Ideological extremism and electoral design
Multimember versus single member districts

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Abstract

Relying on a formal theoretical model, Cox (1984; 1990a; 1990b; 1997) demonstrates that single member districts induce candidates toward policy positions at their constituency median while multimember districts encourage dispersion. We test this theoretical implication in the context of the Arizona state legislature, in which each legislative district chooses one senator and two representatives in single member and multimember contests respectively. To do so, we generate W-NOMINATE estimates of scores based on roll-call data from the Arizona state legislature that are comparable across chambers (Senate and House). Our results are substantially less supportive of the formal theory than are those of prior studies.

1. Introduction

Electoral structures are among the most important institutional arrangements shaping the incentives that drive legislators' behavior. American state legislatures provide considerable institutional variation for testing theories of legislative representation, and one such institution is the multi-member district (MMD) wherein more than one legislator is elected from the same district in the same election. Though the single member district (SMD), in which a single legislator represents one geographic district, is employed in U.S. House and most U.S. state legislatures, several state legislatures are chosen via MMD balloting. Although there can be considerable variation in MMDs among the states, one common structure is multiple candidate competition for two seats representing a single district, with the two candidates receiving the most votes being elected. The electoral game is quite different when a candidate can be running against members of other parties as well as another candidate of the same party. The incentives inherent in such a system diverge from those for a legislator in a SMD, and it likely that such incentives have an impact on legislative representation.

Formal theoretical models suggest that MMD legislators will move away from the median voter under certain conditions (Cox 1984; 1990a; 1990b; 1997), 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). These empirical studies have relied on interest group ratings, interviews, or a few select roll-call votes as proxy indicators of legislator ideology, but none have used large numbers of roll calls over several legislative sessions (compare to Wright and Schaffner 2002).

We seek to test the hypothesis that MMDs influence legislative voting behavior by generating W-NOMINATE scores (Poole and Rosenthal 1997) as ideal point estimates based on roll calls in eight recent sessions of the Arizona state legislature (1995-2002). Arizona provides an institutional structure helpful for testing the effect of MMDs on legislator extremism; the Arizona House is chosen through a free-for-all MMD election while the Senate faces a SMD system, but the geographic lines for both House and Senate districts precisely overlap. Thus, in Arizona, two MMD representatives and one SMD senator represent each voter.

To test the hypotheses on the impact of SMD versus MMD districts on legislative voting, we select roll calls (1) in which the Arizona House and Senate vote on precisely the same language of proposed legislation and (2) which place legislators in the position of choosing between the proposal and the status quo. These roll calls become the data for estimating ideal points that are comparable across chambers. Using the resulting ideology estimates, we test the impact of the electoral mechanism by examining extremism with quantile regression analysis as well as univariate deviation and variance ratio tests. We find little support for specific hypotheses on the number of candidates in an election but more support for the more general notion that MMD legislators reveal more extreme positions (Cox 1990a).

We begin with a review of the literature on MMD and SMD electoral institutions, followed by a discussion of prior efforts to estimate empirically the effect of MMD on extremism. We then formulate our hypotheses, discuss our method for estimating ideal points, and review our methods. Estimation results follow, and the paper concludes with some brief summary remarks.

2. Legislative representation in multimember districts

Multimember district systems have a long history in the American states. 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 1960s when their use declined as a result of voting rights legislation and court decisions. In the 1950s, 36 state legislatures employed MMDs for 45% of legislative seats (Klain 1955), and in 1962 about 46% of legislators were elected from MMDs (Cox 1984). Because partisan or racial minorities in a MMD could be outvoted by the majority even though they could win in a SMD (carved from the larger MMD), many states abandoned the MMD. By 1984, only 26% of all representatives and 7.5% of senators nationwide were elected in MMDs (Niemi, Hill, and Grofman 1985). After redistricting efforts precipitated by the 2000 census, fewer than ten states used MMD systems with free-for-all elections involving multiple candidates.

States have employed a number of types of MMDs over the years, with Arizona using the bloc with partial abstention system.[1] A bloc system institutes 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. Voters must use both of their votes on different candidates in a bloc MMD election, but an important variation includes partial abstention. In this electoral structure, voters may choose to cast only one vote or up to the limit allowed. In the Arizona House (with a district magnitude of two), two Democrats, two Libertarians, two Greens, and two Republicans could all compete simultaneously for the two available seats. Those seats are awarded to the two candidates with the highest vote totals in the district. In a tight four-candidate race, then, a winning candidate may garner as little as 26% of the votes cast in the election.[2]

The vast majority of studies examining the spatial theory of elections have focused on SMD systems, but research on MMD systems demonstrates that most variations of MMD generate incentives for candidates to move away from the median voter. Using a variety of assumptions about rules, voters, and the number of competitors, formal models have identified equilibria distant from the position of the median voter (Eaton and Lipsey 1975; Denzau, Katz, and Slutsky 1985; Greenberg and Shepsle 1987). In the most comprehensive examination of MMD rules, Cox (1990a; 1990b) introduces the concepts of *centripetal* (centrist) and *centrifugal* (moving away from the center) forces to characterize the incentives inherent in various electoral systems. In a unidimensional spatial model with candidates characterized by typical assumptions (e.g., single-peaked preferences, sincere voting), bloc with partial abstention provides centrifugal forces away from the median voter with as few as four candidates in a two-seat MMD (Cox 1990b: 917). Cox shows further that more candidates should lead to more dispersion, or movement away from the median in one direction or another along the unidimensional policy space.

3. The empirical analysis of extremism

The hypothesis that MMDs lead to more extreme legislators in a chamber has received little empirical verification. Much of the work has been done in the comparative context with various MMD arrangements, institutional rules and political cultures that may or may not reflect the realities of American state legislatures. Cox (1997) examined the implications of his spatial models with case studies in nations having various forms of MMD, where he found evidence supporting the extremism hypothesis. Similarly, in two studies of Chilean MMDs, Dow (1998) and Magar, Rosenblum, and Samuels (1998) also find support for the extremism hypothesis. In the American context, Schiller examined the U.S. Senate (a staggered MMD) and finds evidence that "a combination of electoral incentives and institutional forces … push senators [from the same state] in contrasting directions" (Schiller 2000: 4).

The extremism hypothesis has received less attention in the literature on American state politics. One possible effect generated by MMD is that political parties could be different in chambers with members elected in MMD versus SMD elections. To address this issue, Adams (1996: 137) employed formal logic in arguing that in all but the rarest of cases, MMDs "should increase the ideological variance across a party's pool of nominees." Using ratings of Illinois legislators calculated by an interest group before and after a switch from MMD to SMD, Adams finds evidence that parties were more ideologically diverse during the years with the MMD system. This finding is suggestive, but has several limitations. First, it uses only one interest group's rating as a measure of legislator preferences. Second, the Illinois legislature used a cumulative MMD system, which was unique at the time it was in place, has not been used in any state since 1982, and generates different incentives for legislators' behavior than the more prevalent bloc with partial abstention form of MMD (Cox 1990b).

Richardson, et al. (2004) test for ideological extremism in the Arizona state legislature and provide evidence for the 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. The results are suggestive of the impact of MMDs, but their measure of ideology is based on interest group endorsements, and interest group scores have several major limitations (Fowler 1982). First, the interest group score used in the analysis is an ordinal rather than an interval variable having a scale of only nine values. The coarseness of this measure may itself mask extremism. A change in endorsement from one or two groups would have a large impact on whether someone is classified as ideologically extreme. Second, the analysis tests only for chamber differences but does not test formally derived hypotheses regarding the number of candidates.

4. Hypotheses

Our general research question relates the effect of multimember districts to the revealed ideological extremism of legislators in roll-call voting. Testing our hypotheses requires a measure of legislators' ideological preferences. Revealed preferences in office provide a rich source of data for the careful testing of theories of electoral regimes. Roll-call voting provides data for the calculation of ideal point estimates for the measurement of revealed ideology (Poole and Rosenthal 1997) that allows us to test several hypotheses on the relationship between MMDs and ideological extremism. We test two versions of extremism, which we shall call (a) *district extremism* and (b) *legislative extremism*.

District extremism is defined as the absolute difference between representative *i* and the median representative of district *j*, where district *j* is represented by three legislators, one senator and two representatives. We invoke the median voter theorem (Hotelling 1929; Downs 1957) to equate the ideal point estimate of the senator in district *j* with the revealed spatial location of the median voter in district *j*. The median voter theorem shows that a candidate in a SMD election must ideologically converge to the median to win (but see Burger, Munger, and Potthoff 2000). By this logic, elected Arizona senators represent the median district policy preferences. Because senators and representatives are elected in precisely the same geographic districts, the senator's ideal point derived from roll-call patterns can serve as a theoretically valid proxy for district preferences for both of the representatives in the district. Therefore, we can compare each representative's ideal point estimate to that of the senator from his or her district as a measure of extremism relative to the constituency median.

To be sure, the U.S. congressional literature sounds a note of caution against our assumption of convergence in the Arizona senate. For example, Ansolabehere, Snyder, and Stewart (2001: 141) find evidence against candidate convergence to the median voter in U.S. House elections. Using voter data, Gerber and Lewis (2004) find that legislators are most constrained to the median voter in homogeneous districts. Relatedly, Burden (2004) examines the source of divergence in congressional elections, finding that candidates with a solid reputation among voters, whose electoral competitors are weak in general elections, and who face strong primary challenges are more likely to deviate from the median voter.

In state legislative settings, candidates do not enjoy the same popular recognition as those for national office, and competition for SMD state legislative seats is not as keen as in congressional races. For example, in the 1994 through 2000 elections for the Arizona senate that correspond to our sample, the winner faced no challenger in 47 of 120 general elections, and won an average of 79.1% of the vote. In three of the four elections during this period, only a handful of senate races yielded a winner with less than 60% of the vote. Indeed, in 1998, the median senate candidate faced no challengers and won 100% of the vote. Primary competition was also weak throughout the period; in the 1998 and 2000 elections, the median number of primary candidates was one with a median primary vote share of 100%. The Arizona senate fails to meet the empirical conditions that Burden (2004) identifies for divergence to be likely. Thus, we feel that our assumption is more justifiable in the Arizona context than in the case of congressional elections. As a further control, we also include demographic variables in our models to partial out constituency pressures for legislators to generate more or less extreme voting records.

Cox (1990b: 916, Proposition Two) derives the very specific prediction that for a bloc MMD with partial abstention, such as the Arizona House, three competitors in the election is associated with candidate positions around the median voter in the district, but the presence of more than three competitors induces dispersion of positions in the policy space. Because the median voter theorem holds that a SMD election produces candidate positions that tend to cluster around the median voter in the district with three competitors, it is expected that the Senator, elected in a SMD election, reveals an ideology in roll-call voting at the spatial position of the median voter in his or her district. Because Cox's (1990b) Proposition Two is shown relative to the median voter in the district, we can construct the following hypothesis. [3]

> **H1:** Members of the Arizona House in a four or more-candidate race in the most recent general election reveal more *district extremism* than those elected in a 3-way race.

Cox (1990a: 196) also suggests the more general expectation that in MMD elections, "more candidates lead to greater dispersion." To test for this broader concept, we use a measure of the number of candidates in the general election in a quantile regression predicting the district extremism of House members. Because the original proposition refers to the median voter in the district, we employ our measure of district extremism in the test.

> **H2**: A House member elected in a district with more candidates will exhibit more *district extremism* than one elected with fewer candidates.

Legislative extremism is measured relative to the legislative median as the absolute difference between the ideal point estimate of representative *i* and the ideal point estimate of the median member of the legislature. It captures the concept most students of legislative politics identify as ideological extremism, identifying the most conservative and most liberal legislators as the ideological extremists relative to the median legislator. This view of ideological extremism, however, does not reflect whether a particular legislator is extreme relative to his or her district's constituents. If a liberal legislator represents a liberal district, then the legislator's roll-call record reflects the district median preference for liberal policies.

Though not a direct prediction of Cox (1990b: Proposition Two), we also hypothesize that such extremism may be represented at the legislative rather than the district level. This hypothesis focuses attention on the impact of the Arizona's MMD/SMD system on statewide policy outcomes.

Does increased candidate competition produce more extreme representatives more generally? This question is of contemporary interest in the design of electoral systems. A variety of work on the effects of mixed electoral systems (like that in Arizona) has been done at the cross-national level (e.g., Gschwend 2007; Ferarra and Herron 2005; Kostadinova 2002). For example, Kostadinova (2002) finds that mixed systems produce fewer winners and larger electoral margins than proportional representation systems in the emerging democracies of Eastern Europe. Yet less is known about the effect of these electoral structures on the relative extremism of legislative behavior. We test the following hypothesis.

> **H3:** Members of the Arizona House in a four-or-more-candidate race in the most recent general election reveal more *legislative extremism* than those elected in a three-way race.

We test hypotheses H1 and H3 by measuring the effect of two dichotomous variables. The variable *2 Candidates* indicates that a House member was elected in a two candidate, noncompetitive race in the most recent election, while *4+ Candidates* indicates that a representative's most recent election involved four or more candidates (with the reference category being a three candidate race). Testing the hypotheses requires examining the 4+candidate variable and its sign, anticipated to be positive, relative to the three-candidate referent.

Hypothesis H1 derives from a specific prediction of the impact of electoral system type on ideological extremism, but a more general research question goes to whether legislators in a MMD chamber are ideologically distinct from those in a SMD-elected chamber. As noted, members of the Arizona Senate are elected from a SMD that corresponds exactly to the geographic district lines of the MMD represented by members of the Arizona House, permitting a test of the effect of the differing electoral systems on the extremism of the legislators they elect.

> **H4:** Members of the MMD House exhibit more *legislative extremism* than members of the SMD Senate.

Another measure of the impact of electoral system on ideological extremism is simply to compare ideological dispersion, measured by the standard deviation of legislators' ideal points, in the two chambers. If MMDs induce extremism, we would expect the dispersion of the ideal point estimates in the MMD House to be larger than those for members of the SMD Senate.

> **H5:** The dispersion in the ideal point estimates of the MMD House is larger than the ideal point dispersion in the SMD Senate.

Building on the theory advanced by Cox (1990b), Adams (1996: 129) posits that parties elected in a state legislative chamber using MMDs, in all but the rarest of cases, will be "more ideologically diverse than those elected under single member plurality," *ceteris paribus*. Adams shows formally that extremism at the district level aggregates into extremism in the party caucus. Although Adams uses interest group scores, we apply his test to our ideal point estimates for each of the party caucuses in each chamber. Because groups emphasize a limited number of issues that may present a misleading and polarized picture of legislative decisionmaking (Fowler 1982), roll-call based measures make it less likely that we will find polarization and provide a more rigorous test.

> **H6:** The dispersion in the ideal point estimates for a given party caucus in the MMD House is larger than the dispersion of the ideal point estimates for the same party in the SMD Senate.

Several caveats on the significance of support for these hypotheses are in order. First, the Cox (1990b) argument involves candidates in the election rather than floor behavior so our use of ideal-point estimates is an imperfect translation of electoral spatial position onto a legislative policy space.[4] Second, agenda setting in the legislature may reduce the likelihood of finding chamber differences because our estimates account only for those bills that survive the process until a floor vote. Third, the number of legislators (90 in each session) is rather small so it may be more difficult to attain significant results. Finally, partisanship may affect ideological extremism in the form of pressure from party leaders. Regardless of the source of such pressure or whether it cautions moderation or extremism, it may nonetheless reduce the likelihood of finding effects.[5] As noted, we also estimate our models with demographic controls to capture constitutency pressures toward extremism. We note in summary that these factors may reduce the likelihood of finding empirical support for the hypotheses listed above.

5. Estimating legislator ideal points

Our ideal-point estimates rely on roll-call data from the 42nd through 45th Arizona legislatures (1995-2002). An important issue for producing scale comparable ideal points is the "bridging" of observations across chambers (e.g., Poole 2005: ch. 6; Bailey and Chang 2001). Our hypotheses require ideal point estimates that are comparable for members of both the House and Senate. We accomplish this task through the selection of roll calls included in the dataset. To bridge the chambers, we chose roll calls in which one chamber voted on precisely the same version of a given bill as was considered in the last vote in the opposite chamber. The third reading of a bill in the House was matched with a final reading in the Senate with no new amendments or vice versa. Thus, the vote in the Senate and the vote in the House were cast on proposals having *identical* language. These roll calls are akin to "final passage" votes in the U.S. Congress, used by empirical researchers in many spatial voting contexts because they "come very close to pitting a policy alternative against the status quo" (Roberts and Smith 2003: 309). The dataset does not include votes on amendments, bills in which only one chamber voted, or votes prior to a conference committee report. Nonetheless, it is important to point out that the bills could have been amended in either chamber prior to the final reading that was used in our dataset.[6] We treat votes from both chambers on each identically worded proposal as a single roll call, and thus bridge all observations in our dataset. Our dataset includes one roll-call matrix for each session (year) in which the legislature met between 1995 and 2002.[7]

To produce single-session, chamber-comparable ideal point estimates, we used the W-NOMINATE routine (Poole and Rosenthal 1997). Though we do not employ them in testing our hypotheses, we generated bootstrapped standard errors (see Table 1; Lewis and Poole 2004).[8] Following convention, we set the standard for excluding legislators from the estimation at participation in less than 20 roll-call votes.

We chose Kenneth Cheuvront (D-25th District) as "left" (liberal) on the single dimension recovered in each legislative session between 1995 and 2002 for the purpose of identifying the W-NOMINATE estimation routine (Poole and Rosenthal 1997). Drawing on interest group scores and media accounts, we selected Cheuvront as consistently liberal. 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, such as the National Federation of Independent Businesses and the Arizona League of Conservation Voters. These unreported results suggest face validity.

Summary statistics for all ideal point estimates and covariates appear in Table 1. Standard errors in the 1997 and 1999 sessions are the least precise, while those for 1995 display the greatest precision. Fit statistics for the W-NOMINATE procedure are included in Table 2. The percent of roll calls correctly classified by the spatial model ranges from 87.1% to 90.2%. The average proportional reduction in error (APRE) indicates how the classification of roll call votes using a purely spatial voting model improves on a null model under which legislators all cast identical votes. The APRE indicates the extent to which classification results achieved by the use of a spatial model of voting improve upon classification results using an unsophisticated point of reference, such as a model that predicts all members to vote identically. Higher APRE indicates better classification. Finally, the geometric mean probability (GMP) is a distance sensitive measure that imposes greater penalties on classification errors further away from the cutting lines on the roll calls in the dataset. GMP is calculated as the exponentiated average log-likelihood across all roll calls. The high GMPs (ranging from 0.724 to 0.782) suggest votes consistently classify according to the spatial model. For purposes of comparison, the one-dimensional spatial model produces an average GMP of 0.682 across the history of the U.S. Congress (Jenkins 1999: 1156). Overall, the fit statistics suggest the spatial model of voting is sufficiently evident in the behavior of the Arizona legislators over the roll call votes in the sample so that our scores are reasonable estimates of legislator ideology.

We use the estimated ideal points to generate two measures: legislative extremism and district extremism (as described above). To generate the legislative extremism measure, we "fold" all ideal-point estimates around the estimate for the median legislator by taking the absolute value of the difference between each legislator's score and the median. The median legislator's extremism score is thus equal to zero and the legislator farthest away in Euclidean distance (i.e., in either direction) has the highest extremism score. The district extremism measure folds the ideal point estimates for a member of the district's House delegation around the ideal-point estimate of the Senator from that district, such that extremely low (more liberal) or extremely high (more conservative) relative estimates are likewise represented at higher values of district extremism. These extremism measures are used as our dependent variables.

6. Methods

To test the hypotheses of the electoral structure on the extremism of legislators, we employ quantile regression analysis. Ordinary least squares (OLS) regression estimates marginal effects on the mean of our ideological extremism measure for the regressors, that is, it estimates $E(Y|\mathbf{X})$. Such an approach is not reasonable for dependent variables with different variances at different values since no single marginal effect captures the impact of some regressor on Y. This is very likely to be true in the case of ideological extremism. Our extremism measures are based on ideology estimates produced via W-NOMINATE. Yet, the scale of a NOMINATE score is arbitrary. That is to say, it is unclear that a difference of 0.5 is a signal of the kind of extremism implied by Cox's theory, but we do know that it implies more extremism than does a difference of 0.1. Thus, we estimate the effect of the electoral structure at various quantiles of the distribution of our extremism measures to respect the fact that they may not map cleanly to the underlying concept of extremism at work in the theory. For example, if true extremism only maps to very large values of the legislative extremism variable, then marginal effects at the mean produced via OLS cannot meaningfully describe the true effect of electoral structure.

Quantile regression permits an examination of whether extremism (measured either as legislative or district extremism) depends on hypothesized covariates at each quantile along the conditional distribution of the dependent variable (Koenker and Bassett 1978). Because our hypotheses specify the effect of covariates on ideological extremism, it is reasonable to anticipate that more or less extreme legislators may be differentially impacted by these covariates. An OLS analysis would poorly estimate the conditional mean for the least and most extreme legislators in the sample (Koenker and Hallock 2001: 147). Moreover, truncating the sample by segmenting the dependent variable is "doomed to failure for all of the reasons so carefully laid out in Heckman's (1979) work on sample selection" (Koenker and Hallock 2001: 147). By contrast, quantile regression permits an examination of the significant variables for any quantile along the conditional distribution of the dependent variable (Koenker and Bassett 1978), which allows an examination of the full distribution including the extremes.

More precisely, we analyze some quantile, τ, for which a weighted regression is performed such that the residuals (the difference between the observed value of the dependent variable and the linear predictor) are weighted by $w_i = 2\tau$ if the residual is positive and $w_i = (2 - 2\tau)$ if the residuals are less than or equal to zero. By way of example, for $\tau = .20$ (the 20th percentile of the distribution of the dependent variable), $w_i = 0.40$ for positive residuals and $w_i = 1.60$ for negative residuals. The least absolute deviation estimation procedure minimizes an asymmetric loss function defined by the residuals and the weights (see, e.g., Manski 1988, Section 4.2.4; Koenker and Bassett 1978).[9]

As noted, we include two district demographic measures as control variables in the models in addition to the hypothesized variables on the impact of the electoral structure on extremism (such as the number of candidates in an election). *Income Polarization* is the absolute value of household income in the legislator's district minus the median household income of Arizona legislative districts. *Racial Polarization* is the absolute value of a district's percentage minority minus the statewide median percentage minority. These variables partial out the effects of race (Herring 1990) and income (Goff and Greier 1993) that have been shown in prior research to be predictors of legislative behavior. Both control variables are folded to test for the impact of extremity of the district constituent demographic characteristics on the legislator's roll-call voting extremism.[10]

7. Results

Quantile regression estimates are presented in Table 3 through Table 5. They include estimates of the coefficients of quantile functions, $Q(\tau)$, where $\tau = \{0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 0.90\}$ as well as OLS (mean regression) estimates. Each table includes *p*-values for all regression results reported. OLS p-values are based on heteroscedasticity-robust standard errors (White 1980), and the R^2 is reported for each OLS model estimated. We do not present the results of our control variables, racial and income polarization, but generally observe that racial polarization is a positive and significant predictor of extremism in many sessions and quantiles. Income polarization is rarely significant with mixed directional impact.

TABLE 3 ABOUT HERE

District Extremism in the House

Given the median voter theorem, as noted above, we take the ideal point estimate of a district's Senator (SMD) as representative of the median voter in the district. Our measure of district extremism among members of the House is the absolute difference between a House member's ideal point estimate and that of the Senator from his or her district. The most extreme legislators, conservative or liberal, will be indicated by the highest values in the distribution of the dependent variable. Hypothesis H1 states that legislators elected in a race with four or more candidates in the most recent general election should be associated with more district extremism than those elected in three-candidate races. Hypothesis H2 is more general; facing more candidates in the general election leads to a more extreme legislative voting record relative to the district median. As indicated by the results presented in Table 3, neither hypothesis H1 nor H2 is strongly supported in the context of district extremism.

The quantile regression coefficients can be interpreted as the marginal change in the τth quantile for a marginal change in an independent variable. This does not, however, imply that a legislator whose ideal point falls in the τth quantile would still have been measured there if the value of a particular independent variable changed (Koenker and Bassett 1978). So, the magnitude of quantile regression coefficients is interpretable, but with caution. To assess the evidence on hypothesis H1 on the impact of 4+ candidates on district extremism, consider the first two rows below each labeled legislative session in Table 3. Significant positive effects of 4+ candidate races are observed only for the 10th percentile of the 43rd second session and the 50th and 60th percentiles of the 45th first session. Results for the 44th first session are also supportive, with two-candidate races negatively associated with district extremism in the 50th through 80th quantiles of that measure. These results are contradicted, however, by significant and negative coefficients in the 42nd second session for the 4+ candidate results. Further, the absence of significant results for all quantiles of four sessions and only one significant quantile in a fifth session offers reason to reject hypothesis H1.

Hypothesis H2—more candidates are associated with greater district extremism—receives no support in any session as seen in the rows labeled "Number of Candidates" in Table 3. The variable for the number of candidates is never significant, and the coefficients often run counter to the hypothesized direction of impact. Overall, the effect of greater candidate competition in MMD elections on district extremism is nonexistent.

7.1 Legislative extremism

The results presented in Table 4 make it possible to test Hypothesis H3 for each of the eight legislative sessions in our sample. Hypothesis H3 predicts that four-or-more-candidate races induce more legislative extremism (represented by positive coefficients). The dependent variable employed to measure legislative extremism is the absolute difference of a legislator's ideal point estimate from the median of the legislature, House and Senate. Consequently, higher quantiles in the distribution of the dependent variable capture the most ideologically extreme legislators such that the hypothesis suggests the 4+ candidate variable will be significant and positive in the upper quantiles, i.e., τ = 0.70, 0.80, and 0.90.

TABLE 4 ABOUT HERE

A quick glance of Table 4 makes it readily apparent that no significant coefficients show the hypothesized positive direction for the 4+ candidate variables. Indeed, only the OLS (mean) estimate for the 42nd second session is significant, but *negative*, indicating—contrary to hypothesis H3—that legislators elected in races having four or more candidates were *less* extreme in their voting records than their counterparts elected in three-candidate races. Significant results for the two-candidate coefficients in the 42nd first session are in the hypothesized negative direction, but those in the 45th first session show a positive effect. Overall, the results presented in Table 4 provide virtually no support for the specific candidate competition hypothesis in the context of legislative extremism.

TABLE 5 ABOUT HERE

The results in Table 5, which compare the legislative extremism of House versus Senate members (Hypothesis H4 on chamber differences), provide much stronger evidence for the influence of MMD electoral regimes on legislative extremism. Membership in the SMD Arizona Senate is significantly associated with less legislative extremism than membership in the MMD Arizona House in most quantiles in seven of the eight sessions (excepting the 43rd second) shown in Table 5. We note that the coefficients are large relative to the dependent variable. Overall, it appears that extremism relative to the legislative median is related to the electoral system that selects representatives, and the effect of the more generally formulated Hypothesis H4 regarding chamber differences is much stronger than the specific impact of the number of candidates in a particular race from Hypothesis H3.

7.2 Dispersion of legislator ideal points

Our remaining hypotheses relate to the dispersion of candidate ideal point estimates across chambers (H5) and in party caucuses across chambers (H6). If MMDs produce more extreme legislators than SMDs, we expect a greater dispersion of ideal point estimates across the House relative to the Senate (H4). The first two columns of Table 6 indicate the standard deviation of the distribution of ideal point estimates in each chamber for each legislative session. Beneath the standard deviations for each session, the *p*-value of a variance ratio test is presented for a null hypothesis that the standard deviations of House and Senate ideal point estimates are equal against the alternative hypothesis that the standard deviation of House members' ideal points is greater than that of Senators. As Table 6 shows, the dispersion of House ideal point estimates exceeds that of the Senate in seven of the eight sessions, and the standard deviation of House estimates is significantly larger in five sessions.

TABLE 6 ABOUT HERE

Similarly, Table 6 presents the standard deviations and variance ratio test results comparing the party caucuses in each chamber. Columns four and five compare the Democratic caucus in each chamber by session. The ideal point estimates of House Democrats are more widely dispersed than those of Senate Democrats in four of the eight sessions, and that difference in dispersion is significant only once. Alternatively, House Republicans have significantly more dispersion in their ideal point estimates than their Senate counterparts in six of the eight sessions.

The evidence for the effects proposed in H6 is more complex than hypothesized with clear support from the Republican caucus but virtually no support in the Democratic caucus. This finding differs from Adams' (1996) results, which revealed no party caucus differences. We note, however, that an important dynamic characterized the time period in our sample. Democrats were a minority in the House (20-24 of the 60 House members in each of the eight sessions), and constituted a minority in the 42^{nd}, 43^{rd}, and 44^{th} Senates (nine, 12, and 14 of 30 senators respectively). Democrats were numerically tied with Republicans for control of the 45^{th} Senate. Democrats were a substantial minority in the House throughout the sampled sessions, so their caucus may have required more cohesion than the large Republican House majority, which consistently exhibits greater variation in ideal point estimates. It is interesting to note that the ideal point estimates of Senate Republicans vary considerably during the 1999 session but not in 2000 even though they held the majority in both years. In 2001 and 2002, when sharing control of the Senate with Democrats, these Republican caucuses show a much tighter dispersion of ideal point estimates. Partisan control may therefore have some impact on the potential for a party to exhibit ideological extremism, but House party caucuses generally show more dispersion than their Senate counterparts, particularly for the majority party.

8. Conclusion

Electoral structures provide the crucial link in a representative democracy between the preferences of the citizenry and decisions made by their representatives. In this study, we examine the impact of one electoral structure, multimember districts in a bloc with partial abstention form, on the ideological extremity of Arizona state legislators as expressed in roll-call votes. This study identified a quasi-experiment to examine theories of MMD versus SMD elections in an Arizona institutional arrangement in which each legislative district elects two House members in a MMD election and one Senator in a SMD election, and the geographical boundaries are identical for both chambers across the state in perfectly contiguous districts.

We find strong support for the general notion that the chamber with legislators chosen in MMD elections possesses more ideologically extreme legislators than the chamber with legislators chosen via a SMD system. Further, the MMD chamber has wider variances in ideal-point estimates than the SMD chamber. These general results are consistent with previous findings (Adams 1996; Richardson et al 2004). Strikingly, however, the more precise predictions regarding numerical candidate competition in elections derived by Cox (1990a; 1990b) are not supported. This is a new and, we believe, significant finding. Moreover, the extremism that these electoral institutions produce is displayed more starkly in the legislature as a whole rather than in individual districts. While we believe the median voter assumption is justified by the nature of competition in Arizona senate races, it is possible that some of the weakness of this finding is partially due to measurement error introduced by this assumption. Future research should examine alternative means of measuring the MMD district median. Finally, the results suggest majority party caucuses display greater variation in the comparison of the MMD House to the SMD Senate than does the minority party in the same comparison; a result at odds with Adams' (1996) results.

Several interesting implications flow from our results. Research on legislative representation in MMDs has focused more directly on descriptive rather than substantive concerns, but clearly they also have an important impact on substantive representation. Scholars have found evidence that MMDs reduce minority representation (Herrick and Welch 1992; Grofman, Migalski, and Noviello 1986; Moncrief and Thompson 1992; but see Rule 1992) but 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 see Welch and Studlar 1990). Overall, the evidence suggests MMDs produce a different distribution of legislators, and our study provides support for a substantive effect as well. We believe our results suggest the importance of future work on the substantive impact of electoral institutions on representation.

Another implication of our research is that electoral structure may interact with partisan control of a legislative chamber in shaping ideological extremity. Some attention has been devoted to the impact of MMDs on party caucuses, but it has primarily focused on whether MMDs reduce minority party representation (Walker 1976; Rosenthal 1981: 15; Niemi, Hill, and Grofman 1985). Our findings suggest that ideological extremity related to electoral structure occurs in the majority party caucus rather than the minority party caucus in the MMD House, but more research will be needed to determine if this is a unique feature of Arizona politics, a result of legislative agenda control or a consequence of minority party strategic efforts. Because caucus members from the same district must compete against each other in a multimember district election, legislators in a MMD environment face very different incentive structures for partisan cooperation in roll call voting.

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Endnotes

[1] The major variations include bloc, bloc with partial abstention, cumulative, staggered, and seat, but within these structures, the district magnitude, or number of seats in a district, can vary across states and even within a state. Cox (1990b) argues that cumulative systems offer very different strategic considerations for candidates than bloc MMDs. Scholars have argued that the staggered and seat varietals are not true MMDs because they essentially involve SMD elections occurring in the same geographic district (Cox 1984; Hamm and Moncrief 1999: 148; Niemi, Jackman and Winsky 1991: 97), but they are often mistakenly used in analyses of MMD effects on representation.

[2] Consider general election returns reported by the Arizona Secretary of State during the period from which our data are drawn. In the 240 House elections between 1994-2000, 58 had two candidates, 88 had three, 76 had four, 16 had five, and two had six candidates. Among the two-candidate races, the average vote percentage accrued by the winning candidate was 48.98%, while that number fell to 38.23% in three-candidate races, 32.29% in four-candidate, 30.32% in five-candidate, and 24.5% in six-candidate races. In the 94 races with four or more candidates, the winner received an average vote percentage of 31.79%.

[3] Other factors, such the impact of primary elections, party or interest group pressures, or positioning for higher office could induce a Senator to move toward a more extreme voting record or alternatively a Representative toward a more centrist position. Although we acknowledge this set of possibilities, our purpose here is to test the theoretical proposition that MMDs produce extremism whereas SMDs do not. The empirical measure for district extremism is therefore based on a theoretical assumption about the median voter. Our approach is to test this strong assumption, but we also offer a test of an alternative measure of extremism with the legislative extremism measure comparing the legislator to the legislative median.

[4] Theoretically, significant findings are also evidence of the effect of ideological branding or commitment. Revealed preferences in roll-call voting once elected do not perfectly correlate with campaign positioning. If

candidates make one set of campaign statements and subsequently break those promises in office, then ideological inconsistencies from the campaign to roll-call voting reduce the likelihood of finding ideological extremism based on electoral system. This, of course, is likewise true of studies that use interest group ratings or other ideology estimates based on revealed preferences once in office (e.g., Adams 1996; Richardson, et al. 2004). One possible reason for revealed preference stability from campaign to office is "ideological branding" (Dougan and Munger 1989; Enelow and Munger 1993): candidates' ideological reputations make their campaign commitments more credible, but also constrain them as legislators to positions close to those taken on the campaign trail. This result holds even though other inducements to deviate from such positions are present during their terms in office (Dougan and Munger 1989). Another possible rationale is the commitment problem described in Alesina (1988) and related literature.

[5] For example, in Arizona a scandal led to the resignation of Republican Governor Fyfe Symington in 1997, and the unelected Republican Governor Jane Hull may not have been as influential in shaping the legislative agenda of the 44th session. Subsequently, in the 2000 election, Democrat Janet Napolitano was elected Governor to face a strong majority of Republicans in the House and an evenly divided Senate, and the circumstances may have affected the votes available for the study.

[6] Though it might be argued that this selection method throws out some contentious issues, the average majority margins on selected roll calls are not substantially larger than margins in the U.S. Senate. As an extreme example, they are roughly 15% higher than those in the highly contentious 106th Senate, which was characterized by the party-switch of Jim Jeffords from the Republican Party to an independent.

[7] We avoid pooling roll-call data across both sessions in a legislature because the uncertainty reduction due to the increased sample size does not outweigh the benefit of a greater number of temporal observations on the ideal point estimates. The average number of roll calls in the analysis was 113 in each chamber for each year, and every legislator in that session has a vote or abstention recorded for each of the 113 bills. The bridging requires some selection bias because bills that die in a least one chamber are not included. Further,

minor bills that pass both chambers with no amendments and therefore no need for an additional vote in the originating chamber are also not included. As Table 1 (uncertainty descriptives) and Tables 3-5 (estimation results) suggest, pooling across years is empirically unwarranted because bootstrapped standard errors on the ideal point estimates are not unreasonably large nor do the impacts of the covariates across sessions yield similar results.

[8] 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 thousand random draws and W-NOMINATE runs on the sampling matrices are performed, and variances are calculated from these bootstrap trials.

[9] The estimation was performed in STATA 9.0 using the sqreg routine, which produces estimates of the entire variance-covariance matrix by randomly resampling the data. This permits hypothesis testing within and across equations (i.e., $\tau = 0.10, 0.20$, etc.). Bootstrapped uncertainty estimates obtained in this manner are superior to those derived analytically, since the latter may be biased given heteroscedasticity (Koenker and Bassett 1982).

[10] Term limits offer an alternative hypothesis regarding extremism apart from electoral mechanisms. In Arizona, Proposition 107 was approved in 1992, with full implementation by the end of the 44th legislature (2000). Our data include roll calls from the 42nd through 45th legislatures (1995-2002), and thus covers periods both pre- and post-implementation. Term limits did not have a major effect on turnover rates;

turnover in the three elections (1994, 1996, and 1998) prior to implementation was 31%, as compared to 28% for the previous six elections (Moncrief, Niemi, and Powell 2003). Further, in 2000, 15 House members and seven Senators (slightly less than a quarter of each chamber) left office due to term limits. Term limits do complicate progressive ambitions of senators; in the mid-1990s, one legislator moved from the House to the Senate and back to the House, another moved from the Senate to the House, and two moved from the Senate to the House and back to the Senate. Throughout our sample, there was little movement from the House to Senate, with only 8% of House members running for Senate seats. If term limits were likely to have an impact on roll-call voting, we would expect differences in the second session of either the 44th or the 45th legislature. The results reported in tables three-five suggest no significant differences across legislative sessions. In unreported results, we further assess this alternative hypothesis by examining the behavior of legislators facing their last term in office. Because our ideal-point estimates are not directly comparable across years, we conducted an analysis based on the ideological ranks of legislators in each session (an ordinal measure). Controlling for legislator party, legislator gender and district demographics (percentage minority, percentage college educated, and the percentage social security recipients), the impact of term limits on deviations of last term rank from both the average rank of all prior terms (-2.833, $t = -1.93$) and from the rank in the penultimate term only (-2.355, $t = -1.72$) is statistically significant at conventional levels. Yet legislators exiting due to term limits displayed *smaller* deviations in their relative voting record than their non–term limited colleagues.

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Table 1: Summary Statistics for Ideal Point and Uncertainty Estimates

Session	Mean IP estimates	 Bootstrapped Std. Err.	Std. Dev. IP estimates	 Bootstrapped Std. Err.
42nd, 1st Regular (1995) N=88	.069	.113	.591	.023
42nd, 2nd Regular (1996) N=89	-.097	.137	.524	.025
43rd, 1st Regular (1997) N=90	-.017	.193	.492	.047
43rd, 2nd Regular (1998) N=89	.026	.145	.593	.028
44th, 1st Regular (1999) N=90	.005	.182	.583	.060
44th, 2nd Regular (2000) N=90	.016	.128	.555	.030
45th, 1st Regular (2001) N=91	-.193	.138	.525	.028
45th, 2nd Regular (2002) N=88	-.273	.141	.510	.021

Table 2: Spatial Fit Results for Initial W-NOMINATE Estimates by Legislative Session, 42nd - 45th Arizona Legislatures (1995-2002)

	Percent Correctly Classified	APRE	GMP
42nd, 1st Session (1995)	.881	.396	.746
42nd, 2nd Session (1996)	.878	.362	.747
43rd, 1st Session (1997)	.883	.405	.751
43rd, 2nd Session (1998)	.877	.310	.724
44th, 1st Session (1999)	.874	.401	.736
44th, 2nd Session (2000)	.871	.383	.735
45th, 1st Session (2001)	.902	.446	.782
45th, 2nd Session (2002)	.896	.463	.781

Table 3: Quantile Regression Analysis of District Extremism

Variable	τ =.10	τ =.20	τ =.30	τ =.40	τ =.50	τ =.60	τ =.70	τ =.80	τ =.90	μ
										N=58
42nd First										R^2=.02
2 Candidates	.033	.016	.024	-.008	-.171	-.121	-.202	-.166	-.409	-.107
	(.398)	(.802)	(.771)	(.946)	(.160)	(.321)	(.151)	(.376)	(.078)	(.192)
4+ Candidates	-.044	-.020	.053	.045	-.021	-.027	-.037	-.036	.086	-.015
	(.519)	(.840)	(.629)	(.696)	(.848)	(.799)	(.788)	(.867)	(.734)	(.871)
										N=58
										R^2=.02
Number of	-.038	-.015	.031	.027	.089	.078	.065	.124	.040	.046
Candidates	(.226)	(.761)	(.527)	(.599)	(.177)	(.298)	(.428)	(.242)	(.790)	(.312)
42nd Second										N=59
										R^2=.23
2 Candidates	.006	.039	-.012	.008	-.087	-.121	.028	-.044	-.079	-.059
	(.917)	(.547)	(.874)	(.943)	(.557)	(.512)	(.901)	(.805)	(.674)	(.483)
4+ Candidates	-.066	-.114	-.167	-.185	-.304	-.342	-.395	-.407	-.337	-.261
	(.079)	(.001)	(.000)	(.006)	(.000)	(.000)	(.002)	(.001)	(.088)	(.000)
										N=59
										R^2=.00
Number of	-.006	-.038	-.039	.011	.006	-.017	-.070	-.043	.051	-.001
Candidates	(.828)	(.150)	(.197)	(.806)	(.910)	(.805)	(.440)	(.629)	(.607)	(.978)
43rd First										N=60
										R^2=.02
2 Candidates	-.019	-.052	-.167	-.091	-.211	-.184	-.087	-.127	-.137	-.099
	(.841)	(.638)	(.163)	(.477)	(.120)	(.179)	(.469)	(.326)	(.321)	(.236)
4+ Candidates	.019	-.064	-.135	-.105	-.137	-.171	-.005	-.034	.021	-.038
	(.805)	(.525)	(.227)	(.383)	(.281)	(.205)	(.967)	(.770)	(.950)	(.646)
										N=58
										R^2=.00
Number of	.010	-.010	-.026	-.051	-.083	-.051	.013	-.008	.075	.002
Candidates	(.535)	(.638)	(.429)	(.319)	(.228)	(.545)	(.871)	(.917)	(.416)	(.964)
43rd Second										N=59
										R^2=.01
2 Candidates	.021	-.023	.087	.000	-.067	.005	-.138	.072	.167	.029
	(.720)	(.784)	(.446)	(1.000)	(.716)	(.980)	(.628)	(.801)	(.501)	(.805)
4+ Candidates	.110	.084	.155	.079	-.035	.104	-.042	-.142	.083	.058
	(.047)	(.214)	(.139)	(.547)	(.811)	(.502)	(.819)	(.470)	(.668)	(.514)
										N=56
										R^2=.00
Number of	.030	.036	.011	.022	-.031	.017	.016	-.092	-.059	.004
Candidates	(.199)	(.209)	(.791)	(.672)	(.665)	(.852)	(.880)	(.422)	(.511)	(.914)

Table continued on next page

Variable	τ =.10	τ =.20	τ =.30	τ =.40	τ =.50	τ =.60	τ =.70	τ =.80	τ =.90	μ
44th First										N=60 R^2=.05
2 Candidates	-.070 (.181)	.014 (.871)	-.016 (.891)	-.129 (.446)	-.359 (.036)	-.344 (.043)	-.401 (.012)	-.482 (.007)	-.444 (.102)	-.183 (.075)
4+ Candidates	-.048 (.342)	.009 (.914)	.003 (.980)	-.115 (.506)	-.344 (.066)	-.285 (.254)	-.162 (.641)	.194 (.544)	.250 (.165)	-.016 (.897)
										N=60 R^2=.01
Number of Candidates	.000 (.988)	-.007 (.621)	.007 (.525)	.006 (.614)	.000 (.990)	.023 (.542)	.013 (.850)	.113 (.182)	.060 (.370)	.019 (.441)
44th Second										N=60 R^2=.03
2 Candidates	.033 (.721)	-.081 (.467)	-.128 (.290)	-.108 (.317)	-.109 (.386)	-.051 (.718)	-.089 (.512)	-.046 (.722)	-.249 (.211)	-.084 (.325)
4+ Candidates	-.019 (.826)	-.078 (.508)	-.118 (.346)	-.038 (.725)	.011 (.932)	-.062 (.680)	-.118 (.609)	.145 (.582)	.061 (.847)	.036 (.750)
										N=60 R^2=.00
Number of Candidates	-.018 (.297)	-.008 (.654)	-.010 (.452)	.001 (.965)	-.005 (.861)	-.026 (.471)	-.034 (.423)	.028 (.639)	.045 (.569)	.006 (.776)
45th First										N=60 R^2=.04
2 Candidates	.070 (.440)	.161 (.115)	.134 (.204)	.120 (.258)	.129 (.285)	.192 (.236)	.178 (.385)	.261 (.275)	.001 (.997)	.123 (.255)
4+ Candidates	.022 (.742)	.071 (.340)	.048 (.451)	.095 (.060)	.104 (.051)	.159 (.016)	.206 (.131)	.053 (.851)	.357 (.348)	.144 (.145)
										N=60 R^2=.00
Number of Candidates	-.004 (.735)	.005 (.757)	-.004 (.824)	.004 (.862)	.001 (.943)	-.003 (.879)	-.004 (.877)	-.037 (.425)	.065 (.362)	.000 (.982)
45th Second										N=57 R^2=.02
2 Candidates	.002 (.985)	.076 (.581)	.091 (.579)	.321 (.073)	.333 (.061)	.263 (.244)	.141 (.647)	.000 (.999)	.227 (.578)	.138 (.373)
4+ Candidates	.008 (.805)	.031 (.488)	.024 (.669)	.044 (.570)	.107 (.395)	.134 (.463)	.033 (.901)	-.069 (.844)	.179 (.668)	.094 (.440)
										N=56 R^2=.02
Number of Candidates	-.005 (.296)	-.007 (.408)	-.013 (.283)	-.008 (.617)	-.021 (.320)	-.029 (.254)	-.025 (.581)	-.016 (.784)	-.038 (.518)	-.022 (.238)

The conditional densities for each decile of legislator ideology are estimated: i.e. τ = 0.10 denotes the 10th percentile; μ denotes the conditional density of the mean estimated via OLS regression with robust standard errors. OLS R^2 for the mean regression is included. Constant and demographic terms are not reported. Coefficients significant at the .05 level are indicated in grey.

Table 4: Quantile Regression Analysis of Legislative Extremism for Two or 4+ Candidate Elections

Variable	τ =.10	τ =.20	τ =.30	τ =.40	τ =.50	τ =.60	τ =.70	τ =.80	τ =.90	μ
42nd First										N=59 R^2=.48
2 Candidates	-.153	-.160	-.248	-.239	-.234	-.209	-.227	-.286	-.269	-.176
	(.413)	(.264)	(.049)	(.039)	(.033)	(.071)	(.045)	(.004)	(.026)	(.028)
4+ Candidates	-.250	-.257	-.190	-.126	-.146	-.165	-.149	-.189	-.143	-.152
	(.264)	(.100)	(.156)	(.294)	(.123)	(.083)	(.182)	(.163)	(.419)	(.094)
42nd Second										N=59 R^2=.39
2 Candidates	-.206	-.028	-.116	-.126	-.013	-.175	.006	.007	-.044	-.055
	(.228)	(.851)	(.374)	(.332)	(.101)	(.204)	(.963)	(.950)	(.658)	(.574)
4+ Candidates	-.179	-.149	-.124	-.175	-.163	-.247	-.220	-.146	-.150	-.166
	(.131)	(.115)	(.198)	(.106)	(.222)	(.082)	(.091)	(.223)	(.160)	(.029)
43rd First										N=60 R^2=.31
2 Candidates	.019	-.081	-.051	-.044	-.148	-.052	.052	-.014	-.125	-.011
	(.908)	(.641)	(.752)	(.785)	(.338)	(.692)	(.674)	(.911)	(.313)	(.903)
4+ Candidates	.131	.066	.041	.078	.076	.044	.101	.093	.042	.069
	(.181)	(.577)	(.771)	(.531)	(.510)	(.665)	(.376)	(.447)	(.746)	(.407)
43rd Second										N=59 R^2=.31
2 Candidates	.021	.043	.093	-.065	-.020	-.052	-.034	-.051	-.065	-.009
	(.895)	(.813)	(.599)	(.638)	(.880)	(.696)	(.794)	(.573)	(.404)	(.913)
4+ Candidates	.021	-.007	.009	-.025	.015	.087	.121	.055	.047	.032
	(.845)	(.963)	(.958)	(.855)	(.912)	(.542)	(.302)	(.527)	(.498)	(.696)
44th First										N=60 R^2=.02
2 Candidates	.283	.111	-.006	.059	.103	-.004	-.006	.022	.011	.032
	(.242)	(.604)	(.966)	(.659)	(.410)	(.971)	(.958)	(.821)	(.894)	(.715)
4+ Candidates	.213	.003	.007	-.008	.028	-.140	-.134	-.106	-.038	-.021
	(.318)	(.988)	(.966)	(.950)	(.830)	(.417)	(.388)	(.422)	(.707)	(.821)
44th Second										N=60 R^2=.04
2 Candidates	.061	.073	.084	.165	.171	.013	.021	-.009	.030	.077
	(.705)	(.672)	(.642)	(.338)	(.287)	(.920)	(.870)	(.935)	(.731)	(.431)
4+ Candidates	-066	-.023	-.052	.080	.100	.015	-.050	-.119	-.096	-.037
	(.689)	(.903)	(.815)	(.705)	(.613)	(.920)	(.738)	(.299)	(.366)	(.745)
45th First										N=60 R^2=.17
2 Candidates	.432	.334	.255	.379	.364	.257	.263	.217	.296	.327
	(.009)	(.047)	(.079)	(.010)	(.016)	(.087)	(.087)	(.231)	(.099)	(.005)
4+ Candidates	.066	.006	-.060	-.010	-.031	-.078	-.066	.035	.232	.006
	(.518)	(.956)	(.569)	(.929)	(.807)	(.608)	(.722)	(.882)	(.273)	(.958)
45th Second										N=59 R^2=.08
2 Candidates	.129	.085	.016	.149	.116	.133	.127	.363	.097	.145
	(.353)	(.535)	(.914)	(.363)	(.420)	(.559)	(.631)	(.206)	(.687)	(.304)
4+ Candidates	.182	.187	.045	.024	.027	-.082	-.052	-.058	-.056	-.022
	(.116)	(.145)	(.704)	(.833)	(.835)	(.634)	(.811)	(.849)	(.823)	(.851)

The conditional densities for each decile of legislator ideology are estimated: i.e. τ = 0.10 denotes the 10th percentile; μ denotes the conditional density of the mean estimated via OLS regression with robust standard errors. OLS R^2 for the mean regression is included. Constant and demographic terms are not reported. Coefficients significant at the .05 level are indicated in grey.

Table 5: Quantile Regression Analysis of Legislative Extremism with a Comparison of House and Senate Members

Variable	τ =.10	τ =.20	τ =.30	τ =.40	τ =.50	τ =.60	τ =.70	τ =.80	τ =.90	μ
42nd First										N=88 R^2=.45
Senate	-.035	-.066	-.143	-.170	-.196	-.161	-.163	-.197	.013	-.102
	(.745)	(.336)	(.038)	(.007)	(.003)	(.023)	(.041)	(.083)	(.935)	(.084)
42nd Second										N=89 R^2=.36
Senate	.013	-.110	-.088	-.078	-.161	-.160	-.132	-.087	-.020	-.120
	(.876)	(.200)	(.233)	(.287)	(.042)	(.057)	(.107)	(.351)	(.856)	(.017)
43rd First										N=90 R^2=.45
Senate	-.117	-.116	-.178	-.213	-.318	-.343	-.378	-.381	-.398	-.276
	(.044)	(.052)	(.007)	(.010)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
43rd Second										N=89 R^2=.21
Senate	.073	-.023	.015	-.019	-.006	.009	.023	.060	.030	.015
	(.440)	(.850)	(.898)	(.841)	(.948)	(.926)	(.791)	(.342)	(.528)	(.805)
44th First										N=90 R^2=.03
Senate	.113	-.025	-.108	-.142	-.156	.145	-.177	-.106	-.086	-.087
	(.299)	(.757)	(.165)	(.041)	(.017)	(.051)	(.056)	(.285)	(.179)	(.109)
44th Second										N=90 R^2=.23
Senate	-.224	-.177	-.324	-.342	-.398	-.349	-.353	-.346	-.376	-.280
	(.007)	(.057)	(.000)	(.000)	(.000)	(.000)	(.000)	(.001)	(.013)	(.000)
45th First										N=91 R^2=.12
Senate	-.072	-.066	-.110	-.164	-.171	-.119	-.182	-.267	-.330	-.168
	(.280)	(.322)	(.085)	(.025)	(.013)	(.105)	(.051)	(.005)	(.000)	(.007)
45th Second										N=88 R^2=.19
Senate	-.049	-.214	-.222	-.242	-.213	-.256	-.316	-.300	-.694	-296
	(.549)	(.000)	(.000)	(.000)	(.001)	(.001)	(.002)	(.070)	(.001)	(.000)

The conditional densities for each decile of legislator ideology are estimated: i.e. τ = 0.10 denotes the 10th percentile; μ denotes the conditional density of the mean estimated via OLS regression with robust standard errors. OLS R^2 for the mean regression is included. Constant and demographic terms are not reported. Coefficients significant at the .05 level are indicated in grey.

Table 6: Standard Deviation by Chamber and Party Caucus
First Dimension W-NOMINATE Estimates,
42^{nd} – 45^{th} Arizona Legislatures (1995-2002)

	Overall		*Democratic Caucus*		*Republican Caucus*	
Session	*House*	*Senate*	*House*	*Senate*	*House*	*Senate*
42^{nd}, 1^{st} Sess. (1995)	.619	.541	.135	.290	.354	.262
p-value	.220		.997		.082	
42^{nd}, 2^{nd} Sess. (1996)	.567	.432	.208	.164	.405	.208
p-value	.056		.231		.002	
43^{rd}, 1^{st} Sess. (1997)	.572	.270	.167	.209	.282	.121
p-value	.000		.823		.000	
43^{rd}, 2^{nd} Sess. (1998)	.581	.612	.102	.383	.352	.372
p-value	.643		.999		.627	
44^{th}, 1^{st} Sess. (1999)	.607	.520	.207	.169	.405	.411
p-value	.182		.228		.549	
44^{th}, 2^{nd} Sess. (2000)	.627	.351	.241	.248	.390	.234
p-value	.001		.556		.018	
45^{th}, 1^{st} Sess. (2001)	.582	.396	.222	.116	.471	.286
p-value	.012		.025		.006	
45^{th}, 2^{nd} Sess. (2002)	.577	.233	.196	.150	.453	.113
p-value	.000		.148		.000	

Ha: sd (H) > sd (S)
Ho: sd (H) = sd (S)