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History of Economic Thought

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A History of Economic Thought in Baseball Analytics and the Baseball Player Market

The realm of sabermetrics, also known as the statistical analysis of the multifaceted dynamics of baseball by the Society for American Baseball Research, has taken the baseball world by storm in recent years and an evolution of the sport has occurred since then. With the introduction of Amazon Web Services' MLB Statcast in 2015, sabermetrics became the all around norm for not just developing game strategy but for signing underlooked players and thus linking a better pay to a player's impending production.¹ Sabermetrics was made popular by Billy Beane after he capitalized on underlooked opportunities in the early 2000's. Unlike the other major American and European sports, the MLB plays the most games per year (162 games per club) and thus there is a large and rich sample size of performance statistics for both teams and players, though some of those stats were under-observed in the years leading up to Billy Beane's career as the Oakland Athletics' general manager. Though the economics of the baseball labor market now almost solely relies on projections inferred based on sabermetrics, the economic thought of baseball management did not revolve around analytics for the majority of the sport's lifetime before the genius of Billy Beane. General management in baseball did not make an effort to effectively link performance and pay with an econometric process until the early 70s, thus still leaving undesired market inefficiencies in the labor market leading up through the 90s. However, I will argue that thinkers like Bill James led Billy Beane and his

¹ Healey, Glenn. "The new Moneyball: How ballpark sensors are changing baseball." *Proceedings of the IEEE* 105, no. 11 (2017): 1999-2002.

assistant Paul DePodesta effectively to exploit these market inefficiencies by better linking play and pay in the midst of a pricing anomaly and by signing contracts with players who specialized in having overlooked but good stats.

Economist Michael Lewis, author of *Moneyball: the Art of Winning an Unfair Game* and *The Big Short: Inside the Doomsday Machine*, accounts for the events of Billy Beane's genius as the general manager for the low-budget Oakland Athletics in the former. Lewis attributes much of Beane's approach to general management to the man who coined the term sabermetrics, Bill James.² James was a prolific writer in the last three decades of the 20th century and did not go unknown, for his stances on sports management were controversial. Similar to how William Stanley Jevons thought about the field of political economy in the 19th century, Bill James thought that the baseball labor market and baseball in general should be a mathematical and "academic discipline" rather than an "eccentric hobby."³ By undergoing a statistical analysis of accumulated data from box scores, for example, one could draw unbiased conclusions from approaches to managing a team, economically or strategically. Lewis states, "in 1984, James wrote to what was now a rapidly expanding crowd of baseball nuts and proposed a radical idea: Take the accumulation of baseball statistics out of the hands of baseball insiders."⁴ Lewis is implying that James is one those baseball nuts, for he was not an MLB insider. Because MLB clubs kept data pools from the public, it was difficult for the growing sabermetricians to run their analyses on players and teams. Sabermetricians could offer not just strategic insight but economic advice to owners and other superiors. Teams relied on scouts to analyze a player's worth, and though it was relatively accurate, there was much room for error. Lewis reinforces this claim by discussing the career of John Henry, who bought the Florida Marlins and who's

² Lewis, Michael. *Moneyball: the Art of Winning an Unfair Game*. W.W. Norton, (2003): p.82

³ Ibid., p.82

⁴ Ibid., p.83

enamored with sabermetrics was not shared by his subordinates. He states, “inefficiencies in the financial markets had made Henry a billionaire--and he saw some familiar idiocies in the market for baseball players.”⁵ Club ownership was stubborn in realizing the benefit of hiring sabermetricians; they ignored the thought of Bill James and his disciples. They did not realize the inefficiencies of the player market and the myriad of biases that ended up hurting a team. The question still remains: how were these market inefficiencies remedied and how did Billy Beane exploit them?

Before Billy Beane put to practice the different approach of inferential sabermetrics of Bill James to maximize on-field production for a low cost, one of the first attempts to effectively and analytically link pay and production came in the 1970s. After the first ever player’s strike in 1972, Gerald W. Scully thought it was time to compare the “salary and marginal revenue product over various performance levels and career lengths” while viewing an individual player as a unit of observation.⁶ It can be argued that the strike finally put into the perspective all the contributing factors to determining salary. Questions such as whether certain players like Willie Mays for the San Francisco Giants or Carl Yastremski for the Boston Red Sox at the time were being overpaid and other players were being underpaid. Baseball was fundamentally a medium of entertainment for fans, but now it was becoming an evolving business and a serious market for the players in addition to that. The production of concern that teams focused on was revenue, not win count. The main question at the time is how clubs can link a player’s salary with the revenue that their on-field performance contributes to. With that being said, Scully sought to outline “the institutional characteristics of the baseball players labor market”⁷ in addition to linking a player’s

⁵ Ibid., p.90

⁶ Scully, Gerald W. "Pay and performance in major league baseball." *The American Economic Review* 64.6 (1974): p.1

⁷ Ibid., p.1

salary to the marginal product of revenue. Because there are possibilities that a player can be injured, go through a slump, or go on offensive hotstreaks, it is essentially impossible to determine exactly how a player may play. Though it is impossible and much room for error is present, a player's performance can be projected based on raw data of previous years or through specific features like arm strength, raw power, etc. that scouts can see. By outlining the institutional characteristics of the MLB player market and creating a model for performance and marginal product of revenue, a team could attribute a fitting salary to a player and perhaps wring out the best on-field production they could and then more overall revenue.

Not only did the link between pay and performance become more effective in maximizing revenue, but the link itself became a motivation for better performance. This was a tiny revolution in not just baseball but the general labor force according to Kanter and Moss in the 1980's.⁸ They looked at the effects of overpayment as an incentive for better production in various professions. By paying more money to workers or players, the better expected outcome was more likely, that is, better production. Though this idea is merely a theory, it factored into the realm of baseball management, which was in much need of transforming into a more unbiased market.

Though pay and performance were more effectively linked in the 1970s and 1980s, the prime focus among teams in the 90s became outlining the effects of over rewarding players and under rewarding players. These inequitable effects can be both bad and good according to Joseph W. Harder, who found that "underrewarded individuals behaved less cooperatively and more selfishly, while overrewarded individuals behaved more cooperatively."⁹ Equity theory plays a

⁸ Kanter, Rosabeth Moss. "From status to contribution: some organizational implications of the changing basis for pay." *Personnel* 64, no. 1 (1987): p.1

⁹ Harder, Joseph W. "Play for pay: Effects of inequity in a pay-for-performance context." *Administrative Science Quarterly* (1992): p.1

big role in incentivizing players as noted previously, though also noted previously there still remains much room for error when players become injured or suspended. Underpaying players has led to negative effects such as selfishness on and off the field.¹⁰ Harder's article came as a reckoning for what was to come in the next few years. In 1994, the largest strike in MLB history happened because players did not want to accede to club owners' salary caps.¹¹ Players acted selfishly because they were simply being underpaid by their owners. A player misbehaving is an undesirable effect, and when multiple misbehave, they can band together and revolt or play poorly. A team is also losing money by overpaying players in the short run, but Harder states that there is a correlation between overpayment and player incentive to play better in the long run.¹² Though there is an incentive to play, overpayment still meant a team was losing profits when they could be saving money. The spectrum of differences brought about by underpayment and overpayment were just few among many other inefficiencies in the market for players.

While clubs tried to make profit by linking an appropriate price to a free agent that would sign in the 80s and 90s, Bill James created the Society for American Baseball Research and secretly changed the game. Bill James was believed to be crazy and out of his element for his independent studies on baseball. He never played the game nor did he work in a front office. Lewis speaks highly of James and states that during the 1980's, "[James] understood that the search for baseball knowledge was constrained by the raw statistics, and began to think seriously about starting a company to collect better data about Major League Baseball games than did Major League Baseball."¹³ Not only is Lewis stating that James knew that the sport could benefit from making data public to everyone, as noted previously, but also that the raw statistics were

¹⁰ Ibid., p.12

¹¹ Shaikin, Bill. "MLB 1994 Strike Anniversary: Lessons from a Disastrous Work Stoppage Apply Now." *Los Angeles Times*, (2019)

¹² Harder, Joseph W. "Play for pay: Effects of inequity in a pay-for-performance context." *Administrative Science Quarterly* (1992): p.12

¹³ Lewis, Michael. *Moneyball: the Art of Winning an Unfair Game*. W.W. Norton, (2003): p.80

either not enough to determine overall worth in a player or that they were being looked at in the wrong way. “As Bill James had shown, baseball data conflated luck and skill, and simply ignored a lot of what happened during a baseball game,”¹⁴ Lewis states. Statistics that used the simplest raw data led to simple-minded conclusions, but that was not enough to explain the unpredictability of a player’s production or a very specific situation in the game. For example, batting average, which is calculated by dividing the number of hits by the number of at-bats, is one of these simple-minded stats that can easily trap anyone into thinking that it determines true worth. If a player hits only singles and has a certain batting average, then it must be said that there is a difference between said player and another player who hits only home runs and has the same batting average. Home runs are more valuable because they are a guaranteed run; a single is only valuable if whoever hits that single scores a run or that single drives in a run, which is only applicable to certain situations and thus makes batting average seem very subjectively worthless. Batting average in its entire essence is just how often some player gets a hit, not which kind of hit. This is what James means when that there are the wrong stats being looked at, but he gives a suggestion for better stats.

Before mentioning the more high and mighty stats that James touts, it must be noted that outside the sports realm the birth of new financial markets predicting financial futures and outcomes came to be. This is important because it led MLB clubs to adapt the intellectual progress and computation that paved the way for the creation of these new markets. Lewis asserts that the new securities that arose from these markets had a more quantifiable and precise value and that because of this, one could make a fortune off faulty evaluations of this precise value by trading fragments of these stocks.¹⁵ Similarly to the advantage of forming precise

¹⁴ Ibid., p.131

¹⁵ Ibid., p.130

predictions that arose from these new financial markets, Bill James himself focused on better understanding ways to predict certain outcomes in baseball, such as win-loss records for a team. By slapping together what seems to be haphazard formula, James created a titanic asset that every sport now uses to this day in his Pythagorean expectation model. The formula takes into account the runs scored by a team in one season and the runs that they allow.¹⁶ Obviously, if a team scores more runs than they allow, on average they should have a winning record. This formula leads managers and analysts to question how they can manufacture runs and allow fewer runs than the other team, and it was a question that James must have asked too. Though the formula has a somewhat wide confidence interval, analysts succeeding James were able to modify the formula for each major sport, including basketball and soccer, and find an exponent for each one that better fulfilled the equation.¹⁷ Better predicting strategies led James to believe that there were certain stats that could accomplish this goal, and as I will note later, Beane and DePodesta utilized these prediction strategies.

Bill James changed the way analysts and managers look at statistics by making an argument that certain stats such as on-base percentage and slugging percentage are more key to manufacturing runs than batting average for example. James' Pythagorean expectation formula leads to the thinking, as noted previously, that manufacturing runs is part of what makes a winning team, not having a high team batting average. Lewis claims that in the late 1990's, "baseball fans and announcers were just then getting around to the Jamesean obsession with on-base and slugging percentages."¹⁸ On-base percentage determines how often a player gets on base by his own hand, which is more true to itself than batting average is. Slugging percentage is

¹⁶ Heumann, Jay. "An improvement to the baseball statistic "Pythagorean Wins"." *Journal of Sports Analytics* 2, no. 1 (2016): p.49

¹⁷ Ibid., p.58

¹⁸ Lewis, Michael. *Moneyball: the Art of Winning an Unfair Game*. W.W. Norton, (2003): p.128

a good indicator of value since it shows how well a player hits the ball. It factors in what batting average cannot; total worth of a hit. These stats may not be as simple as batting average, but they would revolutionize the way management would determine value regarding on-field production, as we will see starting with Beane. Bruce Weinberg et al. note that, “because a baseball team is afforded only three outs in an inning, avoiding making outs (i.e., getting on base!!) is more important than hitting for power, even though, both, of course, are good.”¹⁹ On-base percentage and slugging percentage, though they were not perfect predictors for runs scored, were far more valuable than the majority of other baseball statistics for they are statistically significant in predicting runs scored.²⁰ Nobody focused on these stats until James revealed them as gospel to the baseball world, though even the Gospel took time to spread.

Though Bill James eventually gained many followers throughout the years, his theories and other various fruits of his studies were not put into practice until Billy Beane and Paul DePodesta both arrived in Oakland. Lewis states Billy Beane witnessed players get signed or drafted because scouts determined their value based on things such as their build or their college batting average.²¹ What many scouts lacked back before Billy Beane’s time as the general manager for the Oakland A’s was sheer objectivity in determining a player’s worth. In regards to the player labor market, managers based the contracts they gave a player on trivial things like theatrics or looks, not objective upside and predictive outcome. Lewis quotes Pete Palmer, who was an engineer for the U.S. military that joined SABR as a hobby; ““managers tend to pick a strategy that is least likely to fail rather than pick a strategy that is most efficient [...] the pain of looking bad is worse than the gain of making the best move.””²² Mis-evaluation of players

¹⁹ Beneventano, Philip, Paul D. Berger, and Bruce D. Weinberg. "Predicting run production and run prevention in baseball: the impact of Sabermetrics." *Int J Bus Humanity Technol* 2, no. 4 (2012): p.69

²⁰ Ibid., p.68

²¹ Lewis, Michael. *Moneyball: the Art of Winning an Unfair Game*. W.W. Norton, (2003): p.128

²² Ibid., p.80

arguably plagued teams in the draft and teams that signed free agents. As Palmer said, managers tend to pick a strategy that will somewhat work rather than work optimally, thus causing many of them to make mistakes plagued by inefficiency and even bias.

Billy Beane himself is an example of a player who was overhyped as a prospect. Beane was drafted by the Mets in the first round of the 1980 Major League Baseball draft and it was said that the Mets, “fully expected Billy to rocket through the minors and into the big leagues.”²³ However, Billy’s career was quite putrid as he barely played above Triple-A baseball. Beane never lived up to expectations, but that was not completely his fault. The expectations were faulty and held almost no weight. Bill James said to Billy, according to Michael Lewis, that he was, “on the receiving end of a false idea of what makes a successful baseball player.”²⁴ Perhaps it was Beane’s career and his driving intensity that led him to challenge the flawed conventions that caused many managers to make mistakes and suffer lukewarm consequences.

A problem that hurt small market teams such as the A’s was that players were becoming more expensive. During the 2002 Major League Baseball Draft, the A’s were hunting for future assets and found one in Denard Span. However, Lewis states, “when seventeen-year-old Denard Span announces that he won’t stand for a penny less than \$2.6 million, his stock plummets.” Though Lewis states Span’s stock plummets, it is indicative of the inflation of in pricing players at the time. It is especially difficult during the draft when a prospect demands money based on scouts’ perceptions of him combined with his own perception. For big market teams like the Yankees and the Dodgers, this was no big deal. Their goal was to make profit so that they could sign and draft whatever player they would like and that will prove to be a deadly weapon against

²³ Ibid., p.44

²⁴ Ibid., p.98

enemy teams.²⁵ The New York Yankees were good because they had a lot of money and their goal was to get more money. The A's were going to have to shop on a budget.

Billy Beane utilized the statistical theories of Bill James beginning after the 2001 season, and instead of creating revenue to compete with the revenue of other big market teams, just focused on competing for wins. After the 2001 season, in which the Oakland A's had won 102 games, the A's were going to lose three of their "star" players: Jason Isringhausen, the closer; Johnny Damon, the A's leadoff man; and Jason Giambi, the team's best hitter and first baseman.²⁶ Replacing these players each had its own respective difficulty, mostly because the club had little money to spend. The Oakland Athletics had "\$40 million to spend on twenty-five baseball players"²⁷ at the beginning of the 2002 offseason. Paul DePodesta, the assistant general manager who was a Harvard graduate and never played baseball, was Beane's right hand man. He used James' Pythagorean Expectation formula and effectively "reduced the coming six months to a math problem" and found that, "the team would need to win between 93 and 97 games [to] wind up in the play-offs."²⁸ To satisfy the Jamesian formula, the team would need to create runs and allow a lot fewer without their star players from the year before. The question was how could they compete for wins and compete against the New York Yankees, who had their pockets loaded; the Oakland A's would need a miracle to make the playoffs in 2002.

In hopes to cause a miracle, Beane implemented a clever strategy; he capitalized on the misevaluation of players to his advantage. The most disposable player that they were going to lose was Isringhausen, who was highly touted because he accumulated saves, a worthless stat to Beane but not to the rest of the buyers in the baseball labor market. Saves to Beane were useless

²⁵ Ibid., p.121

²⁶ Ibid., p.124

²⁷ Ibid., p.119

²⁸ Ibid., p.124

because they were just another subjective stat. Lewis states, “the closer’s statistic did not have the power of language; it was just a number. You could take a slightly above average pitcher and drop him into the closer’s role, let him accumulate some gaudy number of saves, and then sell him off.”²⁹ Since every other club thought saves were highly desirable, Beane could use that to his advantage and get back more valuable assets, and that he did. He traded Isringhausen to the St. Louis Cardinals for their “first-round draft pick, along with a first-round compensation pick.”³⁰ Beane flaked the Cardinals because of their conventional way of thinking at the time and found abundant opportunity in it. The question still remained one of fungibility; how could the A’s recreate the opportunity for runs that Damon and Giambi provided the year before? With Damon, it was easy. Lewis reports Damon’s, “on-base percentage in 2001 had been .324, or roughly 10 points below league average.”³¹ A lower than league average on-base percentage was not desirable for any Jamesian thinker, and definitely desirable for Beane or DePodesta. Replacing Damon would be easy because all the two had to do was find a player who gets on base more than league average, which no other team was looking for. Since on-base percentage, as noted previously, was not a highly lauded statistic ever in the years leading up to Beane, then Beane himself could take advantage of the theory that it could help the Athletics create more runs.

To replace the players that had left the Athletics, Beane and DePodesta signed a motley crew of players with the overlooked stats that James so highly praised. The player who replaced Johnny Damon was David Justice, who was thirty-six years old (past his prime) but “walked a lot.” Lewis furthermore states that Beane and DePodesta did not care about his age; “they sought only to milk the last few ounces of superior on-base percentage out of David Justice before he

²⁹ Ibid., p.125

³⁰ Ibid., p.126

³¹ Ibid., p.129

expired.”³² In essence, Beane and DePodesta boiled down James’ theory of manufacturing runs to a simple practice: sign players who get on base. They tried the same thing when they signed the washed-out Scott Hatteberg as a replacement for the great Jason Giambi. According to Lewis, Hatteberg, “had the same dull virtues as David Justice [...]: plate discipline and an ability to get on base.”³³ It was wash, rinse, and repeat as a mindset for Beane for every player he signed. If they got on base, he was happy. A single might be more exciting than a walk, but a walk is always welcomed because one gets on base. As Beane assembled the new team that would make any Jamesian excited, the A’s prepared for a very memorable season.

The previous mentioned miracle that needed to happen did indeed happen. Near the end of the 2002 regular season, according to Lewis, “the only team with a better second half record than the 2002 Oakland A’s was the 2001 Oakland A’s.”³⁴ The goal of Billy Beane was made manifest: wins and manufactured runs. In the second half of the season, the A’s also completed a feat that had never been done in the history of baseball. On September 4th, 2002, before a crowd of 55,528 people, the A’s won their twentieth game in a row.³⁵ Beane’s and DePodesta’s strategy had worked, that is, the strategy of capitalizing on market inefficiencies by signing players who simply got on base and produced runs. To an added effect, Scott Hatteberg, who was signed by Beane as a replacement for Jason Giambi, hit a walk-off home run to win that twentieth game in a row. The Oakland A’s got their money’s worth in their Jamesian strategy.

Because Beane and DePodesta focused on different skills when signing a player, they showed the entire league that the returns to skill in the labor market could be better linked. The pricing anomaly that the league previously experienced was caused by the mis-pricing of players,

³² Ibid., p.151

³³ Ibid., p.160

³⁴ Ibid., p.217

³⁵ Ibid., p.218

according to Hakes and Sauer.³⁶ This mis-pricing, as noted previously, was caused by the misevaluation of player's skills. Nobody judged a player based on how often they got on base, but rather skills of batting average if you were a hitter or saves if you were a closer for example. The answer that misevaluation of the players in the labor market is not entirely a definitive answer for the various market inefficiencies, but it definitely points to it being one cause. After Lewis released his book, Hakes and Sauer tested this hypothesis and "observed that the returns to skill have increasingly—albeit with aberrations in 2001 and 2002—matched the impact of skills on winning percentage. Moreover, this improved correspondence is focused on the ability of a batter to take a base-on-balls (Eye), as opposed to getting on base via hitting a single."³⁷ Because of this result, the A's powerhouse management better linked pay with play. The game took a left turn. No longer were the days of high average hitters getting paid millions for just hitting singles, and it is all thanks to Billy Beane's ambition to challenge conventional wisdom.

In Hakes' and Sauer's article, "An Economic Evaluation of the Moneyball Hypothesis," they showed that wins are more profitable as an end-goal than revenue itself by analyzing Beane's management strategy. Because Billy Beane unintentionally linked play with pay better than years past, he got better returns in revenue. As the A's signed more players that got on base often, the marginal returns to that skill increased was statistically significant.³⁸ The thinking of Bill James seems to cascade into beneficial consequences. The A's, peasants compared to the other Major League Baseball clubs, reaped the economic rewards of objective and critical thinking in wins and profit. The more wins a club gets, the more clientele they will eventually receive. Hakes and Sauer conclude that, "the Oakland strategy for winning games was a

³⁶ Hakes, Jahn K., and Raymond D. Sauer. "The Moneyball Anomaly and Payroll Efficiency: A Further Investigation." *International Journal of Sport Finance* 2, no. 4 (2007): p.176

³⁷ Ibid., p.189

³⁸ Hakes, Jahn K., and Raymond D. Sauer. "An economic evaluation of the Moneyball hypothesis." *Journal of Economic Perspectives* 20, no. 3 (2006): p.180

successful exploitation of a profit opportunity,” for the attendance drastically rose throughout the years 1999-2003, causing the organization to increase ticket prices.³⁹ By focusing on run production, the Jamesian goal is to achieve wins, not profit. Billy Beane, Paul DePodesta, and the rest of the Oakland Athletics showed this to be true. The demand from the fans for good baseball is always high, and the Oakland A’s supplied them with such. The strategy seemed almost too good to be true, and it was somewhat. The A’s lost to the Minnesota Twins in five games during the play-offs and crushed Beane’s hopes of winning a World Championship that year.⁴⁰ Though the A’s lost, they set a new precedent for the entire league: being more objective in management approaches rather than the opposite. Though it is beyond the scope of this paper, it can be argued that Billy Beane, through the invoked wisdom of Bill James, evolved the economics of the sport into a much more competitive market for wins. Furthermore, it can be argued that he also paved the way for better scouting and both on-the-field and off-the-field management, but again, that is for another paper.

In conclusion, the history of economic thought leading up to the time of Billy Beane and Paul DePodesta slowly but gradually progressed. As noted, in the 1970’s, the marginal product of revenue and a player’s performance were measured, where a player was considered a unit of production. Back then, Major League Baseball became a business of clubs focused firstly on profits and secondly as a provider of entertainment for the fans. In the 1980’s, attempts to understand the errors of judgment in the player labor market were made, and some discovered that there was much room for error. The 1990’s saw economists try to figure out the causes of what led to the over or under-rewarding of certain players for their on-field production. All the while these things were happening, Bill James secretly was changing the sport by redirecting his

³⁹ Ibid., p.183

⁴⁰ Lewis, Michael. *Moneyball: the Art of Winning an Unfair Game*. W.W. Norton, (2003): p.272

readers' focus to a different statistical approach he developed. He came up with his Pythagorean Expectation formula, which was able to predict the winning percentage of a team based on how many runs they scored and how many runs they allowed. James also praised stats such as slugging percentage and on-base percentage as high and mighty during his time as a writer for the Society for American Baseball Research. In the end, it was Billy Beane and his assistant manager who implemented the statistical approach of Bill James and proved its truth. By signing overlooked players with overlooked stats such as how often they get on base or how few batters they let on base, Beane and his management staff were able to achieve a high win count as desired. Post the 2002 regular season, economists were able to see that Beane better linked pay with performance as well as getting better returns for skill. It must be noted that Beane intended to win rather than to make profit, because there was no way he could max the output of revenue of a team such as the New York Yankees or the Los Angeles Dodgers. In the end, Bill James is the brainchild for the newfound competitive spirit of the sport with Beane as the catalyst. With more teams implementing the two's strategies, teams can now make better financial decisions when shopping for players in the labor market.

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