

Bayesian Estimates of Minority Policy Influence

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Abstract

This paper provides a methodology for estimating the impact of a proposed districting scheme on the substantive representation of minority interests. In particular, we propose to measure substantive representation as the number of votes in support of the minority-favored position on roll calls. We first provide a theory of redistricting and policy outcomes that points to the importance of coalition-building in advancing minority policy concerns. We then detail our measure and apply it to the redistricting of the South Carolina State Senate following the 1990 census. We show that this redistricting led to more minorities being elected to office, but less substantive representation. Furthermore, our methodology would have predicted this decrease in policy influence.

1 Introduction

Section 5 of the 1965 Voting Rights Act mandates that jurisdictions with historic patterns of racial discrimination preclear with the federal government any changes to their laws that might impact minorities' ability to influence the political process. The standard for determining preclearance has been "retrogression," meaning that the proposed change cannot be a step backwards for minorities' exercise of the electoral franchise.¹ The concept of retrogression was devised for, and makes perfect sense in, cases dealing with electoral systems. If, for instance, a municipality formerly had an at-large voting system for its city council and had been forced to change to a district-based system, then an attempt to change back to an at-large system would harm minorities and should thus be denied preclearance.

How, on the other hand, does this principle apply to redistricting, which involves comparing two plans and determining if one, on the whole, is more favorable towards minorities than the other? After all, if a proposed plan takes a district which had formerly contained 65% black voting age population (BVAP) and creates a similar district in the area with only 55% BVAP, those 10% black voters did not disappear: they were reallocated to surrounding districts, where they might have the opportunity to influence the election and behavior of another representative. So under what circumstances is a districting scheme retrogressive?

Until now, the courts had emphasized the election of minority representatives as the key to retrogression: a proposed districting plan should be rejected if it would lead to fewer minorities attaining office.² In a major recent decision, however, the Supreme Court announced in *Georgia v. Ashcroft*

¹This standard was first developed in *Beer v. United States*, 425 U.S. 130, 140 (1976).

²Technically, it is not the number of minorities per se elected that matters, but rather "candidates of choice of the minority community," who could be of any race.

a new set of standards for §5 preclearance in redistricting cases.³ *Ashcroft* established the principle that a plan could be acceptable, even if it would plausibly result in fewer minority representatives' being elected, if the plan was adopted with the support of minorities, and with the purpose of moving actual policy outcomes towards those favored by minority voters. In the classic language of Hannah Pitkin (1967), minorities could trade off descriptive and substantive representation if they so desired.

With this decision comes a new, important challenge: how can one identify expected gains (or losses) in substantive representation from a given redistricting plan? That is, how can we operationalize the Court's decision for future cases? This paper offers one such test, based on representatives' voting patterns: a redistricting plan increases substantive representation if it is expected to produce more votes in favor of minority-supported legislation. We show how to calculate the expected makeup of the legislature for a given districting plan, and how many votes that legislature is likely to produce in favor of minority-supported legislation.

We then provide an example of our method, analyzing the changes that took place in the South Carolina State Senate after the 1992 redistricting. This plan sought to increase the number of minorities elected to office, which it in fact did, but, we argue, at the cost of creating an environment more hostile to passing minority-supported legislation. We show that this expected negative impact could have been predicted from comparing the new districting plan to its predecessor, and that the new legislature was more fractured, more polarized, and less friendly to minority concerns than before.

The policy impact of racial redistricting has been addressed previously, mainly in the context of its partisan impact. The first and most influential of these studies was Brace, Grofman, and Handley (1987), which showed that

³*Georgia v. Ashcroft*, 123 S.Ct. 2498 (2003).

over-gerrymandering racial minorities was linked with the election of more Republicans to office. Later studies—including Hill (1995), Lublin (1997), Lublin and Voss (1998) and Karlan (2000)—investigate the possibility that the increase in majority-minority districts in the 1990’s was at least partially responsible for the Republican takeover of the House following the 1994 elections. And Cameron, Epstein and O’Halloran (1996) investigate optimal gerrymanders to maximize minorities’ substantive representation. We build on these prior studies by offering a systematic method for evaluating the expected impact of a proposed redistricting scheme on the votes in favor of minority-supported legislation.

The following section outlines our theoretical approach to voting, districting, and representation. The next section describes our technique for measuring substantive representation. We then apply our approach to the South Carolina State Senate, examine pre- and post-redistricting outcomes, and consider several extensions of the analysis. The final section concludes.

2 Redistricting and Policy Outcomes

The impact of districting on policy is a two-step process. First, each district elects a representative to the legislature. Second, the set of legislators thus elected collectively produce policy. Each of these relationships—between districts and representatives, and between representatives and policy—is complex in its own right. Putting them together is more complicated still. The purpose of the present section is to unpack this relationship and make some general statements about when redistricting *can* influence policy, and the conditions under which it moves policy in a direction favored by minority voters.

2.1 When Is Minority Influence Possible?

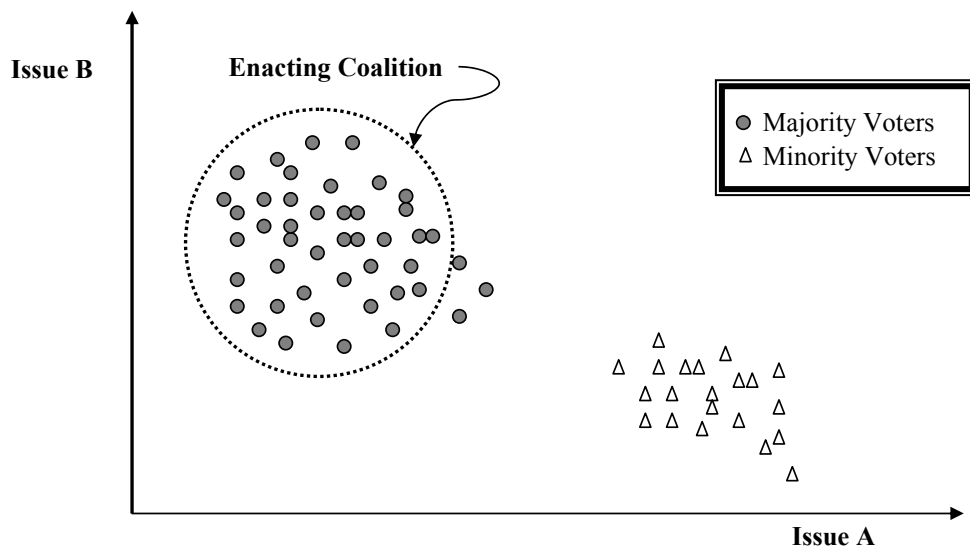
Consider the situation depicted in Figure 1a, where the darkened circles represent voters from the majority group, the triangles represent minority voters, and there are two policy dimensions, A and B.⁴ Issue A, for example, might represent the degree of redistribution in a tax system, while issue B might be the strength of civil rights laws. Assume, as shown in the figure, that the distribution of voter preferences or ideal points yields fairly homogeneous majority and minority groups who oppose each other on both issue dimensions. Further assume that legislators are elected from equally-populated districts and compete for office by adopting the policy positions most preferred by their constituents, so that legislators' ideal points will be the dimension-by-dimension median ideal point of their constituents.

When voter preferences are polarized as in Figure 1a, it is clear that, as long as the districting plan gives the majority group over half of the seats in the legislature, the majority will be able to enact its preferred policy in both dimensions over the wishes of the minority.⁵ A redistricting plan might increase the number of seats that the minority group controls in the legislature, thus boosting descriptive representation, but these representatives will then simply be outvoted in the chamber.⁶

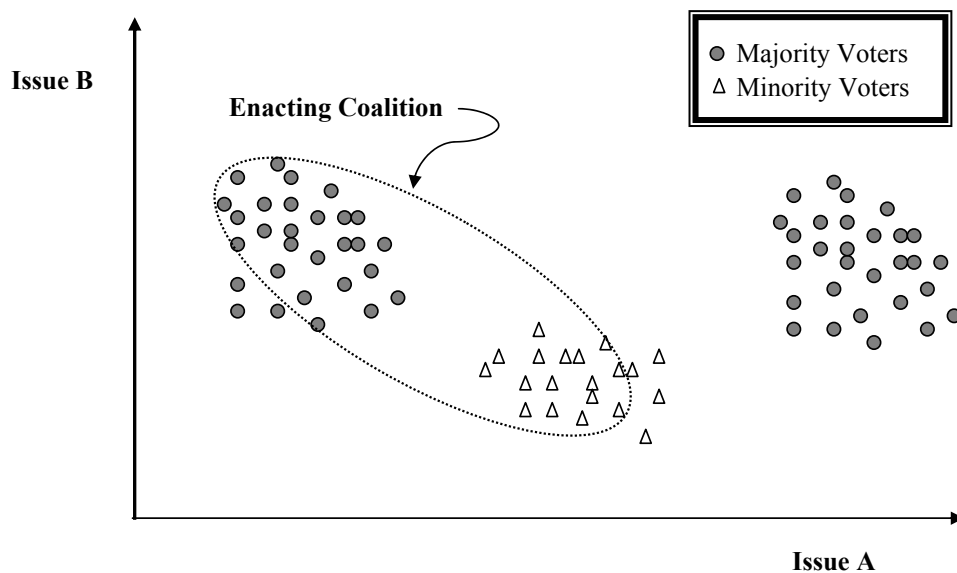
⁴We will assume here, and in the remainder of the paper, that the minority group in question is the black community. Most of the analysis would be identical for other minority groups, such as Hispanics, but these cases present other important issues—such as lower registration rates and policy divisions within the minority community—not treated here.

⁵Given perfectly homogeneous minority and majority populations that are proportions $p \in [0, \frac{1}{2}]$ and $(1 - p)$ of the total population, respectively, a districting scheme can result in the minority's controlling anywhere from 0 to $2p$ of the seats in the legislature, so that a cohesive minority comprising only 25% of the overall population could theoretically control a majority of the legislature. As a rule, though, districting tends to diminish minorities' influence rather than increase it: the "cube law" states that on average the ratio of seats won by minority-backed candidates as opposed to majority-backed candidates will be only $(\frac{p}{1-p})^3$, which is less than p . See Rae (1967) and Taagepera and Shugart (1989) for further discussion.

⁶The example contained within Figure 1a may seem trivial, but some of the legal literature associated with voting rights assumes both that majority and minority preferences are completely polarized *and* that districting can help ameliorate problems of substantive



(a) Bloc Voting and Unresponsiveness to Minority Concerns



(b) Minority Voters as Swing Voters

Figure 1: Alternative scenarios for the role of minorities in passing policy

A similar figure, in fact, can represent any policy space with an arbitrary number of dimensions in which two citizen groups are polarized and vote cohesively on all issues: one could simply draw a line between the ideal points of the majority and the minority groups to yield the same, essentially one-dimensional, picture. Figure 1a thus represents the position of most Blacks in local southern politics since Reconstruction, where the white majority consistently opposed the black minority on issues of public policy. In this situation, racial redistricting alone cannot secure minority voters any say over final policy outcomes.⁷

2.2 Competing Logrolls

Thus the idea that redistricting can affect policy necessarily presupposes some division within the majority community. Consider, then, Figure 1b, where the majority finds itself split over issue A. If the split within the majority faction is large enough, then minority voters might become attractive coalition partners for one of the majority groups. In these circumstances an electoral coalition may look something like the oval indicated in the figure, with one of the majority factions and the minority group trading off policy concerns across the two dimensions. Figure 1b, then, illustrates the position of Blacks as key swing voters in national politics from the late 1950s to the mid-60s, the era in which Democrats and Republicans vied for the black vote and vast strides were made on social issues important to minorities, such as voting rights, housing, and public transportation.

There are two strategies that minorities might employ to build and ex-

representation. For a typical exposition in this genre see John Hart Ely (1997). For an overview of the voting rights case law see Issacharoff, Karlan and Pildes (1998), and for a more nuanced discussion of polarization see Grofman, Handley and Niemi (1992).

⁷This realization was one of the motivating forces leading Guinier (1995) to suggest not just alternative majoritarian voting systems, like cumulative voting, but some non-majoritarian ones as well, including concurrent majorities.

exploit such coalitions. The first emphasizes electing as many minority representatives as possible, thus ensuring a core of legislators heavily dedicated to minority concerns. These legislators can then bargain with representatives from other factions—say, White Democrats—in the legislature to produce policy outcomes favorable, on some issues, to their minority constituents.

On the other hand, it may be more effective to spread out black voters and have less influence over more districts. This shifts the weight of the coalition-building exercise to the electoral stage; minorities become part of the electoral coalition of a major party, in hopes that its representatives will include some pro-minority policies in its platform.

We thus have two alternative strategies for coalition building: one emphasizes legislative coalitions while the other is more electorally-based. In the first, electing as many minority candidates as possible is the key to building policy leverage, while in the latter fewer minorities may obtain office as minority voters are spread out in what are termed “influence districts.” One strategy may be more effective than the other under different circumstances, depending on whether it is easier to logroll electorally, or in the legislature.

In either case, one can measure the success of a districting strategy by the number of votes cast by legislators in the same direction as the votes of minority representatives themselves. That is, both strategies have the same end goal of producing legislative coalitions that pass minority-supported legislation. This standard is appropriate, we argue, not because one assumes that minority legislators vote only for bills that are in exact accordance with their constituents’ desires, but because we assume that they rationally trade off support for some bills that they marginally favor for support of other bills that more directly address their key concerns. To the contrary, fewer votes in support of the minority position may indicate that these legislators are being isolated and hence less influential over policy outcomes.

3 Data and Estimation Methodology

In accordance with the theoretical framework introduced above, we propose to measure minority substantive representation as the number of votes in favor of the minority-supported position on roll calls. This section introduces the techniques necessary to perform these calculations and applies them to the concrete example of the South Carolina State Senate before and after the 1992 redistricting.

South Carolina is a convenient case to study: the entire state falls under the preclearance provisions of the Voting Rights Act, and its minority voting population is composed almost entirely of Blacks, thus avoiding the complexities that arise when more than one minority group is classified as a community of interest. Furthermore, the final redistricting plan adopted for the Senate was expressly designed to increase the number of minority officeholders; notably, this plan was implemented after the Justice Department rejected an earlier redistricting plan on the grounds that it did not create sufficient numbers of majority-minority districts.⁸ Finally, a state-level redistricting plan will gerrymander an entire legislature at once; consequently, we can directly assess the impact of the plan on the overall composition of that legislature.

3.1 Background on the South Carolina State Senate

We begin our analysis with some background: according to the 1990 census, 29.82% of South Carolina's total population and 26.93% of its voting age population were black. The State Senate had 46 seats, and in the regular election cycle all senators were reelected every four years, with no staggered terms. Between 1988 and 1994, there were 97 elections to the Senate. Of

⁸See *Smith v. Beasley*, 946 F.Supp. 1174 (1996), for a history of South Carolina legislative redistricting in the 1990s.

these, 46 occurred in each of the regular election cycles in 1988 and 1992, and five were special elections called to fill vacancies.

Republican candidates won 28 of the 97 elections and Democrats won 69; of the Democratic victors, 56 were non-minority candidates, 13 were minorities, and thus Blacks were elected to office in 13.4% of all elections. Twenty elections were held in majority-black districts; of these, minority candidates were elected in 11 and non-minorities in 9. In addition, there were two elections in which a minority candidate won in a district that was less than majority-minority. Minorities were elected to the Senate from districts as low as 47.7% BVAP, and districts as high as 59.9% BVAP elected non-minority senators to office.

As of the 1990 census, 9 out of the 46 senatorial districts contained a majority of black residents in their voting age populations. The redistricting plan adopted in 1992, though, raised that number to 11 districts, some of which had contorted, irregular shapes.⁹ The strategy behind the redistricting is illustrated in Figure 2, which arranges the districts in the old and new plans in order of increasing BVAP and shows the difference between them. The figure clearly indicates that the redistricting took black voters out of moderate-BVAP districts—those with BVAP’s between 10.5% and 36.9%—and reallocated them to districts with more black voters. This would make it easier to elect minority representatives to office, but would also increase the probability of electing Republicans elsewhere.

In fact, this is exactly what happened. The elections of 1992 saw the number of blacks elected to the legislature rise from five to seven, but it also witnessed the number of Republicans increase from 11 to 16. Before the 1992 elections, White Democrats held 30 out of 46 seats and thus commanded an absolute majority; after the elections, this number fell to 23, a bare non-

⁹In fact, their bizarre shapes led the federal courts to strike down Districts 29 and 37 as unconstitutional racial gerrymanders. See *Smith v. Beasley*, *ibid*.

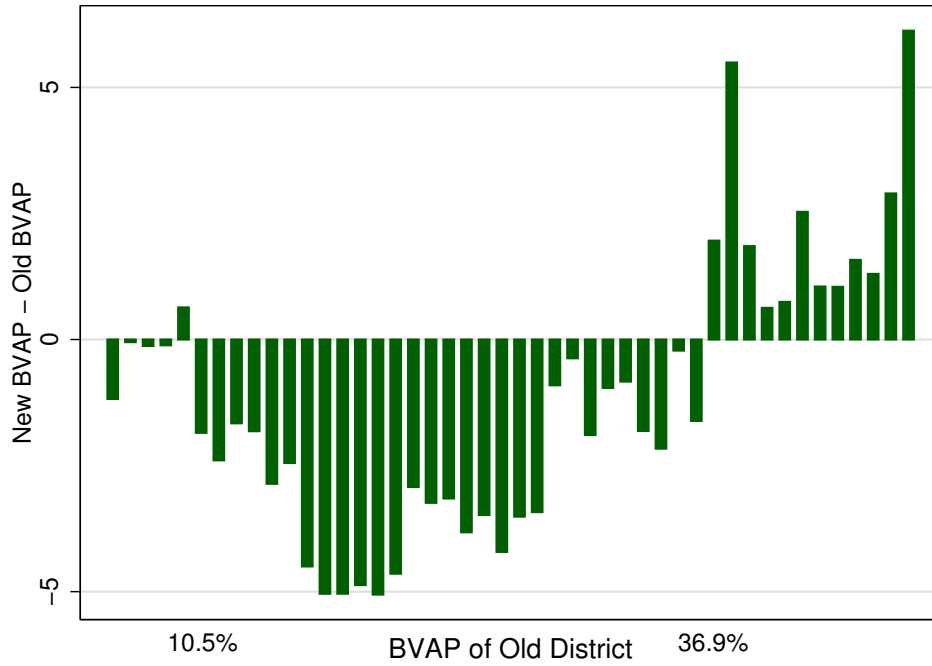


Figure 2: Change in BVAP from Old to New Plan

majority. The purpose of the analysis here is to estimate the impact that these changes had on the substantive representation of black interests.

3.2 Estimating Substantive Representation

These figures suggest that the increase in black descriptive representation after the redistricting may have been offset by a jump in the number of Republicans elected to the chamber. To assess the net impact of these changes on substantive representation, we examine changes in the degree to which legislators voted with the black majority on roll calls.

We implement our approach as follows. First, calculate for each roll call whether the majority of black representatives voted Aye or Nay. Then score each senator for each roll call, assigning them a score of 1 if they voted with the black majority, 0 if they voted in opposition, and a missing value if they abstained. Finally, average these scores by district and year to get what we

term that legislator’s Vote Score. This method is similar to that used by interest groups—such as ADA, COPE, and LCCR—in their rating scores. One then compares the average Vote Score before and after redistricting to evaluate the impact on substantive representation.

To see whether the Vote Score changes in the South Carolina Senate were statistically significant, we also calculate ideal points for legislators using modern simulation-based estimation techniques. These methods produce standard errors, which help determine whether differences across time are statistically significant or not, and they automatically weigh more heavily those roll calls on which the Black Democrat delegation displayed a greater degree of cohesion.

In particular, we employ a Bayesian approach to ideal point estimation in the context of roll-call voting (Bafumi, Park and Gelman, 2003, Clinton et al. 2004, Jackman 2001, Clinton and Meirowitz 2001, Jackman 2000). Roll-call data can be arranged as $Y = \{y_{kj}\}$, a K by J matrix indicating whether senator $k = 1, \dots, K$ votes with ($y_{kj} = 1$) or against ($y_{kj} = 0$) the black majority on a proposal $j = 1, \dots, J$. Each representative k has a preferred policy position, α_k , a point in a d -dimensional Euclidean policy space. We assume $d = 1$, so that the model is equivalent to the two-parameter item-response model used in educational testing (Clinton et al. 2004). Therefore, the model can be set up in the following manner:

$$y_i \sim \text{Bernoulli}(p_i) \tag{1}$$

$$\text{logit}(p_i) = \mu_i \tag{2}$$

$$\mu_i = \beta_{1ji}(\alpha_{ki} - \beta_{2ji}), \tag{3}$$

where β_{1j} is the “item discrimination” parameter, β_{2j} is the “item difficulty” parameter, and α_k , the latent trait or “ability” parameter, is the ideal point

of representative k . Therefore we need to estimate β_{1j} , β_{2j} and α_k for all j and k . In the Bayesian context, we estimate the parameters via the prior $p(\alpha) = \prod_{k=1}^K \phi_1(\alpha_k)$, where $\phi_1(\cdot)$ is the unidimensional standard normal density. We set the following:

$$\beta_{1j} \sim N(\mu_{\beta 1}, \sigma_{\beta}^2) \quad (4)$$

$$\beta_{2j} \sim N(\mu_{\beta 2}, \sigma_{\beta}^2) \quad (5)$$

$$\alpha_k \sim N(\mu_{\alpha k}, \sigma_{\alpha}^2), \quad (6)$$

where

$$\mu_{\beta 1} \sim N(0, .001) \quad (7)$$

$$\mu_{\beta 2} \sim N(0, .001) \quad (8)$$

$$\sigma_{\beta}^2 \sim \text{Unif}(0, 100) \quad (9)$$

$$\sigma_{\alpha}^2 \sim \text{Unif}(0, 100). \quad (10)$$

Estimation in the Bayesian context requires computing the posterior density $p(\beta_1, \beta_2, \alpha | Y)$. We use Markov chain Monte Carlo (MCMC) to build a characterization of the posterior density by sampling from the conditional distributions that constitute the joint posterior density of interest.¹⁰ We use WinBUGS to explore the joint posterior density of all the model parameters.

In practice, these two methods of estimating legislator preferences—Vote Scores and Bayesian estimates—should give similar results. We calculated both these statistics using all roll calls cast in the Senate between 1990 and 1994.¹¹ As shown in Figure 3, there was indeed a high correlation between

¹⁰For a good discussion on MCMC methods for political scientists, see Jackman (2000).

¹¹A total of 903 votes cast in the Senate between 1990 and 1994 were analyzed through the recorded votes listed in the index of the *South Carolina Senate Journal*. All recorded votes associated with a roll call were included, as were all votes over substantive policy matters not contained in the index, e.g., veto overrides.

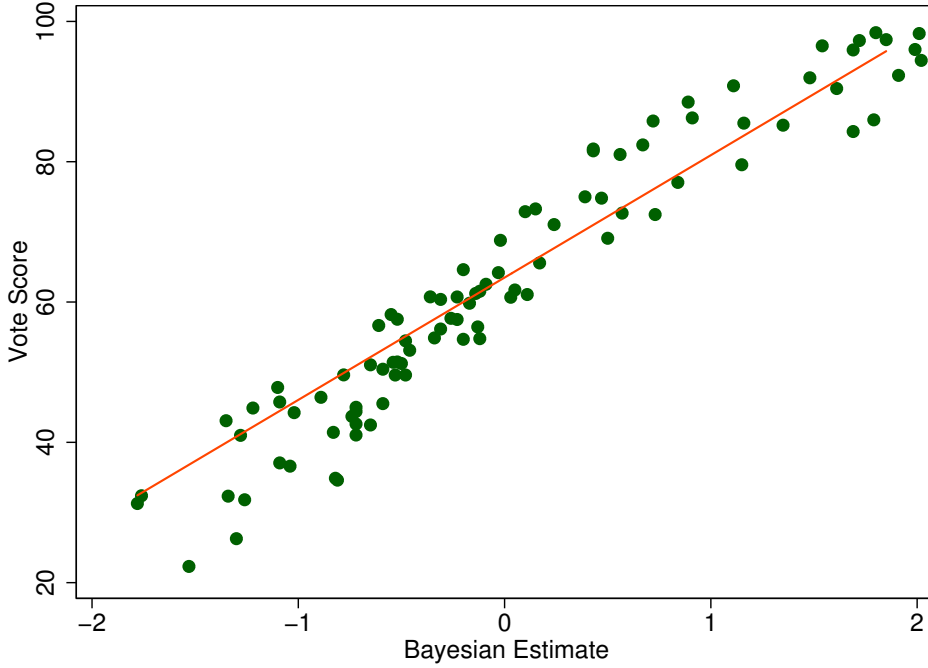


Figure 3: Bayesian Estimates vs. Vote Scores

the two measures (to be precise, it was 0.97). This serves as a primary consistency check on our estimates.

3.3 Predicting Changes in Representation

Vote Score calculations can then be used to predict expected changes in substantive representation due to a proposed districting plan, as follows. First, use univariate ordered probit analysis to calculate the probability of different types of legislators' being elected for a given level of BVAP. For K different types of legislators, then, we have:

$$\Phi^{-1}\left(\sum_{i=1}^k p_i\right) = \alpha_k + \beta * \text{BVAP} \quad (11)$$

where $\Phi(\cdot)$ is the cumulative standard normal distribution and $k = 1 \dots K$. In our study we divide legislators into three types: Republicans, White

Democrats and Black Democrats, so we use Equation 11 to estimate the probability that each type is elected for any given level of BVAP.

Then calculate the expected voting behavior of a given type of representative based on the BVAP in her district

$$E(VS) = VS(BVAP, \theta), \quad (12)$$

where VS is the Vote Score index, and θ is the type of representative. To diminish the impact of outliers it is appropriate to use robust linear regression techniques for this step, after which one can compare the estimated relationship to a non-parametric lowess curve to check for structural breaks or other important non-linearities.

Finally, calculate the expected Vote Score in the new legislature as

$$E(VS|BVAP) = \sum_{\theta} \text{Prob}(\theta|BVAP) * E(VS|BVAP, \theta). \quad (13)$$

That is, the expected Vote Score for a district with a given level of BVAP combines the probability that each type of representative will be elected, given the district BVAP, and their subsequent expected voting patterns, given both BVAP and their type. Calculating Equation 13 for each district in a proposed redistricting plan gives the expected profile of the new legislature. The new median can then be compared to that of the existing legislature to check for expected increases (or decreases) in substantive representation.

4 Results

We now use our estimated ideal points, derived both via Vote Scores and Bayesian methods, to examine the impact of the 1992 redistricting plan on the South Carolina Senate. We first discuss the extent to which the overall

composition of the Senate was affected by the redistricting. We then determine how well the methods described in the previous section could have anticipated these changes. Finally, we analyze the impact of the redistricting on polarization within the Senate and on the composition of winning legislative coalitions.

4.1 Changes in Aggregate Preferences

Starting with the main result, Figure 4 shows histograms of the Vote Score variable before and after redistricting. As shown, consistent with the redistricting strategy illustrated in Figure 2, there are more legislators at the extremes of the distribution and fewer in the middle.

In fact, the average Vote Score dropped after redistricting from 63.5 to 61.2, a modest fall of 3.8%. The median Vote Score fell from 60.7 to 55.5, or 9.4%. Of these two, the former indicates the expected percentage of legislators who would vote with the minority on roll calls, while the latter gives the position of the key swing voter in the legislature, since it is only by getting a majority of votes that legislation can pass. If we recalculate these scores using only those votes on which the black legislators were unanimous (either for or against), the pattern is even more pronounced: a drop in the mean from 65.6 to 60.1 and a median drop from 61.2 to 54.9.

Bayesian ideal point estimates are unsuitable for measuring changes in the mean voter since they are defined to have mean zero both before and after the redistricting. But if a legislature polarizes and shifts in one direction, then the median can change even if the mean and standard deviation are constant.¹²

In our case, the median Bayesian estimate fell from -0.155 to -0.255. To see if this change was significant, we performed a 50,000-draw Monte Carlo

¹²For similar analysis using Supreme Court data, see Martin and Quinn (2002).

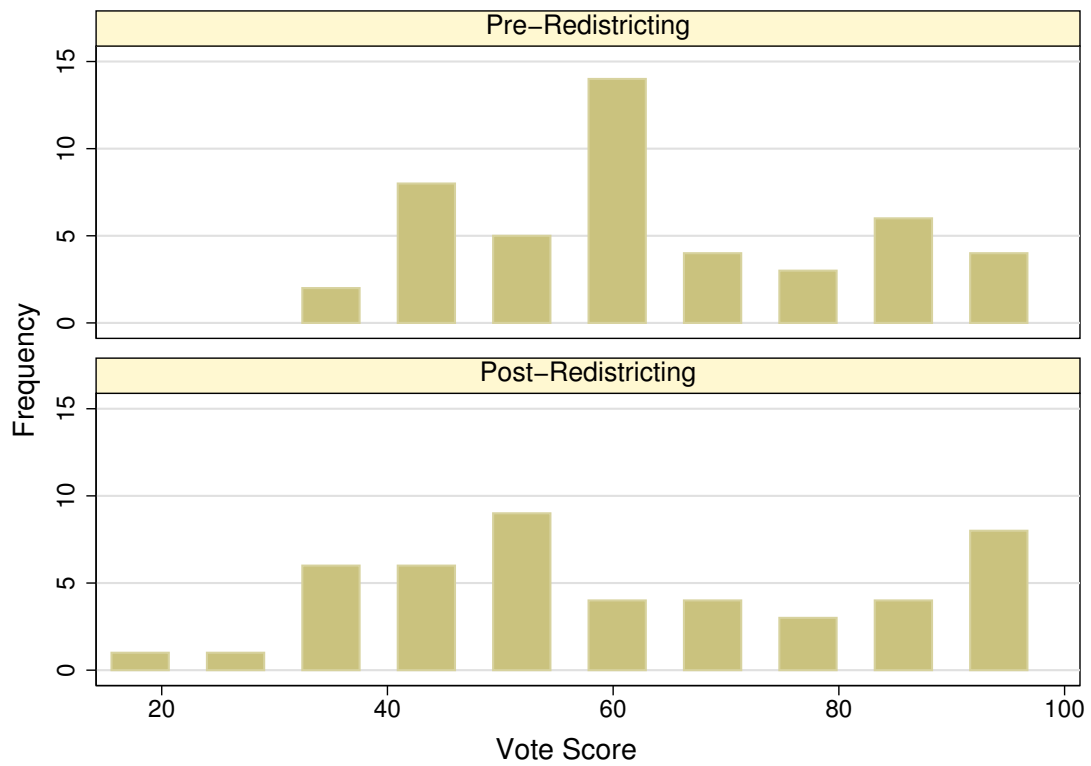


Figure 4: Histograms of Vote Score distributions, before and after redistricting.

simulation, repeatedly drawing legislator ideal points from a normal distribution given by their Bayesian estimated means and standard deviations. We then examined the distribution on the difference between the medians. The simulations yielded a mean difference of 0.106, with a standard deviation of .061, significant at the standard 5% level; we thus conclude that the shift in the legislative median after the redistricting was statistically significant.

From what did this change in aggregate preferences derive? Did legislators of different types act differently in the post-redistricting legislature? We investigated this question from a number of different angles. Figure 5 shows box plots of each type of representative, before and after redistricting, with little variation at all. Moreover, Figure 6 shows linear regressions of Vote Score and Bayesian estimates on BVAP before (“Pre”) and after (“Post”) redistricting. The only notable features of this graph are the slightly higher Republican Bayesian scores after redistricting and the steeper pre-redistricting Black Democrat curves, although the small number of observations makes this latter result less compelling. Finally, we regressed Vote Score on legislators’ race and party, the BVAP in the district, and pre- or post-redistricting. As Table 1 shows, only the redistricting variable was insignificant.

From these results, we conclude that the difference in the pre- and post-redistricting Senates did not lie in the changing behavior of any particular type of representative; rather, it must have come from changes in the overall composition of the legislature. A quick look at the numbers in Table 2 confirms this.

As shown in the table, Republicans had an average Vote Score roughly 20 points below the mean, while Black Democrats were 30 points above the mean. Thus a redistricting plan that had a 3-to-2 tradeoff—i.e., resulted in the election of three extra Republicans for every two extra Black Democrats—would leave the overall average unchanged. As mentioned above, though, the

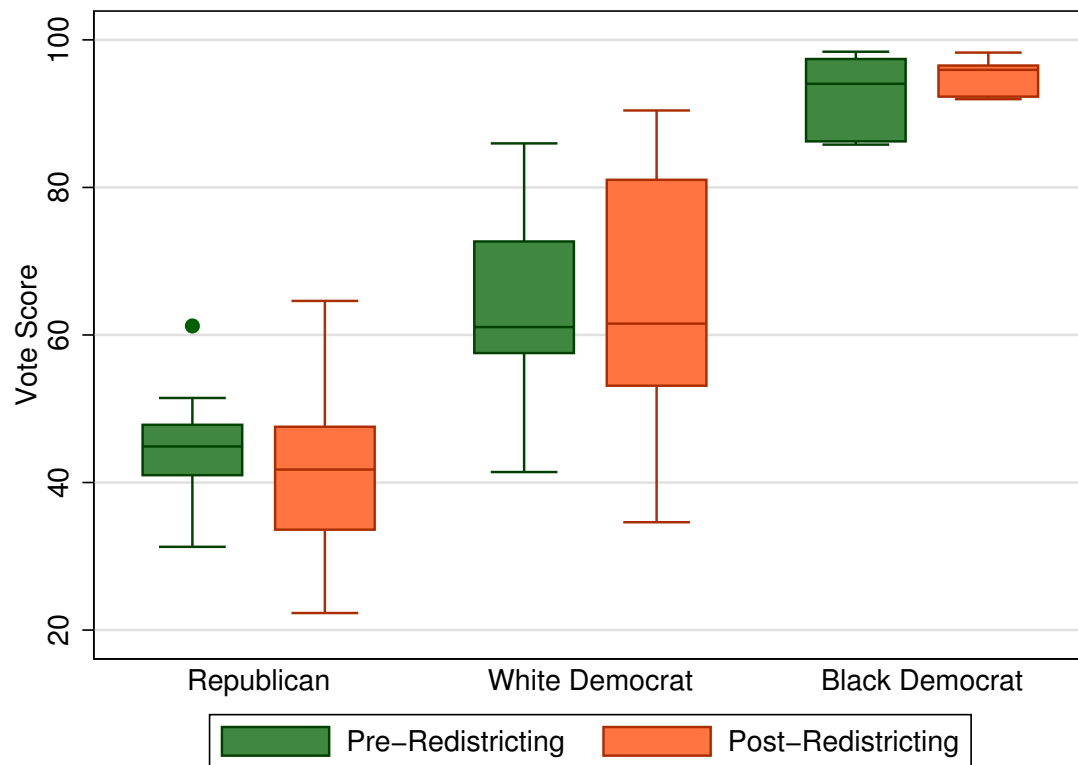


Figure 5: Box plots of Vote Scores, by type of representative, before and after redistricting.

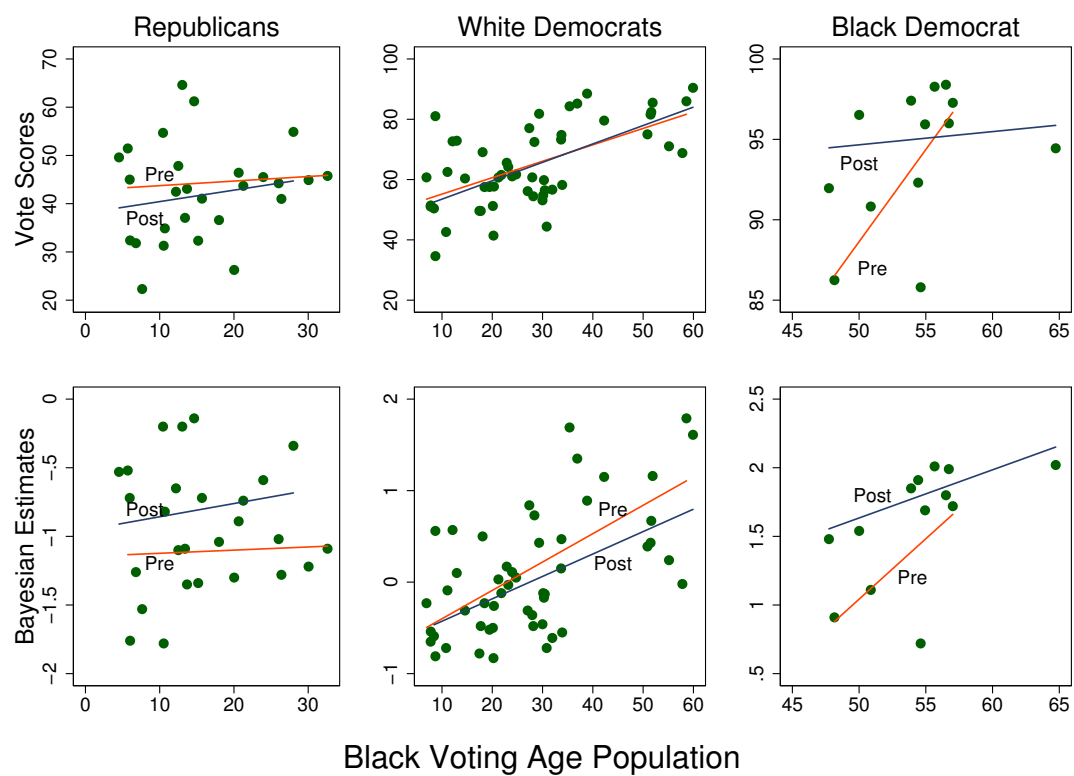


Figure 6: Relation between BVAP and voting patterns, by type, before and after redistricting.

Table 1: VoteScore Regression Results

Variable	Coefficient (Std. Err.)
pre	0.003 (0.021)
Black	0.155** (0.039)
Democrat	0.157** (0.026)
Black Voting Age Population	0.005** (0.001)
Intercept	0.343** (0.025)
N	92
R ²	0.757
F _(4,87)	67.618

Time Period	Republicans	White Dems	Black Dems	Total
Pre-Redistricting	44.5	64.7	92.7	63.5
Post-Redistricting	41.4	64.6	95.1	61.2
Total	42.7	64.6	94.0	62.3

Table 2: Vote Scores, By type of representative

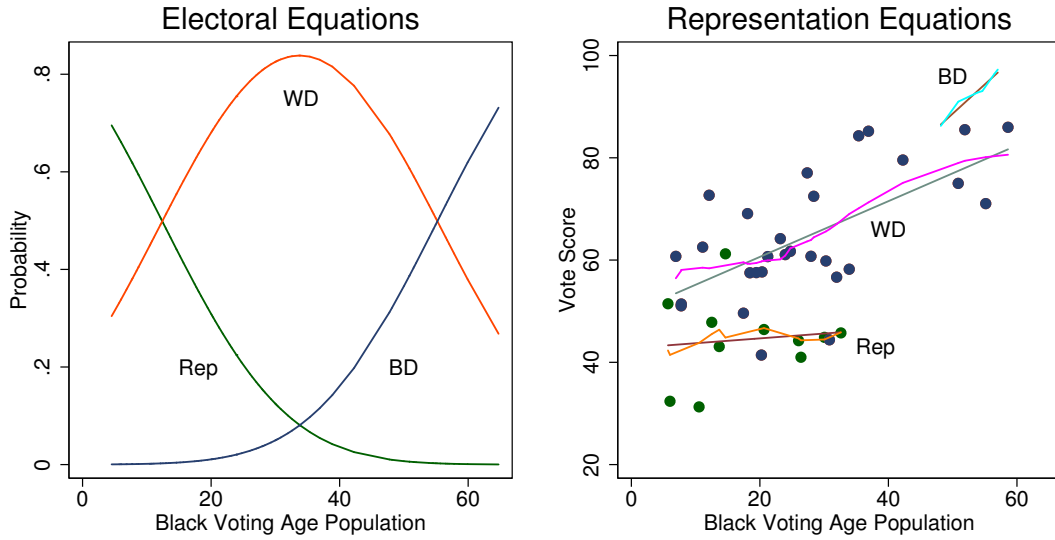


Figure 7: Representation and Electoral Equations

price of two new Black Democrats in 1992 was six new Republicans, and this lowered the expected Vote Score for legislature as a whole.

4.2 Predicting Changes in Substantive Representation

To see how well our methodology would have predicted these changes in legislators' ideal points, we must first estimate the probabilities that different types of legislators are elected, and the relation between a district's BVAP and its legislator's voting behavior, as in Equations 11 and 12. The outcomes from these analyses are illustrated in Figure 7.

The left-hand panel shows the estimated probability of electing each type of representative at different levels of BVAP, based on elections prior to 1992. The results are intuitive: at first Republicans are the most likely to gain office, then White Democrats, and finally Black Democrats at high levels of BVAP. The right-hand panel shows the relation between BVAP and Vote Scores for each type of representative, along with a lowess line. As illustrated, a robust

Actual Type	Expected Type		
	Republican	White Democrat	Black Democrat
Republican	7	9	0
White Democrat	4	17	2
Black Democrat	0	4	3

Table 3: Hits and misses, predicting type of representative

linear fit works well in all cases.¹³

Using these estimates, what should the redistricting have produced? We apply Equation 13 to the electoral and representation equations and derive expected Vote Scores for each new district. In the aggregate, the predictions matched reality quite well: the actual mean Vote Score was 61.2, as compared to a predicted value of 62.8, and the median was 55.5, as compared to a prediction of 57.3.

Digging a little deeper, we look at errors in predicting the types of representatives elected, and the Vote Scores given these types. As Table 3 shows, the predicted election results were fairly accurate, but with some variation due in large part to the number of districts with toss-up Republican/White Democrat or White Democrat/Black Democrat races.¹⁴ In the end, these errors should more or less even out, so that the predicted and actual mean Vote Scores are close, as noted above.

Investigating further, we inspect predicted and actual Vote Scores in the post-redistricting Senate, given the actual type of representative elected. Table 4 shows that the Vote Scores for White Democrats were almost exactly as predicted. But the Republicans' were less than expected, while the Black Democrats were higher than expected. This indicates that in the new leg-

¹³Similar results obtain if we use Bayesian estimates instead of Vote Scores.

¹⁴There were 12 races in which the probability of a Republican vs. White Democrat was between 40% and 60%, and 7 races where the same held for White Democrat vs. Black Democrat.

Type	Mean Vote Score	
	Predicted	Actual
Republican	52.6	41.4
White Democrat	64.9	64.6
Black Democrat	88.2	95.1

Table 4: Predicted and actual Vote Scores, by type of representative

islature, Black Democrats voted even more cohesively than before, while Republicans voted in greater numbers against the positions taken by the minority representatives.

4.3 Polarization and Winning Coalitions

This serves as a good transition to examining the impact of the redistricting on polarization and voting patterns within the Senate. The theory presented above posits that Vote Scores serve as a good proxy for the extent to which other legislators will support Black Democrats on roll calls. Since the Vote Scores fell post-redistricting, we would predict an overall less favorable environment for minority legislators in their attempts to form coalitions to pass legislation.

Our first result on polarization, from Table 4, shows some indications that Republicans and Black Democrats were more in opposition to each other after the redistricting. Indeed, the average black voting age population in white and black Democrats' districts rose slightly, while in Republican districts it fell from 18.1% to 14.2%, so Republicans on average had fewer black constituents to represent. Overall polarization in the legislature increased as well, with the distance between the median Republican and Black Democrat ideal points rising from 2.51 units pre-redistricting to 2.64 afterwards. Voting patterns also polarized; the correlation between Black Democrat and

Type	Average Distance	
	Pre-Redistricting	Post-Redistricting
Republican	0.96	0.60
White Democrat	0.29	0.29
Black Democrat	1.55	2.04

Table 5: Average distance from median winning coalition ideal point to median type ideal point, pre- and post-redistricting

Republican votes fell from -0.16 to -0.33 in the post-redistricting Senate.

Did this polarization lead, in the end, to policies less favored by minority constituents? Measuring policy outcomes is always difficult, but one indication is the composition of winning coalitions. Table 5 shows the average distance from the median ideal point among members of the winning coalition on roll calls to median ideal point of each legislator type. As the table indicates, outcomes were nearer the Republican ideal points, the same distance from White Democrats, and further from Black Democrats.

Finally, regarding actual policy outcomes, strong evidence suggests that the situation worsened from minorities' point of view. Senator Darrell Jackson, for instance, testifying about the impact of the redistricting before the U.S. District Court in *Smith v. Beasley*, said "It's about more than just the license plates," meaning that he, like many other African-American legislators, ran for public office for more than just the free parking that came with the job. Even though a historic number of African-Americans had been elected to the South Carolina General Assembly, he testified, their ability to enact legislation seemed to have diminished as they found themselves outvoted time and again by an unsympathetic coalition of Republicans and White Democrats. He noted that the black community had suffered a number of policy defeats on important issues, including the state flag, a Civil War memorial to black soldiers, and school funding. In the end, he admit-

ted, the same districting plans that promoted the election of minorities to office had also resulted in the election of more conservative representatives in surrounding areas.

5 Conclusion

This paper presented a theoretically-motivated measure of substantive representation as the expected number of votes in favor of the minority-supported position on roll calls. We detailed how this measure can be calculated from a record of members' votes, and how it could be used to project the expected change in substantive representation from a proposed redistricting scheme.

We then applied our technique to the South Carolina Senate and showed that, by our measure, substantive representation fell after the 1992 redistricting. Moreover, this change could have been predicted from the previously available data, and it resulted in a more polarized Senate, less friendly overall to minority policy concerns.

We hasten to add that these results do not mean that the redistricting plan should have been disallowed for these reasons alone. Indeed, minority voters may well choose a plan that trades off less substantive for more descriptive representation without violating any legal norms.¹⁵ The important point, though, is that the *Ashcroft* decision gives them the opportunity to do the opposite as well, to agree to fewer minority representatives but greater overall influence on policy. The techniques presented here thus provide a possible yardstick for measuring when a proposed plan will be expected to meet this objective and raise minority substantive representation.

¹⁵The 1992 plan was overturned not on these grounds, but because its numerous bizarrely-shaped districts ran afoul of the *Shaw v. Reno* standard.

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