Free-Agency and the Competitiveness of Major League Baseball

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Abstract

I investigate whether the removal of the reserve clause in professional baseball affected the competitive nature of the industry in the context of whether teams are actively attempting to monopolize in high-valued inputs. It is possible that a very few teams could purchase all of the best players over time leading to a highly concentrated industry in certain production categories and adversely affect the competitive nature of the industry. To investigate this possibility, I calculate the Herfindahl-Hirschman Index for home runs and strike outs in professional baseball from 1920 to 1996 and relate them to structural changes in baseball. I isolate the structural effect of free-agency and find no evidence that free agency has altered the competitive nature of baseball. My findings support those in Hylan, Lage and Treglia (1996).

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1 Introduction

Prior to its repeal in 1977, the reserve clause in major league baseball effectively removed voluntary factor mobility from the baseball labor market. In 1977 a market for "free-agent" players was created in which players who are not bound by an existing contract and have satisfied a minimum experience requirement of six years are allowed to market their services to other teams in the major leagues. While involuntary movement of baseball labor is still possible via trades and drafts, under free-agency there is more voluntary movement in the industry. Considerable attention has been focused on this market in view of its efficiency and how it affects the demand for professional baseball such as Cymrot (1983), Drahozal (1986), Lehn (1984), and Hylan, Lage and Treglia (1996).

Critics of free-agency contend that a possible outcome of such a market is that a very few teams (possibly one) may purchase all of the best players over time and could effectively limit competition. While this is possible, it is not clear why the removal of the reserve clause is required for this to happen, as players' contracts could be purchased before free-agency. Granted, it may be easier for a team to purchase exceptional players because players have more freedom to choose the team with which to contract their labor services. A counter argument is that free-agency has no adverse effect on the competitive nature of baseball, indeed may have improved it, and that the important aspect of free agency is the reallocation of property rights

(see, for example, Hylan, Lage and Treglia (1996)). After the enactment of free-agency the average salary for baseball players increased dramatically, offering support to the claim that free-agency allows players to seek rents from management (Cassing and Douglas (1980) and Fort and Quirk (1995)).

However, relatively little attention has been focused on whether free-agency structurally altered the competitive nature of professional baseball. Little evidence has been found to suggest that free-agency has led to a select few teams acquiring the services of the best players and most authors contend that free-agency has improved the competitive nature of baseball. Proponents of free agency emphasize the number of different teams that have participated in post-season play since the inception of free-agency as strong support for their position (Daly and Moore (1981) and Drahazol (1986)). Others point to player (factor) mobility as evidence of free agency being neutral or enhancing to competition.

Looking strictly at teams in post-season play or the mobility of labor may not reflect the true competitive nature of baseball, nor the effect that free-agency has had upon this nature. This is because neither of these approaches account for all of the aspects of professional baseball which affect the competitive nature of the industry. This paper offers an alternative measure of competitiveness in professional baseball and investigates the effect of free-agency upon it.

One potential problem with focusing on the turnover of teams in the post-season is that since the inception of divisional play in 1969, teams in post-season play are not necessarily the

best teams in either league. After the beginning of divisional play in 1969 until realignment in 1995, only one team from each division could participate in post-season play. After 1994 and the institution of the "wild-card" playoff team, at most two teams from one of the three divisions can participate in post-season play. However, in 1996 three of the top five payrolls in the American League were all in the Eastern Division: the Boston Red Sox, the New York Yankees and the Baltimore Orioles. At most only two of these teams (the New York Yankees and the Baltimore Orioles) would compete in post-season play although their purchases of highly productive labor inputs have arguably altered the overall competitive nature of the American League. Further, it is conceivable that a team with a losing record at the end of the season could participate in post-season play.[1] A final problem of this approach is that certain teams have participated in post-season play only once since free-agency, e.g., the Seattle Mariners, the Texas Rangers and the Montreal Expos.

In this light, it is possible that this measurement of the competitive nature of baseball could be biased if a few teams were to purchase all of the best players in the free-agent market over time, especially if these teams reside in the same division in a given league, leading to a high concentration of labor productivity.

Looking only at player mobility may not imply much about the changing nature of compe-

[1] For example, the New York Mets won the National League Eastern Division in 1973 with a winning percentage of only 0.509 (Total Baseball, 1994).

tition in baseball because it doesn't control for the quality of the players that are moving, nor to what teams they are moving from or to. Evidence points to free-agency not affecting the overall level of player mobility (see Hylan, Lage and Treglia (1996) in the context of pitcher mobility). Finally, each major league team maintains several minor league teams from which high quality players may come, removing the necessity of having to go to the free agent market. thus, a team may not need to purchase a free agent for every position on the field in order to be competitive.

I suggest that looking at the number of teams in post-season play, or the free-agent mobility between teams, may overstate the competitive nature of professional baseball. Furthermore, I claim that the concentration of baseball production is a better measure of the competitive nature of baseball in this context. Concentration levels offer an alternative measure of the competitive nature of professional baseball and can be used to investigate how free-agency structurally impacted this nature. I focus on the concentration of two categories of baseball production that both affect competition on the field and the desirability of free-agents in the market of a given year: (1) the homerun and (2) the strikeout. In the context of free-agency, I isolate the structural effect of free-agency on these two concentration levels. I find that there is no statistically significant effect from the removal of the reserve clause, supporting the claim that free-agency is neutral to competition.

The paper is structured as follows. Section 2 suggests a new method to measure the competi-

tive nature of professional baseball. Section 3 investigates how structural changes in professional baseball, including the advent of free-agency, affect this competitiveness. The final section offers concluding remarks.

2 Measuring Competitiveness in Professional Baseball

Industrial economists have long debated how best to measure the competitive nature of an industry. One method is to investigate the static market shares of the firms in the industry, how these shares are distributed, and how the distribution affects the performance of the industry. If a very few firms have a substantial portion of the overall market, however the market is defined, then the competitive nature of the industry is questioned. Investigating the dynamic market shares over time can lend more insight into the true nature of the competition in an industry.

Most market share analysis focuses on the percentage of output associated with each firm. In the context of professional baseball (and other industries) using output measures is problematic. I offer an alternative measure of concentration using the market share of factor production. I return to this point below.

Many studies have looked at how concentration levels relate to the competitive nature of industries including Borenstein (1989) and Evans and Kessides (1993) in the context of

the airline industry, Gilbert (1984) in the context of the banking industry, Sullivan (1985) and Sumner (1981) in the cigarette industry, MacDonald (1987) in the railroads and Marvel (1978) in the gasoline industry. An important and often overlooked point is outlined by Geroski (1981) who investigates the relationship between concentration and profitability and the possible simultaneity problem in using concentration to explain industry performance.

The simultaneity problem arises in that structure (e.g., concentration) may affect conduct (e.g., prices) or performance (e.g., profits), but that performance and conduct may affect the structure of an industry. This simultaneity brings into question the validity of using concentration levels as an explanatory variable for conduct and performance variables. This has more to do with how concentration levels are employed in an investigation than with any inherent problems with concentration measures.

A more general problem with concentration levels is that it is often difficult to accurately define the market in question and to accurately account for all firms in the market. This implies that measures of concentration may over or understate the actual level of concentration in the market. An extreme example of this is that many concentration measures do not account for the level of imports and exports in the market, perhaps greatly overstating the concentration if imports are high, or understating the concentration if exports are high.

Despite these general problems, many concentration measures have been developed.[2] One

[2]Beyond those outlined here are the entropy measure and the Gini coefficient. For further discussion on

measure is the x-firm concentration ratio (CR_x), which is a linear summation of the largest x market shares. The CR_x is bounded from below by $\frac{x}{N}$, if N is the total number of firms in the market and all firms have equal market shares, and from above by one. A low $CR_x = \frac{x}{N}$ may indicate a competitive market if N is sufficiently large. Unfortunately, this measure has two major drawbacks. First, it suffers from duplicity, in that there are infinite combinations of x static market shares that sum to the same measure of concentration. This makes it difficult to compare these measures across industries. Second, this measure may not accurately reflect the competitive nature of the market over time if there is substantial turnover in dynamic market shares. A high rate of turnover in the top x firms may indicate that the market is more volatile, and perhaps more competitive, than the linear summation of market shares may suggest. However, the CR_x measure is convenient in that the researcher need only know the market shares of the top x firms, a point which may be important in a market with a large number of firms.

An alternative measure is a quadratic summation of market shares over all firms in the market. One measure, known as the Herfindahl-Hirschman Index (HHI), is defined as $HHI = \sum_i^N (MS_i)^2$, where MS_i is the market share of the i^{th} firm on a scale of 0 to 100. Since this measure does require the market shares of $N-1$ firms in the market, it is often potentially prohibitive in data requirements. However, in professional baseball this is not a problem. The

various concentration measures see, for example, Carlton and Perloff (1993).

HHI offers many improvements over the CR_x. The HHI accounts for all market shares in the industry, changes in market shares between existing firms, and any entry or exit from the industry over time. It doesn't suffer from duplicity and is clearly bounded from below by 0 (perfect competition) and above by 10,000 (perfect monopoly). Professional baseball does not suffer from a lack of data and, in light of the turnover rate of teams in post-season play, market share turnover may be high. Therefore, this is the measure I employ in this paper.

Using market concentration as a proxy for the competitive nature of baseball, the next question is how to measure concentration such that it most reasonably reflects this nature. One possibility is to look at the total wins by individual teams (or equivalently the winning percentage), but it is impossible for one team to win all the games played in either or both leagues, i.e., there can be no *true* monopoly in wins.[3] This introduces a problem not found in most industries. While there cannot be a true output monopoly in baseball, there are a number of variables that affect the number of wins a team can expect to obtain in a given season. Labor production such as hitting, fielding and pitching, measure the production of the labor each team employs during a season. In these production categories, teams can more easily alter their market shares, and theoretically become a (near) monopoly in one or more.[4]

[3] See Drahazol (1986) for non-statistical tests involving free agency, competition and numbers of wins per team.

[4] While it is unlikely that one firm would hold a monopoly in any production category, it is clear that teams can try to improve their market shares in production via free-agency or trades.

Establishing the relationship between wins and various production categories lends insight into those which most affect the competitiveness of specific teams, and thus the overall competitive nature of major-league baseball. Further, this relationship is useful in determining which categories would be most valuable on the free-agent market. The intuition is that teams are aware of those aspects of labor production which are most influential on wins and thus will seek to acquire those players who have the highest output in these categories.

To establish this relationship, I regress total wins in a given season against a number of different team-independent variables, such as expansion years, league of play and time, and team-specific offensive and defensive production totals, such as home-runs hit, pitchers' earned run average, and hits allowed.

I estimate the following stochastic regression using all teams in both the American and National Leagues from 1920 through 1996,

$$\begin{aligned} WINS \;=\; & \alpha_0 + \alpha_1 YEAR + \alpha_2 LEAGUE + \alpha_3 EXPN + \alpha_4 EXPA + \\ & \alpha_5 DIV + \alpha_6 DH + \alpha_7 FA + \alpha_8 RUNS + \alpha_9 ATBATS + \\ & \alpha_{10} HITS + \alpha_{11} 2B + \alpha_{12} 3B + \alpha_{13} HR + \alpha_{14} BB + \alpha_{15} SO + \\ & \alpha_{16} HALLOW + \alpha_{17} KO + \alpha_{18} ERA + \alpha_{19} WALKS + \alpha_{20} HRUNS + \\ & \alpha_{21} CG + v, \end{aligned} \tag{1}$$

where the α_i are parameters to be estimated and v is a stochastic error term.[5] The right

[5] In this function form, I ignore managerial input and assume it is identical across all teams through time.

hand side variables comprise firm-independent and firm-dependent variables for each team for each year.

The firm-independent variables include the year of play (TIME), the dummy variables the league of play (LEAGUE, equals one for National League), expansion in the National League (EXPN, equals one for the years 1962, 1968, 1993), expansion in the American League (EXPA, equals one for the years 1961, 1968, 1977), divisional play (DIV, equals one for all years after 1968), the designated hitter rule (DH, equals one for all years after 1972), and free-agency (FA, equals one for all years after 1976).

The firm-dependent variables include both offensive (hitting) and defensive (pitching) categories. The offensive categories are runs scored (RUNS), at-bats recorded (ATBATS), hits recorded (HITS), doubles (2B), triples (3B), homeruns hit (HR), walks drawn (BB) and strikeouts (SO). The defensive categories are hits allowed (HALLOW), strikeouts pitched (KO), earned run average (ERA), walks allowed (WALKS), homeruns allowed (HRUNS) and complete games pitched (CG).

The results of this estimation are reported in Table 1. The signs of the team-independent variables are as expected. Time has a positive influence on the number of wins a team can expect to have. However, this may reflect the fact that the number of games increased to 162 in 1961. Teams in the National League can expect to have more wins, *ceteris paribus*. Expansion

See Porter and Scully (1992) and Singell (1993) for studies that focus on managerial quality.

in either league has a positive but statistically insignificant effect on the wins of the teams in the league, perhaps reflecting the fact that most expansion teams have losing seasons for the first years of their existence.[6] Introduction of divisional play lowered the number of wins for each team and is statistically significant.

The designated hitter rule increases the number of wins of each team but is statistically insignificant.[7] The focus of this study, free-agency, has reduced the number of wins that each team can expect to obtain, *ceteris paribus*. This result suggests that free-agency has improved the parity of the teams in major league baseball.

The team-dependent variables also have the expected influence on wins. f the offensive categories, homeruns and runs scored have the greatest positive effect on wins obtained. Of these two, the homerun concentration has the highest variance and is used in this study. Further, home-runs are one of the most obvious statistics recorded for individual players (both free-agents and those under contract) which is most dependent on the individual's talent at batting. Runs scored by an individual player have more to do with the player's ability to reach base safely and for his teammates to produce such that he is able to score.

Of the defensive aspect of baseball, as measured by pitching production, the strikeout and

[6] Two obvious failures of this observation are the Kansas City Royals of the early 1970's and the Colorado Rockies of 1995.

[7] The designated hitter rule was instituted in the American League only. One reason for the designated hitter rule was to increase offensive output and fan interest in the game. See Domazlicky and Kerr (1990) for more on this discussion.

the number of complete games pitched have the greatest positive influence on wins. The positive effect of complete games is not surprising because rarely, in modern baseball, do pitchers who are losing a game end up pitching the entire game.[8] However, the variance of the concentration of complete games is very small and rarely is a free-agent hiring based solely upon the number of complete games the player has pitched. The strikeout, on the other hand, is an obvious measure of a pitcher's effectiveness. However, most pitchers who record a high number of strikeouts do not pitch entire games on a regular basis, that is they are relieved before the game is finished. While the variance in the strikeout concentration is not as great as that of the homerun index, the strikeout measure is an obvious statistic that teams would consider in the free-agent market. Further, much like the homerun, the strikeout is obtained on the skill of the pitcher alone,[9] whereas the number of hits allowed, earned run average, and complete games have more to do with the team that the individual pitcher is on. This is true because a pitcher could have a high number of strikeouts but play on a team with a poor defense, thus altering his win-loss record, earned runs and complete games. I use the strikeout as a proxy for defensive competitiveness in this paper.

The positive influence that pitching strike outs and hitting homeruns have on team wins is convenient in the context of the free-agent market. In the free-agent market there are two

[8] Here mention the advent of the relief pitcher.

[9] Not withstanding the ability of the batters facing the pitcher.

types of players, pitchers and non-pitchers, who are valued on a variety of different issues on an individual player and team-need basis. In general though, pitchers should be valued predominantly as defensive players with higher value given to those who can obtain more strikeouts. This is because strikeouts have a positive and statistically significant effect on wins in baseball. Non-pitchers, who are both defensive and offensive players, should be more valued based upon their offensive capabilities and are of higher value the more homeruns they can obtain, for similar reasons as pitchers.

Therefore, if a few firms are actively trying to purchase all of the best defensive or offensive players with respect to strikeouts and homeruns, respectively, the concentration in these categories would increase after the inception of free-agency. The increased concentration would indicate a less competitive industry. I investigate the concentrations of these two production categories because they affect both the competitiveness of baseball and the desirability of those in the free-agent market.

I calculate the HHI for each league, the National and American, as well as for all of major league baseball for both production categories from the years 1920 through 1996.[10] Unlike most industries, baseball has maintained accurate production statistics over this period, making it easy to accurately calculate the market shares of each team in both production categories.

[10]The data start in 1920 because this is the first year in which there are only two leagues, the American and the National. The Federal League was disbanded in 1919, and no subsequent league has been a major employer of professional baseball players.

Of particular importance to this discussion is the advent of the free-agent market in 1977. If free-agency has an adverse (enhancing) effect on the competitiveness of major league baseball, I expect an increase (decrease) in the concentration of one or both of the categories after the institution of free-agency. The six concentration indices, three for each production category, are depicted in Figures 1 through 6.

3 Free Agency and Competitiveness

Figures 1-3 depict the homerun concentration for the American League, National League and all major league teams, respectively. It is clear that the homerun concentration has been declining over time for all three measures. From a peak concentration of nearly 1600 in the American League in 1927, home run concentration has generally fallen, with several visible structural changes. These structural changes, without exception, coincide with expansion in the particular league. While expansion is expected to decrease the homerun concentration as more teams divide the same total percentage of the market, it is of interest the relative stability of the index after these regime changes.[11] On the surface, the removal of the reserve clause in 1977 does not seem to have had much of an effect on the homerun concentration in the National League. However, the minor decrease in homerun concentration in the American league in 1977

[11] Drahazol (1986) offers that expansion reduces the competitive nature of baseball. I find that this is not the case.

coincides with both free-agency and the expansion in the American League by two teams: the Seattle Mariners and the Toronto Blue Jays. This simultaneity hinders the ability to distinguish why the concentration in home runs decreased in 1977. I propose a method to separate these two effects so as to discern more accurately the effect of free-agency on concentration.

Figures 4-6 depict the strikeout concentration for the American League, National League and all of major league baseball, respectively. Unlike homerun concentration, strikeout concentration does not seem to have a general time trend, in either direction. The strikeout concentration is rather stable over time with regime changes during expansion years similar to those found in the homerun concentration. The strikeout concentration of the American League shows a similar structural shift in 1977 as that of the home-run index. However, the same simultaneity problem exists in that the advent of free-agency coincided with expansion.[12]

In view of the simultaneity of free-agency and expansion of the American League in 1977, I propose to isolate the structural effect of free-agency with the following stochastic relationship for both of the home-run and strike-out concentrations

$$\begin{aligned} lnHHI_t &= \beta_0 + \beta_1 lnHHI_{t-1} + \beta_2 lnHHI_{t-2} + \beta_3 TIME + \beta_4 DIV + \beta_5 EXPA + \\ &\quad \beta_6 EXPN + \beta_7 DH + \beta_8 FA + \epsilon_t, \end{aligned} \tag{2}$$

where the β_j are parameters to be estimated and ϵ is a stochastic error term. The right-hand-

[12] This supports the findings in Hylan, Lage and Treglia (1996).

side variables include two lags of the concentration index,[13] a monotonically increasing general time trend which is intended to control for other changes in baseball over time, and dummy variables to control for structural changes in professional baseball. Each dummy variable takes a value of one when its condition is satisfied and zero otherwise.

The dummy variable FA indicates those years after free-agency was introduced in 1977, DH indicates those years after the institution of the designated hitter rule in the American League in 1973, DIV indicates those years after divisional play was introduced in 1969, $EXPN$ indicates those years that the National League expanded, i.e., 1962, 1969 and 1993, and $EXPA$ indicates those years that the American League expanded, i.e., 1961, 1969 and 1977.[14] My approach is different from most studies that utilize the HHI by considering it an endogenous variable which can be explained in part by structural changes in the industry.[15]

This stochastic relationship obviously does not account for all the structural changes in baseball, e.g., rule changes and World War II,[16] nor does it control for many continuous vari-

[13] I include these measures for two reasons. First, contractual arrangements are for multiple years, thus a free-agent who signs for more than one year may be expected to affect the concentration level by remaining on the same team. Second, as teams capture market share in baseball, it is of interest as to whether they can reasonably expect to maintain this market share in the immediate future, i.e., do higher levels of concentration in the past predict higher levels of concentration in the present.

[14] These two dummy variables represent events which are expected to affect the concentration of home-runs and strike-outs.

[15] This point is one not mentioned in the literature. That structural changes in an industry, perhaps beyond the control of individual firms, can explain dynamic changes in concentration is an avenue for further inquiry.

[16] During the war years, professional baseball was dramatically effected by a loss of players to the war effort. While most studies correctly ignore these war years in the context of labor market performance, I include them because concentrations of focus here.

ables, such as salaries, stadia characteristics or managerial quality.[17] However, the stochastic relationship in equation (2) effectively isolates the structural effect that free-agency has had on the competitive nature of professional baseball with respect to the indices measured here. If the estimated coefficient on FA is positive (negative) it indicates that the institution of free-agency had a detrimental (enhancing) effect on the overall competitive nature of professional baseball. I estimate equation (2) for each concentration measures.

3.1 The Home Run and Free-Agency

The results from the estimation of equation (2) with respect to the home-run index are reported in Table 2. The American League homerun concentration is positively related to both one and two time period lagged index values, with only the former being statistically significant. The concentration is negatively influenced by the expansion of both the American and National leagues, the institution of divisional play and the general time trend with only expansion in the American League being statistically significant. The institution of the designated hitter rule has an insignificant effect on the concentration of the American League. The removal of the reserve clause, the focus of this discussion, did not statistically affect the concentration in the American league. These results support those found by Hylan, Lage and Treglia (1996) who

[17] See Porter and Scully (1982) on managerial quality, Domazlicky and Kerr (1990) on stadia characteristics and Hylan, Lage and Treglia (1996) on salaries.

find that free-agency did not statistically affect the mobility of pitchers.

The empirical results for the homerun concentration index in the National League are similar. As was found in the American league concentration level, the once and twice lagged concentration levels have a positive effect on the current level of concentration in homeruns with the former larger in magnitude than the latter. Divisional play, expansion in the National league, and time decreased National league home-run concentration but expansion in the American league has a statistically insignificant effect. The designated hitter rule has had a positive but statistically insignificant effect on the concentration in the National league free-agency has a statistically insignificant effect on the level of concentration.

The home-run concentration index for the entire major leagues follows similar patterns. While this is not surprising, it is of interest as to how the overall competitive nature of major league baseball, with respect to home runs, has been affected by the advent of free agency. The lagged values of concentration are both positive and statistically significant, indicating that concentration tends to be maintained from year to year. The competitive nature of major league baseball was enhanced by the institution of divisional play and expansion in both the American and National leagues, with the effect of National League expansion being larger in absolute value. Professional baseball has become more competitive over time but the designated hitter rule has had an adverse but statistically insignificant effect on the homerun concentration of major league baseball. This result follows intuition in that the designated hitter rule

allows teams to use an expert hitter in place of a weaker hitter, typically the pitcher. As in the individual leagues, the removal of the reserve clause has caused a minor but statistically insignificant enhancement of the competitive nature of the entire major leagues.

3.2 The Strike-Out and Free-Agency

The results of estimating equation (1) with the strike-out concentration are reported in Table 3. I find similar results as in the homerun index with a couple of notable exceptions. In the American League, the once and twice lagged index values are both positive, with the former being statistically significant. This indicates that teams who attain high market shares of strikeouts can be expected to maintain their market share in the short-term future. The retention of market shares follows from contractual agreements, which are typically made for more than one year or the reserve clause, which effectively retained labor on the same team. Expansion of both leagues has an enhancing effect on competition in the American League, with expansion in the American League being greater in absolute value and statistical significance. The designated hitter rule has a detrimental effect on competition, perhaps reflecting the fact that designated hitters are typically experts at batting who should strike-out relatively less than other batters. However the designated-hitter coefficient is not statistically significant.

The advent of divisional play has no effect on the concentration of strikeouts and is statistically insignificant. The strikeout concentration has been decreasing over time, *ceteris paribus*,

indicating increased competition in this production category.[18]

Free-agency, the variable of focus in this study, has an enhancing but statistically insignificant effect on the competitive nature of baseball with respect to strikeouts. This result in particular supports those found in Hylan, Lage and Treglia (1996) inasmuch as free-agency does not affect the concentration of strikeouts. As they point out, free-agency has had a statistically insignificant effect on the mobility of pitchers, which would indicate that free-agency caused no structural change in the distribution of talented pitchers around the league. This, in turn, would not change the concentration of pitching talent in the league.

The National league results are similar except that expansion in the American League has a positive but insignificant effect on the National League strike-out concentration. Further, free-agency has a positive but statistically insignificant effect on the National League index perhaps indicating that National League teams more actively pursue strikeout pitchers in the free-agent market.

The concentration of strike-outs in all of the major leagues is reduced by expansion in both the American and National leagues, with the former being greater in absolute value. The designated hitter also has a negative but statistically insignificant effect on total concentration. Divisional play has a negative and statistically significant effect on the concentration of strikeouts, indicating that the increased ability for teams to reach post-season play has motivated a

[18]Recent studies that investigate pitcher mobility include Hylan, Lage and Treglia (1996) and Cymrot (1993).

more even distribution of pitching talent around the league.

These results indicate that expansion and time have the greatest effect on enhancing competition in professional baseball. The effect of expansion is not surprising in that more firms in a given league causes the same total percentage of the market to be spread over more firms. However, over time teams may be better at gauging and incorporating talent across the entire major leagues such that each firm receives a more egalitarian proportion of the entire market. This result is worthy of further inquiry. Further, free-agency and the designated hitter rule have no statistical influence on the concentration index of homeruns or strikeouts.

4 Conclusions

In this paper I investigate whether the removal of the reserve clause in professional baseball affected the competitive nature of the industry. I use a measure of market concentration as a proxy for the competitiveness of professional baseball. As there can not be a true monopoly in the output of baseball teams, i.e., wins, I focus on two production categories which have the greatest positive effect on the number of wins a team can expect to obtain in a given season: the homerun and the strikeout. As all teams are assumed to know that these two production categories are valuable, with respect to team wins, if free-agency has allowed a few teams to purchase the best players over time, the market concentration in these production categories

would increase. I calculate the Herfindahl-Hirschman Index for these two production categories for 1920 through 1996. I relate current concentration with lagged concentration levels and several structural changes that have occurred in professional baseball over the past 40 years.

That free-agency has not affected the concentration of strikeouts supports Hylan, Lage and Treglia (1996) who find that free-agency did not statistically alter the mobility of pitchers. I also find no evidence that free-agency has statistically altered the distribution of home-run hitters who are the offensive analog to the pitcher. While my results support those found in other studies, my approach does not suffer from problems of measurement and controls for structural changes that occurred in baseball including expansion, the designated hitter rule, divisional play and the removal of the reserve clause.

These findings have two major policy implications for baseball management. Those concerned about increasing payrolls and perhaps the need for either salary caps or luxury taxes are need not be concerned about free-agency alone being a detriment to the competitive nature of baseball. In fact, these policy changes would have ambiguous effects on the competitive nature of baseball inasmuch as they may restrict the voluntary mobility of baseball labor. In light of these results, the question of what effect salary caps and luxury taxes have on the competitive nature of an industry should be further investigated, perhaps using a similar industry which has implemented these policies such as professional football or basketball. Second, the planned expansion of 1998 will once again lead to a decrease in the concentration levels of the vari-

ous baseball production categories, and in this respect may increase the competitive nature of professional baseball and demand in the industry.

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A Figures

These figures depict the Herfindahl-Hirschman Indices for homeruns and strikeouts. The vertical bars depict structural changes in professional baseball, where EXP means expansion in the given league, $EXPA$ means expansion in the American League, $EXPN$ means expansion in the National League, DH means the designated hitter rule, FA means the institution of free-agency.

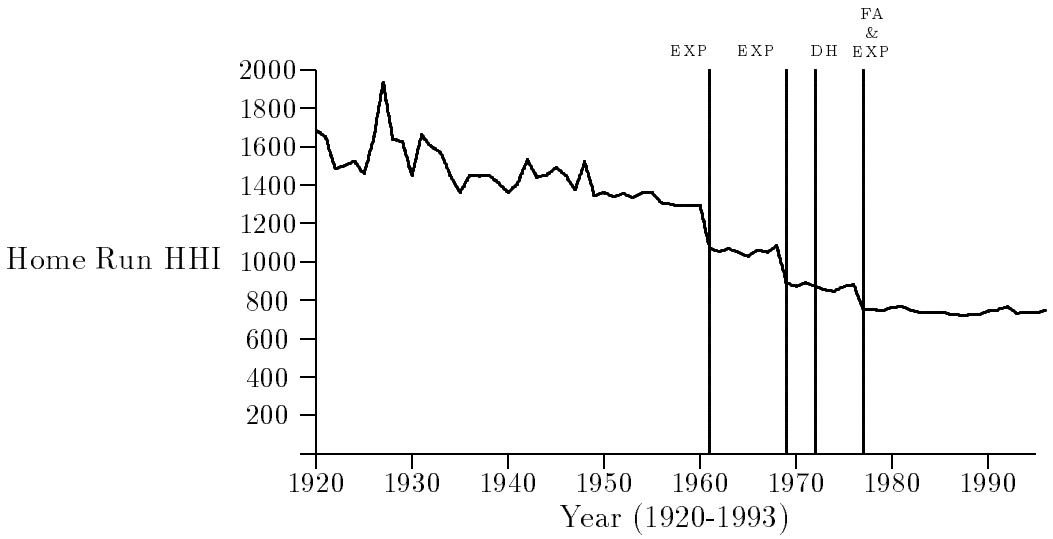

Figure 1: American League Home Run Concentration

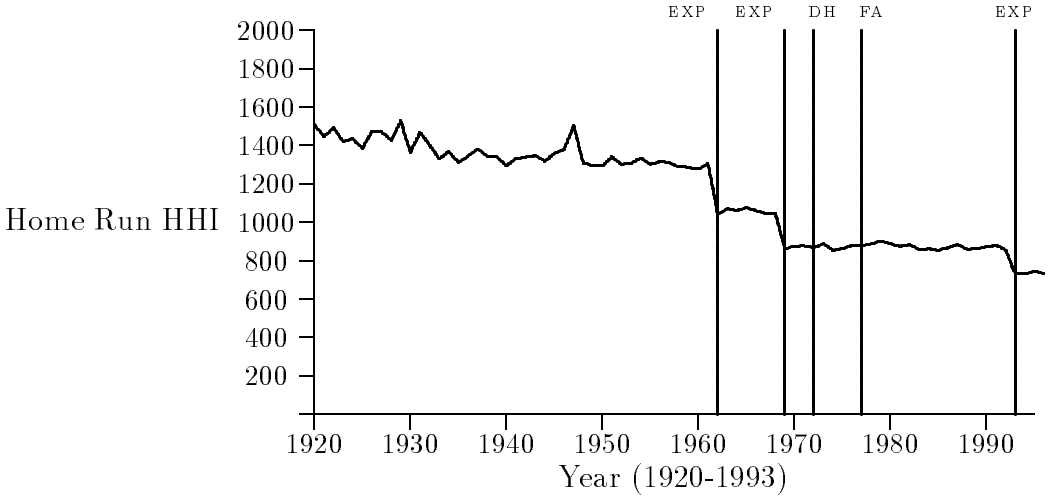

Figure 2: National League Home Run Concentration

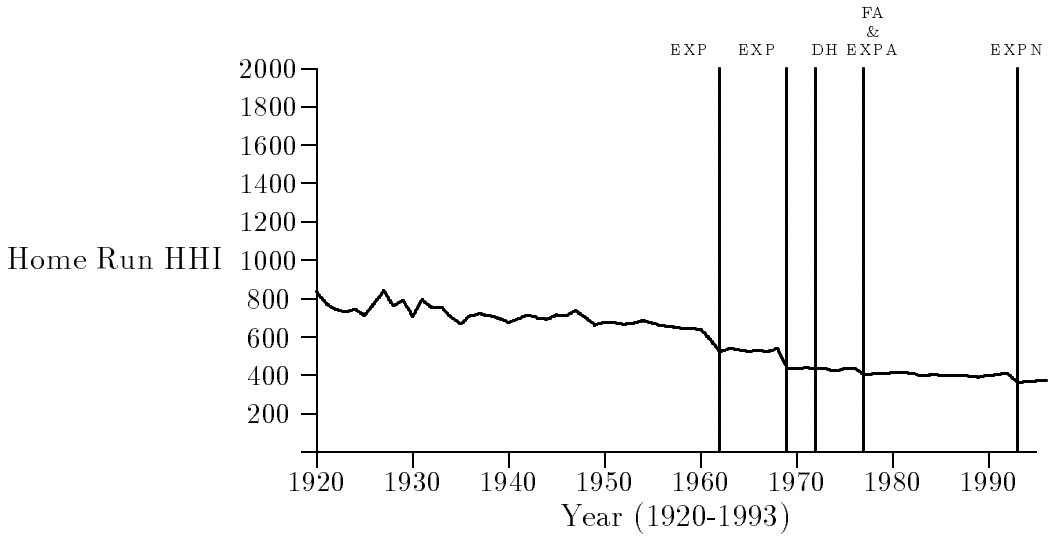

Figure 3: Home Run Concentration All Major League Teams

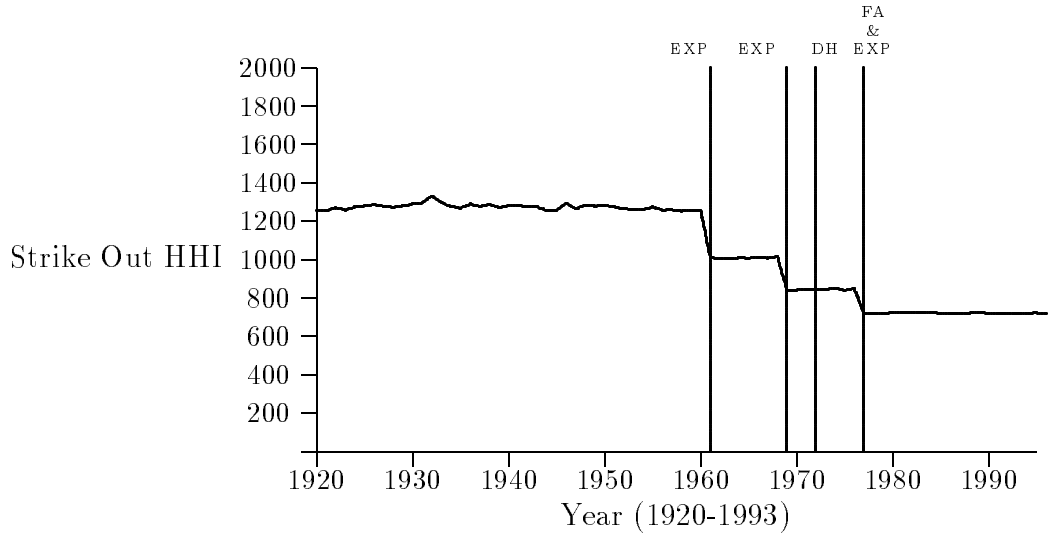

Figure 3: Strike Out Concentration American League Teams

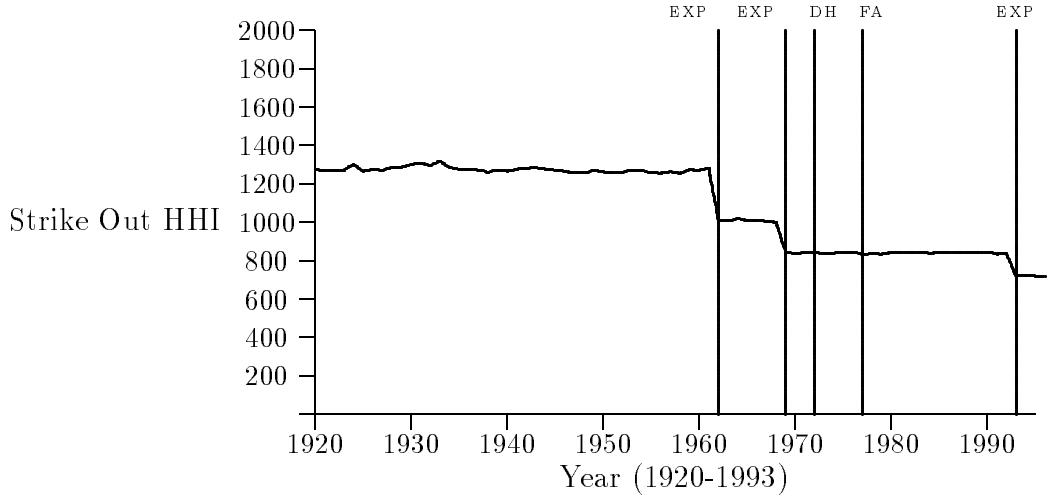

Figure 4: Strike Out Concentration National League Teams

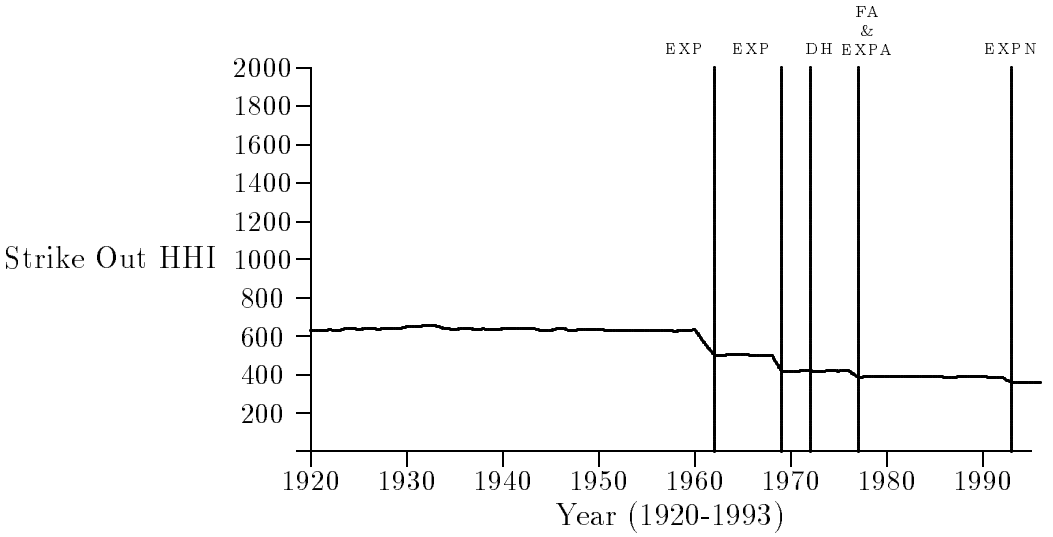

Figure 6: Strike Out Concentration All Major League Teams

B Tables

Dependent Variable: Wins			
Variable	Coefficient	Variable	Coefficient
Intercept	40.055	HR	0.0143
	(10.795)*		(2.040)*
TIME	0.1336	BB	0.0108
	(4.382)*		(3.959)*
LEAGUE	0.2879	SO	-0.0050
	(1.002)		(-2.867)*
EXPN	0.0764	HALLOW	-0.0317
	(0.113)		(-11.252)*
EXPA	0.5890	KO	0.0064
	(0.851)		(4.167)*
DIV	-1.4099	ERA	-7.8553
	(-2.095)*		(-16.200)*
DH	1.1229	WALKS	-0.0248
	(1.344)		(-10.630)*
FA	-1.2315	HRUNS	-0.0280
	(-1.883)*		(-3.789)*
RUNS	0.0888	CG	0.0415
	(17.389)*		(3.116)*
ATBATS	0.0097	R^2	0.861
	(6.480)*	$\bar{R}^2$	0.859
HITS	-0.0028	$ln\mathcal{L}$	-4649.24
	(-0.612)	n	1534
2B	0.0017		
	(0.286)		
3B	0.0284		
	(2.227)*		

Table 1: Baseball Labor Output Related to Team Wins

Two-tailed t-Statistics reported in parenthesis.
* (**) indicates 5% (10%) significance.

Home-Run Herfindahl			
Variable	American League	National League	All Major League
Intercept	2.3232	1.020	1.483
	(3.158)*	(1.666)*	(2.638)*
HHI_{-1}	0.6340	0.6249	0.6584
	(6.113)*	(7.195)*	(6.957)*
HHI_{-2}	0.0538	0.2353	0.1199
	(0.527)	(2.777)*	(1.293)**
Time	-0.0026	-0.0008	-0.0016
	(-2.740)*	(-1.406)**	(-2.294)*
DIV	-0.0679	-0.0426	-0.0562
	(-1.983)*	(-1.563)**	(-2.096)*
EXPA	-0.1359	0.0208	-0.0658
	(-4.383)*	(1.011)	(-3.043)*
EXPN	-0.0267	-0.1791	-0.1047
	(-0.883)	(-8.260)*	(-4.833)*
DH	0.0048	0.0138	0.0094
	(0.139)	(0.720)	(0.377)
FA	-0.0145	-0.0020	-0.0002
	(-0.545)	(0.108)	(0.008)
R^2	0.978	0.981	0.985
$\bar{R}^2$	0.975	0.979	0.984
$ln\mathcal{L}$	126.25	153.94	151.84
n	74	74	74

Table 2: Home-Run Herfindahl Regression Results

Two-tailed t-Statistics reported in parenthesis.
* (**) indicates 5% (10%) significance.

Strike-Out Herfindahl			
Variable	American League	National League	All Major League
Intercept	0.1509	0.1081	0.0898
	(0.866)	(0.564)	(0.678)
HHI_{-1}	0.9618	0.9965	1.0243
	(26.153)*	(25.760)*	(29.393)*
HHI_{-2}	0.0176	-0.0114	-0.0378
	(0.509)	(-0.296)	(-1.105)
Time	-0.0002	-0.0002	-0.0001
	(-1.290)**	(-0.941)	(-1.229)**
DIV	-0.0000	-0.0019	-0.0036
	(-0.005)	(0.201)	(0.514)
EXPA	-0.1865	0.0034	-0.0995
	(-26.162)*	(0.479)	(-18.238)*
EXPN	-0.0053	-0.1845	-0.0876
	(-0.774)	(-24.813)*	(-16.591)*
DH	0.0006	-0.0014	-0.0029
	(-0.091)	(-0.166)	(-0.047)
FA	-0.0003	0.0018	-0.0013
	(-0.530)	(0.296)	(0.289)
R^2	0.998	0.997	0.998
$\bar{R}^2$	0.998	0.997	0.998
$ln\mathcal{L}$	239.38	232.63	256.44
n	74	74	74

Table 3: Strike-out Herfindahl Regression Results

Two-tailed t-Statistics reported in parenthesis.
* (**) indicates 5% (10%) significance.