17

Conclusion: Substance and Method

This book has had two overriding ambitions, as sketched in its preface and in Chapter 1. One ambition has been within the subfield of electoral studies itself, and the other is for political science more broadly. We take up what we have achieved of our ambitions regarding electoral studies first, and then focus later in this concluding chapter on the wider contribution to political science.

CONTRIBUTIONS TO THE KNOWLEDGE BASE ON ELECTORAL AND PARTY SYSTEMS

The book has taken two principal measures of a country's electoral institutions, and from these logically deduced a whole chain of quantitative predictions for party-system outcomes. The two basic measures are the number of seats in the representative assembly ("assembly size," or S) and the number of seats in electoral districts ("district magnitude," or M) through which this assembly is elected. From just these two numbers, the application of rigorous logic permits the deduction of the number of parties in the assembly and in the electorate, as well as the size of the largest. These predictions agree with worldwide averages, which in turn supply a benchmark for country investigations. In doing so, we build on prior works, both our own (Taagepera and Shugart, 1989a, 1993; Taagepera, 2007) and others. Among the other building blocks are Rae (1967), who coined the term, district magnitude, in carrying out the first detailed quantitative examination of electoral systems and party systems, and Lijphart (1994), whose analysis was among the first to take the assembly size seriously.

From the product of M and S, we have a country's *Seat Product*. Based on a large pooled dataset of elections in old and new democracies, we are able, in Chapter 7, to confirm and extend the work done by Taagepera (2007) to show how remarkably accurately these two quantities predict the worldwide average pattern of the effective number of seat-winning parties (N_S).

A major extension, shown in this book for the first time, was to account for the effective number of vote-earning parties (N_V). Many works in the field see N_V as somehow conditioned by the electoral system, but nonetheless fundamentally see the electoral system as a sort of conversion box that takes in N_V and spits out N_S. We show that we can start with the quantity that is more constrained by institutions, N_S, and once we know that, a rather absurdly simple assumption gets us to N_V. That new concept, introduced in Chapter 8, is the idea of the number of pertinent parties. For this we drew on the M+1 rule (Reed 1991, 2003; Cox 1997). We reconceptualized it as N+1 (more precisely in our notation, N_{S0}+1). It is a starkly simplified assumption that there are N_{S0} seat-winning parties (of any size) and one serious striver that just missed, and added together, these comprise the parties that are "pertinent." From that we are able to offer a model of what N_V tends to be, on average. This is how *votes result from seats*, in addition to seats also resulting from votes.

In Chapter 9, we summarized four basic laws of party seats and votes, which we had explained and tested in the preceding chapters. We also extended the explanatory power of M and S to deviation from proportionality, as an application of the basic laws of party seats and votes.

Then we turned our attention, in Chapter 10, to the district level. It has been argued by many works that it is at the level of individual districts that "coordination" around some number of parties occurs and that the question of the national party system is one of how these district party systems project, or are "linked" (Cox 1997), into either a common national system or separate regional ones. We start from a different premise, and show that district-level party-system quantities can be deduced from the size of the nationwide assembly in which a district is "embedded." That is, we put the national assembly electoral system first, and understand a district as one component of the wider system.

Other findings of the book concern presidential systems. It has become standard wisdom in the field to understand the effective number of vote-earning parties in the assembly as being conditioned by competition for the presidency. Such an expectation is straightforward enough, but in reviewing the now-extensive literature to advance that line of reasoning, we were dissatisfied. We detail reasons for the dissatisfaction in Chapters 7 and 12, but two key reasons are worth emphasizing here.

One reason is that we aim for *predictive* models of how institutions work, but if one of the inputs is the effective number of presidential candidates, its means practically giving up the enterprise. It would mean that wherever presidents are important enough to shape assembly party competition, we have to know first one of the very things we are trying to predict – how many serious contenders are there for political power? Such number is surely not exogenous, but many approaches treat as if it were. In fact, we are able to show – remarkably – that we can predict the trend in the effective number of *presidential* candidates based on the *assembly* electoral system. While the scatter is high, because individual presidential candidates make a substantial difference in party support, a model based on the relationship of assembly and presidential competitors allows us to predict the latter, on average. In fact, the effective number of presidential candidates turns out to be more predictable from assembly institutions than is the effective number of parties in the assembly elections of those democracies that have politically important presidents.

The second dissatisfaction we felt with the standard literature is its claim that the impact of presidential competition is conditional on the temporal proximity of the presidential and assembly elections. Again, the idea is sensible, but we found it to be inadequately theorized, as explained in in Chapter 12. Instead, we returned to the notion of the timing of assembly elections as explaining shifts in electoral support for the presidential party (Shugart 1995), but not as a factor in assembly fragmentation. In fact, there is no systematic effect of the timing of assembly elections on the effective number of parties (votes or seats) for the assembly, with one important exception: late-term, or "counter-honeymoon," elections exhibit higher fragmentation. This high fragmentation, however, often gets reduced in presidential elections, as multiple parties coalesce in the short window of time between assembly and presidential elections, with the former being almost like a "primary" within groups of parties. Thus the results of Chapters 11 and 12 allow us to say that presidential democracies have party systems, and even numbers of presidential candidates, that can be predicted from the assembly electoral system – specifically, the Seat Product.

We further extended our logical modeling techniques to the intraparty dimension of representation. Chapter 13 explored how the intraparty dimension is like the interparty in one key respect: *the distribution of votes follows from the seats* for which parties and candidates are competing. Two prime examples of electoral systems that feature intraparty competition for votes – open-list PR (OLPR) and single nontransferable vote (SNTV) – systematically shape how many candidates a party tends to run in a district. The key distinction between these systems lies in whether they have vote pooling (as does OLPR) or not (SNTV). Patterns in the vote shares of candidates can be predicted, based on how many candidates a party puts forth. Chapter 14 extended this idea to include the extent to which votes are concentrated on winning candidates or are spread out with many votes cast for losers.

Moreover, in Chapter 14, we were able to account for votes and seats in electoral systems that are hybrids of OLPR and SNTV. Parties in such systems often present alliances, with one open list containing candidates from two or more parties. We again saw the impact of our two fundamental building blocks, M and S, which allowed us to make sense of high district-level fragmentation of the number of parties in systems where these parties run in alliance. Thus M and S prove useful for modeling key aspects of every broad topic covered in this book – nationwide party systems, how district-level competition is embedded in the national system, presidential competition, and intraparty and alliance politics.

Finally, we address the issue of complex electoral systems. Our basic models of nationwide effects (Chapters 7 to 9) apply to simple electoral systems, where all seats are allocated in districts, using simple formulas. Are they useless for the numerous actual systems that add several tiers, two rounds, legal thresholds, or many other complexities? Complex systems add but do not subtract. They still feature an assembly size and some basic district magnitude, which keep having an impact. Using work by Li and Shugart (2016), Chapter 15 extended the Seat Product Model to two-tier proportional systems, by adding one additional parameter, the share of seats allocated in compensatory upper tiers. We incidentally observed that interaction *with effective number of ethnic groups* does not substantially improve the fit of predicted to actual values in most cases.

We further found, in Chapter 16, that even some other more complex systems turn out to be explained well by *MS*, almost as if they were simple. There is something obviously quite fundamental about these two variables, mean district magnitude and assembly size. Many of those complex systems that have no upper tier still involve a definite number of seats in the assembly, all of which are allocated in districts of some (mean) magnitude. Thus they have a Seat Product. For such systems we simply asked: What would be the largest seat share and the effective number of parties for a simple electoral system with the same Seat Product? And how much would these results be off, compared to the actual figures in the complex system? The surprising answer: all too often, not much. When two countries have similarly complex (but single-tier) electoral systems, but one has a Seat Product of 100, while the other has 10,000, then the Seat Product turns out to be the cake and further complexities (like ranked ballots, second rounds, or moderate thresholds) often just amount to heavy icing on the cake.[1]

But What About the Politics?

Both of the authors of this book frequently receive comments from reviewers or other colleagues or from students that imply we leave the politics out. How can we, as political scientists, say everything comes down to some "mechanical" features of institutions, and to modeling that looks more like physics than what social scientists are accustomed to? Our response is that there remains plenty of room for "politics" if by that we mean the articulation of cleavages, organizing and maintaining political parties, campaigning and, of course, voting. Yet it is

[1] As we saw in Chapter 16, however, some systems like SNTV are hard to explain on the interparty dimension. And systems that have complexity aimed at enhancing majoritarianism similarly defy easy explanation.

true that little of these themes has filled the pages of this book. So maybe we do not think it is important. That would be the wrong conclusion to draw! What we aim to do is understand the institutional channels and constraints in which all of this sort of politics takes place. We offered numerous examples throughout the book of how context shapes the way systems work in practice, starting with our chapters offering short cases studies (Chapters 5 and 6) and at various other opportunities, including our exploration of especially complex rules in Chapter 16.

Rich country contextual analysis and sparse microfoundational models, and numerous other methodologies, have much to contribute. We hope that scholars of diverse traditions will take up the challenge and pick up where we are about to leave off. Why do these parties and not some others form? When a country has some sort of fundamental shock to its political party system, does that system later revert to the expectations set by our models? If so, how long does it take, and how does it come about? If not, is it a political problem, as perceived within the country, that the electoral system and party system are poor fits for one another (again, according to our models)? If so, does a movement for electoral-system change emerge and gain traction? If not, why not? We can illustrate some points of departure for these further analyses next, but the main message is that these questions cannot even be meaningfully asked unless we first have a baseline against which to measure country-level and election-level fluctuations. That is exactly what this book provides, as we said in Chapter 7: *a baseline* for understanding party and electoral politics, *not a threat* to those who study such topics.

Performance of the SPM for Specific Countries

In sum, the logically predictable impact of assembly size and district magnitude reaches even into many of the complex electoral systems. *At the level of worldwide averages*, it reaches seats and votes, national and district, parliamentary and presidential, interparty and intraparty, to a degree that looks impossible – except that it has logical foundation and empirical confirmation. But what good are mere worldwide averages? They supply a baseline for evaluating individual cases. For the first time, we now have baselines that go beyond "Anything goes."

Some readers may still be puzzled, however, by the lack of country-specific factors in the SPM. Partially in anticipation of such puzzled responses, in Chapter 15 we showed regression results that included a variable for one country-varying parameter, the effective number of ethnic groups. We found this had surprisingly little effect for most countries, once we fully specify the most important institutional variables, as in the SPM. Still, maybe there are other country-specific or even election-specific factors that explain N_S. Our response is – of course there are! The institutions set the parameters of the

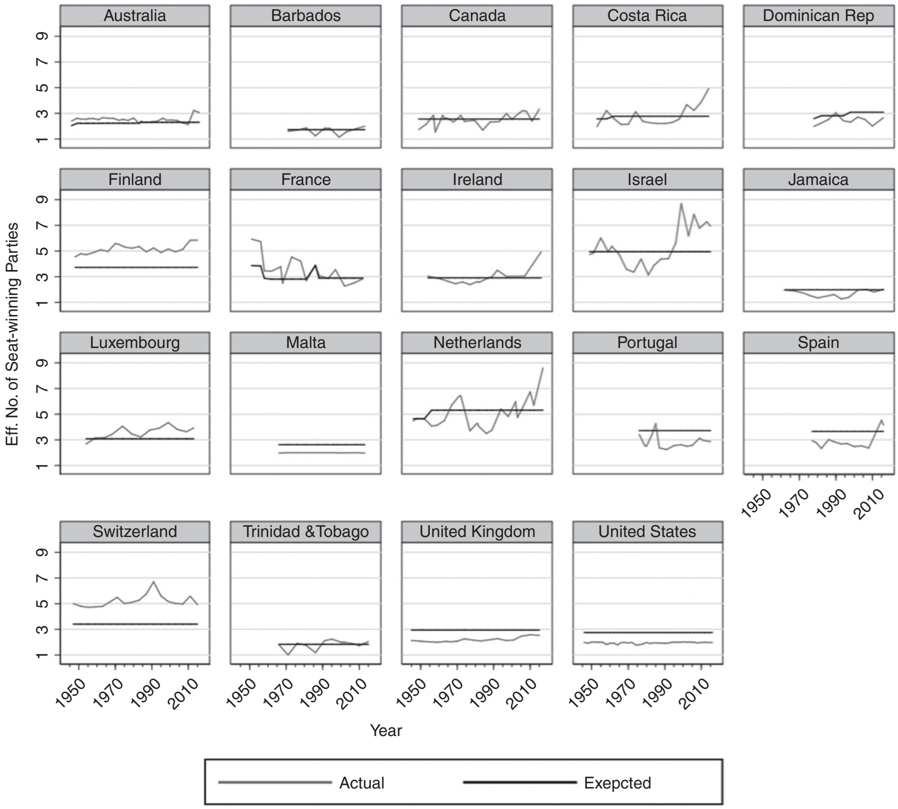

FIGURE 17.1 Expected and actual effective number of seat-winning parties (N_S) over time in long-term democracies with single-tier electoral systems

game, but not every move that the players of the game might make. This should not surprise anyone. After all, even in baseball, the same rules are compatible with distinctive national styles of play (Kelly 2007, 2009). So in electoral and party systems, after taking account of the institutional effects, there remains plenty of room for political actors to maneuver. That maneuvering space is, however, limited by the institutions.

We can visualize how national politics varies around the institutionally derived predictions. Figure 17.1 demonstrates the performance of the SPM for specific countries and how actual N_S fluctuates over time. The countries depicted here all had at least thirty-five years of consecutive democratic experience as of 2015; elections up to early 2017 are included. In addition, they are all either "simple" (as defined in Chapter 2) or are single-tier systems that we determined function as if simple (see Chapter 16). For each country plot, we see a solid black line, which depicts the expected N_S, given the country's assembly size and mean district magnitude. If the line shifts upward or downward, it is because of changes in either of these parameters that are sufficient to produce a change in *expected* N_S.[2] The gray line tracks the actual N_S, for each election.

We see a few countries that have systematically lower or higher than expected N_S – for instance, Spain's N_S is surprisingly low until 2016, and the US is low throughout, whereas N_S in Finland and Switzerland has been surprisingly high.[3] Most other countries fluctuate, with some elections below and some above. A few rarely deviate greatly from the expectation, such as Canada and, until 2016, Costa Rica and Ireland (despite the latter country's use of the nonsimple STV). Some countries that are notable for their very high N_S in recent elections, such as Israel and the Netherlands, also have prior periods when N_S was surprisingly low, given their Seat Product. It is certainly plausible that their party systems could consolidate somewhat again in the future, but there is no guarantee. And that is the point – politics is not determined by the Seat Product, but it is clearly shaped by it.

One theme that we have emphasized is that there is no need to take account of the executive type, or the number of presidential candidates (as is the case in several other authors' approaches), in order to derive a reasonably accurate prediction for N_S. Some of the countries shown in Figure 17.1 are presidential (Costa Rica, Dominican Republic, and the US), and one is a semipresidential system with a very important presidency (France).[4] None of these countries is any more out of line with its SPM prediction than are some nonpresidential systems. Party-system fragmentation may vary for any number of peculiarities of the country or an individual election. Yet if asked to guess what the effective number of parties would be in any given simple system, we would base our guess on the Seat Product, and not whether it was presidential or not, or had a given ethnic fragmentation, or any other factor. More often than not, we would be reasonably accurate, for most elections.

In Figure 17.2, we see a similar plot of multiple countries, this time showing countries with two-tier systems for some or all of the period. The dashed line shows the expected N_S from our extended Seat Product Model (Chapter 15), which applies to two-tier compensatory PR, as well as to simple systems. If there is also a solid black line, it marks any period under a single-tier system, allowing us to see whether the change of system corresponded to a change in N_S.

[2] The spike near the middle of the time series in France is due to the one election held under a PR system (1986). Whether by luck or otherwise, the actual N_S that year was almost exactly as predicted by the SPM.

[3] Some of Finland's high values can be explained by the use of the OLPR/SNTV hybrid. See Chapter 14, as well as the appendix to Chapter 7. The Swiss system also has alliance lists. Despite different rules from Finland's, the alliances may similarly enhance fragmentation.

[4] In addition, France elects its assembly by two-round majority-plurality (except in 1986), an electoral system that we do not define as simple. Yet in most elections, the SPM does well. See Chapter 16.

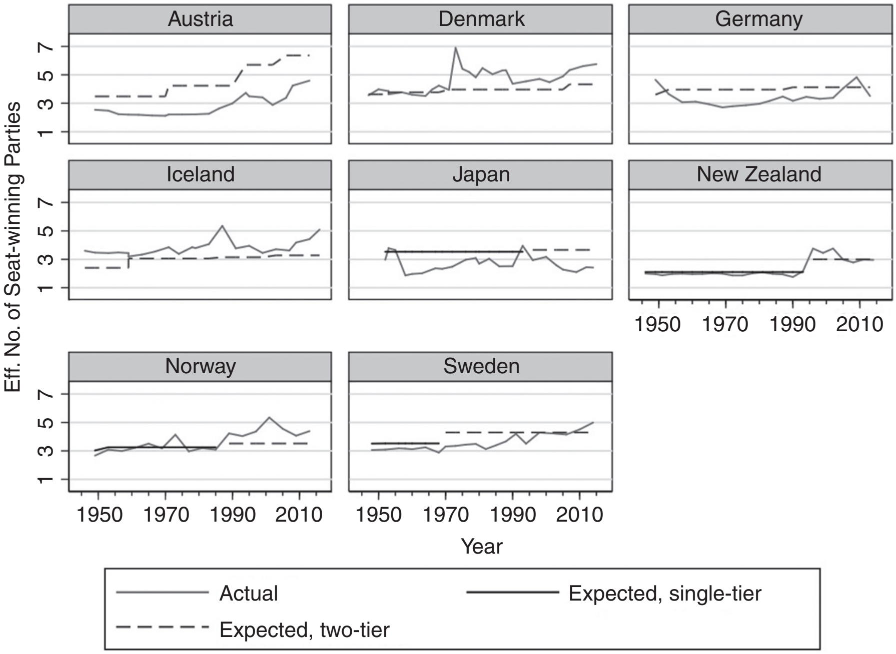

FIGURE 17.2 Expected and actual effective number of seat-winning parties (N_S) over time in long-term democracies with two-tier electoral systems

The overall pattern in Figure 17.2 is similar to that in Figure 17.1: few countries are systematically much higher or lower than expected. One that stands out as exceptional is Austria; even as the rules have been modified several times – note the shifts in the dashed line – actual N_S has lagged. Germany has had unexpectedly low N_S since the 1950s, with the notable exception of 2009. Japan's single-tier system was not simple (it was SNTV) and its postreform system is not compensatory (it is MMM); thus the "expected N_S" here should be treated with caution. We do not intend the models to be able to explain systems like these, and in Chapter 16 we saw that neither SNTV nor MMM could be covered well by the SPM. Nonetheless, we include Japan because it is a prominent example of democracy and of electoral reform. Japan's actual N_S has tended to lag behind what its Seat Product would imply, if we assumed these electoral systems were simple.

Other cases of reform look unexceptional from the standpoint of the SPM. For instance, New Zealand had almost the precise value of N_S that we would expect for decades under FPTP. When it shifted to MMP, there was an initial large increase in N_S, but then it came almost back to the new system's expected value. Changes from single-tier to two-tier PR in Norway and Sweden were quite modest in their effect on expected N_S; the actual value surged higher than expected in Norway, and lagged behind in Sweden before increasing.

The extension of the Seat Product Model to cover two-tier PR systems is one of the accomplishments of this book. In prior iterations of our work, we attempted and failed to do account for such systems. In Taagepera and Shugart (1989a) we attempted to develop an "effective magnitude" to take account of upper tiers and other complicating factors, such as thresholds. We now see that effort as a dead end; in fact, Taagepera (2007) said as much, but did not propose an alternative measure. Figure 17.2 shows that the SPM is approximately as reliable for two-tier PR as it is for simple systems. As with any country and any electoral system, individual elections will vary, and some countries will be chronically more or less fragmented than any broad model would predict. Yet the overall pattern is predicable. The politics play out within constraints set by institutions.

Systems that are still more complex, such as with high thresholds, noncompensatory tiers, or that use multiseat plurality or various *sui generis* combinations remain elusive to predicting outcomes. While we can model the impact of thresholds with some limited success, as we showed in Chapter 16, the main message is that the more complex the system, the harder it is to know how it will work in practice.

THIRTY YEARS AFTER

Thirty years ago we published a book, *Seats and Votes* (Taagepera and Shugart 1989a), that was hailed as a major advance in the study of electoral systems. So it was. Yet, we have practically nothing to cite from that book, and hardly any similar graph or equation to reproduce. This is a measure of later advance. Take just the central issue – the relationship between institutional inputs and outputs such as the number of parties.

In 1989 we were the first to graph the effective number of parties against what we called effective magnitude. On this basis we offered an empirical equation to connect N_V to M. This was the first attempt to express the fuzzy Duverger's "law" and "hypothesis" in such a way that quantitative predictions could be made, tested, and possibly refuted – something "Duverger's law" was safe against, due to is evasive nonquantitative character (see Chapter 7). We called our equation "Generalized Duverger's rule," and it was a major step forward toward quantitativeness. Yet, what did we miss? For one, we missed the role of assembly size, hopelessly trying to telescope its impact, along with district magnitude, into an "effective magnitude."[5] We graphed

[5] We correctly deduced S from cube root of population but used it for predictions only in the "Law of minority attrition." The latter still stands and has its uses (see Taagepera 2007, chapters on this law and on seat allocation in federal second chambers), but we do not need it for our purposes in this book.

N_V against M on regular scales rather than logarithmic, which could have given us ideas for logical modeling (cf. our introductory Chapter's Figure 1.2, albeit the latter addresses districts rather than the national scene). Above all, we had no logical model.

Several of the quantities we then highlighted (Taagepera and Shugart 1989a: 202) have found little or no use in the present book: number of issue dimensions, relative reduction in number of parties, break-even point, and advantage ratio. Among the relationships proposed (Taagepera and Shugart 1989a: 205), only those supported by a logical model have survived: the cube root law of assembly sizes and inverse square law of cabinet duration. (Hence we do not reproduce their derivation, but see respectively, Chapters 2 and 7.) Several other relationships, all empirical, could in hindsight be deduced as approximations based on logical models in the present book. This is how cumulative science proceeds, with many tracks that in retrospect turn out to be sidetracks.

PERSPECTIVES ON DESIGN PRINCIPLES FOR ELECTORAL SYSTEMS

In this book, we have seen that the range of variation in electoral systems is large, because some countries combine many different components. In extreme cases, a country (or other political jurisdiction) winds up with a system that is so complex that we are unable to say how it might work in practice. We reviewed some examples in Chapter 16 of what we termed overly complex systems. For such systems it is not feasible to develop a quantitatively predictive logical model, as has been the goal in this book.

Some actual systems are obviously the product of compromises among many different political forces. To some degree this is inevitable. The electoral system usually must be adopted by the very politicians who will be running for office under its provisions. (Even when approved by a referendum or some other arms-length process, it is generally elected office-holders who get the process started or make key proposals along the way.) Thus, while some degree of compromise with present political needs usually must happen when a new system is being designed, the complexities that sometimes result are regrettable. We believe that electoral systems should be designed for the long run (Taagepera and Shugart 1989b). Frequent tinkering is not wise, but the more the system is designed for the narrow needs of present power-holders, the more likely the system will be seen as inappropriate in the future.

Based on our analysis in this book, we can draw some broad conclusions about what are "best practices" in electoral-system design. The intention here is not to offer a one-size-fits-all model; that would be foolish. Rather, we sketch some principles of design about which the book has shown we can generalize. If we can generalize, we can be relatively more confident of recommendations if called upon in some specific design moment to offer answer to the question, "how might this work?"

Keep it simple. Ideally, an electoral system should avoid complexity. The simplest systems have a single tier of allocation and a common PR formula, with allocation taking place solely within districts. FPTP is included in this category (see Chapter 2), although we will admit a preference for even moderate degrees of proportionality over FPTP. The latter system almost necessarily entails substantial deviation from proportionality (Chapter 9), and is more prone than PR systems to manipulative practices like gerrymandering (Chapter 3). A good design presumably avoids either excessive disproportionality or opportunities for political chicanery, although what is "excessive" is normative. Moreover, there are equally good reasons to avoid being a purist about proportionality, which may invite high party-system fragmentation.

If complexity is needed, keep it limited. The compromises that must be struck to design an electoral system in real-world applications may require some complexity. If so, it remains our advice to keep such complexities limited. Our analysis in Chapter 15, and our Figure 17.2 in this chapter, showed that two-tier compensatory PR (a category that includes MMP) is about as easy to model accurately as simple, single-tier, PR. It is thus as simple as an electoral system can be while falling into the category of complex systems. Other complicating factors like thresholds turn out, according to our analysis in Chapter 16, to be not too troublesome for answering the "how might this work" question – provided the threshold is not very high. We suggest five percent or lower, because a too-high threshold invites partisan actors to seek work-around solutions.[6] Other relatively minor complications like ranked-choice voting (for either the Single Transferable Vote or its M=1 variant, the Alternative Vote) likewise do not render a system's output too difficult to predict through our quantitative logical models. We caution, however, that attempts to combine many complicating factors in one are unwise. For instance, having ranked-choice voting in low-magnitude districts with a compensatory PR tier, plus a threshold, would combine three complicating factors in one system. In such a hypothetical situation,[7] we are not able to say how the resulting system might work.

If the system is presidential, be careful. We do not take a stand on whether presidentialism[8] is itself a problematic institutional design. That question is outside the scope of this book, and is addressed in a separate literature (e.g., Shugart and Carey 1992; Cheibub 2007; Samuels and Shugart 2010). We were able to show in this book that assembly party systems can be modeled without including presidential variables as an input. Thus just knowing the assembly size and the mean district magnitude is generally sufficient to arrive at a reasonable

[6] See the Turkish example sketched in Chapter 16.

[7] The combination mentioned is not entirely hypothetical. Such proposals have surfaced from time to time in Canada and the Netherlands, and perhaps elsewhere.

[8] Including semipresidential, at least if the presidency is not extremely limited in its powers.

estimate of what the effective number of parties (or other output) is likely to be. Presidential systems are, however, more variable, presumably because specific election results may be shaped by the electoral coalitions assembled by particular presidents, even if the overall pattern of presidential democracies is not systematically different from parliamentary.

We would urge special caution in various aspects of electoral-system design for presidential democracies. The timing of elections, while not usually seen as a feature of the electoral system, has measurable impact on assembly elections. If elections are nonconcurrent, we can expect a substantial surge in the vote share won by the president's party if elections are early in the term (honeymoon), and a decline later. Elections very late in the term (in the counter-honeymoon) may be advantageous, however, in multiparty contexts: we showed evidence (Chapter 12) that such assembly elections function almost like primaries among parties that may choose to enter pre-electoral coalitions in the upcoming presidential contest. Such elections are, however, quite likely to result in higher levels of fragmentation than the SPM otherwise would predict. Thus it would be wise to use counter-honeymoon elections only with a moderate Seat Product. The timing of elections should be chosen carefully with an eye to desired impact, and not allowed to be essentially random, as can be the case when presidents and assemblies are elected to different term lengths. A high Seat Product also will tend to result in a higher effective number of presidential candidates, as we showed in Chapter 11.

On the intraparty dimension, also keep it simple. Aside from limiting interparty fragmentation, moderate district magnitude would also have benefits on the intraparty dimension. If lists are open, a high magnitude implies many candidates being elected with extremely small shares of their own party's votes (Chapter 13), and small margins over top losers. Additionally, many votes wind up being cast for losing candidates (Chapter 14), which may be undesirable if voters are not indifferent as to which of their party's candidates is elected. (The whole premise of open lists is that voters are not indifferent, and should be given a choice among candidates.) The implication then is that many winning candidates tend to represent very narrow slices of the electorate. Moreover, it is likely not possible for voters to process information on large numbers of candidates, and thus the cognitive demand on voters from high-magnitude open lists may be too high (Cunow 2014). If magnitude will be on the high side in order to allow for considerable interparty proportionality, it would be wise to restrict the number of candidates per party to something less than *M*.[9] We are aware of no countries that do this, but it should be considered, to keep the system more manageable and to encourage candidates to appeal more widely. In moderate magnitudes, allowing alliances in open lists is reasonable; however, with higher *M*, we would recommend against it, given

[9] Near the end of Chapter 14 we offered a proposal of this sort.

the complications for parties of estimating their seats in intralist allocation and the tendency to encourage substantially increased fragmentation of party labels (Chapter 14). Such enhanced fragmentation is predictable (based on *M* and *S*), so systems ought to be chosen under awareness of the likely outcome.

This book has shown that quantitative logical models can help us understand many aspects of electoral systems, including moderately complex ones. The further development of such models should help illuminate other aspects of electoral systems that we did not cover, and may also assist in advising processes of electoral-system design in new democracies, or where reforms are considered in ongoing democracies.

CONTRIBUTION TO SOCIAL SCIENCE METHODS

The book's direct contribution, as we have reviewed here, is to electoral studies: predicting so much from so little. It also has a contribution that we hope is broader for political science and other social sciences. We have made a centerpiece of this book the development of "quantitatively predictive logical models." The goal of these models is to connect a few variables at a time and then connecting these connections with each other. Having connections among connections is a hallmark of any developed science. While many natural sciences have bodies of quantitative interrelations, such are rare in social sciences. Philosophical arguments abound why this would be impossible in political science, or social sciences more generally. Yet we have shown it can be done: in a small slice of social phenomena, we offer a structure of quantitative interrelations, as indicated in Figure 9.5. Thus the book is a rare *scientific* book about politics, and should set a methodological standard for all social science.

Some of the methods we have used are not among the most usual in social sciences, even though they are familiar in natural sciences. We introduced the method in Chapter 1, and have followed it by developing models for the main questions of Chapters 7 through 16. Now we review the method and hope to point the way forward for further applications.

In Chapter 1, we introduced the idea that science walks on two legs (see Figure 1.1). One leg refers to determining how things *are*. This leads to careful observation, measurement, graphing, and statistical testing. The other leg refers to asking how things *should be*, on logical grounds. That question guides the first one. "How things are" assumes that we know which aspects of things are worth paying attention to. But we largely see only what we look for. It's asking "How things *should be*" that tells us *what* to look for.

This book's approach walks on both legs of science. And this is why it may look out of place in today's quantitative social science that often emphasizes fitting equations with many parameters entered simultaneously and limits its predictive modeling to the direction of a relationship: whether *y* goes up or down when x increases. Even in fine examples of social-science scholarship, typically the emphasis tends to be on whether the relationship goes in the expected direction to a statistically significant degree, neglecting *how much* it goes in this direction. Whether it goes in this direction to the expected extent is of course a moot question when nothing was expected apart from direction. We urge researchers to try and arrive at logical predictions of just *how much* the quantitative impact of a given variable *should be*. Doing so is not always feasible, we recognize,[10] and even the confirmation of a directional hypothesis can offer valuable insight. However, we should aim for better whenever we can.

In contrast, this book constructs logical models that make predictions that are quantitative, not merely directional. We do test these predictions by the usual statistical methods – but mostly when there is something more specific to test than the direction.

The notion of interaction of "should" and "are" is as old as social science. Auguste Comte, one of the initiators of social studies, put it as follows, two centuries ago, in his *Plan of Scientific Studies Necessary for Reorganization of Society:*

> If it is true that every theory must be based upon observed facts, it is equally true that facts cannot be observed without the guidance of some theory. Without such guidance, our facts would be desultory and fruitless; we could not retain them: for the most part we could not even perceive them. (As quoted in Stein 2008: 30–31)

This is a continuous interaction: "some theory" as guidance, some observation, some further model refinement ... The chicken and the egg evolve conjointly. These issues are discussed in more detail in *Making Social Sciences More Scientific: The Need for Predictive Models* (Taagepera 2008). Some basic tenets are worth pointing out here, making use of examples from this book.

Science is more than just learning facts. It deals with making connections among separate pieces of knowledge. Making connections among known facts can lead to new questions and new, previously unexpected vistas. Connections can be expressed in words, but they are more precise when they can be expressed in equations.

A fully developed science is not satisfied with isolated connections between factors. It aims at connections among such connections. In electricity, an array of mutually consistent equations connects voltage, current, charge, resistance, and force. In this book we establish a chain of quantitative connections that tie assembly size and district magnitude to various measures of the number of parties. The chain actually extends to further features that we barely touched on in this book: duration of cabinets (Taagepera 2007: 165–175), and

[10] In fact, we have presented some regressions in this book where only the direction or a vaguer quantitative notion could be expressed in a hypothesis. But we have aimed to minimize our use of such approaches.

dependence of assembly size on population of the country (Taagepera and Shugart 1989a: 173–183). The entire causal chain, from population to cabinet duration (Taagepera 2007: 187–200; Sikk and Taagepera 2014) passes through some of the linkages tested in this book. In contrast, empirical statistical analysis alone too often produces only disconnected relationships, piecemeal knowledge.

Quantitatively Predictive Logical Models

What are "logical models"? These are models one can construct *without any data input* – or almost so. Just consider how things should be or, as importantly, how they could not possibly be. When asked how many parties are likely to win seats in a twenty-five-seat district, we may rush to the Internet for data, or instead, proceed from the knowledge that no less than one and no more than twenty-five parties could win seats – knowledge so obvious we may consider it useless. Yet, knowing what is impossible leads us to what is most likely. The fictional Sherlock Holmes made note of the dog that did *not* bark.

We should aim at logical models that are "quantitatively predictive." In the previous case the prediction must not be just a vague "between one and twenty-five" but a more specific "around five." "Quantitative" does not have to mean "exact" – just much more specific than "between one and twenty-five." Constellations in the center of their possible range tend to occur more frequently, unless specific factors enter, to tilt them away from the center. In the absence of any other knowledge, our best guess is the mean of the possible extremes.[11]

This is an ignorance-based model (Taagepera 2008: 34–36). Normal distribution, so familiar to us, results from an ignorance-based model: How would pea sizes distribute in the absence of any knowledge about them? So does exponential growth model: if we do not know whether relative growth rate decreases or increases, our ignorance-based best guess is that it remains constant. Ignorance-based models are by no means the only types of logical models, but they frequently have come in handy in this book.

Logical models should not be just believed in. They must be tested with data. This book has done so, using several of the most extensive datasets ever used in the analysis of electoral systems.[12] But first we must have a logical model to test, and one that is quantitative – not just directional. "When district magnitude goes up, the number of seat-winning parties goes up" does not suffice. We need "In the absence of any other knowledge, the number of seat-winning parties will be around the square root of district magnitude."

[11] See Chapter 7 or Taagepera (2008: 120–127) for why the geometric mean is preferred in these applications rather than arithmetic mean.

[12] In the book's Preface, we thank several scholars who collected much of the data we use, and without which this book could not have been possible.

In the absence of any other knowledge – this is a central notion. Remarkably often it works. Sometimes it doesn't. Then we may be on the verge of discovering something new: What is it that we have failed to take into consideration? We began expecting that twenty-five-seat districts would tend to have five seat-winning parties, and that the resulting effective number would be the district magnitude's cube root, or 2.92. Yet data stubbornly hint at a slightly higher value for the effective number. Pondering this discrepancy makes us notice that we have neglected the nationwide impact on this particular district. We need to adjust for this embeddedness (see Chapter 10). This example shows there is interplay between logical models and data. Models are tested with data, and discrepancies between data and model suggest ways to refine the model.

According to Hawking and Mlodinow (2005), a good model has the following features:

- It is elegant. (This means simplicity, symmetry . . .)
- It has few arbitrary or adjustable components – it is parsimonious.
- It generalizes, explaining all available observations.
- It enables one to make detailed predictions; the actual data may possibly contradict these predictions and thus lead to a revision of the model.

How does one go on to build logical models? One learns it best by doing, because it's an art.[13] Each situation requires a different model. A model of (almost complete) ignorance is only one of many approaches. If there is one general advice, it is: *make it as simple as possible.* Albert Einstein reputedly added "and no simpler." How do we know when a model is overly simple? When it disagrees with good data. Cube root of district magnitude is a bit too simple for the effective number of parties when this district is embedded in a larger country.

Some of the greatest truths in life and science are very simple. Indeed, they are so simple that we may overlook them. And even when pointed out to us, we may refuse to accept them, because we say: "It cannot be that simple." (Maybe this was your initial reaction to $N'_{S0}=M^{1/2}$, when we first mentioned it in Chapter 1.) Sometimes it can be simple. This does not mean that it is simple to find simple truths. Moreover, combining simple building blocks can lead to quite complex constructs. Think about the equations for district-level votes, in this book.

Science Walks on Two Legs, but Too Often Social Sciences Try to Hop on One

Science largely consists of logical models that are tested with data, using methods that include statistics. Why is it necessary to dwell on this broad

[13] To develop such skills, a hands-on textbook, *Logical Models and Basic Numeracy in Social Sciences* (Taagepera 2015), is available at www.psych.ut.ee/stk/Beginners_Logical_Models.pdf. It has been tested with bachelors and doctoral students in North America and Europe. This section borrows from it.

methodology in a book on a very specific topic, votes from seats? The answer is that logical models too often have been neglected in electoral studies. Thus for some readers their use may look suspicious even when the results from both graphing and statistical regressions agree with the models.

Electoral studies are not alone in this respect. Social sciences all too often neglect to offer a quantitative estimate of *how things should be*. Rather than devising logically based models and then testing them, social sciences are often happy with directional hypotheses – statements that one variable should go up as another goes down, for example. Statistical methods are then used to test these directional predictions, and whether the variables entered are "significant." This can produce valuable insights, but these so-called "empirical models" are not really models at all. Some degree of fit results, but the *predictive* ability is minimal – and the resulting relationships do not interconnect. These cry out for elaboration, and a logic about *how much one variable increases as another decreases*, and *why the relationship takes the form we observe*.

In this book's introduction, we already set out the importance of "two legs" on which science must walk – the leg of "how things are" and the leg of "how things should be," logically (see Figure 1.2). In science the ideal role of statistics is to test logically based quantitative models. To do this, raw data most often must be transformed in the light of the model. For instance, to test the dependence of effective number of parties on the number of seats in the assembly and average district magnitude, we must first replace N_S, S and M by their logarithms, before linear regression could be applied. Failure to do so not only would lead to a lower correlation coefficient (more apparent scatter) but, more seriously, the output would fail to express the process through which these factors interact. Understanding how things are connected would be downgraded to a push-button exercise.

Too often, today's social sciences try to hop on one leg, in the manner depicted in Figure 17.3. The active leg is the one about "how things are," where patterns in the data area observed and statistical testing is done – too often with little or no graphing of the raw data. The other leg, regarding *how things should be* is often not engaged in the scientific "walk."

The excuse sometimes made for "empirical models" is that testing a directional relationship is itself valuable. We agree that it can be, but we should aim to do better. Every peasant in Galileo's time knew the direction in which things fall – but Galileo felt the need to predict more than direction. It does not suffice to predict that more seats available will increase the number of parties represented. One must specify *how many* seats are expected to lead to *how many* parties. Models should predict not merely the direction of processes but also their quantitative extent.

Developed science not only connects individual factors but also establishes connections among these connections. For such broader interlocking knowledge, one must enquire about how things *should be* connected. Ideally,

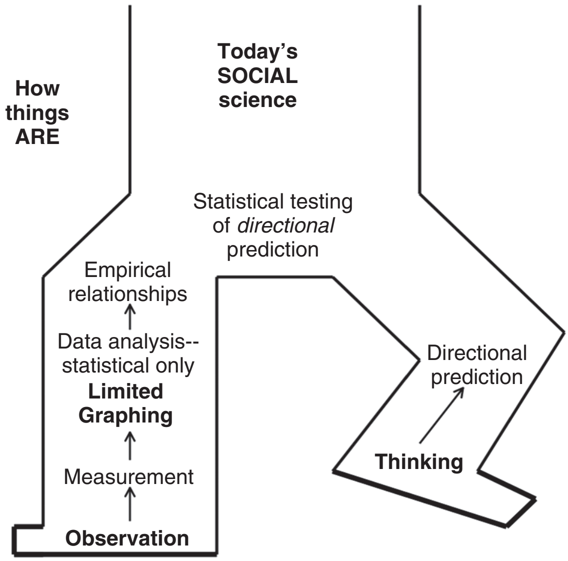

FIGURE 17.3 Today's social sciences too often try to hop on one leg, observation and empirical analysis, with no predictions beyond directional

this process leads to equations that are used over and over. In contrast, empirical regression coefficients, once published, are hardly ever used in any further work. They just take up space in large tables, but are not of intrinsic interest.

One doesn't hop very far on one leg. To continue its recent progress in addressing many important questions, the social sciences will have to reinforce the second leg on which science walks. They must strive to replace the "empirical models" with genuine *logical models* that can then be tested by statistical and other means. Quantitatively predictive logical models need not involve heavy mathematics, but they certainly need active thinking that is much more than the selection of an appropriate statistical approach (important though that is in itself).

Social sciences have made great progress in qualitative understanding and statistical description of patterns in social and political phenomena. Still, if social scientists complement statistical data analysis with logical models, the opportunities for scientific progress will open up even further. We hope that readers will agree that we have made significant progress in these pages in developing deeper quantitative understanding of many aspects of electoral systems. More importantly, we hope to inspire other researchers to make further advances in logical modeling of social phenomena, including electoral and party systems, but also many other topics.