.551764
Washington Nationals	-42.6	$ 80.60	2405.364828

In testing players from the 2003-2008 drafts, the variables mentioned before will be considered: selection number in the draft, whether the player was drafted out of high school or college, position (pitcher or fielding position), and handedness (throwing arm for pitchers, batting side for position players). The players that will be tested are those that have played in Major League Baseball; players drafted that have never played a game in the Majors are not included. Given these criteria, 1,101 players will be observed from the 2003-2008 MLB Drafts. Selection in the draft is deemed important as the earlier a player is drafted, the better they are expected to be. Age of the drafted player is important as some teams may value the youth of a high school player, believing the player to be raw and available to give more years to the organization. Some teams value college players more, as they are more likely to be experienced and developed, though they have more time on their bodies and may not be able to play as long as a player coming out of high school. Position is important as some teams may prefer stockpiling pitchers to position players or vice versa. Pitchers are often seen as more volatile assets, as arm injuries become more prominent due to the strain caused by pitching. Handedness of a pitcher is important because left handed pitchers are rarer due to a greater percentage of population being right handed. Handedness of a batter is significant to teams as left handed batters may be considered valuable to counter the greater amount of right hand pitchers in MLB.

These variables will first be tested in a regression model analyzing if the payroll per season and the games per season variables were significant in determining team success, and if so, to what extent. This test will be used to determine if team success, in the form of run differential per season, can come from a factor besides payroll per season. The equation that will be used for this test will be:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$

In this equation, the dependent variable, y, will represent run differential per season. Beta zero will be the intercept, representing the run differential a team would have if their respective payroll and games per season variables were equal to zero. X-one will represent the payroll per season variable and X-two will represent the games per season variable; Beta-one and Beta-two will represent the coefficients for their corresponding variables.

If the games per season variable is deemed significant then another regression analysis will be conducted. This model will be used to determine what characteristics of a drafted player will be significant in leading to individual games played per season. The equation that will be used to test this will be:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4$$

The dependent variable, y, in this model will represent a player's individual games played per season. X-one will represent a player's pick number in their respective draft, X-two will represent whether the player is a position player or pitcher, X-three will represent if the player was drafted out of high school or college, and X-four will represent handedness of the player (batting stance for position players, throwing hand for pitchers). Again, all four Beta's will represent the coefficients that correspond to the respective variables. The last three variables in this equation are dummy variables: position players, high school draftees, and right handed players will be assigned values of zero, pitchers, college draftees, and lefties will be assigned values of one. In this case, Beta zero will be the intercept representing the games played per season expected from a player drafted with the zeroth pick (which cannot happen, therefore realistically representing players selected first overall) who are position players, drafted out of high school, and right-handed. Pitchers, college draftees, and left handers were given the one

value because it is believed these three variables will be more important to teams and result in more games played per season.

The expectations for these models and the results are to find that teams that draft well will lead to better run differentials, and therefore find more success. To prove this, it is expected that a team's "games per season" variable will show to be significant in determining run differential. It is also expected that payroll will determine this, however this study hopes to find that the draft is the best way for teams with low payrolls to compete with those teams with larger payrolls. If these models prove results that correlate with expectations, then the hope for this study is to decipher what, if any, factors or characteristics of drafted players lead to careers with more games played.

V. Results

Upon conducting the first regression model testing what factors determine a team's run differential, the following results were found:

Regression Statistics	
Multiple R	0.69762302
R Square	0.486677879
Adjusted R Square	0.448654018
Standard Error	41.71340306
Observations	30

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-143.5133357	41.17146004	-3.485748	0.001694425
Payroll Per Year	1.008775379	0.223658032	4.510347	0.000113496
Games/Season	0.023495264	0.020587686	1.141229	0.263795971

By observing the intercept found in the bottom chart, it is expected that a team with no payroll and no games per season from drafted players will have a run differential of -143.5. This is no

surprise, as a team must have players playing and subsequently a payroll to some extent to score and prevent runs. The p-values of the payroll variable proves its significance in determining run differential. Payroll per year is seen to be extremely important, as the p-value is a miniscule 0.00011. With a coefficient of 1.00878, it is expected that with every million dollars of payroll a team spends, its respective run differential will increase by just over a run. The games per season variable is not statistically significant, with a p-value at 0.2638. With a coefficient of 0.0235, it is expected that every game per season a team receives from a drafted player, their run differential will increase by two-hundredths of a run. Though this effect seems small, it is not all too surprising as the average amount of games per season from drafted players for these teams across 2005-2014 is around 1,930 games. Therefore, it is expected that a team with average games per season will have a run differential of just above 45 runs. Originally, a player's total games variable was used rather than a player's games per season, however this proved to be even less significant of a variable. Although the statistical significance of this variable was not as great as was expected, the results are in line with expectations, which motivates testing the second model.

Upon testing the second equation, attempting to prove characteristics that affected a player's games per season, the following results were found:

Regression Statistics	
Multiple R	0.09680023
R Square	0.009370285
Adjusted R Square	0.005754848
Standard Error	40.47519621
Observations	1101

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	53.41439292	3.088417332	17.29506967	1.9232E-59
Pick	-0.008451225	0.003430593	-2.463488552	**0.013911996**
F=0 P=1	1.05301142	2.477307878	0.425062799	0.670874334
HS=0 C-=1	-0.449215456	2.625943232	-0.171068228	0.864201694
R=0 L=1	5.045776848	2.570660123	1.962833127	**0.049918197**

Observing the intercept in these results, it is expected that a right-handed position player chosen zeroth (first) overall out of high school would play 53 games per season. Two variables were proven to be statistically significant in this model: the pick in the draft and the handedness of the player. The significance of what pick in the draft a player was selected was expected to be very important, as players chosen earlier in the draft are expected to be better players and therefore play in more games. It is noted, however, that the coefficient is negative. This is also expected as the later a player is selected, the less play time is expected. The handedness of a player is not entirely surprising, as some teams do value left handed players more due to their rarity.

Although the first model showed that the Games per Season variable was statistically insignificant, the second model proved that there were multiple factors that could indicate a player's success through certain characteristics. These findings and possible reasons for statistical insignificance will be discussed further in the next section.

VI. Discussion

In the previous section, the relationship between two separate independent variables and the dependent variable run differential per season were examined using a regression model. This model proved the relationship between a team's run differential per season and its payroll to be statistically significant with a coefficient of just over one. This relationship essentially shows that every million dollars a team spends on payroll contributes to one positive run. This came as no surprise, as multiple analyses and researchers have concluded that large-market teams have an

advantage simply through the fact they can spend more on top talent. This relationship and its statistical significance proved our point that small-market teams are disadvantaged from the start.

Through the evidence that payroll contributes heavily to a team's success, the next step is to examine whether small-market teams can still compete. Our theory is that these teams can compete and ultimately succeed through the draft. The idea is that these teams will draft players that will play in Major League Baseball and contribute by playing in many games per season. Unfortunately, the model showed the relationship to be statistically insignificant, meaning the relationship is not necessarily accurate. However, this shortcoming could be for numerous reasons.

First, many players do not play for the teams they are drafted by. As mentioned before, many players are used in trades, especially as prospects, and ultimately make their first Major-League roster with a team different than the one that drafted them. This commonality causes a skew in the data, as many players played their games with different teams across their career. Although we accounted for this possibility, we ran the model because we believed the idea that drafting a player that would successfully make the Majors and play in a significant amount of games did not rely solely on which teams they played for, but rather the fact alone that they played in games at the top-level. This idea essentially shows whether teams can scout talent and draft this talent.

Another reason the relationship could prove to come up short is due to some organizations developing players in the minors better than others. Some organizations have a knack for turning unknown talent into quality big-leaguers, and vice versa. Unfortunately, this consideration is difficult to accurately quantify and unable to fit into a regression model for this reason.

One other factor that is difficult to quantify that could play a major role in a team's success is leadership, both on and off the field. Leadership traits in players, managers, and front office personnel is nearly impossible to put into numerical values though it could contribute heavily to a team's success. Managerial performance is a major factor in a team's successes and/or failures and the inability to include this in a model is a definite limitation.

Despite the statistical insignificance found in our data of player games per seasons contributing to a team's run differential per season, a second model was conducted to examine several other relationships. This model made the games per season variable dependent upon four characteristics found in players being drafted. The pick in which a player is selected in the draft, their position, whether the player was drafted out of high school or college, and the handedness of a player were all determined to be possible factors that could influence their value to a team and whether the player would find success.

This model was conducted because, although the games per season variable was found insignificant, we believe it is a stepping stone to future research. Determining factors that can help determine a drafted player's likelihood of contributing playing time to the Major-League club is something worth researching and analyzing.

After running the model, two variables were found to be statistically significant: a player's selection number in the draft and their handedness. A player's position and whether they were drafted out of high school or college proved insignificant in this model, however, both variables carry possible limitations that could have skewed their significance. These will be discussed shortly.

The significance of when in a draft a player is selected is far from surprising; players drafted earlier in the draft are typically considered the best players, hence their high selection. This statistical significance proves that players with better talent are more likely to find success in the future. This is a key point for unsuccessful teams, as these teams receive the top picks and ultimately have the best chance to select better players.

With the significance of a relationship between "better players" and more games played per season, it is now important to determine what specific characteristics of drafted players lead to more games played. The handedness of players was determined to be the only statistically significant characteristic. This relationship shows that left handers are likely to play more games per season. Again, this relationship may be due to the rarity of left handed people in the world. In baseball, it is typical for left handed pitchers to be more sought after due to the lack of left handed players in general. Left handed batters are sought after because lefties typically fare better off of right handed pitchers, and vice versa. With a higher frequency of right handed pitchers across the league, left handed players are valuable to clubs. The coefficient of this variable through this model is just above five, meaning left handed players can be expected to play in five more games per season than right handers.

The position of a drafted player was deemed insignificant through this model. One limitation to this data is that the players' listed position is that of which when originally drafted. Many players experience position changes from the time they are drafted to when they play in Major League Baseball. This issue could have skewed the data and created inaccuracies when testing. This characteristic is one that should be tested further, however, as many teams prefer drafting pitchers over position players, or vice versa. Pitchers are often viewed as a "high-risk, high-reward" type selection while position players are often safer bets.

Whether a player was drafted out of high school or college is the other variable to have been proven insignificant through the model. Like the previous variable, this data had its own limitation that most likely caused inaccuracies. In the data, players drafted who eventually played at least one game in Major League Baseball were tested. However, not every player in the dataset signed when originally drafted. Some players in the dataset were discovered to have been drafted again years later, often by a different team at a different selection number. Given this information, many players that were drafted out of high school went to college instead and later played in MLB after being drafted out of college years after their original selection. Due to time constraints, this inaccuracy was unfortunately ignored.

These results prove to be valuable as they can be used as stepping stones for further research. The fact that payroll plays a significant role in a team's success is nothing new, and this idea was only solidified through these analyses. The significance of how a team drafts was proven to affect how a team performs in the future, despite the statistical insignificance. However, this shortcoming may still be able to shed light on future research on this topic.

In regards to drafting players, this research was proven valuable, identifying two factors that contributed positively to the expectations of a player's career. A player's scouted talent and handedness were proven to be indicators of a player's amount of games played. The other two factors were proven insignificant, though for factors that could be accounted for in the future.

VII. Conclusion

The main objective of this study was to determine a way for a small-market team to compete in a game where large-market teams can so easily dominate. Through research of past studies, the idea that these teams can draft better and ultimately field better teams for

less payroll came to fruition. By drafting better, these teams could control these players on cheap, rookie contracts and employ these players until the contracts expire. This concept is very common in today's game thanks to Michael Lewis' *Moneyball* and can be seen in use by many successful small market teams. Unfortunately, the tests used in this study did not prove this concept, though could be a potential building block for future research.

This study found many limitations throughout the research and models that may have contributed to the statistical significance observed in the first test. Two obvious limitations for this specific study were time and money. A lack of money to acquire more extensive data and a lack of time to properly account for external factors led to this statistical insignificance. Another issue with these tests were the duplicates and inaccuracies in the characteristics of the players tested. The years 2003-2008 were used when observing the drafted players to help analyze how teams drafted after the 2002 Oakland Athletics season, the subject of *Moneyball*. 2008 was used as the last year due to many players drafted in the following years not having had enough time in the Major Leagues to properly test this theory. Due to using these specific years, many players drafted in 2009 and later were included if previously drafted in the tested years, subsequently affecting the results.

Another issue was the fact that a relatively small sample size was used. Although testing 1,101 different players is no small feat, there are simply decades of drafts that can be analyzed before 2003 to help test this hypothesis. Again, the specific years in this study were used for a reason, however, testing over a broader period would possibly yield better results.

One possible shortcoming of this model is the "games per season" variable that was used. This variable is not entirely indicative of the magnitude of a player's performance rather a simple count of how many games a player appears on average per season across their career. This

number is a decent indicator of success, assuming players with more games played are typically better players. However, using actual performance measures could help this study progress. This idea was tested in this very study. The top 300 players from the study in regards to "games per season" were tested again, except instead of using games per season as the variable of interest, their career Wins Above Replacement (WAR) values were used. WAR is a commonly used stat to value all aspects of a player's performance. One unit of WAR essentially equates to one win that the player's team would not have won without that player. Therefore, the higher the WAR, the better. A new model was conducted, using these 300 players' WAR's instead of games per season. To our surprise, the statistical significance was less using WAR. However, this could be explained due to the even smaller sample size. Again, time and money unfortunately made acquiring all 1,101 players' WAR's difficult and unrealistic. However, future research into this topic using a larger sample of WAR could yield dividends.

Although this study failed in proving how small-market teams can find success against large-market teams, it built a foundation for future study into the topic. Countering the limitations this study encountered and using better performance measures are just several ways in which future research can build upon this. The ability to quantify different factors such as leadership are other ways this study can be enhanced to accumulate success. This study did in fact show two characteristics teams can look to exploit when drafting to increase the likelihood of a player's games per season.

If greater financial resources were available, the next step to better this research would be to acquire data with more performance measures and better programs to test and run models more quickly and efficiently. These capabilities would allow for the testing of a greater sample size, decreasing the margin of error.

VIII. Works Cited

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