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Distinguishing Between the Effects of Swing Ratio and Bias on Outcomes in the US Electoral College, 1900–1992

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We review a number of different statistical techniques for creating seats-votes curves and apply the most reliable of these to estimate seats-votes relationships in the US electoral college 1900–1992. We consider the now rejected claim, once firmly established as part of the common journalistic and even academic wisdom, that the US Electoral College has recently been strongly biased in favor of Republicans, and show that this claim was based largely on a confusion between bias (*asymmetry* in the electoral college gains earned by the votes received by different parties or candidates) and swing ratio (*responsiveness* of change in electoral college seat share to change in popular vote). Although there has been substantial bias during this century in the way the electoral college translates Democratic and Republican votes into electoral college seats, and for the earlier party of this century (from 1900 to 1940) that bias has been in favor of Republicans, to explain why many recent electoral college majorities have been so lopsided we must look not at bias but at swing ratio.

We show that the swing ratio in the electoral college has generally been increasing since 1900, rising from an average value (1900–1924) around three to an average value (1976–1992) ranging from about five to about eight, depending upon which of the various statistical estimation techniques we use. Thus, for every one point vote share gain above 50 per cent, a winning presidential candidate in a two-candidate competition can now expect to pick up somewhere between a 5 percentage point and an 8 percentage point increase in electoral college seats—giving the illusion of mandate even for relatively close contests and frequently creating apparent landslides. We show that this historical rise in swing ratio in presidential elections is due almost entirely to changes in the responsiveness of outcomes in the US South as the influence of the Civil War slowly (very slowly) erodes. Drawing on the analysis of the determinants of bias and of swing ratio in the House of Representatives in Brady and Grofman (1991b), we show that the increases in electoral college swing can be accounted for by the nationalization of presidential competition as signaled by the decrease over time in the standard deviation of Democratic share of the two-party vote across states, and that changes in bias can be linked to changes in the magnitude of differences between the mean and the median of that distribution.

Keywords: elections, bias, swing ratio, proportional representation

Introduction

Until the November 1992 election, it was part of the common wisdom in journalistic and even much academic discourse that the US electoral college was biased in favor of presidential candidates of the Republican Party. This view of a Republican electoral college 'lock' was based on the observation that there were a substantial number of states (in the South and the West) that were regularly won by Republican presidential nominees while there were very few states that were 'safe' for Democrats, and the observation that relatively bare popular vote victories by recent Republican presidential nominees had been translated into overwhelming electoral college victories. As early as 1980, Harold Busby (quoted in Schneider, 1988, p. 30) wrote that "the Electoral College, which Democrats prefer to ignore, is a Republican institution. ... If a Democrat incumbent cannot hold it, it must be considered unlikely that a Democrat challenger can retake it."[1] Schneider (1988, p. 30) noted that "[I]n the nine Presidential elections from 1952 to 1984, thirty-nine states have gone Republican at least five times. These states account for 441 electoral votes, or 171 more votes than the majority needed to win the presidency."[2]

The electoral college operates to create the illusion of a popular mandate. For example, Ronald Reagan received a percentage of the popular vote in 1980 which, had it occurred in a congressional election, would have had the winner worrying about the safety of his or her seat, yet this popular vote percentage translated into overwhelming support in the electoral college. Clearly the way in which the popular vote is translated into electoral college votes can distort the general perception of the strength of support for a presidential candidate and the issues that candidate endorses. Does such distortion occur to the same extent and in the same way for a candidate of either party? There is nothing especially surprising about a party that does poorly in terms of vote percentage getting decimated in the electoral college. Yet, prior to 1992, the magnitude of recent Republican electoral college triumphs did appear to give reasons for suspecting a Republican bias in the electoral college.

If we look at recent US presidential elections, we see the Democrats won 51.1 per cent of the two-party vote in 1976, but got only 55.3 per cent of the electoral college vote. In contrast, in 1980 with 55.3 per cent of the two-party vote Reagan captured a whopping 90.9 per cent of the electoral college votes (winning every state but Georgia, Hawaii, Maryland, Rhode Island, West Virginia, and Washington, DC); in 1984 with 59.4 per cent of the two-party vote, Reagan captured an astounding 97.6 per cent of the electoral college votes (winning every state except Minnesota and Washington, DC); and, in 1988, Bush received 54 per cent of the popular vote and 79.3 per cent of the electoral college seats (winning 40 of the states). Similar statistics were quoted in 1991 and 1992 in the pages of the major newspapers and news magazines in the United States as evidence of the poor prospects for a Democratic presidential success in 1992. Moreover, it was suggested that the Republican lock on the electoral college could lead to a situation where a Democratic presidential nominee with a majority of the popular vote might not win a majority of electoral college votes.[3]

To understand the way in which the electoral college operates we examine the implications of the fact that votes in the electoral college are tallied on a winner-take-all basis using the states as the units of aggregation. We offer precise definitions of two key terms: electoral bias and the electoral swing ratio (a.k.a. responsiveness). We estimate values of swing ratio and partisan bias for US presidential elections from 1900 to 1992 using the two best-known and most reliable of these methods and compare our results to earlier estimates of Garand and Parent (1991).[4]

With respect to bias, we find very substantial pro-Republican bias 1900–1940; but net bias actually favoring Democrats in the latter part of the century, completely contrary to the popular wisdom on this topic! However, while bias estimates are almost always statistically significant in the first half of the century and reasonably high by one measure, no post-1940 election exhibited bias to a statistically significant degree, and by another measure there are only a handful of elections showing statistically significant bias in the latter half of the century. Moreover, the estimated absolute level of bias is generally lower in the second half of the century than in the first. We are also able to show that changes in bias track changes in the difference between median and mean values of the partisan distribution of votes across states.

Our strongest findings, however, are with respect to the swing ratio. We find that the electoral college swing ratio for the United States as a whole has been dramatically increasing over time. We show that the increase in swing ratio can largely be accounted for by a decrease in the standard deviation of the partisan distribution of presidential votes across states. Further analysis shows that this decrease is due largely to changes in the US South; nonresponsiveness in the South lowered the national swing ratio in the earlier part of the century. Now, South and non-South differences in electoral responsiveness in presidential elections have largely vanished.

Partisan Bias and Electoral Swing: Concept and Measurement

Defining Bias and Swing Ratio

In two-party political competition, there are two basic measures of the characteristics of a seats-vote curve showing the relationship between a party's vote share and its (expected) share of the seats: *partisan bias* and *swing ratio*.[5]

The swing ratio, customarily denoted β, is a measure of the responsiveness of the electoral system to change in the vote. Roughly speaking, the *swing ratio* (also sometimes known as responsiveness) is the expected size of the percentage point increase in seat share for each percentage point increase in a party's share of the aggregate vote. The swing ratio can also be thought of as the average value of the tangent to the seats-votes curve over some range of points (Grofman, 1983). The exact estimate of the swing ratio will vary depending upon where on the seats-votes curve we are looking.[6] In this paper, as is customary in the literature, we estimate the swing ratio either over a range of points centered around a 50 per cent vote share or at the 50 per cent vote share point only.

The standard definition of partisan bias is that offered by Tufte (1973) and reiterated by numerous other authors including Niemi and Deegan (1978), Grofman (1983), King and Browning (1987), and King and Gelman (1991). In a two-party competition, *partisan bias* is the difference between the seat share a party with exactly k per cent of the vote wins and one minus the seat share that it would be expected to win if it received a $100 - k$ vote percentage, i.e., bias is a measure of asymmetry in the treatment of the two parties. In particular, if both parties were treated equally by the electoral rules, then a vote share of 50 per cent for each would translate into a seat share of 50 per cent for each. Bias can be either be defined exclusively at the 50 per cent vote share, or averaged across a range of points, usually points centered around a 50 per cent vote share (Grofman, 1983). In a two-party contest, the bias for party A is simply the negative of the bias for party B.

Because of the winner-take-all nature of the state-by-state allocation of electoral college votes, one way for bias to arise is if there are asymmetries in the distribution of partisan voting strength across states such that one party 'wastes' more of its votes by winning with much greater average margins than does the other party.[7] We refer to this type of bias as 'distributional' bias (Grofman *et al.*, forthcoming). There are two other types of potential bias in the way the electoral college operates that will not be dealt with in this paper: 'malapportionment-related' bias and 'turnout-related' bias (see discussion in Grofman *et al.*, forthcoming).

The first occurs because voting strength in the electoral college is not perfectly based on population: each state gets two additional electoral college representatives, and even representation in the House of Representatives is not perfectly proportional to population because of rounding issues (the so-called integer allocation problem). Also, each state, no matter what its population, is guaranteed at least one seat in the House of Representatives (Balinski and Young, 1982). Because of these factors, the electoral college vote overrepresents the least populous states. This overrepresentation may be a source of a type of partisan bias if it leads to the overrepresentation of states in which one party (say the Democratic party, with its heavily urban support base) is weakest. This type of bias can lead to a discrepancy (using states as units) between a party's *state-electoral-college-vote* weighted share of the two-party vote and its *state-population* weighted share. A second type of bias arises from the potential difference between a party's *state-population weighted* vote share and its share of the *national* two-party vote. Because the former determination is based on population and the latter on actual voters, if one party's victories are disproportionately concentrated in lower turnout states, then that party may win a majority of the state-population weighted vote (treating states as units) but not a majority of the actual raw vote.

Thus, in looking at presidential election outcomes, in principle, we can distinguish between a party's share of the national two-party vote, a party's state-population weighted vote share of the two-party vote, and a party's state-electoral-college-vote weighted vote share of the two-party vote, and compare these to each other and to the party's actual electoral college vote share based on winner-take-all state-by-state allocations. However, for present purposes, the distinctions among these methods are not of great significance and will be disregarded, and we simply use the national two-party popular vote share as our measure of two-party vote share.[8] In effect, then, we focus exclusively on distributional bias in the electoral college in this paper.

Estimating Swing Ratio and Distributional Bias

There are several different ways to estimate distributional bias and swing ratio. Here we provide estimates for the electoral college using the two best-known techniques: the log-odds method of Tufte (1973) and the simulation method of Gelman and King (1994a). Both methods are election-specific in that their estimates are derived from one or more hypothetical/simulated curves for each individual election.[9]

Tufte (1973) log-odds method Let V be a given party's vote share and S be its share of seats (share of electoral college votes). Tufte (1973) represents the seats-votes linkage as a function based on ratios:

$$\frac{S}{1-s} = \alpha\left(\frac{V}{1-V}\right)^{\beta} \tag{1}$$

Here β is the swing ratio and α may be thought of as an error term such that partisan bias is present when the value of α deviates from one. Following Tufte (1973), for purposes of statistical estimation using OLS, we logarithmically transform equation (2) as below:

$$\log\left(\frac{S}{1-S}\right) = \log\alpha + \beta\log\left(\frac{V}{1-V}\right) \tag{2}$$

Here the parameter β corresponds to the exponent in equation (1) while log α may be thought of as an additive error term from which we can derive our measure of bias.

Using an estimate of the intercept parameter (log α) derived from equation (2), it is convenient to define bias at $V = 0.50$ as

$$\frac{e^{\log\alpha}}{1 + e^{\log\alpha}} - 0.5 \tag{3}$$

where e is the basis of natural logs and α is as in equation (1). When $\alpha = 1$, then log $\alpha = 0$, and the expression in Eq. (3) becomes zero; i.e., when $\alpha = 1$, bias is zero (see Grofman, 1983; Campagna and Grofman, 1990). When equation (3) is positive then bias is in favor of Party A; when equation (3) is negative then bias is in favor of Party B.

By defining bias in this way, the value of bias shown in equation (3) directly tells us how much more than 50 per cent a party receiving a 50 per cent vote share will get. That is, bias is the seat share above/below 0.50 earned by, say, the Democrats if they receive exactly 50 per cent of the votes (in a two-party contest). In other words, if the bias is found to be say, − 0.001, this means that, with 50 per cent of the votes, Democrats can expect to get only 49.9 per cent of the seats. (As we have organized the data, positive bias favors Democrats; a negative bias favors Republicans.)

To provide the data to which the log-odds equation is applied we develop a hypothetical seats-votes curve by assuming that vote changes would take place uniformly across all states. We begin with the actual vote share and seat share of the Democratic presidential candidate (taken as a percentage of the two-party vote) and imagine what states would change control if there were a one percentage, two percentage point, etc. vote share increase (decrease) from the observed actual electoral college outcome.[10]

The Gelman and King (1994b) JudgeIt simulation approach Gary King has made freely available a customizable program developed by Andrew Gelman and himself, called 'JudgeIt', that includes an algorithm to calculate responsiveness (i.e., swing ratio) and bias by simulating a series of 100 (or more) hypothetical elections.[11] In the Gelman and King simulation method, shifts in votes are assumed to be drawn from some probabilistic distribution whose parameters are estimated from previous election results. As Gelman and King (1994b) note, the simulation method exhibits less variance in its estimates than methods that assume vote swings are uniform across all districts. Gelman and King (1991, 1994a) calculate responsiveness by dividing the difference between estimated seats at $V = 0.55$ and estimated seats at $V = 0.45$ by the vote difference across this range (i.e., by 0.10.) Bias for them is obtained by subtracting a party's estimated seat share at V from one minus its estimated seat share at $1 - V$, for V values ranging from 0.45 to 0.55, and then taking the average value of this difference.[12]

Some other methodological issues There do still remain some further choices to be made about where to center the hypothetical seats-votes curve (normally either at a 50 per cent vote share, or at the actual observed vote share, or at a vote share taken to be the 'normal' vote share). We have chosen to create our hypothetical seats-votes curves using the Tufte (1973) log-odds method over the range of points that are at plus or minus 10 percentage points from a vote share of 50 per cent, i.e., to look at values of the hypothetical seats-votes curve between a 40 per cent and 60 per cent vote share. We prefer these choices because we have performed an extensive series of simulations (results not shown) and have become convinced that failure to center the seats-vote curve around 50, or entering too wide a range of vote values, can create major estimation errors when we attempt to estimate the curve using the log-odds method.[13] However, such problems are minimal to nonexistent in the JudgeIt approach because of the fact that, regardless of which points on the seats-votes curve are plotted, the actual calculations as to responsiveness and bias are estimated over the points on the curve that lie in the 0.45 to 0.55 votes range, i.e., over a small range centered at 0.5. Thus, for JudgeIt we used the default options provided by Gelman and King.[14] The default option in JudgeIt is to center the seats-vote curve around the observed vote share and to plot the simulation for points over a vote share range of plus and minus 15 percentage points.[15]

Now we turn to a look at bias and swing ratio (responsiveness) in the 24 US presidential elections in this century from 1900 through 1992.

Partisan Bias and Swing Ratio Estimates for 24 US Presidential Elections

We have fitted a seats-votes curve to the presidential election data at the state level for each of the elections in the periods 1900–1992 using both the log-odds estimation method described in equation (2) and the Gelman and King (1994a) simulation method. As noted earlier, we have chosen to report results for the log-odds method for hypothetical seats-votes curves that are centered around $V = 0.50$ including points in the 0.40 to 0.60 vote share range; while for the Gelman and King method both responsiveness and bias are estimated directly from simulated values of the seats-votes curve in the 0.45 to 0.55 range. Table 1 reports our results for bias and swing (responsiveness), including standard errors of the estimates for both methods. A comparison graph for the two methods is shown in Fig. 1 for bias and in Fig. 2 for swing ratio.

To further aid comparison we have also shown in Fig. 1 the swing ratio estimates calculated by Garand and Parent (1991), the only authors whose work on the electoral college is directly comparable to our own.[16] Like us, Garand and Parent (1991), use a hypothetical seats-votes curve to derive estimates for each presidential election and also make use of a uniform swing assumption such as that we use for our log-odds calculations. However, they use the bi-logit approach of King and Browning (1987) rather than either the log-odds method pioneered by Tufte (1973) or the simulation approach of (King and Gelman, 1991; Gelman and King, 1994a). From the bi-logit method we can derive a responsiveness parameter that is directly comparable to those of our other two methods for estimating swing. However, we do not bother to report the Garand and Parent (1991) bias estimates in Fig. 2 because their bias figures are not directly comparable to those from the other two methods.[17]

Table 1. Swing ratio and bias estimates for the US electoral college, 1900–1992

	Log-odds			JudgeIt	
Year	Swing ratio	Alpha	Bias	Swing ratio	Bias
1900	**3.69**	− 0.5	**− 0.122**	**3.048**	**− 0.13**
(se)	[.212]	[.052]		[.32]	[.019]
1904	**2.36**	− 0.311	**− 0.077**	**2.23**	**− 0.103**
	[.089]	[.022]		[.269]	[.022]
1908	**3.25**	− 0.485	**− 0.119**	**2.89**	**− 0.106**
	[.167]	[.041]		[.316]	[.019]
1912	**3.68**	− 0.306	**− 0.076**	**3.22**	**− 0.094**
	[.322]	[.078]		[.379]	[.019]
1916	**2.7**	− 0.774	**− 0.184**	**2.82**	**− 0.144**
	[.172]	[.042]		[.336]	[.014]
1920	**1.99**	− 0.544	**− 0.133**	**2.16**	**− 0.147**
	[.063]	[.015]		[.236]	[.014]
1924	**1.49**	− 0.462	**− 0.113**	**1.34**	**− 0.119**
	[.086]	[.021]		[.218]	[.011]
1928	**5.38**	− 0.361	**− 0.089**	**3.93**	**− 0.063**
	[.225]	[.056]		[.367]	[.023
1932	**3.23**	− 0.528	**− 0.129**	**3.64**	**− 0.116**
	[.186]	[.046]		[.341]	[.023]
1936	**4.6**	− 0.353	**− 0.087**	**3.38**	**− 0.112**
	[.408]	[.099]		[.347]	[.018]
1940	**3.79**	− 0.538	**− 0.131**	**2.99**	**− 0.138**
	[.481]	[.118]		[.362]	[.018]
1944	**4.92**	− 0.353	**− 0.088**	**4.3**	− 0.07
	[.536]	[.131]		[.298]	[.025]
1948	**6.15**	− 0.226	− 0.056	**4.78**	− 0.055
	[.394]	[.096]		[.427]	[.023]
1952	**7.34**	0.296	**− 0.073**	**5.38**	0.023
	[.297]	[.073]		[.35]	[.029]
1956	**8.05**	0.031	− 0.008	**4.57**	0.011
	[.437]	[.107]		[.351]	[.025]
1960	**8.4**	0.231	**− 0.057**	**6.04**	0.037
	[.334]	[.082]		[.339]	[.027]
1964	**5.92**	0.314	**− 0.078**	**5.93**	0.032
	[.306]	[.075]		[.425]	[.031]
1968	**6.53**	− 0.405	**− 0.099**	**5.19**	0.032
	[.324]	[.079]		[.401]	[.029]
1972	**6.45**	0.039	− 0.01	**5.54**	0.029
	[.262]	[.061]		[.424]	[.028]
1976	**9.27**	0.135	− 0.033	**6.25**	0.02
	[.328]	[.08]		[.352]	[.031]
1980	**7.49**	0.182	− 0.045	**5.33**	0.047
	[.367]	[.09]		[.34]	[.031]
1984	**8.45**	0.207	**− 0.052**	**5.53**	0.041
	[.224]	[.055]		[.377]	[.027]
1988	**9.28**	0.147	− 0.037	**5.29**	0.02
	[.420]	[.103]		[.454]	[.021]
1992	**8.46**	0.154	− 0.038	**5.1**	0.021
	[.339]	[.083]		[.407]	[.024]

Entries are estimates for swing ratio and bias for US Presidential elections calculated as described in the text with standard errors in parentheses. Bold entries are statistically significant at $p < 0.05$. Alpha represents the logit transformation of bias for the log-odds method.

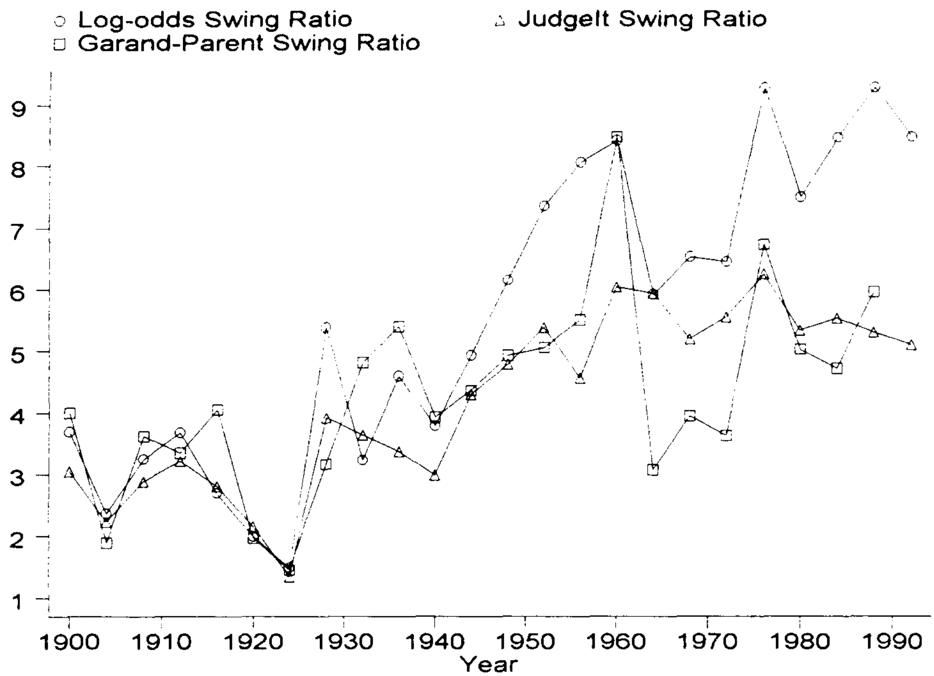

Fig. 1. Swing ratio in the electoral college, 1900–1992. The methods of calculating each measure of the swing ratio are described in the text

Bias

When we look at presidential elections in 1900–1940 we do find evidence of a marked and statistically significant Republican bias in the electoral college regardless of whether we use the log-odds or the Gelman and King method. However, turning to the recent elections (1972–1988) that led so many observers of American politics to support a claim that there was a pro-Republican bias in the electoral college, we actually find a pro-Democratic bias in all five years! However, with the possible exception of 1984, this bias was effectively zero, as shown by the statistically insignificant '*t*' coefficients (see Table 1). Indeed, since 1952 (with only the possible exception of 1968, where one of our methods gives us a statistically significant pro-Republican bias—but one whose importance is marred by the existence of a significant third-party vote in that election, with eight southern states carried by George Wallace), there have been no presidential elections showing a pro-Republican bias. In the post-World War II period we could characterize results as either, on balance, showing a slight pro-Democratic bias or no bias at all, given the statistical insignificance of most of the results.

Note also that the estimated absolute level of bias exhibits a decreasing time trend. For example, according to the log-odds method of calculation, the *lowest* estimated bias from 1900 to 1948 is 5.6 points and the *average* estimated bias is a whopping 10.8 percentage points (in a pro-Republican direction). In contrast, from 1976 to 1992, the *lowest* estimated bias is 3.3 points and the *average* estimated bias is only 4.1 percentage points (in a pro-Democratic direction). Indeed, the correlation between absolute level of bias and year is − 0.78 using the log-odds values and − 0.87 using the JudgeIt values.

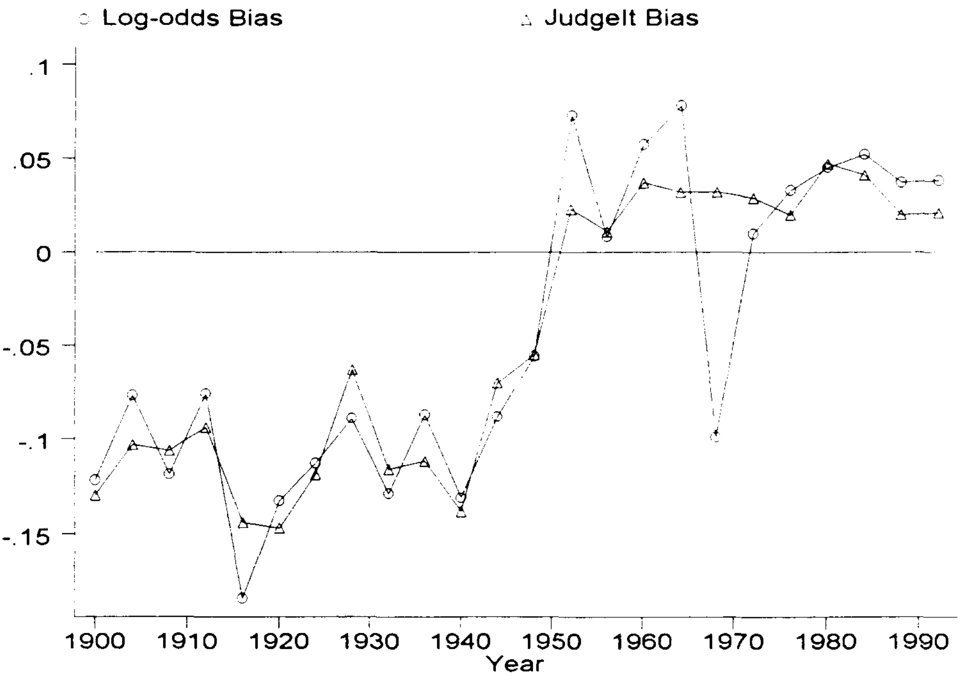

Fig. 2. Bias in the electoral college, 1900–1992. Positive values of bias indicate a Democratic advantage, negative values indicate an advantage for the Republicans, and the horizontal line at 0 indicates no partisan bias.

Swing Ratio

When we turn to swing ratio, the changes over time are equally striking. For example, in the 1976–1992 period, using the log-odds method, the estimated average value of the swing ratio was 8.6, compared to 5.4 in 1936–1952, and only 3.0 in 1916–1932. A similar pattern of (near) monotonic increase over time, though over a much smaller range of values, is calculated from JudgeIt: an estimated average value of the swing ratio of 5.5 in 1976–1992, 4.2 in 1936–1952, and only 2.8 in 1916–1932. The correlation between swing (responsiveness) and year is 0.88 using the log-odds values of swing and 0.84 using the JudgeIt values of responsiveness.

The evidence on bias shows current overall Republican bias in the electoral college to be either nonexistent or even to have reversed in a pro-Democratic direction. *The evidence on swing ratio, however, allows us to account for the popular belief that there was a continuing Republican lock on the electoral college.* The swing ratio has grown so high that whatever party wins, a clear popular vote share majority will now have its share of the electoral college dramatically exaggerated—five or more percentage points in electoral college vote for each one percentage point vote share immediately above 50 per cent.

Comparisons Among the Three Methods

As noted previously, swing ratio estimates for the Gelman and King (1994a) method are generally lower than for the log-odds method,[18] yet it is apparent from visual inspection of Fig. 1 that the results of the two methods tend to parallel each other and the same is true, although to a lesser extent, for the Garand and Parent (1991) bi-logit estimates of electoral college swing. Indeed, the correlation between the log-odds values of swing and the JudgeIt values of responsiveness data reported in Fig. 1 is very high at 0.92. The log-odds and JudgeIt estimates of bias also correlate very strongly with each other, with a correlation of 0.90.

Correlations between Garand and Parent bi-logit estimates of swing and those of the other two methods are also high, but not as high as the correlations of these two methods with each other: a correlation of 0.76 with the log-odds values and of 0.69 with the JudgeIt values. As noted previously, there is a much weaker correlation between the Garand and Parent (1991) estimates of bias and those of the other two methods than is true for the Garand and Parent estimate of swing; nonetheless, as is true for both of the other methods, the bi-logit calculations of Garand and Parent (1991) generally show the early part of this century to be a period in which bias is running heavily in a pro-Republican direction. Moreover, some of the differences between methods vanish if we only consider elections in which statistically significant results are reported.

Regional Differences in Swing Ratio and Bias

The patterns we have seen of increasing swing, decreasing absolute bias, and a shift in the directionality of bias away from the pro-Republican edge of the early part of the century were for the United States as a whole. Are there important regional differences in patterns? Here we shall focus on South versus non-South differences, using a 10-state definition of the South. To avoid high standard errors caused by small *n*s, we estimate the seats-votes relationship for the 40 states of the non-South and then make inferences about the South by comparing results for all states with those for just the non-Southern states.[19] As we shall see, changing patterns in the South (as the South comes to look more and more like the rest of the country) explain most of the observed time trends in both swing ratio and bias.

Swing ratio and bias for the non-Southern states. Table 2 contains the results from rerunning our analyses of swing ratio and bias for non-Southern states only, and Figs 3 and 4 parallel Figs 1 and 2, except that no swing ratio or bias estimates for the bi-logit method used by Garand and Parent (1991) are available for the non-Southern states to be reported for comparison purposes.

For non-Southern states only, the magnitude of pro-Republican bias in the early part of the century is reduced. Now in only five of the dozen elections from 1900 through 1940 where pro-Republican bias was found in Table 1 is there statistically significant bias shown by both the log-odds method and JudgeIt for non-Southern states. Hence, pro-Republican bias in the early part of the century is being produced disproportionately by outcomes in the southern states. On the other hand, after 1952, the evidence of some pro-Democratic bias is marginally strengthened when we look only at the non-Southern states; even though most of the results are not statistically significant, for the first time two of the estimates of bias produced by JudgeIt are statistically significant.

However, it is with respect to swing ratio that we really see South and non-South differences that matter and that change dramatically over time. For the period 1900–1940 we observed a mean swing ratio of 3.3 from the log-odds method and a mean responsiveness of 2.9 from JudgeIt for the United States as a whole; in contrast for that same period, for the non-Southern states we get a mean swing ratio of 6.9 from the log-odds method and a mean responsiveness of 5.5 from JudgeIt. Thus, for this early period we see that the swing ratio in the non-Southern states is roughly twice as high as in the country as a whole. The only way such differences

Table 2. Swing ratio and bias estimates for the US electoral college, non-Southern states 1900–1992

	Log-odds			Judgeit	
Year	Swing ratio	Alpha	Bias	Swing Ratio	Bias
1900	**8.55**	0.095	0.024	**5.83**	− 0.043
(se)	[.464]	[.114]		[.466]	[.0248]
1904	**3.45**	0.255	**0.063**	**4.13**	0.021
	[.19]	[.046]		[.4922]	[.0181]
1908	**8.55**	0.357	0.088	**5.71**	0.003
	[.553]	[.135]		[.5537]	[.0257]
1912	**7.18**	0.011	0.003	**5.75**	0.03
	[.27]	[.066]		[.4918]	[.0305]
1916	**8.78**	− 0.401	− 0.099	**6.49**	− 0.08
	[.59]	[.145]		[.4773]	[.025]
1920	**4.47**	− 0.247	**− 0.061**	**4.43**	**− 0.09**
	[.336]	[.082]		[.5717]	[.021]
1924	**3.84**	− 0.189	**− 0.047**	**3.41**	**− 0.086**
	[.2]	[.049]		[.397]	[.0245]
1928	**6.87**	0.245	**0.061**	**5.95**	0.023
	[.295]	[.072]		[.5172]	[.0223]
1932	**6.11**	− 0.356	**− 0.088**	**6.04**	− 0.042
	[.155]	[.038]		[.4329]	[.0287]
1936	**9.31**	0.02	0.005	**5.79**	− 0.044
	[.393]	[.096]		[.4518]	[.0262]
1940	**9.14**	− 0.181	− 0.045	**6.69**	− 0.029
	[.365]	[.089]		[.4615]	[.029]
1944	**9.77**	− 0.004	− 0.001	**6.55**	0.01
	[.422]	[.107]		[.4015]	[.0302]
1948	**11.26**	0.199	0.050	**6.77**	− 0.011
	[.46]	[.113]		[.4163]	[.0281]
1952	**8.05**	0.437	**0.108**	**6.32**	0.078
	[.569]	[.139]		[.4285]	[.0322]
1956	**10.08**	0.297	**0.074**	**6.63**	0.059
	[.341]	[.084]		[.4835]	[.0312]
1960	**9.99**	0.339	**0.084**	**6.93**	0.066
	[.375]	[.092]		[.3952]	[.027]
1964	**8.53**	0.01	0.002	**5.98**	0.051
	[.244]	[.06]		[.4413]	[.0255]
1968	**8.16**	0.129	0.032	**5.59**	0.027
	[.246]	[.06]		[.4095]	[.0246]
1972	**8.4**	0.118	0.029	**6.12**	0.043
	[.246]	[.061]		[.4079]	[.0321]
1976	**9.83**	0.167	0.042	**6.74**	0.032
	[.452]	[.111]		[.3921]	[.0295]
1980	**6.73**	0.318	**0.079**	**5.45**	**0.076**
	[.367]	[.09]		[.453]	[.0267]
1984	**7.5**	0.277	0.069	**5.57**	**0.084**
	[.408]	[.1]		[.4354]	[.0247]
1988	**9.45**	0.026	**0.006**	**5.77**	0.05
	[.439]	[.108]		[.4432]	[.0248]
1992	**8.73**	0.171	0.043	**5.67**	0.075
	[.581]	[.142]		[.4271]	[.0267]

Entries are estimates for swing ratio and bias for US Presidential elections calculated as described in the text with standard errors in parentheses. The Southern states of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas, and Virginia were removed from the analysis. Bold entries are statistically significant at $p < 0.05$. Alpha represents the logit transformation of bias for the log-odds method.

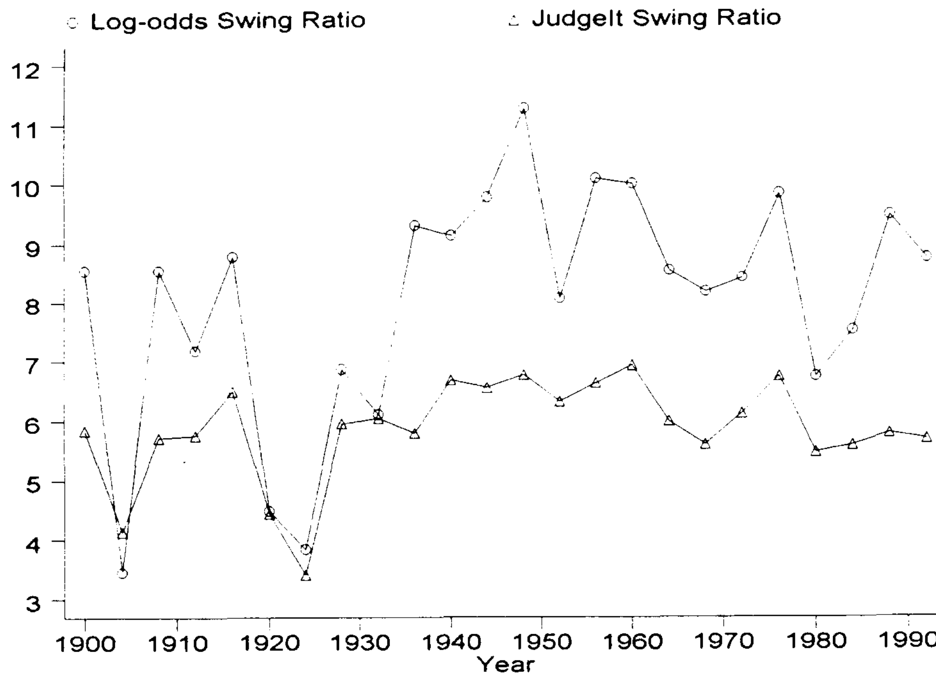

Fig. 3. Swing ratio in the electoral college, non-Southern states 1900–1992. The methods of calculating each measure of the swing ratio are described in the text. The following states were removed for this analysis: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas, and Virginia

can occur is if electoral college outcomes in the South in the first part of the century were almost completely non-responsive to changes in total national presidential vote share.

In contrast, when we turn to more recent elections, we find swing ratio and responsiveness in the non-Southern states very similar to the national figures. In elections from 1976 to 1992, for example, for the United states as a whole, mean swing ratio from the log-odds method is found to be 8.6; while, from JudgeIt responsiveness it is calculated at 5.5. The comparable numbers for the non-Southern states are 8.4 and 5.8. Thus, the gap between South and non-South in terms of swing ratio is now minimal to nonexistent, especially when we contrast it to the differences found in the early part of the century.

Why has electoral college swing ratio been increasing and bias been decreasing? Why has there been such a dramatic rise in the electoral college swing ratio overall? The answer, in one sense, is simple: the South now looks like the rest of the country. If we compare Tables 1 and 2 it is easy to see that there has been essentially no change in swing ratio in the non-Southern states over the course of this century.[20] What has happened is that now there is electoral responsiveness in the South. Following Gudgin and Taylor (1979) and Brady and Grofman (1991) we can look at the relationship between the increase in swing ratio in the US presidential elections and the increasing nationalization of those elections signaled by a decreasing standard deviation of the Democratic share of the two-party vote at the state level. For the nation as a whole, swing ratio and standard deviation are highly correlated, with an r^2

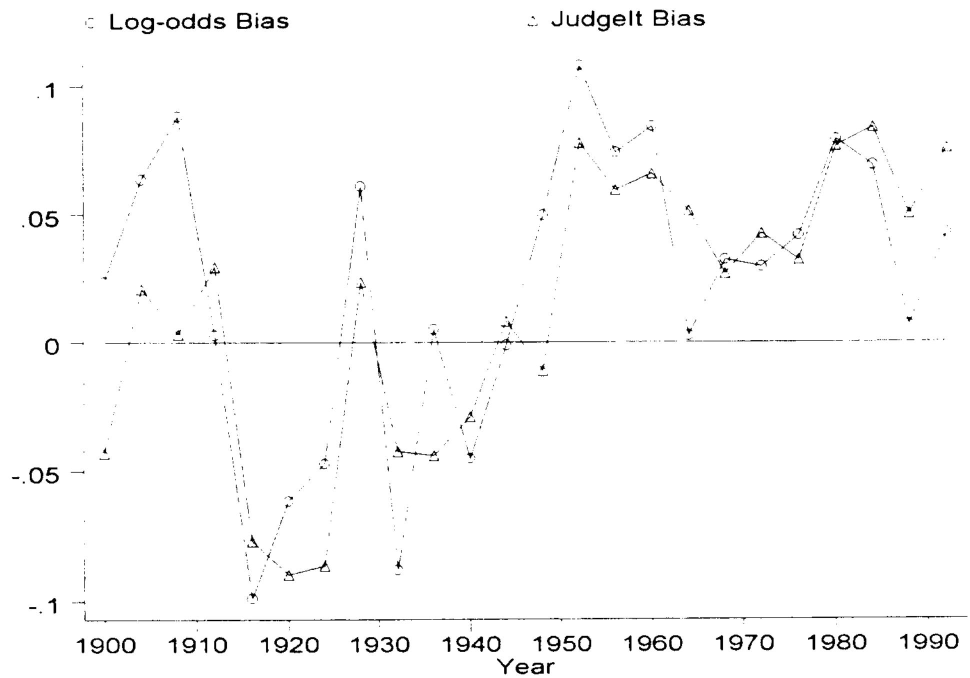

Fig. 4. Bias in the electoral college, non-Southern states 1900–1992. Positive values of bias indicate a Democratic advantage, negative values indicate an advantage for the Republicans, and the horizontal line at 0 indicates no partisan bias. The methods of calculating each measure of the bias are described in the text. The following states were removed for this analysis: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas, and Virginia

value of 0.84 ($r = -0.92$) for the 24 election years covered in Table 1 for both the log-odds methods of calculating swing ratio and the JudgeIt measure of responsiveness.[21] The central reason the standard deviation has been reduced is that the uniqueness of election outcomes in the South (formerly lopsidedly Democratic) has been declining to the point where now differences between South and non-South are relatively small.

In like manner, following Gudgin and Taylor (1979), we can look at bias as a function of the difference between the values of the mean and the median of the partisan distribution of voting strength across states.[22] Regressing bias against the variable 'mean − median', using data for each of the 24 years covered in Table 1, yields an adjusted r^2 value of 0.76 ($r = -0.88$) for the log-odds data and an even higher adjusted r^2 value of 0.83 for JudgeIt.[23] Here, too, growing concordance between Southern presidential voting patterns and those of the rest of the country at the presidential level has led to a general decrease in the absolute level of partisan bias in the electoral college.

The fact of diminishing South and non-South differences is, of course, well known to the political science community (see, for example, Black and Black, 1987, 1992; Brady and Grofman, 1991; Aistrup, 1996) but the implications of this change for swing ratio and bias in the electoral college have not, we believe, previously been clearly traced.

Discussion

To understand how votes translate into electoral college seat share, we must understand that (a) seat share is a function both of swing and bias; (b) the electoral college currently has a very high swing ratio near the 50 per cent vote share point, (c) bias can be linked to a difference between mean and median values in the distribution of partisan support across states, and (d) swing ratio is tied to the standard deviation of the distribution of partisan support across states.

If we look at bias in the seats-votes relationship caused by the winner-take-all nature of electoral college constituencies and the uneven distribution of Democratic support across constituencies we can say with confidence that the pro-Republican bias in the electoral college present in the earlier part of this century has been eliminated. For the United States as a whole, there is no statistically significant partisan bias in favor or against either party in any of the five most recent election years, although the estimated bias is in a pro-Democratic direction under most measures for these elections. However, the average swing ratio has at least doubled from the period 1900–1924 to the period 1976–1992 regardless of which methodology for measuring swing (responsiveness) we use—an increase that we attribute largely to the fact that the South has become more like the rest of the country in its state-wide voting for the office of President. It is this dramatic rise in the swing ratio (coupled with Carter's winning only a bare majority of the popular vote) that accounts for the 'seeming' pro-Republican bias in recent US presidential election years prior to 1992. These results are totally at odds with the impressionistic claims about a supposed post-World War II Republican bias in the electoral college that were commonly made prior to 1992.

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Notes

1. Busby (1980; quoted in Schneider, 1988, p. 30) talks about the Civil War through the 1920s as a period of Republican dominance of the electoral college and calls this period the 'Lincoln lock'; while he refers to a 'Roosevelt lock' for the Democrats during the 1930s and 1940s; and an 'Eisenhower lock' since the 1950s.
2. Schneider (1988, p. 30) then goes on to quote Patrick Caddell, a leading Democrat pollster, as having described the electoral college as "nothing less than an electoral Matterhorn" for Democrats. "Caddell examined statistics from the past five presidential elections and came up with a startling conclusion: the national Democratic party has no base. Only the District of Columbia, with three electoral votes, has voted for the Democratic ticket every time. Twenty-three states, with a total of 202 electoral votes, have voted Republican every time" (Schneider, 1988, p. 30).
3. The popular vote winner has failed to be elected two times in US history: in 1876 and in 1888.
4. All analyses are presented in terms of major two-party vote share. Care must then be taken in interpreting results in election years such as 1968 when there was a strong third party movement.
5. We shall consider only two-party contests, although both ideas can be generalized to multi-party competition (see Gelman and King, 1994a).
6. For example, although 55 + per cent of the vote can yield over 90 per cent of electoral college seats,

further increases in vote share yield diminishing marginal returns in seats. (You cannot win more than 100 per cent of the electoral college). See further discussion below and Grofman (1983).

7. An electoral system is said to satisfy the *majoritarian principle* (Grofman, 1982) if any party with more than 50 per cent of the votes receives more than 50 per cent of the seats. If bias is extreme enough, the results may violate the majoritarian principle.
8. In recent elections, all three methods yield estimates of the two-party vote share that are within well under one percentage point of one other.
9. Alternatively, we may enter actual seat and vote percentages for a given party for each of some set of elections (one point per election) and then estimate an overall seats-votes curve (Dahl, 1956) over an entire range of elections; or we may simply take the difference in a party's seat share between two successive elections and then divide by the difference in that party's vote share for the same set of elections to get an estimate of swing (Abramowitz, 1983; Niemi and Abramowitz, 1994). However, each of these two methods has major problems. The second fails to give us an estimate of bias and may confound bias and swing if bias changes from one year to the next (Campagna and Grofman, 1990). The first may lead to inaccuracies if the underlying parameters of the seats-votes relationship are changing over time. A third method to estimate bias and swing is the bi-logit method defined in King and Browning (1987) and used by those authors in subsequent work, as well as by some others, most notably Garand and Parent (1991). However, Gary King now prefers the simulation methods described in Gelman and King (1994a) to his earlier bi-logit approach.
10. The assumption of uniform swing implies that any given percentage point increase (decrease) in popular vote would occur identically in all states, thus translating into a national percentage point increase (decrease) of the exact same magnitude. The realism of this assumption has been questioned by various authors. Gelman and King (1994a) offer a probabilistic model of how vote shares will shift across constituencies, which is the basis for the alternative estimates of swing ratio and bias we provide later in the paper.
11. JudgeIt is available free via anonymous FTP from latte:harvard.edu. We are deeply indebted to Professor King for providing us a copy of 'JudgeIt', along with an 80-page instruction manual, and prompt replies to numerous e-mails from the present authors to clarify various options in the program.
12. The reason we, like Gelman and King (1994a), prefer to use as our bias estimates from JudgeIt the ones reported from that program that are averages over a 0.45 to 0.55 vote share range is that the point estimates of bias at $V = 0.50$ produced by JudgeIt tend to have very high standard errors and are less reliable than those derived by the averaging method.
13. Given the S-shaped nature of the seats-votes relationship, if we fail to center the curve at $V = 0.50$ we may introduce substantial asymmetries in the estimating process that can yield inappropriately high estimates of bias. Similarly, if we estimate the curve over too wide a range we can get problems; in particular, for high vote share values, swing must be near zero, since almost no further gains in seats can be made. Estimating a log-odds function on a curve that contains a large number of points, 30 or, worse yet, 50 rather than 20, we will be fitting a curve that includes many points very far from $V = 0.50$ where the curve is very flat and where the data tell us little about electoral responsiveness in the range of feasible outcomes. This tends to damp our estimates of swing ratios.
14. This choice has the further advantage of increasing comparability to estimates from JudgeIt that have been done by these authors for the US House of Representatives and for various state legislative bodies in the United States.
15. In contrast, the range previously used by many authors for log-odds calculations is plus and minus 10 percentage points.
16. The only other previous estimates of electoral college swing ratio of which we are aware are Taagepera (1973) and Clubb *et al.* (1980: Table 5.2, p. 174). Both provide a single swing estimate for data pooled over a long period derived by plotting a curve that has one point per election. Taagepera's swing estimate is 4.4 for the period from 1792 through 1972. Clubb *et al.* estimate the swing ratio for Democrats in the period from 1836 to 1972 as 2.9, and for Republicans for the period 1856–1972 as 2.6. Neither Taagepera nor Clubb *et al.* provide any estimate of bias.
17. The JudgeIt and log-odds estimates of bias are highly correlated (see below), but the bi-logit estimates of bias calculated by Garand and Parent (1991) do not correlate highly with either of the other two methods. The correlation between the Garand and Parent (1991) bias estimates and those of the log-odds methods is only 0.24; while the correlation between their bias estimates and those of the JudgeIt approach is only 0.36. Garand and Parent (1991) fit their seats-votes curve to hypothetically created

points that lie plus or minus *25* percentage points from the *observed* vote outcome rather than plus or minus *10* points from a *vote share of 50*. Simulations we have conducted (data omitted) show that log-odds results as to swing ratio tend to be more robust to alternative model specifications than do results as to bias. We believe the same is true for the bi-logit method used by Garand and Parent (1991). In particular, if we plot points centered around the actual vote share outcome, as do Garand and Parent (1991), then more of the plotted points will fall above (below) the 50 per cent vote share point than below (above). This causes problems in estimating bias that are especially severe if the election was not particularly close. However, we would also wish to emphasize that fitting a seats-votes curve around points entered around the observed outcome is a standard approach in the seats-votes literature and one which two of the present authors have previously employed. It is only in the past few years, as a result of various simulations, that we have become convinced that centering the plot on $V = 0.50$ (as well as restricting the range of points on the curve) is to be preferred when using the log-odds (or the bi-logit) method.

18. We believe the principal reason for this is that JudgeIt values are averaged over a range plus and minus five percentage points from a vote share of 50 per cent. Generally speaking, estimates of swing calculated at any single point on the seats-vote curve will decline the further away we are from a vote share of 50 per cent if the seats-votes curve is, as expected, S-shaped (see Grofman, 1983).
19. When we restrict ourselves to only states in the South, almost none of the bias estimates derived from either JudgeIt or the log-odds method are statistically significant. Moreover, because, in many years, there is such low variance in southern presidential election outcomes at the state level, the estimates of swing ratio for the South only are not reliable.
20. The swing ratio correlation with year is not statistically significant for the non-Southern states.
21. The regression equation (N = 24) for log-odds methods is (with t-statistics in parentheses)

$$\text{Swing} = \underset{(19.2)}{11.89} - \underset{(-10.80)}{52.6}\ \text{Standard deviation}$$

22. Gudgin and Taylor (1979) and Brady and Grofman (1991b) have also proposed to model bias as a function of the skewness of the distribution of partisan voting support across states. However, in the electoral college, partisan bias and the skewness of the two-party vote share distribution are only slightly correlated, and multivariate regression involving both the 'mean − median' variable and skewness did not improve fit over that of the 'mean − median' variable alone.
23. The regression equation for the log-odds method (N = 24) is (with t-statistics in parentheses)

$$\text{Bias} = \underset{(2.64)}{0.32} - \underset{(-8.63)}{3.495}\ \text{Mean} - \text{Median}$$

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