X-Politics: How the Ideologues Hijacked America

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Chapter 2: Measuring Ideology

Introduction

Throughout this book we use NOMINATE scores to measure the ideological stances of members of the House and Senate. NOMINATE stands for *Nomina*l *T*hree-Step *E*stimation – a statistical method we developed to analyze roll call voting. In a roll call vote members can only vote "Yea" or "Nay" (Yes or No) on the motion or bill under consideration. NOMINATE distills the hundreds of roll call votes taken during a typical two-year period into scores for each member on the major ideological dimensions that shaped American politics during the period of the voting.

In recent Congresses a single score that measures how liberal/conservative a member is accounts for most of the choices members make. In contrast, fifty years ago there were two major ideological dimensions shaping American politics. In addition to

the liberal/conservative dimension, America was also divided over Civil Rights for African-Americans. The divisions were primarily based in the old Civil War alignment of the northern states versus the southern states. These two dimensions tended to be largely independent of one another. A southern Democrat member of Congress could favor most of the economic policies popular with rank and file Democrats yet be strongly opposed to allowing African-Americans the right to vote. In contrast, conservative Republicans could oppose those same economic policies but champion Civil Rights for African-Americans. Hence, two scores are needed to adequately account for how members of Congress voted during this period.

Driving Distances and Maps

NOMINATE is a fairly complex statistical procedure and we are not going to try to delve into here. However, its end product can be understood without recourse to arcane mathematics. Simply put, NOMINATE produces *ideological maps* which are much like those in our AAA road atlas that we use to drive from one city to another. To see this point consider the driving distances between eleven cities shown in Table 2.1.

Table 2.1: Driving Distances Between 11 U. S. Cities

	Atlanta	Boise	Bos	Chi	Cin	Dal	Den	LA	Mia	DC	SF
Atlanta	0	2340	1084	715	481	826	1519	2252	662	641	2450
Boise	2340	0	2797	1789	2018	1661	891	908	2974	2480	680
Boston	1084	2797	0	976	853	1868	2008	3130	1547	443	3160
Chicago	715	1789	976	0	301	936	1017	2189	1386	696	2200
Cincinnati	481	2018	853	301	0	988	1245	2292	1143	498	2330
Dallas	826	1661	1868	936	988	0	797	1431	1394	1414	1720
Denver	1519	891	2008	1017	1245	797	0	1189	2126	1707	1290
Los Angeles	2252	908	3130	2189	2292	1431	1189	0	2885	2754	370
Miami	662	2974	1547	1386	1143	1394	2126	2885	0	1096	3110
Washington	641	2480	443	696	498	1414	1707	2754	1096	0	2870
San Francisco	2450	680	3160	2200	2330	1720	1290	370	3110	2870	0

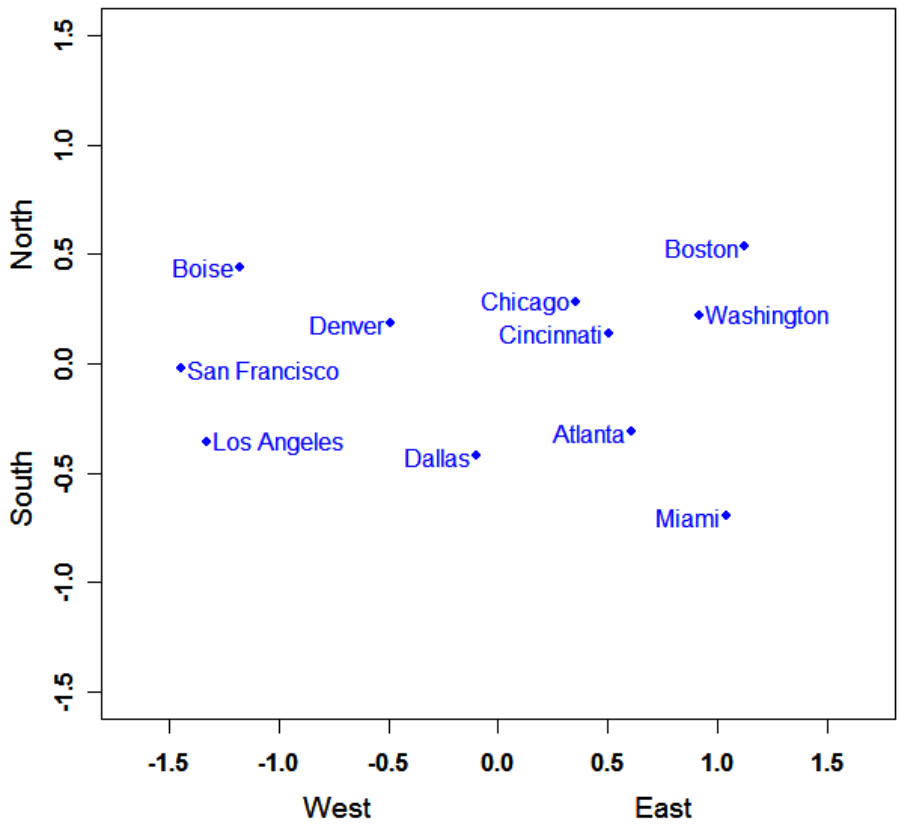
Table 2.1 is much like the table you will find after all the maps in most road atlases. Each entry in the table tells you how far it is to drive between the corresponding row and column cities. A table of distances is very useful if all we want to know is how far apart two cities are. However, it is not a *map*. We can stare at the table for a long time and still not be able to *visualize* the arrangement of the cities. That is, after all, why we also have maps.

But the table of distances has a map within it. With a blank sheet of paper, a ruler, a compass, *and* a lot of patience, we can use the distances to draw a map. For example, let one inch be equal to 500 miles, start with two cities – A and B -- and place them the correct number of inches apart. Then select a third city – C -- and use the compass to draw a circle around city A and a circle around city B with radii equal to the appropriate number of inches. The two circles will intersect at two points. Select one of the points to be city C. Now, if the distances are exact then we can locate all the remaining cities by using the compass to draw circles of the appropriate radii around cities A, B, and C. There will be one unique intersection point of the three circles for each of the remaining cities.

Our geometry example illustrates some important facts about distances. Note that A and B can be located anywhere on our sheet of paper provided they are the correct distance apart. Similarly, we would get the same configuration of cities regardless of which of the two points we used for C (produced by our first two circles around A and B). In other words, once we have the configuration on our sheet of paper we can turn the paper any which way and the configuration remains the same. Technically, the solution is defined only up to a rotation of the configuration.

Of course we are glossing over the fact that driving distances are not exact – roads have curves and are not usually straight lines between cities -- and that the roads are built upon a curved surface – our World. So the configuration on our piece of paper can only be an approximation. "Noisy" distances are not a serious problem provided our map is only of one state or just the U.S. itself. Indeed, the problem of estimating a map from a set of noisy distances like those in Table 2.1 was solved by statisticians working in the field of Psychology in the 1950s and 1960s. We applied the most famous of these methods – non-metric multidimensional scaling[1] -- to the distances in Table 2.1 and the method produced the map shown in Figure 2.1.

Figure 2.1: U. S. Map From Driving Distances



The map extracted from the driving distances is a fairly accurate representation of the positions of the eleven cities. Even though the driving distances were noisy the map within those distances was reasonably detailed.

Disagreement Scores and Ideological Maps

Turning back to congressional roll call voting, we can construct ideological distances between pairs of legislators by computing the proportion of times they *disagree* on their roll call voting choices. Suppose Senators A and B both vote on 500 roll calls and on those 500 roll calls they vote opposite of one another on 200 roll calls; that is, legislator A votes Yea and legislator B votes Nay or A votes Nay and B votes Yea. Then their disagreement score would be 200/500 or 0.40. If we compute these disagreement scores between every unique pair of legislators then we have a table much like Table 2.1 only now we have numbers that we can interpret as "ideological distances." The larger the disagreement score is the further apart they are; similarly, the smaller the disagreement score, the closer together they are. Given this logic we can extract an ideological map from these disagreement scores just as we did for the driving distances.

Table 2.2 shows part of the disagreement score matrix for the 90th (1967-68) U.S. Senate. We show only President Lyndon Johnson and the first 10 of the 101 Senators that served in the 90th Senate. We can treat President Johnson as a "Senator" because he announces his position (Yea or Nay) on many roll call votes. For example, for important federal court confirmation votes the President always votes "Yea". These "Presidential Support" votes are compiled by *Congressional Quarterly* and published at the end of every calendar year.

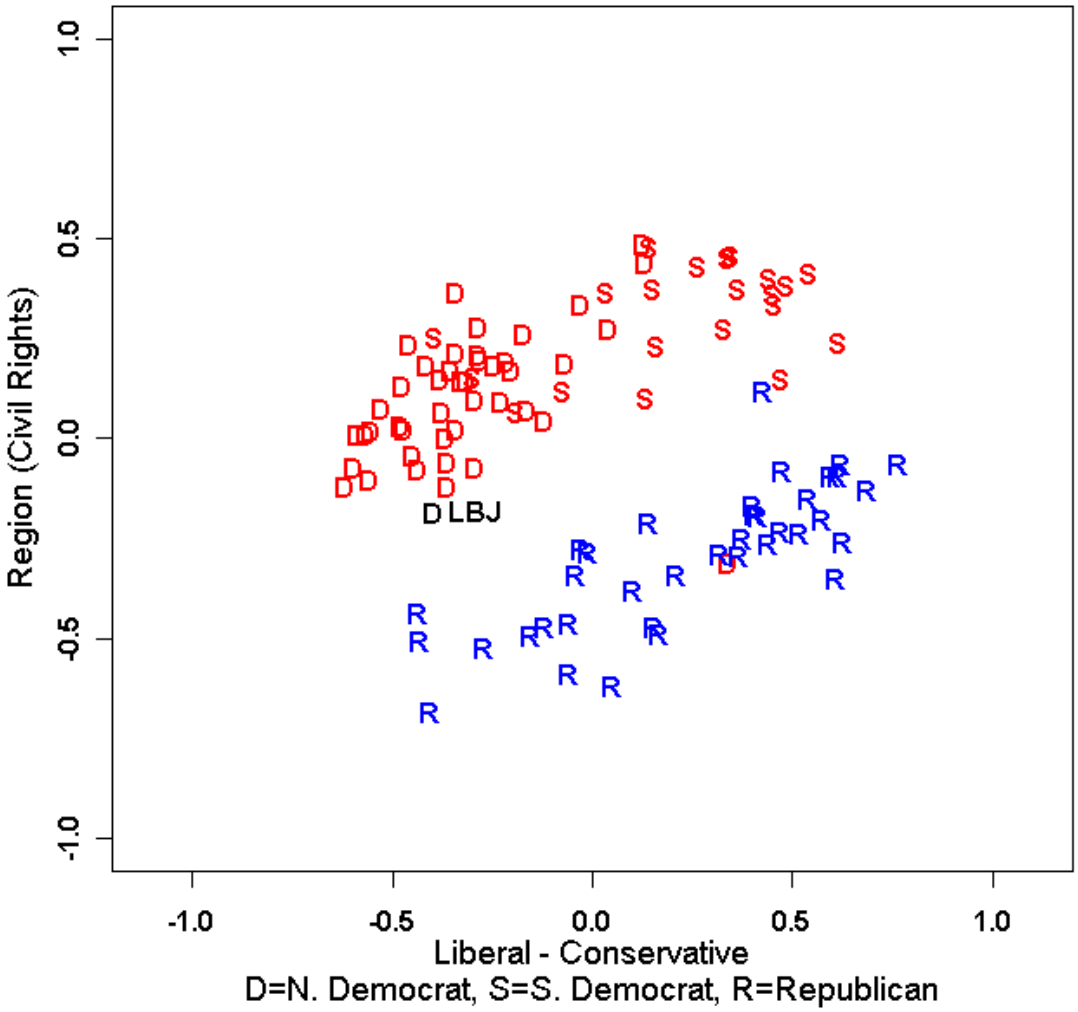
Table 2.2 is laid out in the same fashion as Table 2.1. The rows and columns are the same so that our disagreement score table is symmetric and shows the disagreement scores for every unique pair of Senators. In calculating these scores we threw out unanimous and very lopsided (98-2, 99-1) roll calls because they simply artificially deflate the disagreement score.

Table 2.2: Disagreement Scores for 90th Senate

	LBJ	Spar.	Hill	Grue.	Bart	Hayd	Fann	Fulb	McCl	Kuch	Murp
Johnson (D-US)	0.000	0.389	0.490	0.476	0.349	0.300	0.629	0.550	0.574	0.278	0.574
Sparkman (D-AL)	0.389	0.000	0.101	0.490	0.350	0.150	0.344	0.297	0.211	0.360	0.372
Hill (D-AL)	0.490	0.101	0.000	0.470	0.372	0.214	0.302	0.293	0.191	0.432	0.355
Gruening (D-AK)	0.476	0.490	0.470	0.000	0.238	0.417	0.565	0.313	0.510	0.456	0.556
Bartlett (D-AK)	0.349	0.350	0.372	0.238	0.000	0.296	0.523	0.306	0.437	0.363	0.501
Hayden (D-AZ)	0.300	0.150	0.214	0.417	0.296	0.000	0.426	0.307	0.314	0.365	0.468
Fannin (R-AZ)	0.629	0.344	0.302	0.565	0.523	0.426	0.000	0.416	0.215	0.378	0.124
Fulbright (D-AR)	0.550	0.297	0.293	0.313	0.306	0.307	0.416	0.000	0.327	0.472	0.430
McClellan (D-AR)	0.574	0.211	0.191	0.510	0.437	0.314	0.215	0.327	0.000	0.430	0.275
Kuchel (R-CA)	0.278	0.360	0.432	0.456	0.363	0.365	0.378	0.472	0.430	0.000	0.324
Murphy (R-CA)	0.574	0.372	0.355	0.556	0.501	0.468	0.124	0.430	0.275	0.324	0.000

Figure 2.2 shows the two-dimensional ideological map recovered from the full set of disagreement scores for the 90th Senate. As we mentioned above, there are two basic ideological dimensions – liberal-conservative and Civil Rights/"Social Issues". In the modern era the primary dimension is liberal-moderate-conservative as it is commonly understood and the second dimension captured the conflict over race and civil rights.

Figure 2.2: 90th (1967-68) U.S. Senate From Disagreement Score Matrix



We use tokens to show the political party and regional affiliation of the Senators – "R" is for Republican, "S" is for Southern Democrat (the eleven states of the Confederacy plus Kentucky and Oklahoma[2]), and "D" is for Northern (non-Southern) Democrat. The Southern Democrats are located near the top of the second dimension with the Northern Democrats in the middle with the Republicans near the bottom. The Southern Democrats and a majority of the Republicans are on the right side of the liberal-conservative dimension while the Northern Democrats are on the left side. Note that the

dispersion of the Senators is greater on the first dimension. In this regard it is similar to the U.S. cities map where the east-west distances on average are larger than the north-south distances so the dispersal of the cities is greater on the east-west dimension.

For most of American history only two ideological dimensions are required to account for the fourteen million choices of the twelve thousand members who served in Congress. In fact, one dimension suffices except in two periods, roughly 1829-1851 and 1937-1970, when race-related issues introduced a second dimension. The two brief periods where even multiple ideological dimensions fails to account for roll call voting are the Era of Good Feelings (1815 – 1824), when there was a one party system, and the 32nd Congress (1851-53), when the Compromise of 1850 unraveled. In these periods, there is a poor fit, even when 10 or more ideological dimensions are used. Roll call voting is chaotic.

Through most of American history the first ideological dimension typically divides the two major parties on the fundamental issue of the role of government in the economy. The second dimension differentiates the members by region mainly over race and civil rights but in the latter part of the 19th Century it picked up regional differences on bimetallism and the free coinage of silver. In the modern era the primary dimension is liberal-moderate-conservative as it is commonly understood and the second dimension captured the conflict over race and civil rights and a grab-bag of so-called "social" or "lifestyle" issues such as abortion, gay rights, gun control, and so on.

The arrangement of the political parties shown in Figure 2.2 emerged during the latter part of the New Deal when, in the wake of the 1936 elections, Northern Democrats heavily outnumbered Southern Democrats in Congress. Many of the programs initiated

during the subsequent Second New Deal were not to the liking of the South. Voting on minimum wages in 1937 and 1938 followed by voting during World War II on the poll tax and voting rights in the armed forces helped to split the Democratic Party into two distinct regional wings.[3] Voting in Congress became two dimensional in order to differentiate northerners from southerners on civil rights and related votes. With the passage of the 1964 Civil Rights Act, the 1965 Voting Rights Act, and the 1968 Open Housing Act, this second dimension slowly declined in importance and is now almost totally absent. Race related issues – affirmative action, welfare, Medicaid, subsidized housing, etc. – are now questions of *redistribution*. Voting on race related issues now largely takes place along the liberal-conservative dimension and the old split in the Democratic Party between North and South has largely disappeared. Voting in Congress is now almost purely one-dimensional – a single dimension accounts for about 93 percent of roll call voting choices in the 110th House and Senate – and the two parties are increasingly polarized.

Unfolding Analysis and Ideological Maps

Although analyzing disagreement scores provides very useful information about the legislators, it does not provide any information about the roll call votes. Our NOMINATE method not only produces an ideological map of the legislators it also produces information about each roll call vote that allows us to, loosely speaking, interpret the ideological content of each vote. We use a statistical method known as an *unfolding analysis* to achieve this.[4] To illustrate how unfolding works we turn again to the driving distances problem.

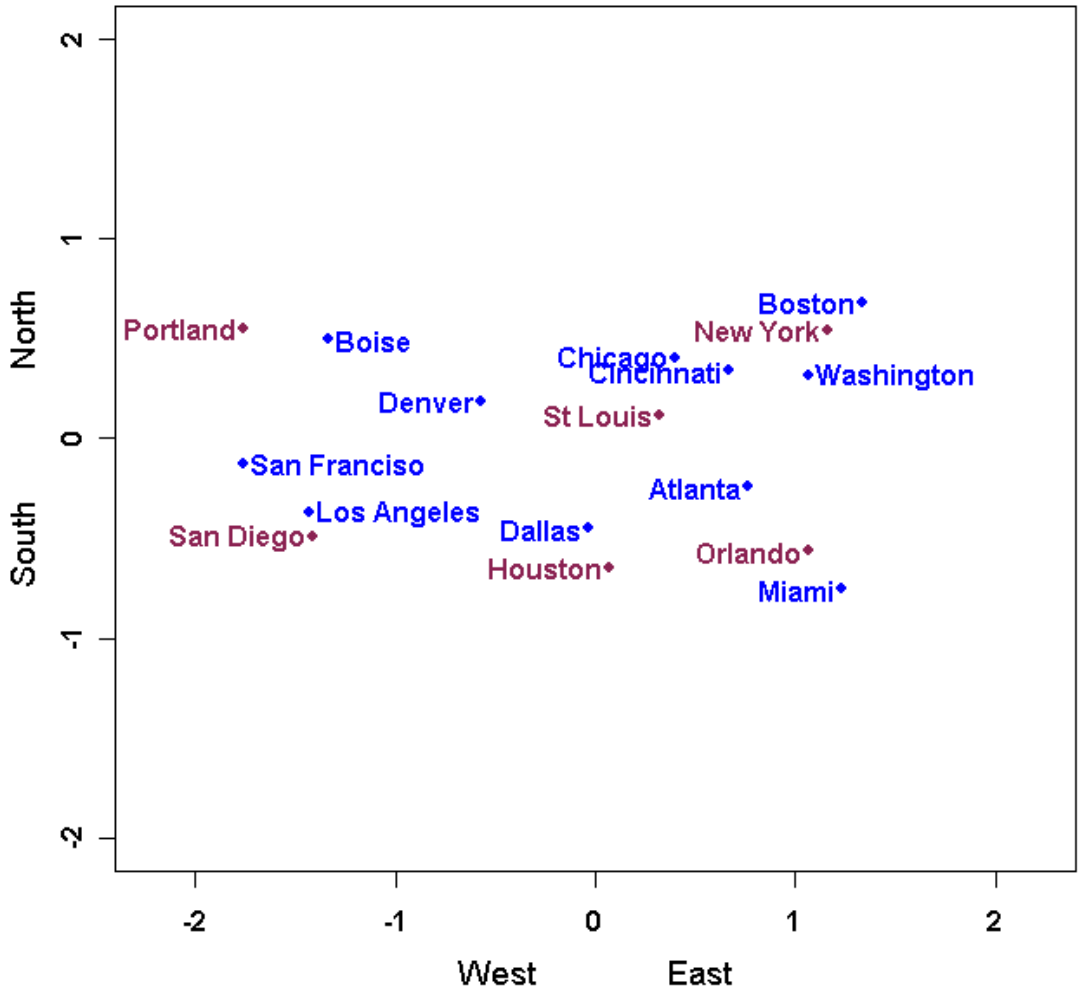
Table 2.3 shows the driving distances between our original 11 cities and 6 additional cities (shown in the columns) where just the distances between the two groups of cities are shown rather than all the distances between every pair of cities. This table also has a map within it that can be found via a different form of the laborious ruler and compass method we described above if the distances are exact. Estimating a map from a set of noisy distances like those in Table 2.3 was solved in the 1970s by a variety of researchers in Psychology, Statistics, and Political Science. We used one of the simpler methods to estimate the map shown in Figure 2.3.[5]

Table 2.3: Driving Distances as an *Unfolding* Problem

	Houston	NYC	Orlando	Portland	St Louis	San Diego
Atlanta	790	850	430	2660	570	2150
Boise	1820	2490	2640	430	1670	980
Boston	1830	210	1300	3140	1210	2880
Chicago	1090	810	1150	2120	290	2090
Cincinnati	1150	470	1000	2430	320	2290
Dallas	250	1560	1100	2040	660	1350
Denver	1030	1790	1880	1260	860	1100
Los Angeles	1540	2790	2430	960	1840	130
Miami	1190	1330	230	3260	1230	2680
Washington	1370	240	850	2780	860	2600
San Francisco	1890	2960	2850	670	2150	490

Figure 2.3 is basically the same as Figure 2.1 showing that although we do not have all the distances between every unique pair of cities enough information is contained in our 11 by 6 city table to reliably recover the map. Note that, once again because the east-west distances are on average larger than the north-south distances the dispersal of the cities is greater on the east-west dimension.

Figure 2.3. U. S. Map From Driving Distances Using Unfolding



Returning to the analysis of roll call votes, we can construct an ideological map of the legislators through the use of an unfolding analysis of the roll call votes themselves without first converting the roll calls to disagreement scores. In Table 2.4 we show the first 20 roll call votes in the 90th Senate for the first 10 Senators and President Johnson. A "Y" stands for Yea (Yes) and a "N" stands for Nay (No). A blank means that the Senator did not vote on that roll call or, for President Johnson, the administration did not announce a position on the roll call.

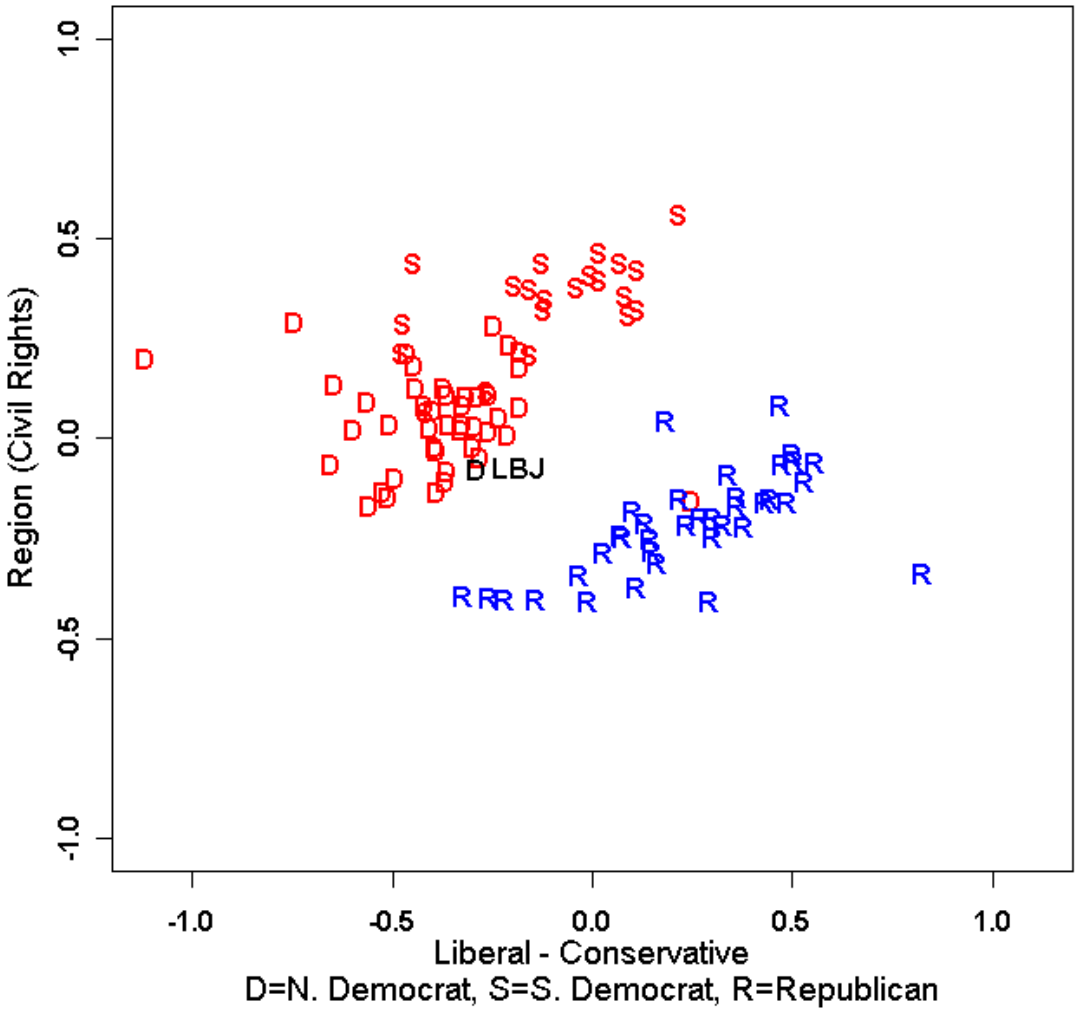
Table 2.4: Roll Call Voting as an Unfolding Problem

Roll Call	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	ETC.
Johnson (D-US)																			N	Y	
Sparkman (D-AL)	N	Y	N	N	Y	N	Y		Y	N	N	Y	N				N	N	Y	Y	
Hill (D-AL)	N	Y	N	N	Y	N	Y	Y	Y	Y	Y			Y	Y	Y	N	N	Y	Y	
Gruening (D-AK)	N	Y	N		Y	N	Y	N	N	N	N	Y	Y				N		Y	Y	
Bartlett (D-AK)	N	Y	N	N	Y	Y	Y	N	N	N	Y	N	Y	Y	Y	Y	Y	N		Y	
Hayden (D-AZ)	N		N	Y	Y	N	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	N	Y	Y	
Fannin (R-AZ)	N	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	N	N	N	
Fulbright (D-AR)	N	Y	N		Y	N	Y	N										N	Y		
McClellan (D-AR)	N	Y	N	N	Y	N	Y	Y	Y	N	Y	Y		Y	Y	Y	N	N	Y		
Kuchel (R-CA)	Y	N	Y	Y	Y	N	Y	N	N	N	N	N		Y	N	Y		N	Y	N	
Murphy (R-CA)	N	Y	N	Y	Y	N	Y	Y	N	N	Y	Y	Y	N	Y	Y	N	N	N	N	

What we assume is that for every roll call vote there is a dividing line or *cutting line* that splits the ideological map into two regions. On one side of the cutting line the legislators are predicted to vote Yea and on the opposite of the cutting line the legislators are predicted to vote Nay. Technically, our NOMINATE voting model is *probabilistic* so that the further away from the cutting line a legislator is the higher the probability that she votes for the choice on that side of the line. We applied NOMINATE to all roll call voting in the House and Senate from 1789 through 2007 (the 1st through the first session of the 110th Congress) where we constrained each legislator to lie on a straight line through the ideological space during her career. This allows us to compare legislators in different Congresses and to analyze the ideological space over time.[6]

Figure 2.4 shows the ideological map of the 90th Senate estimated by NOMINATE and Figures 2.5 and 2.6 show the final passage votes for the 1968 Open Housing Act in the 90th Senate and House, respectively.

Figure 2.4. 90th (1967-68) Senate
Senator Ideal Points



The configuration in Figure 2.4 is essentially the same as that shown in Figure 2.2 even though the two estimation methods are very different. A Senator's position in Figure 2.4 is determined by the Senator's entire voting record during his or her service in the Senate. The position or *ideal point* in the map lies on a line through all the maps for each Senate the Senator served in. We show an example of this below in Figure 2.6.

The three Party groups are quite distinct in the map. During this period there were a substantial number of liberal and moderate Republicans some of whom were as

liberal as President Johnson himself. This changes dramatically as we will show below and discuss in some detail in later Chapters.

Figure 2.5 shows the final passage vote of the landmark Open Housing Act of 1968. The left panel shows all the Senators and the cutting line for the roll call and the right panel shows the errors – Yea voters on the Nay side of the cutting line and vice versa. The errors are close to the cutting line which is consistent with our probabilistic model. The closer a Senator is to the cutting line the closer the probability of voting Yea or Nay is to 0.5 – a coin flip.

In each panel we show the predicted votes and the division on the vote. In the Senate the vote was 71 Yea and 20 Nay with 3 Senators misclassified by our model. The "PRE" is a measure of how well the model fits the roll call. It is calculated as the ratio of the minority on the roll call minus the errors divided by the minority on the roll call. In this case it would be 20-3=17 divided by 20 or 17/20 = 0.85. We use PRE rather than simple correct classification – in this case 97 percent – because if a roll call is very lopsided, say 95 – 5, then we are guaranteed to correctly classify 95 percent of the vote. For the Open Housing Act vote we are guaranteed to correctly classify 71/91 = 78 percent of the vote. The PRE controls for the margin of the roll call and is a better measure of how well our model accounts for the choices of the legislators.

Figure 2.5. Senate: Final Passage Vote Open Housing Act of 1968

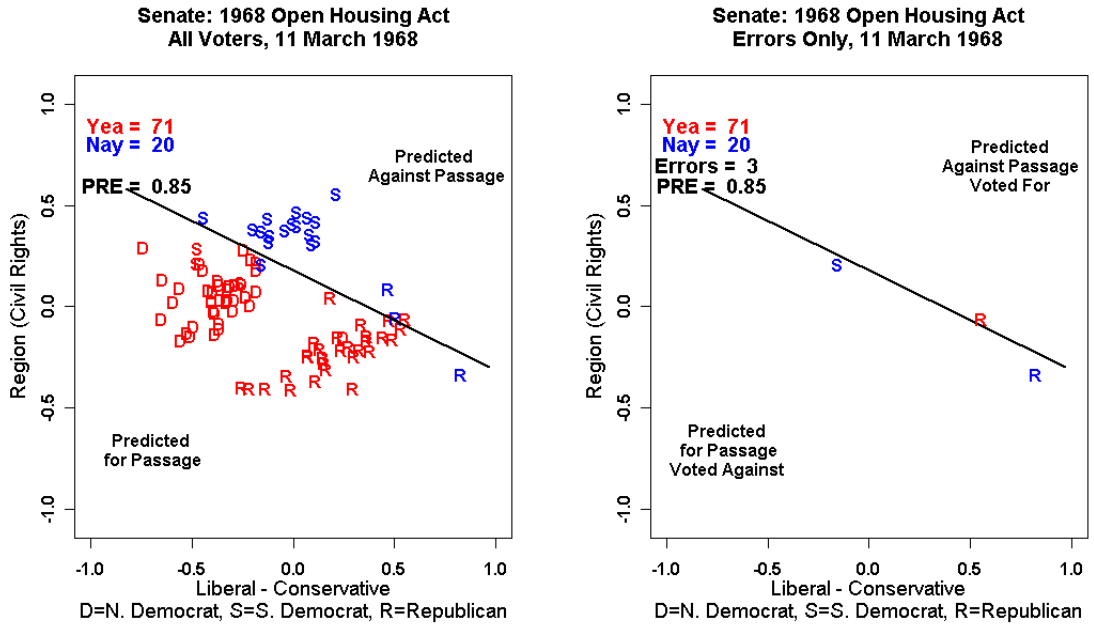
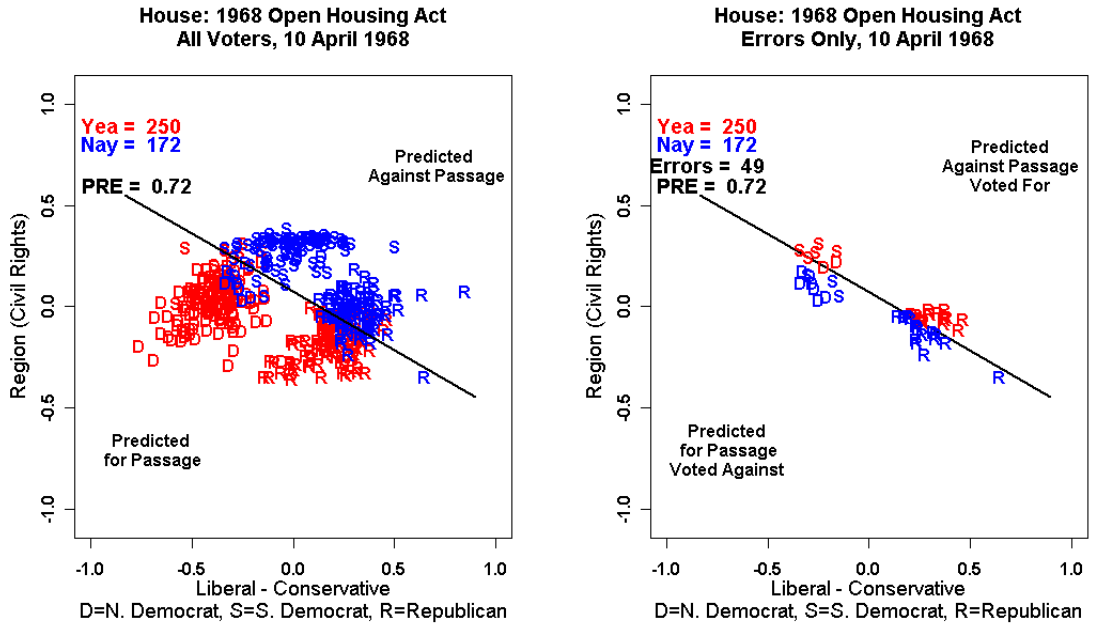


Figure 2.6 shows the final passage vote in the House on the Open Housing Act of 1968. Note that, as in the Senate, almost all of the Southern Democrats voted against the Act but in the House a large bloc of Republicans from the Midwest and West joined the Southern Democrats in voting against. As in the Senate most of the incorrectly predicted votes are close to the cutting line for the bill. The PRE for the roll call is a quite respectable 0.72.

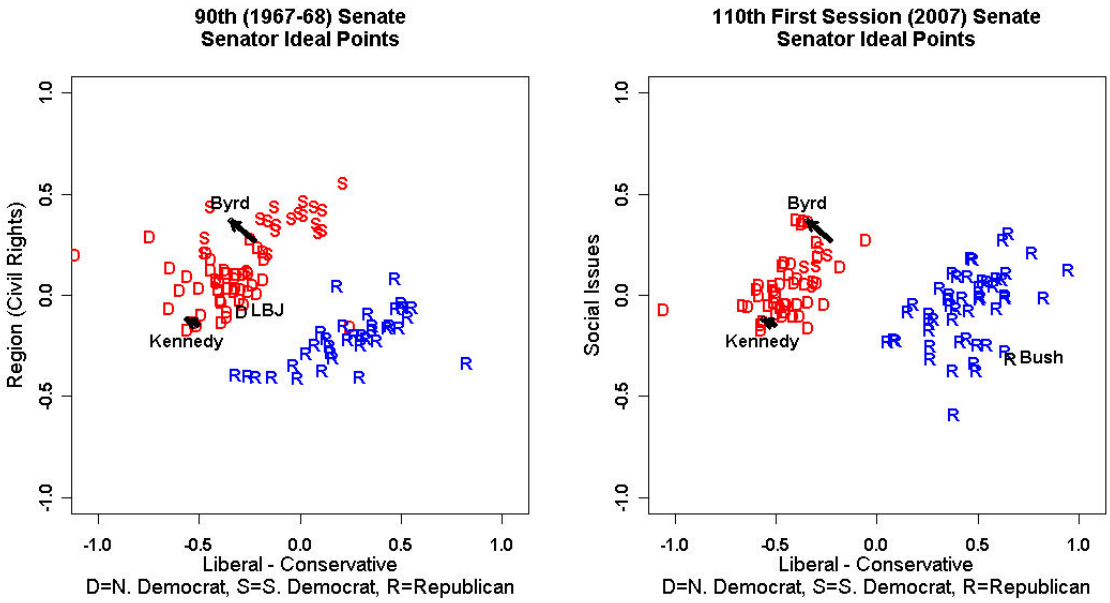
Figure 2.6. House: Final Passage Vote Open Housing Act of 1968



Figures 2.5 and 2.6 illustrate the fact that in the 1960s two ideological dimensions are necessary to capture all the nuances in roll call voting. Both parties had liberals and conservatives and both parties – especially in the House – were divided on the Civil Rights dimension. Later in the 1970s School Busing became a highly contentious issue and it was marked by divisions that cut through the parties in almost the same fashion as the Open Housing Act. However, as we alluded to above, by the 1980s the divisions on issues related to racial and ethnic controversies changed to being conflicts along the main liberal-conservative dimension because the issues revolved more around redistribution and therefore resembled more traditional "tax-and-spend" divisions between liberals and conservatives. The second ideological dimension slowly morphed into a "social" or "lifestyle" issues dimension and the old split between the Northern and Southern Democrats faded as the South become more Republican reinforcing the change. These

changes are illustrated by Figure 2.7 which displays two Senates separated by 40 years – the 90th and 110th.

Figure 2.7. 90th (1967-68) and 110th (2007) U.S. Senates



In the 40 years between the 90th and 110th Senates the traditional Southern Democrats have disappeared. The remaining Southern Democrats are indistinguishable from their non-Southern colleagues. The Democratic Party for the first time since the Civil War is not split ideologically along regional lines. The other major change is the disappearance of the liberal and moderate Republicans. Like ice on a hot stove they have vanished and have been replaced by conservatives. The ideological position of President George W. Bush was empty territory 40 years ago. The Republican Party has moved to the right in lock-step with the disappearance of the traditional Southern Democrats (many of whom were replaced by conservative Republicans). The end result of these trends was

to make the Democratic Party more compact in the ideological space with a widening gap opening up between the two parties. This is the polarization process at work.

In Figure 2.7 we also show the trajectory through the ideological map of Senator Robert Byrd of West Virginia and Senator Edward Kennedy of Massachusetts. The black arrows show point from the entering position in the map to the position in the 110th Senate. Senator Byrd was elected to the Senate in 1958 and in nearly 50 years of service has only moved a short ideological distance. Senator Kennedy was elected in 1962 and has barely moved in the past 45 years. Senators Byrd and Kennedy are typify our results for the post World War II period. Members of the House and Senate do not change ideologically once elected to Congress. They "die with their ideological boots on."

Conclusion

Our purpose in this Chapter was to try to give the reader an intuitive understanding of how we measure the ideological leanings of members of Congress.

Endnotes for Chapter 2

[1] In non-metric multidimensional scaling the basic idea is to reproduce the *rank ordering* of the distances rather than the distances themselves. Roger Shepard (1962a, 1962b) invented non-metric multidimensional scaling but he did not have an objective (loss) function that was minimized/maximized. Joseph Kruskal (1964a, 1964b) developed an efficient algorithm and an objective function – STRESS – that he was able to prove his method minimized.

[2] This is the definition of "South" used by *Congressional Quarterly*. We use *CQ*'s method of classifying states throughout this book.

[3] See Poole and Rosenthal (1997, 2007), chapter 5 for an extended discussion of the divisions in the Democratic Party during this period.

[4] The term "unfolding" was coined by Clyde Coombs (1964). Coombs was an eminent Psychologist and Statistician who pioneered many of the statistical methods that we use to study roll call voting.

[5] We used a simple least squares method discussed in Poole (1984) to estimate the map. Other methods for unfolding distance data were developed by Wang, Schonemann, and Rusk (1975); Cahoon, Hinich, and Ordeshook (1976); and Rabinowitz (1976).

[6] In our original work in the 1980s when we first analyzed all recorded roll call votes simultaneously on the early supercomputers we dubbed this method *D*-NOMINATE where the "D" stands for dynamic (Poole and Rosenthal, 1997; 2007). In the 1990s we developed a more advanced method we dubbed *DW*-NOMINATE (McCarty, Poole, and Rosenthal, 1997) where the "W" stands for weighted. Throughout this book we use the DW-NOMINATE scores and to avoid confusing acronyms from now on we will refer to this simply as NOMINATE. A comprehensive technical discussion of NOMINATE and related methods can be found in Poole (2005).