

The Electoral Sweet Spot: Low-Magnitude Proportional Electoral Systems

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Can electoral rules be designed to achieve political ideals such as accurate representation of voter preferences and accountable governments? The academic literature commonly divides electoral systems into two types, majoritarian and proportional, and implies a straightforward trade-off by which having more of an ideal that a majoritarian system provides means giving up an equal measure of what proportional representation (PR) delivers. We posit that these trade-offs are better characterized as nonlinear and that one can gain most of the advantages attributed to PR, while sacrificing less of those attributed to majoritarian elections, by maintaining district magnitudes in the low to moderate range. We test this intuition against data from 609 elections in 81 countries between 1945 and 2006. Electoral systems that use low-magnitude multimember districts produce disproportionality indices almost on par with those of pure PR systems while limiting party system fragmentation and producing simpler government coalitions.

An Ideal Electoral System?

It is widely argued by social scientists of electoral systems that there is no such thing as the ideal electoral system. Although many scholars harbor strong preferences for one type of system over another, in published work and in the teaching of electoral systems it is standard practice to acknowledge the inevitability of trade-offs. If a country wants a highly representative parliament, where the assembly is a microcosm of the pluralism of opinions in society, a proportional representation (PR) system is best. Alternatively, if a country wants the party that wins the most votes in an election to form a stable single-party government, a majoritarian system is best. You have to choose which you care about most: representation or accountable government. You cannot have both, so the mantra goes.

A glance at the electoral systems of new democracies, or reforms to electoral systems in established democracies, suggests that electoral engineers regularly

seek to soften the representation-accountability trade-off and achieve both objectives. For example, some electoral systems have small multimember districts, others have high legal thresholds below which parties cannot win seats, while others have “parallel” mixed-member systems, where the PR seats do not compensate for disproportional outcomes in the single-member seats. These types of systems sacrifice pure proportionality for the specific purpose of increasing accountability.

To what extent can these efforts to provide both representation and accountability be realized, and by what sorts of electoral rules? To answer these questions we do the following. In the next section, we discuss three common approaches electoral system designers employ to shape the representation versus accountability trade-off, focusing our attention primarily on the number of seats available in each electoral district (or district magnitude). We then introduce our dataset of 609 election outcomes in 81 countries and present some descriptive statistics to illustrate the trade-off at stake.¹ Next, we present the

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¹All data used in this study, including coding and data sources, as well as descriptive statistics, information on countries and electoral systems, and supplementary analyses, are available in the Supplementary Information online: <http://www.dartmouth.edu/~jcarey/Data%20Archive.html>.

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variables we use and the statistical models we estimate, followed by our empirical results, and conclude with a discussion of the implications for electoral system design.

We find that, relative to single-member district (SMD) systems, low-magnitude PR is almost as effective as high-magnitude PR at reducing disproportionality between parties' shares of votes won and seats won in legislative elections, whereas increases in party system fragmentation at low-magnitude PR are less pronounced, which in turn simplifies the coalitional structure of governments. Low-magnitude PR systems allow a broad range of opinions to be represented in a parliament while at the same time provide incentives for voters and elites to coordinate around viable parties. In fact, our results suggest an optimal district magnitude in the range of three to eight. Put another way, some countries—such as Costa Rica, Hungary, Ireland, Portugal, and Spain—appear to have discovered a “sweet spot” in the design of electoral systems.

The Case for Low-Magnitude Proportional Representation

The central trade-off in the design of electoral systems is often characterized as being between the representation of voters' preferences and the accountability of governments (cf. Jenkins Commission 1998; Lijphart 1984, 1994; Powell 2000). By this account, the first virtue of representation is to allow for inclusion of parties reflecting diverse interests and identities in the legislature. PR systems accurately translate parties' vote shares into parliamentary seat shares and allow for inclusion of the broadest possible array of partisan views in the legislature. Arend Lijphart, perhaps the most eloquent advocate of inclusiveness, regards proportionality as “virtually synonymous with electoral justice” (1984, 140). PR tends to produce inclusive parliaments and a close mapping, on a left-right ideological scale, between the median member of parliament and the median member of the electorate (Colomer 2001; Huber and Powell 1994; Lijphart 2004).

In contrast, majoritarian electoral systems with SMDs—such as a simple-plurality, alternative-vote, or majority-run-off system—tend to produce less inclusive parliaments. Particularly in multiparty systems, first-place parties reap bonuses while others find themselves underrepresented or even shut out of parliaments entirely (esp. Duverger [1951] 1964). Majoritarian systems are far more likely than PR systems to produce parliamentary majorities behind governments with less than 50% of the vote and median parliamentary parties ideologically

remote from the median voter (Colomer 2001; Lijphart 1994; Powell and Vanberg 2000).

On representation grounds, then, the case for proportionality is strong. Yet proportionality attracts some skepticism on the government accountability side of the ledger. PR systems can produce broad and fractious coalitions. Voters may not know *a priori* how their votes will determine which party or parties govern and which policies will then result (Strom 1990). Transaction costs of governing may be high in coalition cabinets. Tsebelis (2002) demonstrates that coalition governments tend to be less able to change existing policies than single-party governments. Persson and Tabellini (2003) argue that policy conflicts inside coalition governments are resolved by accommodating the public spending priorities of all the involved parties, leading to higher public spending and higher deficits than would otherwise be preferred by the voters. Empirical studies of electoral accountability indicate that both prospective and retrospective voting are more effective when coalitions include fewer parties (Hellwig and Samuels 2007; Powell 2000, 47–68).

Although the trade-off between representativeness and accountable government is widely acknowledged, the specific shape of the trade-off is often left implicit (Lijphart 1984; Persson and Tabellini 2003; Powell 2000). Does this mean that the trade-off is linear, with any gain in representativeness exacting an accountability cost, and vice versa, in equal measure? Some scholars have suggested that the trade-off is amenable to maximization (e.g., Grofman and Lijphart 1986; Shugart and Wattenberg 2001; Taagepera and Shugart 1989), and we agree. Why might this be the case? The answer depends in parts on arithmetic, on strategic behavior, and on the cognitive limitations of voters.

Beginning with the arithmetic of proportionality, this normative ideal is subject to diminishing returns in the properties of electoral systems that foster it. Moving from a district magnitude of 1 to moderate multimember districts—of magnitude 6, say—will likely allow for representation of parties that can win support at around 10% or greater. As long as the preponderance of votes is cast for such parties, the increase in proportionality in moving from SMDs to six-member districts will far outpace the increase in moving from six-member districts to much larger districts. As it happens, the bulk of votes in most national elections are cast for parties that win substantial vote shares, and the number of viable parties falls well below the upper bound implied by the logic of strategic voting in systems with high district magnitudes (Cox 1997).

Regarding strategic incentives of voters and parties, political scientists of electoral systems have recognized

for some time that strategic, or “tactical” voting, diminishes as district size increases, primarily because estimating how marginal votes will affect outcomes is more difficult as the number of seats, and contestants, rises. In higher-magnitude elections, shared expectations about candidate and party viability are less widely held, and therefore voter coordination around such expectations is more rare (e.g., Cox 1997; Taagepera and Shugart 1989).

The cognitive capacity of voters further suggests that the proportion who are able to coordinate around viable candidacies declines in a nonlinear fashion as district magnitude rises, declining gradually at low magnitudes and then falling more steeply as the number of parties and candidates rises. Cognitive psychology has long posited that humans are capable of distinguishing clearly among a limited set of choices along a single dimension, but that this capacity drops off sharply once the number of options rises to seven or above (Miller 1956).² Relating to electoral behavior, the strategic calculations for voters in a low-magnitude multimember district—say, with magnitude of two to six—should resemble those for voters in single-member districts. Most should have a relatively clear preference ordering over the candidates or lists, acknowledge a disincentive to support hopeless alternatives to signal future electability, and have sound information about which alternatives are, indeed, hopeless as opposed to viable. By contrast, in a high-magnitude multimember district—say, with magnitude above 10—the proportion of voters who will vote strategically is likely to be close to zero. In this situation, voters are unlikely to have clear preference rankings over all the options, and it would be difficult to evaluate with much accuracy the probability of winning for each candidate, especially for those candidates close to the likely threshold of votes needed to win a seat. In this situation, voters are likely to support their first preferred candidate regardless of her electoral prospects.

In short, we expect that the representational gains in moving from SMDs to small multimember districts should outpace the accountability costs because the obstacles to voter coordination at low magnitudes remain navigable, and voter coordination is key to sustaining viable parties near the ideological center of gravity of the electorate while minimizing both disproportionality (generated by wasted votes) and party

system fragmentation. By contrast, once district magnitude rises above moderate levels, a variety of obstacles to coordination present themselves. Too many partisan options within a fixed ideological space present a conceptual obstacle to developing fully ordered preferences. The informational costs of determining which among multiple alternatives are viable present another obstacle. Finally, even where voters can develop preferences over multiple options and discern viability, they face strategic obstacles in identifying and agreeing on which, among multiple competing alternatives, to support. Moving from small to large multimember districts should produce only limited additional gains in representation while eliminating the constraints on choice that foster coordination and accountability.

The Representativeness-Accountability Trade-Off

District magnitude is not the only one manipulated by electoral system designers to affect the representativeness-accountability trade-off. A legal threshold—say, 5% of national votes—can reduce party system fragmentation considerably by denying any representation to parties with vote shares below the threshold. It might also encourage voter coordination, provided that voters can accurately assess which parties are likely to fall above and below the mark, and that those voters who prefer below-threshold contestants are willing to cast their ballots for less-preferred-but-viable parties.

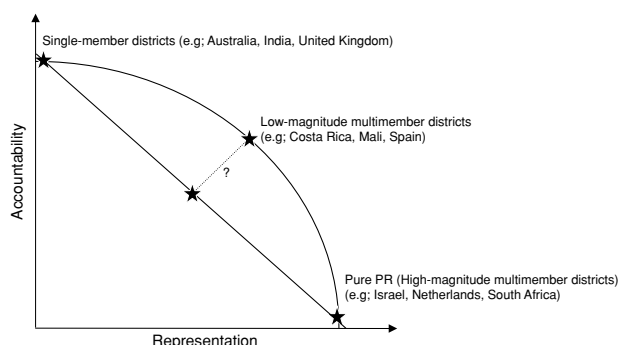
Another modification is the use of mixed-member SMD-PR systems, whereby seats in a given legislative chamber are allocated simultaneously in both SMDs and multimember districts, superimposed upon each other. Mixed-member systems are often introduced as attempts to enhance representativeness without sacrificing accountability and thus to approximate “the best of both worlds” in a single electoral system (Shugart and Wattenberg 2001).³

In short, it may be productive to think of the tension between representation and accountability as a convex maximization problem rather than as a straightforward trade-off. These alternative ways of envisioning the

² This result has generated vast literature in experimental psychology, linguistics, education, survey research methods, and even computer science. Among political scientists, it has inspired hypotheses about the mental models policymakers and voters rely on to select among policy proposals (Jacobs 2009; Tomz and Van Houweling 2008), but to our knowledge, cognitive capacity has attracted no serious attention in research on electoral system design.

³ Shugart and Wattenberg identified a broad trend toward mixed-member systems that crested during the 1990s, chronicling the motivations for the mixed-member reforms. But given their recent adoption in many countries, the volume is necessarily cautious in judging performance. Elsewhere, assessments of mixed-member systems have been skeptical (Ferrara, Herron, and Nishikawa 2005; McKean and Scheiner 2000; Moser 1999).

FIGURE 1 Two Versions of the Trade-Off between Accountability and Representation in the Design of Electoral Systems



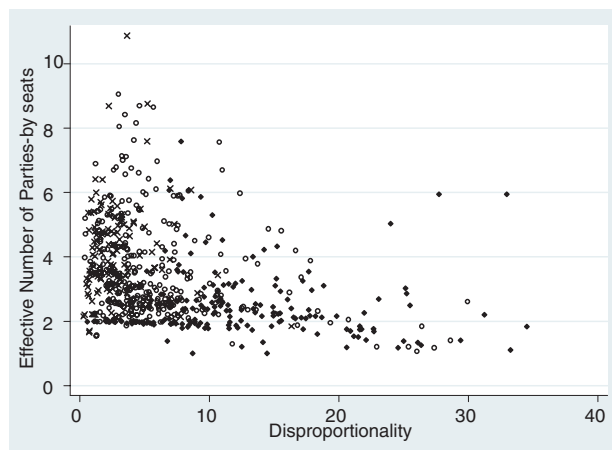
problem are illustrated in Figure 1, in which the y axis represents levels of government accountability and the x axis the inclusiveness of representation in the parliament party system. The figure portrays two possible accountability-representativeness frontiers—one indicating a linear trade-off between these normative ideals, the other convex, suggesting that moves away from extreme values on a given ideal can initially improve values on the other in a disproportionate manner.⁴ Electoral reformers regularly tout their plans on the grounds that they will strike an improved balance between representativeness and accountability (Culver and Ferrufino 2000; Rachadell 1991). We seek to test the validity of these claims and, in doing so, to offer a preliminary map of the representativeness-accountability frontier.

We examine elections from 1945 to 2006 in all democratic countries with a population of more than one million. We follow standard practice of counting a country as democratic if it rates a Polity IV political freedom score of greater than or equal to +6 in the year of the election (cf. Boix 2003; Przeworski et al. 2000). This leads to 609 elections in 81 countries, described in further detail in the online Supplementary Information (see footnote 1).

We distinguish among electoral systems according to the magnitude of the median district, the use of legal thresholds for representation, and the use of a mixed-member format. Note that we use *median* district magnitude as a defining feature of electoral systems rather

⁴ The convex frontier captures the idea that initial returns to efforts on behalf of a given ideal are substantial, even if subsequent returns are diminishing. Of course, one could also portray an inwardly bowed frontier in which returns would be increasing, suggesting economies of scale in realizing these values. Unlike diminishing returns, we are unaware of any theoretical reason to expect electoral economies of scale in achieving representativeness or accountability.

FIGURE 2 Trade-Off between Disproportionality of Representation and Party System Fragmentation



Note: Diamond = system with single-member districts. Circle = system with a median district magnitude between 2 and 10. Cross = system with a median district magnitude greater than 10.

than *mean* district magnitude. This is because many countries have a large number of small districts and only a few very large districts. The mean district magnitude in such systems can consequently be quite large relative to the median. In these systems, very small parties might gain a few seats in a couple of very large districts, but the structure of party competition in most districts will be quite different (Monroe and Rose 1999). We regard median district magnitude as a better measure of the overall constraints on party system fragmentation at the national level. We measure the median district magnitude as follows: in non-mixed-member systems, the median district magnitude is the magnitude of the district with an equal number of larger and smaller districts; in compensatory mixed-member systems, the median district magnitude is the median size of the PR districts; and in mixed-member parallel systems, the median district magnitude is the median size of all districts.⁵

Figure 2 presents an initial illustration of the trade-off between inclusive representation and accountable government. Each observation in the figure is the outcome of an election in a country in Table 1. The x axis is a standard

⁵ Our measure of median magnitude is different from the median magnitude (MedMag) variable from Golder's (2005) widely cited dataset. Golder's codebook describes MedMag as "the district magnitude associated with the median legislator in the lowest tier." As we understand it, this means identifying the legislator for whom there are an equal number of other legislators from districts of greater and/or lesser M , then assigning the value of MedMag as the M of that legislator's district. For more discussion, and examples, of how this difference matters, see the codebook for the dataset for this project, available in the online Supplementary Information (see footnote 1).

disproportionality index, where lower scores mean that partisan representation in parliament more closely reflects the partisan distribution of votes (Gallagher 1991).⁶ In our data, disproportionality ranges from 0.3 to 34.5, with a mean of 7.1 and standard deviation 6.3. The y axis is a standard measure of the effective number of parties represented in the parliament, where a lower number on the scale means a more concentrated party system and a higher number reflects greater fragmentation (Laakso and Taagepera 1979; Taagepera and Shugart 1989). In our data, the effective number of parliamentary parties ranges from 1 to 10.9, with a mean of 3.4 and standard deviation 1.5. The figure illustrates that SMDs tend to produce low party system fragmentation but exhibit high variance on disproportionality. These systems can deliver single-party government and low disproportionality if the same two parties compete in almost all districts (e.g., the United States). Where this is not the case, the result can be either coalition government (e.g., Madagascar), or a highly unrepresentative parliament (e.g., United Kingdom), or both (e.g., Canada). By contrast, PR tends to produce a strong correspondence between vote shares and seat shares but high variance on number of parties, depending on the variety of societal cleavages but also on the ability of voters and elites to coordinate electoral resources around viable parties.

One can think of the axes on Figure 2 as inverted versions of those in Figure 1, where disproportionality (x axis) is the inverse of inclusiveness and party system fragmentation (y axis) is the inverse of accountability. If our idea of a nonlinear trade-off is on target, the empirical pattern should show elections arrayed in a pattern that bows toward the origin of the axes, with an ideal electoral system minimizing disproportionality while constraining fragmentation so as to foster clear partisan responsibility in government. The pattern in Figure 2 confirms this intuition. The observed data—elections—are concentrated along the axes, indicating that there is more disproportionality in elections with low fragmentation, and vice versa; but there is also a cluster of observations near the origin, with relatively low scores on both variables.

Figure 2 divides our elections into three groups by district magnitude: (1) pure SMD systems are represented by

solid diamonds; (2) systems with moderate median magnitudes, ranging from 2 to 10, with open circles; and (3) high-magnitude systems, above 10, with Xs. SMD systems tend toward low fragmentation but exhibit wide variance on disproportionality, with highly disproportional outcomes when voters fail to coordinate expectations on which parties are viable or when winners' bonuses at the district level do not cancel each other out in the aggregate (Powell and Vanberg 2000). High-magnitude systems are inclusive by design and tend toward highly fragmented party systems with correspondingly low disproportionality. Meanwhile, low- and moderate-magnitude systems are clustered in the bottom left-hand corner, with relatively proportional results and a relatively compact party system.

To the extent that minimizing some combination of disproportionality and fragmentation represents a desirable trade-off between representativeness and accountability, Figure 2 suggests that PR with modest district magnitude is a good design. Note that these are just descriptive results, pooled across a wide range of countries and elections, and with no control for other factors that might influence the number of parties in a party system or the proportionality of elections. To investigate our conjecture in more detail, we now move to a statistical analysis of election outcomes in the world's democracies.

Variables and Models

We look at two sets of dependent variables, to capture representativeness and accountability, respectively. The first set includes *Disproportionality*, which we have already discussed, as well as a measure of *Voter-government distance*. Our measure of voter-government distance is adapted from HeeMin Kim and Richard Fording's data, which locate both parties and voters along a standard left-right ideological scale (Kim, Powell, and Fording 2009).⁷ We use the Kim and Fording measure of ideological distance between the median voter and median government party when majority governments form. By contrast, when a minority government forms, we follow seminal work by Strom (1990) and Powell (2000) on the shift in policy-

⁶ Gallagher's (1991) index is an adaptation of a common least-squares method of comparing the relationship between two samples (in this case, vote shares and seat shares of parties) and is the established means of measuring proportionality in electoral studies. The index is calculated as follows:

$$LSq = \sqrt{\frac{1}{2} \sum_{i=1}^n (V_i - S_i)^2}$$

⁷ These data are constructed from the Comparative Manifestos Project data on the location of parties, voters, and governments (Klingemann et al. 2006). Specifically, the method identifies the proportion of voters who lie between the parties just to the left and the right of the median voter, and then calculates the likely location of the median voter in this interval using the relative vote shares of these two parties and the distances between them and the next parties to their left and right, respectively (see Kim and Fording 1998).

making power from cabinets to parliaments, and rely on the Kim and Fording data for a measure of ideological distance between the median voter and median parliamentary party.

The second set of dependent variables, on accountability, includes *Effective number of parties by seats*, which is the Laakso and Taagepera (1979) fragmentation index, also introduced above; and *Parties in government*, which is a simple count of the number of parties in the first cabinet formed after a given election, which serves as an index of how difficult it is for voters to attribute responsibility for government performance and reward or punish governing parties at the next election accordingly.⁸

The principal electoral system factors on which we focus as independent variables are *Median district magnitude*, as described above, and its inverse, $1/(\text{Median district magnitude})$. Our general expectation is that as magnitude rises, representativeness should improve (i.e., disproportionality and voter-government distance should decline) and accountability should erode (i.e., party system fragmentation and government coalition complexity should increase). But we also expect these relationships to be subject to diminishing returns, such that the estimated effect of the inverse magnitude variable should take the opposite sign from that of the simple (linear) magnitude variable. Critically, the sharpness of the diminishing returns effect is reflected by the relative explanatory power of inverse magnitude relative to that of simple magnitude. If, as we expect, gains in representation outpace losses in accountability as magnitude rises in the low range, the contrast between the estimated effects of simple versus inverse magnitude should highlight this.

We also include three other electoral system factors in our models. *Legal threshold* is coded as the percentage of votes a party must win at the national level to be eligible to win seats, and 0 when no legal threshold applies. *Mixed-member parallel* is coded as 1 when members of the lower house are elected from parallel tiers of SMDs and proportional districts and in which allocations of seats in each tier are mutually independent, and 0 otherwise. And, *Mixed-member compensatory* is coded as 1

⁸ When analyzing the effect of electoral systems on party system fragmentation and parties in government, we ran all models with and without controls for the fragmentation of the party system amongst the electorate, as measured by the *Effective number of parties by votes*. Adding this variable allows us to distinguish the “mechanical” from the “psychological” effect of electoral systems, since the vote fragmentation variable captures how far voters and parties coordinate in anticipation of which parties are more likely to win seats. Consequently, the estimated effect of electoral system factors that remains in models controlling for vote fragmentation is purely mechanical. Whether or not the control for vote fragmentation is included never changes the estimated direction or significance of the impact of district magnitude.

when members of the lower house are elected from parallel tiers of SMD and proportional districts and in which the formula for allocating seats in the proportional districts offsets disproportionalities at the SMD level, and 0 otherwise.

All models also include a wide range of control variables that may have an effect on the number of parties in a system, the polarization of party systems, and the stability of governments. Specifically, we control for whether a country has a presidential, a parliamentary, or a hybrid regime; the year of the election; the levels of political freedom and economic freedom; population size; GDP per head; economic growth rates; economic inequality (as measured by the GINI index); the age of the democracy; whether the country has a federal system; the level of ethnic fractionalization; the latitude of the capital city of the country; whether the country was a former colony of the United Kingdom, Spain or Portugal, or another country; and whether the country is in the Americas, Western Europe, the Pacific, South Asia, or Africa and Middle East, or is a former Communist country. The online Supplementary Information provides a detailed description of the variables and the data sources.

We use a large number of control variables for several reasons. First, several of the control variables are political factors which could affect the fractionalization of a party system independently of any direct electoral system effect, such as whether a country has a presidential or parliamentary regime, whether a country has a federal system, the levels of income inequality and ethnic fractionalization, and the size of a country (cf. Taagepera 2007).⁹ Second, several other controls relate to the general political and economic development of a regime, which may indirectly impact the extent of consolidation and stability of a party system, such as political and economic freedoms, economic growth rates, GDP per head, the age of democracy, and the geographic location of a country (cf. Persson and Tabellini 2003).

A third set of controls is included to capture the fact that electoral systems themselves are “institutional choices” resulting from the strategic decisions of political elites when a system is designed or reformed (e.g., Benoit 2007). Major determining factors in the choice of electoral systems are the regional location of a country and a

⁹ Geographical concentration of support for particular parties is also a critical factor driving fragmentation and disproportionality in single-member district and low-magnitude systems. Unfortunately, data on geographical concentration are not available for a sufficient number of countries to be included in our analysis. Our ethnic fractionalization and federalism variables, however, are likely to be correlated with geographical concentration in cases where bloc voting develops around either regional or ethnic identities.

country's colonial origins: hence, almost all Latin American countries have PR electoral systems while most former British colonies have majoritarian electoral systems. The colonial origin of a country also has a significant impact on a range of political and economic factors that no doubt affect how electoral systems impact the party systems and the stability and performance of government (e.g., Acemoglu, Johnson, and Robinson 2001). Also, one factor widely regarded as causally related to the design of the electoral system when a country extends the franchise is the number of parties in a party system (esp. Colomer 2005; Rokkan 1970; cf. Boix 1999). We consequently include the effective number of parties (by votes) as an independent variable in some models to control for this effect.

Although the choice between a majoritarian and a PR system may be endogenous to the number of parties or the colonial origins of a system, however, specific matters of design such as the magnitude of electoral districts or the height of an electoral threshold are unlikely to be determined by clearly identifiable factors. These more technical aspects of electoral system design are highly context specific and are often dependent on the type of electoral system expertise received by policymakers when establishing or reforming an electoral system (Benoit 2007). It is reasonable to assume that expertise and advice about electoral system design has grown and spread over time. We consequently include the year of the election as a control variable to remove a potential timing effect.

We estimate models for each of our dependent variables in a variety of different ways, four of which are presented in the tables below. We first estimate models with the linear *Median district magnitude* term. Then, to test for a nonlinear nature of the relationship between district size and political outcomes, we estimate the same models with an addition inverse term, $1/(\text{Median district magnitude})$. We interpret the shapes of the relationships between district magnitude and our electoral ideals—and more specifically, the relative extent to which they are subject to diminishing returns—as indicative of whether electoral designers might capture some of the benefits of proportionality while bearing relatively fewer of the costs.¹⁰

¹⁰ The nonlinear specification posits a specific functional form for the diminishing returns of district magnitude to our dependent variables. A priori, however, we do not know whether some other functional form might describe the shape of the diminishing returns even better than the simple model that includes our inverse district magnitude variable. For example, if the fall-off in returns to increasing magnitude is particularly steep, then the functional form may be even better characterized by adding squared or cubic versions of the $1/(\text{Median district magnitude})$ term. To determine whether this is the case, we ran all the models presented in this ar-

We estimate the linear and inverse models first pooling the observations across countries, with country panel-corrected standard errors, and then adding country-specific fixed effects. We fix country effects by using multilevel models with country-specific variable intercepts but constant slopes, so that our electoral system variables pick up only within-country variations in the data, such as the effect of adopting a legal threshold, moving from a pure SMD system to a mixed-member system, or changing the electoral district structure in a way that affects median magnitude. There is far less variance in electoral systems within countries than cross-nationally, but the fixed-effects models isolate the within-country effects of what electoral systems reforms are included in the data.¹¹ Later, to illustrate the effects of district magnitude more intuitively, we also estimate the pooled and fixed-effects models with a series of dummy variables that group elections by median magnitude.

Results

Table 1 shows the results from the models of representation. The negative coefficient on the district magnitude variable in the linear specification in Model 1 confirms that larger districts are associated with less disproportionality. Legal threshold has no measurable effect in this model, while mixed-member parallel systems appear to increase disproportionality. Model 2, by comparison, estimates a diminishing returns effect by including the inverse magnitude variable. Note that the R-squared improves by about a third, from .43 to .56, and that the scope of the coefficient on the raw magnitude drops when the inverse magnitude term is included. In this specification the estimated effect of legal threshold is also to

title in alternative specifications adding first the squared, then the squared and cubed inverse terms. The full results of these robustness checks are available from the authors, but the bottom line is that the marginal improvement from adding higher-order inverse terms is either nil or small. Where the relationship between magnitude and our dependent variables is subject to diminishing returns, the big gains in model efficiency are in moving from model to the simple nonlinear specification.

¹¹ Our electoral systems variables are, at best, rarely changing within countries. To estimate effects of such “sluggish” variables in cross-sectional time-series data structures such as ours, when the ratio of between-cluster to within-cluster variance is high, Plümper and Troeger (2007) recommend a fixed-effects vector decomposition (FEVD) approach that separates within-cluster from between-cluster variance in estimation without ignoring the latter entirely. Results of all our models using the Plümper and Troeger method are available from the authors and are generally consistent with those from our pooled, PCSE models, although the latter produce somewhat more conservative estimates.

TABLE 1 Effect of District Magnitude on Representation

Dependent Variable =	Disproportionality				Voter-Government Distance			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Median district magnitude	-.05*** (.004)	-.01** (.003)	-.10*** (.03)	-.02 (.03)	-.01 (.02)	.02 (.02)	-.09 (.08)	.01 (.10)
1 / (Median district magnitude)		10.05*** (.96)		8.38*** (1.72)		15.08*** (3.04)		14.14* (8.11)
Legal threshold	-.26 (.17)	.37*** (.12)	-.48 (.41)	-.14 (.41)	-1.27** (.55)	.02 (.66)	-3.15* (1.69)	-1.14 (2.04)
Mixed-member parallel	3.63** (1.36)	-2.68** (1.30)	4.25** (1.68)	-.86 (1.96)	3.48 (3.00)	-9.15** (3.69)	-.14 (5.73)	-14.31 (9.93)
Mixed-member compensatory	-.57 (.82)	.77 (.64)	-2.00 (1.51)	-1.70 (1.48)	-3.57* (2.05)	2.70 (2.37)	3.34 (5.12)	9.21 (6.12)
Country fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
N observations	609	609	609	609	310	310	314	314
N groups	81	81	81	81	22	22	22	22
R-squared (within groups for fixed-effects models)	.43	.56	.12	.16	.14	.19	.08	.09

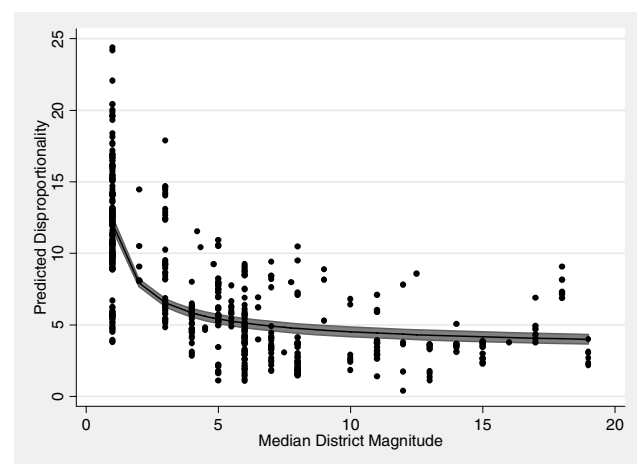
Note: Method: OLS regression. Standard errors in parentheses. Models that pool observations across countries are estimated with panel-corrected standard errors. * $p \leq .1$, ** $p \leq .05$, *** $p \leq .01$. All models contain the following control variables: Presidential regime, Hybrid regime, Parliamentary regime, Election year, Political freedom, Economic freedom, Population, GDP/head, Economic growth, GINI index, Age of democracy, Federalism. The models without country fixed effects also contain the following control variables: Ethnic fractionalization, Latitude, Former colony of the United Kingdom, Former colony of Spain or Portugal, Former colony of another country, Americas region, Western Europe region, Former Communist region, Pacific region, South Asia region, and Africa and Middle East region. The full results are available on request.

increase disproportionality, as expected, while the sign on the mixed-member parallel dummy flips, suggesting that these systems mitigate disproportionality relative to single-tier systems.

Figure 3 illustrates the effect of district magnitude on the disproportionality of an election, with predicted values derived from Model 2. There is a rapid decline in the level of disproportionality of an election as the district size increases beyond 1, and then a flattening out of the relationship as the district size increases beyond 5 or 6. For example, the average level of disproportionality in SMD elections is 11.9, while the average in small multi-member districts (with a median magnitude of between four and six) is 5.3. Then, increasing the size of the district beyond this does not improve the representativeness of a parliament much further: the average score for a median district size of between 7 and 10 is 4.6, for a district size of between 11 and 20 is 3.5, and for a district size of more than 20 is 3.0.

Models 3 and 4, in Table 1, replicate the pooled results using fixed-effects models, providing a more conservative test of electoral system. The key results from Models 3 and 4 are that the estimated effect of magnitude on disproportionality is similar in the fixed-effects models, and that the improvement of the diminishing returns model over the

FIGURE 3 Estimation of the Effect of District Magnitude on Disproportionality



Note: The line is a bivariate asymptotic regression model, with 95% confidence intervals shaded, using the predicted values for disproportionality from Model 2 in Table 2 for electoral systems with a median district magnitude of less than 30.

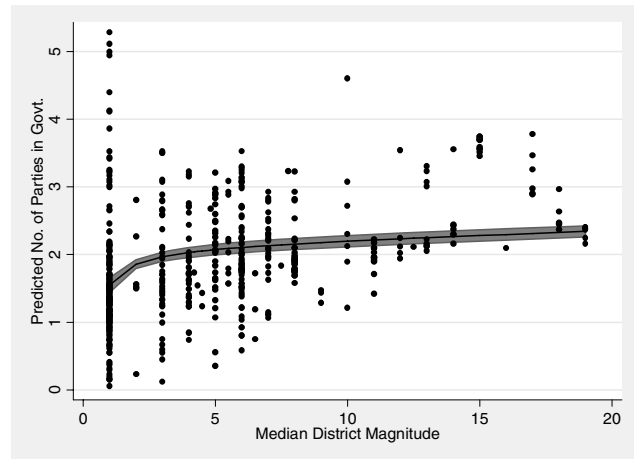
simple linear model remains—indeed, when the inverse term is included in the fixed-effects model, the coefficient on the linear term is indistinguishable from zero.

The effect of district magnitude on our second quality-of-representation variable, *Voter-government distance*, is similar to that on disproportionality. Note that distance and disproportionality are correlated at only .16, so these are not merely picking up the same effect. Model 5, the linear specification using pooled data, shows no measurable impact of magnitude, legal threshold, nor mixed parallel systems on *Voter-government distance*. Model 6, however, confirms that there is a strong diminishing returns effect of magnitude on disproportionality, and again explains a third more variance in voter-government distance than the linear model. With the improved specification, mixed-member parallel systems are also associated with a stronger mapping between the median voter on a left-right spectrum and the pivotal party in government. Again, Models 7 and 8 replicate the effect (diminishing returns, not linear) of magnitude on voter-government distance in the fixed-effects specifications.

Table 2 turns to accountability, as reflected first in the fragmentation of the parliamentary party system. The linear specification in Model 9 confirms that party system fragmentation increases with district magnitude, although the coefficient is quite small. This suggests that, other things equal, a jump from a median magnitude of 1 to 10 is expected to boost the fragmentation index by one-tenth of a unit. Adding the inverse term, in Model 10, confirms that there are diminishing returns in fragmentation to increasing magnitude, although the linear magnitude term remains significant in this specification. Legal threshold also attains significance in this model, mitigating party system fragmentation, as expected, while mixed-member parallel systems have no measurable impact, and compensatory systems inflate fragmentation by a quarter of an effective party, perhaps by encouraging localist parties in SMD competition.¹² Note, however, that the improvement in fit from the diminishing returns model of fragmentation is not as pronounced as with disproportionality or voter-government distance: Model 10 explains just under 3% more of the variance in fragmentation than does Model 9 (the R-squared changes from .31 to .34). With party system fragmentation, again, the fixed effects results closely mirror those from the pooled models, with evidence that higher magnitudes increase fragmentation, although with diminishing effects, legal thresh-

¹² Bear in mind that compensatory systems are, for our purposes, proportional, and we code their median magnitudes according to the proportional districts. We include a dummy for compensatory systems in our model as a check on whether adding the element of single-member district competition affects our dependent variables, even if not through the formula for translating vote shares to overall seat shares.

FIGURE 4 Estimation of the Effect of District Magnitude on the Number of Parties in Government



Note: The line is a bivariate asymptotic regression model, with 95% confidence intervals shaded, using the predicted values for the number of parties in government from Model 14 in Table 2 for electoral systems with a median district magnitude of less than 30.

olds reduce fragmentation, and mixed-member systems increase it.

Models 13 through 16 focus attention on another facet of accountability: the number of parties holding cabinet portfolios. In the familiar sequence, Model 13 tests a linear specification using pooled data, confirming that coalition complexity rises with median district magnitude. Adding the inverse term, in Model 14, confirms some measure of diminishing returns, but, as with fragmentation, the coefficient on the linear term remains positive and significant, and the improvement in overall explanation of variance is minimal (R-squared nudges from .37 to .39). None of the other electoral system factors has a measurable impact. The fixed-effects models, 15 and 16, show no measurable effect of district magnitude on government coalition complexity, although the adoption of mixed electoral systems appears to cut in opposite directions, depending on whether the reform is to parallel (simpler coalitions) or compensatory (larger coalitions) seat allocation.

Figure 4 illustrates the relationship between district magnitude and the number of parties in government. The curve is clearly flatter (more linear) in this figure than the analogous graph for *Disproportionality*. An analogous graph for *Voter-government distance* (not shown), like *Disproportionality*, is strikingly curvilinear, whereas that for *Effective number of parties* (also not shown) falls in between, somewhat more curvilinear than *Parties in*

TABLE 2 Effect of District Magnitude on Accountability

Dependent variable = Method =	Effective Number of Parties (by Seats)				Number of Parties in Government			
	(9) OLS	(10) OLS	(11) OLS	(12) OLS	(13) OLS	(14) OLS	(15) OLS	(16) OLS
Median district magnitude	.01*** (.002)	.01*** (.001)	.003 (.006)	-.007 (.007)	.02*** (.001)	.01*** (.001)	.0001 (.006)	.0007 (.008)
1 / (Median district magnitude)		-1.25*** (.26)		-1.08** (.40)		-.87*** (.22)		.07 (.45)
Legal threshold	-.02 (.03)	-.09*** (.03)	-.34*** (.09)	-.39*** (.09)	.04 (.03)	-.02 (.04)	-.13 (.11)	-.12 (.11)
Mixed-member parallel	-.04 (.45)	.74 (.64)	.47 (.39)	1.13** (.45)	-.01 (.40)	.58 (.55)	-.26 (.44)	-.31 (.54)
Mixed-member compensatory	.44*** (.14)	.27*** (.08)	1.62*** (.34)	1.58*** (.34)	.42** (.17)	.29 (.18)	.94** (.40)	.95** (.40)
Country fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
N observations	609	609	609	609	572	572	572	572
N groups	81	81	81	81	75	75	75	75
R-squared (within groups for fixed-effects models)	.31	.34	.18	.19	.37	.39	.25	.25

Note: Standard errors in parentheses. Models that pool observations across countries are estimated with panel-corrected standard errors. * $p \leq .1$, ** $p \leq .05$, *** $p \leq .01$. All models contain the following control variables: Presidential regime, Hybrid regime, Parliamentary regime, Election year, Political freedom, Economic freedom, Population, GDP/head, Economic growth, GINI index, Age of democracy, Federalism. The models without country fixed effects also contain the following control variables: Ethnic fractionalization, Latitude, Former colony of the United Kingdom, Former colony of Spain or Portugal, Former colony of another country, Americas region, Western Europe region, Former Communist region, Pacific region, South Asia region, and Africa and Middle East region. The full results are available on request.

government, but less so than *Disproportionality* or *Voter-government distance*. The key point is that the relationships between district magnitude and our two dependent variables reflecting representation are distinctly curvilinear, showing sharply diminishing returns to increases in magnitude above quite moderate levels, whereas the relationships between district magnitude and our dependent variables reflecting accountability exhibit more linearity.¹³

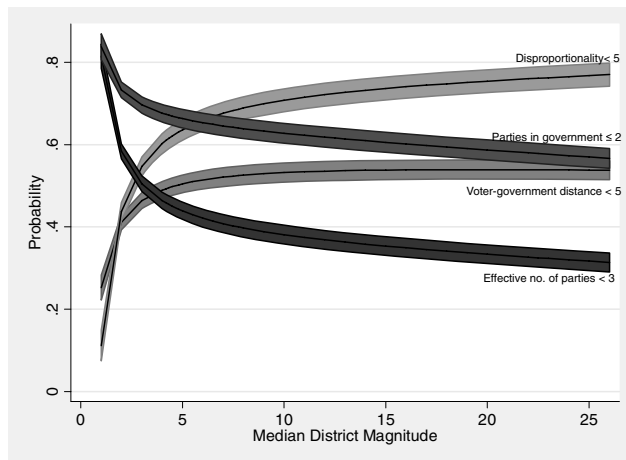
On the whole, the results suggest that the most consistent and powerful electoral system factor driving the representativeness-accountability trade-off is district magnitude. Various dimensions of this trade-off, and their shapes, are shown in Figure 5, which illustrates the relationships between district magnitude, on the one hand, with the predicted probabilities of good outcomes on our two representation dependent variables and the

first two of our accountability variables. The predicted values are derived from regressions on the pooled data, with both the linear and inverse district magnitude variables. We define a “good” outcome as any value below the median value in our data, insofar as we hold high *Disproportionality* and high *Voter-government distance* to be representational “bads,” and we regard high party system fragmentation and complex government coalitions to pose obstacles to electoral accountability. A key message from Figure 5 is that increases in district magnitude yield diminishing returns in improving representation as well as in compromising accountability, but the diminishing returns effect is stronger in the former than in the latter.

The key implication of the relationships sketched in Figure 5 is that it is possible to capture many of the representation gains of increased magnitude while sacrificing relatively less of the accountability ideals. This point is distilled most clearly in Figure 6, which shows the combined probability, conditional on district magnitude, of achieving good outcomes on all four of the dependent variables from Figure 5 simultaneously. The curve rises sharply moving from pure SMDs through the low magnitudes, peaks in the six to eight range, and then declines.

¹³ We also ran logit regressions of the incidence of single-party government, which some regard as the *sine qua non* of accountability, on our explanatory variables. As expected, increasing magnitude diminishes the likelihood of single-party government, but the non-linear specification provides only modest additional leverage beyond the pure linear one. The results of these models are available in the online Supplementary Information (see footnote 1).

FIGURE 5 District Magnitude and the Probability of Lower-than-Median Outcomes

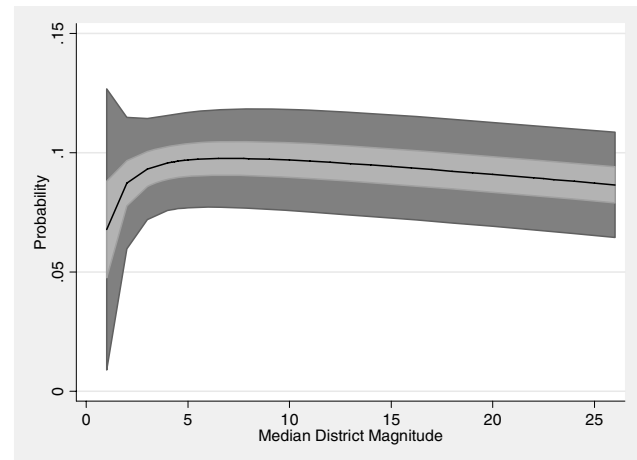


Note: The figure plots the predicted probabilities that an election produced a lower-than-median outcome in the relevant variable, fitting an asymptotic model to the predicted values, with 95% confidence intervals shaded.

Not surprisingly, the predicted likelihood of having better-than-median outcomes on all four criteria is relatively low, peaking just above 10%. If we relax our demands, looking for good outcomes on one representation and accountability ideal each (say, *Disproportionality* and *Effective number of parties*, or *Voter-government distance* and *Parties in government*), then the predicted likelihood of having one's cake and also eating it rises to around 40%. Importantly, however, the shape of the relationship between district magnitude and realization of combined representation and accountability ideals is consistent, always rising sharply through the low magnitudes, peaking below a median magnitude of 10, and then declining as magnitude rises further.

This consistent relationship suggests a magnitude “sweet spot,” in the four to eight range, where the most improvements in representativeness have already been realized but where the predicted party system fragmentation and government coalition complexity remain limited enough to allow voters to sort out responsibility for government performance and attribute credit and blame accordingly. The story that emerges from Figures 5 and 6 in combination is that the vast bulk of improvements in representativeness can be realized by moving from SMDs to multimember districts of modest magnitudes, and that in doing so, electoral system engineers might avoid substantial “accountability costs,” in terms

FIGURE 6 District Magnitude and the Probability of Combined Lower-than-Median Outcomes

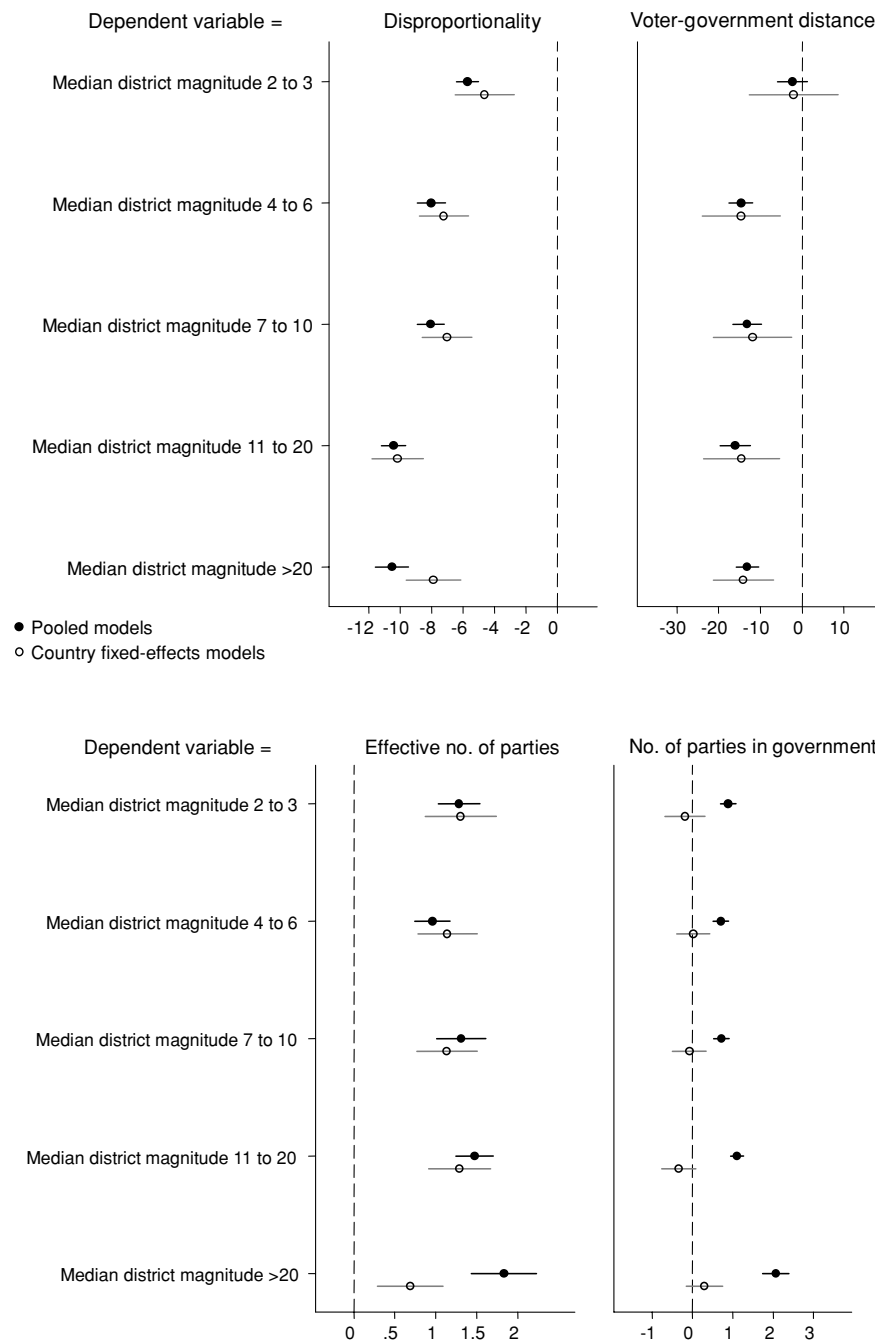


Note: The figure plots the predicted probability that an election produced a lower-than-median outcome in all four of our measures: a disproportionality score less than 5; a voter-government distance score less than 5; less than 3 effective number of parliamentary parties; and 2 or fewer parties in government. The 95% (the outer area) and 50% (inner area) confidence intervals are shaded.

of party system fragmentation and coalition complexity, which increase at higher magnitudes.

We acknowledge that when we pile condition upon condition—low disproportionality *and* voter-government distance *and* fragmentation *and* coalition complexity—we pay a price in statistical leverage, as the broad confidence intervals in Figure 6 testify. So, to investigate further whether we can be confident in the relative advantages of low-magnitude districts, Figure 7 revisits our regressions, this time substituting a series of dummy variables to capture the effects of various magnitude intervals on the dependent variables of interest. The models use SMD systems (among which there are 191 elections in our data) as a baseline category. We group multimember district systems by $M = 2$ or 3 ($N = 50$), 4 to 6 ($N = 160$), 7 to 10 ($N = 75$), 11 to 20 ($N = 69$), and greater than 20 ($N = 64$). We chose these intervals according to a couple of guiding principles. The intervals are smaller at the low end of the magnitude scale because we expect the marginal effects to shift most quickly here, and because we are particularly interested in the marginal effects in this neighborhood. We place systems with median magnitudes of two and three into their own category because the electoral systems literature includes skepticism regarding the dynamics of partisan competition at these particular low magnitudes (see Auth 2006 and Nohlen 2006 on magnitude 2; and

FIGURE 7 The Effect of District Magnitude Thresholds



Note: These figures plot the coefficients and standard errors from a series of regression. The baselines in the model are the outcome of elections with single-member districts. The models that pool observations across countries are estimated with panel-corrected standard errors. See the note to Table 2 for the list of control variables which are included but not reported here. The full results are available on request.

Taagepera and Shugart 1989 on magnitude 3). Beyond this, we aimed for groups with roughly similar numbers of elections to ensure comparable quality estimates across intervals.

The top panel confirms that moving from SMDs to a system with a median district magnitude in the four-to-six range can be expected to reduce disproportionality by almost 8 points, or about three-quarters of the total

expected reduction possible by raising district magnitude. Also, the same magnitude four-to-six category also achieves over 80% of the maximum reduction (relative to SMDs) in voter-government distance.

The second panel shows that the four-to-six range yields only about half the expected increase in party system fragmentation as the highest-magnitude systems, and less than a third the maximum increase in expected number of parties in government (although this result is not significant in a model with country fixed effects).

We also ran the same models illustrated in Figure 7, but using the highest-magnitude electoral systems (those with median district magnitude greater than 20) as the baseline category—see the online Supplementary Information. Significance tests in these models determine whether systems in each magnitude interval are statistically discernible from those with the highest magnitudes, rather than from SMD systems. The key result from these specifications is that there is no measurable “cost,” in terms of disproportionality or voter-government distance, to moving from high-magnitude systems down even as far as to those with median districts in the four-to-six-seat range. That is, the mid-sized districts are either not statistically discernible—or else just barely so—from the highest-magnitude districts. On the accountability variables, by contrast, where the high-magnitude baseline systems perform worst, the mid-sized districts yield measurable improvement on party system fragmentation (in the pooled model) and reduction in government coalition complexity (both models).

Conclusion: Small Multimember Districts Are Best

With the spread of democracy across the world in the last few decades and with more and more established democracies tinkering with their electoral systems, we can identify the nature of the trade-off between inclusive representation of citizens’ preferences and accountable government more accurately than we have been able to before. With this aim in mind, our results suggest that practitioners who seek to design an electoral system that maximizes these competing objectives are best served by choosing multimember districts of moderate magnitudes. Consistent with the traditional view of electoral systems in political science, we find that SMD systems tend to produce a small number of parties and simpler government coalitions, but also have relatively unrepresentative parliaments. On the other side, electoral systems with large multimember districts have highly representative parliaments,

but also have highly fragmented party systems and unwieldy multiparty coalition governments. In contrast, electoral systems with small multimember districts—with median magnitude between four and eight seats, for example—tend to have highly representative parliaments *and* a moderate number of parties in parliament and in government.

On the representation side, our results suggest that increasing the district size from one to around five reduces the disproportionality of representation in parliament by three-quarters and reduces the ideological distance between the median citizen and the median government party even more sharply. This is a result of both the greater opportunities for medium-sized parties to win seats and the new incentives for supporters of small parties, who may simply prefer to “throw away” their votes under SMD elections, to coordinate into medium-sized parties. Increasing the district magnitude beyond six does not improve representation much further. On the accountability side, meanwhile, increasing the district size from one to around five increases the number of effective parties in parliament by around one, and increases the number of parties in government by about a half. Countries with small multimember districts are more likely to have coalition governments than countries with SMDs, but these coalitions are likely to be between two or a maximum of three parties. Put another way, low-magnitude PR simultaneously fosters inclusiveness and limits the political unruliness high magnitudes invite via party system fragmentation and coalition complexity.

In closing, it is also worth noting other research that points to an advantage of low-magnitude districts for the accountability of individual legislators. Carey (2009) describes a trend in electoral reform toward systems that allow voters to cast preference votes for individual candidates, and notes that voters overwhelmingly choose to exercise the preference vote when given the option. Yet the promise such open-list systems hold of individual accountability is conditional on limited district magnitude. In high-magnitude elections, open lists confront voters with a bewildering array of candidates (Samuels 1999), whereas low magnitudes curb both party system fragmentation, keeping a lid on the number of lists, and the number of candidates per list. As a result, voters under low-magnitude open-list systems are better able than those in other systems to identify and hold their representatives accountable. Chang and Golden (2007), for example, find that corruption is lower in countries with open-list than with closed-list proportional representation, *provided that average district magnitude is below 10*, whereas at very high magnitudes (above 20), open-list systems are associated with more corruption. Hence, low

magnitudes make it possible to combine candidate preference votes and individual accountability with proportionality and partisan inclusiveness.

In short, legislative elections work best when they offer opportunities for multiple winners, and thus afford voters an array of viable options, but at the same time do not encourage niche parties or overwhelm voters with a bewildering menu of alternatives. The evidence from a wide range of indicators all points toward low-magnitude proportional representation as providing a good balance between the ideals of representation and accountability.

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