

UNDERGRADUATE RESEARCH

**SALARY CAPS AND COMPETITIVE BALANCE IN
PROFESSIONAL SPORTS LEAGUES**

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Abstract

This paper examines the effects of salary caps on competitive balance in professional sports leagues in the United States. We find no evidence to suggest that salary caps improve competitive balance, as measured by the variation in wins between the best and worst teams in a league in a given year, in any of the major sports leagues. Further, depending on the measure of competitive balance, it appears that salary caps decreased competitive balance in the NBA, which has specific components that differ from those of the NHL and NFL. The results also suggest that revenue sharing arrangements promote competitive balance in a manner that is consistent with economic theory.

Key Words: salary caps, competitive balance, free agency, standard deviation, Herfindahl-Hirschman Index

JEL Classification: D63, L83

Introduction

Sports leagues have become large revenue generators over the last several decades. Player salaries, as well as the profits that teams and leagues generate, have increased considerably. As the value of sports leagues and franchises has increased, their connections to local economies have strengthened and the performance of the local team has become an important economic force in the community as well as a source of pride for fans. As such, policies that affect the competitiveness of teams within a league are an important topic of study.

One topic that has received considerable attention is the impact of policies that limit player salaries. Player salaries represent the largest component of operating cost to team owners and salary caps place a limit on the amount of money that an individual team can spend on player salaries. Salary caps have been introduced over the last three decades in three of the four major sports leagues in the United States: the National Basketball Association (NBA), the National Hockey League (NHL), and the National Football League (NFL). Major League Baseball is the only major sports league in the United States that does not have a salary cap.

Salary caps are a unique area of study for several reasons. The specific rules and enforcement of the salary cap are predetermined each season based on a set of criteria established in each league's collective bargaining agreement between the owners and the players

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union. Collective bargaining dictates that the details of these arrangements, which are largely exempt from antitrust laws, become well known. Thus, the details of the arrangements are fairly transparent. At present, the NFL and NBA are both in the process of renegotiating their collective bargaining agreements to determine the salary caps going forward.

Moreover, the final outcomes for professional leagues over time can be easily measured in wins and losses. Contrary to most of the popular arguments for salary caps, which rest on the assumption of improved competitive balance, there are strong economic arguments to suggest that competitive balance may be completely unaffected by a salary cap, if owners are profit maximizers.

We find no evidence in our data to suggest that salary caps have helped competitive balance, measured as the variation in wins between the best and worst teams in a league in a given year, in professional sports. Further, there is some indication that the introduction of the salary cap in the NBA is associated with a significant decrease in competitive balance. This derives from specific components of the NBA salary cap which differ from those of the NFL and NHL. We also find that revenue sharing and free agency may be better able to address the fundamental disparities between teams which lead to competitive imbalance. Unlike salary caps, these policies appear to increase competitive balance significantly in our data across all specifications.

Background

Salary caps have been introduced over the last three decades in the NBA, NFL and the NHL. The NBA became the first professional sports league in the United States to implement a salary cap system prior to the 1984-1985 season. The NFL installed a cap system prior to the 1994 season and the NHL began using a salary cap in the 2005-2006 season.

The structure of each league's salary cap system is unique. The systems vary in terms of the monetary limit of the salary cap, how this limit is determined, what components of player pay count against the salary cap, and what, if any, exemptions exist to allow teams to spend over the salary cap.³ The NHL and NFL each employ a "hard cap" that teams are required to stay under at all times. Teams that violate the cap are subject to fines, cancellation of contracts, and/or loss of draft picks. Past studies have shown that, even in the NFL, average league payrolls are commonly above the salary cap and large-market owners violate the salary cap both frequently and by large margins (Fort & Quirk, 1995). The NBA, on the other hand, employs a "soft cap" with exemptions that allows teams to spend above the salary cap when they qualify for the exemption. One such exemption is known as the Larry Bird exception, which provides an advantage in salary bargaining to a team with rights to a particular player, by permitting them to exceed the cap for that player. Another example is the Mid-Level exception. This allows teams that are over the salary cap to sign a player for the average league salary once per season.⁴ These characteristics of the NBA's soft cap provide teams with advantages that are not present under a hard cap. Consequently, this form of cap may do more to harm competitive balance by making the top talent less mobile.

³ For example, most leagues allow a team to pay a signing bonus which is pro-rated over the life of the contract for salary cap purposes.

⁴ Additionally, there are characteristics inherent to the game of basketball that hinder competitive balance. In the NBA each player has a larger effect on their team's outcome than in other sports since only five players are on the court at one time. Berri et al. (2005) conclude that the "short of supply of tall people" causes a competitive imbalance in the NBA between teams with highly skilled post players and teams without highly skilled post players.

There are two supposed benefits associated with salary caps. The first obvious benefit of salary caps is that they reduce costs for owners. Owners desire salary caps because minimizing salaries and reducing competition for talent allows for higher profits (Sanderson & Siegfried, 2003). By imposing a salary cap as an enforcement mechanism that limits what a team can spend on player salaries, team owners effectively minimize salary competition for talent and protect themselves against salary inflation on a league-wide basis. History shows that professional sports leagues introduced salary caps for the purpose of reducing costs for owners. After the NBA's reserve clause was replaced with free agency in 1976, many clubs were not doing well financially because of difficulty in adjusting to higher player salaries that were bid up during free agency. Owners wanted financial relief in the form of a salary cap (Staudohar, 1998).

In their public stance, however, leagues do not emphasize the cost cutting features of salary caps. Instead, they often promote salary caps as a way to improve competitive balance, and fans often assume this to be the case (Sanderson & Siegfried, 2003). Team owners publicly claim that salary caps are in place so that each team can be competitive regardless of the characteristics of their home market. Owners contend that salary caps prevent richer, large-market teams from increasing their payrolls to levels that would allow them to accumulate talent far superior to that of small market teams. Lower revenue teams could not be profitable with the same payroll as high revenue teams. Since a salary cap creates an environment where all teams spend a similar amount on talent, the owners claim, the distribution of talent is similar across teams and this similarity in talent enhances competitive balance (Endo et al., 2003).

Economic theory casts serious doubt on the relationship between salary caps and competitive balance. The seminal work by Rottenberg (1956) claims that the distribution of talent across teams within a league will depend only on revenue differences, invariant to other factors. Some other factors could include the structure of contracts and whether players or owners have the right to choose where a player will play. Rottenberg's Invariance Principle is similar to (and actually predates) the well known Coase theorem, which hypothesizes more generally that an asset will be put to use by the person or firm that values it the most, independent of the allocation of property rights (Coase, 1960). Thus, private bargaining will lead to efficient allocation of resources so long as transaction costs are low.

According to the Coase theorem, as well as Rottenberg's Invariance Principle, salary caps should not affect competitive balance, if owners are profit maximizers, because the same mechanisms with regard to revenue are present for the team with or without the cap. Whether or not a salary cap is in place, teams still generate differing amounts of revenue from individual players, and players will have different levels of outside income available to them due to variation in market size and team characteristics. The salary cap does not fundamentally change these factors.

One could argue that every owner would want to maximize wins and not profits if budget constraints were not an issue. In reality, most owners operate as win-maximizers as long as their budget constraints dictate that it is profitable to do so. Maximizing wins requires talent, however, and acquiring talent costs money. Certain markets simply do not provide enough revenue for an owner to earn profits while taking on the costs of a win-maximizing strategy. The implication is that profits become a binding constraint for the majority of owners. Thus, a player will ultimately move to his highest valued use even under a salary cap. The team that places the highest value on a player will still be willing to pay more to acquire that player.

Economic theory suggests that policies that have a direct impact on equalizing team revenues should have more influence on competitive balance, because they address the

fundamental force that dictates the movement of talent. Revenue sharing policies within a league are one clear means to address disparities in revenue. Free agency is another example which removes limits on the teams a player can join. While it is often assumed that allocating talent to the highest bidder may widen the distribution of talent among teams in a league, free agency also reduces transactions costs that may interfere with efficient Coase bargaining.

Empirical Literature

Prior studies by Larsen et al. (2006), Endo et al. (2003), Késenne (2000), Dietl et al. (2009), and Vrooman (2009) have looked at salary caps and competitive balance empirically and theoretically. Larsen et al. (2006) takes an approach most similar to ours. They use changes in the Herfindahl-Hirschman Index (HHI) (dHHI) and standard deviation measurements to study the effect that various league characteristics have on competitive balance in the NFL using data from the 1970 to 2002 seasons. They find that free agency and salary caps tend to promote competitive balance, although their model using standard deviations found that salary caps have not had a statistically significant effect on competitive balance.

Endo et al. (2003) use the Gini index to measure the distribution of wins in the NBA before and after the implementation of the NBA's salary cap using data from the 1974-75 to 2001-02 seasons. Noting that conventional wisdom holds that a salary cap improves competitive balance, and that the coefficient for the salary cap should therefore be less than zero, they find that the Gini coefficient actually increased in the salary cap era, although the increase is not statistically significant.

Késenne (2000), Dietl et al. (2009), and Vrooman (2009) all use a theoretical approach to study the impact of salary caps on competitive balance. The general consensus among these theoretical studies is that salary caps should improve competitive balance. Vrooman (2009) notes that revenue sharing also should improve competitive with or without a salary cap.

An abundance of research has been conducted on the measurement and analysis of competitive balance in sports. Rottenberg (1956) originally measured competitive balance by counting the number of championship that each MLB team had won from 1920 to 1951. The approach of measuring the actual standard deviation of winning percentages in a league and comparing it to the ideal standard deviation was first introduced by Noll (1988) and used by Scully (1989) and Quirk and Fort (1992) to measure the effect of the removal of the reserve clause in Major League Baseball. Fort and Quirk (1995) use Gini coefficients to study the impact of free agency on competitive balance across sports leagues, while Schmidt (2001) and Schmidt and Berri (2001) also used Gini coefficients to study the impact of expansion on competitive balance in Major League Baseball.

Depken (1999) measured competitive balance using the Herfindahl-Hirschman Index (HHI). He claims that this method is a more appropriate way to measure the effects of free agency, because it can control for other exogenous factors, such as talent distribution and the expansion of new teams. Owen et al. (2007), however, note that there are biases in using the HHI method over time. The modified version of Depken's (1999) framework used by Larsen et al (2006) serves as the second method for measuring competitive balance used in this study.

Humphries (2002) introduced another way of measuring competitive balance called the Competitive Balance Ratio (CBR). The CBR is a team's standard deviation of winning percentages over a number of seasons, divided by the league average standard deviation of winning percentages over the same time period. The ratio will range from 0 to 1, with 1 representing perfect competitive balance. As Larsen et al. (2006) explain, this method works best

for leagues where the standard deviation of winning percentages has remained relatively constant over time. This is not the case for the leagues analyzed in this study, particularly for the NFL which has seen a steady decline in the standard deviation of winning percentages over time.

Methodology

We collect data on several aspects of competition from each league over time. The data from the NBA cover the 1978-79 season through the 2009-2010 season. The NFL data are for the 1978-79 season through the 2009-2010 season, while NHL data span 1979-80 through 2009-10.

Competitive balance in our analysis is the variation in wins between the best and worst teams in a league in a given year. When the variation is large a league is unbalanced and when it is small it is balanced. This notion of competitive balance is likely to be the most relevant from the perspective of the league because more of the games (especially late in the season) are important for the final standings in a balanced league. The fans of low performing teams may think of competitive balance in terms of the likelihood that different teams will move up and down the standings over time. In any case, analyzing these sorts of effects over time complicates the isolation of the impact of salary caps with a clear time component. Consequently, we construct two measures of competitive balance from historical data.

The first method of measuring competitive balance is performed by taking the standard deviation of winning percentages for each team in a given year. This actual level of competitive balance is then divided by the ideal level of competitive balance, which is equal to one-half divided by the square root of the number of games played in a season. This type of measurement has been used in past research on competitive balance (Scully, 1989; Quirk and Fort, 1992; Butler, 1995; Schmidt and Berri, 2002; and Zimbalist, 2002).

The second method for measuring competitive balance is to take the deviation of the HHI from the ideal distribution of wins (dHHI). This is done by subtracting $1/N$, where N is the number of teams in the league, from the HHI of wins for each team in a league for a given season. This method for measuring competitive balance has been used by Depken (1999) and Larsen et al. (2006).

We construct these two measures of competitive balance and then perform linear panel regressions of the following form:

$$SD_{it}/dHHI_{it} = \alpha_0 + \beta_1 \text{Salary Cap}_{it} + \beta_2 \text{Salary Floor}_{it} + \beta_3 \text{Revenue Sharing}_{it} + \beta_4 \text{Free Agency}_{it} + \beta_m Z_{it} + \mu_i + \varepsilon_{it}$$

Where i is the league index corresponding to the NBA, NHL, and NFL, and t is an index for the year of the observations. Z_{it} is a vector of controls, μ_i is a league specific error term and ε_{it} is the residual.

The impact of salary caps on competitive balance is the main target of this study. The *Salary Cap* variable is a dummy variable that takes a value equal to 1 for seasons in which the league has a salary cap and 0 for the seasons that a league does not have a salary cap. If salary caps improve competitive balance the sign for the coefficient on *salary cap*, β_1 , should be negative. In another specification, we consider the effect of the salary cap within each league separately by including a dummy variable for each league.

We also include measures for several other factors that may impact competitive balance. Dummy variables are included for *Salary Floor*, *Revenue Sharing*, and *Free Agency*. Each of

these is a dummy variable that takes a value of 1 for seasons in which the league has the policy in place and 0 for the seasons that a league does not have the policy. In each case the sign of the coefficient will be negative if the variable improves competitive balance.

The presence of a salary floor may impact competitive balance, as a league with only a salary cap can still have a large gap between the highest spending teams and lowest spending teams. All three of the American professional sports leagues discussed here that use salary caps also currently have salary floors, but these floors have only recently been adopted.

Revenue sharing is a variable of interest because the concept of sharing revenue among teams could have a large impact on competitive balance as revenue disparities are the cause for variances in player talent across teams (Rottenberg, 1956). *Free agency* may affect competitive balance by altering the distribution of talent, since free agents (individual players) have the right to voluntarily change teams.⁵

The vector of Z_{it} variables includes controls for changing league characteristics as well as player talent. Our league characteristics include league *Expansion*, *Strike* shortened seasons, *Playoff Spots*, *New Stadiums*, and team *Relocation*.

Expansion is included because each of the professional sports leagues in this study has seen the addition of several teams over the last few decades. When an expansion team is added, it receives its players from an expansion draft. In an expansion draft, the new team selects players off of each existing team's roster. League expansion creates an issue with HHI measurements; an increase in teams can cause winning to seem more dispersed, even if actual competitive balance has not changed. Using dHHI measurements as the dependent variables eliminates this downward bias of HHI measurements when leagues expand. Depken (1999) notes, however, that expansion should still be included as an independent variable.

Strike dummy variables are included with the variable taking a value equal 1 if the observation is from a strike shortened season and 0 otherwise. The *Playoff Spots* variable is defined as the change in the number of playoff spots in one season from the last. The intuition behind this variable is that increasing the number of playoff spots could affect competitive balance by keeping a few teams in playoff contention longer, potentially affecting both player effort and the trading away of top players after a team has been eliminated from playoff contention in order to cut payroll.

The *New Stadiums* variable is the number of new stadiums or arenas that have been built in the last five seasons. The potential impact of new stadiums on competitive balance is that new stadiums often bring in more revenue through increased ticket sales and additional luxury suites. This revenue could be used to bring in more talent.

Relocation is the sum of all relocations in the past five seasons. By relocating to a new city, a team could benefit from increased market size and/or increased revenue from ticket sales. A boost to team morale is another potential factor if the team is now playing in front of much larger crowds.

We also include the variables *Points For* and *Points Against* to account for distribution of player talent across a league. In keeping with Depken (1999) and Larsen et. al. (2006), we quantify player talent by measuring points/goals/runs scored and points/goals/runs allowed. In the dHHI model, the variables for *Points For* and *Points Against* are defined as the HHI of points for and points against for each team in a given season. In the SD model, the *Points For* and

⁵ Larsen et al. (2006) combine the dummy variables SCAP and FREE AGENCY into one variable. The reason for this is that in the NFL the salary cap and free agency came into existence in the same season. Our study includes the NBA and NHL, which installed salary caps and free agency in separate seasons.

Points Against variables are defined as the standard deviation of points for and points against for each team in a given season.

There are of course a number of other variables such as injuries, management, and coaching which may influence competitive balance. To the extent that these are invariant to the presence of a salary cap, their effects are captured in the error term.

Results

We report regression results in Table 1 for two measures of competitive balance in professional sports leagues. Columns 1 and 2 present results for regressions using standard deviations of winning percentages as the dependent variable and columns 3 and 4 display results using dHHI calculations as the dependent variable. The two formulations produce somewhat different results, leading to different conclusions about the relationship between salary caps and competitive balance.

In the specification using standard deviations of winning percents to measure competitive balance, the coefficient for the salary cap in column 1 is positive and statistically significant at the 1% level. Since higher standard deviations imply greater disparity in wins and losses, this result suggests that competitive balance has actually *decreased* as a result of the introduction of salary caps. Column 2 separates the effect by league and finds this to be driven by the NBA, which is positive and significant at the 1% level. This is consistent with the fact that the NBA employs a soft cap and has rules that also allow the team which currently holds a player's rights to sign that player for a salary that exceeds the cap. In addition to the effect of the salary cap, the influence of salary floors is also positive and statistically significant at the 5% level in both regressions with standard deviations as the outcome. This implies that floors hurt competitive balance as well.

Revenue sharing appears to be the most beneficial policy to competitive balance as the coefficient on *Revenue Sharing* is negative and significant at the 1% level in both columns. Free agency has a negative and significant coefficient in column 1, at the 10% level, but the same coefficient is not significant in column 2.

None of the controls for strike shortened seasons, playoff spots, new stadiums, expansions, and relocations are statistically significant at conventional levels. Controls for player talent indicate that standard deviations for points for are not statistically significant, but points against is significant at the 1% level in column 1 and the 5% level in column 2.

Using the dHHI measure of competitive balance leads to slightly different conclusions. The sign of the salary cap coefficient in column 3 is again positive, but small in magnitude and not statistically significant. This result suggests that salary caps have no significant impact on competitive balance. Column 4 separates the effect by league and indicates a positive and significant effect at the 1% level on the HHI for salary caps in the NHL. Again, a positive coefficient indicates a decrease in competitive balance. The coefficient for the salary floor is negative and statistically significant in column 4, suggesting an improvement in competitive balance, but this cancels with the positive impact of the salary cap for the NHL.

Using the dHHI measures, *revenue sharing* again appears to generate a statistically significant improvement in competitive balance as this coefficient is negative and significant at the 1% level in column 3 and the 5% level in column 4. The coefficient on *Free Agency* is negative and significant at the 5% level in columns 3 and 4.

Table 1: Regression Results

Explanatory Variables	Standard Deviation		HHI	
	Together	By League	Together	By League
Salary Cap	0.469*** (0.127)	--	0.0002 (.0004)	--
Cap NFL	--	0.096 (0.131)	--	-0.0002 (0.0004)
Cap NBA	--	0.801*** (0.127)	--	0.0003 (0.0003)
Cap NHL	--	0.174 (0.207)	--	0.0027*** (0.0007)
Salary Floor	0.259** (0.124)	0.246** (0.124)	-0.0006 (0.0004)	-0.0016*** (0.0004)
Revenue Sharing	-0.807*** (0.088)	-0.595*** (0.086)	-0.0010*** (0.0003)	-0.0007** (0.0003)
Free Agency	-0.224* (0.124)	-0.153 (0.109)	-0.0011** (0.0004)	-0.0009** (0.0004)
Expansion	-0.004 (0.100)	0.029 (0.087)	-0.0003 (0.0003)	-0.0002 (0.0003)
Points For	-0.015 (0.079)	-0.062 (0.071)	1.1448*** (0.4006)	0.5266 (0.3991)
Points Against	0.234*** (0.078)	0.182** (0.071)	-1.2694*** (0.3950)	-0.6939* (0.3909)
Strike NFL	0.185 (0.242)	0.157 (0.211)	-0.0003 (0.0008)	-0.0001 (0.0007)
Strike NBA	0.525 (0.337)	0.300 (0.296)	-0.0001 (0.0011)	-0.0003 (0.0011)
Strike NHL	-0.257 (0.340)	-0.116 (0.296)	-0.0010 (.0011)	-0.0008 (0.0011)
Playoff Spots	-0.110 (0.098)	-0.044 (0.086)	0.0001 (0.0003)	0.0001 (0.0003)
New Stadiums	0.015 (0.014)	0.011 (0.012)	0.0001 (.0001)	-0.0001 (0.0001)
Relocations	-0.022 (0.033)	0.002 (0.030)	0.0001 (.0001)	0.0001 (0.0001)
R-squared	0.7628	0.8262	0.4964	0.5880
Observations	94	94	94	94

Notes: Standard errors are in parentheses. *, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

As with the standard deviation measures, none of the controls for strike shortened seasons, playoff spots, new stadiums, expansions, and relocations are statistically significant at conventional levels. Controls for player talent indicate that standard deviations for points for are

not statistically significant, but points against is significant at the 1% level in column 1 and the 5% level in column 2.

These findings are different from Larsen, et al. (2006) who found that the introduction of the salary cap in the NFL was associated with an increase in league-wide competitive balance using the dHHI measure and no effect on competitive balance when using the standard deviation method. We prefer the standard deviation measure for wins because Owen et al. (2007) indicate some biases in the HHI approach over time. We are reassured in this by the better fit of the regressions in columns 1 and 2 compared to those in columns 3 and 4.

In either case, we find no evidence that salary caps improve competitive balance and consistent evidence that revenue sharing does improve competitive balance. This is consistent with economic theory which suggests that talent will move to the location for which it generates the greatest revenue. This movement is independent of the salary cap, but does depend on the nature of revenue sharing in the league. Thus, revenue sharing plans are more effective at addressing the primary cause for the disparities in competition across teams, the disparities in revenue generation across teams.

Summary and Conclusions

This research seeks to uncover whether salary caps improve competitive balance in professional sports leagues, as team owners claim and many fans seem to believe. We utilize two different measures for competitive balance across the three major professional sports leagues in the United States that have salary caps. We find no evidence to suggest that salary caps have improved competitive balance in a statistically significant manner. In fact, using standard deviations of winning percentages as a measure for competitive balance, we find evidence that salary caps are associated with a statistically significant *decrease* in competitive balance across leagues. This negative influence is most evident in the NBA, likely as a result of exemptions that limit player movement by allowing teams to spend over the salary cap.

The finding that salary caps do not improve competitive balance may go against fans' perceptions and owners' claims. If owners are profit-maximizers, however, these findings are entirely consistent with the Coase theorem and the Rottenberg Invariance Principle. Both of these posit that talent will go to the location for which it can raise the most revenue. If a player is worth more to a particular team, that team will be willing to pay a higher salary to that player, or offer more in a trade for that player. These differences in value are determined by the amount of revenue that a player can generate, not by the amount that a team can pay for that player. Teams that are located in large markets have the ability to generate more revenue from signing a star player than do those in smaller markets, because large-market teams have more potential fans, more potential merchandise sales, and more local and national media coverage. Varying ability to generate revenue is the root cause of competitive imbalance and a salary cap does not change this.

By contrast, revenue sharing between teams within a league addresses competitive balance by attempting to minimize differences in revenue. In our analysis, the coefficient on revenue sharing is the only coefficient on a league policy that shows a statistically significant improvement for competitive balance across all specifications. In addition, revenue sharing by the league does not necessarily restrict the amount of money that is distributed in the form of player salaries as does a salary cap.

Our analysis reveals that salary caps in their current forms have not clearly improved competitive balance. It is another issue entirely as to whether the observed salary cap structure is

best suited for promoting competitive balance. One could argue that the salary caps that we see in American professional team sports are neither properly designed, nor properly enforced. Nonetheless, we contend that even if salary caps were designed and enforced more effectively, the effect of salary caps on competitive balance would likely still be minimal. The main source of competitive imbalance in professional sports leagues is rooted in the revenue disparities among teams, which a salary cap does not change.

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