WHETHER BELLWETHERS OR WEATHER-JARS INDICATE ELECTION OUTCOMES

C. ANTHONY BROH
Columbia University

THE OLD adage, "As Maine goes, so goes the Nation!" was never a credible prediction of presidential elections in the United States.[1] Maine has been on the winning side only four times since 1932. Indeed, considering all presidential elections, 35 states have been in the electoral majority more often than Maine has. But despite Maine's unreliability as a barometer of electoral tendencies, scholars and others continue to search for a state that disproportionally appears on the winning side in presidential elections. More specifically this search for a bellwether[2] involves a search for both predictors and indicators of electoral success.

Edward Tufte's interest in bellwethers focuses on the concept as a predictor of election outcomes.[3] He asks, "how well would we have done in predicting the election of 19XX if we had followed a group of supposedly bellwether counties chosen on the basis of past elections before the election of 19XX?" He argues that we could have done no better by selecting bellwether countries than by selecting any county at random — and sometimes (1940, 1960, 1968) we would have done worse by predicting with bellwethers. He concludes that bellwethers are not good predictors of elections, and therefore the concept is not useful.

Nevertheless, journalists continue to identify predictive bellwethers. R. W. Apple, for example, told readers of the *New York Times* how to predict the 1976 election: "A . . . cue should be provided by Connecticut, a normally Democratic state that was rated a toss-up in the final survey . . . ."[4] "As Connecticut goes, so goes the Nation!" In the same article, Apple suggested that his readers should watch other states: "Illinois is a useful bellwether state, having voted for the winner in every Presidential election since 1916. . . . Similarly New Mexico has gone the "right" way in every year since statehood. . . ."[5] "As Illinois and New Mexico go, so goes the Nation!" He also discussed the predictive reliability of Kentucky, Indiana, Pennsylvania, Ohio, and California.

In Louis Bean's popular handbooks,[6] one rule of thumb in election prediction is to look at the larger states: "The three geographically distributed states, New York, Illinois and California, singly, and particularly in

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[1] The origin of the phrase is not clear; however, Democrats changed the saying after the 1936 landslide to "As Maine goes, so goes Vermont!"

[2] The term "bellwether" is discussed in greater detail below. It usually refers to a geographic unit (e.g., voting district, county, state) which votes on the winning side an unusually high number of times.

[3] Edward R. Tufte, *Data Analysis for Politics and Policy* (Englewood Cliffs: Prentice-Hall, 1974), p. 48.

[4] R. W. Apple, Jr., "A Guide of Things to Look for When Following Election Returns," *New York Times,* November 2, 1976, p. 1.

[5] Ibid., p. 22.

[6] See Louis H. Bean, *Ballot Behavior* (Washington: Public Affairs Press, 1940), *How to Predict Elections* (New York: Knopf, 1948), *How America Votes in Presidential Elections* (Metuchen, New Jersey: Scarecrow Press, 1968), and *How to Predict the 1972 Election* (New York: Quadrangle Books, 1972).

combination, vote as the nation does."[7] Again, "As New York (and/or Illinois and/or California) goes, so goes the Nation!" Even its severest critics concede that the bellwether concept will not disappear.[8] However, journalists do not insist on its use simply because they ignore social science research. They may intuitively recognize that a second meaning of the word "bellwether" is useful; bellwethers are indicators of election outcomes. In this sense, a state or county, even if it cannot predict *a priori,* can indicate national trends and reflect shifts in voter preference. The bellwether, in this sense, is more sensitive to changes in public opinion than other states or counties.

Tufte does implicitly recognize the importance of bellwethers as indicators. Using the binomial distribution he rejects a null hypothesis which states that the existence of bellwethers is due to chance. That is, one might expect less than one (0.2) of the 3100 counties in the United States to vote with the winner in every election from 1916 to 1968: *three* counties did. Thus these three counties may not be able to predict an election, but they do indicate national trends better than chance expectations.

Journalists are correct, then, in not abandoning the bellwether concept entirely; it does have use. However, their usage of the term is incorrect because they do not understand the difference between bellwethers as predictors and bellwethers as indicators. Thus the term produces more confusion than clarity. One role of social science is to clarify journalistic concepts and to refute popular misperceptions encouraged by the media. This purpose is better achieved by explicating the correct usage than by either abandoning the concept entirely or using it indiscriminately. This article, therefore, discusses the use of bellwethers as indicators of election outcomes.

Let us look more closely at the concept.

Bellwethers and Weather-Jars

Like bellwether sheep, from which the concept derives, a bellwether state indicates electoral outcomes in two senses. First, a bellwether, usually a male sheep wearing a bell on its neck, signals the location and movement of the flock. Similarly a bellwether state indicates electoral trends which signal the location and movement of a candidate's voting strength. (Note that neither the bellwether sheep nor the bellwether state predicts where the flock is going.) Second, a bellwether is a member of the flock and is included in counting the total flock. Similarly the bellwether state casts electoral votes which may influence the outcome of the election in the electoral college.[9] For this reason, we are not surprised to learn that many large states lead the list of states which appear on the winning side.

This article will consider only those aspects of states included in the first meaning of "indicator," that of sensitivity or "weather-jarism." Meteorologists use a weather-jar to determine the barometric pressure which, in turn helps to indicate the weather. In no sense does the weather-jar affect the barometric pressure; it only records shifts, trends, and changes in electoral contests while not affecting the outcome itself. A weather-jar state, then, is an *indicator* of larger trends, but its electoral votes do not affect the decision of the electoral college.

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[7] Bean, *How to Predict the 1972 Election,* p. 34.

[8] See Tufte, *Data Analysis for Politics and Policy,* p. 54.

[9] We differentiate here between a bellwether state and bellwether county. A bellwether state influences the outcome of the electoral college since electoral votes are cast in state blocs. A bellwether county, such as Palo Alto County, Iowa, or Crook County, Oregon, does not, since it is so small compared to the national vote.

All states do not have the same chance of appearing on the winning side of a presidential contest. Because the votes of the electoral college are cast in single blocs by each state,[10] the most populous states have a greater chance of appearing on the winning side.[11] New York's electoral votes, for example, could have changed the outcome of the 1960 and the 1968 election if the voters of the state had supported a different candidate. In these two elections, New York would have been on the winning side regardless of which candidate its voters supported. In determining a weather-jar state, one must consider that a large state is more likely than a small state to appear on the winning side. To measure this tendency among states, one must consider the unit rule in the electoral college.

This article suggests a way to determine whether some states have been more likely than other states to appear on the side of the winner while controlling for the chance expectation of appearing on the side of the winner. We call this factor the *weather-jar ratio.* First, it will be necessary to observe the proportion of times each state has appeared on the winning side of the presidential elections. Second, it will be necessary to consider the proportion of times a state could have appeared on the winning side if that occurrence were by chance alone. The ratio of the two factors will be an indication of each state's value as a weather-jar state.

Methodology

The proportion of times a state was on the winning and losing sides since statehood in presidential elections is presented in Table 1, columns 2 and 3; the percentage of elections in which a state has been on the winning side is displayed in column 4.[12]

Some states are on the winning side more than other states. Since each state casts all of its electoral votes for the plurality winner in that state, larger states have a disproportionally greater chance of appearing on the winning side. To see this more clearly, we use a Monte Carlo technique to simulate the number of times a state might appear on the winning side by chance alone.

Our Monte Carlo technique assumes that there is a .50 probability that either party will win a state, that is Pr (Democrats win the state) = Pr (Re-

[10] New Hampshire, New Jersey, Ohio, Pennsylvania, Rhode Island, and Virginia were the first states to adopt the winner-take-all procedure in the election of 1804. Since 1836 all states have used this practice with only a few exceptions. Electors in Massachusetts in 1848, Florida in 1868, and Colorado in 1876 were chosen by the state legislature. Michigan selected electors by a district plan in 1892; Maine presently selects two electors at-large and two in districts. Some states allow election of slates of electors with split partisan loyalties. Electoral vote splits of this kind since 1836 occurred in the following states: New Jersey in 1860; Oregon in 1892; Kentucky in 1896; Maryland in 1904 and 1908; and West Virginia in 1916. On a few occasions an elector has not cast his/her vote for the nominee of the party which won the state. Since 1836 this has occurred in the following states: New Hampshire in 1828, South Carolina in 1948, Alabama in 1956, Oklahoma in 1960, North Carolina in 1968, Virginia in 1972, and Washington in 1976. See Robert A. Diamond, ed., *Guide to U.S. Elections* (Washington: Congressional Quarterly, 1963), pp. 204-7.

[11] We differentiate here between the chance that a state will appear on the winning side and the chance that a citizen of a state will appear on the winning side. The former is affected solely by the number of electoral votes which are cast in a bloc. The latter is affected by several other considerations. See John H. Yunker and Lawrence D. Longley, "The Biases of the Electoral College," in Donald R. Matthews, ed., *Perspectives on Presidential Selection* (Washington: The Brookings Institution, 1973); Guillermo Owen, "Evaluation of a Presidential Game," *American Political Science Review* 69 (September 1975): 947-53.

[12] The compilation of "States as Barometers" was presented in Svend Peterson, *A Statistical History of the American Presidential Elections* (New York: Unger, 1963). The data were updated using Diamond, ed., *Guide to U.S. Elections.*

TABLE 1. STATES AS PREDICTORS OF PRESIDENTIAL ELECTIONS

State	*Number on Winning Side**	*Number on Losing Side**	*Bellwether Index*	*Average Simulated Proportion*	*Weather-ja Ratio*
New Mexico	16	1	94.1	52.0	1.81
Arizona	14	3	82.4	51.8	1.59
Rhode Island	29	7	80.6	51.3	1.57
Utah	17	4	81.0	52.0	1.56
Minnesota	25	5	83.3	53.9	1.55
Hawaii	4	1	80.0	51.8	1.54
Idaho	17	5	77.3	51.0	1.52
Wyoming	17	5	77.3	51.5	1.50
North Dakota	16†	5†	76.2†	50.9	1.50
West Virginia	23	6	79.3	53.0	1.50
Montana	17	5	77.3	51.8	1.49
Nevada	22	7	75.9	51.2	1.48
California	27	5	84.3	57.7	1.46
Oklahoma	14	4	77.8	53.6	1.45
New Hampshire	27	9	75.0	51.8	1.45
Oregon	23	7	76.7	53.0	1.45
Wisconsin	26	7	78.8	54.8	1.44
Illinois	31	5	86.1	60.1	1.43
Connecticut	27	9	75.0	53.6	1.40
Delaware	25	11	69.4	50.3	1.38
Washington	16	6	72.7	52.8	1.38
New Jersey	27	9	75.0	54.6	1.37
Iowa	24	9	72.7	54.3	1.34
Kansas	21	8	72.4	54.8	1.32
Indiana	27	9	75.0	56.9	1.32
Florida	22	10	68.8	52.9	1.30
Michigan	26	10	72.2	56.2	1.28
Missouri	26	10	72.2	56.3	1.28
Colorado	17	9	65.4	51.3	1.27
Ohio	28	8	77.8	61.3	1.27
Nebraska	18	9	66.7	52.9	1.26
Massachusetts	26	10	72.2	57.3	1.26
Pennsylvania	29	7	80.6	65.6	1.23
Maine	23	13	63.9	53.2	1.20
New York	30	6	83.3	70.1	1.19
Maryland	23	13	63.9	54.1	1.18
Alaska	3	2	60.0	52.0	1.15
North Carolina	22	13	62.9	55.1	1.14
South Dakota	13	9	59.0	52.0	1.13
Vermont	21	15	58.3	51.5	1.13
Tennessee	21	14	60.0	55.9	1.07
Virginia	20	14	58.8	56.1	1.05
Louisiana	19	15	55.9	54.5	1.03
Texas	18	13	58.1	57.2	1.02
Kentucky	20	16	55.6	55.6	1.00
Arkansas	18	16	52.9	53.5	0.99
District of Columbia	2	2	50.0	51.0	0.98
South Carolina	18	17	51.4	54.1	0.95
Alabama	17	18	48.6	54.5	0.89
Georgia	17	18	48.6	54.6	0.89
Mississippi	16	18	47.1	53.5	0.88

*All elections since adoption of Unit rule by states in 1836.
†Excludes electoral split in 1892

publicans win the state) = .50. Thus, assigning states at random to the Democratic column or the Republican column simulates one election. Totaling the electoral votes determines which party wins the simulated election. This procedure is repeated 10,000 times to determine the percentage of times that each state appears on the winning side, given that that occurrence is by chance alone. Clearly no state would appear on the winning side in fewer than 50 percent of the elections since there is a .50 probability that the state will vote Democratic (or Republican). Even a hypothetical state with no electoral votes would be on the same side as the winner in half of the simulated elections.

On the other hand, large states appear on the side of the winner more often than small states. For example, a very few combinations of 51 states (50 states and the District of Columbia), taken *11* at a time, will produce winning coalitions. These winning coalitions are composed of the largest 11 states. Similarly, some combinations of 51 states, taken *12* at a time, will produce winning coalitions. The winning coalitions in this case must include most — but not all — of the largest states. Considering all combination of 51 states, taken N at a time, the winning coalitions will include large states more often than small states.

The simulation of states is different for each presidential election for three reasons. First, not all states joined the Union at the same time. Second, a few states did not vote during the Civil War and/or the Reconstruction era. Third, the number of electoral votes for each state has been reapportioned following almost every decennial census. Thus, in any given election each state has a unique — but possibly different from other elections — simulated proportion of times of appearing on the winning side. We computed the simulated proportion of times that a state appeared on the winning side in each presidential election and averaged these proportions over all elections. That is, the Monte Carlo technique was repeated for each presidential election to simulate the electoral college votes of every election year since 1796; the mean proportion of times on the winning side for each state in all elections since statehood was then computed. Table 1, column 5 shows each state's simulated proportion of voting with the winner for all elections since statehood.

The weather-jar ratio measures the extent to which states are sensitive to national trends in presidential elections. Thus, it is necessary not only to observe how many times a state appears on the winning side, but to compare these appearances to a baseline of chance expectation. To accomplish this, we divided the observed proportion of times a state appeared on the winning side (Table 1, column 3) by the average simulated proportion of times a state might appear on the winning side by chance alone (Table 1, column 4). When the resulting ratio is greater than 1.0, the state has appeared on the winning side more often than one would predict, controlling for the state's influence on the electoral college. Conversely, if a state's ratio is less than 1.0, the state has appeared on the winning side fewer times than one would predict, controlling for the state's influence on the electoral college. The state with the highest weather-jar ratio is the one which most accurately reflects national election trends.[13]

[13] The mean of the weather-jar ratios is 1.29. The fact that the mean is greater than 1.00 indicates that most states have done better than chance; that is, the actual distribution of states on the winning side is negatively skewed rather than binomial.

There are two reasons for the skewness. First, each individual state is not independent of all other states during an election, as the Monte Carlo simulation assumes. Every combination of state coalitions is not equally probable; some states are more likely to vote similarly than others. See Chester Spatt, "Communications," *American Political Science Re-*

Discussion and Conclusions

The simulation method of computing a state's chance expectation of appearing on the winning side is similar to other indices which measure the influence of a state in the electoral college. For example, the Banzhaf index is a function of the probability that a state's defection from one candidate to another will change a minimum winning coalition to a non-winning coalition.[14] The Shapley index is a function of the probability that a state will create a minimum winning coalition by joining the same side as several other states.[15] Both indices have been applied to a citizen's voting power in the electoral college.[16]

Two other indices of electoral college influence also resemble our simulated proportions of appearing on the winning side. The Brams' "3/2's Rule" suggests that the influence of the electoral college in an election game between two candidates is proportional to the number of electoral votes of a state raised to the 3/2's power.[17] These calculations are disputed by Colantoni et al. who argue that the influence of the electoral college is directly proportional to the number of electoral votes in a state.[18]

All four indices consider the electoral college as it affects either voter or candidate strategy; that is, they all depend on game theoretic or decision-making strategies. For example, the Banzhaf index requires game theoretic assumptions about the nature of citizen voter coalitions while the Shapley index requires decision-making assumptions about the nature of citizen voter coalitions. Thus they all differ from the simulation used here. We are concerned, not with a minimax strategy of electoral college influence, but solely with the appearance of a state in a winning coalition (not a minimum winning coalition nor a coalition of strategic states defined by a candidate). As such the chance expectation of appearing on the winning side is a new index, appropriately defined as the chance expectation of agreeing with the winner.

More substantively, some states are historically on the winning side but not very good weather-jar states. For example, New York has been on the winning side in 83.3 percent of the elections since its statehood; however,

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view 70 (December 1976): 1221-23; Seymour Spilerman and David Dickens, "Who Will Gain and Who Will Lose Influence Under Different Electoral Rules," *American Journal of Sociology* 80 (September 1974): 443-77; Carleton W. Sterling, "The Electoral College Biases Reavealed," *Western Political Quarterly* 31 (June 1978): 159-77.

Second large coalitions of states have occurred more frequently than small coalitions. For example, the probability of a candidate's winning 49 states in one election is quite small, yet Richard Nixon accomplished this feat in 1972 with 64 percent of the vote. The electoral college exaggerates vote totals. See Bean, *How to Predict Elections,* pp. 105-35.

[14] John F. Banzhaf, "One Man, 3.312 Votes," *Villanova Law Review* 13 (Winter 1968): 303-46.

[15] L. S. Shapley, "A Theory of N-Person Games" in H. W. Kuhn and A. W. Tucker, eds., *Annals of Mathematical Studies* (Princeton: Princeton University Press, 1953).

[16] For an application of the Banzhaf index using computer simulation, see Yunker and Longley, "The Biases of the Electoral College." For an application of the Shapley index which uses a multilinear extension algorithm rather than computer simulation, see Owen, "Evaluation of a Presidential Game." The Owen computations are criticized by Spatt, "Communications"; they are defended by Guillermo Owen, "Communications," *American Political Science Review* 70 (December 1976): 1223-24.

[17] Steven J. Brams, *Game Theory and Politics* (New York: The Free Press, 1975).

[18] See Claude S. Colantoni, Terrence J. Levesque, and Peter C. Ordeshook, "Campaign Resource Allocation Under the Electoral College," *American Political Science Review* 69 (March 1975): 141-54. Brams and Davis defend his 3/2's Rule in Steven J. Brams and M. D. Davis, "Comments on Campaign Resource Allocation Under the Electoral College," *American Political Science Review* 69 (March 1975): 155-56. See also Claude S. Colantoni, Terrence J. Levesque, and Peter C. Ordeshook, "Rejoiner to 'Comment' by S. J. Brams and M. D. Davis, "*American Political Science Review* 69 (March 1975): 157-61.

this percentage is only slightly better than the simulated chance expectation of 70.1 percent for New York. New York's weather-jar ratio ranks thirty-sixth among the states while its appearance on the winning side is second. Similarly, California and Illinois appear on the winning side in a high percentage (84.3 and 86.1 percent) of the elections since statehood, but their large number of electoral votes inflates their true sensitivity to national election outcomes. Conversely, Idaho has been on the winning side in 77.3 percent of the elections since statehood; this is sixteenth in appearances on the winning side. However, Idaho is fairly sensitive to national election outcomes, ranking seventh in the weather-jar ratio.

The journalists of the world write interesting election commentary; the historical phenomenon of a state appearing on the winning side generally impresses the reader of these popular campaign guides. Many will be disappointed that New Mexico voted for a losing candidate in 1976 for the first time since statehood. They should, however, realize that New Mexico's record of voting for the winner is still much greater than chance expectation. Hence, New Mexico is the best weather-jar of national election outcomes. However, don't depend on the Sunshine State to predict the next election. "As New Mexico Goes, So Goes the Nation"; but don't bet on it.

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