did; the average Conservative loyalty was over 4 percentage points lower in Labour-held seats contested by the Liberal party in 1983 than in those contested by the SDP.[9]

Campaign spending has received little attention from British electoral analysts. The evidence provided here, however, suggests that the amount spent is related to the result in the individual constituencies at the margins, and in the context of the present analyses can be seen to have assisted the opposition parties in their local advocacy of tactical voting.

SUMMARY

The analyses presented in this note have extended earlier work on tactical voting in Great Britain by looking at variations between constituencies in the flow-of-the-vote matrix that are consistent with hypotheses of tactical voting. They have suggested that about 4 per cent of the British electorate voted tactically in 1983, as did nearly 6 per cent in 1987. The volume of tactical voting was greater in Conservative-held than in Labour-held seats, and in both was greater the more marginal the seat. In general, the opposition party with the greatest chance of unseating the incumbent, as suggested by the result of the previous election, gained from the tactical voting process, and there is evidence that greater campaign effort, as indexed by constituency spending, helped them in this.

[9] Note that this finding occurs when marginality is held constant, so that Liberal candidates did better than their SDP counterparts, irrespective of their being allocated more of the 'winnable' seats within the Alliance.

The Impact of By-elections on General Elections: England, 1950–87

GRAHAM J. G. UPTON*

In his introduction to a definitive collection of articles on British by-elections, David Butler observed that by-elections 'may offer some guide to the public mood; but who now would dare to give a figure for the likely difference between a by-election today and what would happen in an immediate general election?'[1]

By contrast, in a study of the by-elections occurring during the course of the 1983–87 parliament, I wrote that the results in the general election following a by-election could be expected 'to exhibit results that represented a compromise between the returns in the by-election and in the preceding general election, suitably modified by the shifts in opinion over the intervening time period'.[2] This Note demonstrates the merits of that claim.

A second study of these same by-elections suggested that 'what happened in these

* Department of Mathematics, University of Essex. I am very grateful to an anonymous referee and to the editor, Ivor Crewe, for their detailed comments on an earlier draft of this Note, which have resulted in great improvements. Any errors that remain are, of course, my responsibility.

[1] David Butler, 'Introduction' in C. Cook and J. Ramsden, eds, *By-elections in British Politics* (London: Macmillan, 1973).

[2] Graham Upton, 'The Components of Voting Change in England 1983–1987', *Electoral Studies*, 8 (1989), 59–74, p. 66.

by-election results clearly affected the parties' general election performance in those seats. . .a by-election was more likely to influence the general election result if it had changed the tactical situation'.[3] In this Note the truth of that statement is demonstrated.

TABLE 1 *Numbers of Informative By-elections* during Governments*

Government	Contested by	
	Con. and Lab. only	Con., Lab. and Lib./All.
1950–51	4	0
1951–55	16	3
1955–59	19	5
1959–64	5	16
1964–66	0	9
1966–70	3	9
1970–Feb. 1974	3	7
Feb. 1974–Oct. 1974	0	1
Oct. 1974–1979	0	27
1979–83	0	4
1983–87	0	13

* 'Informative by-elections' are those contested by parties that also contest the seat at each of the preceding and following general elections.

The parameter(s) of the model are estimated by using the results of the 144 'informative' English by-elections that occurred between the 1950 and 1987 general elections, as indicated in Table 1. A by-election contested by n major parties (n = 2 or 3) is informative if it was both preceded and followed by general elections in which the same n parties contested the seat. Omitted are those constituencies affected by a major boundary change and also Bristol South-East, which experienced two by-elections within a single parliament.

The next three sections develop the structure of the variables considered. These variables utilize a combination of observed election results and Gallup Poll information. The numerical justification of the decisions made in the formulation of these variables is presented subsequently.

THE BASIC MODEL

For a particular constituency, let the vectors $\mathbf{P}_1$, $\mathbf{P}_2$ and $\mathbf{P}_b$ denote the proportions of votes cast for the various parties at, respectively, the first and second general elections and at the by-election. Following my earlier suggestion, the basic model proposed is that the vector $\mathbf{P}_2$, may be regarded as a weighted combination of the earlier vectors:

$$\mathbf{P}_2 = \alpha\mathbf{P}_b + (1 - \alpha)\mathbf{P}_1. \tag{1}$$

A more convenient way of writing equation (1) is in terms of the changes between elections:

$$(\mathbf{P}_2 - \mathbf{P}_1) = \alpha(\mathbf{P}_b - \mathbf{P}_1). \tag{2}$$

[3] John Curtice and Michael Steed, 'Analysis', in D. Butler and D. Kavanagh, *The British General Election of 1987* (London: Macmillan, 1988), p. 340.

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There are two obvious deficiencies to this model: it takes no account of any national changes in public opinion that would lead to variation in $\mathbf{P}_b$ and $\mathbf{P}_2$, and neither does it take account of the generally low turnout rates in by-elections.

ALLOWING FOR NATIONAL CHANGE IN PUBLIC OPINION

An excellent first approximation to the change in voting behaviour experienced in any particular constituency between a pair of general elections is provided by the overall national change.[4] Suppose that, at the two general elections, the national proportions of votes cast for the parties are denoted by the vectors $\mathbf{N}_1$ and $\mathbf{N}_2$. Then, for a constituency unaffected by a by-election, one would expect that (approximately)

$$(\mathbf{P}_2 - \mathbf{P}_1) - (\mathbf{N}_2 - \mathbf{N}_1) = \mathbf{0}. \tag{3}$$

The observed value of the left-hand side of this equation therefore measures, for a specific constituency, the 'unexpected' change in support for the parties.

The extent to which a constituency can be affected by an intervening by-election is illustrated by the change in party fortunes for the Greenwich constituency between 1983 and 1987. The (Conservative, Labour, Alliance) vote in Greenwich was (35, 39, 26) in 1983. With an overall change of (0, 3, −3) between 1983 and 1987, one would have expected a 1987 breakdown not dissimilar to (35, 42, 23), whereas the reality was (24, 35, 41). The massive 'unexpected' rise in the Alliance vote is clearly attributable to the mid-term by-election result of (11, 34, 54).

It might be expected that the natural progression from equations (2) and (3) would be to

$$(\mathbf{P}_2 - \mathbf{P}_1) - (\mathbf{N}_2 - \mathbf{N}_1) = \alpha(\mathbf{P}_b - \mathbf{P}_1). \tag{4}$$

However, equation (4) does not incorporate any measure of the national change that would have been expected at the time of the by-election. The two sides of equation (4) are measuring different types of deviation, with the right-hand side measuring absolute change and the left-hand side measuring change relative to that experienced by the nation as a whole.

If there had been a complete national election at the time of the by-election, with a national figure of $\mathbf{N}_b$ for the party in question, then a correction factor involving $(\mathbf{N}_b - \mathbf{N}_1)$ could be added to the right-hand side of the equation. However, $\mathbf{N}_b$ cannot be measured and a surrogate is required. It is natural to turn for this to the monthly opinion polls of voting intention produced by Gallup. In the 1950s the question asked by Gallup was 'If there were a general election tomorrow, how would you vote?' and, in essence, this remains the question asked today.[5] A follow-up question presses the undecided to show an inclination.

Denoting the vectors of Gallup percentages by $\mathbf{G}$, with an appropriate suffix, the adjustment to the right-hand side of model (4) leads to

$$(\mathbf{P}_2 - \mathbf{P}_1) - (\mathbf{N}_2 - \mathbf{N}_1) = \alpha\{(\mathbf{P}_b - \mathbf{P}_1) - (\mathbf{G}_b - \mathbf{G}_1)\}. \tag{5}$$

[4] See, for example, the discussion in S. J. Stray and G. J. G. Upton, 'Triangles and Triads', *Journal of the Operational Research Society*, 40 (1989), 83–92.

[5] This question was changed in the early 1960s to 'How would you vote if there were a general election tomorrow?' and, in June 1970, to 'If there were a general election tomorrow, which party would you support?'

The actual values taken for $\mathbf{G_b}$ and $\mathbf{G_1}$, and the justification for using $(\mathbf{G_b} - \mathbf{G_1})$ rather than $(\mathbf{G_b} - \mathbf{N_1})$ are the subjects of the next section.

Model (5) takes no account of turnout. It seems logical to suppose that the impact of a by-election in which few people vote will be appreciably less than that in which many vote. Denoting turnout by the letter T, with an appropriate subscript, and bearing in mind that we are concerned with the impact of the by-election on the second general election, a natural weighting is T_b/T_2, leading to the amended model

$$(\mathbf{P_2} - \mathbf{P_1}) - (\mathbf{N_2} - \mathbf{N_1}) = \alpha(T_b/T_2)\{(\mathbf{P_b} - \mathbf{P_1}) - (\mathbf{G_b} - \mathbf{G_1})\}. \quad (6)$$

Note that model (6) is still a single parameter model of the form $Y = \alpha X$, since all the quantities aside from α have known values.

It might be expected that the time elapsing between the by-election and the second general election would influence the value of α, but it will be shown subsequently that this does not appear to be the case.

USING OPINION POLL DATA

The monthly Gallup interviews are usually held towards the beginning of a month and are spread over some five to ten days. Thus $\mathbf{G_b}$ is taken as the level of support reported for the party in question for the month in which the by-election takes place, scaled so that the values for the major parties (Conservative, Labour and, as appropriate Liberal or Alliance) contesting the by-election sum to 100 per cent.

However, voting in a general election and responding to an opinion pollster are very different matters. As other commentators have noted, 'opinion polls require an instant reaction whereas the act of voting ... allows considerable time for reflection'.[6] Furthermore, there is a more fundamental difference than this. As already mentioned, the question asked each month by the Gallup organization is typified by, 'If there were a general election tomorrow, how would you vote?' Only in the last few months of a government, when a general election is widely anticipated, will this be other than a hypothetical question, and 'opinion polls therefore yield accurate results only at times close to elections'.[7]

Following the announcement of a general election, Gallup change their monthly question to 'If you vote which candidate will you support?'[8] The monthly poll result at the time of a general election is therefore a direct estimator of the national vote and is very different in nature to that at the time of a by-election.

At the time of the by-election the only information available is $\mathbf{G_b}$, the set of responses to a *hypothetical* question. This cannot sensibly be compared with the real-life values given by $\mathbf{N_1}$. Instead, we take the Gallup value, nearest in time to the first general election, which relates to the same hypothetical question as is asked at the time of the by-election. Thus $\mathbf{G_1}$ is the (scaled) value for the month *immediately following* the first general election. This month is chosen in preference to the month immediately

[6] S. J. Stray and M. Silver, 'Government Popularity, By-elections and Cycles', *Parliamentary Affairs*, 36 (1983), 49–55, p. 50.

[7] Stray and Silver, 'Government Popularity, By-elections and Cycles', p. 50.

[8] For further details concerning the manner in which Gallup and other polls have been conducted, see Chapter 5 of S. J. Stray, 'British Parliamentary By-elections, 1950–1982: An Empirical Investigation', unpublished doctoral dissertation, University of Essex, 1986.

before the election because 'coming events cast their shadows before them' – for most general elections there will have been speculation concerning the precise date for some months in advance of the election. An empirical confirmation of the merits of this choice is given later (Table 3).

THE DATA

The dates of the by-elections considered are summarized in Table 1. As the table suggests, the period 1950–87 subdivides conveniently into two, with the break occurring in October 1974. This break is governed by the strategy of the third party. In each of the general elections from October 1974 to 1987, the Liberal party (or the Alliance) contested virtually every seat in England, whereas, before that election, it contested relatively few seats.[9] The fifty by-elections included in this study, which were contested by just the Conservatives and Labour parties, therefore all fall into the first time period, which also contains fifty of the ninety-four three-party contests.

We can anticipate that the model will function least well for the three-party contests in the first time period, because the Gallup figures ($\mathbf{G_1}$, etc.) incorporate information from constituencies where no Liberal candidate existed at the preceding general election. The actual change in the support for the Liberal party in such constituencies is likely to be underestimated by the quantity $(\mathbf{G_b} - \mathbf{G_1})$.

The national figures ($\mathbf{N_1}$, $\mathbf{N_2}$) used in this study have been taken from the statistical summaries that form the appendices of the book on each general election by David Butler and various co-authors.[10] In their summary tables, the figures given for a party are the average percentages of the vote obtained by that party in those seats in which the party fielded a candidate. In the first time period these percentages therefore total to more than 100 per cent. For example, for the 1951 general election, the English (Conservative, Labour, Liberal) figures are given as (49.2, 48.8, 12.4). In this present study, when dealing with a two-party seat, the Liberal percentage has been neglected, and the others have been scaled to sum to 100 per cent giving (50.2, 49.8, 0.0), while for a three-party seat, the Liberal percentage has been preserved, and the others scaled down so that the overall total becomes 100 per cent: for the 1951 this gives (44.0, 43.6, 12.4).

PARAMETER ESTIMATION AND GOODNESS OF FIT

Each of the models considered has featured a single unknown parameter, α, presumed constant over all constituencies. This single parameter governs the changes experienced by each of the parties from one election to the next. It is natural to use some form of least squares procedure in order to estimate α, since this results in a minimization of squared errors. The estimates reported subsequently are so-called ordinary least

[9] At its lowest ebb in this period, it contested just 91 of the 506 seats available in 1951.

[10] For example, D. Butler and D. Kavanagh, *The British General Election of 1987* (London: Macmillan, 1988).

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squares (OLS) estimates, which are unbiased but not, in the present case, fully efficient, in the sense that estimates with smaller standard errors could be calculated.[11]

The previous discussion has obscured an unusual problem that can be illustrated by reference to model (4) which is repeated for convenience:

$$(\mathbf{P}_2 - \mathbf{P}_1) - (\mathbf{N}_2 - \mathbf{N}_1) = \alpha(\mathbf{P}_b - \mathbf{P}_1). \quad (4)$$

This model could equally well have been written as either

$$(\mathbf{P}_2 - \mathbf{P}_1) = (\mathbf{N}_2 - \mathbf{N}_1) + \alpha(\mathbf{P}_b - \mathbf{P}_1). \quad (4a)$$

or

$$\mathbf{P}_2 = \mathbf{P}_1 + (\mathbf{N}_2 - \mathbf{N}_1) + \alpha(\mathbf{P}_b - \mathbf{P}_1). \quad (4b)$$

In the form (4), the emphasis is on the *discrepancy* between the change experienced in a particular constituency and the national change. In the form (4a), the emphasis is on predicting the *change* in a constituency, while in the form (4b) the emphasis is on predicting the *vote* in a constituency.

The general form of the model is $\mathbf{Y} = \mathbf{k} + \alpha(\mathbf{P}_b - \mathbf{P}_1)$ in each case, where $\mathbf{k}$ is a known vector, and $\mathbf{Y}$ is variously $(\mathbf{P}_2 - \mathbf{P}_1) - (\mathbf{N}_2 - \mathbf{N}_1)$, $(\mathbf{P}_2 - \mathbf{P}_1)$ or $\mathbf{P}_2$. No matter which form is used, the same estimated value will be obtained for α and therefore the lack of fit will be identical in each case. However, the proportion of the variation in the 'Y' values explained by the model differs very considerably. For the complete set of 144 constituencies one gets $\hat{\alpha} = 0.3136$, leading to an overall sum of squares for lack of fit of 0.6046. For (4) the overall total sum of squares (of 'Y' values) is 1.0253, which rises to 1.9490 for (4a) and to 66.6818 for (4b). Thus the same model can be evaluated as having 'explained' either 41.0 per cent, 69.0 per cent or 99.1 per cent of the variation![12]

[11] The lack of full efficiency arises because of the compositional nature of the data. For each constituency the elements in the vectors $\mathbf{x}$ and $\mathbf{y}$ sum to zero. The 'experimental errors' associated with each constituency vector are therefore correlated, the correlation being -1 in the case of two-party constituencies. Within the least squares framework, this can be taken into account by introducing a variance-covariance matrix $\mathbf{V}$. However, this results in a considerable increase in programming complexity that does not seem justified in the present context, where the aim is to explore a phenomenon rather than provide fully efficient estimates. The standard work on the treatment of compositional data is J. Aitchison, *The Statistical Analysis of Compositional Data* (London: Chapman and Hall, 1986). Aitchison advocates the use of so-called log-ratio models. In the context of three-party (Conservative, Labour, Liberal) data, these models would imply the use of Y variables of the form log(Conservative/Labour) and log(Labour/Liberal). However, these log-ratios are not natural quantities for use in this context, and a model such as 'log(Conservative/Labour) = constant' does not have any relation either to reality or to the original motivation of the present model in terms of the present vote being effectively a weighted combination of past votes.

[12] The final figure of 99.1 per cent is calculated from $100(66.6818 - 0.6046)/66.6818$ and simply reflects the fact that constituencies vary far more from one to another than any particular constituency varies over time. This accounts for the fact that, in their study of by-elections (D. T. Studlar and L. Sigelman, 'Special Elections: A Comparative Perspective', *British Journal of Political Science*, 17(1987), 247–56), the authors found that 'general election results can be predicted with impressive accuracy [from by-election results]' (p. 254). It would be amazing if it were not the case that two successive elections gave broadly similar results. Studlar and Sigelman do not look at the *extra* explanatory power of the by-election, having taken account of the previous general election result.

Each of these definition of the 'Y' values is of genuine interest. However, the one that most firmly highlights the impact of the intervening by-election is that in which the Y-variable represents the discrepancy between the change in the constituency and the change in the nation as a whole – in other words the form originally presented as equation (4).[13]

RESULTS

Table 2 summarizes the performances of models (4), (5) and (6). It will be seen that 41 per cent of the discrepancies experienced by constituencies affected by by-elections are explained directly by the shift experienced at the by-election. However, some of that shift reflected the national shift in opinion at the time of the by-election, which is of a transient nature. When this is accounted for by using equation (5), a further 13 per cent of the variation has been explained.

TABLE 2 *The Parameter Estimates and Predictive Ability of Three Variants of the Regression Model*

Equation	Explanatory variable	Estimated slope ($\hat{a}$)	95% confidence interval	R^2 (%)
(4)	Change at by-election	0.31	(0.25, 0.37)	41
(5)	Discrepancy at by-election	0.51	(0.43, 0.59)	54
(6)	Above, adjusted for turnout	0.65	(0.56, 0.74)	57

TABLE 3 *The Dependence of the Fit of the Model (Measured Using R^2) on the Month Chosen to Provide Gallup Information Concerning the State of the Parties at the Time of the First General Election*

	Months prior to election						Months after election				
	−12	−6	−3	−2	−1	0	1	2	3	6	12
R^2 (%)	51	52	56	52	45	51	57	54	56	49	42

By comparison, the extra explanation resulting from allowing for differential turnout rates, using equation (6), is very small. The appreciable change in the estimate of a between equations (5) and (6) is a result of the turnout in by-elections being on average

[13] With this definition for Y, the basic unexplained variation is simply $V = \Sigma Y^2$, where the sum is over all parties and all constituencies. The variation explained by the model is $M = \Sigma(Y - \hat{Y})^2$, where $\hat{Y} = \hat{a}X$, and $\hat{a}$ is the estimated value of a. The ratio M/V is essentially equal to R^2, the coefficient of determination, since it measures the percentage of variation explained by the model.

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about 80 per cent of that in general elections. Table 2 also provides a 95 per cent confidence interval for a, so that an idea may be gained of the precision of the estimated value.[14]

Table 3 reveals the dependence of the fit of model (6) on the correct definition of $\mathbf{G_1}$. If the Gallup data for three months in advance of the election, or from one to three months after the election, is used, then there is little difference in the fit of the model. If data more distant from the time of the election is used, then, unsurprisingly, the fit worsens. However, if the Gallup data from the period immediately prior to the election is used, then the fit is appreciably poorer. This shows clearly the difference in people's responses to a question about a hypothetical election and a question about a real election.[15] The optimal choice is clearly the poll for the month after the general election, as suggested in the formulation of the model.

Since equation (6) takes no account of the time at which a by-election occurs, it effectively proposes that the outcome of the subsequent general election is independent of the time-lag between the two elections. One might expect one or both of a and R^2 to be affected by the size of the time lag, but the results given in Table 4 suggest that this is not the case.

TABLE 4 *The Influence of the Time Elapsing Between a By-election and the Subsequent General Election on the Slope Parameter and the Fit of the Model for By-elections Resulting in No Change of Control of the Seat*

Time elapsed	Number of cases	Estimated slope ($\hat{a}$)	95% confidence interval	R^2 (%)
Up to 12 months	36	0.45	(0.24, 0.66)	36
Between 13 and 30 months	48	0.58	(0.31, 0.85)	29
More than 30 months	35	0.49	(0.31, 0.67)	46

Anticipating a later finding that the outcome of a by-election can have a bearing on the value of a, Table 4 confines attention to the 119 by-elections that did not result in a change in control. It can be seen that the three a-values are all comparable, with similar confidence intervals and no clear pattern to the R^2 values. In interpreting this

[14] For models of the form $Y = aX$, the confidence interval takes the form $\hat{a}[1 \pm \{1 - r^2)/(n-1)R^2\}^{1/2}]$, where t is the appropriate significance point of a t distribution having $(n-1)$ degrees of freedom. The interval therefore widens with increasing $\hat{a}$ and narrows with increasing R^2 or n.

[15] This period clearly corresponds to the 'homing period' described by S. J. Taylor and C. Payne, 'Features of Electoral Behaviour and By-elections', in C. Cook and J. Ramsden, eds, *By-Elections in British Politics* (London: Macmillan, 1973). See also Stray and Silver, 'Government Popularity, By-elections and Cycles'.

finding, it should be recalled the that X and Y values are measuring *departures* from the national trend, not the trend itself.

IMPROVEMENTS ON THE BASIC MODEL

The previous section was concerned with presenting a numerical justification of the form chosen for the basic model, given by equation (6). In this section we consider a number of refinements.

Throughout the last three decades there have been marked regional deviations from the national change.[16] It can therefore be anticipated that, in the left-hand side of equation (6), replacement of the term $(\mathbf{N}_2 - \mathbf{N}_1)$ by the term $(\mathbf{R}_2 - \mathbf{R}_1)$, where $\mathbf{R}$ denotes a vector of regional values, will lead to some improvement in the fit of the model. In practice, the improvement in fit is rather small, with R^2 rising from 57 per cent to 58 per cent. Most of the improvement in fit occurs with the more recent by-elections. One reason that a greater improvement in fit does not occur is because a similar correction cannot be applied to the Gallup values, which are not easily available on a regional basis.

A second adjustment, which proves to be of greater significance, results from taking account of the observation that a by-election has more influence if it changes the tactical situation. This suggests the model

$$(\mathbf{P}_2 - \mathbf{P}_1) - (\mathbf{R}_2 - \mathbf{R}_1) = \alpha_i(T_b/T_2)\{(\mathbf{P}_b - \mathbf{P}_1) - (\mathbf{G}_b - \mathbf{G}_1)\}, \qquad (7)$$

where $i = 1$ if the seat is retained by the incumbent party, and $i = 2$ if the by-election results in a loss of the seat for the incumbent party.

Table 5 shows that the use of different α-values results in an appreciable improvement in the fit. Equation (7) accounts for 62 per cent of the overall variation, as opposed to the 58 per cent of the regional version of equation (6). The improvement is a consequence of the very different sizes of the two α-values; the α-value corresponding to a change in party is about 60 per cent larger than that for a by-election in which no change occurs. It is noticeable that the R^2 value for the seats that change hands is appreciably larger than that for the other seats, indicating that the model is a much better predictor in these cases. The summary figures for the complete set of 144 by-elections suggest that, in the case of no change, the by-election vote and the previous general election vote are of comparable importance, whereas, in the case of a change of party, the by-election vote is roughly four times as important as the previous general election vote.[17]

Table 5 also presents a subdivision of the constituencies into three separate groups. The separate values for the two groups of three-party constituencies are in good agreement with each other, and the proposition of constant α-values over these two groups and the group of two-party seats appears plausible.[18]

It should also be noted that the R^2 values for the forty-four by-elections held during the period in which the Liberal/Alliance party was a genuine national force, contesting

[16] Curtice and Steed, 'Analysis', Table 3.

[17] Incorporating a third α-parameter, for three-party constituencies in which the second and third places were exchanged at the by-election, results in only a marginal improvement in the overall R^2, to 63 per cent.

[18] Fitting three separated α-values instead of one single value improves the fit by an insignificant 0.2 per cent.

TABLE 5 *The Influence of a Change in Party Control on the Predictive Ability and the Slope Parameters of the proposed Two-parameter Model*

By-election result	Number of cases	Estimated slope ($\hat{a}$)	95% confidence interval	R^2 (%)	Overall R^2 (%)
All by-elections					
Change in control	25	0.80	(0.64, 0.96)	81	62
No change	119	0.52	(0.39, 0.61)	41	
Two-party seats					
Change in control	2	0.73		51	21
No change	48	0.39	(0.17, 0.61)	21	
Three-party seats before October 1974					
Change in control	10	0.78	(0.47, 1.09)	78	56
No change	40	0.58	(0.27, 0.89)	27	
Three-party seats after October 1974					
Change in control	13	0.82	(0.59, 1.05)	84	73
No change	31	0.49	(0.32, 0.66)	53	

TABLE 6 *Does the Size of the By-election Change have a bearing on the Fit of the proposed Model? An Examination of the Twenty-Three By-elections in the Period 1974–87 that Resulted in a Change of Control*

Largest change	Number of cases	Estimated slope ($\hat{a}$)	95% confidence interval	R^2 (%)
Less than 21%	13	0.88	(0.42, 1.34)	59
More than 21%	10	0.79	(0.58, 1.00)	89

all the English seats, are noticeably greater than the other R^2 values. This may be attributed to the consequent improved reliability of the Gallup figures.[19]

It might be argued that the enhanced impact of by-elections that experienced a change in the party of the incumbent was due to the magnitude of the increase in vote that

[19] The problem in the earlier period may well be that some would-be Liberal supporters will be unsure how to answer the standard Gallup question, because the idea of a Liberal candidate standing in their constituency is itself a fiction.

brought about that change rather than to the change itself. To investigate this idea, Table 6 presents a breakdown of by-elections by type and by the magnitude of the largest change, $\text{Max}\{C_b - C_1\}$, experienced by any of the competing parties in that constituency. The results suggest that the size of the change has little effect on the value of α, but that larger changes lead to a more predictable result in the subsequent general election.

CONCLUSIONS

Mughan has attempted to model the outcome of by-elections in terms of the effects of turnout, political attitudes and economic indicators.[20] None of these work very well, although Mughan concluded that public opinion had the strongest influence. The 'carefree' nature of the voting at by-elections is clearly manifest in the huge changes in vote that occasionally result. A prime example is the February 1983 result for Bermondsey (not included in the analysis because of a subsequent boundary change), in which the Liberal vote increased by 51 per cent, nearly triple the national rise in popularity for the third party at that point in time.

Butler has remarked that 'in by-elections the variation is appreciably greater [than in general elections] ... voters are more affected by special factors such as a local grievance or by the personality of the candidate' and that 'by-elections encourage the citizen to try his luck and vote for the other side'.[21] Butler inferred that by-elections would be a rather poor indicator of the result at the following general election because of this 'carefree' attitude and this led to his comment about predictability that was quoted at the outset of this Note.

We have seen, however, that a degree of prediction is possible, particularly if the by-election was sufficiently spectacular as to lead to the loss of the seat by the incumbent party. Under these circumstances, after discounting that part of the by-election change due to national factors, it can be expected that four-fifths of the remaining change will be manifest at the next general election. This fraction drops to one-half in the case of by-elections that do not result in the loss of a seat. These fractions are independent of the size of the change that takes place at the by-election and they are independent of the date of the by-election.

The implication of these findings for the political parties is that *all* by-elections have an effect that is far more enduring than may have been realized hitherto. A poor result cannot be dismissed as a transient phenomenon, since it will almost surely lead to a relatively poor result in that constituency at the following general election. Parties need to try their utmost to obtain a good result, *relative to the current national political trend.* Since by-elections occur singly, or a few at a time, parties should be able to devote more of their machinery to each by-election than would be the case in a national election. In addition to the consequences for that particular constituency, it is also the case that a good by-election result may promote a national trend.[22]

[20] A. Mughan, 'On the By-election Vote of Governments in Britain', *Legislative Studies Quarterly*, 13 (1988), 29–48.

[21] Butler, 'Introduction'.

[22] P. Norris and F. Feigert, 'Government and Third-party Performance in Mid-term By-elections: The Canadian, British and Australian Experience', *Electoral Studies*, 8 (1989), 117–30, p. 117.

This Note has shown that when a by-election produces a result that is out of line with the current national trend, then this deviation is reflected in the result at the following general election. I am grateful to a referee for the observation that similarly enduring effects may arise from atypical local or Euro-elections.

Constituency Service and Incumbency Advantage

GARY KING*

I INTRODUCTION

Numerous scholars have documented a dramatic increase in incumbency advantage in US congressional elections and also state legislative elections over the past four decades.[1] For example, Gelman and King show that incumbents in the House of Representatives now receive about twelve extra percentage points solely as a result of holding congressional office during the campaign;[2] the comparable figure for most of the first half of this century was only 2 per cent. This advantage of incumbency has made members of the US House and many state legislators nearly invulnerable to electoral defeat.

Many agree that incumbents' use of constituency service explains their widening lead over challengers. The perquisites of legislative office include the franking privilege, money for travel to the constituency, staff support and other benefits that enable members of congress to provide many services to, and answer many specific requests of,

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[1] Robert S. Erikson, 'The Advantage of Incumbency in Congressional Elections', *Polity*, 3 (1971), 395–405; Robert S. Erikson, 'Malapportionment, Gerrymandering, and Party Fortunes in Congressional Elections', *American Political Science Review*, 66 (1972), 1234–55; Albert D. Cover and David R. Mayhew, 'Congressional Dynamics and the Decline of Competitive Congressional Elections', in Lawrence C. Dodd and Bruce I. Oppenheimer, eds, *Congress Reconsidered* (New York: Praeger, 1977), pp. 54–72; Richard Born, 'Generational Replacement and the Growth of Incumbent Reelection in the US House', *American Political Science Review*, 73 (1979), 811–17; James L. Payne, 'The Personal Electoral Advantage of House Incumbents', *American Politics Quarterly*, 8 (1980), 375–98; John R. Alford and David W. Brady, 'Partisan and Incumbent Advantage in US House Elections 1846–1986', (Houston, Tex.: Center for the Study of Institution and Values, Rice University, 1988); John R. Alford and John R. Hibbing, 'Increased Incumbency Advantage in the House', *Journal of Politics*, 43 (1981), 1042–61; James C. Garand and Donald A. Gross, 'Change in the Vote Margins for Congressional Candidates: A Specification of the Historical Trends', *American Political Science Review*, 78 (1984), 17–30; John A. Ferejohn, 'On the Decline of Competition in Congressional Elections', *American Political Science Review*, 28 (1977), 127–46; Candice Nelson, 'The Effects of Incumbency on Voting in Congressional Elections', *Political Science Quarterly*, 93 (1978–79), 665–78; Thomas E. Mann and Raymond E. Wolfinger, 'Candidates and Parties in Congressional Elections', *American Political Science Review*, 74 (1980), 617–32; Keith Krehbiel and John R. Wright, 'The Incumbency Effect in Congressional Elections: A Test of Two Explanations', *American Journal of Political Science*, 27 (1983), 140–57; Bruce Cain, John Ferejohn and Morris Fiorina, *The Personal Vote: Constituency Service and Electoral Independence* (Cambridge, Mass.: Harvard University Press, 1987).

[2] Andrew Gelman and Gary King, 'Estimating Incumbency Advantage Without Bias', *American Journal of Political Science*, in press.