Candidate Extremism and Electoral Design in U.S. State Legislative Elections*

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Abstract

This study examines the effect of electoral system variation in U.S. state legislative elections on candidate ideological dispersion. Previous work suggests that, under certain conditions, greater district magnitude has a centrifugal polarizing effect on candidate ideology. Cross-national investigations of this theory by Ezrow (2008) and Dow (2001, 2011) have produced conflicting results. Building on this body of research, this paper leverages electoral system variation in U.S. state legislative elections to evaluate whether district-level electoral system variation influences candidate ideology. We find strong evidence for a polarizing effect of district magnitude on candidate ideology, even under plurality voting. This paper has significant implications for our understanding of candidate ideological positioning in sub-national contexts as well of how electoral systems affect the quality of representation voters receive from legislators.

Key words: electoral systems, U.S. elections, state politics, polarization, sub-national elections

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Electoral systems have long been understood to be a major influence on party systems. From classic work by Droop (1881) and Duverger (1951), to more modern research by Shugart & Taagepera (2017), we know that the number of parties in a given state is contingent on its electoral system. What is less understood, but no less important, is how electoral systems affect the ideological orientation of party systems. Through the use of formal modeling, Cox (1990) demonstrates that candidates face significant incentives to cultivate electoral support among more ideologically extreme sub-constituencies when in multi-seat districts. Subsequent spatial modeling work by Merrill III & Adams (2002) similarly predicts that centrifugal incentives should increase as the number of parties increases (which tends to correspond with electoral system proportionality[1]). These formal predictions conform elegantly with the predictions of candidate behavior famously proposed by Downs (1957), that majoritarian electoral systems should incentivize party ideological convergence (a "centripetal" effect) whereas proportional systems should incentivize party ideological dispersion (a "centrifugal" effect). Cox (1990) similarly argues that higher district magnitude should increase ideological dispersion within non-proportional plurality elections as well – a heretofore largely unexamined proposition.

Recent large-N cross-national tests of Cox's (1990) theory regarding the relationship between electoral system proportionality and party ideological dispersion have yielded mixed results. While Dow (2011) finds compelling evidence of a "centrifugal" polarizing force from more proportional electoral systems, Ezrow (2008) uses similar methods and finds no evidence for the effect. While Dow (2011) attributes the difference in his results with those of Ezrow (2008) to differences in data and measurement (their data contain no common elections, making direct comparisons even across nations present in both datasets challenging), the fundamental hypothesis advanced by Cox (1990) remains in dispute. Furthermore, despite the authors' comprehensive approach, they are nevertheless constrained by unobserved variation in political context across countries. Additionally, as Boix (1999) and North (1990)

[1]Shugart & Taagepera (2017)

have argued, a party's choice of electoral system may be endogenous to its party system (i.e. party extremism, the number of parties, the degree of power sharing, etc.)– further complicating the interpretation of cross-national analyses.

In order to bring new evidence to bear on this ongoing debate, we provide a novel analysis of the effect of electoral system variation on polarization in U.S. state legislative elections. Rather than focus on the inter-party relationship between electoral system proportionality and ideology as Ezrow (2008) and Dow (2011) do, we focus our attention on the intra-party dimension of Cox's (1990) theory, whereby *candidate* ideology is conditioned on the types of electoral districts they are competing in. Specifically, we aim to establish whether variation in electoral systems across U.S. state legislatures contributes to candidate polarization at the district-level. In contrast with prior cross-national research, this study is able to hold constant the national party system, issue cleavages, and the national political environment (among other unobserved variables). Analyzing within a single country gives this analysis additional causal leverage, especially since differences in political environment between U.S. states tend to be overshadowed by national politics (Mondak 1993; Schaffner & Streb 2002). Since the U.S. party system is two-party at both the national and sub-national level, and because granular candidate ideology data are available. we are able to compare ideological polarization across districts rather than across states. We estimate candidate ideological compactness across districts as a function of district magnitude (the number of seats up for election in a district, or "M") as well as a variety of control variables, including divided government, term limits, and legislative professionalism, and find that multi-seat districts feature more polarized candidates than their single-seat counterparts. The analysis provided in this paper is the first to provide empirical evidence for Cox's (1990) theorem that, under certain conditions, districts that use the multiple non-transferable vote present centrifugal polarizing incentives for competing candidates.

1 Determinants of Party (Candidate) Polarization

Though the relationship between electoral system proportionality and party extremism is a matter of open debate, there is no shortage of empirical research on the causes of party (and candidate) polarization in legislative elections. The spatial modeling work conducted by Cox (1990) is foundational for our understanding of candidate polarization. Under this framework, Cox (1990) argues that more proportional systems will yield more ideologically dispersed parties, whereas majoritarian systems will result in a more compact ideological group of parties. Cox (1990) argues that the cause of these "centrifugal" and "centripetal" effects are due to district magnitude.[2] Even in theory, there are a number of conditions under which this theory should not hold, including when the electoral system in place is a cumulative vote (Cox 1990), when parties are competing across multiple issue dimensions(Enelow & Hinich 1984; Rexford 2017), and when parties have significantly differing valence characteristics (Clark 2014; Adams & Merrill 2009).

Still others question the theoretical basis for these inquiries, arguing that the majoritarian/proportional dichotomy in incentives for parties to ideologically converge is less clear-cut. Miller & Schofield (2003) argue that parties' spatial positions are motivated in part by incentives from party activists. A similar theoretical framework is advanced by Bawn et al. (2012), who argue that American political parties are primarily defined by interest groups and activists, who develop common agendas and vet candidates who are seeking party nominations. Since party activists tend to hold extreme views, parties face centrifugal incentives to appeal to them. Thus, even in majoritarian systems, we might expect that parties face significant incentives to ideologically diverge. Furthermore, Schofield et al. (1998) find in the cases of the Netherlands and Germany, that parties may take spatial positions that are not vote-maximizing in order to make themselves more ideologically appealing as coalition partners following the election – a *centripetal* incentive in these two proportional systems.

[2]Which is also the main driver of electoral proportionality (Droop 1881; Shugart & Taagepera 2017), though the direction of this effect is conditioned by whether the electoral system uses a plurality or proportional formula.

In addition, there are a large number of determinants of party polarization that are not directly related to district magnitude. Comparative studies, both country case studies and large-N multi-country analyses, have identified a number of variables including public opinion (Ward, Ezrow & Dorussen 2011; Adams et al. 2004), parties' organizational attributes (Schumacher, De Vries & Vis 2013), rival parties' policy positions (Adams & Somer-Topcu 2009; Han 2015; Spoon 2011; Williams 2015), the preferences of the affluent (Gilens & Page 2014) and of the party's core supporters (Ezrow et al. 2011), and past election results (Laver 2005; Somer-Topcu 2009). Investigations of party and candidate polarization in U.S. states yield still more predictive variables, including legislative professionalism (Squire 2017), population size, divided government, unemployment, population size, term limits (Olson & Rogowski 2018), economic inequality, and the proportion of the population that is foreign-born (McCarty, Poole & Rosenthal 2006). While the sub-national method does not totally eliminate variation in these other sources of polarization, it significantly mitigates them, making causal inference about the effects of institutional variation more feasible.

Despite the large body of research on the effect of electoral system proportionality on party/candidate ideological dispersion, there has been almost no examination on the effect of electoral system variation within plurality systems.[3] Per Cox's (1990) spatial modeling, the electoral system type, along with the number of candidates running, should be expected to affect the ideological dispersion of candidates in a given district, even under plurality voting. Under first-past-the-post (FPTP) voting (which utilizes single-seat districts), candidates have a strong incentive to ideologically converge (Downs 1957; Hotelling 1929), unless there are more than two candidates (Eaton & Lipsey 1975; Cox 1987). Another frequently employed majoritarian system is the multiple non-transferable vote or "MNTV" (sometimes called "bloc voting"), whereby the plurality rule is used to translate seats into votes in multi-seat districts; and voters may cast as many votes as there are seats. The top "M" vote-earning

[3]For an exception, see research by Catalinac (2018) which examines another majoritarian electoral system type used in Japan from 1947-1994, SNTV (in which voters cast a single vote in multi-seat districts, and the winners are decided via plurality rule), and finds that candidates tend to diverge as district magnitude increases.

candidates are then seated (e.g. the top three vote-getters in a three-seat district). In this system, as with FPTP, there is generally an incentive for candidates to ideologically converge, unless voters are allowed to partially abstain, vote cumulation is not employed, and there are at least two more candidates than the district magnitude (Cox 1990). Despite these strong theoretical expectations, they have been not been empirically validated. Instead, previous studies have contrasted single-seat district FPTP systems with multi-seat PR systems to determine an effect of electoral system on candidate/party ideological dispersion (Dow 2001, 2011; Ezrow 2008).

2 Electoral System Variation in U.S. Legislative Elections

In the United States, procedures for electing members of Congress and state legislators vary significantly by state. This variation manifests in different nomination procedures, different electoral rules, and different electoral systems. However, while there is significant variation in district magnitude at the state legislative level, no such variation exists at the congressional level in the United States due to the 1967 Uniform Congressional Districts Act, which mandates the use of single-seat districts. As such, it behooves us to instead focus on variation in district magnitude in state legislative contests in order to ascertain whether district magnitude matters in U.S. legislative elections.

Though no large-N U.S. cross-state analysis of the effects of district magnitude on candidate/party ideology exists, there have been a number of single-state case studies. Like Merrill III & Adams (2006), Adams (1996) also uses spatial models to make a similar argument as Cox (1990), and finds support for a "centrifugal" effect from increased proportionality in his analysis of district magnitude variation in the Illinois general assembly. Richardson, Russell & Cooper (2004) also find support for Cox's (1990) hypothesis in their examination of Arizona state legislator voting behavior following the 1998 elections. Unlike Richardson, Russell

& Cooper (2004) who use interest group scores to quantify state legislator ideology, Bertelli & Richardson (2008) reexamine legislator behavior in Arizona using W-NOMINATE scaling of member ideal points and also find that multi-seat districts tend to produce more extreme legislators than single-seat districts.[4]

While a number of U.S. states currently employ multi-seat districts in their state legislative elections, traditional classifications of electoral systems would still classify these cases as majoritarian, not proportional. Each of the eight states that currently uses true multi-seat state legislative districts employs MNTV (whereby voters receive and cast votes equal to the number of seats in their district).[5] While such an electoral system still employs the plurality rule, and can rightly be considered majoritarian (not proportional) despite having M>1, Cox (1990) finds that under certain conditions such a system still produces centrifugal incentives.

By reviewing the theorems derived from formal logic in Cox (1990), we can develop a theory that logically predicts that district magnitude affects candidate ideological dispersion in U.S. state legislative elections. Cox (1990) notes that when MNTV is employed, candidates are likely to engage in Downsian clustering – provided that partial abstention is prohibited (i.e. voters are required to vote for M candidates) and there are fewer than M×2 candidates. However, when partial abstention is allowed, as it is in all U.S. states with multi-seat districts, centrifugal dispersion of candidate ideology becomes far more likely. If there are more than M+1 candidates in a multi-seat district with MNTV, the equilibrium outcome is for candidates to disperse. In such a system, candidates have a strong incentive not to all cluster at the median voter, as positioning themselves at a more extreme position would likely result in ideologically voters voting only for them. This under-voting both maximizes the ideological representation of the voters and the likelihood of victory for the candidates.[6]

[4]Arizona is a particularly useful case since its lower chamber uses M=2 districts and its upper chamber M=1 districts; and these districts have identical boundaries.

[5]Two U.S. states, Washington and Idaho, use "multi-seat" districts where candidates compete separately for each seat or "post." In line with previous research, we do not consider these true multi-seat districts, as each post is essentially M=1.

[6]For a full spatial model explaining these equilibria, refer to the section entitled "Systems with Partial Abstention but No Cumulation" in Cox (1990).

Consider as an example a two-seat state legislative district with MNTV that allows partial vote abstention. If there were only two candidates in the general election, the median voter would have no impact on the outcome, as the number of candidates is equal to the district magnitude. If there were three general election candidates, the median voter would be incentivized to select the two most proximate. Under these conditions (and perfect information), each candidate would be motivated to converge on the median voter – any candidate deviating would receive fewer total votes. When there are four or more candidates (M+2 or greater) however, the candidates now have an incentive to disperse. For example, if even one candidate moves to the left of the median voter, liberal voters in the district have an incentive to vote for that candidate, and that candidate alone, abstaining with their remaining vote. By contrast, conservative voters would have no clear signal to help them allocate their votes among the remaining three candidates clustered at the median voter. Under these conditions, the candidate deviating from the median voter is rewarded, as they should get a vote from slightly under 50% of the electorate, whereas each of the remaining three candidates would split votes from slightly over 50% of the electorate equally, giving each roughly 33% support. Thus, when there are M+2 candidates or greater, candidates have incentives to (at least minimally) ideologically disperse rather than converge at the median voter.

In addition to the logic outlined by Cox (1990), there are additional reasons to believe that MNTV (in contrast with FPTP) should be likely to yield additional candidate dispersion in U.S. state legislative elections. First, since the vast majority of FPTP state legislative contests contain only two serious candidates (only 3% have three or more),[7] we should expect that the candidate quantity requirement for dispersion should be more likely to be met in MNTV races (e.g. 33% of M=2 races feature 4 or more candidates). In addition the general election stage outlined by Cox (1990), state legislative candidates must first be chosen by voters in party primaries. Despite popular and scholarly predictions to the contrary,

[7]Candidates who do not receive donations from at least two contributors are excluded since more donations are needed for them be scaled ideologically in the Bonica (2016) dataset.

variation in the restrictions on the pool of voters who are allowed to participate primaries has been found to have no effect on the ideology of state legislative nominees (Rogowski & Langella 2015). It is notable however that each of the states that employs MNTV in general elections also features MNTV at the primary election stage. Thus, if we apply Cox's (1990) logic regarding MNTV with partial abstention to the nomination stage as well, we should expect a compounding effect of district magnitude on candidate ideological dispersion at the general election, as candidates have centrifugal incentives to disperse at both stages (relative to their counterparts in FPTP contests).

3 Hypotheses on Candidate Ideology & District Magnitude

The simplest reading of Cox (1990) is that plurality systems tend to yield candidate ideological convergence ("centripetal incentives") whereas proportional systems tend to cause candidate ideological dispersion ("centrifugal incentives"). Cox (1990) assumes that voters are engaged in uni-dimensional, policy-based voting, and finds that electoral rules and the number of candidates in a race shape the candidate's positioning incentives. Subsequent research by Dow (2001) finds that this effect does indeed manifest empirically in party-level competition across five different countries with varying electoral systems. By contrast, Ezrow (2008) finds no evidence of a relationship between electoral system proportionality and extreme party positioning in his cross-national study of fifteen countries. However, using nearly identical methodology, but a different sample of elections, Dow (2011) finds that there is a positive relationship. Across this body of literature, there is a clear set of logical expectations: parties/candidates stake out positions to maximize their votes, and their optimal strategy for doing so is constrained by the electoral rules in place.

Unlike the cross-national research conducted by Dow (2001, 2011) and Ezrow (2008), U.S. state legislative elections do not feature proportional electoral systems, rendering a plurality

vs. proportional dichotomy moot. Cox's (1990) finding that under certain conditions the use of MNTV in multi-seat districts results in candidate dispersion provides the basis for the core hypothesis of this article, which aims to explain variation in candidate ideological dispersion across U.S. state legislatures. Since U.S. state legislatures use either first-past-the-post single-seat districts or multi-seat districts with MNTV, we should still expect multi-seat districts to display higher levels of candidate polarization than the single-seat districts.

⋆ H_1: Multi-seat districts with MNTV increase the ideological dispersion between candidates compared to first-past-the-post districts in U.S. state legislative races.

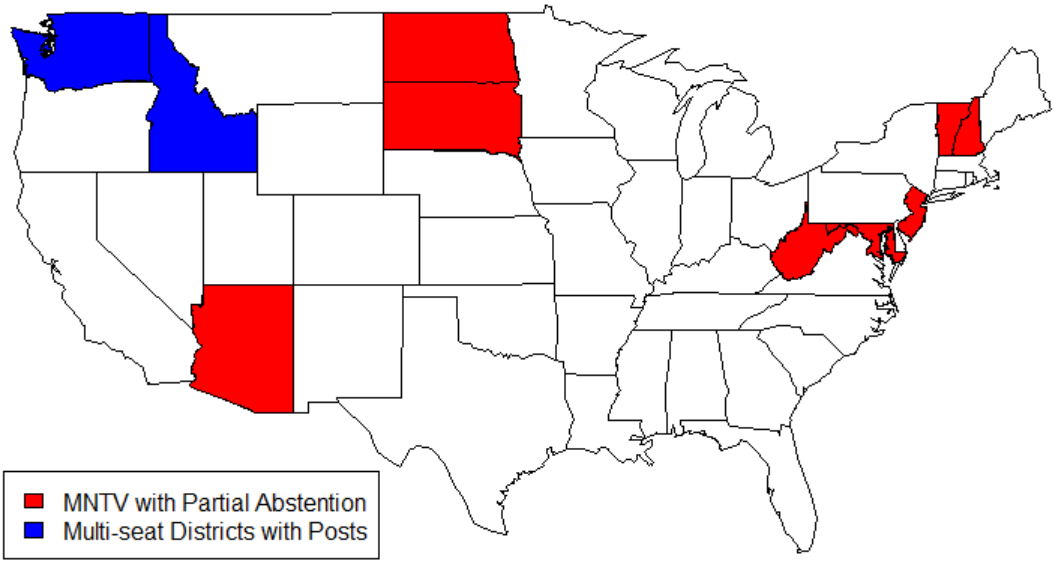
4 Empirical Strategy

4.1 District-Level Data on State Legislative Elections

One of the benefits of examining electoral system variation at the sub-national level in the U.S. is that there is a plethora of (largely untapped) data. Additionally, the advantages of the sub-national comparative method (in contrast with cross-national or single country case studies) – including increased observations, uniform coding conventions, controlled comparisons – all assist in making valid causal inferences (Snyder 2001). This analysis includes all U.S. state legislative elections from 2001-2013 (with the exceptions of New Hampshire, Massachusetts, and Vermont due to missing district-level data on candidate ideology). Klarner's (2018) dataset on state legislative elections provides district-level election returns with vote totals and party affiliations for each candidate in the race.

4.2 Measuring the Independent Variables

Figure 1: Map of States With Lower Legislative Chambers That Use Multi-seat Districts



The primary independent variable of interest in this paper is district magnitude. Figure 1 highlights all U.S. states which currently use multi-seat districts in elections to their lower legislative chamber. The states in blue (Idaho and Washington) employ multi-seat districts, but elections in these districts are for specific *posts*, meaning that candidates are never competing over more than one seat. As such, districts in these states are not considered multi-seat for the purposes of this analysis. The states in red each use multi-seat districts with MNTV in their lower chamber elections. Arizona, New Jersey, and North Dakota exclusively use two-seat districts. By contrast, Maryland,[8] New Hampshire, South Dakota,[9] Vermont, and West Virginia feature districts of varying magnitude. Unfortunately, district-identifying data for Massachusetts, New Hampshire, and Vermont, are currently missing

[8]Maryland uses both three-seat districts with MNTV and one/two-seat "post" elections embedded within "three-seat" districts. As such candidates competing for these posts are not running in actual M=3 districts, and are thus considered to be running in M=1 (FPTP) or M=2 (MNTV) contests in this analysis (depending on the number of posts).

[9]South Dakota contains two districts that use single-seat posts. These are treated as single-seat districts in this analysis.

from the Bonica (2016) DIME dataset, so these two states are excluded from our analyses.[10]

Though the vast majority of states in the U.S. currently use single-seat districts, the sheer number of legislative elections occurring within this study's 2001-2013 time-frame still makes analysis on the basis of district magnitude feasible. Table 1 breaks down the number and percentage of state legislative elections in the U.S. by district magnitude. While nearly 96% of elections are single-seat district contests, over 1,000 observed races take place under MNTV. Thus, we should consider any effect of district magnitude on candidate ideology in this study to be notable, as the limited variation in district magnitude make U.S. state legislative elections in this period a "least-likely" case.

Table 1: Number of U.S. State Legislative Elections By District Magnitude, 2001-2013

District Magnitude	Number of Districts	% of Districts
1	23,357	95.9
2	853	3.5
3	130	0.5
4+	28	0.1

Because of the relative paucity of multi-seat districts (especially within any given election year), it is more feasible to pool elections longitudinally and cross-sectionally rather than subset multi-seat districts in our analyses. Recall that per Cox's (1990) theory, candidates in multi-seat MNTV districts should only have centrifugal incentives to ideologically diverge when the number of candidates is M+2, and they should cluster ideologically (as they are theoretically expected to in 2-candidate FPTP contests) otherwise. Because of the N-size limitation, rather than group multi-seat districts by the number of candidates, we simply conduct our analysis without differentiating multi-seat districts by the number of candidates. Though this approach does not follow the precise theoretic specifications of Cox's (1990) models, it should *underestimate* any effect of district magnitude on candidate ideological

[10]Nebraska is also excluded, as it has a non-partisan unicameral legislature.

dispersion, since many multi-seat districts do not have at least M+2 candidates competing (and almost all FPTP contests feature exactly two major candidates).

4.3 Calculating Average Candidate Ideological Dispersion

The dependent variable for this investigation is *average candidate ideological dispersion*. The measure developed by Ezrow (2008) that is used in the body of literature on cross-national determinants of ideological dispersion focuses on parties, not candidates. In the case of the United States of course, there is little sub-national variation in the party system – the Democratic and Republican parties have been overwhelmingly dominant in state legislative contests in recent decades.[11] As of March 2019, less than 0.5% of lower chamber state legislators identify as neither Democratic or Republican (26 in total).[12][13] As such, a direct replication of the Ezrow (2008) method for measuring party ideological dispersion is impractical. In this manuscript, we adapt Ezrow's (2008) variable formula for district-level analysis of *candidate* ideological dispersion in a two-party context.

To acquire a measure of state legislative candidate ideological dispersion, we rely on the Bonica (2016) Database on Ideology, Money in Politics, and Elections ("DIME"). This novel dataset uses records on political donations made to candidates in order to scale the candidates ideologically, based on networked donor ideology.[14] As with DW-NOMINATE, this measure is comparable across time and across chambers. Notably, this measure does not rely on roll-call voting to scale legislator ideology, as DW-NOMINATE does for the U.S. Congress (Lewis et al. 2018) or as Shor, Berry & McCarty (2010) do for state legislatures. The use of donor data rather than roll-calls allows analysis of all candidates at the district-level, not only those who win seats in the state legislature. Furthermore, DIME and DW-NOMINATE scores are correlated at $r = 0.92$ (Bonica 2013), strongly suggesting that DIME scores are

[11] National Conference of State Legislatures - *State Partisan Composition*

[12] Ballotpedia - *Partisan composition of state legislatures*

[13] The majority of these members are independents, though 6 are members of the Vermont Progressive Party.

[14] For more information, see Bonica (2013).

capturing the same left-right ideological dimension present in the roll-call-based measures.

In line with the Ezrow (2008) model, we construct a measure of average candidate ideological dispersion that takes into account not only the ideological positions of candidates, but also of voters. Measuring average candidate ideological dispersion requires us to calculate the degree to which candidates diverge from the center of the voter distribution in their district. We rely on scores from the American Ideology Project (AIP) for each decennial redistricting cycle to estimate the mean voter ideology in each state legislative district (Tausanovitch & Warshaw 2013).[15] These scores are generated using multilevel regression and post-stratification ("MRP"), and are based on ideological self-placement questions asked in both the Annenberg National Election Survey (NAES) and the Cooperative Congressional Election Study (CCES) from 2000-2011. Because the AIP mean district scores are measured from -1 to 1, but Bonica's (2016) DIME candidate ideology scores are measured from -7 to 7, we have re-scaled both to a standard 0 to 1 scale. Doing so allows for greater comparability between the measures.

We also need information about not only the average voter ideology in the district, but also its dispersion. In line with Ezrow (2008), we use the standard deviation of the MRP score generated by the left-right ideology self-placements of voters in the state legislative district. The reason why candidate ideological dispersion needs to be anchored to the voter distribution has been explored thoroughly in the literature (Alvarez & Nagler 2004; Kollman, Miller & Page 1998). Imagine that two state legislative districts A and B each have four candidates that are equivalently ideologically dispersed. An unweighted measure (such as the standard deviation of the candidates' ideology) would say that they candidates in each district are equally extreme. However, suppose that the *voters* in district A are significantly more ideologically dispersed than those in district B. In such a case, we could conclude that the candidates in district B are more extreme because they are more dispersed relative to

[15] An unfortunate limitation of this data is that there is not district ideology data available for districts prior to the 2000 redistricting cycle.

the distribution of voters.[16]

With these concepts we can construct our dependent variable, which measures the average level of candidate ideological dispersion in a given state legislative district. The following equation adapts the weighted measure of party policy "extremism" developed by Ezrow (2008) (and also used by Dow 2011 in his rebuttal). In both our and Ezrow's (2008) formulae, higher values of this variable indicate greater candidate ideological dispersion. The weighted measure of candidate ideological dispersion ("WCD") is defined as follows:

$$WCD_k = \frac{\Sigma_{j=1}\ VS_j|(P_{jk}\ -\ \bar{V}_k)|}{\sigma_{vk}} \tag{1}$$

where:

- $\bar{V}_k =$ the mean voter MRP left-right ideology score in state legislative district k
- $P_{jk} =$ the ideological position of candidate j in district k
- $VS_j =$ the vote share for candidate j
- $\sigma_{vk} =$ the standard deviation of the MRP-generated mean voter ideology in district k

4.4 Specifying a Model of Candidate Polarization

Recall that the theoretical model proposed by Cox (1990) stipulates that under certain conditions (no vote cumulation, partial abstention permitted, and a minimum number of candidates) increased district magnitude will create a polarizing ("centrifugal") incentive for candidates – even with plurality rules. H_1 thus proposes that there is a positive relationship between district magnitude and the average candidate ideological dispersion variable. We

[16]For additional explanation of why this weighted measure is appropriate for measuring candidate/party ideological dispersion, see: Alvarez & Nagler (2004), Ezrow (2008), and Dow (2011).

employ an ordinary least squares design, applied with the following linear regression model:

$$WCD_{kt} = \beta_0 + \beta_1 * \text{District Magnitude}_{kjt} + \beta_i * \text{X} + D + T + \varepsilon_{it} \quad (2)$$

where *WCD* is the weighted candidate ideological dispersion in district k in year t, *District Magnitude* indicates how many seats are up for election in district k at time t, X is a set of state and district-level control variables, D is an indicator variable for each state, T is an indicator for each election year, and ε_{it} is the error term.

While the first analysis presented in this paper is a simple bivariate regression of candidate ideological dispersion on district magnitude (along with state and year indicators), we also estimate a model that incorporates state-level covariates that have been identified by prior studies as potential confounding variables. At the state level, we include indicators for the presence of legislative *term limits*, which may increase party polarization by diminishing electoral accountability and reducing the value of elected office – which in turn increases the role of parties in recruiting and electing legislative candidates (Olson & Rogowski 2018). In a similar vein, we incorporate the Squire (2017) index of *legislative professionalism* (which incorporates each state's number of legislative staff, staff salaries, and average days in session) as a control variable, as increased professionalism may increase policy congruence between legislators and constituents and decrease the influence of parties (Maestas 2000; Jenkins 2010). Finally, we also control for the difference in seat shares between the majority and minority parties (*party competitiveness*), as previous research on U.S. state legislatures has found that more competitive party systems yield more polarized legislative parties (Aldrich & Coleman Battista 2002).[17][18]

[17]While McCarty, Poole & Rosenthal (2006) suggest that economic inequality and the relative size of the immigrant population contribute to legislative polarization in the U.S. Congress, these data are not available at the state legislative district level. However, in their study of the determinants of legislative polarization in U.S. states, Olson & Rogowski (2018) find no effect from economic inequality or percent foreign born.

[18]Summary statistics for all variables are available in the Supplementary Material.

5 Testing the District Magnitude and Candidate Ideological Dispersion Hypothesis

Table 2 reports parameter estimates for both our baseline bivariate model and our full model with additional control variables. The bivariate model, shown in Column (1) includes only our measure of *district magnitude* in addition to year and state fixed effects. The coefficient for *district magnitude* is positive (0.13) and statistically significant, which provides evidence that increased district magnitude has a centrifugal effect on candidate ideology in U.S. state legislative elections. Column (2) reports results when control variables suggested by the literature are added. Despite their addition, the coefficient for *district magnitude* is unchanged. This finding across both models would appear to confirm hypothesis H_1.

We find that one of our included control variables is associated with district-level candidate ideological dispersion. A more even partisan divide in the state legislature (*party competitiveness*) has a positive effect on candidate ideological dispersion. Unlike Olson & Rogowski's (2018) findings regarding legislative polarization, we find no effect of term limits on candidate ideological dispersion. We also find no effect of legislative professionalism on candidate ideological dispersion.

Table 2: OLS Estimates: Weighted Candidate Ideological Dispersion

	(,1)	(,2)
District Magnitude	0.13**	0.13**
	(0.05)	(0.05)
Term Limits		−0.01
		(0.06)
Leg. Professionalism		−0.04
		(0.21)
Competitive State		0.31***
		(0.09)
State Fixed Effects	✓	✓
Year Fixed Effects	✓	✓
R^2	0.18	0.18
Observations	24,368	24,368

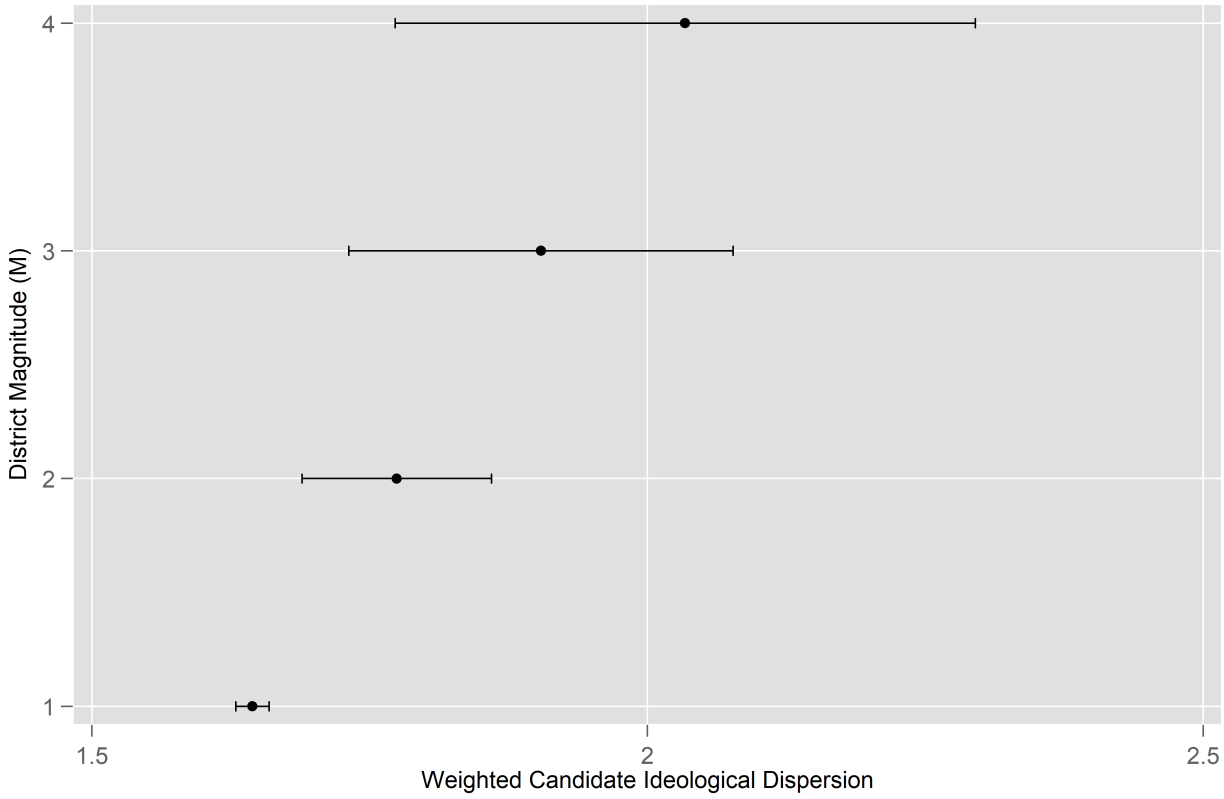
Note: Entries are linear regression coefficients with standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Substantively, the results shown in Table 2 provide clear evidence for a positive effect of district magnitude on candidate ideological dispersion in U.S. state legislative elections. It is particularly notable that this effect exists even among plurality voting systems, as is the case for all U.S. state legislative elections. This finding is consistent with the theoretical expectations of the effects of electoral system type on candidate ideology proposed by Cox (1990): under certain conditions, MNTV should yield greater candidate dispersion than FPTP with two major candidates (which is the norm in most U.S. state legislative elections). As such, MNTV in the U.S. appears to have a polarizing effect on candidate ideology without providing the representational benefits of proportional representation.

To get a better visualization of how district magnitude affects the ideological dispersion of candidates, we can examine Figure 2. Figure 2 shows the predicted level of candidate ideological dispersion in a state legislative election by district magnitude. These predictions

are shown for district magnitudes of one, two, three, and four seats.

Figure 2: The Effect of District Magnitude on Candidate Ideological Dispersion



As we can see, district magnitude being greater than one has a positive and statistically significant effect on candidate ideological dispersion. Despite the predicted values of weighted candidate ideological dispersion increasing with each level of district magnitude, the differences between these predictions when district magnitude is two or higher are non-significant. The reasons for this are fairly straightforward: the number of multi-seat contests in our 2001-2013 sample is very small in comparison to the number of first-past-the-post races. As we saw in Table 1, nearly 96% of elections in our sample took place in single-seat districts. While a fair number of elections took place in two-seat districts, there are simply too few observations in districts with magnitude greater than two to make statistically significant distinctions between their effects on our dependent variable, weighted candidate

ideological dispersion.

The findings reported in Figure 2 and Table 2 are robust across a range of further analyses. We have estimated alternative models to test whether our results hold when additional sample restrictions are placed on our universe of analyzed elections. These robustness checks and the accompanying tables and figures are provided in the Supplementary Material.

6 Discussion: The Implications of Electoral System Type for Candidate Polarization

This paper provides a novel test of Cox's (1990) theoretical expectations about the relationship between electoral system type and the ideological positioning incentives possessed by parties and candidates. Considering the robust debate over the validity of Cox's (1990) predictions (Dow 2001, 2011; Ezrow 2008), what new contributions do the empirical analyses presented here make? First, in contrast with cross-national studies by Ezrow (2008) and Dow (2011) which examine the effect of electoral system on national party system polarization, we examine candidate ideological dispersion at the district-level. This distinction is important, since Cox's (1990) original spatial model stipulates that the effects of electoral system type should manifest both inter-party and intra-party in candidates at the district-level. While the focus of Dow's (2011) and Ezrow's (2008) studies on national-level party extremism is understandable, since rich candidate-level ideology data seldom exists,[19] the availability of such data for U.S. elections provides a unique opportunity to test Cox's (1990) theories at the level they were originally formulated for.

A second major contribution of this paper is that, again in contrast with previous cross-national studies, we are able to hold the national political environment constant, as all our observations are at the sub-national level in one country. While previous cross-national

[19]There is no theoretical distinction between national party system polarization and district-level candidate polarization when a country uses a single nationwide district (e.g. Israel).

research by Dow (2011) and Ezrow (2008) is extremely useful for providing generalizable results, there is considerable variation in the politics of each country that could potentially confound their results. Differing definitions of left and right, differing long-term political trends, and particular within-country political events that shift the party system and voters' perceptions of it can make cross-national comparisons challenging (Snyder 2001). In fact, as Dow (2011) notes, the fact that his findings contradict Ezrow's (2008) may entirely have to do with a variety of uncontrollable differences in the party systems in their samples in the different time periods that they examine. By contrast, our study has the advantage of being able to hold national politics constant, by virtue of focusing only on U.S. state legislative elections. Since national-level politics tend to shape district-level races (Shugart & Taagepera 2017), particularly in contemporary U.S. congressional and state legislative elections (Abramowitz & Webster 2016), this study is able to hold the political context for candidate behavior and citizen perceptions/behavior constant, minimizing some of the methodological difficulties that arise in cross-national approaches.

We also contribute to an active debate in the electoral systems literature about whether the game-theoretic predictions made by Cox (1990) are empirically borne out. We find evidence that electoral system type does affect candidate ideological dispersion – a finding in line with Dow (2001, 2011), but that differs with Ezrow (2008). While the research presented here is reflective of only one country and a constrained set of electoral systems (none of the systems used to elect state legislators in the U.S. are proportional), the findings hold across states and across time. These results are especially notable considering that there a number of reasons to doubt that electoral systems affect polarization. As Adams & Rexford (2018) note, polarization varies significantly in countries with no change in electoral system and there are a large number of other factors (e.g. public opinion, past election results', rival parties positions, valence, etc.) that have been demonstrated to affect polarization. Given those causes to doubt that any relationship between electoral system type and candidate polarization exists, the results presented here carry additional weight.

Finally, this research is the first empirical test of Cox's (1990) theory that (under certain conditions) MNTV creates centrifugal incentives for candidates, leading them to ideologically disperse. The findings presented here empirically confirm Cox's (1990) expectations: even under plurality rule, electoral system variation can affect candidate's incentives to ideologically disperse or converge. While the data limitations of this project do not allow for testing whether the increased candidate polarization under MNTV vs. FPTP is conditional on the number of candidates competing (as Cox predicts), the omission of this condition should dilute the magnitude and significance of any effect. Like Dow (2001, 2011) and Ezrow (2008), this study only uses a unidimensional measure of left-right ideology (in this case do to date constraints in the Bonica DIME data). If and when such data becomes available, additional research into whether electoral system type affects more than one dimension of ideology could be another valuable text of Cox's (1990) theory.

Beyond these contributions to the debate on the Cox (1990) hypotheses, this research also speaks to the limited American Politics literature on the effect of district magnitude on state party ideology and the scant Comparative Politics literature on sub-national legislative electoral systems. While some previous research on U.S. state legislative elections has examined the role of electoral system type on various aspects of candidates (e.g. ideology, descriptive characteristics, valence, etc.), these studies have tended to focus on single states (e.g. Adams 1996; Bertelli & Richardson 2004, 2008; Cox & Morgenstern 1995; Kirkland 2012). This study is the fist to systematically examine the effect of district magnitude on candidate ideology across states and election cycles. Outside the U.S., there have been several case studies of how sub-national electoral systems in a country affect that country's party system (e.g. Hough & Jeffery 2006; Hennl & Kaiser 2008; Panov & Ross 2013), but seldom do these studies leverage variation in sub-national electoral system types.[20] This analysis is able to leverage both the relative wealth of data on sub-national U.S. elections and the variation in electoral systems across U.S. states in order to provide a unique contribution to

[20]For an exception, see: Vengroff, Nyiri & Fugiero (2003).

the literature on the comparative effects of sub-national electoral systems.

Normatively, this study improves our understanding of how electoral institutions affect the quality of democratic representation citizens receive. Considering the latitude that U.S. states have in selecting their own electoral systems for state legislative races, policymakers have the opportunity to affect the ideological polarization of candidates. Considering that MNTV is still a plurality-rule system, increased candidate polarization relative to FPTP may have normatively negative results for policymaking. While increasing district magnitude in a proportional system may increase party ideological dispersion (Dow 2001, 2011), there is a corresponding normative benefit of party identifiability and increased proportionality (Taagepera & Shugart 1989; Strøm 1990). Higher district magnitude under plurality rule may be the worst of both worlds: increased legislative polarization without an increase in proportional representation. While advocates of electoral reform as a solution to legislative polarization in the U.S. might naturally look to M>1 electoral systems already in use, MNTV appears to increase rather than decrease candidate polarization where it has been used.

In summary, this study provides evidence for Cox's (1990) theory that electoral system type affects candidates' incentives to ideologically disperse or converge. By focusing on U.S. state legislatures, we are able to leverage the advantages of the comparative sub-national method and minimize confounding effects from exogenous political variation across elections. Despite the elections in this study constituting a "least-likely" case by dint of limited variation in electoral system type (the vast majority are FPTP, and even multi-seat contests employ plurality rule), we nevertheless find a robust and positive effect of district magnitude on candidate ideological dispersion This study thus contributes to our knowledge of the relationship between electoral systems, candidate ideology, and the quality of democratic representation.

7 Appendix

7.1 Coding Scheme for Variables Used to Construct *WCD*

Voter Ideology ***($\bar{V}_k$):*** Continuous variable capturing the mean voter left-right ideology score in a given state legislative district. These scores are taken from the American Ideology Project, which generates them using multilevel regression and post-stratification ("MRP"). The source data are based on ideological self-placement questions asked in both the Annenberg National Election Survey (NAES) and the Cooperative Congressional Election Study (CCES) from 2000-2011 (Tausanovitch & Warshaw 2013). Higher values indicate a more ideologically conservative district. This variable has been standardized so all values are between 0 and 1.

Standard Deviation of Voter Ideology ***(σ_{vk}):*** Continuous variable capturing the standard deviation of $\bar{V}_k$ in a given state legislative district. These scores are also taken (and standardized) from the American Ideology Project (Tausanovitch & Warshaw 2013). Higher values indicate a more ideologically conservative district. This variable has been standardized so all values are between 0 and 1.

Candidate Ideology ***(P_{jk}):*** Continuous variable capturing the left-right ideological position of each candidate running in a state legislative district. These scores are taken from the Bonica (2016) DIME dataset which scales candidate ideology using campaign donation data. Higher values indicate a more ideologically conservative candidate. This variable has been standardized so all values are between 0 and 1.

Candidate Vote Share ***(VS_j):*** Continuous variable capturing the proportion of the vote won by each state legislative candidate in a district-year. 0 indicates a candidate won 0% of the vote and 1 indicates a candidate won 100% of the vote. These data are taken from the Klarner (2018) State Legislative Election Returns dataset.

7.2 Coding Scheme of Independent Variables

District Magnitude: Ordinal variable capturing the number of seats assigned to a state legislative district. Multi-seat districts in Idaho and Washington with "posts," whereby candidates run for a specific seat, are coded 1.

Term Limits: Dichotomous variable coded 1 if the state the district is in employs term limits in a given election cycle and 0 otherwise.

Legislative Professionalism: Continuous variable capturing the level of legislative pro-

fessionalism in a state, with higher values indicating a more professionalized legislature. Values are taken from Squire (2017), who creates a scale based on number of legislative staff, staff salaries, and average days in session. Index updates were provided in 2005, 2009, and 2015. Scores for each election are taken from the most temporally proximate version of the Squire Index.

Competitive Legislature: Semi-continuous scale capturing the partisan breakdown of seats in the state legislature following the election. Calculated by subtracting the percentage of seats held by the minority party from the share of seats held by the majority party. This difference is then inverted (by subtracting 1 and multiplying by -1) to generate a measure of statewide legislative competitiveness.

State Fixed Effects: Dichotomous variables for each state coded 1 if the legislative district is in that state and 0 otherwise.

Year Fixed Effects: Dichotomous variables for each election year coded 1 if the legislative elections takes place in that year and 0 otherwise.

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8 Manuscript Supplemental Information

8.1 Summary Statistics

Table A-1: Summary Statistics of All Variables

Variable	N	Mean	Std. Dev.	Min	Max
WCD	24,368	1.65	1.26	0	17
District Magnitude (M)	24,368	1.04	0.27	1	7
Term Limits Indicator	24,368	0.30	0.46	0	1
Legislative Professionalism	24,368	0.21	0.13	0.05	0.63
Competitive Legislature	24,368	0.77	0.16	0.16	1

8.2 Robustness Check: Varying-Magnitude States

Because our results are pooled across states with different political environments, it is worth examining whether within-state variation in district magnitude still produces similar results. To test this proposition, we limit our analysis to the three states in our sample with variable district magnitude: Maryland, South Dakota, and West Virginia. Table A-2 reports the breakdown of elections in each state by district magnitude. When we re-administer our analysis with this restriction, including all the covariates listed in Table 2, we find that district magnitude still has a positive and statistically significant effect on candidate ideological dispersion. The results shown in table A-3 provide strong evidence that our results are not being driven only by variation in magnitude across states: the effect occurs within states as well.

Table A-2: District Statistics for Variable District Magnitude States, 2001-2013

State	Observed Districts (all years)	Minimum M	Maximum M	Mean M (all years)
Maryland	195	1	3	2.16
South Dakota	202	1	2	1.92
West Virginia	356	1	7	1.15

Table A-3: OLS Estimates in States with Varying District Magnitude

	(1)
District Magnitude	0.12**
	(0.04)
Term Limits	N/A†
Leg. Professionalism	0.06
	(2.16)
Competitive State	−0.31
	(0.55)
State Fixed Effects	✓
Year Fixed Effects	✓
R^2	0.05
Observations	753

Note: Entries are linear regression coefficients with standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001
† The term limits coefficient is omitted here as only SD possesses them

8.3 Robustness Check: South Omitted

We re-administer our analyses omitting states considered to be part of the American South. The theoretical basis for this admission lies with the literature on racial realignment and the corresponding shift in partisan identification among Southern voters in the late 20th and early 21st century (Carmines & Stimson 1989; Aistrup 1996; Valentino & Sears 2005). We confirm that our results are not being confounded by this longitudinal shift in voter behavior by dropping the southern states[21] from our analysis. The magnitude and statistical significance of the effect of district magnitude is not affected by this omission, as shown in Table A-4.

[21]The states that are dropped are those that constituted the Confederacy during the Civil War – a common coding and demographic convention. These states are Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

Table A-4: OLS Estimates Among Non-Southern States

	(,1)
District Magnitude	0.13**
	(0.04)
Term Limits	0.03
	(0.06)
Leg. Professionalism	−0.09
	(0.22)
Competitive State	0.42***
	(0.11)
State Fixed Effects	✓
Year Fixed Effects	✓
R^2	0.19
Observations	17,485

Note: Entries are linear regression coefficients with standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001