The Growing Spatial Polarization of Presidential Voting in the United States, 1992–2012: Myth or Reality?

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ABSTRACT There has been considerable debate regarding a hypothesis that the American electorate has become spatially more polarized over recent decades. Using a new method for measuring polarization, this paper evaluates that hypothesis regarding voting for the Democratic party's presidential candidates at six elections since 1992, at three separate spatial scales. The findings are unambiguous: polarization has increased substantially across the country's nine census divisions, across the 49 states within those divisions, and across the 3,077 counties within the states—with the most significant change at the finest of those three scales.

Writing in 2005, Glaeser and Ward addressed what they termed five myths regarding American political geography, of which the second was "the two parties [Republican and Democrat] are more spatially polarized than in the past" (Glaeser and Ward 2005, 5). They claimed that "the number of states that can be considered 'safe' for either party has not been rising over time" and, using the well-established dissimilarity index for measuring spatial segregation, demonstrated that "county-level evidence shows that segregation by party is not significantly increasing"—although they did identify a "slight upward trend" over the four elections 1992–2004 (their Figure 2 – p.39 – which shows a substantial increase from 1976 to 2004 of about 50% in the index size).

Three years later, in a much-discussed book (*The Big Sort*), Bishop and Cushing (2008) argued that electoral polarization had indeed been taking place over the preceding three decades, as a result of sorting processes consequent upon major volumes of inter-region, inter-state and inter-community migration. Their argument was not based on extensive, rigorous statistical analysis, however. For two presidential elections only—1976 and 2004 (both of them close)—they defined counties as characterised by "landslides" if one of the parties defeated the other by 20 percentage points or more. The number of such counties increased from 38% of the total in 1976 to 60% in 2004, and the number of electors living in them grew from 27% to 48% of all those who voted. This was the core of the quantitative evidence sustaining their argument of increased polarization.

Abrams and Fiorina (2012) published a major critique of *The Big Sort*, challenging both the conclusion that polarization had occurred and the processes—selective migration—that Bishop and Cushing claimed were the cause of that geographical outcome. Looking only at the first part of that challenge—whether or not spatial polarization had occurred—Abrams and Fiorina rightly criticized Bishop and Cushing for relying on two arbitrary end-dates (especially the first) to establish a trend. They also questioned the use of the binary division of the country into "landslide" and "non-landslide" counties as the elements of the portrayal; other indices suggested to them that counties were becoming "increasingly politically heterogeneous, not increasingly homogeneous" (Abrams and Fiorina 2012, 205). Nevertheless, they were careful in their concluding response:

> Do the preceding analyses prove that political residential segregation is not occurring? No. That is not our position. We are simply pointing out that Bishop's sweeping argument about geographical political sorting has little or no empirical foundation.

So who is right? Glaeser and Ward, Bishop and Cushing, or Abrams and Fiorina? In this brief article, we present an alternative,

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rigorous analysis of voting at presidential elections over the period 1992–2012.[1] By using a sequence of elections we do not entirely obviate the Abrams-Fiorina critique because the choice of end-dates remains arbitrary, but if we can establish a trend—especially a statistically significant trend—we are moving the argument substantially forward from that in the Bishop–Cushing analysis. Despite Abrams–Fiorina criticising Bishop-Cushing for their use of presidential voting data—because how a county votes for president at a particular election may not be a good reflection of the local political ethos—nevertheless presidential elections are the only ones in which all US counties participate with the same two main candidates. Our results simply explore trends in the pattern of voting for president across those six elections, and we make no greater claim that they are necessarily representative of wider changes in political attitudes and behavior.

Finally, Glaeser-Ward note that arguments regarding greater spatial polarization of the US electorate have also been made at the state scale. To establish whether polarization has occurred over the period at more than one scale, therefore, we use a recently developed procedure for measuring spatial segregation which is explicitly multi-scalar in its construction.

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MEASURING POLARIZATION/SEGREGATION

There is a very large literature on the measurement of spatial segregation—which is the equivalent of spatial polarization. Almost all of it (as in Glaeser and Ward's 2005 paper) uses single-number indices of polarization/segregation that are descriptive only; they lack a basis in formal inferential statistics, and so any judgement regarding their relative size is qualitative.[2] If one wants to establish that polarization is greater at one date than at another, then a method is needed with which the statistical significance of any observed differences can be evaluated. Further, as clearly demonstrated by Carrington and Troske (1997), most of those indices based on the variance in a distribution over a set of spatial units systematically inflate the identified level of segregation because they confound systematic and random variation, especially where the spatial units contain relatively small numbers of people.

Most studies of segregation/polarization using single number indices to assess its intensity are conducted at a single spatial scale only—such as counties in Bishop and Cushing's (2008) book and in Lang and Pearson-Merkowitz's (2015) parallel study to that reported here. But—as Glaeser and Ward (2005) indicate—there is a substantial literature exploring whether there is greater polarization in voting patterns at the state scale, and other work focuses on even broader scales, such as those of the nine census divisions. A full evaluation of any evolving spatial pattern thus requires exploration of trends at a variety of scales. However, as pointed out some decades ago (Duncan, Cuzzort, and Duncan 1961) but rarely taken into consideration since, any measure of segregation at one spatial scale necessarily incorporates its measure at any larger scales: if there is growing polarization at the state scale, for example, this is bound to be incorporated—to an unknown extent—at the county scale too and, as Jones et al. (2015) have argued, any measure of segregation at a micro-scale is likely to be over-stated if it does not "hold constant" that measure at a macro-scale within which the micro-scale units are nested (e.g. counties within states).

To take both of these major criticisms of the standard measures of segregation into account, in this article we apply a recently-developed method for the analysis of residential segregation in cities (Jones et al. 2015), which subsequent work has demonstrated is clearly multi-scale in its organization (e.g. Manley et al. 2015). We have modelled the proportion voting Democrat with the denominator as the total Democrat plus Republican vote. Those rates are then modelled within a multi-level framework, to obtain estimates of the intensity of segregation at each scale, net of segregation at the next largest scale and taking account of binomial variation occasioned by the varying denominators that form the proportion of those who vote Democrat. (Full details of the modelling strategy are in Leckie et al. 2012.) Thus each of the polarization measures reported here is for a particular spatial scale, independent of any polarization at a larger scale within which the specified units are nested. Polarization at the county scale, for example, is measured net of any polarization at the state scale; we are evaluating whether there is polarization across the states and then, independently, whether there is further polarization across counties within states—testing whether any observed differences across counties simply reflect differences between the states within which they are located.

In work on multi-group segregation patterns—such of those of ethnic group residential segregation in cities—the derived segregation measure from this modeling approach is the Median Rate Ratio (MRR). Where just two categories are involved, such as voting either Republican or Democratic, we use the Median Odds Ratio (MOR), which can be interpreted in exactly the same way as odds ratios in logistic regressions. The MOR values are derived from the modeled (logit) variances in the rates at each scale, and they have associated Credible Intervals (CIs), which provide the degree of empirical support for the values of a parameter. We have used the 95% intervals to convey the uncertainty; as they are based on Bayesian estimation, they can be asymmetrical around the estimated MOR value.

MORs can be interpreted in the following way. Take a set of counties within a state for which we have the modeled rate. Take any pair of counties at random and calculate the ratio between the highest and lowest of the pair of modeled rates. Repeat this many times. The MOR is then the median value of the resultant distribution—the average difference between any pair of modelled rates; a value of 1 means that there is no polarization whatsoever. Further, because the measures are ratios, they can readily be compared: an MOR of 1.5 is 20% larger than one of 1.25, for example,

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and so in comparing two measures we can not only assess how much larger one is relative to the other but also, using the associated Bayesian credible intervals, whether the two are significantly different from each other.

Our chosen measure of the degree of spatial polarization is thus superior to the standard indices of spatial unevenness (such as the index of dissimilarity used by Glaeser and Ward 2005) because it: is readily interpretable; has associated credible intervals that allow for rigorous and robust estimates of differences over time; and separately identifies—again using credible intervals allowing for robust testing—the intensity of any observed differences at a number of spatial scales (in this case, three) independent of patterns at each of the other scales. With it we can estimate with confidence whether polarization is greater at some dates rather than others, and at some scales rather than others—and the combination of those two. It allows for a clear test of the spatial polarization hypothesis.

reported here, we use three:[3] the nine divisions used for reporting many statistical series by the US Bureau of the Census and which approximate to the political culture regions identified by Elazar (1972); the 49 states (excluding Alaska, which is not divided into counties or equivalent smaller areas for the reporting of vote numbers); and the 3,077 counties—or county-equivalents—within those states.[4] The variable whose spatial pattern is being modelled is the number of Democratic voters and the null hypothesis is that those voters are distributed across the counties (and thence the states and divisions) in proportion to the total number of Republican-plus-Democratic voters (i.e. we exclude votes for minor-parties). The data are a bespoke collection derived from the official returns published in each state after the relevant election.[5]

The resulting MORs, with their associated CIs, are shown in figure 1. Those in the left diagram are for the nine census divisions; those in the central diagram are for the 49 states, net of any

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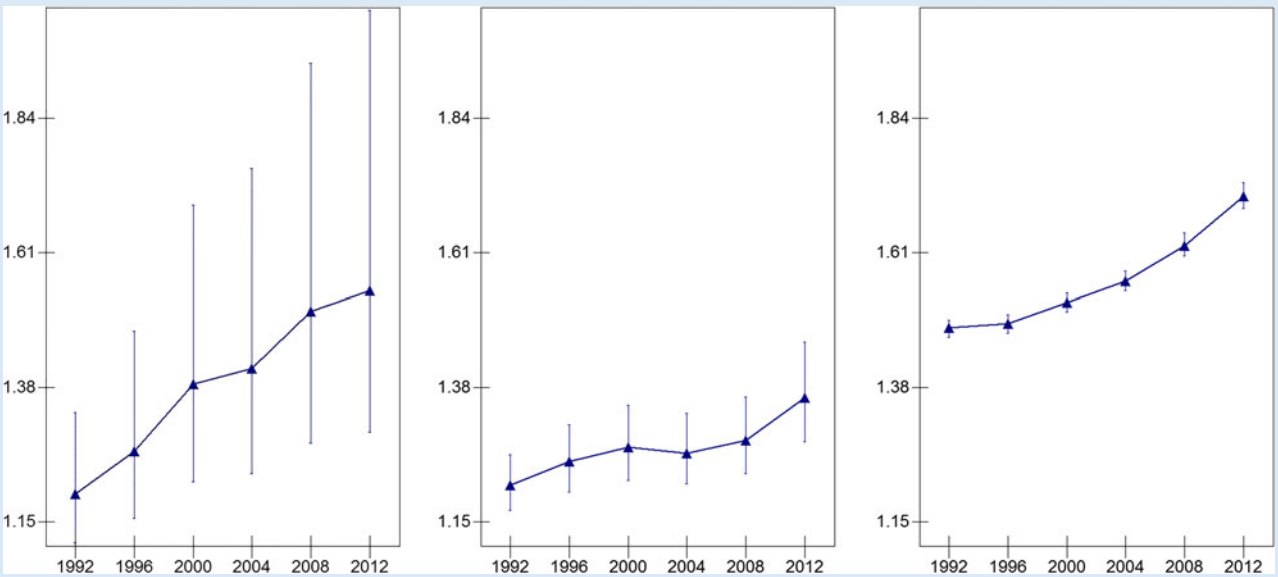
SPATIAL POLARIZATION IN VOTING DEMOCRATIC AT THREE SCALES, 1992–2012

Any analysis of spatial polarization is necessarily arbitrary in its selection of the number and nature of scales to be included. In that

variations between divisions (i.e. the MORs are the average odds ratios in each year between pairs of states within each division—and so are net of any inter-division variation); and those in the right diagram are for counties within each state (i.e. the average

Figure 1

Polarization Trends at Three Spatial Scales



The polarization trends at the three spatial scales, showing the MOR values and their associated CIs. The MOR values for counties are net of any differences between states, and those for states are net of any differences between divisions.

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ratio between pairs of counties selected at random within a state, and thus net of any inter-state, inter-division variation).

All three diagrams provide clear evidence of growing polarization at the selected scales. There was greater polarization in Democratic voting over the period 1992–2012 across the nine divisions—that is, there was greater segregation of Democratic voters into some divisions relative to others. (The MOR value for 2012—1.55—was 29% larger than that for 1992—1.20.) There was greater polarization in Democratic voting over the period 1992–2012 between states within the nine divisions—that is, there was greater segregation of Democratic voters into some states within each division relative to others although that increased polarization was less than that which occurred at the divisional scale (a 12% increase to 1.36). And there was greater polarization in Democratic voting over the period 1992–2012 between the 3,077 counties within states—that is, there was greater segregation of Democratic voters into some counties relative to others within each state (the MOR increased by 14% to 1.69).

These clear upward trends at each scale vary in the statistical significance of the differences in the MOR values at any pair of dates. At the divisional scale, the CIs are large and—not surprisingly given the low number of observations (nine)—overlap: there is no convincing statistical evidence that polarization was significantly greater at any one later date compared to an earlier one—even the CIs for 2012 overlap slightly with those for 1992. However the estimates do not show trendless fluctuation as the pattern is one of consistent increasing polarization.

At the state scale, too, the number of observations (of states within divisions) is fairly small, and the CIs are relatively wide as a consequence – though much less so than at the divisional scale. The modelled MOR for 2012 is significantly greater than that for 1992, however, indicating that by the end of this relatively short period there was greater polarization in voting Democratic at that scale than there was at its beginning. The states were less divided–net of the divisional changes—in their support for Bill Clinton than they were for Barack Obama.

The modelled MOR values at the state scale are much smaller (and significantly so) than those shown in the diagram for the county scale. For counties—within-states, within-divisions—polarization was relatively high at the start of the period (an MOR of 1.48, 48% larger than a value of 1.0 which would indicate no polarization) and substantially larger still (at 1.69) 20 years later. Further, after the first two elections in the sequence, the MOR for each contest was statistically significantly larger than that for the previous election, giving very strong evidence of greater polarization over time at that finest of geographical scales analyzed.

It is also possible to decompose the total logit higher level variance (Browne et al. 2005) between the three scales at each date, and the resulting percentages are shown in table 1. These indicate a substantial shift across the two decades, with the percentage of the variance between divisions more than doubling whereas that between-counties within states declined by a comparable amount; there was no change in the percentage associated with between-states within divisions. Across the six elections, therefore, whereas the differences at the macro-scale between divisions have become more accentuated, those at the micro-scale between counties within states have become less. In relative terms the fine-grained patterning at the start of the period—accounting for over two-thirds of the variance across the map—has become less important whereas the coarser-grained differences at the macro-scale of the nine divisions have become more pronounced. Thus while the absolute change as shown clearly in figure 1 has seen increasing polarization at all three levels, the greater proportion of it has been at the most macro level. But this does not mean that in absolute terms the between-county variation has decreased—quite the contrary. This difference between absolute and relative change poses a further set of questions to be addressed in exploring the reasons behind these changing and increasingly important electoral geographies.

It has provided clear evidence that over the period 1992–2012 the US electorate has become more polarized across the country's nine divisions; that within those divisions it has become more polarized across their component states; and that within the states it has become significantly more polarized across their component counties.

DISCUSSION

This brief article has deployed a new method of measuring polarization/segregation, derived from a multi-level modelling strategy based in Bayesian statistics, at multiple scales. It has provided clear evidence that over the period 1992–2012 the US electorate has become more polarized across the country's nine divisions; that within those divisions it has become more polarized across their component states; and that within the states it has become significantly more polarized across their component counties. In terms of absolute values—the estimated MORs—the greatest polarization over the period has occurred at the largest of those scales (the divisions), but in statistical terms, using the standard measure of significance, the clearest changes have occurred at the

Table 1

Decomposition of the Higher-level Variance into the Percentage of the Total at the Three Spatial Scales

Year	Divisions	States	Counties
1992	14.6	16.6	68.8
1996	21.5	19.1	59.4
2000	30.9	17.4	51.7
2004	31.9	15.1	53.0
2008	36.3	13.8	49.9
2012	33.2	16.8	50.1

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smallest of the three scales analyzed—the counties. At that scale, the evidence is very clear: polarization increased over the 20 years—within a context of increased polarization at both of the scales within which the counties are nested.

This conclusion does not necessarily contradict Glaeser and Ward's. Their study was concerned with a much longer time-span and their chosen measure suggested the same trend as identified here for much of the shorter period we have analyzed. Our—more sophisticated—measures focus on the trends in that shorter period and emphasize their strength. Nor do our findings directly counter Abrams and Fiorina's argument, since they only concluded that they had identified no convincing evidence of the greater polarization claimed by Bishop and Cushing. Our analyses have provided such evidence, not only at the county scale but also at two larger scales as well, although the statistically strongest conclusions apply to the counties.

Any statistical study of this type is constrained by its choice of data, time period and spatial scales to be analyzed and its findings should not be over-generalized; as Abrams and Fiorina suggest, analyses of other data, periods and scales may produce different findings (all spatial analysts are aware of the importance of the Modifiable Areal Unit Problem, for example: see Wong 2009). Nevertheless, the findings reported here provide strong—if not conclusive—support for Bishop and Cushing's claims regarding the changing electoral geography of the United States over recent decades. Whether that change is because of a "big sort" or the operation of other processes remains open to assessment: the analyses reported here have provided clear evidence that the question needs to be asked. Those multilevel analyses do not address the processes underpinning the observed greater polarization, however: Bishop and Cushing argued that these involved selective migration, a contention sustained by a number of recent studies (Cho et al. 2013; Gimpel and Hui 2015; McDonald 2011). Further research into those processes is clearly called for given the strong evidence of greater spatial polarization adduced here: a clear pattern calling for explanations has been established. ■

NOTES

1. The period that we study is shorter than that covered by Bishop and Cushing and was determined by the availability of a carefully collated data set covering the six presidential elections between 1992 and 2012. Since Bishop and Cushing's argument clearly implied a trend between 1974 and 2004 (later 2008) rather than a step-change at some point in the sequence, if we discover a significant trend in the 20 years studied here this would almost certainly validate their argument.
2. Lang and Pearson-Merkowitz (2015) assess trends using inferential statistics, but their parallel approach to the study of polarization to that adopted here does not—unlike Glaeser and Ward, 2005—deploy an index of polarization. Both Myers (2013) and Kinsella et al. (2015) use single-scale inferential measures of spatial clustering to identify changing intensity of polarization.
3. A strong case can be made for the inclusion of other scales, as in the micro-scale variations in Texas explored by Myers (2013) and in Cincinnati by Kinsella et al. (2015), but such data are not available for a country-wide analysis.
4. One of the very useful reviews of a first version of this paper raised the issue of weighting counties according to their populations. In most states, county populations vary widely, and are positively skewed (there is a small number of large counties and a larger number of small ones). This is important, as shown by Firebaugh's (2003) analysis of global income inequality which is found to be increasing in an unweighted analysis that treats each country as a unit but decreasing in a weighted analysis that takes China's huge population into account. In the present analysis the size of the population (defined as the number of voters who are Democrats plus Republicans in each county at each election) is taken into account through an underlying lower level in the manner set out by Browne et al. (2005). This views the proportions voting Democrat at the county level as consisting of replicated binary responses for individuals at the lowest level. As there are no predictors at the individual level the information content of the proportions modelled here as a binomial is exactly the same as individual binary outcomes estimated as a Bernoulli model and the same results will be obtained but more efficiently (as explained in Subramanian et al. 2001). Put simply, the analysis is not based on just the proportions who voted Democrat for they are weighted by the total voters—the so-called binomial weights.
5. The data were collected and collated by Clark Archer, Fred Shelley and Bob Watrell, and we are extremely grateful to them for allowing us to use their material in this study.

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