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Revenue sharing and within-team payroll inequality in Major League Baseball

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Abstract

Using data from the 2000 to 2012 Major League Baseball seasons, this article investigates how changes to revenue sharing in the 2007 collective bargaining agreement altered within-team payroll inequality. Results indicate that inequality within teams decreased after the 2007 bargaining agreement. This reduced inequity is concentrated among those teams that were already experiencing relatively higher levels of inequality. This indicates that changes to revenue sharing should help increase competitive balance within the league. Additionally, the reduction in inequality occurs only among hitters and not pitchers. These results highlight how collective bargaining can have heterogeneous effects on groups of workers despite there being no requirement of differential treatment.

Keywords

MLB, revenue sharing, earnings inequality, quantile regression

I. Introduction

This article uses data from the 2000 to 2012 Major League Baseball (MLB) seasons to analyse how changes made to revenue sharing in the 2007 collective bargaining agreement (CBA) altered within-team payroll inequality. From 1997 to 2006, team owners and player union representatives agreed to a form of revenue sharing that resulted in a regressive tax. Under the 1997 CBA, the marginal tax rate equalled 20% and 41% for high- and low-revenue clubs, respectively (Maxcy, 2009). The analogous rates in the 2003 CBA were 40% and 47%, respectively (Zimbalist, 2003). The regressive tax structure created an incentive for low-revenue teams to divest in player talent and not compete rigorously in the talent market, thereby potentially reducing competitive balance within the league (Maxcy, 2009). Due to concerns of growing competitive imbalance, the 2007 CBA modified the structure of revenue sharing to correct the incentive to divest in player talent. Changes to the mechanisms used to distribute funds resulted in a marginal tax rate equalling 31% for all teams (MLB, 2006).

Many view the modifications to revenue sharing in the 2007 CBA to be one of the largest changes made to the operation of MLB since the beginning of the century. To date, there has been no evaluation of the effects of this policy change. Results from this analysis should be of interest to sports researchers due to the potential implications for competitive balance. Revenue sharing's intent is to allow smaller market/revenue teams to invest in player talent and become more competitive. This may affect not only players' salaries but also team-level payroll inequality. Research shows that larger payrolls and lower levels of inequality increase team performance (Depken, 2000; Jewell and Molina, 2004; Annala and Winfree, 2011) and reduced payroll inequities are associated with increased individual player performance (Bloom, 1999).

These results will be of interest not only to sports researchers but also to those interested in industrial relations broadly defined. Unlike other industries, there is a large amount of detailed data available on firm/worker performance and worker salary for the professional sports industry. Studying MLB allows the ability to understand how negotiations made through collective bargaining can alter the salary structure within an industry. An additional advantage to studying MLB is the clear distinction made between different groups of workers, specifically hitters and pitchers. The analysis will focus on overall within-team inequality in addition to inequality experienced by hitters and pitchers, separately. This allows for an understanding as to how changes made to CBAs can have heterogeneous effects on different groups of workers despite there being no requirement of differential treatment.

II. Data and Methodology

The analysis sample includes players on teams' opening day rosters reported by USA Today from 2000 to 2012. Using a sample of players from opening day rosters is consistent with previous research on within-team payroll inequality (Jewell et al., 2004). The data used here come from USA Today, Doug's NBA and MLB Statistics and Rodney Fort's database.¹ The analysis begins by constructing yearly Gini coefficients for each team from

$$G_j = [2/(n_j^2 \bar{y}_j)] \sum_{i=1}^n i(y_{ij} - \bar{y}_j)$$

(1)

Here, y_{ij} is the real salary of player i on team j , \bar{y}_j is average team salary and n_j is the sample size. Following a similar methodology as Jewell et al. (2004), G_j is regressed on a set of variables that fall into three categories: team-specific, market-specific and time.² The general form of the equation is

$$G_{jt} = x'_{jt}\beta_1 + \beta_2 fan_{jt} + \beta_3 post2006 + \beta_4 T + u_{jt}$$

(2)

In Equation 2, x_{jt} contains team-specific measures including winning percentage, real revenue (measured in millions of dollars), a dummy variable equalling one if the team competes in the National League, average player experience and a cubic in average real salary (measured in millions of dollars). The variable fan_{jt} is the fan cost index and represents the team's market-specific variable. The index equals the real cost of four average-price tickets, two small draft beers, four small soft drinks, four regular-size hot dogs, parking for one car, two game programs and two least-expensive, adult-size adjustable caps.³ This index measures not only the potential size of the team's market but also the intensity of fan participation in the stadium itself.

Variables $post2006$ and T are time-related variables. The variable of interest, $post2006$, is an indicator equalling one during the years after 2006 and captures the effects of the 2007 CBA and the changes made to revenue sharing in MLB. The variable T is a time-trend, and u_{jt} is the time-varying error. Equation 2 is estimated using OLS three times, once when the Gini is calculated using salaries of hitters and pitchers combined, again when it is calculated only using salaries of hitters, and finally when the Gini is calculated using only salaries of pitchers.⁴ To see how modifications to revenue sharing affected team-level inequality at different points in the Gini distribution, the general form of Equation 2 is estimated also using quantile regression techniques.

III. Results

Table 1 presents descriptive statistics of the variables used in the analysis for the combined sample of hitters and pitchers before and after the changes made to revenue sharing. There are not many differences between periods; however, average team salary increases by \$152,000, and team revenues are \$20 million higher in the latter period. Figure 1 presents estimates of the average team-level Gini for hitters and pitchers combined and separately. Combined, there appears to be no trend in average inequality. The Gini fluctuates around 0.577, and there has been an increase in average inequality since 2007. Only examining the combined Gini masks some interesting differences between hitters and pitchers. Aside from 2000, 2007 and 2008, hitters experience more inequality on a team than pitchers do. Not only is there a difference in the level of inequality between the two groups but also inequality's trend differs. For hitters, the average team Gini increases significantly from 2000 to 2004, declines until 2007 and subsequently increases. The average team Gini for pitchers decreases from 2000 to 2004, increases until 2008 and subsequently declines.

Fig. 1. Average team Gini by year and player type

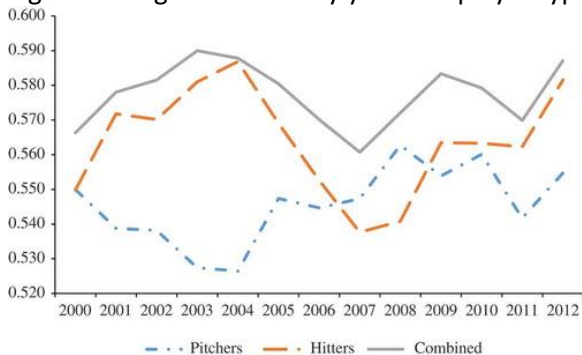


Table 1. Descriptive statistics of selected variables

	2000–2006	2007–2012
Gini coefficient	0.579	0.575
Average real salary	\$ 1,322,976	\$ 1,474,893

Winning percentage	0.500	0.500
Average experience	5.943	5.596
National League	0.533	0.533
Real revenue (\$1,000,000)	\$ 72.50	\$ 92.81
Real fan cost index	\$ 81.55	\$ 88.94

Source: Author's calculations from the data.

Tables 2–4 represent the results from Equation 2 for the combined sample, hitters and pitchers, respectively. The second column in each table represents results when using OLS to estimate Equation 2, and columns three through 11 show results from the quantile regressions at the deciles of the Gini distribution. The parameter estimate associated with *post2006* shows the effects of the 2007 CBA and the changes made to revenue sharing on within-team inequality. Focusing on column two of Table 2, the combined sample, it appears that the changes made to the 2007 CBA reduced inequality within teams, on average. When focusing on the quantile regressions, this reduction only occurs for those teams in the seventh, eighth and ninth deciles of the Gini distribution. In other words, the changes made to the 2007 CBA only reduced inequality among those teams that already had higher levels of payroll inequality. Research shows that lower levels of inequality are associated with greater team performance (Depken, 2000; Jewell and Molina, 2004; Annala and Winfree, 2011). Therefore, the changes to revenue sharing should help enhance competitive balance.

Table 2. Gini OLS and quantile regressions – combined

	OLS	1	2	3	4	5	6	7	8	9
Trend	0.000	0.001	0.001	0.001	-0.001	0.000	-0.001	0.001	0.002	-0.001
	(0.13)	(0.39)	(0.22)	(0.55)	(0.35)	(0.25)	(0.64)	(0.63)	(0.91)	(0.26)
Post 2006 = 1	-0.022	-0.024	-0.017	-0.029	-0.010	-0.017	-0.020	-0.034	-0.036	-0.026
	(2.21)**	(1.00)	(1.07)	(1.72)*	(0.86)	(1.42)	(1.50)	(2.49)**	(2.54)**	(2.15)**
Avg salary	0.352	0.416	0.303	0.356	0.356	0.353	0.305	0.255	0.235	0.322
	(4.10)***	(3.05)***	(3.57)***	(3.85)***	(4.38)***	(3.60)***	(3.15)***	(3.12)***	(2.44)**	(3.68)***
Avg salary ²	-0.162	-0.177	-0.135	-0.161	-0.157	-0.160	-0.141	-0.121	-0.118	-0.155
	(3.75)***	(2.35)**	(2.90)***	(3.00)***	(3.52)***	(3.07)***	(2.66)***	(2.81)***	(2.26)**	(3.26)***
Avg salary ³	0.023	0.024	0.019	0.023	0.022	0.023	0.020	0.017	0.017	0.022
	(3.42)***	(1.94)*	(2.32)**	(2.40)**	(2.88)***	(2.60)***	(2.22)**	(2.36)**	(1.91)*	(2.68)***
Winning percentage	-0.095	-0.060	-0.053	-0.053	-0.120	-0.113	-0.103	-0.147	-0.128	-0.109
	(2.15)**	(0.59)	(0.94)	(0.98)	(1.99)**	(2.04)**	(1.93)*	(2.96)***	(2.39)**	(2.37)**
Avg experience	-0.024	-0.022	-0.023	-0.025	-0.023	-0.026	-0.027	-0.020	-0.018	-0.023
	(6.83)***	(2.87)***	(4.37)***	(5.28)***	(5.63)***	(7.12)***	(7.73)***	(5.18)***	(3.63)***	(5.42)***
National League = 1	0.016	0.024	0.027	0.027	0.021	0.016	0.014	0.009	0.007	0.015
	(2.20)**	(2.55)**	(3.70)***	(3.90)***	(2.70)***	(3.31)***	(2.18)**	(1.23)	(1.07)	(2.48)**
Revenue (1,000,000)	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
	(0.72)	(0.90)	(0.00)	(0.17)	(0.75)	(1.39)	(1.94)*	(2.28)**	(1.77)*	(1.68)*
Fan cost index	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.04)	(0.01)	(1.19)	(0.87)	(0.87)	(0.73)	(0.85)	(1.26)	(0.71)	(0.07)
Constant	0.516	0.425	0.460	0.469	0.527	0.542	0.584	0.603	0.611	0.590
	(12.70)***	(4.95)***	(9.79)***	(8.22)***	(11.63)***	(10.04)***	(12.29)***	(14.24)***	(10.63)***	(12.19)***
R ²	0.20									
N	390	390	390	390	390	390	390	390	390	390

Notes: Dependent variable is team Gini index.

For the OLS regression, robust *t*-statistics clustered at the team level are shown in parentheses.

For the quantile regressions, *t*-statistics based upon bootstrapped SEs are shown in parentheses. Bootstraps are calculated from 100 repetitions.

p* < 0.1; *p* < 0.05; ****p* < 0.01.

Source: Author's calculations from data.

Table 3. Gini OLS and quantile regressions – hitters

	OLS	1	2	3	4	5	6	7	8	9
Trend	0.001	0.001	0.000	0.000	0.001	0.003	0.004	0.003	0.002	0.002
	(0.44)	(0.28)	(0.09)	(0.00)	(0.64)	(1.32)	(1.90)*	(1.71)*	(0.89)	(0.90)
Post 2006 = 1	-0.037	-0.039	-0.037	-0.023	-0.036	-0.041	-0.053	-0.055	-0.056	-0.054
	(2.81)***	(1.52)	(1.73)*	(1.23)	(2.11)**	(2.68)***	(3.74)***	(3.60)***	(2.92)***	(2.65)***
Avg salary	0.347	0.362	0.311	0.310	0.288	0.303	0.258	0.259	0.251	0.202
	(3.75)***	(2.13)**	(2.85)***	(5.04)***	(4.66)***	(4.51)***	(5.17)***	(4.72)***	(3.35)***	(2.73)***
Avg salary ²	-0.140	-0.135	-0.117	-0.127	-0.114	-0.117	-0.102	-0.111	-0.102	-0.078
	(3.27)***	(1.82)*	(2.30)**	(4.36)***	(3.82)***	(3.64)***	(4.17)***	(4.21)***	(2.77)***	(2.11)**
Avg salary ³	0.017	0.015	0.013	0.015	0.013	0.013	0.012	0.013	0.011	0.008
	(2.94)***	(1.67)*	(1.84)*	(3.83)***	(3.00)***	(2.85)***	(3.12)***	(3.32)***	(2.04)**	(1.53)
Winning percentage	-0.068	-0.013	-0.024	-0.021	-0.038	-0.086	-0.101	-0.111	-0.153	-0.083
	(1.24)	(0.09)	(0.21)	(0.24)	(0.51)	(1.80)*	(1.93)*	(2.24)**	(2.74)***	(1.35)
Avg experience	-0.025	-0.034	-0.029	-0.019	-0.024	-0.025	-0.025	-0.022	-0.026	-0.025
	(7.95)***	(4.02)***	(3.84)***	(4.63)***	(6.13)***	(7.67)***	(8.01)***	(6.69)***	(8.19)***	(8.21)***
National League = 1	0.017	0.031	0.034	0.022	0.027	0.024	0.022	0.012	0.010	0.000
	(1.95)*	(2.21)**	(3.10)***	(1.90)*	(3.39)***	(3.79)***	(3.15)***	(1.33)	(1.06)	(0.05)
Revenue (1,000,000)	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.001
	(1.32)	(1.07)	(0.86)	(0.82)	(0.70)	(0.76)	(1.33)	(2.88)***	(3.11)***	(2.49)**
Fan cost index	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.46)	(0.38)	(0.13)	(0.16)	(0.34)	(0.34)	(0.67)	(1.10)	(1.51)	(1.37)
Constant	0.479	0.371	0.432	0.418	0.480	0.522	0.564	0.558	0.616	0.659
	(8.83)***	(2.71)***	(5.81)***	(7.39)***	(8.33)***	(11.07)***	(13.57)***	(13.03)***	(10.39)***	(10.44)***
R ²	0.25									
N	390	390	390	390	390	390	390	390	390	390

Notes: Dependent variable is team Gini index.

For the OLS regression, robust *t*-statistics clustered at the team level are shown in parentheses.

For the quantile regressions, *t*-statistics based upon bootstrapped SEs are shown in parentheses. Bootstraps are calculated from 100 repetitions.

p* < 0.1; *p* < 0.05; ****p* < 0.01.

Source: Author's calculations from data.

Concerning the other variables in Table 2, National League teams have higher levels of inequality, on average, than American League teams, which indicates different institutional factors between the two divisions. In the American League, teams are required to invest in a designated hitter (DH), whereas there is no DH in National League games. Quantile regressions show that this effect is somewhat larger towards the bottom of the distribution. Increases in team winning percentage reduce team inequality, on average; this result is more pronounced for those teams that are in the top of the Gini distribution. Team revenues have no impact on payroll inequality, on average. However, there appears to be a positive and statistically significant effect towards the top of the Gini distribution. The fan cost index has no effect on within-team payroll inequality, suggesting that market-specific factors do not influence payroll inequality as suggested by Jewell *et al.* (2004).

An increase in average experience reduces team-level inequality. Players with at least 6 years of service time are eligible for free agency, which is associated with larger increases in pay since players can bargain with multiple teams and have their salary dictated by market forces (Hill and Spellman, 1983). Those with between 3 and 5 years of service time are eligible for final offer salary arbitration, which is also associated with larger increases in pay, particularly for those who file for arbitration (Hill and Jolly, 2014). The CBA has strict rules determining pay for younger players with less than 3 years of experience. Thus, as suggested by Jewell *et al.* (2004), as the average experience of a team increases, pay for an increasing number of players is dictated more by market forces as opposed to strict rules in the CBA, and overall inequality falls. Finally, the estimated parameters associated with the cubic in average salary show that a team's inequality increases, decreases and then increases again as average salary rises, which is consistent with results in Jewell *et al.* (2004).

Table 3 shows that modifications made to revenue sharing reduced inequality for hitters, on average. The effect is concentrated in the middle and top of the Gini distribution and increases, in absolute value, when moving from the fourth to the ninth deciles. Many of the other variables used in the analysis have similar effects on inequality as seen in Table 2. Interestingly, results in Table 4 indicate that the changes made to the 2007 CBA did not affect team-level inequality for pitchers. This finding highlights the idea that uniform regulations within CBAs can have heterogeneous effects on different groups of workers. The other independent variables shown in Table 4 have similar effects on team-level inequality for pitchers as those found in Table 2 for the combined sample.

Table 4. Gini OLS and quantile regressions – pitchers

	OLS	1	2	3	4	5	6	7	8	9
Trend	-0.003	-0.001	-0.002	-0.001	-0.003	-0.004	-0.003	-0.003	-0.004	-0.003
	(1.17)	(0.27)	(0.87)	(0.41)	(1.11)	(1.69)*	(1.72)*	(1.34)	(2.12)**	(1.26)
Post 2006 = 1	-0.001	0.011	0.013	0.002	-0.004	0.006	-0.006	-0.012	-0.001	-0.016
	(0.11)	(0.56)	(0.70)	(0.08)	(0.21)	(0.36)	(0.44)	(0.89)	(0.07)	(0.79)
Avg salary	0.504	0.414	0.431	0.440	0.445	0.466	0.541	0.501	0.657	0.628
	(4.26)***	(2.01)**	(3.42)***	(3.01)***	(3.08)***	(3.42)***	(4.41)***	(4.24)***	(4.83)***	(3.45)***
Avg salary ²	-0.240	-0.176	-0.188	-0.198	-0.199	-0.225	-0.274	-0.250	-0.343	-0.341
	(3.68)***	(1.31)	(2.02)**	(1.89)*	(1.99)**	(2.39)**	(3.17)***	(2.91)***	(3.52)***	(2.75)***
Avg salary ³	0.034	0.023	0.025	0.026	0.026	0.032	0.041	0.037	0.055	0.059
	(3.09)***	(0.88)	(1.23)	(1.15)	(1.23)	(1.57)	(2.21)**	(1.92)*	(2.55)**	(2.24)**
Winning percentage	-0.129	-0.170	-0.112	-0.179	-0.119	-0.107	-0.080	-0.040	-0.062	-0.134
	(2.18)**	(1.82)*	(1.28)	(2.14)**	(1.60)	(1.49)	(1.28)	(0.55)	(0.76)	(1.44)
Avg experience	-0.024	-0.020	-0.025	-0.022	-0.027	-0.024	-0.027	-0.027	-0.026	-0.026
	(6.79)***	(2.39)**	(4.41)***	(3.93)***	(6.15)***	(5.19)***	(5.42)***	(6.21)***	(5.22)***	(4.90)***
National League = 1	0.024	0.032	0.020	0.022	0.032	0.026	0.025	0.027	0.020	0.014
	(2.77)***	(2.52)**	(1.76)*	(1.75)*	(2.97)***	(3.24)***	(3.40)***	(3.26)***	(2.38)**	(1.45)
Revenue (1,000,000)	0.001	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(1.22)	(0.36)	(0.41)	(0.88)	(1.42)	(2.09)**	(2.64)***	(2.96)***	(1.80)*	(1.28)
Fan cost index	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
	(0.09)	(0.65)	(1.58)	(0.23)	(0.12)	(0.19)	(0.08)	(0.33)	(1.03)	(1.65)
Constant	0.414	0.339	0.388	0.403	0.433	0.425	0.412	0.416	0.406	0.523
	(8.82)***	(3.15)***	(6.19)***	(5.07)***	(6.08)***	(7.05)***	(8.08)***	(8.10)***	(5.68)***	(5.25)***
R ²	0.28									
N	390	390	390	390	390	390	390	390	390	390

Notes: Dependent variable is team Gini index.

For the OLS regression, robust *t*-statistics clustered at the team level are shown in parentheses.

For the quantile regressions, *t*-statistics based upon bootstrapped SEs are shown in parentheses. Bootstraps are calculated from 100 repetitions.

p* < 0.1; ** *p* < 0.05; * *p* < 0.01.

Source: Author's calculations from data.

IV. Conclusions

This article uses data from the 2000 to 2012 MLB seasons and shows that changes made to revenue sharing in the 2007 CBA reduced team-level inequality, on average. This reduction is concentrated among hitters and those teams already experiencing relatively high levels of inequality. This overall decrease in within-team payroll inequality should help to increase on-field performance. Additionally, there is no effect on team inequality for pitchers. The different results for hitters and pitchers suggest that uniform regulations within CBAs can have heterogeneous effects on different groups of workers. Examining the 2007 CBAs effect on competitive balance in the league and explaining the differences between hitters and pitchers would be interesting areas for future research.

Acknowledgements

I thank J. Richard Hill for assisting in data collection and providing comments on an earlier draft.

Notes

- 1 The URLs for the *USA Today* website, Doug's Statistics and Rodney Fort's database are <http://usatoday30.usatoday.com/sports/salaries/index.htm>; <http://www.dougstats.com> and <https://sites.google.com/site/rodswebpages/codes>, respectively.
- 2 Jewell *et al.* (2004) analyse the determinants of within-team payroll inequality from 1985 to 2000.
- 3 The fan cost index is calculated by Team Marketing Report and can be found at Rodney Fort's database.
- 4 Equation 2 was re-estimated with team-level fixed-effects and again with team-level random-effects. Results are available upon request. The quantitative results are little changed and the qualitative results remain the same.

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