Dynasties and the Uncertainty of Outcome Hypothesis: The Case of Major League Baseball

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Abstract: Whether Rottenberg's uncertainty of outcome hypothesis extends to the case of dynasties (or, consecutive season outcome uncertainty) remains an open theoretical and empirical question. A simple theory shows that consecutive season outcome uncertainty requires a curious asymmetry in fan attendance behavior. Using break point analysis, we find no statistically significant impact of consecutive season outcome uncertainty on league attendance per game over the history of Major League Baseball. This rejects both the theoretical asymmetry curiosity and the extension of Rottenberg's uncertainty of outcome hypothesis to the case of dynasties for this league. We also find that break points in the attendance data coincide with both World Wars and to particular historical occurrences in Major League Baseball, suggesting interesting future research topics.

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I. Introduction

This paper addresses both the absence of theory and the state of empirical results concerning one aspect of Rottenberg's (1956) uncertainty of outcome hypothesis (henceforth, the UOH), namely, dynasties in pro sports leagues. The UOH is multi-faceted and any discussion of the past theoretical and empirical work is facilitated using a categorization first suggested by Sloane (1976) and then explicitly enumerated in Cairns (1987). Game uncertainty (henceforth GU) concerns the closeness of individual contests. Playoff uncertainty (henceforth PU) pertains to the closeness of championship races either in the regular season or in the playoffs. Consecutive season uncertainty (henceforth, CSU) applies to the question of dynasties over time.

The importance of the UOH, in any of its forms, is found in Rottenberg's original argument that outcome uncertainty and competitive balance on the field, court, or ice are positively related; the more uncertain outcomes become, the greater is competitive balance in a league. Members of sports leagues have a vested interest in competitive balance for the following reason. Declining competitive balance in a league causes fan interest in perennial losing teams to wane, threatening the economic viability of those teams. But this also matters for surviving teams since they may suffer reduced revenues as general interest in the sport declines.

Theoretically, however, Rottenberg never addressed the issue of dynasties, or CSU. Further, while the very first rigorous works on sports leagues by El Hodiri and Quirk (1971) and Quirk and El Hodiri (1974) were explicitly dynamic models, the aim was to determine the dynamic distribution of talent in the league, that is, the determination of competitive balance over time. To our knowledge, there is nothing in the subsequent *theoretical* literature on the role CSU plays in fan demand, either in a static or dynamic context.

Despite the lack of theoretical justification, there has been empirical work on attendance demand extending the UOH to the case of CSU. Some simply assume that it holds so that attendance increases in the presence of CSU (Humphreys, 2002; Hadley, Cieka, and Krautmann, 2005). Other work attempts to estimate the impact of CSU on attendance demand. Szymanski (2003) provides a survey of findings and Fort (2006) shows that the bulk of the earlier work suffers from two problems vis a vis the UOH. First, all of the possible types of outcome uncertainty—GU, PU, and/or CSU—have not been applied where relevant leaving past work subject to specification error. Second, with very few exceptions, the time series elements of attendance receive little formal treatment. This is particularly true in the empirical work on Major League Baseball

(MLB).

The only recent exception that focuses on dynasties and attendance is Krautmann and Hadley (henceforth, KH, 2006) who include both intra-seasonal outcome uncertainty and inter-seasonal outcome uncertainty. KH also recognize the unit root problem with MLB attendance and undertake their demand estimation after taking first-differences of the attendance series. KH then find that their inter-seasonal measure, Markov transition probabilities for playoff teams, identifies a small but significant impact but only for the American League (AL) and not the National League (NL).

However, KH only analyze data over 1950-2003 when attendance is available back to the turn of the century and they omit consideration of a direct measure of PU. Further, they handle structural change with a variable measuring the percent of teams that make the playoffs. On this issue, Fort and Lee (2006) show that actually assessing break-points in the attendance data will greatly enhance understanding of attendance demand. This suggests that the KH work suffers omitted variables bias. One indicator of an omitted variables problem is the small R^2 findings in KH (their highest is only 0.14 for their 53 year time series). Further, while they note a significant finding for CSU in the AL, not much is made of the fact that many sign contradictions occur in those results compared to the NL.

In this paper, we attempt two tasks. First, to begin to fill a gap in the literature, we offer a very basic theory of CSU and attendance. Even our simple theory suggests this extension of the UOH to the case of dynasties is out of the ordinary. For attendance to increase in the presence of CSU, the lost attendance to the previously dominant team due to its reduced winning percent must be smaller than the increase in attendance to the now dominant team. We think of no reason why such a curious asymmetry would actually exist among baseball fans in markets with different revenue potentials.

Second, our empirical work adds to what has been learned from past results and extends it in important ways. Accounting for the time series behavior of MLB attendance along the lines suggested by Fort and Lee (2006), we estimate the relationship between the UOH in all of its relevant forms—GU, PU, and CSU—with a complete specification of the rest of the determinants of demand over the entire modern MLB period to date (1901-2003). In addition to extending insights into past empirical work on CSU, use of break point analysis has offered interesting insights into historical occurrences in North American pro sports leagues relative to sports time series data (Lee and Fort, 2005; Fort and Lee, 2007), suggesting fruitful lines of future research.

Our chosen case is MLB attendance at the annual league level as opposed to crosssection analysis of individual team attendance or the analysis of game day attendance. We have no doubt that other levels of aggregation also prove informative. For example, if one examines team level, game-by-game attendance data, the insights gained would concern measures of GU at the time two teams meet and PU at different points in the season. Aggregated and disaggregated analysis as complementary, but three things are gained from league level aggregation. First, Rottenberg's original discussion concerned just why the UOH is a *league*-level concern suggesting a league-level attendance analysis. Second, since all three types of outcome uncertainty matter at the aggregate level, we are able to investigate the different roles played by GU, PU, and CSU in our analysis. Finally, examining annual attendance data is a guide to future analysis at the disaggregated level because ignoring the time series behavior of the attendance data can leave disaggregated approaches confronting spurious correlation problems (Davies, Downward, and Jackson, 1995; Jones, Schofield, and Giles, 2000).

The paper proceeds as follows. Section II presents our modeling consideration of CSU, including the aforementioned curious asymmetry. Section III contains our empirical model and results on CSU and annual MLB attendance per game. We find no statistically significant impact of CSU on annual league attendance for the entire history of MLB. This rejects both the curious asymmetry in fan attendance and the extension of Rottenberg's UOH to the case of dynasties at least for MLB. Section IV is an assessment of our discovered break points in light of the history of MLB, suggesting interesting topics for future research. Conclusions round out the paper in Section V.

II. Model: CSU and Attendance

We offer a very simple theoretical depiction of CSU that eventually raises questions about the application of Rottenberg's UOH logic to the case of CSU (and we stress that Rottenberg never actually did such an application). Suppose a two team league compared over two consecutive seasons. Let W_{it} be team i's winning percent, i = 1, 2, at times t = 1, 2. The adding-up constraint in league play has $W_{1t} + W_{2t} = 1$, t = 1, 2. Also let $A_{it}(W_{it})$ be attendance for team i at time t, dependent on its winning percent at that time and assume $\frac{dA_{it}}{dW_{it}} > 0$ so that attendance demand increases for more successful teams and declines for teams that falter. Finally, suppose that team 1 is the champion of the first season with $W_{11} > 0.500$ so that $W_{11} > W_{21}$ by the adding-up constraint.

The definition of CSU is a reversal of fortunes in season 2, that is, $W_{22} > 0.500$ so that $W_{22} > W_{12}$ by the adding-up constraint. Clearly, then, $W_{12} < W_{11}$ and $W_{22} > W_{21}$. In addition, if fans respond positively in the presence of CSU as dictated by the UOH, then total league attendance increases in season 2, that is:

(1) $A_{12}(W_{12}) + A_{22}(W_{22}) - [A_{11}(W_{11}) + A_{21}(W_{21})] > 0$.

Grouping terms by team rather than by season, (1) becomes:

(2) $[A_{12}(W_{12}) - A_{11}(W_{11})] + [A_{22}(W_{22}) - A_{21}(W_{21})] > 0$.

Since attendance decreases with a decrease in winning percent for team 1, the first term in (2) is negative, that is, $W_{12} < W_{11} \Leftrightarrow A_{12}(W_{12}) - A_{11}(W_{11}) < 0$. Since attendance increases with an increase in winning percent for team 2, the second term in (2) is positive, that is, $W_{22} > W_{21} \Leftrightarrow A_{22}(W_{22}) - A_{21}(W_{21}) > 0$. This all dictates the following from (2):

(3) $A_{22}(W_{22}) - A_{21}(W_{21}) > |A_{12}(W_{12}) - A_{11}(W_{11})|$.

The result in (3) is the source of our earlier claim that the application of Rottenberg's logic to the CSU case is questionable. Doing so dictates that the magnitude of the lost attendance to the previously dominant team 1 due to its reduced winning percent must be smaller than the increase in attendance to the now dominant team 2. This is a curious asymmetry because in a two-team league the increase in winning percent enjoyed by team 2 must be exactly offset by the decrease in winning percent suffered by the previously dominant team 1 (e.g., team 1 falls from 0.750 to 0.400, team 2 must have risen from 0.250 to 0.600; $W_{22} - W_{21} = 0.350$

$= -(w_{12} - w_{11})$). Since there is nothing in the theory suggesting such an asymmetry, application of Rottenberg's UOH logic is questionable.

Empirical results that reject CSU impacts on attendance will also reject the asymmetry derived in expression (3) since it is both a necessary and sufficient condition for increased attendance. Further, since the presence of CSU would have no impact on attendance, extensions of Rottenberg’s UOH idea to the case of CSU (which he did not discuss) would be invalid.

III. Empirical Model and Evidence on CSU

Fort and Lee (2006) test our same data for unit root with endogenous break points in the attendance time series and find that the series is stationary with break points. This suggests applying the methods of Perron (1989) and Bai and Perron (1998, 2003), henceforth the BP method, to pin down the break points more specifically. The BP method helps identify stationary periods for attendance regressions using level data. This method also has the advantage of allowing for elasticity calculations that is lost using the first differences method.

Lee and Fort (2005) detail the BP method so we do not reproduce it here. In addition, they detect break points in the *competitive balance* time series but none of these coincide with the break points we discover below in the *attendance* time series.

However, we still utilize a one-step procedure, including our measures of GU, PU, and CSU in the break point analysis, because outcome uncertainty, as we measure it, may be one of the determinants of the attendance break points in the first place.

A second issue is the scale effects inherent in the attendance data due to expansion in the number of teams in a league. For example, attendance increased by 12.8 million and again by 6.8 million for the 1993 and 1998 NL expansions, respectively. Our approach to the possibility of scale effects is to measure attendance on a league average per game basis. In addition, the AL and NL are analyzed separately since measures of competitive balance are generated from separate league play for nearly the entire sample.

As our final consideration, Schmidt and Berri (2002, 2004) and Coates and Harrison (2005) find that work stoppages may have short-term effects on the attendance time series and these short-term impacts may falsely influence our break point estimation aimed at detecting longer-term structural changes. However, accounting for work stoppages is somewhat problematic for the BP method. Dummy variable techniques for work stoppages cannot be used in the BP method since it essentially divides the sample into two sub-samples in order to estimate break points. In some cases, dummy variables could equal zero or one for all observations in these sub-samples. Given this issue, we account for work stoppages in the following way.

Using league average attendance per game at time t, $LAPG_t$, 1901-2003, we run the following regression for each league:

(4) $$LAPG_t = b_1 + b_2 STRIKE_t + e_t\ ,$$

where $STRIKE_t = 1$ for t = 1981, 1994, 1995, and $STRIKE_t = 0$ for all other years (only these three episodes altered the number of games available to fans). Then we calculate "adjusted" attendance without strikes as:

(5) $$LAPG_t^{'} = LAPG_t - \hat{b}_2 STRIKE_t\ .$$

$LAPG_t^{'}$ is our dependent variable, that is, estimated attendance without strikes in 1981, 1994 and 1995 and actual league attendance per game in all other years.

We apply the BP method to these adjusted league average annual attendance data, allowing both levels and trends to change (Perron, 1989). The attendance regression results with breaks are from the following regression:

(6) $$LAPG_t^{'} = z_t \beta_i + x_t \gamma + \varepsilon_t\ , \quad t = T_{i-1}+1,...,T_i\ , \quad i = 1,...,m+1\ .$$

In (6), i indexes the ith regime and the indices ($T_1,...,T_m$) are treated as the unknown break points. For example, we find that there are three breaks in the NL (1918, 1945, and 1967) but in this case i = 1, … , 4: (1901, 1918), (1919, 1945), (1946, 1967), (1968, 2003). z_t is a (q×1) dimensional covariate with coefficients β_i subject to change over time, essentially the constant and a trend. x_t is a (p×1) covariate comprised of our outcome uncertainty variables, GU_t, PU_t, and CSU_t. Expression (6) is a partial structural change model since the parameter vector γ is not subject to change. When p = 0, this model is a pure structural change model where all the coefficients are subject to change. Perron's GAUSS code was used to estimate the break points using (6).

Turning to the specification of outcome uncertainty in (6), Fort (2006) reviews all of the different ways that GU, PU, and CSU have been measured. In order to determine which variables best capture GU, PU or CSU, we ran subsidiary regressions to determine which measurements generate the best fit (the results of these exploratory regressions are available on request). Descriptive statistics for all variables are in Table 1.

A variable for GU should capture how close games were during the regular season. End-of-season winning percents should be more tightly bunched around 0.500 the more evenly matched teams were during the season. Subsidiary regressions suggested the "tail likelihood" (henceforth, TL) measure of winning percent dispersion from Fort and Quirk (1995), also examined by Lee (2004). TL utilizes data for the teams in the upper and lower tails of the winning percent distribution. If fans are insensitive to changes around winning percents of 0.500, but are sensitive to changes in the relative extremes of the winning percent distribution, then TL may capture more of the variation in attendance than, say, the popular “ratio of standard deviations” measure of Noll (1988) and Scully (1989). If TL increases, the tails of the distribution are moving closer to 0.500 and GU within the season has increased.

For PU, the chosen variable should capture the level of contention for final season outcomes. The measure suggested by the subsidiary regressions for PU is labeled "WINDIFF" in Table 1. This is the average difference across a given league in winning percents between first and second place finishers. For years prior to division play in 1969, we use the average difference in winning percents between the pennant winner and runner up in each league. For the period of two-division play, 1969-1972, we use the *average* difference in winning percents between first and second place division finishes. For the three-division modern format, we also add the winning percent difference between wild-card teams and the next best team to the calculation of the average. Lee (2004) found this variable to be quite robust in capturing PU across baseball leagues in Japan, Korea, and the U.S. If WINDIFF increases, division races are relatively less likely to be tight and PU has decreased.

A variable measuring CSU should measure the occurrence of dynasties; if the same teams are champions year after year, outcome uncertainty has decreased on this dimension. The subsidiary regressions suggest a version of the measure used by Butler (1995) labeled “CORR” in Table 1, the correlation of winning percentage between this season and the last three seasons. If CORR increases, the same teams dominate over time and CSU decreases.

The estimation results from the BP model are summarized in Table 2. The goodness-of-fit is high as would be expected in time series analysis, about 0.98 for each league, and there are no surprises in terms of the signs of the statistically significant estimated coefficients. We note that 1) R^2 is dramatically higher and 2) sign inconsistencies on the UOH variables between the two leagues do not plague our results compared to the earlier KH results.

Our main focus concerns the results for CSU and, straight to the point, there is no statistically significant impact of CSU on league attendance per game. Fans in each league *do* respond to PU but not to either GU (measured by TL) or CSU (measured by Corr). Since the estimated coefficient on CSU equals zero, accounting for the time series characteristics of the data, including a full characterization of the three elements of outcome uncertainty, the data on league attendance per game reject both 1) the curious asymmetry in fan attendance behavior derived in the theory section and 2) the extension of Rottenberg’s UOH logic to CSU.

We note that our results augment previous findings of significant but small CSU impacts on attendance, and only in one league, in KH. It could be that attention to the additional years, 1901-1949, have brought more information to bear on the actual effects of CSU. But we suspect that it is the fuller treatment of structural changes through the BP approach that is responsible for the difference. Where KH handled structural change with a variable measuring the percent of teams that make the playoffs, we measure all three types of outcome uncertainty allowing for break points in the league attendance per game time series. That R^2 improves so dramatically relative to KH, and that the results are consistent across the two leagues, suggests our approach overcomes omitted variables problems in that earlier work.

While not our main focus, we note in passing that the UOH has very little support at all given our results. Even though it is statistically significant, attendance is extremely inelastic with respect to PU for two comparison years. At the sample averages of PU and LAPG in Table 1, the estimated elasticity is about 0.026 in the AL and 0.056 in the NL. Thus, for a 1 percent change in PU evaluated at average LAPG, attendance per game increases by about 3.5 fans in the AL and 7.7 fans in the AL. This is quite small even if one puts the comparison in terms of “games back” rather than WINDIFF. At the mean of our measure (WINDIFF of about 0.05 in either league from

Table 1), a 1 percent change in PU is about 0.0005 in terms of winning percent while a change by a full game would be 1/162 = 0.006, an increase over elasticity by a factor of $\frac{0.006}{0.0005} = 12$. Even if the gap between first and second place finish fell by a full game, the impact is quite small—around 42 fans per game in the AL and 92 fans per game in the NL.

IV. Break Point Results

The actual statistical testing methodology used to uncover break points in the attendance data are detailed elsewhere (Fort and Lee, 2006) and, for the sake of brevity, we do not provide our test results here (of course, they will be provided upon request). We find the four break points in the AL and three in the NL detailed in Table 2 but it is easier to discuss these break points using the fitted values of $LAPG_t'$ in Figure 1. Using the coefficient estimates on the trend variables to interpret changes before and after the break points is straight forward. But it is not so easy to see what happens with the coefficient estimates of intercepts. For example, the intercept estimates are single-season values for the first season in the sample, 1901, but not when a season occurs during a break point.

In Figure 1, attendance was stable roughly between 4,000 and 5,000 per game in the two leagues to 1918. After a significant upward jump to 7,000 per game in both leagues, coincident with the end of World War I, attendance again remained stable from 1919 to 1945. The shift up at the end of World War II approximately doubled attendance per game in both leagues but, unlike preceding upward shifts, attendance was anything but stable from 1946 on. NL attendance gently increased to 1962 while AL attendance per game actually *declined*; the only prolonged decline observed over the entire sample period. The decline was truly precipitous at the AL break point in 1962, after which attendance rebounded at the highest rate of increase in the sample for either league. The NL enjoyed a trend increase only at its final detected break point in 1967. While NL attendance per game has continued its increase since 1967, AL attendance leveled off after 1987. In the very few most recent years in the sample, it appears the NL is leaving the AL behind.

Of interest to analysts of structural change in MLB, no break points coincide with the draft in 1965, the introduction of division play in 1969, free agency in 1975, the move to three divisions and a wild card team in 1994, the move to pooled revenue sharing in 1995 (and its expansion in 2001), or the introduction of inter-league play in 1997. Neither do we find any break point coinciding with the explosion of regional cable TV through the early 1990s.

Moving beyond the immediate end of World War II does, however, bring other outcome uncertainty and structural change episodes to mind. The first episode concerns the negative trend revealed in the AL, compared to the positive trend in the NL, 1946 through 1962. It is tempting to incorporate the Yankee dominance of the period into the explanation. After all, the Yankees won 13 of 17 AL pennants from 1946-1962, with a streak of 4 consecutive pennants (1955-1958) sandwiched between two streaks of 5 consecutive pennants (1949-1953; 1960-1964). But this type of evidence concerns CSU and our model produces no statistically significant impact for dynasty occurrences.

Turning to our statistically significant result that PU matters to fans, Table 3 shows that WINDIFF in the 1940s was half its 1930s level and the decline in WINDIFF (improvement in PU) continued through the 1950s for the AL. Not until the 1960s do we see an increase in WINDIFF, signaling worse PU. Since fans should like this result, this would be an offsetting effect on the negative trend in Figure 1.

If the Yankee dynasty had no statistically significant impact on attendance, and if the impacts of improved WINDIFF was not enough to offset the decline, then the explanation lies elsewhere. In their time series assessment of competitive balance, Lee and Fort (2005) suggest that attitudes toward race may have been different in the AL and NL cities and racial integration occurred over this same post-World War II period.

From the attendance perspective, an operational hypothesis would be that racial attitudes were different in cities *not shared* by the AL and NL. Racial attitudes in jointly occupied cities are the same for teams in either league so the marginal difference must be in cities solely occupied by one league or the other.

Excluding the Twin Cities and Houston that only had teams for one and two years respectively, in this period, the AL solely occupied Baltimore, Cleveland, Detroit, Kansas City, and Washington and the NL solely occupied Cincinnati, Los Angeles, Milwaukee, Pittsburgh, and San Francisco. If fans in cities in the AL list were relatively cooler to integration compared to fans in cities in the NL list, attendance could fall in the former and rise in the latter. Interestingly, Baltimore and Kansas City involved team moves and increased attendance followed so that this racial attitude difference would have had to have been very strong in Cleveland, Detroit, and Kansas City. Further, since both leagues enjoyed strong attendance increases after 1962, it required the extraordinary jump in 1987 for the AL to catch up to the NL fully 25 years after its declining attendance episode. Only more detailed analysis can shed further light on this issue.

For the occurrence of an increase in the rate of attendance in the NL, but not the AL, in 1967, our empirical result on PU suggests another look back at the behavior of

PU. In Table 3, the 1960s showed the smallest WINDIFF average of any decade in the NL since the 1920s and 1930s. But we find no broader structural issue coincident with this behavior of PU so just why it occurred, and only in the NL, remains a puzzle.

Turning to 1987 break point for the AL only, Table 3 shows that PU had never been better in this league (except for the very distant history of the decade of the 1900s) and we also can identify a possible structural issue that remains important to present. This is the period characteristic of the new age of baseball slugging brought forth by the "Bash Brothers" of the Oakland A's (Jose Canseco and Mark McGwire), disgraced recently under the shadow of performance enhancing substances. The shift up in attendance, followed by a leveling of attendance in the AL, is consistent with AL fans identifying with more exciting run production (whether it actually increased or not) and then, upon new of performance enhancing substances, finding the source of that run production distasteful after all. Again, these are only occurrences that coincide at this historical juncture and only further analysis will settle the question.

V. Conclusions

Rottenberg (1956) developed his uncertainty of outcome hypothesis around game uncertainty and playoff uncertainty, but not consecutive season uncertainty. In addition, we document that there is no theoretical work on the relationship between attendance and consecutive season uncertainty. But this lack of theoretical guidance has not stopped empirical researchers from assuming consecutive season uncertainty increases attendance. Only one paper examines the impact of consecutive season uncertainty on attendance, and there is room for improvement to, and extension of, that work. Further, the remaining empirical work on attendance demand also leaves room for improvement and extension.

We demonstrate theoretically that increases in attendance associated with consecutive season uncertainty require a very curious asymmetry among fans. For exactly the same magnitude of quality change, the increase in attendance associated with a team quality increase must be larger than the size of the decrease associated with a team quality decrease. The implication is that empirical work that rejects any impact of consecutive season uncertainty on demand rejects both the curious asymmetry and the extension of Rottenberg's uncertainty of outcome hypothesis to dynasties.

Our empirical work accounts for the time series behavior of attendance in MLB using break point analysis and incorporates a full array of variables for game uncertainty, playoff uncertainty, and consecutive season uncertainty in order to avoid omitted variables bias. We find no statistically significant impact of consecutive season uncertainty on league attendance per game. Thus, the data reject the curious attendance asymmetry and the extension of Rottenberg's uncertainty of outcome hypothesis to the case of consecutive season uncertainty.

The work here suggests the following future research. First, assessment of the break points in the attendance data suggest further analysis of the variation in racial attitudes in cities solely occupied by either the AL or NL at the time of racial integration. Second, the break point for the AL in 1987, but not for the NL, suggests that the analysis of fan attitudes toward runs produced by power hitters will be quite different before and after the use of performance enhancing substances became widely known by those fans. Third, our findings hold for one North American league and for league level attendance. Extensions to other leagues and to cross-sectional data at the team level, or the individual game level, also are in order since consecutive season uncertainty could matter at that level. Of course, that type of analysis should take into account the fact that break points do exist in the attendance time series in order to avoid well-known problems of spurious correlation.

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Table 1. Descriptive Statistics, 1901-2003.

AL

Variable	Min	Max	Median	Mean	Std. Dev.
LAPG	3,067	30,366	12,313	13,270	7,859
TL (GU)	0.0003	1.621	0.068	0.167	0.239
WINDIFF (PU)	0.004	0.128	0.042	0.046	0.031
CORR (CSU)	-0.197	0.942	0.618	0.564	0.245

NL

Variable	Min	Max	Median	Mean	Std. Dev.
LAPG	2,701	32,532	13,928	13,836	8,420
TL (GU)	0.0001	2.421	0.091	0.211	0.350
WINDIFF (PU)	0.006	0.198	0.034	0.043	0.032
CORR (CSU)	-0.536	0.958	0.614	0.533	0.320

Table 2. Generalized Least Squares Attendance Estimation Results, AL and NL.

Regime	Variables	AL	NL
(1901, 1918)	Intercept	6.094*	7.002*
		(7.92)	(6.50)
	Trend Slope	-0.064	-0.153***
		(-0.85)	(-1.63)
(1919, 1945)	Intercept	8.101*	7.131*
		(8.00)	(6.16)
	Trend Slope	-0.001	0.026
		(-0.04)	(0.07)
(1946, 1962)	Intercept	25.201*	
		(7.91)	
	Trend Slope	-0.204*	
		(-3.23)	
(1963, 1987)	Intercept	-20.431*	
		(-6.22)	
	Trend Slope	0.518*	
		(14.57)	
(1988, 2003)	Intercept	18.850*	
		(2.85)	
	Trend Slope	0.101	
		(1.41)	
(1946, 1967)			9.115*
			(3.32)
			0.117**
			(2.33)
(1968, 2003)			-12.878*
			(-6.22)
			0.447*
			(17.74)
	GU (TL)	-0.036	0.189
		(-0.52)	(-0.61)
	PU (WINDIFF)	-7.586***	-17.940*
		(-1.73)	(-3.08)
	CSU (CORR)	-0.555	-0.421
		(-0.84)	(-0.80)
	R-squared	0.977	0.971

*Significant at the 99% critical level.

** Significant at the 95% critical level.

***Significant at the 90% critical level.

Figure 1. Fitted $LAPG'_t$, AL and NL.

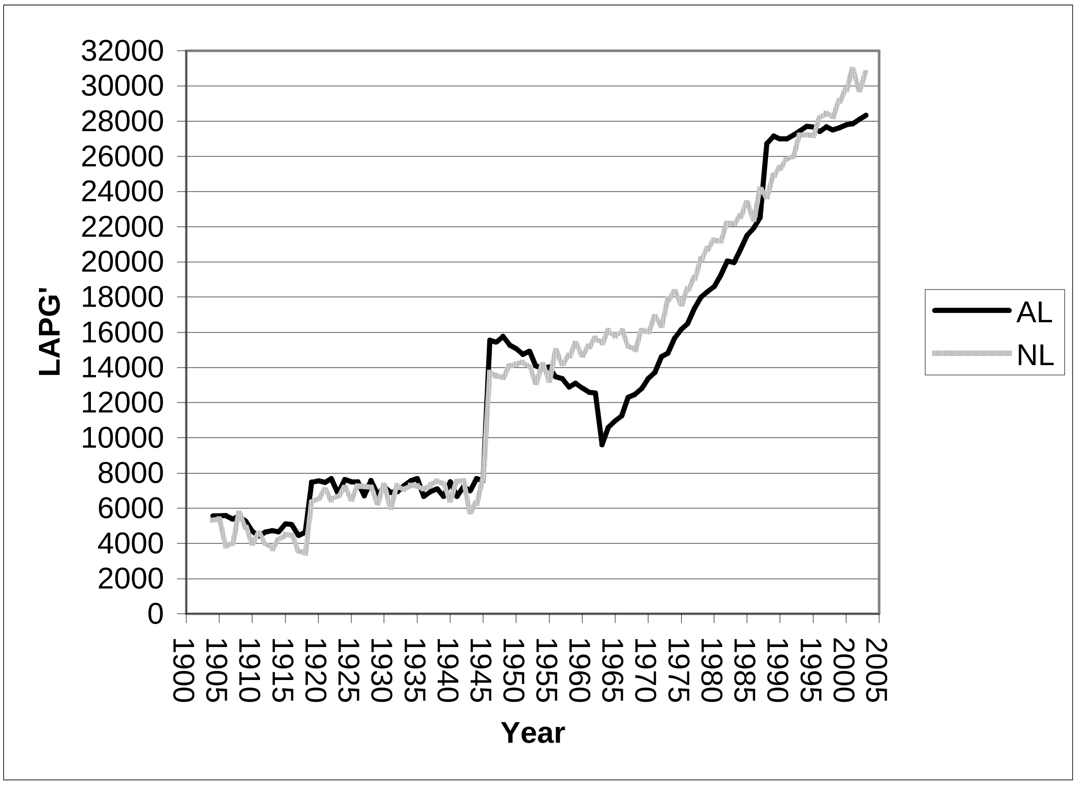

Table 3. Playoff Uncertainty (WINDIFF) by Decade, AL and NL.

Decade	AL Ave.	NL Ave.	Ave. Diff.	Ave. % Diff.
1900s	0.027	0.082	-0.054	-48.2%
1910s	0.051	0.062	-0.010	-14.6%
1920s	0.050	0.032	0.019	152.8%
1930s	0.072	0.029	0.043	204.2%
1940s	0.045	0.043	0.002	128.1%
1950s	0.040	0.038	0.002	128.5%
1960s	0.047	0.030	0.018	155.1%
1970s	0.043	0.040	0.003	61.7%
1980s	0.035	0.038	-0.003	65.7%
1990s	0.045	0.038	0.008	41.2%
1990a	0.039	0.035	0.005	62.7%
1990b	0.051	0.039	0.012	38.0%
2000s	0.042	0.044	-0.002	119.3%
1901-2003	0.046	0.043	0.003	90.0%