The Components of Elections: District-Time Effects, District Heterogeneity, and Volatility

SCOTT MORGENSTERN

Assistant Professor of Political Science
Duke University

RICHARD F. POTTHOFF

Senior Research Scientist
Department of Political Science
Duke University

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To what extent do legislative elections turn on national issues, rather than constituency service, candidate qualities, and the provision of pork? This question has been a central concern in both the comparative and the American politics literature, as it drives our understanding of the links between citizens and their representatives. It also has important normative implications. Writing for the American Political Science Association's Committee on Political Parties (1950), Schattschneider emphasized the benefits of a system in which the political parties take a leading role in debating and ultimately defining national issues. Schattschneider contrasted "responsible" party systems with that of the United States, where legislators are relatively independent of their political parties and are protected from national swings in the vote. As a result, national issues are of less consequence in legislative elections than are the candidate's abilities to bring resources to the district, solve minor constituent demands, and run a successful campaign. He argued the implications for national welfare were decidedly negative.

The comparative literature has taken a similar stand, contrasting the quality of political representation and the prospects for development in pork-ridden systems such as Italy, Colombia, and Brazil with more nationally centered party systems (Mainwaring, 1999; Cain, Ferejohn and Fiorina, 1987; Geddes, 1991; Shugart and Carey, 1992; Haggard and Kaufman, 1995). This work has helped to establish the conventional wisdom about the difference between politics and elections in the United States and the United Kingdom, as well as provoking a growing body of literature about the problems of political accountability in the less industrialized regions of the world. It has also been very influential in defining the incentives of legislators in pursuing a "personal vote" (Carey and Shugart, 1995).

The substantive and methodological issues raised by Schattschneider and his followers (see especially Stokes, 1965, 1967) are closely related to two other sets of literature. First, Rose and Urwin (1970), Bartolini and Mair (1990), Coppedge (1998), Mainwaring and Scully (1995), and Roberts and

Wibbels (1999) have argued about the causes and effects of electoral "volatility". An important purpose of Bartolini and Mair's work is to counter the work about the growing instability in European elections, an issue with direct consequences for accountability and representation in the short run and democratic consolidation in the long run. While other factors can cause electoral volatility, these authors explain that it has frequently been associated with a decline of longstanding cleavage structures, which "encapsulate" and constrain political conflicts. It is also related to questions about the national consensus, the homogeneity of political culture, and the institutionalization of democracy generally. Roberts and Wibbels focus on Latin America, arguing that "electoral volatility is a function of short-term economic perturbations, the institutional fragilities of both democratic regimes and party systems, and relatively fluid cleavage structures" (p. 575).

The second body of related work has focused on the "nationalization" of elections, a term that applies to two different concepts. First, Stokes (1967), Katz (1973), and Claggett, Flanigan, and Zingale (CFZ; 1983) have used it to discuss the degree to which a party's electoral support responds uniformly to national events or issues. This concept is thus related to Schattschneider's concerns. More recently Caramani and Mainwaring/Jones have used this term to apply to parties that have relatively homogeneous electoral support across districts. Caramani argues that the degree to which support is homogenous is related to the "territoriality of political cleavages" (p. 67), and has important ramifications for the "standardization" of government processes, military socialization, social welfare, and economic policies (p. 68). In a manner not dissimilar from Schattschneider and Stokes, he argues further that as nationalization increases, "local candidates…lose their character of representing the local community. Rather they become the representatives of the national centre of the political organization" (p. 68). This, he continues, leads the voters to shift their attention from local to national issues. As a consequence of its effects on policy and the political process, Mainwaring and Jones add that nationalization has implications for the survival of democracy.

In spite of clearly separable meanings of the terms "nationalization", "district effects", and "volatility", a debate has continued as to the appropriate definition, interpretation, and measurement of each concept. This paper, in response, offers definitions of the concepts with more precise theoretical and statistical meanings and develops a methodology to analyze the concepts simultaneously. In so doing we are able to separate the concepts -which we name *district heterogeneity, the district-time effect, and electoral volatility*- and explain the theoretical and empirical relationships among them. Our main conclusion is that there is no theoretical basis for conflating these terms, and empirically the relations are very weak.

The statistical methodology that we draw upon is based on Stokes' original model. In two landmark studies Stokes (1965, 1967) analyzed U.S. and U.K. district level electoral results through a components of variance model. Our version of that model -which we apply to 20 countries in Europe and the Americas- allows us to parse the data and study district heterogeneity, district-time effect, and electoral volatility as independent aspects of electoral competition. We argue that without such parsing there is a danger of biased results resulting from a conflation of issues. We draw on Stokes' model as it allows us to distinguish and explore the interrelationship among these three issues. We argue, however, that his and other similar models all have important flaws, the interpretation of the effects is imprecise, and they require some reorientation for application to comparative work.

In this paper we focus the majority of our attention on developing the statistical model for studying the different components of elections. We do, however, also reach several theoretical and empirical conclusions. Our primary theoretical conclusion is that, despite their presumed ties in the literature, there are neither statistical nor theoretical links between the district-time effect and district heterogeneity, and neither is linked with volatility either. The three concepts are, instead, three separable characteristics of parties. But, because they all relate to electoral data, statistical studies that focus on just one or two of the concepts run the danger of generating biased results. At the empirical level, this paper focuses on the US-UK comparison, using

the results from 18 other countries to test the theoretical proposition about the relationships among the different components and put the results regarding the United States and Great Britain into a wider perspective. This allows us to argue that these two Anglo countries are more similar than different. We show, in particular, although the conjunction of traits is not unique, the parties in these two countries are among the very few that combine very heterogeneous support across their nations, relatively stability over time, and a significant role of local forces in their elections. At the same time, we find that in recent decades the parties in the United States and Great Britain have separated on the last of these traits (what Stokes called the "district effect"), as the effect has grown considerably in Britain's former colony. This is a noteworthy change given that Schattschneider and Stokes were very concerned about the relatively small differences in the 1950s.

In order to put forth this argument, we first develop an example that allows us to clearly define the effects that we are measuring. We then discuss some of the problems with recent attempts to address these issues. Next, we develop our components of variance model which we apply first to the US-UK comparison and then to a broad set of cases across Europe and Latin America. We use the empirical section to categorize 63 parties according to the three traits and buttress our claim that the different aspects of representation are not highly correlated. The concluding section summarizes the findings and suggests directions for future research by noting a few of the comparative patterns and discussing issues related to defining a model for explaining these patterns.

DEFINITIONS AND PREVIOUS ANALYSES

The following example illustrates our definitions for district heterogeneity the district-time effect and electoral volatility. The example assumes two hypothetical countries, A and B each with three equally sized districts D1, D2 and D3. For both countries party P1 is assumed to have won 59 percent in D1, 53 percent in D2 and 47 percent in D3 for the first year, Y1. This

represents relatively consistent support across districts, or a relatively low *district heterogeneity*. In second electoral year, Y2, the overall average support for party P1 dropped by 10 points in both countries, representing at least a moderate level of *volatility*. The distribution of that loss, however, varied in the two countries. Country A's party P1 lost exactly 10 percent in each district, while in country B the 10 point total loss between the two years is not distributed equally among the districts. The perfect consistency of the electorate's movements across districts and over time would therefore yield a *district-time effect* equal to zero in country A and considerably higher in country B.

Volatility, in sum, is a measure of the degree to which a party's average vote is stable across different electoral time periods. It should be high in countries where successful new parties form or the electorate easily shifts among parties. We apply the term district heterogeneity to conjure an image of the degree to which a party wins consistent support across districts. It should be relatively high for the U.S. parties, since their support varies greatly between rural Kansas and metropolitan New York. Finally, the district-time effect addresses the localism issue that concerned Schattschneider and Stokes. Having once accounted for movement over time and across districts, what is left are the idiosyncratic qualities and characteristics of candidates and districts. Stokes interpreted this as a measure of the importance of the idiosyncracies to the election, apart from national events. As we discuss in more detail below, Katz and others have argued that these idiosyncracies may also yield systematic (but not uniform) responses of the districts to national events. Regardless of this interpretive distinction, the district-time effect captures the degree to which variance in electoral returns is accounted for by characteristics particular to districts (or candidates) at a particular time.

Table 1
Examples: Support for Party P1

	Country A			Country B		
District	Y1	Y2	Avg	Y1	Y2	Avg
D1	59	49	54	59	43	51
D2	53	43	48	53	49	51
D3	47	37	42	47	37	42
avg	53	43	48	53	43	48

Though under different guises the concepts represented by district heterogeneity, the district time effect, and electoral volatility have been at the core of studies on electoral politics and representation, they have not been clearly tied together either substantively or methodologically. Instead, comparativists have generally addressed single dimensions of the problem. For example, Caramani's historical study of Europe and Mainwaring and Jones' interesting study of the "nationalization of parties and party systems" in Latin America only address the homogeneity of support across districts[1]. These are both important works that offer compelling findings and useful methodological innovations. The above example, however, well illustrates the problems with their unidimensional approach.

In the first of these studies, Caramani uses the coefficient (or index) of variation[2] to consider the spread of electoral returns to each party in each district. If the returns are relatively consistent, then the party is considered nationalized. He finds important variation across the countries of Europe, but his main finding is increased homogenization of districts over time. For both countries in Table 1, the standard deviation for party P1 in both years is 6, and thus for both countries he would calculate a coefficient of 6/53 in Y1 and 6/43 for Y2, numbers that would indicate relatively high levels of nationalization. His measure, however, would miss the perfectly parallel movement of the districts in country A and a lack of such parallelism in country B.

It is important to note that Caramani calculated his statistics without regard to whether a party competed in all districts. This may be defensible since part of his interest was to show increasing levels of coverage for the parties and in most of Europe the proportional representation systems

encourage parties to compete in most districts. But, the model will not return reasonable results for the United States, Great Britain, or other countries where major parties fail to compete in all districts as a result of the use single-member districts and incumbency advantages. In our analysis of the single-member district countries, therefore, we exclude districts where either of the two parties did not receive at least 2.5 percent of the vote in each election years[3].

Mainwaring and Jones have a similar goal in their tests for Latin America. Instead of the coefficient of variation, they argue that the Gini coefficient provides a better measure of inter-district homogeneity. Like the coefficient of variation, the Gini coefficient yields a scaled statistic that is useful in comparing results among countries or over time for a single country. They then use this method to show which parties in which countries have had more success in developing consistent support levels.

While they do provide interesting comparisons, the works by Caramani and Mainwaring/Jones, in focusing solely on homogeneity of districts, have important limitations. First, the measures are flawed, in that they effectively conflate the issues of district heterogeneity and district-time, even though seemingly they purport to assess only district heterogeneity. Second, while it is useful to have a statistic that points to the different levels of Democratic support in Massachusetts and Utah, it is also interesting to know whether a scandal or its inverse in Washington produces consistent changes in the Democratic votes in the two states. It is also important to capture the degree to which the Democrats retain relatively consistent support across time. In the terms of country A in the above example, the Caramani and Mainwaring/Jones approaches would capture the important static differences between districts D1, D2 and D3, but not the relatively volatile average support for the party across time nor the remarkable dynamic consistency in the movements across time for the P1 party. Along these same lines, offsetting district support levels would go undetected in these homogeneity studies. That is with either of the two approaches, if P1's vote totals for D1 and D2 were interchanged for any year as shown in the comparison of the countries A and B, the statistics

for homogeneity across districts would not detect the difference (i.e. they would yield identical results in both examples)[4].

A straightforward way to capture the dynamic element would be to compare the swing -the change in the electoral returns for a party across two elections- for each district. The standard deviation of the district-level swing would give a sense of the degree to which districts move together. If all districts gained or lost a similar proportion of the vote across two elections, then the standard deviation would be small. This would indicate that national events have a similar impact across districts -or in the sense of the word suggested by Stokes, that the election is "nationalized[5]". In the above example, for country A party P1 had a swing of -10 points between year Y1 and Y2 in all districts and thus the standard deviation of the swing was zero. Of course, a model looking solely at this indicator would suffer from the same incompleteness as the studies on district homogeneity.

It is important to note that this notion of nationalization is not uniformly accepted. As Katz and more recently Brady et. al. have argued, different sets of the population should be expected to respond differently to issues. New gun control legislation, for example, might harm the Democrats in the South, but help them in the North. These authors, therefore, argue for measures of non-uniform responses to national phenomena.

While this is a cogent argument, in a rejoinder to Katz, Stokes argues that he tested for non-uniform responses and found them to be negligible.[6] He argues further that uniform responses are an interesting phenomenon that inform analyses of congressional behavior. Claggett, Flanigan, and Zingale concur, as the consistent responses indicate the degree to which "the distinctive regional political cultures and traditions are being replaced by a more similar mixture of political sentiments across the nation" (p. 80). Further, they argue, while Katz's singular interest in distinguishing between national and local stimuli leads him to "lump uniform and nonuiniform responses together" (p. 83), Stokes' model -which we discuss in detail below- does separate out the uniform effect. These authors also quibble with Stokes, arguing that his measure of the "district effect" may contain elements of non-

uniform responses to national events as well as the impact of candidates and local effects. We concur with their interpretation and their general approach, but we are concerned about important errors in the published formulas and apparently faulty techniques in estimating the components of variance[7].

Brady et al. (2000) are also interested in non-uniform responses, and argue for a regression model of nationalization that includes as predictors the vote for the president (which is supposedly national) and that for the member of Congress in the district. Their measurement, however, still conflates district heterogeneity with the district-time effect. Further, their measure may still fail to capture the differential effect that some policies would have in different districts. If the president became identified with a policy (such as gun control) that drove support in different directions, then the coefficient on the vote for the president in the previous election could be near zero, since the regression (roughly) computes the average effect. Aside from these issues, the Brady et al. model is not applicable to countries that, unlike the United States, do not employ mid-term elections. As such, their model is incapable of addressing comparative issues.

The last issue in these debates is the degree to which parties retain consistent support across time. This has been an important issue in Latin America, where some parties have risen and fallen in dramatic fashion. It also generated much concern in Europe, where there was a perceived increase in volatility since the 1970s that many associated with the breakdown of traditional cleavage systems (as first defined by Lipset and Rokkan 1967).

While the debate about causes and consequences and even the interpretation of data[8] rages, the statistical techniques used to measure volatility have not generated much controversy9. Most studies have settled on the Pedersen index, which as Mainwaring and Scully explain, is calculated: "by adding the net change in percentage of seats (or votes) gained or lost by each party from one election to the next, then dividing by two. An index of 15, for example, means that some parties experienced an aggregate gain of 15 percent of the seats from one election to the next while others lost a total of 15 percent" (p. 6).

As with the studies of district homogeneity or inter-election swings, volatility is a useful and interesting concept, but its unidimensionality calls into question its statistical utility.

In response to all of these measurement and interpretive problems, we propose returning to the method first proposed by Stokes. His approach was to study district-level electoral returns through a components of variance model that broke down the electoral changes into what he referred to as district, state (or regional), and national components. In contrast to the recent studies, his basic approach can capture both the static and dynamic aspects of electoral change. In particular, as we explain below in detail, our modified version of his model captures, in terms of country A, the perfect parallel of cross-time movement among districts, the important inter-district heterogeneity, and the relative level of over-time consistency of party P1's aggregate electoral returns.

While we favor the Stokes approach for its ability to account for the multi-dimensional variance in electoral support, the specific model he uses requires two important adjustments. First, we argue that his model has one crucial flaw, regarding the assumption of fixed effects for the district and state elements. Second, for comparative work, the model requires an adjustment since unlike the United States, most countries have two geographic levels as opposed to three[10]. As a result, while Stokes' model allows for elections that vary at three levels -district, state, and national- our comparative model only assumes two levels: district (which is equivalent to a province or state in most countries) and what he called national[11]. We argue further that the national component should be reinterpreted. As we explain below, while that component does capture the uniform responses that Stokes and others discussed when expressed as a percentage of the total variance in the system, as a raw figure it signals the level of change in a party's overall support. As such, it is an indicator of electoral volatility.

THE STOKES COMPONENTS OF VARIANCE MODEL

In order to explain the problem with the fixed effect assumption and describe our alternative model, we first transform the Stokes model from three geographic levels to two. In addition to the national level, his model provides for districts, subscripted by *j*, within states, subscripted by *i*. By simply suppressing the j index and combining terms we are left with a model that has only two geographic levels. The two-level analogue of his model then becomes:

Model A*:

$$y_{ik} = \mu + A_k + \beta_i + C_{ik} \qquad (i = 1,4 \ ,I; \ k = 1,4 \ ,K).$$

Here, y_{ik} is the percentage of the total vote (received by the political party under consideration) in the election in district *i* at time *k*; *K* is the number of elections, or years, covered by the analysis; *I* is the number of districts; A_k is a nationwide random effect for time *k*, assumed to have mean 0 and (unknown) variance $_4$; βi is a fixed effect (covering all years) for district *i*, providing for district heterogeneity; C_{ik} is a residual effect, or random interaction effect, for district *i* and time *k*, assumed to have mean 0 and variance σ^2; and μ is a fixed effect representing the overall unweighted mean of the party's vote percentages across all districts and elections. As in the models that follow, Greek letters imply fixed effects and Latin letters imply random effects12. The letter name of the model refers to which effects are random. The asterisk refers to the inclusion, as opposed to absence, of a fixed effect for the other component (e.g. A* implies a random effect for A and the inclusion of a fixed effect for B).

The substantive interpretation, and hence the labeling, of these components is critical. Stokes labeled the variance component attributed to A_k (σ_A^2) the national component, arguing that it captures the average or national movement of a party. This is an imprecise interpretation, however. In the example above, the σ_A^2 would capture the 10 point aggregate change for

the party, not the degree of uniformity of response in the districts (which is captured in the residual). The interpretation given by Stokes is only justified by considering σ_A^2 as a percentage of total variance, since it would then reflect the importance of the aggregate or national change in terms of other factors. As a raw number, however, it indicates the magnitude of a party's change in support, and is thus better interpreted as a measure of volatility.

Stokes' focus on the proportion of the total variance explained by σ_A^2 is explained by his focus on the United States and the United Kingdom. The raw numbers, however provide useful information for comparisons among countries where volatility has been an important issue. For country B, the model would (in rough terms) attribute the 10 point aggregate swing to σ_A^2 and use the differences in each district from that average (-6, +6, and 0) to estimate the residual component[13]. A focus on percentages alone would miss the magnitude of that change. If, for example, there were a 20 point average change with residuals also twice as large (i.e. if σ_A and σ both doubled) the ratio of σ_A^2 to the total variance -and hence the figure for the "national effect- would remain the same. The magnitude of σ_A^2, however, would be much larger, correctly capturing the idea of greater volatility. As a result, we label σ_A^2 our "time" or "volatility" component as its magnitude captures the variance of the party over time (albeit at the national level).

As the βi in the model captures the variation in a party's average returns across districts it is a measure of "district heterogeneity". We generally agree with this interpretation, but we argue below for a variation in how to model this concept.

Stokes reasoned that by accounting for the effects due to time (national), state, and district he would be left with changes that could be attributed to the qualities of candidates or the idiosyncratic characteristics of districts. He thus interpreted the residual -C_{ik} in our model- as a measure

of the "district effect". This term is also somewhat imprecise, however, since the residual has both a time and a district subscript. In other words, the residual captures the idiosyncratic movement of districts and time that are unaccounted for by district heterogeneity or national level volatility. Following Stokes and CFZ, this should be interpreted, therefore, as capturing both non-uniform responses to national policy, as well as the importance of candidate characteristics and district peculiarities to the election. This leads us to adopt the phrase "district-time effect".

The estimates of the variance components for model A* are

$$\hat{\sigma}_A^2 = \frac{M_A - M_R}{I} \text{ and}$$

$$\hat{\sigma}^2 = M_R .$$

M_A , the mean square due to time, is calculated as:

$$M_A = \frac{S_A^2}{K-1} \text{ where}$$

$$S_A^2 = I\sum_{k=1}^{K}(y_{.k} - y_{..})^2$$

Following Stokes' notation, the dot subscript indicates the average over the replaced index. S_A^2 is the sum of squares due to the time effect. The mean square of the residual, M_R or $\hat{\sigma}^2$, is defined by:

$$\hat{\sigma}^2 = M_R = \frac{S_R^2}{(K-1)(I-1)}$$

Finally, the residual sum of squares is:

$$S_R^2 = \sum_{i=1}^{I}\sum_{k=1}^{K}(y_{ik} - y_{i.} - y_{.k} + y_{..})^2$$

Since βi is a fixed effect, Model A* has just two variance components,

σ_A^2 and σ^2, but not one that pertains to variability among districts. This seems to us an inappropriate assumption.

The decision to apply random or fixed effects is not always clear-cut. According to Jackson and Brashers (1994), random factors should be applied if the factors can be treated as if they were chosen at random from a population, if the sample could be replaced by another sample without changing the research question, or if the conclusions can be generalized to other levels of the variable (p. 5-6). In this case, while our districts are exhaustive for a particular year, they are simply the observed sample of all district years. Further, we could hypothetically redraw the district boundaries and rerun our analysis without changing our research questions.

Still another conception of this issue is to consider the districts (or the times, for that matter) as being drawn randomly from a superpopulation (Deming and Stephan, 1941). The superpopulation of districts would be the hypothetical infinite set of districts from which the actual districts could have been drawn.

Thus, it seems clear that district heterogeneity should be treated as emanating from a random effect. The consequence of treating random (in this case district heterogeneity) effects as fixed is that an important source of variation is simply left out of the analysis. All the variation is thus attributed to the time (national) and residual components. As a result, by making the inappropriate assumption that the effects for district heterogeneity are fixed, the utility of the results is dubious.

Stokes apparently reasoned that any effect involving time should be treated as random, but that any effect involving only geography should be treated as fixed on the grounds that the population of a district (or state) is given. Our alternative formulation postulates random rather than fixed variation with respect to district heterogeneity.

Our solution to this problem is to simply replace the βi with a B_i, where B_i is a random effect (covering all years) for district *i*, assumed to have

mean 0 and variance σ_B^2. We therefore apply the model:

Model AB: $y_{ik} = \mu + A_k + B_i + C_{ik}$

In this model A_k and C_{ik} have the same expectations and variances as in model A*, and also σ_A^2 and σ^2 are estimated the same as before. We now require, however, expressions to estimate σ_B^2, M_B, and S_B^2, respectively the mean square and the sum of squares reflecting district heterogeneity, are calculated as:

$$M_B = \frac{S_B^2}{I-1} \text{ and}$$

$$S_B^2 = K\sum_{i=1}^{I}(y_{i.} - y_{..})^2$$

Under model AB, the statistic

$$\hat{\sigma}_B^2 = \frac{M_B - M_R}{K}$$

is used to estimate (and has the expected value of) σ_B^2. Under Model A*, however,

$\frac{M_B - M_R}{K}$ does not estimate σ_B^2 –because the model has no σ_B^2.

Instead, this statistic has expectation $\sum_i \frac{(\beta_i - \beta.)^2}{(I-1)}$, where $\beta.$ is the mean of the *I* βi's.

Though Model AB is our preferred model, it is important to discuss another variant, proposed by Kawato (1987). Kawato uses a different form of a components of variance model to reexamine Stokes' findings about the increasing role of national forces in U.S. elections. His model, however, makes what we consider to be some untenable assumptions that result in the

exclusion of certain sources of variation. He assumes a nested model of districts within states and states within the nation[14]. To explain, we first modify Kawato's model as we did with the Stokes model to account for just two geographic levels (district and nation) instead of three (district, state, and nation). The two-level analogue of Kawato's model is

Model A: $y_{ik} = \mu + A_k + C_{ik}$.

Because Model A is a nested model of districts within the nation, it has the same type of flaw as the corresponding three-level model. It is, however, a simpler model and therefore easier to present. Because of its nested nature, Model A has neither a random effect (B_i in Model AB) nor a fixed effect (βi in Model A*) to take account of district heterogeneity. In fact, it rests on the dubious assumption that variability among districts is nonexistent, that is, that σ_B^2 = 0 in the context of Model AB or that all βi's are the same in the context of Model A*. As a consequence, if variability among districts does exist, then the Model A estimates of both σ^2 and σ_A^2 (whose formulas are given in Table 2) will be distorted, with the former estimate being inflated and the latter too low[15].

Model AB treats time and districts symmetrically, whereas Models A* and A do not. That is, Models A* and A retain a random effect for time but not for district heterogeneity. Why, one might wonder, would it not be equally logical to apply a model that has a random effect for district heterogeneity but not for time? This query leads to the last two models that we cover,

Model B*: $y_{ik} = \mu + \alpha_k + B_i + C_{ik}$ and

Model B: $y_{ik} = \mu + B_i + C_{ik}$.

Model B* is the same as Model AB except that A_k, a random effect for time k in Model AB, has been replaced by α_k, a fixed effect for time k. Model B is like Models AB and B* except that it has neither a random nor a fixed effect for time.

Of course, we mention Models B* and B not because we advocate them, but rather to give a fuller perspective. Although models like A* and A have appeared in the literature whereas models like B* and B apparently have not, there would seem to be little more reason to treat the effects for time but not district heterogeneity as random than to treat the effects for district heterogeneity but not time as random. We prefer both to conceive of districts as being drawn randomly from a superpopulation of districts and to conceive of times as being drawn randomly from a superpopulation of times.

The Table 2 indicates the primary elements of the different models. The models are differentiated as to which effects are included and whether these effects are dealt with as fixed or random effects.

Table 2
Estimates of Variance Components /1

Model	σ_t^2 Time or Volatility	σ_s^2 District Heterogeneity	σ^2 Residual; District-Time Effect
A (Like Kawato) $y_{it} = \mu + A_t + C_{it}$	$\hat{\sigma}_t^2 = \frac{M_A - M_{AB}}{I}$	0	$\hat{\sigma}^2 = M_{AB}$
A* (Like Stokes) $y_{it} = \mu + A_t + B_i + C_{it}$	$\hat{\sigma}_t^2 = \frac{M_A - M_B}{I}$	/2	$\hat{\sigma}^2 = M_B$
B $y_{ik} = \mu + B_i + C_{ik}$	0	$\hat{\sigma}_s^2 = \frac{M_B - M_{AB}}{K}$	$\hat{\sigma}^2 = M_{AB}$
B* $y_{ik} = \mu + G_i + B_i + C_{ik}$	/2	$\hat{\sigma}_s^2 = \frac{M_B - M_E}{K}$	$\hat{\sigma}^2 = M_E$
AB (Preferred) $y_{ik} = \mu + A_i + B_i + C_{ik}$	$\hat{\sigma}_t^2 = \frac{M_A - M_E}{I}$	$\hat{\sigma}_s^2 = \frac{M_B - M_E}{K}$	$\hat{\sigma}^2 = M_E$

/1 The formulas for M_A, M_B, and M_E appeared in the text. The formulas for M_{AB} and M_{AB} are given by:

$$M_{BB} = \frac{S_{BB}^2}{K(I-1)}, \quad S_{BB}^2 = \sum_{i=1}^{I}\sum_{k=1}^{K}(y_{ik} - y_{.k})^2 \qquad M_{AB} = \frac{S_{AB}^2}{I(K-1)}, \quad S_{AB}^2 = \sum_{i=1}^{I}\sum_{k=1}^{K}(y_{ik} - y_{i.})^2$$

/2 No component of variance because effect is fixed rather than random.

There are methods to estimate variance components other than through the traditional formulas that we have used[16]. These traditional formulas are simple, are consistent with the work of Stokes (1965) and Kawato (1987), and in most cases would appear to give results that differ little if any from those of other, newer methods. Although some other methods do avoid negative

estimates of variance components, such negative estimates did not arise often in the data analyzed for the present paper.

APPLYING THE MODEL

Results for the Hypothetical Countries

In order to show the validity of the different approaches, we first return to the simple three-district example we used earlier. Under our model the estimates for the time, district heterogeneity, and residual (district-time) effects for country A are, respectively:

$\hat{\sigma}_A^2$ = 50.0, $\hat{\sigma}_B^2$ =36.0, and $\hat{\sigma}^2$ = 0.0.17

Consistent with the data, $\hat{\sigma}_A^2$ implies that there is an important degree of volatility in the party's support over time (the party having lost 10 percent of its support), $\hat{\sigma}_B^2$ implies that the party's base support levels among the districts are somewhat variable (with a 12 percent difference in support separating the two most extreme districts), and $\hat{\sigma}^2$ implies that the party's vote across the districts moves in perfect tandem (each district having lost exactly 10 points). The estimate for district heterogeneity is about average in comparison with most of the actual cases we detail below, while most actual parties sport lower values for their time components. Of course, no actual party scored a perfect zero for the district-time component, but the analysis did yield very low scores for some parties in both Latin America and Europe. The parties of the United States and Great Britain, in contrast, scored much higher.

As we noted earlier, Kawato's model generates biased results. His model ignores $\hat{\sigma}_B^2$ and for both countries A and B it would calculate $\hat{\sigma}_A^2$ = 38 and $\hat{\sigma}^2$ = 36. The associated bias yields very misleading results (as he underestimates $\hat{\sigma}_A^2$ and overestimates σ^2 for both countries). Another problem with the Kawato model (as with the Caramani and Mainwaring/Jones models) is that it yields identical results for countries A and B. In contrast, our preferred

model (AB) accurately reveals important differences between the hypothetical countries. For country B our model would yield $\hat{\sigma}_A^2$ = 44.0, $\hat{\sigma}_B^2$ =18.0, and $\hat{\sigma}^2$ = 18.0.

The measures proposed by Caramani and Mainwaring/Jones for district heterogeneity also yield misleading results. The problem with these measures is that they reflect the district heterogeneity component and the residual component combined. Note that for both countries A and B the sum of $\hat{\sigma}_B^2$ and $\hat{\sigma}^2$ is 36, the square root of which is the standard deviation of the party's vote percentages across districts in each year (equal to 6, as noted earlier) that Caramani would obtain through his analysis.

For both countries A and B, Stokes' model would yield the same values as ours for $\hat{\sigma}_A^2$ and $\hat{\sigma}^2$ but would not produce a $\hat{\sigma}_B^2$ at all.

Results for Actual Cases

To review, our model produces three components of variance. In non-technical terms, the district heterogeneity component measures the degree to which the vote share for a party is consistent across the country. Bigger values of that component therefore mean that the party's vote shares are less consistent across districts. The time component is analogous to studies of volatility, in that it measures the degree to which a party's national vote share varies across time. Larger values of this component, therefore, imply that a party's national vote share is less consistent over time. The residual component, finally, measures the degree to which the returns to a party vary across elections within a particular district, having accounted for the other effects. Here larger values imply more inconsistency in how a national level shock is distributed across districts.

To begin to understand and compare these three concepts cross-nationally, we first focus on the United States-Britain comparison. As noted, for the United States, we followed conventional practice and only used districts where both of the main parties won at least 2.5 percent support in every

election over the time period[18]. In effect, however, a cutoff point of up to 20 points yields substantially the same set of districts. For that country, we show results for the 1950s, 1970s, and 1980s, accounting for redistricting. Since there are just two parties competing, the results are the same for each. For Britain, redistricting led us to assemble three periods for the analysis: the five elections from 1955-1970, the three elections between 1974-1979, and the two elections of 1983-1987. Following Stokes' practice, we conducted the analysis on districts where either the same two parties or all three parties competed in every year of the period. In the latter two periods we were able to run the analysis on the Conservatives, Labour, and the Liberals. For the first period, while the Liberals ran in enough districts for us to calculate separate results for Labour and the Conservatives, the party did not run in enough districts for us to estimate separate results for it. Further details are in Appendix I.

In the multi-country below we present tables on both the raw estimates as well as the proportions of the variance explained by each component. Here, however, we focus on the raw values in order to draw attention to the amount of variance inherent in the system. The table below portrays the estimates for the three components of variance for the United States and the United Kingdom, showing important similarities for two components, but important differences for the district-time component, especially in the 1970s and 1980s.

The statistics under the time component heading reflect the parties' changing support levels in the three sets of elections. For Britain, the Conservatives saw important changes in their support levels between 1955 and 1979 (for example, falling about seven percent from 1959 to 1966), but between the 1983 and 1987 elections their aggregate totals were virtually unchanged. The statistics also reveal that a switch between the Conservatives and the Liberals accounted for most changes in the 1970s, as Labour's support remained quite stable. For the United States, there was greater volatility in the 1950s than in the later decades, with tremendous stability in the parties' vote totals for the 1980s. This stability is reflected in the remarkably

Table 3
Components of Variance Estimates: United Kingdom and the United States

	Time (aka Stokes national effect & analogous to volatility)	Distnct Heterogeneity (akin to studies by Caramani and Mainwaring/Jones)	District-Time (aka Stokes district effect)
United Kingdom			
1955-70 (n=235)			
Conservatives	9.2	125.2	9.1
Labour	4.6	267.4	10.3
1974-79 (n=409)			
Conservatives	18.5	105.3	5.7
Labour	3.1	190.9	5.9
Liberals	15.2	55.7	8.5
1983-87 (n=632)			
Conservatives	0.1	185.4	6.6
Labour	7.0	273.3	7.7
Liberals + SDP	4.7	56.9	9.4
United States			
1952-60 (n=289)	10.0	126.2	19.5
1974-80 (n=300)	6.8	217.2	61.9
1984-90 (n=234)	2.1	242.8	51.3

Data for the United Kingdom comes from Caramani s dataset, with corrections coming from *British Parliamentary Results*. Data for the United States is available through ICPSR. Results for the United States are mirrored for both parties. For the 1955-70 period in Britain, the Liberals did not compete in enough districts for the analysis. Their participation, however, allowed separate analyses for Labour and the Conservatives.

small change in the congressional division of seats resulting from those four elections.

Next and more dramatically, the table shows that the district heterogeneity component dominates the other components for both countries, and is similar in both absolute and relative terms for the two countries. Moreover, in comparison to the other countries that we explore below, the British and American figures stand out as among the largest. In both countries this heterogeneity -which the statistics underestimate due to the exclusion of uncontested districts- has manifested itself in the large number of safe seats for one or the other of the main parties.

To show the validity of these data, Table 4 displays statistics that correspond with Caramani's analysis of the spread of the party vote across districts. While he does not dwell on the issue, his analysis of 1918 to the present shows that the British electorate is the least homogeneous of any

European country (see his Table 3.3, p. 75)[19]. Eliminating any district in which the pattern of competition changed (e.g. the status of the Liberals changed with respect to whether or not they competed) or where either the Conservatives or Labour did not win at least 2.5 percent of the vote, the standard deviation of the Conservative vote has varied between 10 and 15 points, and has been even higher for the Labour Party. The coefficient of variation that Caramani studied has also been consistently higher since the election in 1983 than in the previous quarter century. For Labour the coefficient of variation is markedly higher than for either the British Conservatives or the U.S. Democrats. In sum, as our components of variance model suggests and this table confirms, parties in both countries experience wide differences in their support levels across districts, even when accounting for uncontested races and the occasional inclusion of third parties.

While the estimates for district heterogeneity are relatively similar for the two countries, the estimates for district-time show important differences. The figures in the last column of Table 3, as well as the columns indicating the standard deviation of the swing in Table 4, resonate with standard descriptions of the two systems, in that they imply that the electoral tides are spread much more evenly across British districts than in the United States.

Comparing the results for the district heterogeneity and the district-time effects highlights the problem with the term "nationalization". These statistics imply that while Stokes and Schattschneider were right about how national issues or events are translated more consistently across Britain than in the United States, in neither country are elections "nationalized" by the standards applied by Caramani[20].

Aside from the terminological issues, the two tables also suggest a modified view of the comparison between the United States and the United Kingdom. Stokes concluded that although the district-time effect (to use our term) for the United States had shrunk considerably throughout the first half of the 1900s, it was still much greater than in the United Kingdom. This helped substantiate Schattschneider's fears about U.S. elections having

Table 4
Comparisons of Vote Spread: United States and United Kingdom

Year	British Conservative Party			British Labour Party			Year	US Democratic Party		
	Stdev of District Returns	Coeff. of Var.	Stdev of Swing	Stdev of District Returns	Coeff. of Var.	Stdev of Swing		Stdev of District Returns	Coeff. of Var.	Stdev of Swing
1955	11.9	0.272	redistricting	16.1	0.315	redistricting	1952	11.6	0.256	redistricting
1959	11.5	0.261	2.7	16.5	0.334	2.8	1954	12.2	0.247	5.0
1964	10.7	0.269	3.3	17.3	0.334	3.4	1956	11.7	0.247	4.8
1966	11.2	0.306	2.6	17.2	0.312	2.6	1958	12.8	0.239	5.3
1970	12.5	0.306	3.5	16.3	0.322	4.0	1960	12.2	0.240	5.7
1974F	9.9	0.249	redistricting	13.2	0.386	redistricting	1974	15.0	0.263	redistricting
1974O	10.5	0.269	2.4	14.1	0.377	2.3	1976	16.4	0.297	8.9
1979	11.1	0.238	3.2	14.6	0.422	3.5	1978	17.1	0.319	9.9
1983	13.2	0.311	redistricting	15.7	0.536	redistricting	1980	18.1	0.362	9.2
1987	14.5	0.345	3.6	17.8	0.540	3.9	1984	17.0	0.345	redistricting
1992	14.1	0.342	redistricting	17.8	0.483	redistricting	1986	17.8	0.341	7.9
1997	12.4	0.410	redistricting	17.9	0.392	redistricting	1988	18.2	0.355	7.9
							1990	15.5	0.296	9.4

n=289 for US districts for 1952-60, 300 for 1974-80 and 234 for 1984-90, eliminated all where Democrats had more than 97.5% or less than 2.5%. (This is practically the same as taking cutoffs of 10% and 90%; see appendix for other details). For Britain n=235 for 1955-70; 409 for 1974-79; 632 for 1983-87; 634 for 1992; and 640 for 1997. Eliminated districts where Conservatives or Labour had more than 97.5% or less than 2.5% or where third party competed in some, but not all years. The F and O for 1974 refer to the two elections held in February and October of that year.

greater focus on narrow constituency issues rather than issues of national importance. Our figures for the rough time period (the 1950s) that Stokes studied suggest that the district-time component was of a similar scale for the two countries at that time, but that the difference grew dramatically in the succeeding decades[21].

The similarity of this effect for the two countries in the 1950s and 1960s becomes even clearer if we modify an important assumption that Stokes made about which districts to include in his analysis. Stokes' study focuses on only about one-half of British districts, including just those where the Liberal party either competed every year or did not compete in any year. This may be a reasonable assumption in that the inclusion of a third party can have dramatic effects on the existing two parties. At the same time, however, the fact that the Liberal party comes and goes at different times in different districts implies that there is a larger district-time component than is implied in the smaller dataset. Our figures in Table 3 use Stokes' assumptions about the third parties, but if we reapply our model to the British data without taking out the districts where the Liberals ran sometimes but not always, the district-time component jumps for the 1955-70 period by about 50 percent for the Conservatives and 20 percent for Labour. These new numbers almost rival the statistics obtained for the United States in the 1950s.

Regardless of which districts we include in the analysis, the most important result is that the trend that Stokes discovered towards a smaller district-time effect in the United States has apparently been reversed (at least in absolute terms). Schattschneider's concerns about high district-time effects, then, appear to have more relevance today than for the period that he and Stokes studied.

In sum, the estimates from the components of variance model and the supporting descriptive statistics suggest several important theoretical and empirical conclusions. First, at least for Britain, the two meanings of "nationalization" found in the literature conflict. There, the relation between the district heterogeneity and the district-time effect is negative, since while there is great variability in the amount of support that different British

constituencies provide for parties, there is relative consistency -at least vis-à-vis the United States- in how the constituencies absorb national changes in the parties' fortunes. Second, in contrast to the downward trend that Stokes discovered in the United States for the first half of the 1900s, there was a sharp increase in that effect for the 1970s and 1980s. This change, which perhaps parallels the growing incumbency advantage, should be a cause of concern to proponents of the responsible party model.

Finally, in spite of some divergence in recent decades, there are important similarities in the results for the two countries. District heterogeneity is relatively similar in the two countries and though local/ephemeral issues may be more prominent in U.S. elections, they also enter into the British equation. In other words, elections have not been "all local" in the United States nor "all national" in Britain. In the next section we highlight this finding by showing that few other countries have such high levels of district-heterogeneity and district-time effects in a context of limited volatility.

COMPARATIVE EXTENSIONS

In order to put the United States-United Kingdom analysis into a comparative perspective, and allow us to explore the relationships between the three different indicators of representation, the following two tables display the estimates for the variance components for a variety of European and Latin American cases. We have conducted our tests on every European and Latin American country for which data was available and party competition was consistent enough to allow cross-temporal and cross-district tests. Data for Europe comes from Caramani's publicly available dataset and we have collected the Canadian and Latin American data from various sources[22]. We constructed data sets for each of the countries that covered as many consecutive post-war elections as possible, using only those countries and parties where we could include at least three consecutive elections. The only exception to this rule was the inclusion of Canada, for which there have only been two consecutive elections with unchanged district borders since

the 1970s. We included this case since, like the United States and the United Kingdom, it uses single-member districts. Only in Canada, the United States and the United Kingdom did we have to eliminate districts where parties received only a minimal share of the vote, since by virtue of their proportional representation electoral systems, the parties in our analysis from other countries compete in every district[23]. In a few cases their vote totals dipped below the cutoffs that we used in the British and American cases, but the low returns appear as normal variation in their support. Details about the cases are in the appendix.

Given that the analysis is only run for parties or alliances that were large enough to have competed in (virtually) every district for at least three elections, the results, in one sense, are biased towards the parties that are relatively homogeneous in their support across districts, and not so volatile as to have lost all their support[24]. But, the rise or fall of parties not included in the analysis will be reflected in the statistics for the other parties. What our numbers will reflect is how the changing availability of votes that results from the birth or death of a party is captured by the other parties. If the change in available votes were to have relatively even effects across districts, then the change would be reflected in a smaller volatility component. If the change were less homogeneous, the district-heterogeneity and residual components would rise.

The first of the two tables below portrays the raw data from the components of variance analysis, in order to give a sense of the magnitude of the each component. The second table then converts the numbers into proportions and arranges the cases according to the size of the party in order to facilitate comparisons among parties of relatively equal size (Table 5).

Table 5
Components of Variance Estimates, Europe, Latin America and the United States

	Avg % Vote*	Time	District Hetero-geneity	District Time
Europe, Canada, and the United States				
Austria 1971-94 (7 elections)				
Socialist	33.9	27.6	63.7	3.1
Volkspartie	28.7	45.0	63.0	2.8
Canada 1988-93 (2 elections)				
PC	16.3	320.5	41.4	61.8
PL	43.3	55.0	201.1	43.6
NDP	8.1	80.6	99.4	26.5
Denmark 1971-98 (12 elections)				
Social Dems	35.7	15.9	14.6	4.8
Venstre	24.5	25.5	40.3	2.5
Socialists	7.7	11.6	14.0	2.2
Conservative	8.5	28.8	7.4	2.3
France 1978-93 (5 elections)				
Socialists	20.8	62.2	25.8	6.6
Communist	10.4	28.4	30.1	4.7
Right	45.4	5.2	47.2	6.3
Germany 1957-87 (9 elections)				
CDU/CSU	41.9	3.7	53.2	6.1
Free Dems.	9.0	4.6	1.6	3.3
SDP	38.7	18.9	36.0	5.3
Iceland 1959-95 (11 elections)				
Social Democ	9.9	7.8	18.3	5.8
Independence	32.4	11.3	51.8	8.2
Progressive	30.2	17.5	115.5	8.6
Communists	14.6	5.8	10.5	7.3
Italy 1972-83 (4 elections)				
Chr. Dems	34.5	6.6	77.6	4.3
Communists	30.2	8.2	109.0	2.0
MSI	6.3	1.5	8.7	1.4
Social Dems.	4.0	0.5	1.7	0.6
Socialists	9.7	0.9	4.4	1.4
Netherlands 86-98 (4 elections)				
Socialists	29.2	17.0	41.0	5.2
Volkspartij	25.4	17.6	33.7	1.9
Democ. 66	9.2	16.0	1.9	0.5
Chr. Dems	17.0	67.4	43.0	6.9
Norway 1973-97 (7 elections)				
Socialists	35.5	11.4	54.5	6.4
Venstre	4.4	0.2	1.8	0.9
Hoeire	12.8	42.6	40.1	3.9
Kristelig	14.5	6.2	26.5	1.2
Senderpartiet	9.3	16.7	21.8	2.9
Portugal 1975-95 (9 elections)				
56.6	23.3	12.7		
CDU	8.4	11.5	169.1	7.7
All CDS/PSD	44.9	35.0	231.2	16.3
Spain 1982-96 (5 elections)				
8.6	67.1	9.9		
Pop Allian.	42.6	38.5	100.9	11.4
Communists	8.9	6.5	8.2	2.2
Sweden 1948-91 (15 elections)				
MS	19.9	10.3	18.0	5.3
Folkpartiet	8.6	26.7	15.4	5.3
Social Dems	39.1	5.6	32.3	4.0
United Kingdom 1955-70 (5 elections)				
Conservatives	40.9	9.2	125.2	9.1
Labour	50.5	4.6	267.4	10.3
United States				
1952-60	50.9	10.2	126.9	19.6
1974-80	50.0	8.8	217.2	61.9
1984-90	52.5	2.1	242.8	51.3
Latin America				
Argentina 1991-95 (3 elections)				
PJ	45.7	1.8	70.1	44.0
UCR	24.4	14.0	99.9	29.4
Brazil 1990-98 (3 elections)				
PMDB	19.2	1.6	77.0	53.9
PFL	19.9	2.1	87.0	76.3
PT	10.6	1.4	24.7	10.3
Chile 1989-97 (3 elections)				
Concertación	59.9	-0.4	33.8	48.9
Colombia 1974-86 (4 elections)				
Conservatives	35.2	8.3	72.3	17.2
Liberals	45.2	18.1	64.1	41.8
Uruguay 1984-94 (3 elections)				
Colorados	38.4	48.4	45.7	6.0
Blancos	42.3	38.0	55.3	6.7
Fr. Amplio	19.3	29.4	66.9	3.7
Venezuela 1958-83 (6 elections)				
AD	52.9	100.9	52.7	46.3

Note: for countries with just two competitors, such as the United States and Chile (considering coalitions) the figures are identical for each party or alliance.
* Unweighted average of vote percentages across districts, for last year in series.

Table 6
Proportion of Variance Explained by Components (Parties with at least 15% average support)

country/party	Avg % vote	Total Variance	(Time national effect	) District Heterogeneity	District Time
	%		%		
Chile Concertación	59.9	82.3	-0.5	41.1	59.4
Venezuela AD	52.9	199.9	50.5	26.4	23.2
US Dems avg	51.1	246.9	3.4	79.5	17.1
Argentina PJ	45.7	115.9	1.6	60.5	38.0
France Right	45.4	58.7	8.9	80.4	10.7
Colombia Liberals	45.2	124	14.6	51.7	33.7
Portugal Alliance.	44.9	282.5	12.4	81.8	5.8
Portugal Socialists	44.1	92.6	61.1	25.2	13.7
Canada PL	43.3	299.7	18.4	67.1	14.5
Spain Popular Allian.	42.6	150.8	25.5	66.9	7.6
Uruguay Blancos	42.3	100.0	38.0	55.3	6.7
UK Conserv. Avg.	42.1	155.0	6.9	88.4	4.7
Germany CDU/CSU	41.9	63.0	5.9	84.4	9.7
UK Labour Avg	40.9	256.7	1.9	95	3.1
Sweden Soc Dems	39.1	41.9	13.4	77.1	9.5
Germany SDP	38.7	60.2	31.4	59.8	8.8
Uruguay Colorados	38.4	100.1	48.4	45.7	6.0
Spain Socialists	38.2	85.6	10	78.4	11.6
Denmark Soc Dems	35.7	35.3	45	41.4	13.6
Norway Socialists	35.5	72.3	15.8	75.4	8.9
Colombia Conserv.	35.2	97.8	8.5	73.9	17.6
Italy Chr. Dems	34.5	88.5	7.5	87.7	4.9
Austria Socialist	33.9	94.4	29.2	67.5	3.3
Iceland Indep	32.4	71.3	15.8	72.7	11.5
Italy Communists	30.2	119.2	6.9	91.4	1.7
Iceland Progr	30.2	141.6	12.4	81.6	6.1
Netherlands Soc.	29.2	63.2	26.9	64.9	8.2
Austria Volkspartie	28.7	110.8	40.6	56.9	2.5
Netherlands Volksp	25.4	53.2	33.1	63.3	3.6
Denmark Venstre	24.5	68.3	37.3	59	3.7
Argentina UCR	24.4	143.3	9.8	69.7	20.5
France Socialists	20.8	94.6	65.8	27.3	7.0
Sweden MS	19.9	33.6	30.7	53.6	15.8
Brazil PFL	19.9	165.4	1.3	52.6	46.1
Uruguay Fr. Amplio	19.3	100	29.4	66.9	3.7
Brazil PMDB	19.2	132.5	1.2	58.1	40.7
Netherlands Ch Dems	17.0	117.3	57.5	36.7	5.9
Canada PC	16.3	423.7	75.6	9.8	14.6
Average	35.0	124.8	23.7	62.5	13.8
St. Deviation	10.8	82.3	20.3	20.1	13.2

Taken together, these two tables suggest many interesting comparisons among regions, within countries, and both among and within party families. Developing these comparisons and a model to explain the patterns is beyond the scope of this paper, because it would require careful consideration of the different time periods and number of elections under consideration -which are variant here due to our attempt to provide results for the longest possible time period taking in which district lines did not change and the same parties continued to compete. Still, for each individual case the tables do provide information about how the change in electoral patterns was distributed according to the three effects. In Canada, for example, the extremely high time component is a function of the shocking collapse of the Conservatives and the NDP in 1993, along with the rise of the Reform Party. What may be less well-known is how the change was absorbed across the country, which the district heterogeneity and district-time components capture. Developing these comparisons and a model to explain the patterns, however, is beyond the scope of this paper. Our main task, instead, is to use these comparative results to reinforce our proposition about the similarities between the United States and the United Kingdom and test the proposition about the very weak link among the three variance components.

In this context, the first finding from the comparative data is that while Table 3 suggested a widening gap between the United States and the United Kingdom in recent decades, it is clear that these two countries are more similar than different. The British and American parties are at the top of the spectrum in terms of their district heterogeneity and close to the top for the residual (district-time) effect. The parties from these two countries are joined by only a handful of other parties as scoring high for both the district heterogeneity and the district-time components: Spain's Popular Alliance, Portugal's Alliance, and two parties from each of three Latin American countries (Argentina, Brazil, and Colombia). Of these, the two European cases are parties (alliances) in flux, having much higher time components than the other cases. The parties in the United States and the United Kingdom, along with the few Latin American cases, could thus be described as having *stable*

but heterogeneous support, plus an important district-time effect. This could be contrasted with much of Europe, where parties have more *homogenous but less stable support, combined with minimal local/ephemeral effects.*

Table 6 also reinforces the similarity of these two countries in terms of what Stokes labeled the national effect. As discussed above, he uses σ_A^2 expressed as a percentage of total variance as his indicator of this effect. Table 6 shows that in both United States and the United Kingdom are well below the mean on this dimension.

These two typologies are not opposing ends of a unidimensional continuum, because the three effects do not co-vary. If we eliminate the parties that have less than 5 percent support, the Pearson correlation coefficient between the time and district heterogeneity components is -0.09 and between the time component and our residual component it is only 0.31[25]. The relationship between the residual and district heterogeneity components is also, 0.31. If we apply the tests to the ranks instead of the actual values (i.e. Spearman's rank correlation coefficient) the strength of the relationship between the district heterogeneity and residual components rises considerably (to 0.57), but the relationship is still far too weak to conjoin these components into a single dimensional continuum[26]. Moreover, if we restrict the analysis to parties that have at least 10 percent, the Spearman coefficient drops sharply (to 0.38).

The similarities of the United States and the United Kingdom, as well as the weak relationships among the variables, is shown in the Table 7. Dividing each of the components at its median, the table shows that all eight possible combinations of the three components are filled and that while their position is not unique, the United States and all the parties in the United Kingdom do occupy the same cell.

Table 7
Classifications of Parties

District Heterogeneity	Low Volatility District Time HIGH	Low Volatility District Time LOW	High Volatility District Time HIGH	High Volatility District Time LOW
HIGH	Argentina: PJ Argentina UCR Brazil PFL Brazil PMDB Colombia Cons. Spain Socialists UK Labour UK Conserv UK Liberals* US	Italy Chr. Dems Italy Comm	Colombia Liberals Iceland Progr Portugal Alliance Spain Pop. Alliance Canada PC	Austria Socialist Austria Volkspar Uruguay Fr Amplio
LOW	Chile Iceland Indep	France Right Ger. CDU/CSU Norway Socialists Sweden S Dems Sweden MS Denmark S. Dems	Canada PL Portugal Socialists Venezuela AD	Denmark Venstre France Socialists Germany SDP Netherl. Chr. Dem Netherlands Soc Netherlands Volks Norway Hoeire Uruguay Colorad. Uruguay Blancos

High and low defined by the median of the raw components for the 38 parties with support greater than 15 percent.
* Average support under 15 percent

This weak empirical relationship stands in contrast to the presumed strong relationship implicit in studies of single aspects of volatility, district heterogeneity, and the district-time effects. There is very little basis for a strong theoretical relationship either.

Consider, for example, the relationship between district heterogeneity and district-time. If district heterogeneity is minimal, then one would not be surprised to find that the district-time effect is also minimal, since the districts generally must move together to yield the district homogeneity[27]. The reverse, however, is not true. A party with heterogeneous support across districts may experience a small district-time effect (as in classical analyses of Britain) or a large district-time effect (as in the United States). It is therefore of little surprise that the statistical relationship between these two variables is very weak.

This pattern is evident in the data. Of the 63 cases in our sample (ignoring the parties with less than an average of five percent support), five of

the six with the lowest levels of district heterogeneity are also among the ten cases with the lowest residual components. In contrast, of the six cases that are found at the other end of the heterogeneity scale, only three rank among the ten with the highest residual components.

The theoretical relationship between either of these variables and time is even weaker. When district-heterogeneity is low, then perturbations in a party's support would be magnified across the country, thus augmenting volatility. But, it seems unlikely that a party that was entrenched enough to have gained relatively homogeneous support across a country would also suffer from significant volatility. Alternatively, we would expect rising new parties or those led by crashing populists to have uneven support across the country. The United States and the United Kingdom, however, show that even over a long period of time, heterogeneous support levels do not necessarily imply large levels of volatility.

Our data empirically confirm these expectations about weak links between volatility and district-heterogeneity. Of the six most homogenous parties, two experienced high levels of volatility (the Netherlands' Democracy 66 and Denmark's Conservatives). At the same time, other parties (notably Italy's Socialists and MSI) were both very stable over time and could count on very homogeneous support across districts. Towards the other end of the scale we find the U.S. parties and the British Conservatives of 1983-1987, which combined stability over time with heterogeneous support across districts.

There is little theoretical basis to expect a strong relation between volatility and the district-time effects either. While elections focused on local issues could help a party stave off large fluctuations in its national vote share (e.g. the United States), a high district-time effect would not necessarily preclude sharp aggregate changes (unequally distributed amongst districts). High volatility could also imply the coming and going of parties with strength in only subsets of a country's districts (such as the Liberals in Britain in the 1950s and 1960s). The relationship is also ambiguous at the other end of the scale. Where the district-time effect is very small, we should find some of

the more volatile parties, since they could both take advantage of and be vulnerable to changes in salient issues. A populist or Green party, for example, could experience a meteoric rise or crash, since voters would be focused on the national leaders and their issues. But, as argued above, where there is low district heterogeneity there should also be a low district-time effect (though the reverse is not true). The low district heterogeneity, we further argued, was likely to be associated with established parties, which, in turn, impede volatility. To further illustrate this weak relationship, imagine two countries each with two districts. Assume further the ruling party has very different levels of support in the two districts in one country, but its counterpart has consistent levels support in the other country. If both ruling parties crashed to zero support, then the volatility would be high in both cases, but the district-time effect would be high in the first country and low in the other.

Again, the data bear out this expectation. While five of the ten most stable cases of parties over time rank among the seven with the highest residual effect, Italy's Socialists and MSI have very low ranks for both of these components. At the other extreme is Venezuela's AD, for example, which was both the second most volatile party in the sample, as well as the case with the sixth highest district-time component.

CONCLUSION

Though traveling under different pseudonyms, the concepts of district heterogeneity, volatility, and the district-time effect have long been at the center of debates about democratic stability and representation. In this paper we have argued that analyses of these concepts have been hampered by imprecise definitions, measurement techniques that are not broadly applicable, and important flaws in the statistical models.

In our effort to explore these issues we have rejected recently developed methodological tools, and have instead reverted to Stokes' original components of variance model. In so doing we discovered an important flaw in his methodology, and have thus offered here a modified version of his model. In

addition to correcting a flawed statistical assumption, our alternative allows straightforward analysis for countries that unlike the United States, use proportional representation electoral systems. The method is also valid for single-member district systems as found in Britain and its former colonies, because for these countries it focuses on districts instead of states or provinces as the proper level of analysis. Finally, while explaining the algebra behind the model involves multiple lines of equations filled with Greek letters, the model has the virtue of requiring only a few lines of code and a built-in SAS function.

In applying the model we have focused on our finding that, although they have separated on one dimension (the district-time effect) in recent decades, the United States and the United Kingdom have some important similarities that bi-country analyses have overlooked.

As this paper has focused more on methodological themes than on comparisons and explanation, we have not attempted to develop a model to explain the many suggestive patterns revealed in the empirical data. That data, for example, suggests that in spite of Caramani's finding that nationalization has progressed throughout Europe, most parties' support levels are still quite variable across districts. The data also shows that aside from a few exceptions, the time components in both Europe and the Americas are quite small. While the data set does not include some of the more volatile countries such as Ecuador, Bolivia and Peru, this is still a particularly noteworthy finding for Latin America where historically parties have experienced high levels of volatility. Another avenue for future research could explore the dramatic differences between Europe and the Americas in terms of the inter-election changes at the district level (as captured by the residual component). With the exception of the Portuguese Alliance of the CDS and PSD, no party in Europe scored above 12.7 for this component. For Latin America only the Uruguayan parties, the Colombian Conservatives, and the Brazilian PT scored below 29.4.

In moving towards an explanation of these and other patterns, future researchers will have to contend with variation among regions, as well as

among and within countries. Some apparent variables, such as the use of single member district electoral systems, therefore, can only provide partial explanations. The use of single member districts may help separate the U.K. and U.S. cases from the pack, but that variable cannot explain the widening gap in those two cases or the differences among other cases. It is also clear that the size of the party or the number of districts in a system cannot account for the size of any particular component uncovered in this analysis, or even the amount of total variance. For example, joining the parties of the United States and its former colonist in portraying a high level of total variance are parties from Portugal, Venezuela, and Brazil, which have just 20, 23, and 27 districts respectively. At the other end of the scale, some of the parties in Chile, Italy, and Spain have relatively low amounts of total variance in spite of having to compete across a relatively large number of districts (60, 95, and 52, respectively).

Use of our methodology, in sum, provides a useful window on three types of variability exposed in district level electoral data. While we leave the difficult task of explaining the revealed patterns to future efforts, we would suggest that any full explanation will require a combination of macro or institutional variables to capture the inter-country and inter-regional differences and a set of variables that can differentiate amongst parties within a single country.

Appendix

The countries selected to test for this model were all those available in Caramani's dataset (available on CD) and those Latin American cases for which we could acquire data. The U.S. data is available from the Inter-University Consortium for Political and Social Research (ICPSR). We ran the analysis for the most recent time period in which there were at least three consecutive elections in which the main parties did not change and there were no districting changes. As explained in the text, we also required that the parties compete in all districts in all years. As a result, in cases such as France or Germany, where two or more parties joined in at least occasional alliances, we were forced to run the model as if the parties were always in alliance. Similarly, for Chile we could only run the analysis on the two coalitions instead of the parties, since no party has competed in every district. As stated in the text, for the United States and Great Britain, we followed conventional practice and eliminated districts in which the two main parties did not each win between 2.5 and 97.5 percent (if the criterion were changed to between 20 and 80 percent very few additional districts would drop out). This is a less important restriction where there are multiple parties running under proportional representation rules, and thus, for example, we have calculated estimates for the Italian MSI, for example, in spite of their support falling to under 2.5 percent (but not to zero) in some districts.

It is important to note the very serious errors that we found in Caramani's dataset. For Britain we found about 20 errors (for the period 1955-1987) in which a digit was dropped or added to the reported statistic, numbers were erroneously transcribed, or the Labour and Liberal votes were interchanged. The errors that we discovered all changed the affected party's vote by at least 15 percent, and usually by at least 20 percent. We also found two districts in Spain where there was a serious error in the statistic listed for the Alianza Popular in 1982. We have verified that there are no significant errors in other countries by looking at the inter-election changes at the district level. A list of the errors we found is available upon request.

The following table details the specific coding arrangements we followed, the years of the included elections, and the number of included and excluded districts.

Appendix
Table 1
Notes on Parties, Districts, and Elections included in Analysis

Country	Number of elections in analysis	Number of districts included/ excluded	Years of Elections included
Argentina	3	25/0	1991, 93, 95
Austria	7	9/0	1971, 75, 79, 83, 86, 90, 94
Brazil	3	27/0	1990, 94, 98
Canada	2	271/24	1988, 93
1993 brought the destruction of the NDP and a great decline in the support for the Conservatives. As a result, in many districts the NDP won less than 2.5 percent of the vote. But, since this was a general trend, we eliminated only those districts where the party won less than 2.5 percent and the fall was greater than the average national decline (about 13 points). This led us to eliminate 23 districts, all from Quebec. We also had to eliminate one district in Ontario where the Liberals did not compete in 1988.			
Chile	3	60/0	1989, 93, 97
The analysis was conducted on coalitions rather than parties, since no party has com peted in every district.			
Colombia	4	26/0	1974, 78, 82, 86
Denmark	12	17/0	1971, 73, 75, 77, 79, 81, 84, 87, 88, 90, 94, 98
France	5	96/0	1978, 81, 86, 88, 93 (97 available but not us ed)
The Right consists of a combination of the UDF, GAU and other conservative parties (labeled as conservative candidates and moderate parties in Caramani s dataset). In that data se the other conservative parties were not separated for 1997 election, and thus that election was excluded from the analysis. The Socialists reported in the table are a combination of the Socialists, the RG (left movement), and those labeled as other left . The Communists are a combination of the French Communist Party and those labeled as other extreme left . The dataset does not list other extreme left for 1997.			
Germany	9	10/0	1957, 61, 65, 69, 72, 76, 80, 83, 87
Under the German system, voters cast two ballots, one for the single-member districts and one for the proportional representation (PR). The statistics are calculated for the PR part of the vote. The CSU but not the CDU has com peted in Bavaria since 1957. In 1957 the CSU and the CDU competed in Saarland, and we combined their vote totals for that province (Land).			
Iceland	11	8/0	1959, 63, 67, 71, 74, 78, 79, 83, 87, 91, 95
Italy	4	94/1	1972, 76, 79, 83
Threw out district 94 (a very small district) where most parties did not compete. MSI is Movimiento Social Italiana-Destra Nazionale.			
Netherlands	4	20/0	1986, 89, 94, 98
The Socialist party is named the Partij van der Arbeid			
Norway	7	19/0	1973, 77, 81, 85, 89, 93, 97
Portugal	9	20/0	1975, 76, 79, 80, 83, 85, 87, 91, 95

The communists run under the title Coligacao Democrática Unitária . The Centro Democrático Social (CDS) and the Partido Social democráta (PSD) formed an alliance for most districts for the elections of 1979 and 1980. We therefore combined their vote totals for every year of the analysis.			
Spain	5	52/0	1982, 86, 89, 93, 96
The calculations do include those very few districts where Communists did not compete in every year, as their average share of the vote in years that they did compete in those districts was under five percent. As noted above, we corrected the vote totals for two districts in 1982.			
Sweden	15	28/0	1948, 52, 56, 58, 60, 64, 68, 70, 73, 76, 79, 82, 85, 88, 91
United King.	5	235/383	1955, 59, 64, 66, 70
	3	409/214	1974f, 74o, 79
	2	632/1	1983, 87
We dropped districts where either Labour or the Conservatives failed to compete (or win at least 2.5 percent) or as noted in the text, where the third party competed in some, but not all years. For the 1955-70 period, for example, we only included districts where the Conservatives and Labour each won between 2.5 and 97.5 percent and the Liberal vote was either consistently below or above the 2.5 percent threshold in all years. The data does not include Northern Ireland. For Table 3 we also show the results for the three elections held in February1974, October 1974, and 1979 and the two elections held in 1983 and 1987. As noted above, we corrected the serious errors we found in Caramani s database.			
United States	5	289/146	1952, 54, 56, 58, 60
	4	300/135	1974, 76, 78, 80
	4	234/201	1984, 86, 88, 90
Redistricting occurred in several states before the 1974 and 1984 elections, but between 1974 and 1980 only in Tennessee and between 1984 and 1990 only in Ohio. The statistics are therefore calculated for the other 49 states for those two decades. We further followed Kawato and eliminated all districts in which the two parties did not both receive between 2.5 percent and 97.5 percent of the vote. In practice, there were almost no districts where one of the major parties received between 2.5 and 10 (or even 20) percent. Lastly, a few districts were eliminated for missing data, which generally occurs when candidates run unopposed.			
Uruguay	3	19/0	1984, 89, 94
Venezuela	6	25/0	1958, 63, 68, 73, 78, 83
COPEI did not compete in two districts in 1963, and we thus ran the analysis for just AD. AD did not win more than 20 percent in either of those districts in 1963.			

NOTES

1. Their statistics, however, effectively conflate district heterogeneity and the district-time effect.

2. Coefficient of variation = Standard deviation/mean.

3. This is Kawato's cutoff point. Excepting 0, the choice of cutoff points has almost no bearing on the analysis. As noted later, we also excluded one Italian district where not all major parties competed.

4. A final problem with either approach is that for two-party systems, the results are dependent on which party the investigator chooses as a reference. For example, the index of variation would be different for the Democrats and Republicans in the United States, even though one is a reflection of the other.

5. There is an important distinction between the "national effect" and a nationalized election. For Stokes and Schattschneider the term nationalization appears to mean that the national events drive elections. As such, Stokes terms an election nationalized if the district effect (what we call the district-time effect) is small. What he terms "national effect," however, is closer to our measure of "district heterogeneity". The confusion is even greater if we bring in Caramani and Mainwaring/Jones, whose use of the term nationalization reflects the idea of district heterogeneity.

6. He then turns to a criticism of Katz's methodology.

7. See footnote 14 for details.

8. Bartolini and Mair, for example, largely debunk the notion that Europe experienced an increase of volatility in the 1970s.

9. Bartolini and Mair even note: "there has been remarkably little debate or disagreement concerning the actual mathematical formula from which the index of aggregate volatility is derived" (p. 20).

10. A related difference between our model and that of Stokes involves his use of nesting. In his model he nests congressional districts within states, in order to account for systematic movements of all districts within a state. CFZ, alternatively, nest the districts (actually counties in their case) within regions. Neither of these techniques can be applied comparatively, for, among other reasons, the fact that under most PR systems there is but a single district per state (or province). We see the justification for nesting a sub-sub-national level within a sub-national level as rather underdeveloped and imprecise. While Stokes' method assumes the possibility of state tides, CFZ argue in favor of a model that measures regional tides. An alternative approach could test for tides among districts based on rural-urban categories, their relative wealth, ethnic makeup, or some other characteristic(s) of districts. All the points just mentioned lead us to use a basic model without nesting -a model with the district as a single sub-national level, and with the district effects random rather than fixed as will be explained shortly.

11. An alternative to dropping the extra geographic level would be to assign a regional component to the European and Latin American countries that would

be analogous to the U.S. states. This is the strategy that Stokes follows in his later (1967) article for application to the United Kingdom. We refrained from following this method, however, for although there are some exceptions where regions elect governors or other regional figures, in most of our cases the regions and the districts are co-equal.

12. In this and all other models, it is assumed that a party vote percentage, yik, is available for each district i at each time k. Special steps may be necessary to ensure that this assumption is satisfied if one encounters splitting, combining, birth, or death of districts or of parties.

13. For simplification we are ignoring out the issue of district heterogeneity here.

14. In regard to earlier authors' works that have used variance-components analysis, our main emphasis in this paper is on examining the *models* in these works, rather than the formulas that the authors used to estimate the variance components under those models. The models and the estimation formulas are two distinct entities. In particular, one can have an inappropriate model but appropriate estimation formulas given that that model holds, or one could have a suitable model but improper estimation formulas. We did examine estimation formulas as well as models, even though the former were not a primary concern. The estimation formulas of Kawato (1987), as described in conjunction with his equations (3)-(8), are entirely suitable given his (questionable) model. We had difficulty in figuring out both the model and the estimation formulas that Claggett, Flanigan, and Zingale (1984) used. Among other things, (i) no model equation is ever shown; (ii) the only two equations in their paper, (1) and (2), are both incorrect, as is evident from the fact that the left and right sides of the equation are not equal; (iii) on both page 87 and page 88 the cursory verbal descriptions of their mathematical calculations indicate that the square root was taken at the wrong point (before rather than after division); and (iv) these descriptions omit any mention of the essential step of performing certain subtractions (as done, e.g., in our subtraction of MR in equations above). Stokes (1965) gives his estimation formulas in equations (12), (13), and (14) of his Appendix. Although (12) is a proper formula, (13) and (14) evidently have some typographical or other errors. One would probably expect (13) and (14), like (12), to be unbiased estimators (given his model) of the variance components that they are intended to estimate, but they are not. Of course, Stokes' numerical results could still be correctly calculated even though the printed formulas, (13) and (14), are not valid.

15. Kawato applies his approach not only to (i) the vote percentages themselves but also to (ii) the changes in vote percentages between two successive

elections. The objection that his method ignores district effects pertains just to (i), which is the only application that we consider here. It does not pertain to (ii), because the district effect drops out when the difference between two vote percentages in the same district is obtained. On the other hand, the formulas for estimated variance components that apply to (i) are not valid for (ii), because of the negative correlation between any two consecutive changes in a district.

16. Just three lines of SAS code are required to trigger the formulas: A "proc varcomp" statement with option "method = type1," a "class" statement, and a "model" statement, the latter two specifying district and time.

17. The algebra is quite simple. With I=3 and K=2, S_A^2=3[(53-48)²+(43-48)²] = 150; M_A=150/(2-1) = 150; S_R^2 = [(59-54-53+48)² + (49-54-43+48)² + (53-48-53+48)² + (43-48-43+48)² + (47-42-53+48)² + (37-42-43+48)²] = 0; and $M_R = \hat{\sigma}^2$ = 0/[(2-1)(3-1)] = 0. Thus $\hat{\sigma}_A^2$ = (150-0)/3 = 50. The calculations for $\hat{\sigma}_B^2$ are equally trivial.

18. In a set of papers, King and his co-authors propose alternative techniques to deal with uncontested districts, based on estimating the expected vote for parties that declined to participate (see especially Gelman and King 1994 and Katz and King 1999). Since these techniques are complex, apply only to two-party systems, or may require models specific to each case, and since our analysis covers many countries, we have not tried to use those methods. Future case studies, however, may find these techniques useful.

19. This analysis is not a function of Northern Ireland, which is eliminated from his analysis. Given the errors in his database, we have some concerns about his actual figures. At the same time, however, as our table shows we still find large degrees of heterogeneity after cleaning the data.

20. Stokes' work revealed a relatively large district variance component (our district-time component) for Britain, though he did not emphasize that finding.

21. Using different methods (and hence definitions) Brady et al. (2000) and others have also discussed changes in the "local effect" since the 1950s.

22. Caramani's data set is available on CD with the accompanying reference volume. As explained in the appendix, we have had to correct a number of errors in that database. We thank Mark Jones, Peter Siavelis, Brian Crisp,

Maria Escobar-Lemmon, and Octavio Amorim-Neto for supplying parts of the Latin American data. The Canadian data has two sources: the Canadian parliamentary website (http://www.parl.gc.ca) and the official reports of the Chief Electoral Officer of Canada. We plan to make all of these data available on our website.

23. There was one exception to this rule: we eliminated one small Italian district where not all parties competed. See appendix for details.

24. In some cases it was necessary to conduct the analysis on alliances rather than parties. If the alliance was short-lived, we ran the model as if the two (or more) parties were in alliance for our complete time series. For some countries (such as Ireland), however, the frequent changing of parties and/or districts was too great to overcome. Details by country are in the appendix.

25. These data are based on including all the data for the United States and the United Kingdom. If we use just the 1955-1970 data for the United Kingdom and just the 1950s for the United States, the correlations shrink even further towards zero. It is important to exclude the small parties from the correlational analysis, since small parties that compete in all districts must be relatively homogeneous and their volatility and residual are also severely bounded. These parties must compete in almost all districts in order to be included in our analysis. If we exclude parties that receive less than 10 percent as opposed to just 5 percent, the relationships weaken as well.

26. The relation between time and other components remains very weak (-0.03 and -0.01 for district heterogeneity and the district-time effect, respectively).

27. Since the statistics are based on averages it is possible to conjure up a set of districts where the heterogeneity is zero and the district-time effect is greater than zero, but the empirical basis for such a case seems very weak.

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Institut de Ciències Polítiques i Socials (ICPS)
Mallorca, 244, pral.
08008 Barcelona
Fax: 93 487 11 49
e-mail: cabreat@diba.es