Has a Salary Cap in the NFL Improved Competitive Balance?

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> If you're around long enough, you lose games
> that you're supposed to win and you win games
> that you're supposed to lose.
>
> <div align="right">Brett Favre
Green Bay Packers</div>

Without spending limits in professional sports, there is a danger that a few high-budget teams will dominate each league. Theoretically, a salary cap would narrow the spread among teams in total player salaries, prevent an overzealous owner from monopolizing playing talent and, presumably, improve competitive balance.

The Gini index, which is typically used in statistical analysis to measure the distribution of income, is here used as a measure of competitive balance.[1] The best teams in the National Football League (NFL) with the most wins are considered to be the richest, and the worst teams with the fewest wins are considered the poorest. The Gini index is based on the Lorenz curve, which relates the cumulative percentage of games won in a season to the cumulative percentage of teams, arrayed from poorest to richest. (Games won are from http://www.nfl.com/history/standings.) The Gini index is given by

$$\text{Gini index} = \sum_{i=1}^{n} \left(f_i \, y_{i+1} - f_{i+1} \, y_i \right)$$

where f_i denotes the cumulative percentage of teams (arrayed from poorest to richest) and y_i denotes the cumulative percentage of wins. The closer the Gini coefficient is to 0, the closer the NFL is to perfect equality (or competitive balance) in that season, while the closer this value is to 1, the closer the league is to perfect inequality in that season. The Gini index is presented in Table 1 on a year-by-year basis for each conference as well as for the entire NFL beginning in 1973.

Prior to the 1994 season, the NFL adopted a hard salary cap.[2] The *GINI* coefficient is regressed from 1973 through 2003 against a time trend (*YEAR*) and a binary variable (*CAP*) which is equal to 1 for seasons after the salary cap. The regression results are as follows:

$$GINI = 3.47 - .0016 \ YEAR + .0097 \ CAP$$
$$\quad (1.87) \ \ (1.75) \qquad\quad (0.54) \qquad\qquad\qquad R^2 = .159$$

where absolute *t*-ratios are in parentheses.[3]

According to the conventional wisdom, a salary cap should have improved competitive balance in the post-1993 era. That is, the coefficient on *CAP* should be less than 0. Instead, the evidence is that in the years following the NFL salary cap, the Gini index has actually increased, although the increase is not statistically discernible from 0 ($p = .59$). When the GINI index for each conference is regressed against the same two regressors, *CAP* is not significant in either regression (NFC, *p*-value on *CAP* coefficient is .85; AFC, $p = .46$).

In 1973 there were 26 teams in the NFL, 13 in each conference. League expansions in 1976, 1995, 1999, and 2002 have increased the number of clubs to 32. Expansion teams tend to struggle in their early years because of the initial low quality of their playing talent. Although an *XPAN* binary variable (equal to 1 in the aforementioned expansion years) was not statistically significant in any of the *GINI* regressions (for either conference or the entire league), increasing the number of teams typically diminishes competitive balance by widening the differences in team strengths.

Concluding Remarks

When the GINI index is used to measure competitive balance in the NFL, the data from 1973 through 2003 show neither an improvement in competitive balance over time nor a discernible change in competitive balance after the NFL instituted a salary cap before the start of the 1994 season. Why? Teams can undermine the effectiveness of salary caps by restructuring their players' contracts (deferring payments, for example). Moreover, the NFL allegedly gives this season's worst (best) teams relatively easy (difficult) schedules next season, an arrangement that tends to reduce variation in the distribution of team wins. The absence of a trend in the era 1973-2003 might also be explained by other factors which help minimize differences in team strengths: free agency, the reverse-order draft (where the worst teams choose first), and extensive revenue-sharing (where home and visiting teams split the gate 60-40 and revenue from all national broadcast rights are split evenly among teams).

Table 1.   Gini Index by Conference and League, 1973-2003

Year	National Football Conference	American Football Conference	National Football League
1973	.2675	.2706	.2732
1974	.2220	.2101	.2187
1975	.2727	.2733	.2790
1976	.2564	.2943	.2789
1977	.2358	.2337	.2391
1978	.1779	.1887	.1907
1979	.2283	.1452	.1913
1980	.2514	.1579	.2109
1981	.1541	.2143	.1882
1982	.1751	.2868	.2397
1983	.2053	.1671	.1882
1984	.2169	.2526	.2372
1985	.2259	.2016	.2165
1986	.2623	.2041	.2375
1987	.2308	.1435	.1953
1988	.2116	.1609	.1901
1989	.2469	.1186	.1968
1990	.2003	.2385	.2245
1991	.2251	.2483	.2430
1992	.2217	.2288	.2312
1993	.1667	.1903	.1795
1994	.1802	.2014	.1923
1995	.1561	.1812	.1700
1996	.2203	.1738	.2025
1997	.1983	.2094	.2059
1998	.2633	.2094	.2394
1999	.2000	.1995	.2050
2000	.1933	.2422	.2201
2001	.2633	.1826	.2261
2002	.2025	.1500	.1817
2003	.1944	.2288	.2144

Reference

1.   D.E. Carbonneau and Paul M. Sommers, "Measuring Competitive Balance in Major League Baseball," *Journal of Recreational Mathematics*, 28:3, pp. 161-165, 1996-97.

Footnotes

1. See Carbonneau and Sommers [1] in this journal for an application of the Gini as a measure of competitive balance in Major League Baseball before and after the advent of free agency in 1976.

2. The National Basketball Association allows individual teams to exceed the salary cap if they are re-signing free agents from their own team.

3. When the regression is re-estimated with data beginning in 1978 (the year the NFL adopted a 16-game schedule), *YEAR* ($p = .25$) and *CAP* ($p = .22$) are still not statistically significant.