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Constructing Legal Rules on Appellate Courts

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Appellate courts make policy, not only by hearing cases themselves, but by establishing legal rules for the disposition of future cases. The problem is that such courts are generally multimember, or collegial, courts. If different judges prefer different rules, can a collegial court establish meaningful legal rules? Can preferences that take the form of legal rules be aggregated? I use a "case-space" model to show that there will exist a collegial rule that captures majoritarian preferences, and to show that there will exist a median rule even if there is no single median judge. I show how collegial rules can differ from the rules of individual judges and how judicial institutions (such as appellate review and the power to write separate opinions) affect the stability and enforceability of legal rules. These results are discussed in light of fundamental debates between legal and political perspectives on judicial behavior.

Ultimate power over legal policy in the United States lies mainly in appellate courts, particularly the Supreme Court. These courts do not and could not hear all cases themselves. Rather, appellate courts make policy by laying down rules for disposing of cases, rules that the lower court judges who hear the vast majority of cases are to apply in their decisions.

The problem is that, in the United States and many other countries, appellate courts are multimember, or *collegial*. The individual judges that compose such courts often differ in their policy goals, which is to say that they might prefer different case outcomes and different rules for disposing of cases. This raises the problem of whether judicial preferences over rules can be aggregated in a meaningful way. A lone judge could issue a rule to tell lower courts how to decide cases her way, but can a collegial court do the same? Can a collegial court operating under majority rule construct a coherent legal doctrine? The answer is far from obvious—social choice theory shows that even mildly complex preferences often cannot be combined to form a rational group preference, such that there is no policy that can be said to represent "the" majority. In short, we lack a theory as to how preferences that take the form of legal rules can be aggregated, even though this is a foundational issue for the study of judicial policy making.

In this paper, I ask whether and how judges on a collegial court can aggregate their preferred rules. I contend that there is a meaningful way to construct a collegial rule, one that reflects differences among individual judges, but still captures their preferences in a majoritarian fashion. I also consider the implications of collegiality and how it affects the structure and content of legal rules. That is, can collegial rules fulfill the same logical requirements as the rules of individual judges? I explore how collegial rules might differ from individual rules, as well as the implications for legal policy.

Next, I ask what role judicial institutions play in achieving a collegial rule. Collegial courts are not required to speak in a single voice. Rather, appellate judges can issue separate concurring or dissenting opinions, each implicitly or explicitly advancing its own legal rule. How does this affect rule making? What would be the effect of barring separate opinions and requiring an appellate court to issue a single rule/opinion? Finally, I ask what role appellate review of lower court decisions plays in establishing a collegial rule and show how the possibility of subsequent review limits the set of enforceable rules.

This paper uses a formal theory of legal rules to provide unified and coherent answers to these questions. I develop what I call the "case-space model," a variant of the common policy-space model. It is structured to capture *judicial* policy making, putting case facts and legal doctrine at the analytic center, while still taking into account judges' personal or ideological preferences. In doing so, I suggest a way of reconciling disconnects between political science theories and legally oriented theories of how judges make decisions, as well as reconciling disconnects within political science between theories that focus only on case votes and those that focus on judicial opinions and more general forms of policy making.

LAW v. POLITICS

Judicial decision making has unique characteristics that distinguish it from decision making in legislative settings. A judge makes policy by resolving legal disputes, that is, by deciding cases that present themselves as bundles of facts. Murphy (1964) notes that the need to make policy through individual cases is one of the more important technical checks on judges. Even the most ideological and policy-oriented appellate judge must make policy by telling lower court judges what facts to consider and what those facts mean for case outcomes. Even a dictatorial judge cannot just list all desired dispositions for every possible case that might arise. He or she must provide some framework or guideline for lower courts and future judges to follow, a legal

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doctrine or rule for sorting out winners and losers. Thus, judge-created rules are the heart of judicial policy.

This holds whether his or her preferences for who wins are ideological or derived from normative principles or a legal philosophy. To be sure, the application of legal rules is the core of law and legal theory, but thinking of judges as political creatures does not obviate the need to think about cases and rules. From either a purely political or purely legal perspective, rules, cases, and case facts are quite significant concepts—yet political models of judicial policy making, formal and otherwise, often pay little attention to them.

This is, perhaps, understandable. The founding debate of judicial politics—whether judges make law or find law—yielded an uneasy relationship with legal doctrine. In rejecting law as an exogenous constraint on choice, any role for legal rules or doctrine became suspect. In stressing ideological goals, the structure and substance of judicial preferences were set aside. In emphasizing the freedom of Supreme Court justices to pursue policy goals, the instruments by which they might do so were neglected. Perhaps for these reasons, even some legal scholars who agree that judging can be political argue that much political science trivializes law and the legal enterprise (e.g., Friedman 2006; Tiller and Cross 2006).

There are conflicts within political science as well. The Attitudinal Model (Segal and Spaeth 2002) focuses on the dichotomous votes of Supreme Court justices to affirm or reverse lower court decisions, arguing that justices cast such final votes solely and sincerely on the basis of personal ideology. Others study how justices interact in their pursuit of legal policy goals (e.g., Epstein and Knight 1998; Maltzman, Spriggs, and Wahlbeck 2000). But, what exactly is the content of the "legal policy" that is the focus of this interaction? How does legal policy as established in judicial opinions relate to case votes? Can we reconcile the primacy of sincere final votes over case dispositions with the (possibly strategic) policy choices justices make in writing opinions? Indeed, the nature of judicial preferences is a question theoretically prior to that of how preferences interact.

Formal models of judicial policy making often treat the objects of choice as points in a policy space, but this approach raises similar questions. What is a "case" in the standard spatial policy model? Is a policy point the outcome within a specific case? If so, what makes one case different from any other? How does a court's (mostly) passive reliance on cases to make policy constrain it? If judges make policy by deciding specific cases and creating and applying general legal rules, these concepts should at least be compatible with our modeling constructs—but how does a policy point capture how rules work?[1]

Another issue is that the usage of the standard policy-space model often requires harsh simplifications. In a unidimensional setting, the median voter's ideal point represents a majoritarian policy, but in a multidimensional setting, there is usually no median ideal point, and hence no meaningful majoritarian policy point (let alone a stable one). This issue is usually avoided either by assuming collegial courts are unitary actors or by assuming unidimensionality. That is, instead of adapting formal theory to the substance of judicial politics, the set of choices or of players is arbitrarily cut to fit the needs of the abstract theory. I show that this Procrustean choice may be unnecessary.

The "case-space model" resolves many of these difficulties. While still invoking assumptions about choice, these are tailored substantively to the institutional features of judicial policy making. This model thus provides a structure for thinking about cases, facts, judgements, opinions, and legal rules, without rejecting a role for judicial preferences.

This model has its origins in Kornhauser (1992a,b), which specified the idea of a rule as a function that establishes equivalence classes of cases to be decided similarly. Cameron (1993) suggested a geometric version of this approach, with a spatial representation of cases and rules, but in this early version of the case-space, courts were explicitly assumed to be unitary actors. Grofman (1993) briefly considered unstructured rules from a collegial perspective. Cameron, Segal, and Songer (2000) used a unidimensional, unitary-actor case-space to study auditing in the judicial hierarchy. Lax (2003) analyzed a collegial, but still unidimensional, case-space model to explore the impact of the Supreme Court's institutional rules on compliance in the lower courts. Kastellec (2007) extended this model to explore whistle-blowing in the lower courts. The present paper studies a *collegial* court making policy in a *multidimensional* case space.[2]

CASES AND RULES

I first define the basics of the case-space model, *cases and rules*, and then define an important type of rule, a *proper rule*.

[1] Kornhauser notes that some policy space models do incorporate "doctrine" by making precedent or deference one of the dimensions, but comments that this approach still "makes no reference to the facts of a case or features of legal discourse that appear in an opinion" (1999, 52). There are also models that bring in a status quo policy point to represent a constraint on judicial policy making, and the "case" might be seen as determined by the policy area with this given status quo. I would argue, however, that a case space can better articulate what the status quo rule is (rather than representing it as a structureless point) and can better articulate the difference between disposing of the instant case and announcing a general policy.

[2] Unlike Kornhauser (1992a,b), which focus on legal rules whose premises are all dichotomously and separably determined, the present paper analyzes more general preferences defined over continuous and multidimensional case spaces. Unlike Kornhauser (1992a), I set aside normative requirements that a current court respect the decisions of prior judges at the same hierarchical level (horizontal stare decisis). Finally, whereas Kornhauser and Sager (1986) and Kornhauser (1992b) focus on the application of a fixed legal rule to a single case and the aggregation of subjudgments under this fixed rule, I allow judges to differ in their preferred rules, consider why these subjudgments might differ, and study the aggregation of rules over the range of possible cases.

Cases

Judges resolve legal disputes; that is, they decide cases that present themselves as bundles of facts.[3] These facts might include the degree of negligence by one of the parties (or the subsidiary facts that yield such a determination), or the trimester in which a restriction on abortion rights is to be applied, or something as simple as the velocity of a car when pulled over for speeding. Depending on the facts presented in the case, the judge determines the case's disposition. Typically, this is a dichotomous judgment for one side or the other, classifying the case as a winner or a loser, a "yes" (Y) or a "no" (N). An evidentiary search is admissible or inadmissible. An instance of "speech" is protected free speech or it is not. An affirmative action plan violates the equal protection clause or it does not. A driver is speeding or she is not.

Although on the surface a case space looks similar to a standard policy space, they differ in the assumptions made about the structure of choice. In a policy space, one makes policy by choosing a point. In contrast, in a case space, each point represents not a general policy, but a specific potential case. These case points are exogenously fixed, and when given a case to decide, a court chooses a disposition for it. Judicial policy making is then the mapping of fixed points to dispositions. In other words, the judicial choice is not "Which point shall I pick?"; rather it is "Which disposition shall I choose for this given point?" Indeed, cases are the fundamental units of judicial policy making—and a case-space model is specifically designed to capture the importance of these units.

Formally, a *case* is modeled as a point in a multidimensional case space, capturing its location (between 0 and 1) on each factual dimension:

Definition. A **case** is a point x in the unit m-hypercube, $\mathbf{C}^m$, denoted by the vector $(x_1, \ldots, x_m)$, where $x_s^i \in [0, 1]$ is the location of case x^i on dimension $s \leq m$.

The factual dimensions capture whatever facts might be considered relevant to the judges. Figure 1 shows a two-dimensional case space and three sample case points.

Rules

When appellate courts address judicial policy more generally, they typically do so in opinions that establish (new or modified) legal rules for deciding current and future cases. Rules are thus the derivative unit of judicial policy making.

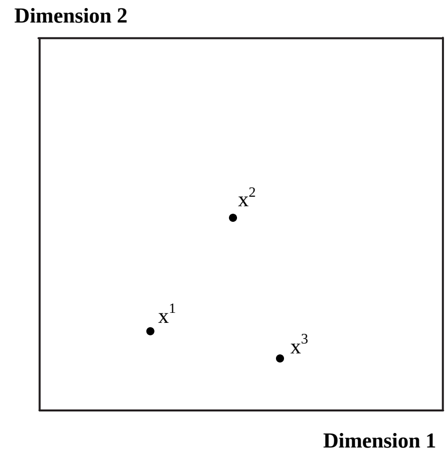
A judge will prefer one disposition or the other in each case, and so each case can be mapped to a disposition Y or N in the outcome space. Kornhauser (1992a) calls the list of such preferred dispositions an *extended rule*. This generic form of rule simply sorts cases into two equivalence classes, one getting Y and the other getting N. An *extended rule* C can be formally defined as a set, the set of cases that get decided as Y:

Definition. An **extended rule** is a closed set C such that the decision in case x^i is Y if and only if $x^i \in C$.

See Figure 2 for examples of extended rules. Note that an extended rule, as defined by Kornhauser, need have no special substance or structure. (Grofman [1993] similarly treats rules as amorphous sets of cases.) The set of Y outcomes need not be meaningfully shaped

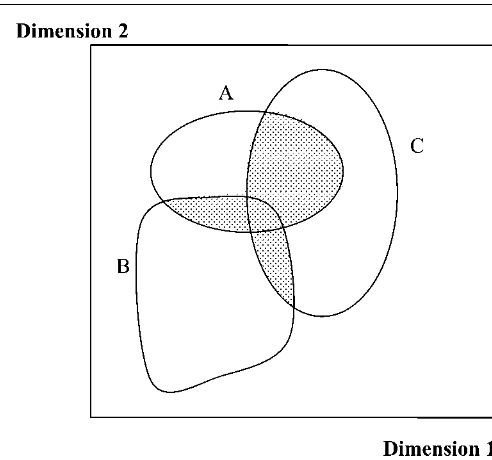
[3] This way of thinking about the judicial process and legal policy is broadly compatible with the standard fare in the first year of legal education, and it is elaborated in detail (albeit informally) in basic textbooks on legal reasoning, for example, Levy (1948) or Twining and Miers (1991), and in most casebooks.

FIGURE 1. Comparing Cases



Note: Three cases are shown, according to their positions on the two factual dimensions. A rule would associate each fixed case with a disposition as Y or N. Case x^2 is more extreme than case x^1, so under any proper rule, if x^2 gets Y then x^1 must get Y.

FIGURE 2. Three Generic Rules and the Implicit Collegial Rule



Note: Each rule denotes an area where cases are to get Y dispositions. The shaded region shows the Implicit Collegial Rule, which captures any case where two or more generic rules overlap. Any case in this region gets a Y disposition by majority vote.

or even contiguous. In particular, extended rules make no use of the spatial setting. They need not be even minimally rational in how they allocate cases to dispositions. (The equivalent for a standard policy space might be non-single-peaked preferences or, more generally, dimensions which do not order points in a meaningful way.) Legal rules, on the other hand, are usually highly structured. I next add additional structure to case dimensions and then to sets of case dispositions.

Ordering Cases

Code each dimension such that the "mildest"case takes a value of 0 on all dimensions and the most "extreme" case takes a value of 1 on all dimensions (similar to the ordering of policy points in the standard policy space from least to most). Let more extreme values be those more conducive to a *N* outcome. For example, in equal protection cases (where the question is the constitutionality of a state's classification scheme based on race, gender, etc.), the dimensions might include (1) how "suspect" the class invoked is (coded directly), (2) how compelling the state interest is (coded inversely, so that a more compelling interest is more conducive to a *Y*), and (3) how necessary the classification is (again coded inversely). Or, these dimensions could be broken down further.

A case is more extreme *on a particular dimension* if it takes a higher value on that dimension. It is said to be *more extreme* than another case overall if it is more extreme on at least one dimension and not less extreme on any other. Thus, in Figure 1, case x^1 is less extreme than case x^2, but x^3 is neither more nor less extreme overall than either x^1 or x^2 (of course, x^3 is more extreme on dimension 1 and less extreme on dimension 2). Formally,

Definition. Case x^i is weakly more **extreme** than case x^w, denoted $x^i \succeq x^w$, if for all s, $x^i_s \geq x^w_s$. It is strictly more extreme, $x^i \succ x^w$, if there exists t such that $x^i_t > x^w_t$.

This ordering of cases leads naturally to an intuitive type of rule.

Proper Rules

Assume a judge is (weakly) more inclined to vote *N* as the score on any one dimension increases. Call a rule with this monotonicity property a *proper rule*. Formally, a proper rule requires that, if a case x^i gets *Y*, then any case less extreme than x^i also gets *Y* (and that, if x^i gets *N*, then any case more extreme than x^i must also get *N*):

Definition. A rule *C* is a **proper rule** if and only if, for all $x^i \in C$ and all $x^w \preceq x^i$, $x^w \preceq x^i \Rightarrow x^w \in C$.

Under this definition, a judge must not have "perverse" preferences. For example, if one dimension is the degree of probable cause in a search-and-seizure case, a judge does not want to strike searches simply because there is "more" probable cause. Or, more simply, driving slower should not be more likely to yield a "speeding" verdict than going faster. A judge may still think any or all dimensions irrelevant.

Although all proper rules are extended rules, not all extended rules are proper rules. In Figure 1, a proper rule would allow both x^1 and x^2 to get *Y* or both to get *N* or only x^1 to get *Y*, but a rule under which x^2 gets *Y* and x^1 gets *N* would not be a proper rule. A proper rule would allow *either* disposition for x^3, no matter what is decided for the other two cases, since x^3 is neither more nor less extreme overall. (An extended rule meanwhile would allow any combination of dispositions.)

If we focus on the boundary dividing *Y* cases from *N* cases, we can use an alternate and perhaps more intuitive formulation of a proper rule. A proper rule sets a limit, a limit representing how extreme a case can be before getting *N* (with all cases less extreme getting *Y*). Consider the speed limit, a simple proper rule in one dimension, with lower speeds permissible and any higher speed a violation. A more complicated speeding proper rule might set different limits for different traffic conditions or locations (55 under normal conditions, 30 in a school zone, 20 when it is snowing, etc.), again with any speed beneath the appropriate limit acceptable and any speed above subject to sanction. A proper rule thus has the sort of structure we tend to think of as associated with a legal rule (as compared to the unstructured extended rule).

To be a proper rule, the limit established must have certain features:

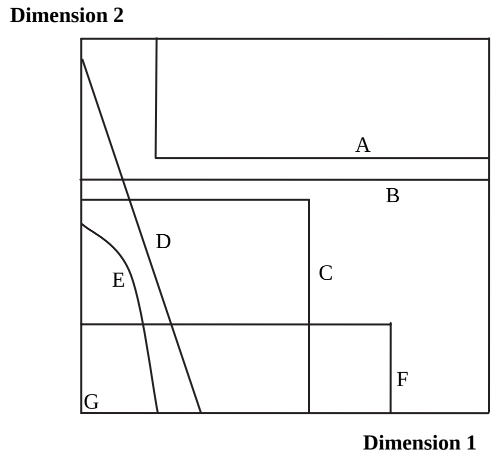
Proposition 1. *Rule C is a proper rule if and only if there exists a function $r(x_1, \ldots, x_{m-1})$ with two properties:*

1) $r(x_1, x_2, \ldots, x_{m-1})$ *is weakly decreasing in all* $x_{s<m}$; *and*
2) $x^i \in C$ *if and only if* $x^i_m \leq r(x^i_1, x^i_2, \ldots, x^i_{m-1})$.

This function sets the limit for a *Y*, defined on one dimension (dimension *m*) with respect to the case's location on the other $(m-1)$ dimensions. The boundary of a proper rule never has positive slope. (Of course, if the boundary always has positive slope, we could just flip axes so that the rule would be proper for the new configuration.) We can represent judge *j*'s proper rule either by the boundary function r_j *or* by the set *C* itself (though only the former usage makes it clear that the rule is indeed a proper rule).

Even given this structural restriction, proper rules can still capture a wide variety of substantive rules, as in Figure 3, showing seven proper rules in a two-dimensional case space. (In comparison, none of the rules in Figure 2 are proper rules.) Any case above/to the right of the rule gets *N* and any case below/to the left of the rule gets *Y*. Judge G has the simplest rule; she never wants *Y* no matter what the case facts are. Judge A prefers a simple disjunctive rule (with the logical form $Y \leftrightarrow P \vee Q$)—a case must fall below a fixed threshold on dimension 1 or below a fixed threshold on dimension 2 to get *Y*. Judge B sees dimension 1 as irrelevant and wants a fixed (lower) threshold for dimension 2 (this rule takes the form $Y \leftrightarrow P$). Judge C prefers a simple conjunctive rule (both thresholds must

FIGURE 3. Proper Rules



Note: This figure shows seven proper rules. Any case under/to the left of a rule gets decided as *Y* instead of *N*. Rule A is the most extreme rule shown, as it includes every *Y* disposition of every other rule, along with additional cases decided as *Y*.

be met, yielding the logical form $Y \leftrightarrow P \wedge Q$).[4] The two-pronged "strict scrutiny" test takes this form: classifications by race affecting fundamental rights must be a necessary (and least intrusive) means for pursuing a compelling governmental interest. As can be seen, the thresholds for the dimensions can vary by judge, as can the trade-off between them, even where the structure of their rules remains the same—Judge C and Judge F both agree that "the" strict scrutiny test is to be applied but still require different levels of factual findings.[5] Finally, proper rules also include more complicated forms, which allow trade-offs between the two dimensions. Judge D's rule involves a fixed trade-off between the two dimensions, whereas Judge E's rule allows for a more nuanced trade-off.

In one dimension, a proper rule is just a constant, a cut-point dividing *Y*s and *N*s—and may seem similar to an ideal point in a standard policy space. In a multidimensional case space, however, a proper rule can no longer be just a point itself, as it generally takes more than a point to partition cases into *Y*s and *N*s. The set of cases to be captured by a proper rule will potentially have as many dimensions as the space itself, and the limit must be defined across all but one of these. To divide points in a two-dimensional case space, we would need a (one-dimensional) plane curve, such as a line. In a three-dimensional case space, a proper rule must be a (two-dimensional) surface, such as a plane or part of a sphere. (Formally, a proper rule must be a co-dimension-one hypersurface.)[6]

Ordering Proper Rules

In standard policy spaces, we often label one direction liberal and the other conservative, and we call one policy more extreme than another. We can discuss proper rules in the same way. A rule might be more "conservative" the more cases it would decide as *Y* (or more "liberal," depending on the issue area). If a given proper rule yields at least all the same *Y* outcomes as another rule, and includes still additional *Y* outcomes, we can say the former is a *more extreme rule*:

Definition. Proper rule C_j is more **extreme** than proper rule C_z if and only if $C_z \subset C_j$.

We can also state this condition in terms of the "limit" definition of a proper rule:

Corollary 1. *Proper rule C_j is (weakly) more extreme than proper rule C_z if and only if $r_j(x_1, x_2, \ldots, x_{m-1}) \geq r_z(x_1, x_2, \ldots, x_{m-1})$ for all $x_1, x_2, \ldots, x_{m-1}$.*

In Figure 3, rule A is more extreme than rule B, B is more extreme than C, and C is more extreme than E. Similarly, rule A is more extreme than rule D, and D is more extreme than E. (These are not exhaustive lists.) One difficulty in comparing rules is that a rule might be more liberal in some areas of the case space and less liberal in others. Comparing rules C and D, for example, rule D includes cases near the upper left as *Y* that rule C does not, whereas C includes cases toward the right of and excluded by D. (One could still, perhaps, compare the percentage of possible cases decided as *Y* under different rules to assess overall liberalism or conservatism.)

I next consider whether preferences over rules can be aggregated in a meaningful way.

A THEORY FOR AGGREGATING RULES

Assume there are *k* judges (*k* odd) and that judge *j* has extended rule C_j. Let this profile of rules be denoted $\mathbf{r}$. The first key result is that there always exists a collegial rule—the *Implicit Collegial Rule,* or ICR—capturing those cases that get *Y* by majority vote:

[4] Note that, if we instead focus on *N* outcomes, it is Judge A who has a conjunctive rule and Judge C the disjunctive rule. Note also that a proper rule does not require a case located at the weighted average of two *Y* cases to also get *Y*.

[5] In Kornhauser (1992a,b) and Kornhauser and Sager (1986), rules are composed of dichotomous (yes/no) judgments over which the judges may differ. This spatial generalization of preferences shows *why* judges might differ over these judgments—on a given dimension, they can prefer different thresholds (even if they agree as to the facts of the case). In the original conference in *Craig v. Boren* (1976), for example, Justices Rehnquist and Stewart both applied "the" rational basis test, yet only the former thought the case satisfied the test (Epstein and Knight 1998, 5).

[6] Note that, although the curve traced out by a proper rule may look like an indifference curve, it is not an indifference curve. It does not represent the set of points, of which one is to be chosen, such that all yield the same utility—because a judge does not choose a point; he chooses a disposition for the point. Instead, the rule traces out the set of points that are on the cusp of getting the opposite disposition. (He may well be indifferent as to the disposition of any of the cases at this very limit, but that does not make this a traditional indifference curve.)

Proposition 2. *For any k rules* $(C_1, \ldots, C_k)$, *there exists an extended rule* $\hat{C}$ (*the Implicit Collegial Rule*), *such that* $x^i \in \hat{C}$ *if and only if* $|\{j \text{ s.t. } x^i \in C_j\}| \geq \frac{k+1}{2}$.

The ICR is the (closed) set of cases where a majority of rules overlap. A case is in this set if it is in at least $\frac{k+1}{2}$ of the individual sets, and so applying the ICR has the same effect as the collegial court directly hearing a case and voting by majority rule. This set, however, is simply an extended rule, and so it need have no special structure. Figure 2 shows the set of cases that compose the ICR for a given set of individual extended rules.

Given the substantive primacy of proper rules, suppose that all k individual rules are proper rules. Then, we have the following key result:

Proposition 3. *If all rules* $C_1, \ldots C_k \in \mathbf{r}$ *are proper rules*, *then the Implicit Collegial Rule* $\hat{C}$ *is a proper rule.*

That is, not only will there always an exist a collegial rule that has the same effect as the majoritarian aggregation of the judges' preferred proper rules, but this collegial rule will also be a proper rule itself—the aggregation of proper rules is a proper rule. Thus, collegiality will not induce perversity of group preference. If the individual preferences relate to the factual dimensions in a nonperverse way, so will the group preference.

The next step is to show what this rule is and how it relates to the individual proper rules. The following result defines the *Implicit Median Rule* (IMR) for any set of proper rules and shows that it will be the ICR:

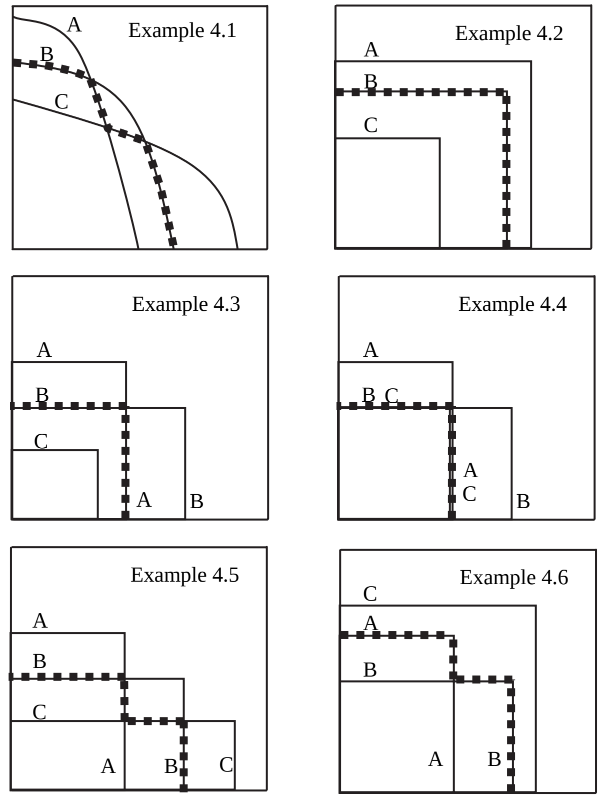
Definition. Given proper rules $r_1(\cdot), \ldots, r_k(\cdot) \in \mathbf{r}$, let the Implicit Median Rule (IMR) be the rule $\bar{r}(\cdot)$, associated with $\bar{C}$, such that, for each set of values $x^i_1, \ldots, x^i_{m-1}$, $\bar{r}(\cdot)$ is equal to the median value of $r_1(\cdot), \ldots, r_k(\cdot)$, and such that $x^i \in \bar{C}$ if and only if $x^i_m \leq \bar{r}\cdot$.

Proposition 4. *Given proper rules* $r_1(\cdot), \ldots, r_k(\cdot) \in \mathbf{r}$, *the Implicit Median Rule is a proper rule and is the Implicit Collegial Rule induced by* $\mathbf{r}$.

Recall that each judge with a proper rule has a preferred limit for wanting a disposition Y, a limit set on dimension m given a case's location on dimensions 1 through $m - 1$. Intuitively, the limit set by the IMR, $\bar{r}$, always takes the median value of these limits, and these median values themselves form a proper rule. If a given case gets Y under this rule, so will any case less extreme; if a given case gets N, so will any case more extreme.

Graphically, the IMR is formed by all median rule segments. Figure 4 presents various examples for three-judge courts in a two-dimensional space. In each, for judges A, B, and C and their respective proper rules, the dotted line is the IMR, which is also a proper rule. Thus, in a case space, even in multiple dimensions, if all rules are proper, there exists a unique "median" rule. If all judges have proper rules, then they can always create a proper rule that has the same effect as hearing each case themselves.

FIGURE 4. Examples of Implicit Median Rules



Note: In each graph, for judges A, B, and C and their respective proper rules, the bold dotted line denotes the Implicit Median Rule (IMR), which is also a proper rule. Any case "under" this rule gets a *Y* disposition by majority vote.

Only in example 4.2 is there a true median rule/judge. In examples 4.2 through 4.6, each individual judge has a conjunctive rule, such as a strict scrutiny test (requiring a necessary means and compelling interest). In examples 4.2, 4.3, and 4.4, the IMR is also a conjunctive test, but it is not a conjunctive test in examples 4.5 or 4.6.

Median Rules and Median Judges

It is possible that there will exist a true median judge, one whose rule is always more extreme than half the remaining rules and less extreme than half the remaining rules. Formally,

Definition. There exists a **true median judge** (judge $\frac{k+1}{2}$) with a **true median rule** (rule $C_{\frac{k+1}{2}}$) if and only if the judges can be ordered such that $C_{j<\frac{k+1}{2}} \subset C_{\frac{k+1}{2}} \subset C_{j>\frac{k+1}{2}}$. Proper rule $r_{\frac{k+1}{2}}(\cdot)$ is a true median rule if and only if $r_{j<\frac{k+1}{2}}(\cdot) \leq r_{\frac{k+1}{2}}(\cdot) \leq r_{j>\frac{k+1}{2}}(\cdot)$.

In Figure 4, only example 4.2 shows a true median rule/judge. Note that the existence of a true median will be stable to small perturbations (unlike a multidimensional median in a policy space, which requires extremely precise symmetries of ideal points).

The IMR can exactly match the actual rule of one of the judges, and this will occur when a true median judge exists:

Corollary 2. *The Implicit Median Rule will be the rule of one of the judges if there exists a median judge (a true median rule), so that judge* $\frac{k+1}{2}$ *has proper rule* $r_{\frac{k+1}{2}}(\cdot) = \bar{r}(\cdot)$

Interestingly, the IMR can also be the actual preferred rule of one of the judges even if her rule is *not* a true median rule. In example 4.4, Judge C is not a true median judge (and there is no true median rule), yet her preferred rule tracks the *implicit* median rule exactly.

However, the IMR need not actually be the preferred rule of any one judge—*there will exist a median rule even without a median judge*. (This again contrasts with the standard policy space, in that, if a policy-point median exists for an odd number of players, it must be one of the player's ideal points.) Furthermore, regardless of whether there exists a median judge with a true median rule, there will always be a local median rule and a local median judge for each range of cases defined by the segments of $\bar{r}$. That is, for different regions of cases, different rules and judges are pivotal. In Figure 4, example 4.1, moving from left to right, judge B is first pivotal, then A, then C, then B again.

Assessing the Collegial Rule

For Kornhauser and Sager (1986, 91), "the principal measure of performance in preference aggregation is the ability of a particular process to reflect correctly the preferences of the members of the decision-making group," which they call "authenticity." By this measure, the implicit median (collegial) rule performs quite well, capturing majoritarian case outcomes perfectly. Moreover, we can expect consistency across similar cases. However, they distinguish consistency from "coherence," which requires decisions to be "derivable from a unitary set of principles or embedded in some structured theory," and they note that an amalgamated rule might not be derivable in this way even if the individual rules are (108, 111).

Because the amalgamation of proper rules is itself a proper rule, it will also be coherent to that extent. This stands in contrast with Easterbrook (1982) and Grofman (1993, 1757–77), which argue that we cannot expect consistency or coherence from collegial courts. On the other hand, even though the IMR induced by individual proper rules will always be a proper rule itself, this aggregated rule can still differ greatly in appearance and complexity. In examples 4.2 through 4.6, each individual judge has a conjunctive rule (a two-part test), such as a rational basis test, requiring a law challenged under the equal protection clause to be a rational means to a legitimate government end. The judges simply differ as to their preferred thresholds for meeting this test. Although the IMR is always a proper rule in these examples, it is not always a conjunctive test itself, as shown by examples 4.5 and 4.6. Thus, the aggregation of conjunctive rules need not yield a coherent conjunctive rule, and collegial doctrine can still differ from the jurisprudence of individual judges.[7]

Furthermore, perhaps not all proper rules are equally defensible philosophically. Perhaps, that is, some trade-offs between dimensions are defensible, and others are not. Perhaps some doctrinal structures are defensible, and others are not. Does "incoherence" only matter as a normative issue? If not, what are the implications of incoherence for compliance in the lower courts or the development of law? This paper suggests a framework with which to explore these issues.

I now move from a theory of rules to theories of rule making.

IMPLEMENTING COLLEGIAL RULES

If legal rules are the heart of judicial policy making, then battles over law are struggles over legal rules and over how they partition the case space. This section asks what rules can be implemented by self-interested judges as they come together to aggregate their preferences. There are two ways that judges on a collegial court make policy, through actual case decisions and through judicial opinions announcing general rules for deciding cases. I treat each in turn and then combine the two perspectives. Although proper rules have great intuitive and substantive appeal, most results below hold for extended rules more generally, and so I present results in terms of the ICR where possible (noting that this will be the IMR when all individual rules are proper rules).

Policy Making through Cases

Preferences over Case Dispositions. Assume that a judge suffers a loss for each case disposition that is "incorrect" given her preferred rule. Formally, let $d^i \in \{0, 1\}$ be the court's disposition in case x^i (0 for N; 1 for a Y outcome), and let d^i_j be the preferred disposition of judge j, such that $d^i_j = 1$ if and only if $x^i \in C$. Let the loss for the incorrect disposition of case x^i to judge j be $a^i_j \geq 0$ (these are the utility weights of each case to each judge).[8] Then, the total payoff to judge j is $-\sum_{i=1}^{n} a^i_j |d^i_j - d^i|$. (In other words, where the desired disposition matches the actual disposition, there is no loss.) Unless noted otherwise, I only assume that a judge prefers a correct case disposition to an incorrect disposition, all else equal (e.g., $a^i_j \geq 0$). Specifically,

[7] These examples reveal another nonobvious effect of collegiality. In both example 4.3 and example 4.6, the IMR tracks segments of rule A and rule B, and never rule C. However, the contour of the median rule formed *is* affected by the position of judge C. Her shift from a limited rule to a more inclusive rule drives the IMR outward, changing the balance of power between judges A and B in different regions of the case space, and preventing the court from achieving a conjunctive rule.

[8] This assumes that judicial utility is separable over cases, so that the marginal payoff from one case disposition does not depend on the dispositions of other cases.

unless otherwise noted, nothing is assumed about the relative trade-offs between cases (e.g., whether $a_1^1 > a_1^2$).

Although all key results (indeed most results) hold regardless of these case weights, it may nevertheless be helpful for the reader to keep in mind two possible case-weight constraints. A few supplemental results rely on the *fungibility assumption*, in which "winning" in one case would be traded by a judge for "winning" in any other case. The case weights are then constant ($\forall i, j : a_j^i = 1$), meaning that the judge values each case equally. Only the number (or proportion) of "correct" dispositions matters.

Or, cases might not be equally valued. For proper rules, another intuitive possibility is the *proximity assumption*—the judge's loss for an incorrect disposition depends on how close the case came to going the other way. In cases that lie exactly at the rule boundary, the judge will be indifferent between the two possible dispositions. Cases near the boundary are close calls, and the judge might suffer a small loss from an incorrect disposition. Cases farther away are more clear cut, and the wrong disposition is a greater injustice with respect to the judge's preferred rule. Then, loss would be a function of the distance between the case and the rule, and, for overall utility, it would matter precisely *which* case dispositions are correct or incorrect.

Now, consider the following game.

The Case-by-Case Game. In this game, the judges decide all cases themselves. They hear a sequence of n cases, voting case by case, and judge by judge. In period i, the judges vote sequentially in case x^i, and its disposition is by majority rule. Then, the following result holds (see the Appendix for supplemental formal results).

Proposition 5. *In the Case-by-Case Game, the subgame perfect Nash equilibrium yields those case outcomes dictated by the Implicit Collegial Rule.*

In a single case ($n = 1$), there are only two possible outcomes, and so no cycling or log-rolling is possible. The collegial court's behavior is by simple majority, which is captured by the ICR. The intuition for a sequence of cases is that the ICR is achieved because the judges cannot commit their votes over time—judges obviously cannot sign binding contracts as to how they will vote in the future. In any future case, each judge has an incentive to cast a sincere vote, which, by backward induction, unravels any non-ICR votes along the game tree. This collectively induces the ICR. In short, a commitment problem prevents log-rolling.

Policy Making through Rules

Preferences over Rules. Suppose the collegial court does not hear all cases itself; rather, it announces a rule for lower courts to follow. As an extension to the general assumption made over case utility, I only assume that a judge strictly prefers rule C_y to rule C_z if the former yields all the same "correct" case disposition as the latter rule, and at least some additional region of "correct" dispositions. In effect, I only require that the judge prefer C^y to C^z if the former strictly dominates the latter as far as partitioning the case space, and I do not require any particular valuations over areas of the case space.

Formally, given the judge's preferred rule C_j, $u_j(C_y) > u_j(C_z)$ if $C_z \subset C_y \subset C_j$ or $C_j \subset C_y \subset C_z$. Otherwise, if there is a trade-off, either rule may be preferred. I need not and do not make assumptions as to how the judge resolves the trade-off, unless otherwise stated. This is a weak restriction on preferences, and so the results below are robust. (Parallels to the case preference assumptions noted above exist, and the fungibility assumption for utility over rules is shown in the Appendix.)

The Explicit Collegial Rule Game. In this preliminary version of a game over rules, I make two assumptions. First, the court votes over rules (by majority rule) and must announce a single rule, the explicit collegial rule (ECR). That is, no separate opinions are allowed (or at least any such opinions are ignored). Second, I assume this ECR is self-enforcing and automatically binds all subsequent case decisions, thus setting aside for now the problem of enforcement. This model is intended as a baseline for assessing the effects of modifying these assumptions to better capture actual judicial practice and institutions.[9]

In this game, is there an ECR that is stable under majority rule? Will the court cycle, or does the core exist?

Proposition 6. *In the Explicit Collegial Rule Game,*

a) *under the fungibility assumption, if there is a true median rule, then it is in the core (and is itself the Implicit Collegial Rule);*
b) *under the fungibility assumption, if there are only three judges, then the core is the Implicit Collegial Rule;*
c) *if an explicit collegial rule is in the core, then it is the Implicit Collegial Rule;*
d) *otherwise, cycling can occur.*

That is, on larger collegial courts or where judges do not value all cases equally, there is generally no stable ECR. Any such ECR can be beaten by some other ECR by majority vote. If the judges made policy over a case space like legislators do, announcing a single binding statute (rule) as law, there can be cycling.[10] In short, the binding nature of the ECR "solves" the commitment problem associated with log-rolling over cases, but this creates a cycling problem. Indeed, were this the last word on the subject, cycling in a case space would be even more troublesome than in a policy space,

[9] Indeed, as they stand, these assumptions better resemble legislative decision-making, in which a single statute is passed, rather than collegial judicial decision making.

[10] Requiring a single rule thus potentially gives power to an agenda setter.

in that a meaningful majoritarian policy would exist without being stable.

However, the assumptions of this baseline model do not reflect current appellate court practice: judges and justices *are* permitted to write separate opinions, and their opinions *are not* self-implementing; rather, they are implemented through individual cases rising up the judicial hierarchy. The next step is to incorporate these features.

The Opinion Coalition Game. Suppose that each judge on the collegial court signs on to some opinion stating a rule to govern lower court decisions. This might be a coalition opinion supported by a majority, a plurality opinion, or even his or her own solo opinion.

How will lower courts decide cases when there is no majority opinion, in the shadow of fragmented opinions in the court above?[11] Suppose, for now, that the lower courts look to see where the opinions overlap and count votes, such that they look for which case dispositions would get majority support given the announced rules. The lower courts then decide Y in a case if and only if it gets Y under the rule or rules reflecting majority support for that disposition. (Again, this could be a single majority opinion announcing a rule with the support of at least $\frac{k+1}{2}$ judges, or separate opinions/rules that show the support of at least $\frac{k+1}{2}$ judges for this disposition.)

That is, suppose the lower courts obey the implicit collegial rule that would be induced by the announced set of rules, given the number of judges supporting each of them. (The next section shows why they should do so.) Let this be the *Induced Implicit Collegial Rule* $\hat{C}^*$ (IICR). If there is a majority coalition behind a rule, then that rule becomes the IICR. Otherwise, it is cobbled together from those regions where a majority of *announced* rules overlap (just as the ICR itself is the majoritarian overlap of sincerely preferred rules).

Formally, an action for a judge in this game is the announcement of a rule, which may be the same rule as other judges (to form an opinion coalition). The set of rules announced yields the IICR, which in turn controls case dispositions and yields payoffs. The question is which rule coalitions will be stable (such that no judge will want to defect from her current position or current opinion coalition)? In equilibrium, can the IICR be the *true* ICR? In short, yes:

Proposition 7. *In the Opinion Coalition Game, the true implicit collegial rule can be supported as the induced implicit collegial rule ($\hat{C}^* = \hat{C}$) as a Nash equilibrium. If a judge prefers to announce either his own preferred rule or the ICR when otherwise indifferent as to the rule he announces* (*i.e.*, *case dispositions under the IICR are not affected by his choices*), *then the true implicit collegial rule is the only rule that can be supported as a Nash equilibrium.*

Various specific opinions and coalitions are compatible with this, so long as the IICR is the true ICR itself (otherwise, the coalitions are not stable). Each of the following possibilities is, for example, equilibrium behavior:

1. Each judge writes separately, announcing his or her own (sincere) preferred rule.
2. Each judge joins an opinion announcing the ICR.
3. A combination of these two strategies, so that each judge in the majority in the current case announces the ICR and others announce their sincerely preferred rules in dissent or separate concurrences.

Therefore, although requiring a single, binding ECR can lead to cycling, the possibility of writing separately means that the true ICR will be stable against individual defections and that rules other than the ICR are vulnerable to such defections. Indeed, note that it is a weakly dominant strategy to announce ones own preferred rule.

So far, this assumes that lower courts simply obey the IICR. One final result, bringing individual case decisions back in, shows why they should do so.

Enforcing Legal Rules

When an appellate court announces a legal rule in a formal opinion, the game does not end there. The judges on that appellate court can themselves hear appeals in the very cases decided under that rule. How does this affect collegial rule-making?

Oliver Wendell Holmes defined law as "the prophecies of what the courts will do in fact, and nothing more pretentious"(1897, 460). To meet this standard, a meaningful legal rule must predict how courts will actually decide cases. Segal and Spaeth (2002) agree with Holmes's emphasis on prediction, arguing that we should pay more attention to what justices do than to what they say—but this raises an important question. Can we use what they say as a guide as to what they *will* do? When will a rule announced by a collegial appellate court actually be "law" in the Holmesian sense? When will it predict how the appellate court will decide cases on appeal?

Call a legal rule *enforceable* if it correctly predicts how the collegial appellate court will decide the cases it reviews after that rule is applied. Consider a game in which the court decides a case by majority vote, announces a legal rule or rules, and then decides another case in the same issue area by majority vote. Then, the following result holds:

Proposition 8. *The only enforceable legal rule is the Implicit Collegial Rule.*

If an appellate court states a legal rule other than the ICR, or if the rule induced by a set of opinions is other than the ICR, the judges face a commitment problem.

[11] The Supreme Court itself has offered lower courts limited guidance for dealing with fragmented opinions. In *Marks v. United States* (1977), they offered the "narrowest grounds rule": "When a fragmented Court decides a case and no single rationale explaining the result enjoys the assent of five Justices, the holding of the Court may be viewed as that position taken by those Members who concurred in the judgment on the narrowest grounds." There is, however, significant conflict as to what this entails, as demonstrated by the briefs in *Grutter v. Bollinger* (2003).

Any case that would be decided in contradiction to the ICR can be reversed by majority vote on appeal, undercutting any incentive to logroll in the first place. In any such case, a lower court could evade the "official" rule and simply follow the ICR, knowing that a majority of justices support that act of noncompliance. In fact, a lower court *following* the "official" rule would be subject to reversal on appeal.

Setting aside further complications, the lower courts thus have little incentive to apply a rule other than the ICR, and so the higher court has little incentive to issue a divergent rule in the first place. Although appellate review can help a higher court control a lower court, it also creates a commitment problem for logrolls and undermines the implementation of any rule other than the ICR.

CONCLUSION

Judges on collegial appellate courts can aggregate their preferences over legal rules and case dispositions in a meaningful way through majority rule. This collegial rule can meet the same basic requirements of rationality as individual proper rules.

Moreover, I have shown that this aggregate rule is more than a theoretical possibility, in that it can actually be implemented by self-interested judges. Indeed, if it were otherwise, if the "game" being played led away from this natural majoritarian rule, or if cycling prevented its implementation, that itself would be a severely disquieting feature of collegial adjudication. It would mean that, for example, the Supreme Court's own majority opinion could yield case outcomes opposed by a majority of Supreme Court justices. A case could then receive a different treatment if decided under the application of the majority opinion, than if decided by the Court directly.

The implicit median rule is reinforced by key institutions of our judicial hierarchy—specifically, the power to write separate opinions, the power to audit lower court decisions while announcing general rules, and the lack of a binding authority to force the Supreme Court to obey its own precedents (see Spaeth and Segal 1999). This might explain the puzzle noted by Cross (1998) as to the lack of explicit log-rolling on collegial courts. Rather than invoking norms of deference, the answer I suggest lies in the institutional structure of the judicial hierarchy, which does not allow the judges on such courts to sustain gains from trading—they cannot easily commit to enforcing such deals upon appellate review.

This paper makes a number of further contributions. First, it presents a new way of thinking about power on collegial courts. It is common to focus on a single swing justice (recently said to be Justice O'Connor, and now Justice Kennedy). Replacing this particular justice is seen as having great impact, whereas replacing others is considered less important (see Krehbiel 2007). However, although in one dimension the collegial rule can be the preferred rule of a single justice, this need not be so more generally. The preferred rule of the Court as a whole may be sensitive to the individual rules of many different justices, each pivotal for different ranges of cases (as in Figure 4), even if they are in dissent in the particular case heard by the Court. Replacing any of these justices, and not just a single so-called swing justice, can affect legal policy in nontrivial ways. Focusing only on which justice is the swing voter in a particular case will then omit much of interest in the collegial formation of legal doctrine.

Second, this paper suggests a way of reconciling competing modes of analysis of judicial behavior. For one, it bridges a gap between the political science of judging and the so-called Legal Model (see Segal and Spaeth 2002), which sees law as the sole determinant of, or at least a significant exogenous constraint on, judicial choice. Judicial behavior can be consistent with legal theory in form and function, while consistent with political accounts as far as the incentives faced by judges. It is then possible to take a political perspective on what judges do while still incorporating the accoutrements of real-world legal decision making. One can even remain agnostic (for some purposes) as to whether preferences start with preferred case outcomes (which induce a rule) or with a preferred rule (which leads to case outcomes).

Taking legal rules seriously need not require jettisoning notions of ideological preferences and their dominance in Supreme Court voting. There is nothing inherently nonideological (or nonattitudinal) about preferences in the case-space model, and so there is nothing incompatible between the case-space approach and the Attitudinal Model. Indeed, the one-dimensional Attitudinal Model as developed in Segal and Spaeth (2002), inter alia, is very much a case-space model—the justices each have a cut-point separating cases. The natural extension of the Attitudinal Model to higher dimensions is *not* then a standard policy-space model (with a multidimensional ideal point), but rather a multidimensional case-space model as analyzed here.

This paper also bridges a gap between the Attitudinal Model and the "Strategic Model." (see Epstein and Knight 1998). Although the Attitudinal Model claims that Supreme Court justices will always vote sincerely and ideologically, the Strategic Model argues that collegial politics will affect judicial behavior. Note that, whereas the collegial rule might not be the rule of any one justice, and so a justice may indeed sign on to a rule that does not sincerely match his or her preferred rule, the collegial rule will capture the sincere majoritarian votes of the justices. This suggests that both sides can be right in their central arguments—collegiality does affect policy, but policy in the form of case votes that are still sincere reflections of personal ideology. Indeed, the collegial rule itself captures the aggregation of such sincere votes.

Note also that this paper provides a firmer grounding for existing formal models of Supreme Court policy making. In the standard policy-space interpretation, the content of judicial policy is never truly specified. However, the ideal points in models such as that of Schwartz (1992) or that of Hammond, Bonneau, and Sheehan (2005) could be recast as cut-points in a case space (see, e.g., Lax and Cameron 2007). In one dimension, the two perspectives are largely isomorphic—thus providing a substantive interpretation for the policy content in question. Furthermore, although all three of these models assume unidimensionality, and this assumption in a policy space can yield far different results than for a multidimensional policy space, a case-space interpretation means this assumption carries far less baggage—the existence of a median policy (around which bargaining might occur) does not then depend on a unidimensionality assumption.

Third, a multidimensional approach raises new questions given existing work.[12] For example, what are the effects in a multidimensional case space of opinion writing costs and bargaining (as in Lax and Cameron 2007) or of uncertainty as to case locations (as in Cameron, Segal, and Songer 2000) or of the link between the Supreme Court's certiorari rules and compliance (as in Lax 2003)?

Next, many questions are raised as to the structure of legal doctrine, in particular as to the relationship between the structure of individual "input" rules and the structure of collegial rules as "output." That proper rules induce a proper collegial rule is important, but this result is not the last word. As shown by example, aggregating conjunctive tests (such as the strict scrutiny test) *can* yield, but will not necessarily yield, a collegial rule of the same coherent form. When can rule preferences be aggregated without requiring a differently structured rule? Are collegiality and doctrinal complexity related (see, e.g., Landa and Lax 2007)? How does the need to communicate doctrine constrain the structure of collegial doctrine? Or, what determines the factual dimensions over which doctrine is defined? I would argue, for example, that even if natural dimensions do not exist, the judges must surely create them to communicate their desired doctrines. How does the need for lower court compliance constrain choices over doctrinal structure (see, e.g., Jacobi and Tiller 2006; Lax 2006)? Further, what additional "coherence" restrictions might be placed on a rule besides "properness"? A case space allows us to consider these and other issues of collegial jurisprudence that would remain hidden in a standard policy space, wherein every "rule" would simply be a structureless point.

One might also consider the growth of doctrine over time. Although the current paper portrays judges as announcing a complete partitioning of the case space, this is often done incrementally over time as additional cases are considered. Kornhauser (1992a) considered this in light of a binding norm of stare decisis, but how will pure policy-seeking judges develop a doctrine? Why would they make policy incrementally? Does it matter? Regardless of such complications, of course, the implicit collegial or median rule still provides a baseline for understanding the behavior of appellate courts.

Thinking about judicial preferences in terms of rules also requires thinking about new ways to measure preferences empirically, going beyond unidimensional ideal points or the percentage of votes cast in the liberal direction—in a multidimensional case space, preferences no longer reduce to a single number. One possibility is the "classification trees" method (Kastellec 2005). Other promising possibilities for empirically measuring legal policy include network-citation analysis (Fowler et al. 2007) or opinion-content analysis (Hall and Wright 2006; McGuire and Vanberg 2005).

Finally, one can consider rule-based, case-sorting policy making more generally. Bureaucracies, like courts, often function in this manner. Even much of legislative policy-making involves the classification of behavior as acceptable or not, and the setting of limits. This is precisely what many statutes do. A case-space approach, then, might be useful far beyond the judicial branch for which it was designed.

APPENDIX (PROOFS AND SUPPLEMENTAL FORMAL RESULTS)

Proof of Proposition 1. First, proof of *necessity* by contradiction. Let $r(x_1,\ldots,x_{m-1})$ be weakly decreasing in all $x_{s\le m}$ and let $x^i \in C$ if and only if $x^i_m \le r(x^i_1,\ldots,x^i_{m-1})$. Assume C is not a proper rule. Then, there exists cases x^i and x^w, such that $x^i \succeq x^w$, $x^i \in C$, and $x^w \notin C$. Then, $x^i_m \le r(x^i_1,\ldots,x^i_{m-1})$ and $x^w_m > r(x^w_1,\ldots,x^w_{m-1})$. Since $x^i \succeq x^w$, for all s, $x^i_s \ge x^w_s$ and specifically $x^w_m \le x^i_m$. Since $r(\cdot)$ is weakly decreasing in x_s for all $s<m$, $r(x^i_1,\ldots,x^i_{m-1}) \le r(x^w_1,\ldots,x^w_{m-1})$. Then, $x^w_m \le x^i_m \le r(x^i_1,\ldots,x^i_{m-1}) \le r(x^w_1,\ldots,x^w_{m-1}) < x^w_m$, which is a contradiction. C must be a proper rule. Second, proof of *sufficiency* by construction. Let C be a proper rule, which is closed and bounded above by 1 for all x_s. For any set of values $x^i_1,\ldots,x^i_{m-1}$, there is a set of cases for $x^i_m \in [0,1]$, from case $(x^i_1,\ldots,x^i_{m-1},0)$ to $(x^i_1,\ldots,x^i_{m-1},1)$. There are two possibilities. If, given $(x^i_1,\ldots,x^i_{m-1})$, for all x^i_m, $x^i \notin C$, then let $r(x^i_1,\ldots,x^i_{m-1}) = \alpha < 0$. Otherwise, since C is closed, there must exist a unique value of x^i_m, $\tilde{x}_m$, such that $(x^i_1,\ldots,x^i_{m-1},x^i_m) \in C$ if $x^i_m \le \tilde{x}_m$ and $(x^i_1,\ldots,x^i_{m-1},x^i_m) \notin C$ if $x^i_m > \tilde{x}_m$. Then, let $r(x^i_1,\ldots,x^i_{m-1}) = \tilde{x}_m$. To prove that $r(\cdot)$ is weakly decreasing in all $x_{d<m}$, suppose not. Then, $\exists s<m$ such that $x^i_s > x^w_s$ with $r(x^i_1,\ldots,x^i_s,\ldots,x^i_{m-1}) > r(x^i_1,\ldots,x^w_s,\ldots,x^i_{m-1})$. Case $(x^i_1,\ldots,x^i_s,\ldots,x^i_{m-1}, r(x^i_1,\ldots,x^i_s,\ldots,x^i_{m-1})) \in C$ and so case $(x^i_1,\ldots,x^w_s,\ldots,x^i_{m-1}, r(x^i_1,\ldots,x^i_s,\ldots,x^i_{m-1})) \in C$, since C is proper. Then, it must be that $r(x^i_1,\ldots,x^i_s,\ldots,x^i_{m-1}) \le r(x^i_1,\ldots,x^w_s,\ldots,x^i_{m-1})$ which is a contradiction. ■

Proof of Corollary 1. *Sufficiency.* Suppose $C_z \subseteq C_j$ but there exists $\acute{x}_1,\ldots,\acute{x}_{m-1}$ such that $r_z(\acute{x}_1,\ldots,\acute{x}_{m-1}) > r_j(\acute{x}_1,\ldots,\acute{x}_{m-1})$. Then, case $(\acute{x}_1,\ldots,\acute{x}_{m-1}, r_z(\acute{x}_1,\ldots,\acute{x}_{m-1})) \in C_z$ but $(\acute{x}_1,\ldots,\acute{x}_{m-1}, r_z(\acute{x}_1,\ldots,\acute{x}_{m-1})) \notin C_j$ which is a

[12] One might also consider case spaces that are partitioned into more than yes/no dispositions—including the choice of remedy, for example. However, as Kornhauser (1992b, 443) points out, "the remedial choice ... is almost invariably left to the finder of fact" so that the appellate courts simply "supervise this factual determination." The remedy chosen by the fact finder could then be one of the dimensions in the case, so that again the disposition is a dichotomous answer (acceptable remedy or not). Or, one could extend the analysis here to deal with partioning of the case space into a greater number of equivalence classes, ordered by increasingly severe remedy. It would seem, intuitively at least, that many if not all of the results would hold in some form (e.g., if remedial rules are proper rules for specifying remedies, ordering the cases disposition classes non-perversely, then the aggregate remedial rule might still be proper).

contradiction. *Necessity*. Suppose $r_j(\cdot) \geq r_z(\cdot)$ for all $x_1, \ldots, x_{m-1}$ but $C_z \nsubseteq C_j$. Then, there exists a case $\acute{x}$ such that $\acute{x} \in C_z$ and $\acute{x} \notin C_j$. Since, $\acute{x} \in C_z, \acute{x}_m \leq r_z(\acute{x}_1, \ldots, \acute{x}_{m-1}) \leq r_j(\acute{x}_1, \ldots, \acute{x}_{m-1})$ and so $\acute{x} \in C_j$ which is a contradiction. ■

Proof of Proposition 2. $\hat{C}$ is the set of points lying in the intersection of at least $\frac{k+1}{2}$ extended rule sets, each of which is closed, and therefore the intersection is closed. ■

Proof of Proposition 3. Suppose C_j^Y is a proper rule for all j but $\hat{C}$ is not a proper rule. Then, there exists cases x^i and x^w, such that $x^i \succ x^w$, $x^i \in \hat{C}$, and $x^w \notin \hat{C}$. Since $x^i \in \hat{C}$, then $|j \text{ s.t. } x^i \in C_j^Y| \geq \frac{k+1}{2}$. If $x^i \in C_j$, then, for proper rule C_j, $x^w \in C_j$. Thus, $|j \text{ s.t. } x^w \in C_j^Y| \geq \frac{k+1}{2}$ and so $x^w \in \hat{C}$ which would be a contradiction. Thus, $\hat{C}$ is a proper rule. ■

Proof of Proposition 4. Assume the IMR is not the ICR. Then, there either there exists a case x^i such that $x^i \in \hat{C}$ and $x^i \notin \bar{C}$ or there exists a case x^w such that $x^w \notin \hat{C}$ and $x^w \in \bar{C}$. Suppose such a case x^i exists. Then, $x_m^i > \bar{r}(x_1^i, \ldots, x_{m-1}^i)$ which is greater than or equal to at least $\frac{k+1}{2}$ values of $r_j(x_1^i, \ldots, x_{m-1}^i)$. Thus, for more than half the values of j, $x^i \notin C_j$ and so $x^i \notin \hat{C}$, which is a contradiction. Suppose that x^w exists. Then, $x_m^w \leq \bar{r}(x_1^w, \ldots, x_{m-1}^w)$ which is less than or equal to at least $\frac{k+1}{2}$ values of $r_j(x_1^w, \ldots, x_{m-1}^w)$. Thus, for more than half the values of j, $x^w \in C_j$ and so $x^i \in \hat{C}$, which is a contradiction. Since the ICR will be a proper rule (by Proposition 3), the IMR is a proper rule. ■

Proof of Corollary 2. This follows from the definition of the IMR. ■

Proof of Proposition 5. Let v_j^i be the vote of judge j in case x^i. There are $k \times n$ moves and we solve by backward induction. Voting sincerely is a weakly dominant strategy for any judge: voting against her own preferred disposition in case x^i at best leaves her payoff unchanged and otherwise lowers her payoff by a_j^i. Thus, I assume that, if indifferent, judge j votes according to C_j. Note that if the vote of judge z is (going to be) pivotal (i.e., if $|j_{j\neq z} \text{ s.t. } a_j^i = d_z^i| = \frac{k}{2}$), then she must choose $a_z^i = 1$ if and only if $d_z^i = 1$, which is to say she will vote sincerely. Working backwards from the final vote in the final case, the vote of judge k in case x^n must be sincere (either she is not pivotal and votes sincerely due to indifference or she is pivotal and votes sincerely by necessity), and thus so must that of judge $k-1$, and so on. Thus, in equilibrium, $d^i = 1$ if and only $|j \text{ s.t. } x^i \in C_j| \geq \frac{k+1}{2}$, and so case dispositions match those dictated by the ICR. ■

If the judges can bind their votes over a set of cases, then cycling can occur:

Example 1 (Cycling over disposition sets). Consider two cases, x^1 and x^2, and three judges with preferred rules as follows. Let $d_1^1 = 1, d_2^2 = 1$, and otherwise $d_j^i = 0$. Then, there are four possible sets of case dispositions, $\{1, 1\}$, $\{1, 0\}$, $\{0, 1\}$, and $\{0, 0\}$. Unless we restrict case-weights, these can be ranked to form the following preference orderings, which are compatible with the preferred rules above: $J_1 : \{1, 0\}\{1, 1\}\{0, 0\}\{0, 1\}$; $J_2 : \{0, 1\}\{1, 1\}\{0, 0\}\{1, 0\}$; and $J_3 : \{0, 0\}\{1, 0\}\{0, 1\}\{1, 1\}$. Under the ICR, the dispositions would be $\{0, 0\}$. But this bundle of dispositions like this will not stable, as shown by the following cycle (with the judges voting in each majority shown): $\{0, 0\}\underset{J_1,J_2}{\rightarrow}\{1, 1\}\underset{J_2,J_3}{\rightarrow}\{0, 1\}\underset{J_1,J_3}{\rightarrow}\{1, 0\}\underset{J_2,J_3}{\rightarrow}\{0, 0\}$.

Even so, three results would hold:

Lemma 1. *If the judges are voting over bundles of case dispositions, if an disposition set is stable, then it is consistent with the ICR (that is, no disposition set other than the ICR can ever be stable).*

Lemma 2. *If there is a set of bundled cases to be decided by a collegial court consisting of three judges (such as the U.S. Courts of Appeals), under constant case utility, then the set of dispositions under the Implicit Collegial Rule is the unique disposition set in the core under majority rule.*

Lemma 3. *If there is a set of bundled cases to be decided by a collegial court, under constant case utility, and there exists a true median, then the set of dispositions under the Implicit Collegial Rule is the unique disposition set in the core under majority rule.*

Proof of Lemma 1. Suppose not. Then there exists a stable outcome set $\tilde{C} \neq \hat{C}$, such that there cannot exist any extended rule that beats $\tilde{C}$ by majority vote. There must exist a case x^i such that $\tilde{}(x^i \in \tilde{C} \wedge x^i \in \hat{C})$. Consider the extended rule $\tilde{C}'$ that matches $\tilde{C}$ in every case other than x^i. Since a majority (by definition) prefers the decision for x^i under $\hat{C}$ to that under $\tilde{C}$, $\tilde{C}'$ will beat $\tilde{C}$ by majority vote and so the latter cannot be stable. ■

Proof of Lemma 2. Suppose not. Then, there exists a disposition set $\tilde{C}$ that beats the ICR set $\hat{C}$ under majority rule, so that at least two judges strictly prefer $\tilde{C}$. Without loss of generality, let these judges rules be C_1 and C_2. Of the n cases being decided, consider the subset $\mathbf{C}''$ cases that are decided differently under $\hat{C}$ than under $\tilde{C}$. Let each case in $\mathbf{C}''$ be sorted into one of four subsets, $\mathbf{C}''_A$, $\mathbf{C}''_B$, $\mathbf{C}''_C$, and $\mathbf{C}''_D$, with cardinalities $|\mathbf{C}''_A|$, $|\mathbf{C}''_B|$, $|\mathbf{C}''_C|$, and $|\mathbf{C}''_D|$. Let $\mathbf{C}''_A$ consist of all cases for which both judge 1 and 2 prefer $\tilde{C}$ to $\hat{C}$, let $\mathbf{C}''_B$ consist of all cases for which neither judge 1 and 2 prefer $\tilde{C}$ to $\hat{C}$, let $\mathbf{C}''_C$ consist of all cases for which only judge 1 prefers $\tilde{C}$ to $\hat{C}$, and let $\mathbf{C}''_D$ consist of all cases for which only judge 2 prefers $\tilde{C}$ to $\hat{C}$. $|\mathbf{C}''_A| = \varnothing$, since 1 and 2 together would form a majority in any case within it, so that if they do not like the outcome according to $\hat{C}$ for this case, $\hat{C}$ could not be the ICR. Since overall judge 1 strictly prefers $\tilde{C}$, $|\mathbf{C}''_C| > |\mathbf{C}''_B| + |\mathbf{C}''_D|$. Since overall judge 2 strictly prefers $\tilde{C}$, $|\mathbf{C}''_D| > |\mathbf{C}''_B| + |\mathbf{C}''_C|$ Thus, $|\mathbf{C}''_C| > |\mathbf{C}''_B| + |\mathbf{C}''_B| + |\mathbf{C}''_C|$, which is a contradiction. ■

Proof of Lemma 3. The proof is similar to that above. Any case decided in opposition to the ICR will divide each judge $j > \frac{k+1}{2}$ from each judge $j < \frac{k+1}{2}$. The two sides cannot both prefer the non-ICR set to the ICR, as any overall increase in the number of cases correctly disposed of with respect to a judge of the former type will mean an overall decrease for the judges of the latter type. ■

This sort of cycling is unlikely, however. One reason is that most appellate court policy making is made through the issuing of rules, and not through voting directly over bundles of cases or even individual cases. Indeed, the Supreme Court handles relatively few cases directly. Second, cases cannot usually be bundled to induce these cycles. The Supreme Court will sometimes link related cases to be decided under a single opinion, but judges on the Courts of Appeals do not generally independently do so, and are subject to appellate review in any case. Third, and perhaps most importantly, even if cases can be bundled, a judge cannot sign a binding contract to link together her votes across cases. She is always free to switch her vote in an individual case within the set of cases being decided, until the decisions are officially handled down.

Possible Restrictions on Utility over Rules: These are parallel to the case-utility assumptions. The fungibility assumption requires that the judge only care about the percentage of the case space that is correctly partitioned. For proper rules, in one dimension, this would the distance between the preferred rule and the ECR cut-point r^*: $-|r^* - r_j|$. In two dimensions, the utility loss is the area between the curves $(\int_0^1 -|r^*(x_1) - r_j(x_1)|dx_1)$. In more general spatial terms, this loss is the hypervolume of cases incorrectly decided. Meanwhile, the proximity assumption would allow the judge to care more about some regions of the case space than others, depending on how close they fall to the indifference set marked out by the preferred proper rule. This would require an integral weighted by a salience term.

Cycling over ECRs can occur:

Example 2 (Variable utility and voting over rules). Consider Example 1 above. Let rules r_a, r_b, and r_c be equivalent to $\bar{r}$, except for deciding bundles of cases surrounding x^1 and x^2 as {1, 1}, {0, 1}, and {1, 0}, respectively. Then cycling can occur as above, with $\bar{r} \underset{J_1,J_2}{\rightarrow} r_a \underset{J_2,J_3}{\rightarrow} r_b \underset{J_1,J_3}{\rightarrow} r_c \underset{J_2,J_3}{\rightarrow} r$.

Proof of Proposition 6. (a) Suppose the ICR is not in the core. Then, there exists a rule $\tilde{C}$ that beats the ICR outcome set $\hat{C}$ under majority rule, so that at least a majority of judges strictly prefer $\tilde{C}$. The proof from this point is similar to that of Lemmas 2 and 3, focusing on the percentages of cases in each of the four categories instead of the cardinalities of sets of cases. (b) The proof follows that for Lemma 2. (c) The proof follows that for Lemma 1. ■

Proof of Proposition 7. First, note that there are Nash equilibria in which the IICR is the true ICR, so that $\hat{C}^* = \hat{C}$. Specifically, if every judge supports his or her own rule or the ICR, then $\hat{C}^* = \hat{C}$. There is no incentive to defect, because if judge j is pivotal for some set of case outcomes, a shift away from supporting C_j or $\hat{C}$ can only lead to the wrong case outcomes under C_j. (If judge j is not pivotal, there is obviously no reason to defect.) Given the indifference assumption, to show that only the true ICR can be supported, suppose otherwise and consider an arbitrary judge j not announcing her preferred rule. If her rule is not pivotal in any case (if the induced collegial rule does not change), she will announce her sincere rule or the ICR. If her announced rule is pivotal in any set of cases, then defecting from it to her preferred rule increase the set of "correct" dispositions. No matter what the other judges announce, a sincere announcement of C_j is a weakly dominant choice. ■

Proof of Proposition 8. Working backwards, Proposition 5 shows that any subsequent case outcomes following the announcement of a legal rule will be controlled by the ICR (as must be the case in period 1). Thus, only the ICR is enforceable. ■

REFERENCES

Black, Duncan. 1958. *The Theory of Committees and Elections*. London: Cambridge University Press.

Cameron, Charles M. 1993. "New Avenues for Modeling Judicial Politics." Presented at the Conference on the Political Economy of Public Law, Wallis Institute of Political Economy, Rochester University.

Cameron, Charles M., Jeffrey A. Segal, and Donald Songer. 2000. "Strategic Auditing in a Political Hierarchy: An Informational Model of the Supreme Court's Certiorari Decisions." *American Political Science Review* 94-1 (March): 101–16.

Craig v. Boren, 429 U.S. 190 (1976).

Cross, Frank. 1998. "The Justices of Strategy." *Duke Law Journal* 48-3: 511–70.

Easterbrook, Frank. 1982. "Ways of Criticizing the Court." *Harvard Law Review* 95: 802–32.

Epstein, Lee, and Jack Knight. 1998. *The Choices Justices Make*. Washington, DC: C.Q. Press.

Fowler, James H., Timothy R. Johnson, James F. Spriggs II, Sangick Jeon, and Paul J. Wahlbeck. 2007. "Network Analysis and the Law: Measuring the Legal Importance of Supreme Court Precedents." *Political Analysis.* Forthcoming.

Friedman, Barry. 2006. "Taking Law Seriously." *Perspectives on Politics* 4-2 (June): 261–76.

Grofman, Bernard. 1993. "Public Choice, Civic Republicanism, and American Politics: Perspectives of a 'Reasonable Choice' Modeler." *Texas Law Review* 71: 1541–87.

Grutter v. Bollinger, 539 U.S. 306 (2003).

Hall, Mark A., and Wright, Ronald F. 2006. "Systematic Content Analysis of Judicial Opinions." Wake Forest University Legal Studies Paper No. 913336 (June 30, 2006). Available at SSRN: http://ssrn.com/abstract=913336.

Hammond, Thomas H., Chris W. Bonneau, and Reginald S. Sheehan. 2005. *Strategic Behavior And Policy Choice On The U.S. Supreme Court*. Palo Alto, CA: Stanford University Press.

Holmes, Oliver Wendell. 1897. "The Path of Law." 10 *Harvard Law Review* 457.

Jacobi, Torja, and Emerson H. Tiller. "Legal Doctrine and Political Control." Working paper, presented at the 2006 Annual Meeting of the Midwest Political Science Association.

Kastellec, Jonathan. 2005. "Legal Rules and the Classification of Supreme Court Decisions." Working paper, presented at the 2005 Annual Meeting of the American Political Science Association.

Kastellec, Jonathan. 2007. "Panel Composition and Judicial Compliance on the U.S. Courts of Appeals."*The Journal of Law, Economics, & Organization*. 23-2 (Summer).

Kornhauser, Lewis A. 1992a. "Modeling Collegial Courts I: Path Dependence." *International Review of Law and Economics* 12-2 (June): 169–85.

Kornhauser, Lewis A. 1992b. "Modeling Collegial Courts II: Legal Doctrine." *Journal of Law, Economics and Organization* 8–3 (October): 441–70.

Kornhauser, Lewis A. 1999. "Appeal and Supreme Courts," in the *Encyclopedia of Law and Economics*, http://encyclo.findlaw.com/7200book.pdf.

Kornhauser, Lewis A., and Lawrence G. Sager. 1986. "Unpacking the Court." *Yale Law Journal* 96: 82–117.

Krehbiel, Keith. 2007. "Supreme Court Appointments as a Move-The-Median Game." *The American Journal of Political Science* 51-2 (April). Forthcoming.

Landa, Dimitri, and Jeffrey R. Lax. 2007. "Legal Doctrine on Collegial Courts." Working Paper, earlier version presented at the 2005 Annual Meeting of the Midwest Political Science Association.

Lax, Jeffrey R. 2003. "Certiorari and Compliance in the Judicial Hierarchy: Discretion, Reputation, and the Rule of Four." *Journal of Theoretical Politics* 15-1 (January): 61–86.

Lax, Jeffrey R. 2006. "The Collegial Politics of Legal Doctrine: Rules vs. Standards." Working paper, presented at the 2006 Annual Meeting of the Midwest Political Science Association.

Lax, Jeffrey R., and Charles M. Cameron. 2007. "Bargaining and Opinion Assignment on the U.S. Supreme Court." *Journal of Law, Economics, & Organization*. 23-2 (Summer).

Maltzman, Forrest, James F. Spriggs, and Paul J. Wahlbeck. 2000. *Crafting Law on the Supreme Court: The Collegial Game*. Cambridge: Cambridge University Press.

Marks v. United States, 430 U.S. 188 (1977).

McGuire, Kevin T., and Georg Vanberg. 2005. "Mapping the Policies of the U.S. Supreme Court: Data, Opinions, and Constitutional Law." Working paper, presented at the 2005 Annual Meeting of the American Political Science Association.

Murphy, Walter F. 1964. *The Elements of Judicial Strategy.* Chicago: University of Chicago Press.
Schwartz, Edward P. 1992. "Policy, Precedent, and Power: A Positive Theory of Supreme Court Decision-Making." *Journal of Law, Economics, & Organization* 8-2 (April): 219–52.
Segal, Jeffrey A., and Harold J. Spaeth. 2002. *The Supreme Court and the Attitudinal Model Revisited*. Cambridge: Cambridge University Press.
Spaeth, Harold J., and Jeffrey A. Segal. 1999. *Majority Rule or Minority Will: Adherence to Precedent on the U.S. Supreme Court*. Cambridge: Cambridge University Press.
Tiller, Emerson H., and Frank B. Cross. 2006. "What is Legal Doctrine?" *Northwestern University Law Review* 100-1: 517–34.
Twining, William, and David Miers. 1991. *How to Do Things with Rules.* London: Weidenfeld and Nicolson Ltd.