Measuring Electoral Change in Three-Party Systems: An Alternative to Swing

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In a recent paper in this journal, Butler and Van Peek (1990) advocated analyzing patterns of electoral change in the USA with the swing statistic—the average change in the share of the vote won by two parties contesting successive elections. The generality of their case was countered by Rose (1991), who showed that most liberal democracies do not have two-party systems; thus the swing statistic, which involves comparing the performance of two parties only, conceals more than it reveals of the pattern of electoral change in most situations. His preference was for the separate study of the "ups and downs" of each party.

In a riposte to Rose, Gibson (1992) argued for the superiority of swing over the single party measures. His case was built on a curious argument, however. On the basis of goodness-of-fit statistics, he showed that a combination of independent variables relating to the characteristics of constituencies in Greater London predicted variations in swing better than they predicted variations in the performance of individual parties. Such analyses in no way indicate the superiority of swing as a measure of electoral change, however; they merely demonstrate that swing is more closely correlated to some independent variables than is another measure of change. Gibson's argument is a case of a spurious correlation.

All analysts of British elections since the 1970s have recognized that the two-party system assumed by the swing statistic no longer exists, and that study of changes in the proportion of that part of the electorate which supports one of the two parties only (almost invariably the Conservative and Labour parties) is not very revealing. England now has a three-party system, and Scotland and Wales each has a four-party system. Thus analyses of spatial (i.e., inter-constituency) variations in electoral change usually look at the ups and downs of individual parties, as recommended by Rose (see Johnston and Pattie 1992a, 1992b). In this note, we suggest the use of two statistics which summarize change in the three-party situation.

The Electoral Triangle

It has long been recognized that the distribution of constituencies according to the percentage of votes among three parties can be depicted using triangular graphs (see Gudgin and Taylor 1979; Miller 1977; Upton 1976; and Stray and Upton 1989). These have been used in a number of presentations of the English three-party system during the 1970s, 1980s and 1990s. (Throughout that period the Conservative and Labour parties dominated the electoral system. Up to and including the 1979 general election, the Liberal party was the third. In 1983 and 1987, the third "party" was the Alliance of the Liberals with the newly-formed Social Democratic Party. In 1992, the third party was the Liberal Democrats. For examples of the use of the triangle, see Johnston, Pattie and Allsopp 1988.)

More recently, triangular graphs have been used to portray changes in the three-party distribution of the vote, using arrows to depict the shift from one election to the next. Both Dorling (1992) and Upton (1989, 1991) have placed these arrows on cartograms, thereby illustrating the geography of variations in electoral change. If the pattern were uniform across the country, then all arrows would point in the same direction and be of the same length (this would be the equivalent of Butler's concept of "uniform swing"); if the pattern varied, this would be indicative of regional or other differences in the relative performance of the three parties.

In this introductory note we move the use of triangular graphs beyond the visual to the analytic. We derive two statistics summarizing change in three-party systems, and briefly illustrate their use in analyzing electoral change in Great Britain between 1987 and 1992.

Measuring Electoral Change in Three-Party Systems

Figure 1 is a triangular graph in which the axes represent the percentages of the votes cast for the three parties together which were won by the Conservative (C), Labour (L) and Liberal Democrat Parties (D). For the triangular graph to be used, the three percentages must sum to 100; other parties and abstainers must be omitted from the calculations.

Nationally, the percentages for the three parties at two elections (1 and 2) were

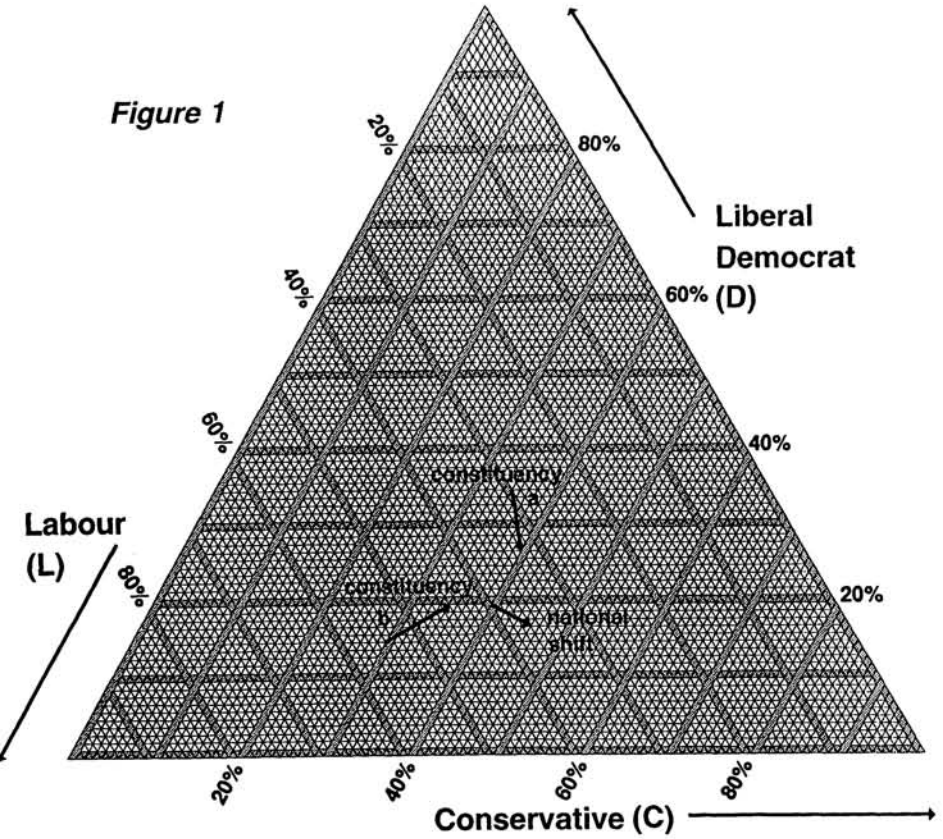
	C	L	D
Election 1	40	40	20
Election 2	46	37	17

There was a movement away from both Labour and the Democrats, with the Conservative party the net gainer. This is shown by the arrow for the national shift on Figure 1, which is oriented to the "southeast."

Also shown on Figure 1 are the shifts for two constituencies (a and b). The relevant figures are:

	C	L	D
Constituency a			
Election 1	35	30	35
Election 2	40	33	27
Constituency b			
Election 1	30	55	15
Election 2	35	45	20

FIGURE 1



These two shifts are in different directions from the national pattern. That for constituency a is oriented almost "due south," because Labour as well as Conservative was a net gainer. That for constituency b is oriented "east-north-east," reflecting gains by both Conservative and Democrats.

Different shifts are represented by arrows at different angles. In trigonometry, those angles would normally be measured relative to a notional base. Rather than compare patterns of change with a rather meaningless datum, however, we have developed a measure of the angular difference between the arrow for each constituency and that for the national pattern. In this, positive angles represent arrows to the "north" of the national arrow (i.e., moving in an anti-clockwise direction from it); negative angles represent arrows to the "south" (moving clockwise from the national arrow). Thus the larger the angle (the maximum value is $\pm 180°$) the greater the deviation from the national trend, whereas the sign of the angle indicates the direction of that deviation. The Appendix gives the formulae for computing these angles.

On Figure 1 there is a second difference between the national change and that in each of the two constituencies—the latter two arrows are longer than that for the country as a whole. This is because the latter had greater net change in the pattern of votes than was the case nationally: for constituency a the net change in the distribution of votes (the sum of the absolute differences divided by two) was 8 and for constituency b it was 10: the national net shift was only 6. Thus the greater the volume of movement the longer the arrow, which gives us a second measure of electoral change. (The absolute differences just described are equal to the length on the graph divided by the square root of 3.0.) The Appendix also gives the formula for deriving the length of each arrow.

An Application: Great Britain, 1987-1992

We have derived two measures of electoral change in constituencies in three-party systems, using trigonometry based on the triangular graph:

(1) *The directional angle* (A_d), which summarizes the net direction of change in a constituency, relative to the national pattern; and
(2) *The length of the arrow* (L_d), which indicates the magnitude of change.

To provide a brief illustration of these two, we have analyzed Great Britain between the general elections of 1987 and 1992, when there were 633 separate constituencies.[1] For this, we use the percentage of the votes cast for the three main parties only, which nationally were:

	C	L	D
1987	44.2	32.2	23.6
1992	44.5	36.5	19.0

Values of A_d and L_d were calculated for each constituency.

Figure 2 shows the national arrow, pointing "south south west" (because the Conservative percentage of the votes cast remained virtually constant, whereas Labour's percentage increased and that of the Liberal Democrats fell). It also provides a template for interpreting the values of A_d. Thus, for example, an angle of between $-63°$ and $-3°$ indicates a greater than average loss of votes for Conservatives and a loss for the Democrats, countered by an increase for Labour, whereas one between $+57°$ and $+117°$ indicates a Conservative gain and a loss for each of the other two; in the latter segment, the larger the angle the smaller the Democrat loss and the larger the Labour decline.

Frequency distributions and summary statistics for the two variables are given in Table 1. The data for A_d indicate substantial variability around the national figure, with only just over half of the constituencies within 25° of it; relatively few are more than 90° from the national trend, however, indicating that most constituencies fell within the "south-western" third of the template. These indicate, just as the swing statistics for earlier two-party contests illustrated (Johnson 1983), that there was little uniformity of electoral change across the country's constituencies. Most swung towards Labour—any

angle between $-123°$ and $+57°$—and few shifted towards the Liberal Democrats (an angle either $> -63°$ or $> +117°$). There were fewer large positive angles (substantial shifts to the Conservative party) than there were large negative ones (substantial shifts away from the party of government).

TABLE 1
Summary Statistics for the Measures of Angle and Length (Shifts between the 1987 and 1992 General Elections in Great Britain: 633 Constituencies)

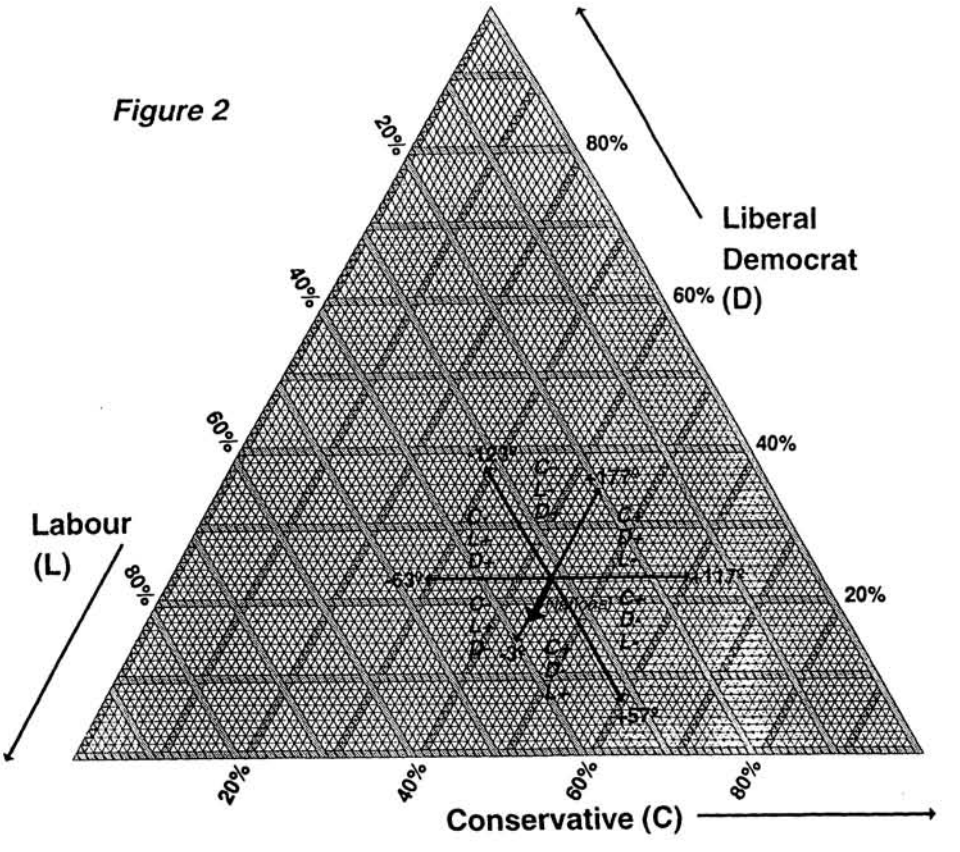
Angle	Number	Length	Number
-180:-135	14	0:1	16
-134: -90	34	1:2	38
-89: -60	22	2:3	43
-59: -45	15	3:4	58
-44: -40	8	4:5	75
-39: -35	15	5:6	52
-34: -30	26	6:7	68
-29: -25	26	7:8	42
-24: -20	36	8:9	39
-19: -15	33	9:10	43
-14: -10	53	10:11	24
-9: -5	54	11:12	32
-4: -0	54	12:13	16
0: 4	49	13:14	16
5: 9	39	14:15	12
10: 14	27	15:16	9
15: 19	19	16:17	13
20: 24	20	17:18	9
25: 29	17	18:19	4
30: 34	15	19<	24
35: 39	10		
40: 44	5		
45: 59	18		
60: 89	14		
90: 134	4		
135: 180	6		
Mean[a]	30.74		7.82
Standard Deviation	35.57		5.91

[a]The mean angle is calculated irrespective of sign.

The data for length show that although most shifts were less than 8 units long—a relatively small net movement—there was a considerable positive skewness, with some very substantial shifts indeed.

Inter-constituency variations in electoral change within Great Britain have been a research focus of geographers and others in recent years (e.g., Johnston, Pattie and Allsopp 1988). Here, by way of illustration of the use of our new statistical measures, we present the results of two analyses of such variations.

Figure 2



Regional Differences

Much has been written about the increased regional polarization in the British electorate since the 1960s (e.g., Johnston, Pattie and Russell 1993). To enquire whether there were regional variations between 1987 and 1992 we used analyses of variance together with multiple classification analysis (ANOVA with MCA) to investigate differences between 22 regions in both angle and length of arrow. (The regions are those used in all of our recent analyses: see Johnston, Pattie and Allsopp 1988 for a map. They comprise the country's Standard Statistical Regions, subdivided into the major conurbations and the rest.)

The results are given in Table 2, which shows the results of the analyses of variance (the F values) and of the MCA (the difference between each region's average and the grand mean). They indicate significant inter-regional variations on both variables. In terms of angular variations around the national mean of $-4.23°$, the large positive values—which indicate little growth in the Labour vote—are recorded for the Scottish regions; the largest negative deviations, which indicate substantial Labour growth and relative stability in the Liberal Democrat performance, are for the more rural regions of the south.

Variations in the volume of change, as indicated by arrow lengths, showed less change than the national figure throughout northern England, and also in London's outer zones (where it is widely believed that the Conservative party "saved" its majority).

More detailed analyses of these variations are called for, but are beyond the scope of this introductory note. For the present purposes, the results in Table 2 indicate that we have derived measures which resonate with our general appreciation of the regional variations in British electoral behavior between the 1987 and 1992 general elections.

TABLE 2
Results of the Analyses of Variance with Multiple Classification Analysis: Regional Variations in Angle and Length, Great Britain, 1987-1992

Analysis of Variance		
	Angle	*Length*
F value	8.79	3.78
R^2	0.24	0.12

Multiple Classification Analysis		
	Average Regional Deviation from Grand Mean of	
	Angle	*Length*
Region	-4.23	7.82
Strathclyde	43.02	-0.34
East Central Scotland	49.06	0.91
Rural Scotland	34.81	4.54
Rural North	-6.85	0.54
Industrial North East	22.64	-1.73
Merseyside	1.69	-1.31
Greater Manchester	2.65	-1.94
Rest of North West	-0.03	-2.18
West Yorkshire	10.68	-0.66
South Yorkshire	13.99	-3.03
Rural Wales	9.68	1.03
Industrial South Wales	-4.81	-0.92
West Midlands Conurbation	5.47	-1.46
Rest of West Midlands	-1.77	-0.25
East Midlands	-11.22	0.94
East Anglia	-6.32	1.94
Devon and Cornwall	-38.23	7.98
Wessex	-51.93	1.88
Inner London	7.82	1.54
Outer London	-4.31	-0.21
Outer Metropolitan	-1.95	-1.51
Outer South East	-26.36	-0.50

Marginality and Tactical Voting

Another topic of considerable psephological interest at recent British general elections has been tac tical (or "strategic") voting. The focus of opposition has been on defeating the incumbent Conservative party and as a consequence it has been suggested that the more marginal the Conservative party's hold on a seat, the greater the likelihood that opponents will concentrate their votes on the party in second place after the previous election (Johnston and Pattie 1991).

To test the validity of this argument as a potential explanation for the inter-constituency variations in electoral change between 1987 and 1992, we look at those seats held by the Conservative party only. We expected to find that in the more marginal seats, where Labour was second in 1987 the direction of change would be towards it (i.e., a negative angle) whereas where the Democrats were second in 1987,[2] the relative shift would be towards them (i.e., a large positive angle).

To test this hypothesis, we split the constituencies into five bands depending on their degree of marginality (the Conservative lead over the second-placed party in 1987, expressed as a percentage of the total poll then), as shown in Table 3. For each band, we further classified the constituencies into those in which Labour came second in 1987 and those where the Democrats occupied that po ition.

An analysis of variance showed that there were significant differences in the average angle between both categories, as there was (slightly) for the interaction between the two (Table 3). The average value for Conservative-held seats of $-15.89°$ indicates that in those seats as a whole there was a slight shift towards Labour and away from the other two parties. In the most marginal seats (with a Conservative lead of less than 3 percentage points) the Conservative percentage actually increased: where Labour was in second place, it too won an increased share of the vote whereas the Liberal Democrat percentage fell; in the five seats where the Liberal Democrats were the main challengers on average the Labour increase was much less, as was the decline in the Liberal Democrat vote. (An average angle of 59° puts the trend in those seats almost exactly or the margin between a Labour gain and a Labour loss, according to the template in Figure 2.)

TABLE 3
Marginality and Angle: Conservative-Held Seats, 1992

Analysis of Variance			
	Margin	*Second Place*	*Interaction*
F value	7.91	3.97	3.03
Beta	0.28	0.14	

Average Value = -15.89

	Second-Placed Party	
Conservative Lead	*Labour*	*Liberal Democrat*
0.0-2.9 percent	33.83 (7)	58.97 (5)
3.0-5.9 percent	17.77 (6)	22.94 (4)
6.0-8.9 percent	11.10 (8)	-95.59 (2)
9.0-11.9 percent	0.57 (11)	-48.07 (6)
12.0 < percent	-7.52 (155)	-34.81 (128)

The numbers in parentheses refer to the number of constituencies in each category.

In constituencies where Labour was in second place, as the margin between it and the Conservative incumbent increases so the average angular value falls. In the relatively safe seats with the Liberal Democra in second place, the large negative values indicate both Labour gains and Conservative losses. Overall, therefore, the Conservative party di not suffer greatly from tactical voting in its marginal seats, though there was a shift to Labour in the most marginal where it was in seco place.

* * * *

This section gives two very brief examples only of the types of

analysis possible with these new measures of electoral change in Britain's three-party system. They illustrate the potential for analytical work which the use of swing denies and which investigation of the movement for each party separately would ignore.

Conclusion

With Rose, we contend that the two-party swing statistic popularized by Butler and promoted by Gibson is not a sensible measure of electoral change in three-party systems. Rather than adopt the procedure of looking at each party separately as suggested by Rose, however, we have derived two new measures of shifts in three-party systems which are based on use of the triangular graph. Those measures are presented and briefly illustrated here, as potentially useful indices which can be employed in further work, on Britain and elsewhere.

Appendix

To compute the relative angles, which are calculated in radians, for shifts from election a to election b.

D_{bi} = Vote for Democrats at election b in constituency i

D_{bn} = Vote for Democrats at election b nationally

D_{ai} and D_{an} = the same variables for election a

L_{ai}, L_{an}, L_{bi}, L_{bn} = the same variables for votes for Labour, and

C_{ai}, C_{an}, C_{bi}, C_{bn} = the same variables for votes for Conservative

Then

$$Y_i = (D_{bi} - D_{ai})*\sqrt{3}$$
$$Y_n = (D_{bn} - D_{an})*\sqrt{3}$$
$$X_i = (C_{bi} + L_{ai} - L_{bi} - C_{ai})$$
$$X_n = (C_{bn} + L_{an} - L_{bn} - C_{an})$$

For the constituency (i) the angle (A_i) is then

If $X_i < > 0.0$ then $A_i = \arctan(Y_i/X_i)$ else $A_i = \pi$ and if $X_i < 0.0$ then $A_i = A_i + \pi$

For the national angle (A_n)

If $X_n < > 0.0$ then $A_n = \arctan(Y_n/X_n)$ else $A_n = \pi$ and if $X_n < 0.0$ $A_n = A_n + \pi$

To compare the constituency and the national angles

$$A_d = A_i - A_n$$

IF $A_d > \pi$ then $A_d = A_d - (2*\pi)$

IF $A_d < -\pi$ then $A_d = A_d + (2*\pi)$

To convert that angle from radians into degrees

$$A_d = A_d * (180/\pi)$$

To compute the length of the line

$$L_d = \sqrt{((X_c - X_n)^2 + (Y_c - Y_n)^2)}.$$

Notes

1. In fact there were 633 in 1987 and 634 in 1992. The constituency for Milton Keynes was divided in 1991, because its electorate had become very large (there were some slight alterations to adjacent constituencies too). For our purposes, we have combined the two 1992 Milton Keynes constituencies.
2. In 1987, seats were fought by the Alliance, to which the Liberal Democrats were the 1992 successor in most constituencies.

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