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Multi-Dimensional Ideology in the Multi-Member District: An Analysis of the Arizona Legislature

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American state legislatures provide considerable institutional variation for testing theories of legislative representation, and one such feature is the multi-member district system (MMD). Whereas the U.S. House and most American state legislatures use the single member district system (SMD) in which a single legislator represents one geographic district, several state legislatures still use a system in which more than one legislator is elected from the same district in the same election. Although there can be considerable variation in the rules for such MMDs, one structure common to many state legislatures is a situation in which multiple

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candidates run against each other for two seats from one district, and the two receiving the most votes are elected. Clearly, the electoral game is quite different in a situation in which a candidate is likely to be running against not only members of other parties but also another candidate of the same party. The incentives inherent in such a system are quite different than those for a legislator in an SMD, and it likely that such incentives change legislative representation in a number of ways.

Legislative representation has many features, including symbolic, descriptive, and service aspects, but we are interested in how MMDs affect substantive representation as displayed through roll call votes on legislation. In particular, in this paper we examine roll call voting behavior for Arizona state legislators from 1995 to 2002. Arizona provides a natural experiment for the effect of MMDs because the House is MMD, the Senate is SMD, and the geographic lines for the districts are the same in both chambers. For each district, two House members chosen in a free-for-all election represent the exact same geographic district as one senator elected via an SMD system. If median voter theory holds across legislative institutions, then we would expect all three legislators to look very similar in their roll call voting patterns as each winning candidate sought the median voter position. But if MMDs offer an incentive structure for candidates to use ideological branding to differentiate oneself from the opponents in the campaign, then all three legislators may be quite different from each other in terms of how they vote on roll calls.

Formal models suggest that MMD legislators will move away from the median voter under certain conditions (Cox 1990), but there are few empirical examinations of how MMDs affect floor voting behavior in state legislatures (Adams 1996; Jewell 1982a, 1982b; Richardson, Russell, and Cooper 2004). The empirical studies have largely relied on interest group ratings

and interviews as measures of ideology, and a few selected roll-call votes, but none has used large numbers of roll call data over several legislative sessions. We seek to test the hypothesis that MMDs influence legislative roll call behavior by generating W-NOMINATE scores with bootstrapped standard errors as ideal point estimates based on roll-call votes in four recent sessions of the Arizona legislature. Employing a spatial model of purely preference-based voting, we test the impact of the electoral mechanism by examining 1) the congruence of preferences for legislators representing the same geographic district and constituents, and 2) differences in the distribution of preferences for the party caucuses in each chamber.

Legislative Representation in Multi-Member Districts

Multi-member district systems have long a history in the American states, and as Klain (1955, 1113) notes “for nearly a century after the Declaration of Independence the American states elected by far the greater part of their law-makers in multiple constituencies.” The use of MMDs flourished in the first half of the twentieth century up until the *Baker v. Carr* decision. In the 1950s, 36 state legislatures employed MMDs for 45 percent of the legislative seats (Klain 1955), and in 1962 about 46 percent of legislators were elected from MMDs (Cox 1984). Because partisan or racial minorities could be outvoted by the majority in all races within an MMD even though they could have a large enough percent to win in an SMD carved from the larger MMD, states (either by legislative decision or court decision) began to move away from MMDs after *Baker v. Carr*. The percent of legislators from MMDs nationwide had dropped to 26 percent of all House representatives and 7.5 percent of senators by 1984 (Niemi, Hill, and Grofman 1985). After the redistricting efforts caused by the 2000 census, fewer than 10 states used MMD systems with free-for-all elections involving multiple candidates.

Research on legislative representation in MMDs has tended to focus on descriptive representation issues much more than substantive representation. In particular, the question of whether geographically concentrated racial minorities are disadvantaged by MMDs has been important both for scholars and for civil rights cases involving legislative redistricting plans. Generally, the consensus has been that MMDs diluted black voting strength such that fewer black legislators were elected to state legislatures, especially in southern states (Herrick and Welch 1989; Grofman, Migalski, and Noviello 1986; Moncrief and Thompson 1992). On the other hand, some have argued against this finding (MacManus 1979), and Rule (1992) argues that MMDs may be bad for black male legislators but good for the number of black female legislators. Further, research suggests that MMDs may increase the number of female legislators in state legislatures (Arceneaux 2001; Darcy, Welch, and Clark 1985, 1987; Hogan 2001; King 2002; Rule 1990), but there is some conflicting evidence (Welch and Studlar 1990). Overall, the evidence suggests that MMDs may produce a different distribution of legislators, but much less work has been done on whether it has an impact on legislative decisions.

Political parties drive the legislative agenda, and some attention has been devoted to the impact of MMDs on state legislative political caucuses. If a minority group (in this case partisan) can be overwhelmed in all elections within an MMD, then it is possible that a group large enough to elect a representative within a specific SMD division of the district could be shut out of representation in the larger MMD. Some scholars have suggested this to be the case over the years (Walker 1976; Rosenthal 1981, 15), but Niemi, Hill, and Grofman (1985) provide evidence that minority party strength is not diluted by MMDs. They show evidence that MMD chambers are not statistically different than SMDs on several measures, including representation

of the minority party in districts, the percent of seats split between parties, and minority representation after a switch from MMD to SMD.

If legislative party representation as measured in terms of a quantity is not affected significantly by MMDs, then is it possible that parties are different in some qualitative way because of MMDs? To address this issue, Adams (1996) uses formal logic to argue that MMDs do not provide the same incentive to converge on the median voter as SMDs (Downs 1957; Duverger 1953; Hotelling 1929), and that in all but the rarest of cases MMDs “should increase the ideological variance across a party’s pool of nominees” (137). Using interest group scores in Illinois before and after a switch from MMD to SMD, Adams finds evidence that the parties were more ideologically diverse during the years with the MMD system. This finding is suggestive, but it uses only one interest group score as a measure of legislator preferences, it does not focus on individual legislators, and the Illinois legislature used a cumulative MMD system, which was unique at the time and not used in any state since 1982.

The Illinois cumulative MMD is but one type of MMD employed in the states over the years. The major variations include Bloc, Bloc with Partial Abstention, Cumulative, Staggered, and Seat, but even within these different types the magnitude (or number of seats in a district) can vary across states and even within a state. The Bloc system uses a free-for-all election in which multiple candidates compete simultaneously for two or more seats, and the candidates with the most votes win the seats. In the Bloc system, voters have to use both of their votes on different candidates, but one variation is the Bloc with partial abstention in which voters can choose to cast only one vote. For example, in the Arizona system two seats are available in each district, and as many as two Democrats, two Libertarians, two Greens, and two Republicans could vie for the two available seats that go to the two candidates with the most votes. In a tight

four-candidate race, the winning candidates may have as little as 26% of the votes cast in the election.

The cumulative system allows a voter to use all of the votes allowed for one candidate or split the votes among multiple candidates. Cox (1990b) argues that cumulative systems offer very different strategic considerations for candidates than bloc MMDs. The staggered election, exemplified by the U.S. Senate, involves two or more candidates representing the same geographic district but elected in separate elections at different times. Finally, the seat or post type of MMD involves an election in which two or more separate races are conducted in the same geographic district at the same time, but candidates must designate which seat (say A or B) they are contesting and voters can only choose candidates from within each designated seat list. Scholars have argued that these last two types (staggered and seat) are not true MMDs because they basically serve as SMDs occurring in the same geographic district (Cox 1984; Hamm and Moncrief 1999: 148; Niemi, Jackman and Winsky 1991: 97), but are often mistakenly used in analyses of MMD effects. For this particular study, our reference to the MMD system is the bloc with partial abstention form used in the Arizona House.

The vast majority of studies examining the spatial theory of elections have focused on SMD systems, but the less numerous studies of MMD systems provide ample evidence that most MMD variations provide incentives for candidates to move away from the median voter. Using a variety of assumptions about rules, the number of competitors, and voters, several studies have shown equilibria located away from the media voter (Eaton and Lipsey 1975; Denzau, Kats, and Slutsky 1985; Greenberg and Shepsle 1987). In the most comprehensive examination of MMD rule scenarios, Cox (1990a, 1990b) uses the ideas of centripetal (centrist-directed) and centrifugal (extremism away from the center) forces to characterize the incentives inherent in

various electoral systems. Using a standard spatial model with a single left-right ideological dimension, single-peaked preferences, and sincere voting, bloc with partial abstention provide centrifugal forces away from the median voter with as few as 3 candidates in a two-seat MMD (917), and more candidates should lead to more dispersion away from the median.

The hypothesis that MMDs lead to more extreme legislators in a chamber has not received much empirical verification. Much of the work has been in the comparative context with various MMD arrangements, institutional rules and political cultures that may or may not apply to American state legislatures. Cox (1997) tested his spatial models with case studies from several countries with various forms of MMDs, and he found evidence supporting the idea of MMDs producing more extreme legislators. Similarly, in two studies of Chilean MMDs, Dow (1998) and Magar, Rosenblum, and Samuels (1998) also find confirming evidence of the extremism hypothesis. In the American context, Schiller examined the U.S. Senate (a staggered MMD rather than a bloc MMD), and she finds evidence that “a combination of electoral incentives and institutional forces ... push senators [from the same state] in contrasting directions” (Schiller 2000, 4).

The hypothesis has received less attention in the literature on American state politics. Richardson, Russell, and Cooper (2004) test for ideological extremism in the Arizona State Legislature, and they also find confirming evidence of ideological extremism hypothesis. Using a scale of interest group endorsements as a measure of legislator preferences, they compare the distribution of preferences in the MMD House and SMD Senate, the differences between legislators within the same geographic districts, and the distributions across party caucuses. In addition, they use logistic regression analysis to explain the differences in ideological preferences, and find that the MMD system is significant in explaining this extremism. Finally,

they argue that ideology is significant in explaining votes in the MMD House but not the SMD Senate.

The evidence in the comparative context and this single test in a state legislature are suggestive, but to adequately test the spatial models predicting centripetal aspects of MMDs we need better measures of legislator ideal points than just interest group endorsements. The hundreds of roll-call votes in each legislative session offer a wealth of information on revealed legislator preferences, and single or two-dimensional space estimates can be obtained to test the hypotheses. In the next section we describe our use of W-NOMINATE to estimate legislator ideal points revealed in roll call data for Arizona in the 42nd to 45th legislative sessions.

Estimating Legislator Ideal Points

Our study draws roll-call data from the 42nd through 45th Arizona legislatures, which is publicly available on the internet. An important issue for producing scale comparable ideal points is the “bridging” of observations across chambers (e.g., Poole 2004, ch. 6; Bailey and Chang 2001; Bailey 2001). Our hypotheses require ideal point estimates that are comparable for both members of the house and senate. To bridge the chambers, we chose roll-call votes in the following way. According to Arizona’s parliamentary procedure, a bill that originates in the senate goes to the house for an initial vote (before amendments) after a final vote in the senate. Thus, the final vote in the senate and the initial vote in the house are on *identical* language. We treat both votes as a single roll-call, and thus bridge all observations in our dataset. Our estimates are made by performing the procedure described below on one roll-call matrix for each session (year) in which the legislature met between 1995 and 2002, with the exception of the second session of the 43rd legislature (1998).²

² The data for this session were inexplicably corrupted. We are resigned to including an analysis of this session in the next version of our paper.

For single-session ideal points, we use W-NOMINATE and generate bootstrapped standard errors for our estimates (Lewis and Poole 2004). The process begins by running the W-NOMINATE routine until it converges. Then, the probabilities for the observed roll-call votes are calculated, and a matrix with legislators as rows and roll-call votes as columns is created, with the cells containing the probabilities of each observed vote choice. A random draw of roll-calls is then created by (a) drawing from a $U(0,1)$ distribution, (b) recording the sampled value as the “observed” choice if the random draw is less than or equal to the probability calculated subsequent to the W-NOMINATE run, or (c) recording the *opposite* of the sampled value as the “observed” choice if the random draw is greater than the probability calculated. This generates a sampling roll-call matrix, on which W-NOMINATE is run. One hundred random draws and W-NOMINATE runs on the sampling matrices are performed, and variances are calculated from these bootstrap trials. If the fit of W-NOMINATE is poor, the bootstrapped variances will be large (Lewis and Poole 2004, 109).

The W-NOMINATE program identifies Kenneth Chevront (D-25th District) as “left” (liberal) on dimension one and Susan Gerard (R-18th District) “up” on dimension two, constraining the scale to the unit circle. Using interest group scores and media accounts, we have selected Chevront as consistently liberal. Gerard is known as the leader of the “Sue Nation,” which later sprouted into the “Mushroom Coalition,” a group of moderate Republicans who broke party ranks on a variety of votes during this period.

As a simple check on the face validity of the ideal points, we compared the first dimension scores to a variety of interest group scores across the years. The results for two different years and interest groups are reported in Figures 1 and 2, and they are representative of other years. In Figure 1, the Dimension 1 Ideal Points are arrayed from a negative one value on

the left to a positive one value on the right, with a liberal pegged as the negative value. The NFIB scores are generally viewed as ranging from liberal at the low end to more conservative (or pro-business) at the higher end. Therefore, we would expect an upward sloping distribution of ideal points, and table 1 shows this to be true. In Figure 2, the League of Conservation Voters code votes so that a high value is a pro-environment or more liberal score so we would expect a downward sloping pattern, and this is what the plot shows. Generally, these figures offer some face validity to the measure of ideal points and our interpretation of their values.

Testing the Impact of MMD on Legislator Ideal Points

To test the hypothesis that the MMD electoral mechanism leads to more extremity in legislators, we examine both state- and district-level measures of extremity. Beginning with the more aggregate analysis, we can state the hypothesis as follows:

H1: The ideal point for the median member of the MMD House for a given party should be larger, in absolute terms, than the ideal point for the median member of the SMD Senate.

In other words, the Democratic Senate median should be less negative than the Democratic House median, and vice versa for the Republican Party.

Table 1 presents our first dimension W-NOMINATE estimates for all sessions in the sample. It is readily apparent that the among Democratic chamber medians, the MMD House median is more liberal than the Senate median in every year except 1995. These differences are statistically significant in 1997 and 1999. This pattern is also true for Republicans except in the 45th legislature (2001-2002).³ Nonetheless, this distinction is only statistically significant in

³ Republicans are in the majority in both chambers for all years in the sample, though that majority vanishes in the 45th Senate, where each party is represented by fifteen members.

2000. Table 2 presents second dimension W-NOMINATE estimates, which have a less clear interpretation because they measure the degree of agreement with Sue Gerard and the Mushroom Coalition.⁴

[Tables 1 and 2 about here]

Our aggregate measures lend some support to the extremism hypothesis, but they do not speak to activity within the districts. To examine this, we construct three measures of extremism among legislators representing the same geographic constituency:

- (a) absolute spatial distance between representatives: $|H1 - H2|$,
- (b) average absolute spatial distance between the senator and each representative
 $\text{mean}\{|S - H|\}$, and
- (c) maximum absolute distance between the senator and extreme representative, $\max\{|S - H1|, |S - H2|\}$

We can state the district-level hypotheses as follows:

H2 (Centripetal Force): $|H1 - H2|$ should be nonzero.

H3 (Extremism): Both $|S - H1|$ and $|S - H2|$ should be nonzero, and $\max\{|S - H1|, |S - H2|\}$ should be large.

Values for each of these measures are presented in Table 3. One can quickly see that unlike the aggregate measures, these district-level statistics strongly suggest a pattern of extremism. The House members representing the exact same geographic constituency assume very different positions in the policy space measured by dimension 1. In addition, the average difference between House members and the Senator from the same district are also quite large. Further, the maximum distance from a House member to a Senator from the same district is on average quite large too, and this difference often exceeds even the House differences. Finally,

⁴ Due to time constraints, we do not discuss these effects, but simply present them for the reader.

the standard errors of the estimates in the final column are much smaller than any of the legislator differences so this provides some context for interpretation of these spatial distances in ideal points for the legislators.

Conclusion

Though there have been important implications of spatial models regarding the effect of MMD versus SMD electoral mechanisms on legislator ideology, there have been few attempts to examine these effects in large-N studies using roll-call data. This paper presents a preliminary examination of the MMD extremism hypothesis using a new dataset of chamber comparable ideal point estimates for members of the Arizona legislature from 1995-2002. We find sparse evidence that MMD and SMD effects are cognizable in the aggregate legislature, but that the effects of these electoral mechanisms within districts is strong and consistent. Multi-Member Districts in the Arizona house produce more ideologically extreme representation than their single-member senate counterparts.

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Table 1: Comparison of the First Dimension Ideal Points and the Ratings from the National Federation for Independent Business in the 44th Arizona Legislature

Dimension 1 and the NFIB scores, AZ 44th, First Session

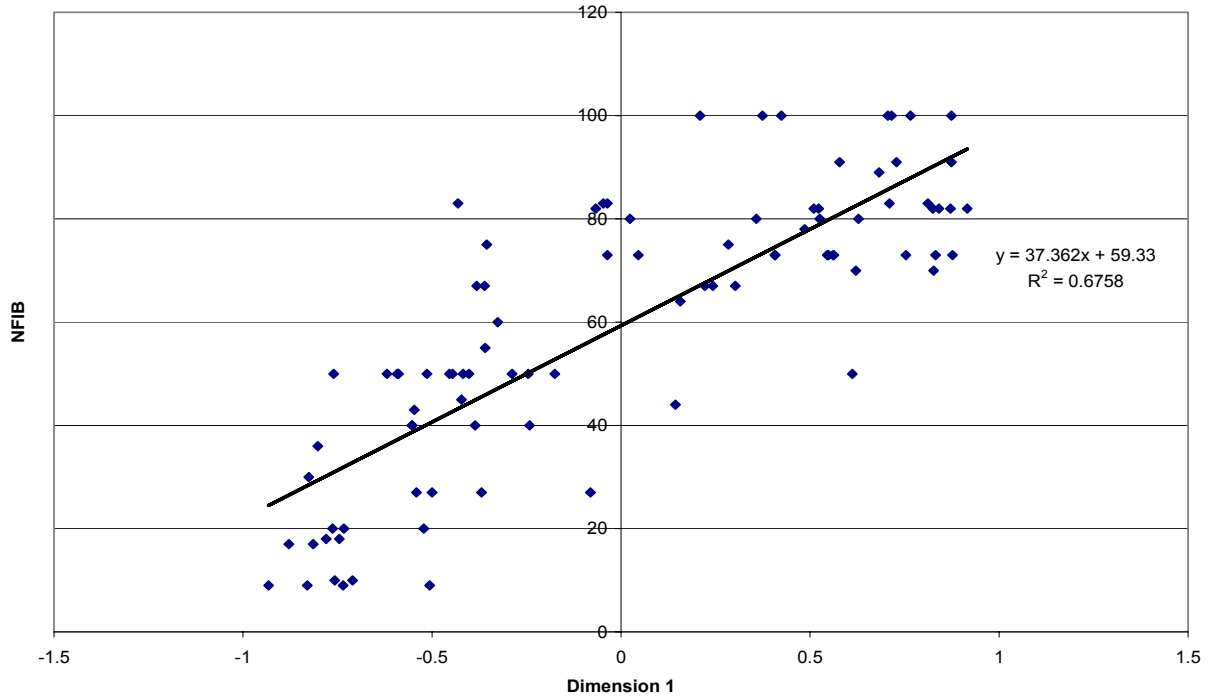


Table 2: Comparison of the First Dimension Ideal Points and the Ratings from the Arizona League of Conservation Voters in the 45th Arizona Legislature

Dimension 1 and League of Conservation Voter Scores, AZ 45th First Session

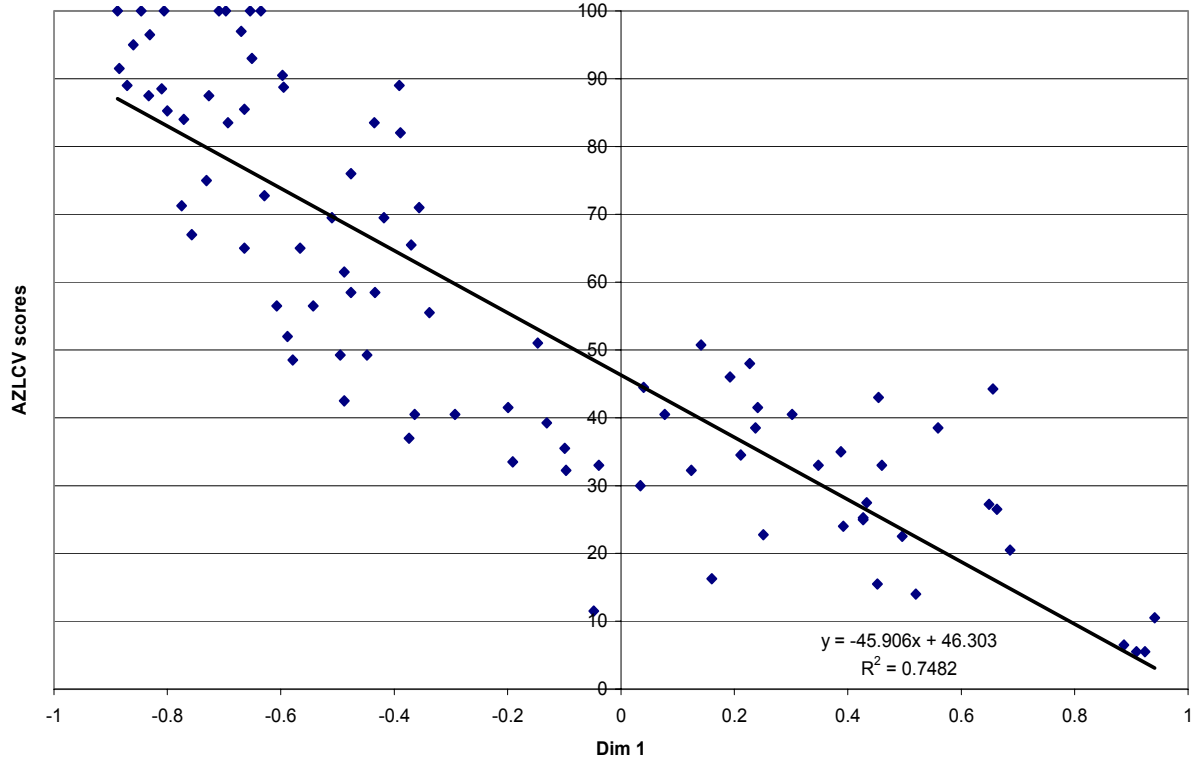


Table 1: First Dimension W-NOMINATE Estimates with Lewis-Poole Standard Errors for Chamber and Party Median Legislators, 42nd – 45th Arizona Legislatures*

<i>Session</i>	<i>Democratic Median</i>	<i>Republican Median</i>	<i>House Democratic Median</i>	<i>Senate Democratic Median</i>	<i>House Republican Median</i>	<i>Senate Republican Median</i>
42 nd , 1 st Sess. (1995)	Armistead (23 rd) -.716 (.103)	Turner (15 th) .441 (.112)	McClendon (5 th) -.706 (.116)	Peña (22 nd) -.751 (.137)	Gardner (27 th) .509 (.116)	Spitzer (18 th) .393 (.115)
42 nd , 2 nd Sess. (1996)	Nichols (13 th) -.723 (.134)	Kaites (16 th) .168 (.148)	Nichols (13 th) -.723 (.134)	Cummiskey (25 th) -.669 (.127)	Wong (18 th) .224 (.157)	G. Richardson (29 th) .149 (.150)
43 rd , 1 st Sess. (1997)	Chevront (25 th) -.393 (.238)	Leff (24 th) .183 (.206)	Nichols (8 th) -.509 (.203)	J. Lopez (22 nd) -.208 (.220)	Allen (28 th) .202 (.275)	Bee (9 th) .086 (.217)
44 th , 1 st Sess. (1999)	Mitchell (27 th) -.589 (.166)	May (26 th) .486 (.175)	Landrum (23 rd) -.733 (.202)	P. Rios (7 th) -.552 (.194)	Griffin (8 th) .526 (.167)	Freestone (30 th) .243 (.247)
44 th , 2 nd Sess. (2000)	Horton (14 th) -.655 (.104)	Huppenthal (6 th) .383 (.129)	Nichols (13 th) -.709 (.110)	Cunningham (13 th) -.287 (.136)	Griffin (8 th) .539 (.118)	Freestone (30 th) .050 (.142)
45 th , 1 st Sess. (2001)	Chase (7 th) -.664 (.14)	Daniels (6 th) .192 (.148)	Pickens (14 th) -.771 (.139)	J. Lopez (22 nd) -.588 (.138)	Gray (16 th) .160 (.146)	Bee (9 th) .211 (.128)
45 th , 2 nd Sess. (2002)	Giffords (13 th) -.732 (.117)	Leff (24 th) -.070 (.153)	Lugo (8 th) -.735 (.120)	Mitchell (27 th) -.698 (.160)	Weiers (16 th) .133 (.158)	Petersen (29 th) -.305 (.128)

*Note: The ideal point estimates in this table are the means of 1000 bootstrap Trials. Standard Errors appear in parentheses. These ideal point estimates are not comparable across sessions. However, they are comparable across chambers in a single session. Where a relevant subset of legislators is an even number, the median presented is the ideal point estimate for the senator in position $(\max - \min) / 2$. Legislators are listed with their district immediately following in parentheses.

Table 2: Second Dimension W-NOMINATE Estimates with Lewis-Poole Standard Errors for Chamber and Party Median Legislators, 42nd – 45th Arizona Legislatures*

<i>Session</i>	<i>Democratic Median</i>	<i>Republican Median</i>	<i>House Democratic Median</i>	<i>Senate Democratic Median</i>	<i>House Republican Median</i>	<i>Senate Republican Median</i>
42 nd , 1 st Sess. (1995)	Hubbard (10 th) -.281 (.158)	Turner (24 th) .172 (.194)	Horton (14 th) -.344 (.159)	Soltero (22 nd) .336 (.200)	Lynch (1 st) -.106 (.177)	Wettaw (2 nd) .527 (.216)
42 nd , 2 nd Sess. (1996)	Jackson (3 rd) -.007 (.223)	Preble (9 th) .160 (.241)	E. Richardson (11 th) -.764 (.142)	Henderson (3 rd) -.392 (.172)	Allen (28 th) -.171 (.205)	Barnes (21 st) .542 (.300)
43 rd , 1 st Sess. (1997)	Hamilton (3 rd) .204 (.154)	Jarrett (30 th) .034 (.204)	Fagin (13 th) .242 (.160)	Soltero (14 th) -.607 (.164)	Shaw (12 th) .121 (.171)	Day (12 th) -.540 (.174)
44 th , 1 st Sess. (1999)	Maiorana (8 th) .057 (.141)	Weiers (16 th) .106 (.165)	Clark (7 th) .416 (.126)	Jackson (3 rd) -.567 (.145)	Griffin (8 th) .204 (.171)	Bundgaard (19 th) -.531 (.113)
44 th , 2 nd Sess. (2000)	Cunningham (13 th) -.553 (.184)	McGibbon (9 th) .223 (.195)	Valadez (10 th) .358 (.145)	E. Richardson (11 th) -.551 (.177)	Huffman (12 th) .144 (.199)	Bee (9 th) -.654 (.205)
45 th , 1 st Sess. (2001)	Loredo (22 nd) -.149 (.169)	May (26 th) -.088 (.169)	Foster (20 th) -.261 (.146)	Cummiskey (25 th) .318 (.165)	Nelson (17 th) -.251 (.170)	Gnant (28 th) .623 (.128)
45 th , 2 nd Sess. (2002)	Avelar (23 rd) -.053 (.216)	Verkamp (2 nd) .165 (.222)	Pickens (14 th) -.333 (.209)	Mitchell (27 th) .190 (.228)	Pearce (29 th) -.157 (.248)	Petersen (29 th) .523 (.246)

*Note: The ideal point estimates in this table are the means of 1000 bootstrap Trials. Standard Errors appear in parentheses. These ideal point estimates are not comparable across sessions. However, they are comparable across chambers in a single session. Where a relevant subset of legislators is an even number, the median presented is the ideal point estimate for the senator in position $(\max - \min) / 2$. Legislators are listed with their district immediately following in parentheses.

Table 3: Intra-District Comparisons of House Members to the Other District Representative and the District Senator

Session	House Comparison $ H1-H2 $	Average Absolute Difference House/Senate $\text{mean}\{ S-H \}$	Largest House/Senate Difference $\max\{ S-H1 , S-H2 \}$	Mean Standard Error of the Estimates
42-1	0.477	0.413	0.590	0.113
42-2	0.474	0.322	0.461	0.137
43-1	0.584	0.479	0.641	0.193
44-1	0.313	0.366	0.477	0.182
44-2	0.313	0.431	0.545	0.128
45-1	0.371	0.338	0.432	0.138
45-2	0.308	0.384	0.525	0.141

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