

# ***Labor Markets in the Classroom: Marginal Revenue Product in Major League Baseball***

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## **ABSTRACT**

This paper presents an easily understood example of a labor market that is useful in introducing how wages and rents are determined, using professional baseball as the context. The mechanics of a competitive labor market are outlined and an empirical analysis of the major league baseball (MLB) labor market is described. An example out-of-class exercise investigating how salaries are determined is also presented. Additionally, sample topics are provided for in-class discussion at various levels of undergraduate economic instruction.

## **Introduction**

Students in economic principles courses often struggle with the normative and positive aspects of labor markets, even to the point where many principles professors avoid discussing labor markets all together. The positive aspects of labor markets help determine wages and the distribution of any surplus value (or rents) generated by workers. The positive characteristics of a labor market are not terribly different than the market for televisions. However, the normative aspects of labor markets are typically much more controversial than in the television market. Indeed, any employer rents generated by employees are often considered unfair. Yet, employer rents may be used to finance future endeavors, reward owners for bearing risk, or contemporaneously finance the purchase of other factors of production. Nevertheless, students often aver that the distribution of labor surplus is unjustly biased toward firm owners, perhaps unknowingly addressing one concern Marx analyzes in *Das Kapital*.

This paper initially presents a comparison between a perfectly competitive labor market and that for professional athletes. This comparison facilitates in-class discussion about how wages and employer rents are determined, and how worker experience and market power can alter the distribution of rents between workers and firm owners. We initially outline the positive mechanics of a competitive labor market, wherein wages are determined by the coordination of supply and demand for labor, and describe how rents to workers and owners are distributed. We then discuss the important differences between the canonical competitive labor market and the market for professional athletes, in which each player's salary is the outcome of a negotiation between team owners and the player (and his agent). We next turn to an empirical investigation of the Major League Baseball (MLB) labor market and show how the seemingly high salaries in major league baseball are not completely unjustified.<sup>2</sup>

To illustrate the applicability of this material to higher-level courses, the marginal revenue product (MRP) of professional baseball players, determined by the marginal revenue attributed to various

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<sup>2</sup> We commonly present this material in one of the concluding lectures in a principles course to illustrate further applications of economics, but it is also appropriate for higher-level courses such as intermediate microeconomics, labor, and econometrics.

performance measures, is estimated for the years 1996 and 1997. The MRPs are calculated by first estimating each production category's contribution to team output: wins. Then second step entails estimating the impact of team wins on the team's total revenue. Combined, the two sets of regression estimates facilitate an estimate of each production category's contribution to total revenue. Using end-of-season production statistics, it is possible to estimate each player's contribution to team revenue, or MRP, and how this compares to a player's salary.

Next, the marginal revenue product for the ten highest-paid players and the average minimum-wage player from 1997 are calculated. The difference between actual salary and the estimated marginal revenue product of a player is an estimate of the rents that player generates for the team's owner. Further, by calculating the ratio of owner rents to the player's salary one can measure the distribution of rents.

Finally, the correlation between a player's experience and rents as a percentage of his salary is calculated and indicates that more experienced players are able to shift owner rents to themselves through their increased market power. In our experience, these estimates provide a numeric reference point for classroom discussion that students are quick to comprehend and apply to other labor markets.

The paper proceeds as follows. The next section outlines the mechanics of competitive labor markets and uses professional sports as the context for determining equilibrium wages and rents. Section 3 investigates the determinants of player salaries in Major League Baseball. Section 4 discusses an out-of-class project based upon the analysis provided in the previous section. Section 5 offers topics for in-class discussion for various levels of undergraduate instruction. The final section offers concluding remarks.

### **The Mechanics of Competitive Labor Markets: An Overview**

The demand for labor reflects the marginal value of a worker's production. This is determined by the marginal product of the worker's labor effort and the revenue the firm can generate from that marginal product. This is referred to as marginal revenue product (MRP). The value of worker's effort is assumed to decline primarily because of the law of diminishing returns.

Labor markets are traditionally depicted as competitive. The supply of labor comes from households or workers and is either horizontal, if sufficiently large numbers of workers are willing to work at the prevailing wage rate, or upward sloping if extra workers must be paid more to induce them to work. Labor demand is derived from firms and reflects the marginal revenue product of labor. The demand for labor is typically downward sloping because of the law of diminishing marginal returns and because technological constraints tends to limit productivity as the number of workers increases.

Figure 1 depicts such a market in which wages are reflected on the vertical axis and the number of workers hired is on the horizontal axis. The equilibrium wage and number of workers hired is determined by the equalization of the demand and supply for labor. In the competitive labor market all workers are paid the same equilibrium wage,  $w^*$ , and employers hire  $L^*$  workers. The total wages received (paid) by workers (firms) is  $w^*L^*$ . Similar to consumer surplus in consumption goods, firms have the potential to gain surplus from hiring workers for less than they may be willing to pay, known as labor rents.

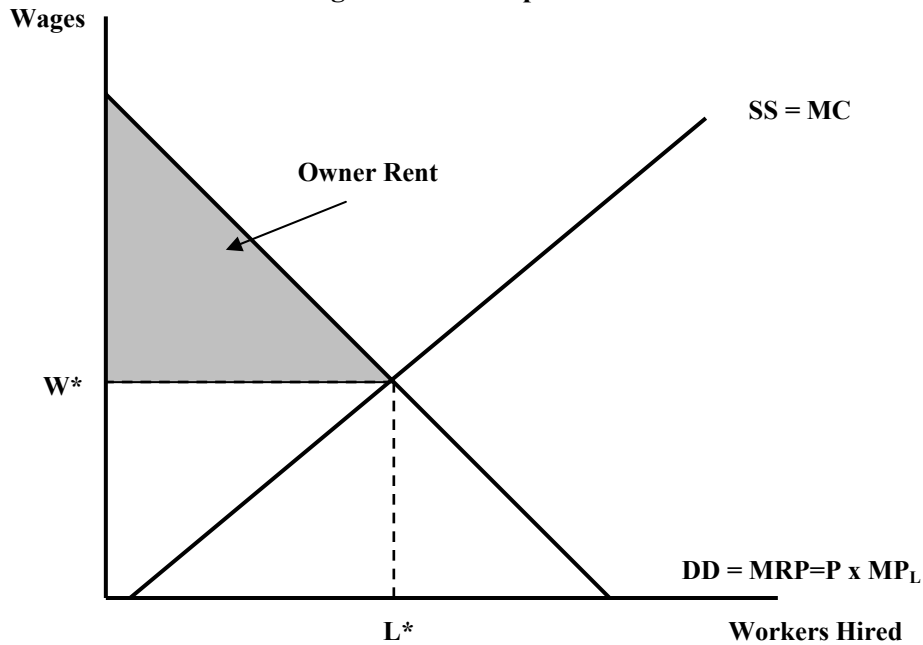
Labor rents reflect any difference between the wage paid to a worker and the market value of that worker's productivity. The shaded region in Figure 1 shows the labor rents generated in the hypothetical competitive labor market. While labor rents are not guaranteed to provide profits to firm owners, they provide for the possible purchase of other production factors such as machinery, energy, or natural resources. In addition, these labor rents may finance previous or future endeavors by paying off previously incurred debt or reduce future debt liabilities.

The mechanics of competitive labor markets are fairly straight-forward and may be applicable to a large number of labor markets, many of which average college students have experience: pizza delivery, bartending, or telemarketing to name a few. However, there are many labor markets in which the canonical competitive market is not able to explain how wages are determined, nor who is actually hired. Sports labor markets are a prime example of this exception.

Sports players almost universally have personal agents who negotiate on their behalf salary contracts with team owners. This is in contrast to most workers in the economy who do not have representative agents to assist in the negotiation of employment contracts (labor unions are important exceptions). The lack of personal agents for fast food workers and the prevalence of personal agents for professional athletes indicate

that the competitive labor market may be inappropriate to describe the sports labor markets; thus an alternative approach is required.

**Figure 1: A Competitive Labor Market**

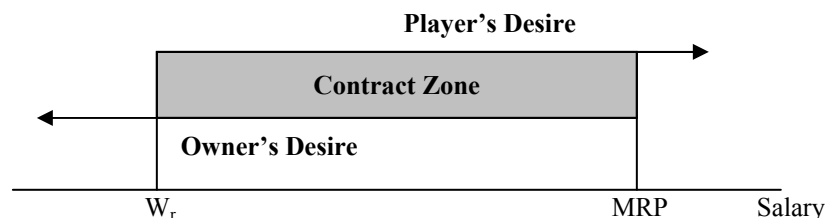


One alternative is to formally model the negotiation between the player (and their agent) and the team’s management. In general, negotiations take place in private and are therefore not easily modeled in terms of the actual discussion, but many times the ultimate result of the negotiation is made public, usually with a widely distributed press release about the salary for which a player agrees to play.

The negotiation process involves a “game” in which the player tries to get as high a salary as possible while the team owner wants to get salary as low as possible. However, the player cannot demand an arbitrarily high salary, because the player will not receive an amount greater than the expected value of the player’s marginal product to the team. Likewise, the team owner cannot demand an arbitrarily low salary, because the player will not accept anything below his reservation wage. Thus, for a contractual agreement to be possible a player’s reservation wage,  $W_r$ , must be less than the player’s marginal revenue product, MRP. The difference between these two values can be referred to as the “contract zone,” the range in which the player’s ultimate salary will fall (Leeds and von Allmen 2001). If the team owner insists on paying a salary less than  $W_r$  the player will choose not to play, often referred to in the sporting press as a player “sitting out.” On the other hand, if the player insists on a salary greater than their MRP, the team owner will refuse to pay and the player is forced to seek employment elsewhere.

Figure 2 shows a hypothetical contract zone. The player is satisfied with a salary greater than their reservation wage, and owners are pleased with a salary less than the player’s MRP. The resulting contractual agreement is specific to each player and in part dependent upon the relative negotiating power of the player and team. Therefore, it is possible for team owner to have enough negotiating power to drive salary close to  $W_r$  and possible for the player to drive salary closer to MRP.

**Figure 2: The Contract Zone for a Professional Athlete**



It is logical to expect that younger, less experienced players have less negotiating power and therefore their wages may be closer to their reservation wage than players with more experience. In professional baseball this is generally the case. For the first six years of big-league play, teams retain the majority of negotiating power through what is called the “reserve clause.” The reserve clause provides the team with exclusive negotiating rights to the player for the first six years of his major league career. After this first six years, the player can “shop” his talent to other teams. Therefore, younger less experienced players are typically paid close to the league’s minimum wage (\$300,000 per year in 2004). In contrast, players who apply for free agency (after six years) tend to be paid closer to their MRP.

How exactly is a player’s MRP determined? In practice, a baseball player does not directly produce wins (or losses) for a team, but contributes to an overall team performance by their offensive and defensive contributions on the field. Previous research in professional baseball indicates that baseball fans value winning and are willing to pay for additional wins. Therefore, a player’s value is determined by how much a player’s talent contributes to wins for a team and how much fans are willing to pay for each additional win. The next section empirically investigates the MRP of baseball players and compares the MRPs of several players to their actual salaries.

### An Empirical Estimation of Marginal Revenue Product in Professional Baseball

In many labor markets, it is difficult if not impossible to accurately measure the productivity of any particular worker. Therefore, an accurate estimate of a worker’s marginal revenue product is often infeasible. However, in professional sports there are no shortage of production data with which to analyze measure labor production and marginal revenue product. In professional baseball, there are several categories of production statistics for offensive players including hits, runs, runs batted in, homeruns, walks, strikeouts, stolen bases, and slugging percentage. Pitchers have a distinctly different set of production statistics including walks allowed, strikeouts, earned run average, and homeruns allowed.

In this exercise, we estimate the impact of various player production statistics on the total revenue of baseball teams in a two-step process.<sup>3</sup> The reason for this approach is to acknowledge that player productivity only indirectly impacts team revenues through its impact on team wins.<sup>4</sup> In this simple analysis, the influence of various professional baseball production statistics on team winning are estimated for the years 1996 and 1997. The influence of team winning on attendance revenue is then estimated.<sup>5</sup>

Table 1 presents the estimates for the team production function,

$$\textit{Winning} = f(\textit{HITS}, \textit{HR}, \textit{BB}, \textit{K}, \textit{KP}, \textit{HRA}),$$

where *Winning* is the absolute number of games won in a given year, *HITS* is the total number of hits, *HR* is the total number of homeruns, *BB* is the total number of walks, and *K* is the total number of strikeouts for the team in a given year. The pitching side of the team’s input to winning includes the *KP*, the total number of strikeouts pitched, and *HRA*, the total number of homeruns allowed. For simplicity, defensive and non-measurable player characteristics are not included in this example. This function provides estimates of the marginal product of each production category in terms of wins.

For advanced undergraduate courses, such as econometrics, Table 1 also reports the standard errors of parameter estimates, indicates which parameters are statistically significant, and provides regression diagnostics including R-squared and the regression F-statistic.

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<sup>3</sup> While students are generally unfamiliar with such estimation techniques, the use of the estimated coefficients adds to the clarity and depth of student understanding of a labor market that they are often already familiar with.

<sup>4</sup> Scully (1974), Lehn (1982), Vrooman (1996), and Krautman (1999) among others have done more rigorous estimations of these relationships.

<sup>5</sup> Team revenue figures were obtained from various issues of *Financial World*. Team and player production statistics were obtained from [totalbaseball.com](http://totalbaseball.com) and [espn.com](http://espn.com).

**Table 1: MRP Estimates for Professional Baseball 1996-1997**

Variable	MP <sub>L</sub> in Wins	MRP (Total Revenue) <sup>a</sup>
Hit	0.0156 (0.014)	\$24,936.07
Home Run	0.0900* (0.029)	\$274,376.62 <sup>b</sup>
Offensive Walk	0.0302* (0.015)	\$48,372.19
Offensive Strikeout	-0.0340* (0.117)	-\$54,348.55
Pitcher's Strikeout	0.0202* (0.010)	\$32,304.42
Opponent's Homerun	-0.1872* (0.037)	-\$299,232.09
R-squared	0.699	
Adjusted R-squared	0.659	
F-statistic	17.451*	
N	52	

\* Indicates statistical significance at the five percent level.

<sup>a</sup> Each win was worth approximately \$1.6 million in additional revenue.

<sup>b</sup> Each Homerun was worth an additional \$146,389 beyond its contribution to winning.

*A priori* expectations are that the number of hits, homeruns, walks, and the number of strikeouts pitched should enhance team winning, while strikeouts by hitters and homeruns allowed should reduce team winning. The second column of Table 1 reports the estimation results of how each production category contributes to team wins. For example, an additional hit contributes 0.0156 wins whereas an additional homerun contributes 0.09 additional wins. Conversely, each additional offensive strikeout reduces wins by 0.034 and each homerun surrendered by a team's pitching staff reduces wins by 0.187. These estimated marginal products conform to expectations, the production categories expected to enhance (reduce) winning are statistically significant and impact wins as logic would predict.

However, as described above, the marginal product is only valuable to firm owners in so much as it generates revenues. To determine the value of each win, a team total revenue function is also estimated,

$$Total\ Revenue = f(Winning, Team\ HR),$$

where *Total Revenue* is the team revenue generated in a given year from all sources (gate, media, stadium, and concession sales) in 1997 dollars. The inclusion of homeruns as a separate influence on team revenue tests whether baseball fans value the homerun in excess of the homerun's contribution to winning. Anecdotal evidence suggests that baseball fans, especially younger fans, value homeruns; for example, the annual All-star Game's homerun derby is very popular with baseball fans.<sup>6</sup>

The estimated revenue function indicates that each additional win is worth approximately \$1.6 million dollars and each homerun hit by the home team is worth \$275 thousand dollars.<sup>7</sup> The estimated marginal

<sup>6</sup> Additional anecdotal evidence to the value of the homerun is available from the 1998 baseball season. During that season, both Mark McGwire of the Saint Louis Cardinals and Sammy Sosa of the Chicago Cubs chased, and eventually surpassed, Roger Maris's 1961 record of 61 homeruns. While the Cubs ultimately secured a playoff spot, the Cardinals did not, finishing third in their division. However, the pursuit of Roger Maris's record increased attendance at games in which McGwire or Sosa played, perhaps above and beyond the homeruns' impact on winning percentage. If individuals attended games hoping to witness McGwire and Sosa hit another homerun, the total value of their homeruns would not necessarily be captured by their homeruns' indirect influence of winning percentage on revenue.

<sup>7</sup> Specifically, the estimated revenue function is  $Total\ Revenue = -80.91 + 1.60WINS + 0.146HRS$ , where total revenue is measured in millions. The t-statistics for the three parameter estimates, calculated as the parameter estimate divided by its standard error, are -3.22, 5.17 and 1.82, for the intercept term, the number of wins, and the number of homeruns, respectively.

revenue from each additional win allows for a calculation of the dollar value for each additional hit, walk, strikeout, etc., by multiplying each marginal product (in wins) by the marginal revenue of a win.

As reported in Table 1, an additional hit contributes approximately 0.016 wins, whereas an additional walk contributes approximately 0.03 wins. Given that the estimated value of an additional win is approximately \$1.6 million, an additional hit is worth approximately \$25,000 to the team owner (0.016 x \$1.6 million) and each additional offensive walk is worth approximately \$48,000 (0.03 x \$1.6 million). An additional homerun, however, has two impacts on a team's revenues. First, the impact of the homerun on team wins is worth \$144,000 (0.09 x \$1.6 million), but each homerun is also worth an additional \$130,326 in total revenues. Therefore from the point of view of team owners, each additional homerun is worth a total of \$274,326. Unfortunately, not every at-bat yields a hit, walk, or homerun. As indicated by the second column of Table 1, each additional offensive strikeout reduces wins by 0.034, and therefore reduces total revenue by \$54,400. The MRP of the remaining production categories are also reported in Table 1.

Aggregating the estimated values of a player's various production categories yields an estimate of the total MRP a player provides a team owner. As described in the previous section, a player's MRP is the most a team owner would be willing to pay a player. If player's have an idea of what they are worth to a team owner, and the player is in a position to negotiate their salary, the ultimate result of salary negotiations may be closer to a player's MRP than a player's reservation wage. For example, if a player had 50 hits, 8 homeruns, 20 walks, and 35 strikeouts, the player's estimated MRP would be

$$(50 \times \$24,936) + (8 \times \$274,376) + (20 \times \$48,372) - (35 \times \$48,372) = \underline{\underline{\$2,716,228}}$$

This would be the most a team owner would be willing to pay a player with these production capabilities. Whether such a player would actually be paid this much depends upon the outcome of the salary negotiation. However, what becomes increasingly clear with just a few additional hypothetical examples is that the *potential* salary, as reflected in MRP, can be much greater than most students suspect.

To compare how the estimated MRP compares to selected salaries, Table 2 reports the teams, salaries, production statistics, marginal product in terms of team wins, and the estimated MRPs, including the additional value of homeruns, for the ten highest paid baseball players in 1997. For further comparison, the production statistics of the average rookie player that earned the league minimum of \$150,000 in that year are also included.<sup>8</sup>

**Table 2: Top Ten Salaries in 1997 vs. Estimated Marginal Revenue Product**

Player	Team	Salary	H	HR	BB	SO	Extra Wins	Est. MRP <sup>a</sup>	Est. Owner Rents <sup>b</sup>
Albert Belle	White Sox	\$10,000,000	174	30	53	105	3.45	\$9,903,924.13	(\$96,075.87)
Cecil Fielder	Yankees	\$9,237,500	94	13	51	87	1.22	\$3,856,067.61	(\$5,381,432.39)
Barry Bonds	Giants	\$8,666,667	155	40	145	87	7.45	\$17,761,293.68	\$9,094,626.68
Jeff Bagwell	Astros	\$8,040,000	162	43	127	122	6.09	\$16,033,724.73	\$7,993,724.73
Ken Griffey Jr.	Mariners	\$7,885,532	185	56	76	121	6.11	\$17,968,056.61	\$10,082,524.61
Juan Gonzalez	Rangers	\$7,500,000	158	42	33	107	3.61	\$11,911,964.00	\$4,411,964.00
Mark McGwire	A's/Cardinals	\$7,150,000	148	58	101	159	5.18	\$16,769,980.03	\$9,619,980.03
Frank Thomas	White Sox	\$7,150,000	184	35	109	69	6.97	\$16,270,013.76	\$9,120,013.76
Matt Williams	Indians	\$7,150,000	157	32	34	108	2.69	\$8,978,413.99	\$1,828,413.99
Mike Piazza	Dodgers	\$7,000,000	201	40	69	77	6.21	\$15,775,570.95	\$8,775,570.95
Min. Wage Rookie		\$150,000	52	5	18	39	0.48	\$1,499,099.31	\$1,349,099.31

<sup>a</sup> Calculated using estimated MRP coefficients in Table 1.

<sup>b</sup> Calculated as Estimated MRP-Salary

The results in Table 2 provide an interesting basis for classroom discussion and support the intuition behind the contract zone depicted in Figure 2. Of the top ten salaried offensive players, only two seemed to have been "overpaid:" Albert Belle of the Cleveland Indians and Cecil Fielder of the New York Yankees. Albert Belle was paid just a bit more than the estimated value of his production in 1997 whereas Cecil Fielder

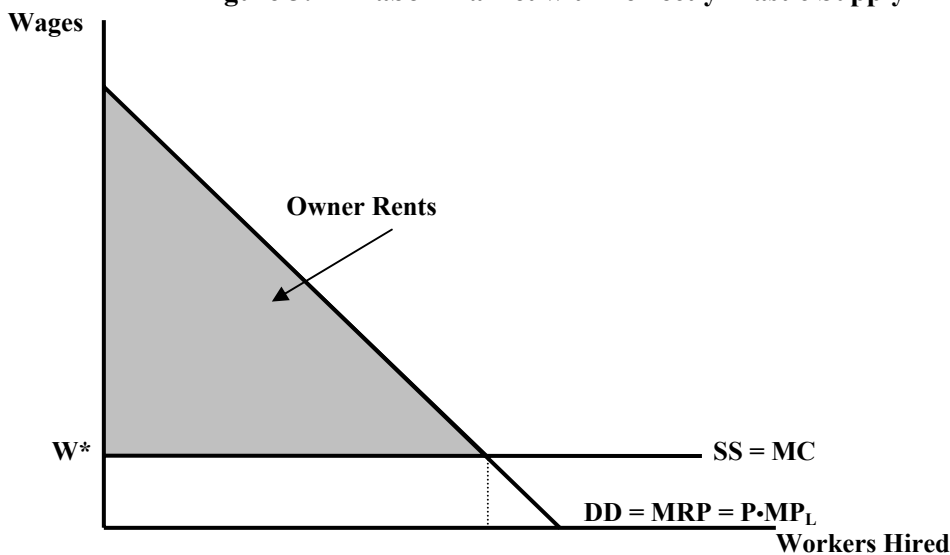
<sup>8</sup> Kirby Puckett was dropped from the list because he did not play in 1997 although he was paid a guaranteed salary of \$7.2 million. Puckett had to retire in 1994 after a career-ending eye injury.

was paid over \$4 million more. Of the remaining eight players, all generated positive rents for their team owners; the players were actually paid less than the dollars they generated for their team owner. Of the ten highest-paid players in 1997, the average salary was approximately \$8 million, but the average of owner rents was \$5,444,931. Thus, for the highest paid players in baseball in 1997, the on average owner rents were 74.5% of salaries paid. The estimated MRPs the highest paid players in baseball show that these players generate provide tremendous value to team owners and therefore player salaries may be more justified than students initially believe.

Why are the salaries for the best baseball players so much greater what some might think appropriate for playing a “child’s game?” One reason is that the revenues of major league baseball teams are very large; they are comprised of ticket sales, advertising, merchandise sales, concession sales and local and national media revenues. While baseball salaries are considerably higher than those of average workers, the salaries in professional sports are consistent with the theory that labor demand is derived from marginal revenue product. Team owners are not willing to pay more than a player’s production is worth and players are not willing to accept less than their reservation wage. There is nothing idiosyncratic to the professional baseball labor market except that players tend to negotiate for their salaries much more than in competitive labor markets (for a more in depth discussion see Rosen 1981).

As a counterpoint to the salaries and the value of production attributed to the highest paid players, Table 2 also reports the average production and value for a minimum wage player in 1997. In that year, the minimum wage for professional baseball players was \$150,000 per year but the average rookie generated much more than \$150,000 in revenue for team owners. As shown in the last row of Table 2, the average offensive rookie generated approximately \$1.3 million of surplus value to team owners. Thus, owner rents were approximately nine times the minimum salary.

**Figure 3: A Labor Market with Perfectly Elastic Supply**



Obviously, there is a dramatic difference in the rents team owners can extract from veteran players relative to rookies. In the context of the canonical market depicted in Figure 1, a minor alteration can explain the combination of relatively low salaries and high owner rents for rookie players. In Figure 3 it is assumed that the marginal cost of labor is low and the supply of labor is perfectly elastic at the league minimum of \$150,000. There are two ways to interpret the horizontal supply of labor. One is that at the given wage of \$150,000, there are sufficiently large numbers of people that would play professional baseball (most students would jump at the chance regardless of their ability). While in reality not everyone is qualified to play professional baseball, there are lots of people that could provide at least \$150,000 in total value to a team owner. However, of those that can generate the minimum amount of value to a team owner, team owners are interested in those players that will generate the most value, i.e., the highest quality players. Indeed, a high quality rookie might generate more revenue for a team owner than a seasoned veteran who might be paid much more. While this might seem unfair to many, this reality simply reflects the lack of market power held by first-year players.

**Table 3: Rent Distribution and Player Experience**

Player	Team	Years of Major League Experience <sup>a</sup>	Owner Rents as Percentage of Salary <sup>b</sup>
Belle, Albert	White Sox	8	-0.96
Fielder, Cecil	Yankees	12	-58.26
Bonds, Barry	Giants	11	104.94
Bagwell, Jeff	Astros	6	99.42
Griffey, Jr., Ken	Mariners	8	127.86
Gonzalez, Juan	Rangers	8	58.83
McGwire, Mark	A's/Cardinals	11	134.55
Thomas, Frank	White Sox	7	127.55
Williams, Matt	Indians	10	25.57
Piazza, Mike	Dodgers	5	125.37
Average		8.6	74.49
Correlation between Owner Rents and Years of Experience			-0.44
Average Minimum Wage Rookie		0	899.40

<sup>a</sup> Years of Major League Baseball experience up to, not including, the 1997 season.

<sup>b</sup> Calculated as (Estimated MRP-Salary)/Salary.

To explain why the top ten players are paid so much more than first-year players, the general structure of the professional baseball labor market is important to incorporate into a class discussion. Through 2004, a player is held to a reserve clause for the first six years of his career. The reserve clause ties the player to the franchise that holds their contract and acts to reduce the player’s market power. This shifts the distribution of rents to team owners by pushing rookie salaries closer to the reservation wage (or more likely the league minimum). After six years of major league experience a player can enter a competitive labor market and negotiate a contract with the team of his choice, usually for more money than he received while under the reserve clause. However, because rookie salaries are much closer to a player’s reservation wage, rents as a percentage of salary are much larger for rookies than for free agent players.<sup>9</sup>

Table 3 reports estimated owner rents as a percentage of actual salary for the ten highest-paid offensive players, the average minimum wage rookie player, and the years of experience for each player. It is evident that as the number of years of experience increases, the greater proportion of a player’s total value to the team owner is shifted to the player in the form of higher player salaries. Although the absolute levels of owner rents are greater for veteran players, owner rents as a percentage of salary are much lower for veteran players. The correlation between owner rents and player experience amongst the top ten paid players is -0.44, indicating that as a player’s experience increases, especially after six years of experience, the level of rents that a team owner can generate from a player declines. The reduction in rents as a percentage of salary is a direct result of the increased market power players obtain when they become free agents.

### An Out-of-Class Assignment

Having shown how to calculate estimated MRPs for the baseball players during the 1997 season, we also provide a prototype out-of-class project that often helps solidify the material for students. In the appendix, Figure 4a provides an example of a possible homework assignment with Figure 4b providing the answer key.

<sup>9</sup> The baseball player’s union agreed to the six year restriction on free-agency and therefore players that agree to an initial Major League Baseball contract explicitly agree to abide by the standing contract between the labor union and the baseball team owners. Those players who show considerable talent in their first few years of big-league experience can file for Final Offer Arbitration after three years. In FOA, the team owner and the player present one-time salary bids to an agreed-upon arbitrator. The arbitrator then chooses the team owner’s or the player’s offer as the salary the player will be paid. However, consistent with Figure 2, player’s who file for FOA are not motivated to ask for more than their MRP and the team owner is not motivated to offer less than the player’s reservation wage.



The project, as presented, asks students to access historical baseball statistics for several players using one of several possible on-line databases. Students are asked to calculate the estimated value of each player's season production and to compare this value with his 1997 salary. Students are then asked to compute the amount of rents that owners earned from each player and owner rents as a percentage of each player's salary.

From our key, it is apparent that most players' salaries were much less than the estimated MRP for the team owner. The exception is Danny Tartabull, who was injured early in the 1997 season but was paid a guaranteed salary of \$2 million. A possible extension to the homework questions provided in Figure 4a is to ask advanced students to "justify" this overpayment by the management of the Philadelphia Phillies.

One possible explanation is as follows. Based upon Tartabull's career averages in each production category (102.2 hits, 19.3 homeruns, 57.9 walks and 103.1 strikeouts), his expected value of production was \$2,815,460.27, more than his actual salary of \$2 million. Therefore, had Tartabull remained healthy for the entire season and performed near his career averages his value to the Phillies was expected to be greater than his salary. This particular outcome shows that hiring a player is not guaranteed to generate owner rents but, *importantly*, that Tartabull's 1997 salary was not irrational.

### **In-Class Discussion**

There are several avenues of discussion once the basic information has been conveyed to students. We present several possible questions appropriate for different levels of undergraduate instruction, although our suggestions are by no means exhaustive.

#### **Principles of Microeconomics**

- Why are MLB player salaries seemingly high?

Professional baseball salaries are high because the value of player production is high. As teams have several multimillion dollar sources of revenue and these revenues are impacted directly and indirectly by player production, player salaries are correspondingly high.

- Why are owner rents, as a proportion of overall salary, inversely related to the experience of a particular player?

Professional baseball has a limited reserve clause that binds a player to a particular team for the first six years of his major league career. The removal of the reserve clause allows teams to openly bid for a player's services. This combines to (a) increase the final salaries of the best players in the league and (b) to increase the market power that a player will have over any particular team. The increase in market power allows a player to negotiate a wage that is closer to the total value he offers a team, thereby reducing owner rents as a proportion of total salary.

- Why do owner rents tend to increase in total dollar value as the experience of a player increases?

As the best players in the major leagues gain experience, their skills may become more valuable to consumers. Fan loyalty, historical expectations, and other idiosyncratic player attributes can combine to make the best players in the league more valuable to consumers relative to players with less experience. Therefore, even though the best players are able to extract higher salaries from team owners, these players offer dramatically more value to consumers, thereby increasing the dollar value of owner rents.

- Is the labor market of professional baseball truly competitive?

Most likely this is not the case. However, it is instructive that the competitive model is able to describe the mechanics of the baseball players market as well as it does. Those players who are restricted by the reserve clause have effectively no market power to alter the wages

offered by team owners. This scenario would correspond to a perfectly elastic supply curve for younger players. As players are released from their reserve clauses, the best players may become less substitutable with other players and therefore enjoy a downward sloping demand curve for their services. The best players in the league may operate more as firms do in imperfect competition, e.g., monopolistic competition or oligopoly.

**Intermediate Microeconomics**

- What can one say about monopsony power and the minimum wage? Why is the minimum wage so “high” in baseball?

One would expect monopsony power to reduce the minimum wage, or at least limit its rapid increase. The minimum wage in MLB in 2002 was \$200,000 (approximately 10% of the average salary in the league) compared with the general minimum wage of \$5.25 per hour (approximately 30% of the average salary in the general population). As workers abilities increase, the ability for workers to extract greater rents from the labor market also increases. While highly skilled individual may be able to extract such rents on their own, lesser skilled players have benefited from the collective bargaining power of the baseball players’ union.

- What is the impact of increased market power of players on the monopsony power of the owners?

The market power of the players, which may be provided through solidarity with their players’ union or through the free-agency status of the player, partially offsets the monopsony power of the owners. Since monopsony power tends to reduce wages, while employee market power increases wages, it is ambiguous whether the market power of the players is able to offset the monopsony power of the owners, although the evidence presented here seems to indicate that it does not.<sup>10</sup>

- Is there a relationship between expectations and baseball salaries? If so, what is the relationship?

Expectations on the part of owners and players play a vital role in determining salaries. Players’ salaries are most often agreed upon before the season starts. Therefore, a player’s true MRP is determined after his salary has been determined. This might motivate team owners to push the price of players lower because of the inherent risk in setting the salary before productivity is known. On the other hand, players may actually be motivated to produce value for team owners greater than their salary in order to justify future salary increase.

- What role, if any, does the Player’s Union serve in the salaries of major league ball players?

This question is somewhat institutional in nature. The MLB players’ union tends to negotiate for rather general rules such as minimum wages, free agency, arbitration and pension plans. The individual players are left to their own skills and negotiating strengths to determine their wages. This is rather different than the way other unions operate, such as the United Auto Workers and the National Education Association, that negotiate strict wage structures for their members.

**Labor Economics**

- This exercise has measured owner rents as a proportion of the total wage bill. What would be required to estimate player rents?

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<sup>10</sup> Marburger (1996) estimates the combined effect of arbitration and free agency on baseball players’ salaries, while Scully (1995) describes player-earning profiles across several sports.

To estimate the rents earned by individual players, one would require player specific data with which to estimate the marginal cost of labor effort. Such data would be difficult to collect (few players would voluntarily provide accurate data) and many variables would be unmeasurable. For example, how exactly would one measure the opportunity costs for the best baseball players in the major leagues?

- How similar is the baseball labor market to other labor markets?

By comparing the baseball labor market to the labor market for medical doctors or primary school teachers, it becomes clear that many professions have a period of restricted labor rent collection, i.e. medical residencies or student teaching. However, in each case these periods of restriction are followed by an increased ability on the part of labor to extract rents.

### Conclusion

This paper provides an easily understood labor market in which to discuss the generation of rents and their relationship to the overall wage bill in a market. We have found that sports provide powerful examples that students are quick to relate to and are often eager to discuss. This paper provides a basic description of the mechanics of a perfectly competitive labor market including how equilibrium wages and employer rents are determined and then relates these mechanics to the professional baseball labor market.

We estimate the impact of various production statistics on wins in Major League Baseball during 1996 and 1997. We also relate team wins to total revenue from the same years. Combined, these results provide for an estimate of marginal revenue product to team owners; the most team owners are willing to pay for this product. For the ten highest-paid offensive players in the major leagues in 1997, we compare the estimated value generated to team owners with actual salary paid. With two exceptions, these players were paid less than the value they generated for team owners. Notwithstanding the temptation to label professional athletes' salaries as excessive, our simple estimates indicate that the large salaries in major league baseball can be defended given the value ballplayers generate for team owners. We compare the estimated owner rents to the salaries of the ten highest players and the average offensive rookie. This comparison indicates that owner rents as a percentage of the wage bill are inversely related to the experience of the player.

The market power of experienced players increases once they are released from the limited reserve clause. They are then able to dramatically shift the rents in the labor market towards themselves and away from team owners. These findings are useful points of departure for in-class discussion on the positive mechanics and normative implications of free and restricted labor markets. In our penultimate section, we have provided sample topics for in-class discussion for various levels of undergraduate economic instruction, additional topics are not difficult to generate.

### References

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