What Explains Labor's Declining Share of Revenue in Major League Baseball?

John Charles Bradbury
Kennesaw State University

Department of Economics, Finance, and Quantitative Analysis
560 Parliament Garden Way, NW
Kennesaw, GA 30144
E-mail: jcbradbury@kennesaw.edu
Phone: 470-578-2369

Abstract

Since the early-2000s, the share of revenue going to Major League Baseball players has been diminishing similar to the decline of labor's share of revenue observed in the US economy. This study examines potential explanations for the decline in baseball, which may result from related factors and provide information relevant to explaining this macroeconomic trend. The results indicate that the value-added from non-player inputs, collective bargaining agreement terms, and related changes in the returns to winning contributed to the decline of players' share of income. Competition from substitute foreign labor and physical capital are not associated with the decline in labor's share of income in baseball.

JEL Classification: J30, J50, Z22

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1. Introduction

The introduction of free agency in Major League Baseball (MLB) in 1976 eliminated the "reserve clause" that restricted player compensation, and thus MLB players' share of League revenue greatly expanded. But after the initial increase, the players' share has fluctuated. Following findings of owner collusion during the 1980s, players saw a dramatic rise in their share of revenue in the 1990s before experiencing a general decline in the early-2000s to the present. This recent decline is a curiosity given the observed stability of labor's share of income in the overall economy until recently.

Labor's share of income has long been viewed as a near constant by economists; however, like it has in baseball, workers' share of income aggregated across all industries has been falling since the beginning of the 21st century, which has prompted economists to search for explanations. The complex economy makes identifying the contributions among many factors to this sudden decline difficult. While several hypotheses propose explanations for the declining share of labor, none have been able to provide a complete explanation.

Revenue and compensation data from MLB provide an opportunity to examine changes in labor's revenue share in a controlled environment. MLB's output is entertainment, which is highly valued by consumers, and its revenue has grown monotonically, with an average annual growth rate of 7.5 percent since 1990. As a spectator sport, its product is labor-intensive, which limits the extent to which capital can substitute for labor to a greater degree than most industries. Thus, an analysis of the decline of MLB's labor share may aid in understanding the potential causes of the economy-wide decline in labor's share by examining an industry that has experienced a similar decline despite minimal labor-capital substitution, increased importation of labor, and is unionized.

Section 2 presents stylized facts regarding labor's declining share in MLB and the economy and posits potential explanations. Section 3 investigates the hypotheses empirically. Section 4 concludes the paper with a discussion of the findings. The analysis indicates the that changes to the returns to winning, which were influenced through collectively-bargained rules, and the emergence of profitable technology-driven non-player inputs provide the best explanations for the decline in players' share of revenue. The substitution of

foreign labor or changes in the return to stadium capital do not appear related to the share of income going to labor.

2. Stylized Facts and Potential Explanations

Figure 1. MLB and US Labor Share of Income (1990-2015)

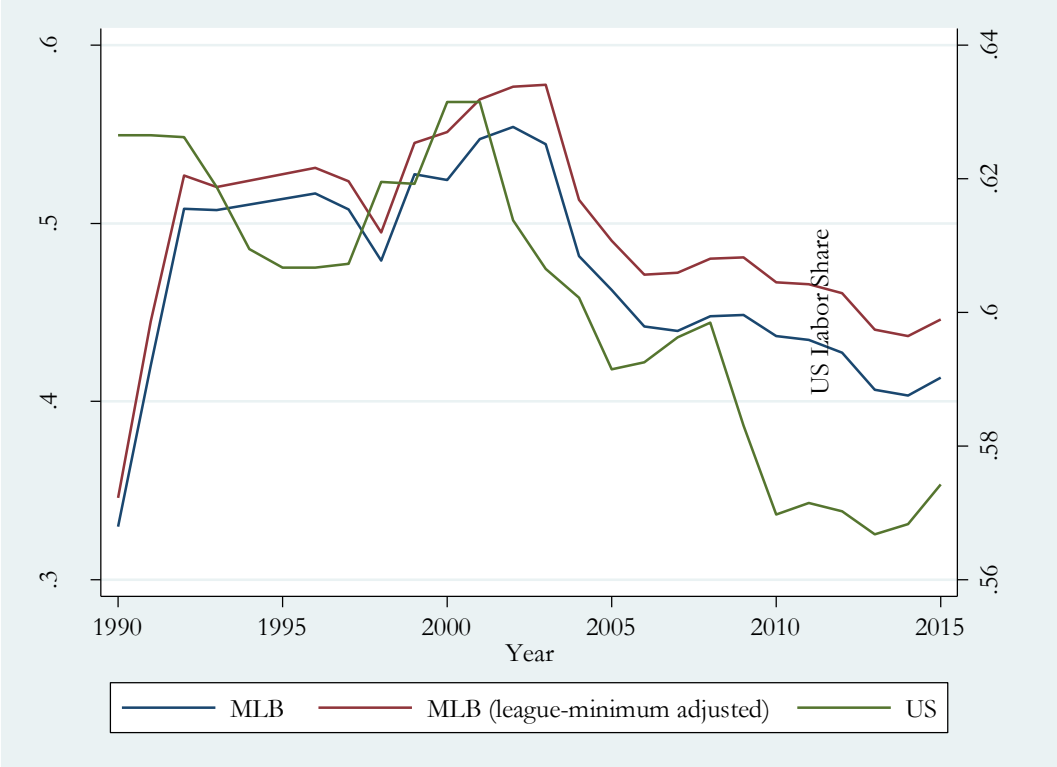

Figure 1 presents two measures of players' share of income in MLB and all workers' share of income for the entire US economy, as reported by US Bureau of Labor Statistics from 1990 to 2015 (excluding the strike years of 1994 and 1995 for MLB). The players' share of income is measured simply as total salaries paid to players divided by total MLB revenue by year. Salaries of players on opening day rosters are made publicly available by the players' union (Major League Baseball Players Association or MLBPA); however, salaries of players added after the season begins do not have listed salaries. Teams have incentives to limit MLB roster membership as the season opens to take advantage of collectively-bargained salary restrictions on pay that are

a product of service time on a roster, and thus excluding players for whom salary information is unavailable may bias the labor share downwards. The number of players with unreported salaries in the sample did increase substantially from 21 percent in the 1990s to 36 percent in the 2000s; therefore, it is possible that the decline in labor's share is an artifact of teams' increased use of players without recorded salary.

To address the reporting issue, I develop an adjusted-measure of labor share that proxies for the wages of players whose salaries are not reported. For the most part, players added during the season are young marginal player who are paid a pro-rated share of the league-minimum salary—which ranged from $100,000 (1990) to $507,500 (2015) per season during the sample—for the days that they were on a MLB roster. Identifying days on an MLB roster is difficult, because players on the roster do not always appear in games. Therefore, I identified every MLB player who appeared as a hitter or a pitcher in each year who did not have a recorded salary, and I assigned these players the league-minimum salary for that year when calculating labor's share of MLB revenue. This method overstates the level of compensation paid; however, the positive bias of this correction ensures that the reduction in the labor share is not an artifact of teams using more players with unreported salaries.

The reported and league-minimum-corrected salary shares in Figure 1 show the two estimates track closely together, with the league-minimum-corrected salary shares being slightly above the uncorrected salary shares. Though there does not appear to be any bias in reporting that could make the players' share appear to be declining, I use the corrected share for the remainder of the analysis to remove this potential bias. It is important to note that the players' share does not cover all of labor's share of the baseball industry, as it does not include the compensation of non-players (front office management, coaches, medical personnel, game-day and facility operations staff, etc.) or minor-league players who are paid by MLB franchises; thus, the macro-economic and MLB players' shares are not directly comparable.[1] However, changes in the players'

[1] Comparisons to other North American professional sports leagues as a measure of labor's bargaining strength are also inappropriate, because they lack the extensive minor-league system that is funded almost entirely by MLB.

share heavily affects labor's overall share of income in MLB, and, because it is measurable over time, it is useful for the analysis.

Since 2000, labor's share of income in the U.S. economy declined from approximately 63 percent to 57 percent in 2015. MLB players' share fell from 57 percent in the early-2000s to 44 percent (54 to 41 percent using the uncorrected players' share). Figure 1 shows a similar reduction of US and MLB players' share of income over the period. Changes in the players' share tend to mirror fluctuations in the US labor share with a lag, possibly indicating responses to similar phenomena. Baseball players frequently work with long-run contracts, which would slow down adjustments to external forces that might adjust labor's share. Therefore, if the same factors that affect other sectors also affect MLB, then it would not be surprising for MLB salaries to adjust slower.

Several hypotheses have been put forth and examined as potential explanations for the declining labor share in the US, generating a recent large literature on the topic. Elsby, Hobijn, and Şahin (2013) provides a thorough survey of proposed explanations for the economy-wide decline in labor's share of income. First, changes in the measurement of proprietor's share of income have resulted in income previously credited to labor is now being shifted to owners, thus overstating the decline in labor's share. Approximately, one-third of the decline in US labor share is attributable to this change. This explanation is not applicable to MLB, because ownership and labor of teams remain separate.

Second, though the aggregate labor share was relatively stable through much of the 20th century, intra-industry fluctuation in labor shares was somewhat common, thus the perceived stability in labor's share is partly attributable of changes in labor shares in sectors cancelling out in aggregate. Therefore, changes in the revenue-generating structure of MLB and how they might affect labor's share are worth examining. If players' marginal revenue products declined during this period, then a decline in labor's share is expected.

Third, declines in unionization in the US economy may explain a decline in the labor share through reduced employee bargaining power. Baseball remained a unionized industry during this period of analysis, but changes in bargaining strength may have played a role in the players' share of revenue. The identifiable and

discrete implementation of collective bargaining agreements (CBAs) allow for comparison across agreements, and thus sheds light on the role of bargaining strength in wage determination.

Fourth, the offshoring of labor has allowed US industries to substitute cheaper foreign workers for domestic labor, putting downward pressure on wages. Throughout much of its history, MLB teams have relied mostly on domestic players. During this period, baseball experienced an increased importation of labor, largely from Latin America and Asia, and foreign players now account from more than one quarter of MLB players. Thus, the increased supply of baseball talent offers another possible pathway for the reduction in the players' share of revenue.

Fifth, technological innovation allowing physical capital and non-player inputs to substitute for labor may have lowered the returns to labor throughout the economy. As a spectator sport, the capital-to-labor ratio has remained largely stable; however, changes in the value of non-labor inputs, such as stadiums and consumption through broadcast media may contribute to fluctuations in the returns to labor.

3. Empirical Analysis

a. Changes in the Baseball Industry

I begin by examining changes in the baseball industry that have affected labor's share through the valuation of player contributions. The earliest studies of the economics of sports leagues have identified winning as the chief determinant of revenues for profit-maximizing teams. Fans desire to observe and be associated with successful teams, and thus teams that win more garner more consumers which increases revenue. Scully (1974) uses winning as the sole determinant of team revenues, and further studies (e.g., Scully (1989), Krautmann (1999), Bradbury (2010)) have done the same. Player marginal revenue products fluctuate with the returns to winning; therefore, changes in the value of winning ought to affect the share or revenue accruing to players.

Equation 1 presents the empirical model which was developed by Bradbury (2017), which examines the determinants of revenue in the four major North American sports leagues and identifies the relevant factors

for determining league revenue. The study finds that on-field success through winning and playoff participation, market size as measured by the population, and the age of the stadium are the main determinants of revenue for MLB teams.

$$(1)\quad Revenue_{it} = \alpha + \Phi\mathbf{Winning}_{it} + \beta_1 Population_{it} + \beta_2 Stadium_{it} + \beta_2 Yankees_{it} + \tau\mathbf{T}_{it} + \varepsilon_{it} + \nu_i$$

Revenue is the total revenue team *i* generates in year *t*, measured in 2015 dollars.[2] Revenue data were published in *Financial World and Forbes* and have previously been used in economic studies of sports leagues.[3] Winning is a vector of on-field success that contains three variables, run differential, run differential squared, and the lag of run differential. The run differential is highly correlated with winning and has the added advantage of further distinguishing between teams with similar winning percentages.[4]

Population controls for the market size of the host city using the metropolitan statistical area population, which has been shown to be positively correlated with MLB team revenue. Stadium is the reciprocal of stadium age (year of observation – year of opening +1). The reciprocal transformation provides the best fit of the model and conforms to the theoretical strong-but-diminishing novelty effect of a new stadium. Yankees controls for the unique revenue effects experienced by the New York Yankees that are not explained by the included explanatory variables. T is a vector of year effects, ε is a standard error term, and ν is a franchise-specific error term. All estimates are generated using the Baltagi and Wu (1999) random-effects estimator, which controls for identified serial correlation.[5] Table 1 lists the summary statistics.

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[2] Dollar values are converted to 2015 MLB revenue values. Thus, changes in team revenue reflect changes in explanatory variables after controlling for the growth in league revenue.

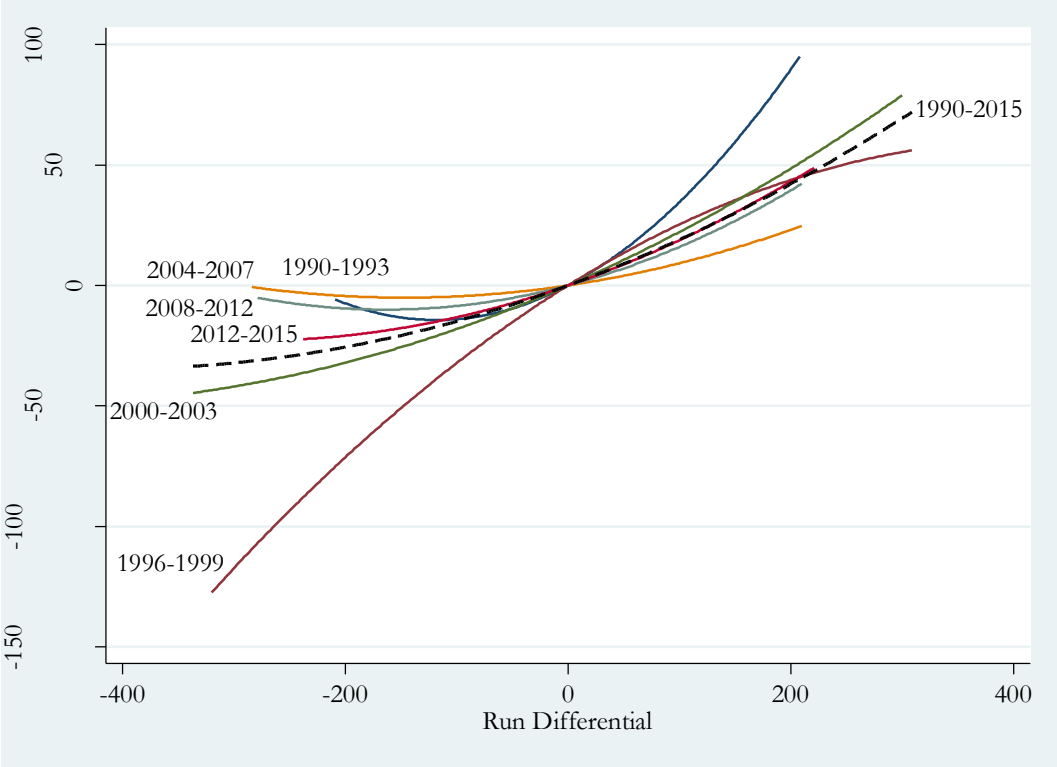
[3] For example, see Berri, Leeds, and von Allmen (2015), Bradbury (2010), and Depken (2006). Data from various years, *Forbes* observations culled from internet searches of cached pages using the Internet Archive: Wayback Machine (https://archive.org/web/). *Financial World* observations from Papas, Business of Baseball Pages (http://roadsidephotos.sabr.org/baseball/). Data from both sources was compiled annually by Michael Ozanian.

[4] Postseason participation is excluded for this analysis for simplicity, and any playoff effects are captured through the run differential variables. Though postseason participation is associated with enhanced revenue, it is highly correlated with winning, which complicates measuring the impact of on-field success from year to year. Estimates produced using winning directly are similar to the results using run-differential.

[5] Using the appropriate diagnostic tests, Bradbury (2017) determines random effects is the appropriate estimator; however, the analysis provides fixed-effects estimates that, unsurprisingly, produce similar results. In addition, other functional forms and variable specifications were examined to identify the best empirical model, which serves as the form used in this paper.

To measure the change in the determinants of revenue over time, I estimate Equation 1 using four-year increments as well as a single specification for the entire sample. The four-year increments provide sufficient sample size variation for panel analysis and produce exactly six separate estimates over the sample, excluding the strike-shortened 1994 and 1995 seasons which are difficult to use in this comparison because revenue data derive from partial seasons.[6] Table 2 presents the results. The quadratic and lagged success variables make the interpretation of the raw coefficient estimates difficult; therefore, Figure 2 presents the estimates graphically by four-year increments and as a whole.[7]

Figure 2. Returns to Wining in MLB by Era



The estimates show that the returns to winning are positive and increasing in all but one period (1996-1999). Rottenberg (1956) and Neale (1964) make the case theoretically that the returns to winning ought to diminish,

[6] Estimates using shorter and longer increments showed similar responses.
[7] Estimates generated using the quadradic estimate of the current score differential in the present year and the discounted present value of score differential in the following year, based on the average revenue growth of the MLB.

resulting in competitive balance in sports leagues. Diminishing returns are a common assumption in the sports economics literature, but this assumption does not have strong empirical support and is not supported by these estimates.

The one exception in this analysis (1996-1999) is consistent with findings presented in Solow and Krautmann (2007), which uses different empirical methods to examine a similar time period and identifies diminishing returns to winning. One notable difference during this era was the existence of a "luxury tax" from 1997 to 1999 that required the top-five teams in payroll to pay a 35-percent (34 percent in 1999) tax on salary amounts above the mid-point of salaries between the fifth- and six-highest team payrolls. Unlike the version of this tax that was reintroduced in 2003—which included nominal salary thresholds so high that few teams approached and taxed overages at a mostly lower rate—the top-five payroll teams (which were successful in generating wins) faced this steep tax every year by decree, which necessarily reduced the returns of winning among the best teams in the league. Thus, the finding of diminishing returns is likely a product of this brief era and it institutions and not a product of consumer demand for competitive balance, as hypothesized by Rottenberg (1956) and Neale (1964).

In general, it appears that the returns to winning are positive and increasing, a result that is also identified in basketball and hockey (Bradbury 2017). This finding is consistent with evidence that finds little effect of competitive balance the demand for sports (e.g., Berri, Schmidt, and Brook (2007) and Coates, Humphreys, and Zhou (2014)).

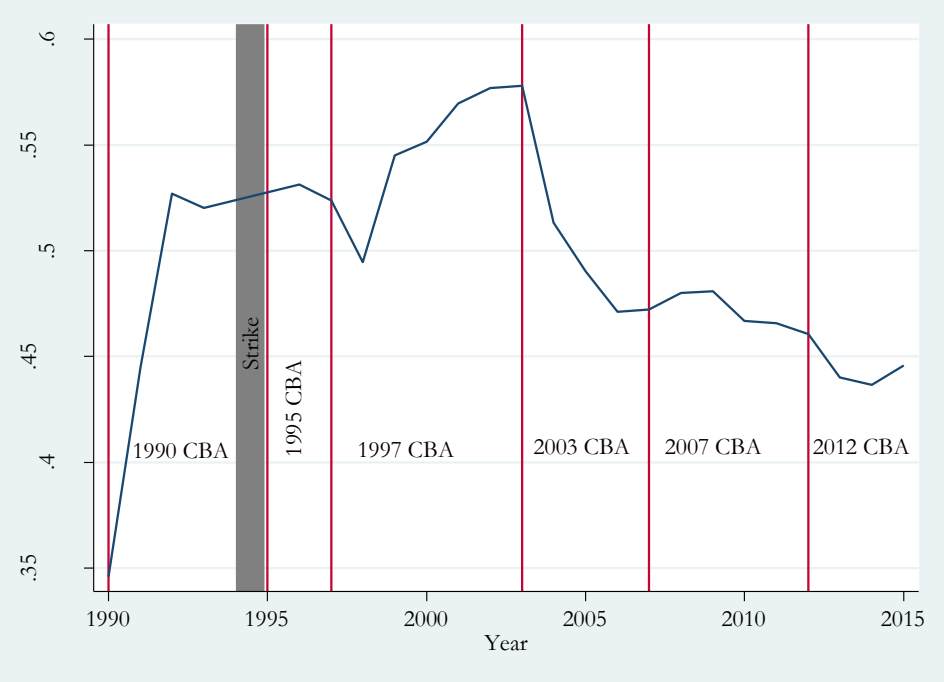
Over time, the returns to winning declined relative to the early 1990s, reaching their lowest level in the 2004-2007 period, and then improving from 2008 to 2015. A decline in the returns to winning means that player marginal revenue products (after adjusting for league revenue growth) were declining, and thus labor's share should be expected to decline. Therefore, the reduction in the returns to winning may partially explain some of the decline of labor's share of revenue. These periods loosely correspond with collective bargaining agreements (CBA), which are examined explicitly in the following subsection.

b. Union Influence through Collective Bargaining

MLB's relationship with its players and their union during the past four decades has been contentious at times—resulting in two major in-season labor strikes (1981 and 1994-1995) and findings of owner collusion in the latter-half of the 1980s—but the relationship has been mostly peaceful in reaching collective bargaining agreements without a work stoppage since 1995.

Figure 3 presents the players' share of revenue by year, separated by CBA. A sharp rise in labor's share followed the 1990 CBA, which was signed following a contentious battle with MLB owners that concluded with arbitration findings that owners colluded to restrict free agent salaries. Changes implemented with the new agreement, as well as a market free of collusion, were associated with a rapid rise in the players' share of revenue. This rapid shift toward players likely made owners more willing to reverse the trend when the CBA expired following the 1993 season. The owners demanded a salary cap for teams, which resulted in a strike that would cancel in portions of the 1994 and 1995 seasons. The strike would come to an end just prior to the 1995 season and a temporary CBA in 1995 governed MLB similar to the 1990 agreement until the 1997 CBA.

Figure 3. MLB Labor Share by Collective Bargaining Agreement (1990-2015)



Maxcy (2009) and Hill and Jolly (2017) find the revenue sharing components of particular CBAs, intended to improve competitive balance, affected player compensation, which would affect the players' share of revenue. As poor teams receive revenue sharing when losing and successful teams must transfer additional revenue generated by further winning, the returns to winning decline. The CBAs involve complicated revenue-sharing plans with luxury taxes on high payroll teams (that are difficult to disentangle), thus the following descriptions revenue sharing arrangements in the CBAs are general.

The 1997 CBA introduced revenue sharing with an intended net transfer value of $70 million (approximately three percent of MLB revenue in 1997). The collection and distribution involved a complicated "split pool" distribution—20 percent of net local revenue was contributed to a common pool and phased-in an equal distribution of 75 percent of revenues to all teams, with the remaining 25 percent allocated to below-average revenue teams. The 1997 agreement also imposed a luxury tax on payroll expenditures over a certain relative threshold (discussed above). The tax was 35 percent in 1997 and 1998, 34 percent in 1999, and was not in force from 2000 to 2002. Maxcy (2009) argues that perverse redistributive incentives created by the 1997 CBA resulted in low revenue teams divesting in talent. Though revenue sharing lowered the returns to winning, it was not associated with a diminishment in labor's share of revenue. MLB's revenue grew at a relatively high 12.2 percent annual rate during this time period, which may have made owners more willing to pay for player-talent.

The 2003 CBA greatly expanded the revenue sharing plan with an intended net transfer value of $248 million (approximately 6.4 percent of MLB revenue in 2003) with a straight pool collection and redistribution of 34 percent of net local revenue. A luxury tax was reinstituted, beginning with a tax rate on above-threshold payroll expenditures at 22.5 percent for a first-time overage (17.5 percent in 2003), 30 percent for a second overage, and 40 percent for three or more overages. However, the payroll threshold was only exceeded by three teams (Boston Red Sox, Los Angeles Dodgers, and New York Yankees) during this CBA period. MLB revenue also grew at a more modest (relative to the previous period) 8.8 percent growth during this time. The implementation of the 2003 CBA coincided with a rapid decline of labor's share of income, which indicates a significant role in the CBA in determining labor's share. This finding is also consistent with Maxcy

(2009), which argues that the 2003 CBA amplified the incentives of low-revenue clubs to divest in talent that was less valuable with revenue sharing.

The 2007 CBA reversed course and lowered revenue sharing contributions from 34 to 31 percent of local net revenue and maintained the escalating luxury tax rates, which were paid by only three clubs (Boston Red Sox, Detroit Tigers, and New York Yankees) during the CBA period. MLB revenue growth declined to 4.5 percent during this period, which was its lowest growth rate during the sample. During the 2007 CBA, the rate in the decline of labor's share of revenue slightly increased following its implementation before decreasing. The decline in labor's share stalled and was stabilized relative to the previous period. This is consistent with the observation of Hill and Jolly (2017) that the 2007 CBA was associated with increased player salaries following the lowered revenue sharing tax rate.

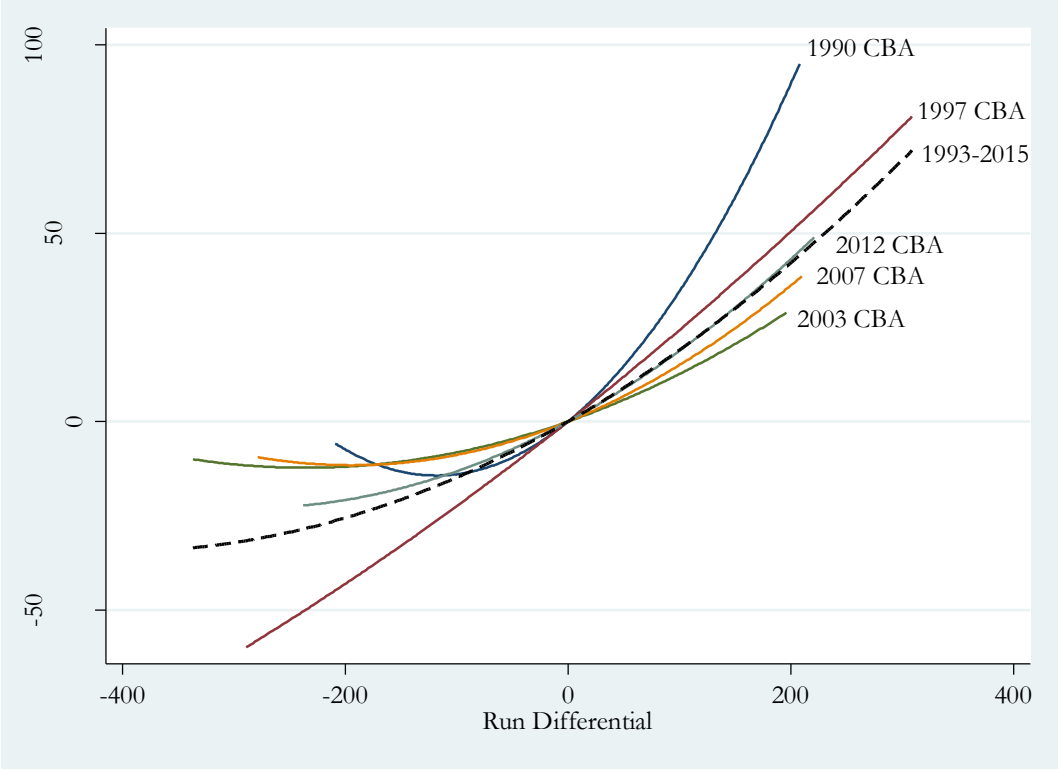
The 2012 CBA returned to the revenue sharing contributions rate to 34 percent of net local revenue, and included rules for revenue sharing recipient eligibility with stipulations that a minimum of proceeds be spent on player payroll to require reinvestment of revenue-sharing funds. Luxury tax contributions were lowered for first-time overages to 17.5 percent in 2013, and four or more threshold overages were taxed at 42.5 percent (2012) or 50 percent (2013 to 2016). Average MLB revenue growth was 7.2 percent during this period. The players' share further declined.

Overall, fluctuations in labor share corresponded with changes in revenue sharing as predicted. Using the same empirical method employed in the previous section for the four-year increments, I estimate the impact of winning on revenues by CBA cohort. If CBA rules lowered the value of winning, then the returns to winning (Revenue includes revenue sharing proceeds/contributions) then the revenue functions should adjust accordingly to reflect the change. Increases in revenue sharing should lower the returns to winning, lowering the marginal revenue product of player contributions to winning, and thus lower the players' share of revenue. Table 3 reports the full regression results, and Figure 4 presents the estimated returns to winning graphically. I further estimate the returns to winning during the entire sample, using indicator variables for CBAs as well as interaction terms with score differential to denote changes in returns to winning.

The estimates show a decline in the returns to winning after the implementation of the 1997 CBA, and that the returns to winning fell to their lowest level during the 2003 CBA, which imposed the greatest level of revenue sharing. Revisions of the CBA in 2007 and 2012 were associated with increased returns to winning, relative to the 2003 CBA; however, returns remained below the 1997 CBA level.

In summary, the evidence indicates a strong role for collective bargaining between the players' union and the owners in determining the players' share of revenue. However, not all of the changes in revenue can be attributed to changes in the CBA terms, as changes in the market value of winning (discussed in the preceding subsection) may have contributed.

Figure 4. Returns to Winning in MLB by Collective Bargaining Agreement



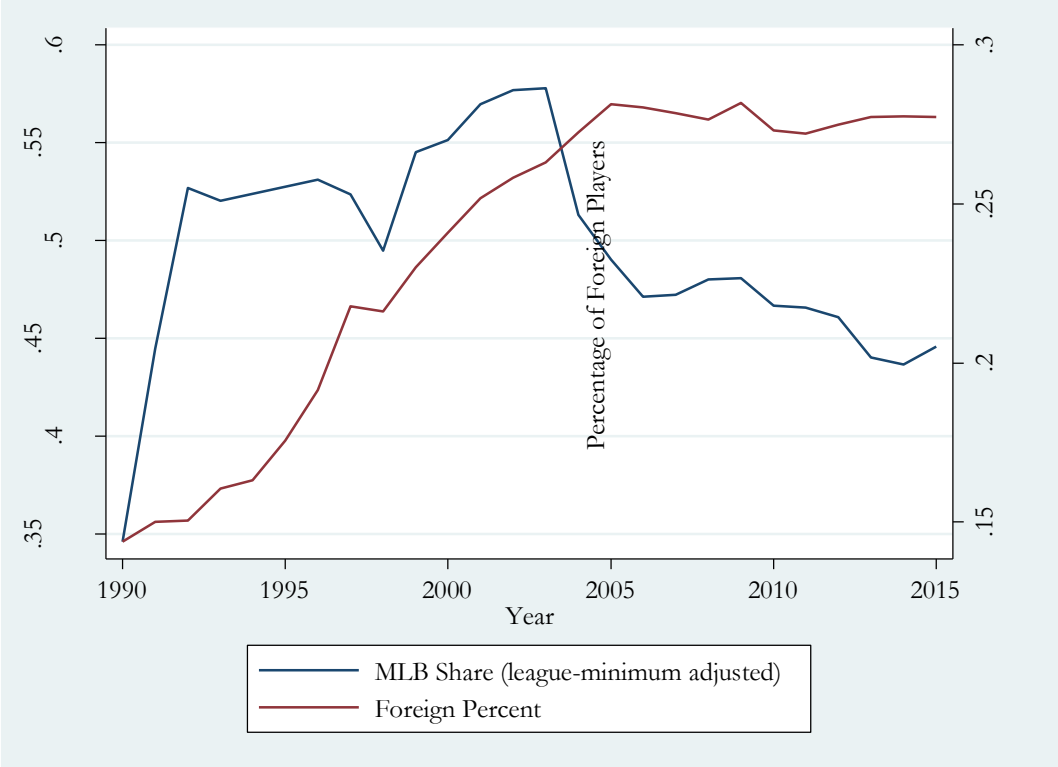
c. Outsourcing Labor

In baseball, the equivalent of outsourcing inputs that have contributed to the declining share of US workers is the importation of foreign players to the United States. During the period of analysis, MLB experienced an influx of non-domestic players from Latin American and Asia. Foreign players are not subject to the amateur

draft and are frequently signed as free agents by MLB clubs. These players may have served as substitute for domestic labor inputs and thus lowered the wages that all players (foreign and domestic) could command. Figure 5 maps the players' share of revenue and share of US-born players in MLB from 1990 to 2015.

The relationship shows that while the percentage of American-born players has been declining, it is not strongly correlated with players' share of income ($r = 0.06$, $p = 0.76$). From the late-1990s to the early-2000s, players experienced their largest share of income, while the foreign share of players was growing at a rapid rate. If cheaper foreign talent placed downward player wages that reduced labor's share of income, then players' share should not have risen as it did during this period. Thus, the importation of foreign workers appears to have played little, if any, role in the declining players' share of income.

Figure 5. Percentage of Foreign Players and MLB Labor Share (1990-2015)



d. Returns to Non-Player Inputs

Baseball produces more output than just baseball games and employs labor and capital that is complementary to players. Teams offer concessions and other entertainment amenities to its customers as complementary

products. The most obvious physical capital investment is the stadium and game-related equipment, such as computers, medical equipment, security devices. Franchises also employ non-players as workers to evaluate, train, scout, provide medical care, and manage activities. Clubs run extensive farm systems, which involve at least five levels of minor-league teams (each with 25-man rosters), as well as additional developmental squads and training camps around the world. If the returns to non-player inputs increased relative to MLB talent inputs, then a decline in player wages would decline in accord with their diminished marginal revenue products.

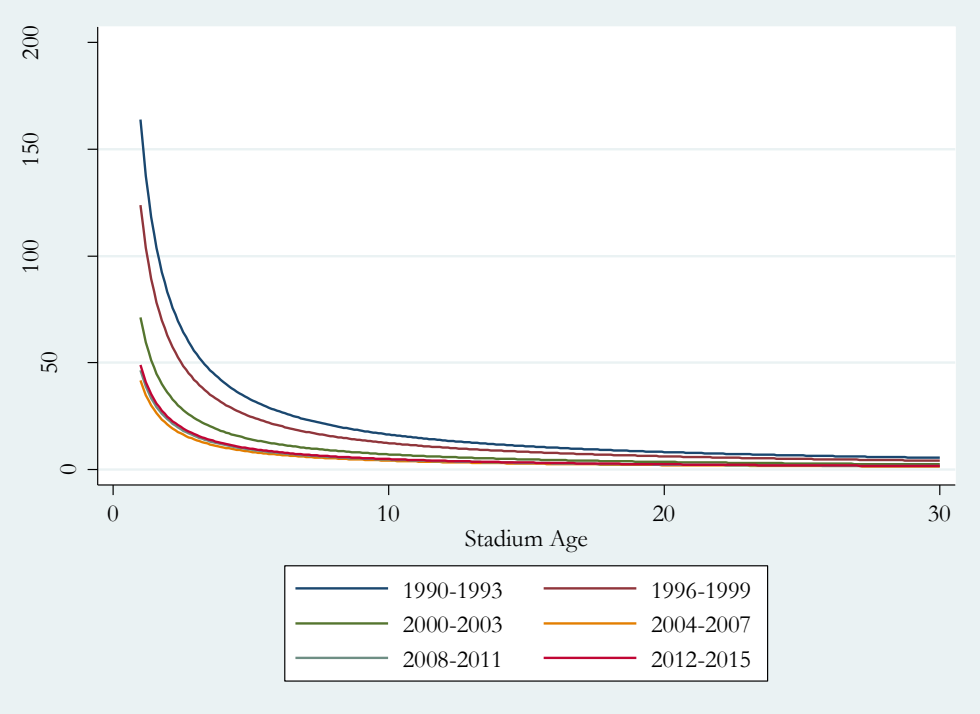
i. Physical Capital

While changes in the value of many non-player inputs are difficult to observe over time, the returns to a particularly important piece of capital, stadiums, are observable. MLB teams generate revenue from ticket, concession, sponsorship, and advertising sales at stadiums. Previous studies of the returns to new stadiums show a novelty or honeymoon effect of increased demand brought about by increased fan interest and enhanced revenue streams. Bradbury (2017), Depken (2006), Poitras and Hadley (2006), Coates and Humphreys (2005), and Hakes and Clapp (2005) have identified strong increased demand from new stadiums that diminishes quickly within approximately a decade of opening. If the importance of stadiums and related capital increased relative to labor inputs, then it should be observable in the returns to the novelty effects, with newer stadiums increasing in importance during the period.

Figure 6 maps the returns to stadium age estimated by Equation 1, and presented in Table 2, in four-year increments over the sample. The estimates reveal much stronger novelty effects early in the sample than in during the 1990s compared to the 2000s, when labor's share was declining, which is contrary to the hypothesis of capital generating relatively higher returns to labor. Thus, it appears that a shift of the returns to stadium capital is not able to explain the decline in the players' share of revenue.[8]

[8] This relationship is further explored in Bradbury (2017), which notes that teams that built stadiums were typically low-revenue teams before the addition of the new stadium, not high-revenue teams; therefore, the high returns are the product of a novelty effect.

Figure 6. Returns of MLB Stadiums by Age (1990-2015)



ii. Returns to Other Non-Player Inputs

Though teams did not experience increased relative returns to stadiums, returns to other forms of capital and non-player labor inputs may be contributing factors. If the returns (Y) to baseball are function of player labor (L) and non-player (N) inputs are less than player inputs $\left(\frac{\partial Y}{\partial L} < \frac{\partial Y}{\partial N}\right)$, then labor's share would be expected to decline if the returns to non-labor inputs increased. This is consistent with the fact that quantity of fans consuming baseball has expanded beyond the labor and capital used to provide it. In 1990, MLB fielded 26 teams with an average season attendance of 2.11 million per team. In 2015, MLB fielded 30 teams with an average season attendance of 2.45 million per team. Thus, attendance increased by 16.6 percent, controlling for the labor stock of players provided to consumers. The increase is made possible by the non-rivalry of consumption of spectator sports. A portion of this growth may be attributable to expanding population and interest in baseball; however, during this time MLB was drastically expanding its broadcast capability to expand beyond local markets where fans were served by one or two teams.

In 2000, MLB created MLB Advanced Media (MLBAM) to manage online activities that included ticket sales and broadcasting. In 2003, its MLB.tv began selling stand-alone broadcast packages that allowed fans to watch MLB games over the internet enabling consumption by a larger fanbase. MLBAM has since partnered with other sports leagues and media companies to manage online operations and video streaming. Knowing MLBAM's contribution is difficult because it is a privately-held company; however, in 2017, MLBAM sold a 75-percent share of its streaming subsidiary BAMTech to Disney for $2.58 billion, indicating its strong revenue-generating capability (Barnes and Koblin 2017).

The MLBAM venture increased league revenue by expanding the distribution of its same labor product more widely to garner uncaptured revenue. In addition, the revenue is shared equally across teams; therefore, teams cannot increase revenue through this channel by improving the individual team product. Though the returns to winning remain positive and increasing, the marginal contribution of labor to MLBAM revenues is small and thus a decline in labor's share of income is to be expected. The gains do not result from an increased marginal revenue product of players, and therefore this revenue should not be expected to flow to players in wages. This explanation is also consistent with the estimates of the returns to winning in Figure 2 that show decreased returns to winning after 2003, when MLBAM became a successful financial venture.

This hypothesis is similar to the superstar firm hypothesis that technological changes have allowed for the concentration of sales among firms with high productivity put forth by Autor et al. (2017). The authors find that as industries became more concentrated in the US economy, labor's share declined. Further analysis indicates that industry concentration was likely a response to increased productivity, and that a declining labor share is expected due to decreased value-added from labor from these more-profitable firms. Thus, MLB's perfect concentration is further enhanced by capital flowing to the technology-enhanced sector where value is added and instead of the player-labor sector.

4. Discussion and Conclusion

Labor's share of income in baseball has been declining since the early 21st century in a manner consistent with the decline observed in US industries in aggregate. This study examines hypothetical explanations for the observed economy-wide phenomenon using baseball's labor market. The analysis indicates that competition for labor from substitute labor inputs (foreign workers) and capital (stadiums) have not played a large role in the decline of players' share of income. However, changes in the returns to winning, which are heavily influenced by collective bargaining with the players' union appear to be correlated with changes in labor's share of income in MLB. This may indicate a role for unions in determining labor's share in economy that has not been previously identified; however, the comparison should be made cautiously given the bilateral monopoly structure of MLB that is unique to professional sports and applicable to few other industries.

The estimates reveal that collectively-bargained rules for operation influence labor's share of revenue in MLB; however, this influence is not necessarily the result of a bargaining game that transfers rents between parties. CBA influence is connected to its influence on the returns to wins. Thus, revenue sharing rules with perverse incentives that punish winning and reward losing may induce teams to pay players less due to reduced marginal revenue products and thus reducing player's share of revenue.

Furthermore, the success of MLB's online media venture MLBAM provided a new revenue stream that was equally shared across teams and did not increase player's marginal revenue products. Thus, player wages should not be expected to grow with this revenue stream and thus the decline in players' share of income is expected. Thus, while collectively-bargained revenue-sharing rules may have contributed to the decline of the players' revenue share, the rise in the returns of a non-labor sector were also a product of the change in the revenue-structure of the industry.

This study also highlights the importance of unique characteristics of industries in determining labor's share, and gives credence to the notion that the relative stability of the US labor share in the past was partly a result of fluctuations across individual industries cancelling each other out in aggregate. The decline in labor's revenue share in MLB is consistent with changes in revenue share in the hospitality and leisure industry that

experienced a decrease in labor's share of income from 65.7 percent to 62.1 percent between 1987 and 2011 (Elsby, Hobijn, and Şahin 2013). Studies of labor's share by industry may provide further insight the determinants of the decline of aggregate labor's share in the US and other economies.

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Table 1. Summary Statistics

	Mean	Standard Deviation	Minimum	Maximum
Revenue	286.9031	83.48831	28.175	626.22
Score Differential	0.9025788	103.365	-337	309
Population	5618585	4555545	1434279	20200000
Stadium Age	26.21633	24.81311	1	104

Table 2. Returns to Winning in MLB by Era

	1990-1993	1996-1999	2000-2003	2004-2007	2008-2011	2012-2015	1990-2015
Score Differential	0.10165	0.15128	0.12699	0.05303	0.07261	0.08493	0.10906
	[1.83]	[3.47]**	[5.48]**	[2.64]**	[3.62]**	[3.63]**	[8.77]**
Score Differential^2	0.00123	-0.00022	0.0002	0.00025	0.00038	0.00031	0.00021
	[2.04]*	[0.92]	[1.81]	[1.80]	[2.67]**	[1.60]	[2.72]**
Score Differential (t-1)	0.15556	0.14533	0.08273	0.01743	0.05407	0.08135	0.06474
	[2.53]*	[3.25]**	[3.96]**	[1.01]	[2.78]**	[3.23]**	[5.16]**
Population	0.00001	0.00000357	0.00001	0.00001	0.00001	0.00001	0.00001
	[4.28]**	[1.45]	[2.94]**	[5.28]**	[4.53]**	[2.63]**	[3.41]**
Stadium Age	164.05063	123.88745	71.10589	41.61923	46.40558	48.90423	80.44812
	[4.89]**	[4.25]**	[7.03]**	[3.40]**	[4.62]**	[1.50]	[11.60]**
New York Yankees	97.2033	210.03599	136.50399	121.61733	193.04402	187.12248	166.66451
	[1.50]	[3.48]**	[2.60]**	[3.44]**	[6.04]**	[3.62]**	[3.67]**
R^2	0.57	0.6	0.58	0.66	0.79	0.56	0.57
Observations	104	114	120	120	120	120	698

Absolute value of z-statistics in brackets. * $p<0.05$; ** $p<0.01$. Constant and year effects not reported.

Table 3. Returns to Winning in MLB by Collective Bargaining Agreement

	1990 CBA	1997 CBA	2003 CBA	2007 CBA	2012 CBA	All Years	All Years	All Years
Score Differential	0.09524	0.13735	0.07887	0.06914	0.08457	0.10906	0.17991	0.16923
	[1.67]	[5.22]**	[3.85]**	[4.15]**	[3.65]**	[8.77]**	[5.29]**	[4.99]**
Score Differential^2	0.00103	0.00009	0.00022	0.00031	0.00028	0.00021	0.00021	0.00129
	[1.68]	[0.67]	[1.96]*	[2.57]*	[1.49]	[2.72]**	[2.64]**	[3.75]**
Score Differential (t-1)	0.15868	0.10374	0.02711	0.05389	0.08095	0.06474	0.06677	0.06505
	[2.51]*	[4.10]**	[1.44]	[3.22]**	[3.25]**	[5.16]**	[5.30]**	[5.18]**
Population	0.00001	4.47E-06	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
	[4.22]**	[1.77]	[4.80]**	[4.41]**	[2.71]**	[3.41]**	[3.46]**	[3.44]**
Stadium Age	162.34737	95.6785	48.0735	51.79666	43.14256	80.44812	80.4221	81.02359
	[4.75]**	[7.65]**	[4.72]**	[6.16]**	[1.40]	[11.60]**	[11.53]**	[11.66]**
New York Yankees	101.39095	169.5283	124.69451	175.9045	186.681	166.66451	167.12356	166.62518
	[1.58]	[2.69]**	[3.24]**	[5.31]**	[3.66]**	[3.67]**	[3.68]**	[3.63]**
1995 CBA						-5.91094	-4.86585	4.89047
						[0.68]	[0.56]	[0.51]
1997 CBA						-30.23736	-29.17485	-18.17798
						[3.03]**	[2.97]**	[1.75]
2003 CBA						-30.00365	-28.94464	-20.0877
						[2.98]**	[2.93]**	[1.94]
2007 CBA						-29.47106	-28.4329	-19.06442
						[2.91]**	[2.86]**	[1.82]
2012 CBA						-27.59107	-26.56823	-18.41408
						[2.70]**	[2.65]**	[1.74]
1995 CBA * Score Differenial							0.01478	0.01342
							[0.24]	[0.20]
1995 CBA * Score Differenial^2								-0.00116
								[2.51]*
1997 CBA * Score Differenial							-0.05011	-0.03839
							[1.25]	[0.96]
1997 CBA * Score Differenial^2								-0.0012
								[3.31]**
2003 CBA * Score Differenial							-0.09685	-0.0846
							[2.25]*	[1.92]
2003 CBA * Score Differenial^2								-0.00109
								[2.86]**
2007 CBA * Score Differenial							-0.1235	-0.11361
							[2.91]**	[2.69]**
2007 CBA * Score Differenial^2								-0.00113
								[2.91]**
2012 CBA * Score Differenial							-0.08841	-0.07814
							[2.03]*	[1.80]
2012 CBA * Score Differenial^2								-0.001
								[2.47]*
R^2	0.56	0.55	0.64	0.77	0.57	0.57	0.58	0.58
Observations	104	176	120	150	120	698	698	698

Absolute value of z-statistics in brackets. * p<0.05; ** p<0.01. Constant and year effects not reported.