Chapter 2: What Courts Do ... And How To Model It

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Abstract

We review the basic building blocks of the case-space approach to modeling courts, particularly cases, dispositions, and rules. We provide numerous examples of case spaces. We clarify the policy-making actions of courts, distinguishing statutory interpretation, review of agency rule-making on procedural grounds, review of agency rule-making on substantive grounds, and constitutionsl review. We demonstrate that simple versions of the case-space approach are extensible to more complex legal concepts such as evidence, doctrine, and causes of action. We note some of the feed back effects of judicial actions, particularly on the distribution of presented cases, the behavior in society at large, and on social welfare.

This essay is a draft chapter of a book-in-progress on the positive political theory of courts.

I. Introduction

This chapter sets out a mathematical framework for modeling the actions of courts. We use this framework throughout the book.

In our view, a satisfactory framework should satisfy five conditions. First and foremost, the framework must capture the essential features of adjudication. Otherwise, one can hardly be said to be modeling *courts*, as opposed to legislatures, bureaucracies, or chief executives. Second, because courts interact with legislatures and the executive, the framework should be able to express or accommodate these interactions. Put differently, we should be able to embed models of courts within a constitutional order of separated powers. Third, the framework should be extensible, flexible enough to investigate more complex features of judicial institutions and legal reasoning, such as doctrine and evidence. Fourth, the framework should connect the operation of courts to the behavior of individuals and firms, as they respond to judicial action. Put differently, we should be able to embed models of courts within society. Finally, the framework should be straight-forward and tractable – easy to learn and easy to use. We believe the framework laid out in this chapter satisfies those five desiderata.

Because of its emphasis on cases, this framework is sometimes called the "case space approach" to modeling courts. In fact, the case-space approach has applicability far beyond courts. The same approach applies whenever an actor is presented with objects she must process correctly according to rules, for example, when bureaucrats evaluate applications, determine eligibilty for programs, or enforce regulations.[1] It even applies when instructors grade exams. The case space approach also can incorporate policy-making that occurs during case processing.

The chapter is organized the following way. First, we review the basics of what courts do. We then introduce the case-space approach to modeling judicial actions. We note some possible extensions of the core components of the case-space approach. Finally, we suggest some of the social implications of judicial actions, including feedback effects from judicial

actions to social consequences and the distribution of presented cases.

II. What Do Courts Do?

> A court is a public body for *resolving disputes* in accordance with law. In every *case* the court must determine what the *facts* are and what their legal significance is. If the court determines their legal significance by applying an existing *rule* of law unchanged, it is engaged in *pure dispute resolution*. But if to resolve the dispute the court must create a new rule or modify an old one, that is *law creation*. (Posner 1985:3, emphasis added)

This quotation, from a prominent federal judge and leading legal scholar, identifies the distinctive features of a common law court. Hence, it identifies the basic concepts that a formal framework of adjudication must accommodate: disputes, cases, facts, rules, dispute resolution, and law creation. Let's unpack Posner's dense description, taking each piece in turn.

First, a court is, in a certain sense, passive. Before a court can act, a litigant must ask the court to act. Once asked, a court may be obliged to respond, at least if the petitioner has standing (legally sanctioned access to the court) and follows designated procedures, and the court has jurisdiction (legally sanctioned authority over the petitoner's case). On the other hand some courts, like the U.S. Supreme Court, have an almost entirely discretionary docket, so they may choose freely from among the cases brought to them. Second, the selected litigants present a *case*; i.e., a concrete, fact-ridden dispute between two or perhaps more parties. Cases are central to all courts, not just common law courts. In civil law systems even the highest appellate courts are case driven, though technically they decide only the question of law raised by the case.[2] Third, the Court must resolve this concrete dispute: it determines which party prevails. Dispute resolution is not optional; it is obligatory in every instance. So, the court cannot hold "don't know" or "it's a tie." It is this disposition of the case that "resolves" the dispute and thus is a necessary feature of adjudication. Fourth,

the court must resolve the dispute by applying law in the form of a rule to the facts in the case. It is this feature of courts that make them principled rather than lawless. Indeed, rule-driven dispute resolution is central to the very concept of rule of law. Finally, some courts, particularly high appellate courts like the Supreme Court, may go beyond the simple disposition of the case and make "policy" of a kind. We shortly return to exactly what kind of policy these courts make. This policy-making action is what Posner means by "law creation."

Modeling the actions of courts requires, minimally, a mathematical vocabulary that instantiates the concepts of *cases*, *facts*, *rules*, and *dispositions*. As we discuss in the Bibliographic Note for this chapter, judicial theorists developed this vocabulary during the early and mid-1990s. It is increasingly used to model courts of all kinds both theoretically and empirically. Because this mathematical vocabulary takes cases seriously, it is sometimes called the "case space" approach to modeling courts.

Scholars trained in legislative studies or voting theory often feel some mental strain upon encountering models that take judicial activities seriously. After all, when modeling congressional voting or voting in referenda, one need only represent policies; there are no cases and no case dispositions. As a result, legislative or electoral scholars frequently ask, If I am just interested in policy, do I really need to bother with cases and case dispositions?

The answer is a resounding, "It depends." More specifically, it depends on whether dispositions interact with policy-making. If they do not, then dispositions may be ignored, at least conceptually. For example, consider judicial review of an administrative regulation on purely procedural grounds. Here, if the court rules that the agency obeyed the procedures specified in the Administrative Procedures Act, it accepts the regulation. But if it rules the Agency violated those procedures, it strikes down the regulation, effectively vetoing it. In this decisional mode, the distinction between the case disposition (government prevails vs. challenger prevails) and the policy action (acceptance of the regulation vs. veto of the regulation) is slight. On the other hand, if dispositions and policy-making do interact,

then a formal model restricted to policy is apt to be misleading. An important example is contemporary models of intra-court bargaining, discussed in Chapter 9. In many of these models, case dispositions and policy-making interact profoundly – members of the Court in the minority dispositional coalition do not participate in the bargaining over the policy content of the majority opinion. If this is correct, one cannot get very far in understanding policy-making on multi-member courts without incorporating dispositions. In Chapter 11, we consider a model of statutory interpretation in which the Court modifies a legislative rule only when confronted with particular cases, since often the Court can dispose of the case as it wishes without modifying Congress's rule. Here again, policy-making interacts profoundly with cases and dispositions. Cases and case dispositions also play an essential role in the models of judicial whistle-blowing and auditing in judicial hierachies, presented in Chapter 7. Examples may be found in most chapters of this book! Finally, most empirical studies of courts rely on data about judicial case dispositions (which are abundant), not data about judicial policies (which are difficult to devise). If the empirical work is to be grounded in theory, the theory needs to incorporate the entity actually employed in the empirics. In sum, treating a court like a cut-down legislature is intellectually unsatisfying; more than that, it is likely to be misleading. Fortunately, taking cases seriously isn't terribly difficult.

Suppose one wants to take cases seriously. Doing so places at least two demands on the analyst. First, the model must be able to represent cases. Thus, the model must have some space of cases. Second, the model must include the "rendering of judgment" among the actions the judge takes.[3] We shall typically call the rendered judgment a "disposition." So the model must also include some space of possible dispositions. In addition, as noted by Posner, courts sometimes create or modify rules; we turn to policy making shortly.

III. The Basics: Cases, Dispositions, and Rules

In the case-space approach to modeling courts, there is a space of possible cases, X, with a specific case $x \in X$. A case connotes a legally relevant event that has occurred, e.g.,

the actual level of care exercised by a specific manufacturer, the degree of intrusiveness of a particular police search, the speed of a given car on the highway. The space of cases is then all possible legally relevant events, e.g., the possible levels of care, the possible degrees of intrusiveness, or the possible speeds of the car. The case space X can be a high dimensional space so that x is a vector (a point) in that space (we analyze an example in Appendix A). Or, X could be the possible nodes in a lattice with x a particular node. Typically though, we assume the set of possible cases may be represented by the real line ($X = \mathbb{R}$), hence x is a scalar. Through artful definition of the case space (e.g., intrusiveness of search, entanglement of church and state, likelihood of harm to returned political asylum seeker, degree of procedural regularity in the formulation of an agency rule), this simplification is much more flexible than it might initially appear.

A case space is the basic building block of a model of adjudication. To go further requires an understanding of what courts do. As Posner noted, courts resolve disputes. In our framework, courts decide cases. Technically, a resolution has two elements: a *disposition* and, should the plaintiff prevail, a *remedy*. The disposition of the case determines which party prevails in the dispute between the litigants. The remedy may be an award of damages or an injunction directing the plaintiff to take some action. These two resolutions correspond to two distinct phases in a dispute resolution: a liability phase that determines who wins, via the case disposition; and a remedial phase that determines the remedy.

We consider the disposition the nub of dispute resolution. Denote the set of outcomes or dispositions as $D = \{0, 1\}$. A disposition is thus d, with 0 connoting a disposition in favor of one litigant and 1 connoting a disposition in favor of the other. In what follows we shall largely ignore the remedy.[4] But, in some contexts, it may be reasonable to posit a set of remedial outcomes – that we might denote $R = \mathbb{R}$ where $\mathbb{R}$ denotes the real line. This approach allows fines, penalties, transfers, sentence lengths and the like.

A legal rule maps a case space into the outcome space. Thus, a judicial rule maps the set of possible cases into possible dispositions, $r : X \to D$. In words, it indicates the "correct"

disposition given the event that occurred. This is the nub of dispute resolution according to law: given what occurred, who is entitled to win the dispute under law?[5]

Call the space of possible legal rules R_x. Notice that R_x is a set of *functions* from X into D, and these functions may be very complex. However, we typically adopt a more geometrical and restricted characterization. Given a one-dimensional case space, we restrict the set of legal rules to the set of *cut-point rules*. A rule with a cut-point has the form:

$$r(x;y) = \begin{cases} 1 \text{ if } x \geq y \\ 0 \text{ otherwise} \end{cases} \tag{1}$$

where y denotes a cut-point. A universally familiar example is a speed limit. Here, a case is the speed of a car. The case space $X = \mathbb{R}_+$, the non-negative real numbers, encompasses all possible speeds of a car. The legal rule is a cut-point rule in which a driver is not speeding if the speed of the car is below the speed limit y, while the driver is speeding if the speed of the car is above the speed limit. Similarly in the case of tort law, in one formulation Defendant is not liable if Defendant exercised at least as much care as the cutpoint y. Other examples include allowable state restrictions on the provision of abortion services by medical providers; state due process requirements for death sentences in capital crimes; the degree of procedural irregularities allowable during elections; the required degree of compactness in state electoral districts; the allowable extent of religious intrusion into government operations; the allowable extent of gender-based distinction in employment; and the allowable degree of intrusiveness of police searches. Many other examples of cutpoint rules may suggest themselves to the reader. So, though cut-point rules are a significant simplification, they are more flexible than one might initially suppose.

One small caveat is in order, though. Analysts typically index cut-point rules by the value of the cut-point. This practice, though handy, can lead to a confusion of the case space X (e.g., possible speeds of the car) and the space of rules or policies R_x (e.g., possible speed limit rules). The examples in Appendix A highlight this point because in them, the

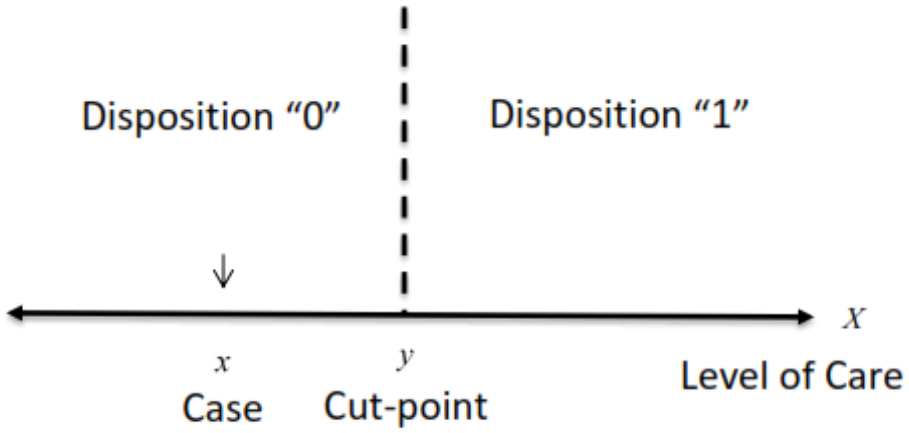

Figure 1: A Legal Rule Creates Equivalence Classes within the Case Space. Shown is a simple cut-point legal rule. The case space (here, the level of care) is X. A case x is an element of the case space. The cut-point y separates the cases receiving the dispostion 0 from those receiving the disposition 1.

dimensionality of the case space and the dimensionality of the rule space differ. In a related way, when we discuss judicial policy-making, we mean the creation or modification of a rule – a *policy* is a *rule*. (We elaborate shortly.) However, because cut-point rules are neatly indexed by a cut-point y, it is tempting (though technically not quite correct) to refer to the cut-point y as the policy. More accurate, but rather cumbersome, terminology would label y the policy-index rather than the policy.

A key feature of a legal rule (not just a cut-point rule) is that it partitions the fact space into a set of equivalence classes: all of *these* cases are to be treated in this fashion, all of *those* cases to be treated in that fashion. A given rule is thus a partition of the fact space and the set of all rules is the set of possible partitions of the fact space. Figure 1 illustrates the simple partition of a cut-point rule in tort.

The logical structure of cut-point rules implies both consensus and conflict in dispositions between two rules employing different cutpoints. So imagine two cut-point rules, one employing y^L and the other employing y^R. (See Figure 2). As Figure 2 indicates, for a case $x < y^L$, both rules agree that the appropriate resolution of the case is "0" ($x < y^L$ implies $x < y^R$). Similarly, when $x > y^R$, the two rules agree that the appropriate resolution of the

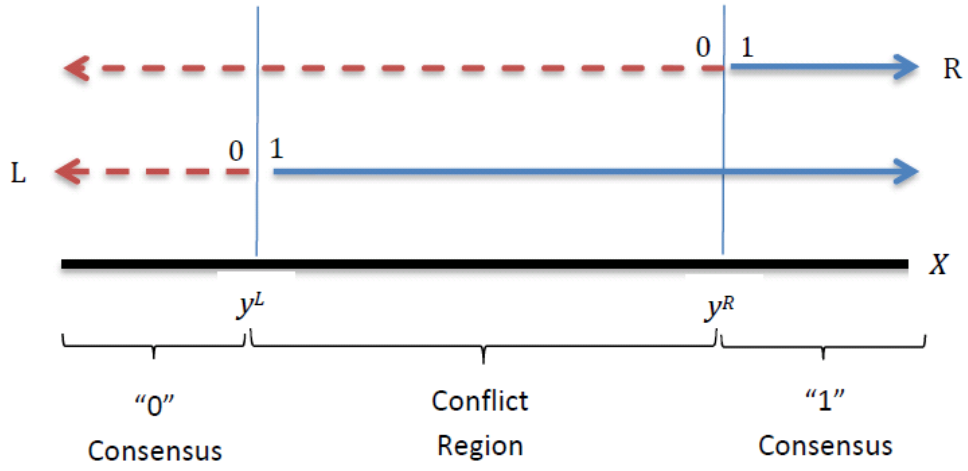

Figure 2: Conflict and Concensus Regions Induced by Two Distinct Rules. The structure of doctrine creates conflict and consensus regions when two judges disagree over the proper cutpoint to enforce.

case is "1". Only when $x \in [y^L, y^R]$ do the rules disagree: $y^L < x < y^R$ implies that the L doctrine holds the appropriate resolution of x is "1" while the R doctrine holds the appropriate resolution is "0". In many settings, we are interested in what happens in this *conflict region* – the $[\overline{y}^L, \overline{y}^R]$ interval where the two rules disagree about the correct disposition.[6]

A one dimensional case space with a cut-point rule provides a simple setting in which to study adjudication. The one dimension-one parameter set-up is attractive because it captures the essence of cases and rules, is extremely tractable, yet rich enough to build interesting models of courts.

Most of the models in this book utilize this simple setting. But the case space formalism is hardly restricted to such settings. Many extensions are straight forward. For instance, one may increase the dimensionality of the case space to a more realistic size. Most legal rules condition liability on many legal facts; the accident law example that motivates the cut-point rule focuses on only one element, reasonable care, that the plaintiff must establish to prevail. The actual cause of action depends not only the "reasonable care fact" but also on facts about causation, proximate causation, and harm. The case space is thus at least four-dimensional. Empirical applications often must consider quite complex case spaces (see, e.g., Cameron et

Mode	Actors	Judicial Action	Notation	Status Quo
Statutory Interpretation	H, S, P, J; or, J^1-J^9	Disposition + Rule	$d(x)$, y^J	None once J moves because no actor has a veto over the rule
Administrative Law – Procedure	A, J	Disposition (judicial veto)	$d(x)$	Judicial action restores a prior rule
Administrative Law – Substance	A, J; or H, S, P, A, J	Disposition + Block-veto	$d(x)$, $\underset{\leftarrow}{y}^J$, $\overrightarrow{y}^J$	Judicial action restores a prior rule but blocks some rules
Constitutional Review	J, C; or J, L; or J, P	Disposition + Block-veto	$d(x)$, $\underset{\leftarrow}{y}^J$, $\overrightarrow{y}^J$	Judicial action restores a prior rule but blocks some rules

Table 1: Decisional Modes of Judicial Policy-making. (See text for notation.)

al. 2000.). Similarly, one may enrich the space of possible rules, allowing complex partitions of even simple case spaces. In general, though, we believe essential principles are clearest in simple settings.

IV. Judicial Policy Making

As Posner noted, common law appellate courts often go beyond disposing of cases – though they must always do that – to create policies. Policy-making is actually the primary business of apex courts like the U.S. Supreme Court. What are these policies and how can they be modeled?

Broadly speaking, courts like the U.S. Supreme Court engage in policy-making in three distinct modes: 1) statutory interpretation; 2) administrative law, particularly the review of agency rule-making but sometimes executive orders; and 3) constitutional review, particularly (for the U.S. Supreme Court) review of federal statutes, state statutes, or executive actions. Policy-making actions in these venues are somewhat distinct from each other and need to be modeled in somewhat different ways.

Table 1 provides information about appellate court decision-making in each decisional mode, further distinguishing between review of administrative rules on procedural grounds and their review on substantive grounds. In the table, the notation is as follows: H = House of Representatives, S = Senate, P = President, A = Agency, C = Congress, J = Supreme

Court, L = state or local government, J^i= Justice i, $d(x)$ = disposition of case x, y^J = judicially created cut-point, $\underleftarrow{y}^J$= floor on allowable cut-points, $\overrightarrow{y}^J$= ceiling on allowable cut-points. The second column in the table indicates typical players in game theoretic models of the decisional mode. For example, models of substantive review of agency rules typically include players such as an Agency, the Court, but also the House, the Senate, and the President. On the other hand, models of bargaining on a multi-member appellate court focus on the judges themselves. The third column in Table 1 indicates the nature of the court's decision, e.g., a disposition plus the creation of a new rule or a disposition and the veto of a proposed rule. The fourth column indicates the modeling convention associated with the judicial action. Finally, the fifth column indicates the role of the status quo ante in each mode, a somewhat vexed question.

A. Statutory Interpretation and Judicial Rule Making

Here is a definition of statutory interpretation: A court engages in statutory interpretation when it alters or modifies a policy or rule created by a legislature. This is a very broad definition, which covers mild forms such as disambiguation of unclear statutory language, all the way to deliberate substitution by the court of a new rule for the statutorily mandated one.

In models of statutory interpretation, such as Ferejohn and Weingast 1992, Schwartz et al 1994, or Iaryczower et al 2002 , the court creates a policy. In the formalism introduced above, the court creates its own cut-point y^J for use in Equation 1, which it then applies to the instant case to derive the disposition $d(x)$. Presumably the court will use this rule to dispose of future cases, unless Congress over-rules the court's rule by enacting a new statute. A subtlety, indicated in the last column of Table 1, is that under U.S. law Congress has no mechanism simply to veto the court's rule and thereby re-establish the original statutory rule $r(x; y^C)$. Rather, Congress must enact a new statute articulating a new rule $r'(x; y^C)$. The original statutory rule is thus irrelevant once the court acts. The court's rule becomes the

effective status quo, much as the President's unilateral action becomes the effective status quo in models of unilateral executive action (see Moe and Howell 1999, Howell 2003).

B. Administrative Rule-making, Rule Vetoes, and Block-Vetoes

Courts review rules promulgated by administrative agencies. There are a variety of grounds on which a court may do so. However, it is useful to distinguish *procedural review* from *substantive review*. The former determines whether the administrative agency properly followed the procedures specified in the Administrative Procedures Act. The latter typically hinges on whether the agency's interpretation of a statute was proper, that is, whether the agency actually had legislative authority to formulate the rule that it issued. For example, does the Environmental Protection Agency have the authority under the Clean Air Act to regulate carbon emissions from power plants?

In terms of the formalism introduced above, procedural review is straight-forward. The case space can be viewed as "extent of procedural regularity in rule-making," the Agency's rule is a point in this space, and the cut-point in Equation 1 indicates an obligatory level of procedural regularity. If the Agency's rule-making failed to meet or exceed the obligatory level of procedural regularity, the rule fails on procedural grounds. Thus the disposition $d(x) = 0$ denotes a decision in favor of complainant and effectively vetoes the instant rule, while the disposition $d(x) = 1$ denotes a decision in favor of the agency and effectively accepts the instant rule, at least on procedural grounds. Arguably, there is no policy making by the court at all, but simply enforcement of the Administrative Procedures Act. A judicial veto of the instant regulation restores the status quo prior to the issuance of the Agency's regulation. A nearly equivalent formalization would have the Agency propose a policy, and the Court veto or accept the policy (see for instance Ferejohn and Shipan 1990 or Gely and Spiller 1990, discussed in Chapter 11).

Substantive review is a more complex matter. The Agency establishes a rule $r(x, y^A)$ which it intends to use to regulate the conduct of some entities, e.g., firms, individuals,

or state or local governments. (The conduct of these entities becomes the cases x feeding into the Agency's rule.) The Agency justifies its rule via an interpretation of a statute, such as the Clean Air Act or the Food and Drug Act. When the Court reviews the rule on substantive grounds, it may review the Agency's interpretation of the statute, not just the agency's rule-in-hand. Rejecting the Agency's statutory interpretation naturally rejects the Agency's rule-in-hand – but it often implicitly or explicitly rejects many other possible rules as well. And conversely, accepting the Agency's statutory interpretation accepts the Agency's rule-in-hand but may implicitly accept a variety of other possible rules as well.

Using the formal notation, the action by the Court imposes restrictions on the set of possible Agency rules, the set R_x. This restriction may be quite complex. But in the simplified setting of one-dimensional cut-point rules like Equation 1, the Court's actions often take the form of a floor on allowable cut-points ($\underleftarrow{y}^J$), or a ceiling on allowable cut-points ($\overrightarrow{y}^J$). In the former case, any cut-point set by the Agency must exceed $\underleftarrow{y}^J$; In the latter, any cut-point established by the Agency may not exceed $\overrightarrow{y}^J$. In either case, the Court vetoes not a single proposed rule but a block of possible rules, hence its action is a *block-veto*. If the Court strikes down the Agency's rule using a block-veto then, just as in a rule-veto, its action re-establishes the status quo ante. Of course, Congress can legislatively reverse the Court's block-veto, by giving the Agency new statutory authority or by asserting that the Agency's understanding of its prior authority was correct.

C. Constitutional Review and Block-Vetoes

Supreme Court review of statutes or executive action on constitutional grounds strongly resembles substantive review of agency rules, with the obvious difference that Congress cannot legislatively reverse the Court's ruling.

V. Beyond the Basics: Extensibility

Our exposition thus far has outlined the basic structure of case space. These are the concepts and notation that will be used over and over in this book. However, the formalism may be further elaborated to explore other features of adjudication, many of which are of considerable interest to judicial scholars. In this section, we briefly discuss the distinction between evidence and legal facts, and the concept of doctrine and related matters such as legal issues and causes of action. Although the case-space framework can easily accommodate these concepts, to date very little formal analysis has embraced them.

A. Evidence, Facts, and Rules

Disputes may arise for distinct types of reasons. In some cases, the parties might agree about the norms of behavior but disagree about what happened. In a simple property dispute, for example, adjoining landowners A and B may agree that A has no right to construct a building within five feet of the boundary line marking their parcels but disagree about where the boundary line is. Alternatively, the parties may agree about the facts, but disagree about the norms that govern the conduct in dispute. Suppose, for example, that B's property fronts on the ocean and that, under state law, the beach up to the mean high water mark is public. A and B may disagree whether state law grants A the right to cross B's property to reach the public beach.

In most disputes, both what happened – the facts – and the content of the prevailing norms are in dispute. The literature on courts, however, has focused on this second, normative or policy aspect of disputes. This focus somewhat distorts not only the role of courts but how courts apply and create legal rules.

As we discussed, a legal rule is a mapping from a set of legal facts to a disposition. At trial, the finder of fact examines evidence and then draws the factual conclusions that permit the application of the rule. Often the finder of fact has discretion about what facts to find from a given body of evidence. Thus, two fact-finders considering the same evidence may

reach different conclusions of (legal) fact. This discrepancy may easily arise under standards such as "reasonable care" or with respect to legal facts about mental states. We do not observe mental states directly (if they exist at all) and hence on the same evidence one fact finder might find that an agent acted "intentionally" while another fact finder would conclude that she had acted recklessly. There is thus not a unique mapping from evidence into legal facts, and hence no unique mapping from evidence into dispositions.[7]

We motivated our example of a cut-point rule by reference to a negligence rule in which the cut-point constituted the standard of care that the agent must meet. This stylized example has many uses but it surely does not fully capture the fact-finding process and the relation between evidence and legal facts. "Reasonable care" is not a precise rule but a standard; reasonable care refers to the care that a reasonable person would take under the relevant conditions. In the driving example, reasonable care would depend not only on the car's speed but the amount of traffic, the condition of the road, and the weather. As a result one fact-finder might conclude that driving at 50 m.p.h. on a curving road when it is dark and foggy is "reasonable care" and another fact-finder conclude the driver was negligent.

These considerations are real but lie, at present, at or beyond the research frontier. In our opinion, civil procedure is a natural and logical venue for the case space approach. But exactly how this field of endeavor will play out is a matter for the future.

B. Doctrine, Legal Issues, and Causes of Action

The definition of a legal rule as a mapping from a case space into the binary outcome space D essentially treats a legal rule as a list: the rule matches a disposition to each case. In some sense, to resolve the dispute, the court looks down the list until it finds the case before it and then applies the disposition indicated on the list. In a one-dimensional case space with a cut-point rule, reading this list is simple. When the case space has more dimensions, the list may prove very complex with further complexity added by the tangled knots of evidence the fact-finder must consider. A court thus has reason to search for a more perspicuous

way than a list to present the legal rule. A more comprehensible and accessible approach facilitates a high court's management of lower courts as well as making it easier for citizens to comply with the rule.

A legal doctrine – or at least a good doctrine – states the rule in a more perspicuous manner. It does so by decomposing the rule into a set of interrelated but simpler inquiries that are typically called "issues." One may understand each issue as a lower dimensional case space which we may call an issue space S and which we shall write $C_{|s}$; its resolution depends on the partition of that issue space. An issue, that is, is a mapping from some subset of case space $C_{|s}$ into the outcome space D. To resolve the case, the court must then aggregate the resolutions of the issues. If, for example, there are four issues I_j, each defined by an issue space $C_{|s}$ and a mapping $f_s : C_{|s} \rightarrow D$, then the resolution of the case is defined by a function $f^D : D^4 \rightarrow D$. Typically, a doctrine is *conjunctive*; plaintiff wins only if she prevails on each issue; i.e., $f_s(c) = 1$ for each issue s. Put differently $f(c) = \min_s f_s(c)$. As we discuss in Chapter 10, this structure of doctrine presents difficulties on collegial courts when the views of different judges are aggregated into a decision of the court.

Some doctrine is not conjunctive. Some rules direct the court to "balance" a set of legal facts and these doctrines have a different structure. Proportionality tests in the constitutional law of Canada, for example, has this balancing structure as does the rule of reason under US antitrust law.

It is important to distinguish between *a* doctrine and *doctrine*. The latter might be understood as the compendium of individual doctrines. Following Kornhauser 1992b we might understand each doctrine as *a cause of action*. A litigation often consists of multiple causes of action. When the court resolves the dispute, it determines whether plaintiff prevails on each cause of action; she prevails in the litigation if she prevails on one cause of action. The multiplicity of causes of action united in a single litigation identifies an equivocation in our terminology. A "case" colloquially refers to the dispute as a whole; and the opinion written in a case, colloquially understood, will address each cause of action. In our technical

sense, however, each cause of action is a distinct case as it relies on a distinct legal rule and distinct set of facts.[8]

As an example consider contract law. A contract dispute typically arises when the promisee complains that the promisor did not meet its obligations under the contract. To prevail, plaintiff must establish a variety of legal facts. She must first show that, in fact, a contract existed between promisee and promisor. To do so, several issues must be resolved favorably to plaintiff: was there an offer? was there an acceptance? Did the promisee provide consideration to the promisor? Plaintiff must then prove that the promisor did not perform the contract. The promisor might raise various defenses that would excuse performance – mistake, frustration, impossibility. Each of these issues refers to distinct legal facts and requires attention to a subset of the evidence that the fact-finder will consider. This decomposition of the case into distinct issues facilitates the presentation and evaluation of evidence as well as the application of the legal rule to the found facts.[9]

We might represent a doctrine by a decision tree. In the contract case, at the first node the fact finder must determine whether an offer was made or not. To do so, she refers to the relevant evidence. If an offer was not made, the contract cause of action fails and defendant prevails; a disposition of 0 results. If an offer was made, the fact finder proceeds to the next node at which she must determine whether the offer was accepted. If the offer was not accepted, a disposition of 0 is again required. If the offer was accepted, the fact finder proceeds to the next node at which the question of consideration is addressed. This tree structure illustrates the structure of the conjunctive rule. Inducing such decision trees from a statistical analysis of cases is a current research frontier in empirical judicial studies, see e.g., Kastellec 2016. Very little theory has yet been developed for this representation of case spaces, rules, and doctrine.

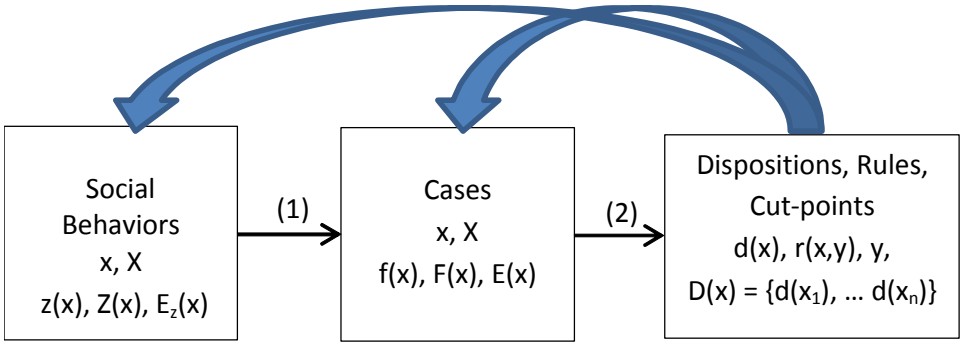

Figure 3: Judicial Actions and Social Consequences. Social behaviors generate cases. In turn, cases generate judicial actions. Then, judicial actions affect social behaviors and cases. See text for further elaboration.

VI. Judicial Actions and Social Consequences

Judicial actions have consequences. So, let's be explicit about some of those consequences (we will return to this material in Chapter 3 when we discuss judicial preferences).

Figure 3 provides a schematic device for thinking about judicial actions and their consequences. Consider the space of possible social behaviors or acts X, for instance, the speed of cars on interstate highways, the care taken by manufacturers, the assembly of citizens to protest government actions, and so on. There is a density of actual social behaviors $z(x)$, a distribution of social behaviors $Z(x)$, and an expected social behavior $E_z(x)$. The distribution of social behaviors or acts gives rise to a set of social costs and benefits (not indicated in the figure) and hence social welfare. In addition, the distribution of social behaviors gives rise to judicial cases. The mechanisms by which a particular social act becomes a particular judicial case are many (indicated by arrow (1) in the figure). These include law enforcement as well as individual decisions to initiate legal action and settle legal disputes. The actual set of legal cases is necessarily a subset of actual social behaviors. So the set of possible legal cases is again X with a given case $x \in X$. And, there is a density of cases $f(x)$, a distribution of cases $F(x)$, and an expected case $E(x)$. Cases in turn give rise to the judicial actions noted in Table 1. The mechanisms by which cases afford judicial action – indicated by arrow (2) in Figure 3 – are the games we analyze in this book. As noted in the figure,

judicial actions include case dispositions, rules, and the selection of cut-points, and also the use of block-vetoes and the creation of floors and ceilings. A series of judicial actions create sets of judicial acts, for instance, the set of case dispositions $D(x)$.

Because people are forward-thinking, judicial actions feed back into social behaviors and hence the cases presented to courts. So, if a judge creates a new rule or changes an old one, this action may well alter the distribution of cases subsequently presented to the court. And it may alter the distribution of bevhaviors in society. Thus, the density of cases presented to the court should more properly be written $f(x; y)$ or perhaps $f(x; D(x))$, and similarly the density of social actions should more properly be written $z(x; y)$ or perhaps $z(x; D(x))$. The extent to which judges anticipate these changes or indeed strive to bring them about, is a complex issue we discuss in the next chapter. But certainly a social analyst may consider how the design and operation of a judiciary – as connoted by arrow (2) – affects the actions of judges, which in turn affect the cases presented to courts and the behavior of individuals and firms in society at large. And those behaviors in turn affect social welfare.

VII. Bibliographic Note

The case-space approach to modeling courts was first formalized in Kornhauser 1992a and Kornhauser 1992b. It has since become a work horse in the applied modeling of courts, though many analysts continue to force courts into a legislative Procrustean bed. Lax 2011 provides a useful review of recent work. The case space approach was initially deployed in an applied model in political science in Cameron et al. 2000., a formal model of certiorari and compliance in the judicial hierarchy with empirical tests. The origin of what we dub a block-veto is an extremely creative paper, Spiller and Spitzer 1992. The small literature on policy floors and ceilings, e.g., due to federal mandates applied to state governments, is highly relevant to judicial action, see Cremer and Palfrey 2000. Kastellec 2016 explores some implications of judicial block-vetoes. With respect to extensibility, a formal model of civil procedure is Sobel 1989. But in general this is a very under-tilled field. The social

welfare properties of specific legal rules is perhaps the central theme of the field of law and economics. However, not surprisingly, relatively fews analyses fully articulate the linkages between judicial behavior, the distribution of legal cases (including the efforts of law enforcement and calculations of potential litigants), the distribution of social behaviors, and social welfare. Though by now somewhat dated, Cooter and Rubinfeld 1989 takes a refreshingly broad view of factors involved in arrow (1) in Figure 3.

A Advanced Examples

The examples in the text involve one-dimensional case spaces with one-parameter cutpoint rules. But the case space approach easily extends beyond the one dimension-one parameter configuration. The following examples illustrate straight-forward ways to extend the basic framework. First we consider a two-dimensional case space with a legal rule characterized by one parameter. Then we consider a single-dimensional case space with a rule characterized by two parameters. One may extend these examples to $n-$dimensional case spaces with $m-$parameter rules. However, we tend to avoid these notationally heavy, insight-light settings

A. A Two-Dimensional Case Space with a One-Parameter Set of Rules

Spiller and Spitzer 1992 suggest that some doctrines in constitutional law can be treated as partitions of a two-dimensional case space – they point to parts of discrimination law and parts of First Amendment law (freedom of speech law). In tort law, relative negligence affords another example. So suppose the case space X has two dimensions. A given case is now a vector (x_1, x_2) (here, subscripts denote dimensions). For concreteness, imagine the case space as the unit square, so the space is $X = [0, 1] \times [0, 1]$.

This two-dimensional space can be partitioned in many different ways. A particularly useful partition uses a cutting line, $x_2 = ax_1 + b$. This set of cut-line rules is the obvious generalization of the cutpoint rules in a one-dimensional case space. In two dimensions, a

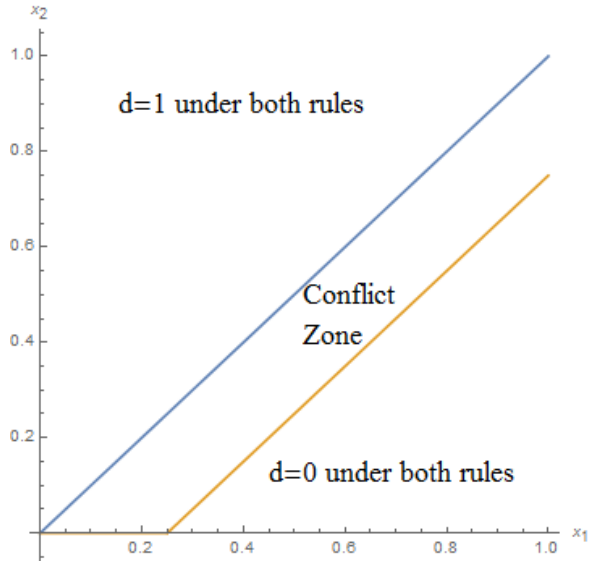

Figure 4: Two dimensional case space with a one parameter rule. The case space is the unit square. The dark line ($x_2 = x_1$) represents the most-preferred rule of the judge. An alternative rule is $x_2 = \max\{x_1 - b, 0\}$. The conflict zone is the space between the two cutting lines. In the figure, $b = \frac{1}{4}$.

cut-line rule partitions the case space into two sets: Cases "above" the line receive one disposition; cases "below" the other. So the enforced rule is:

$$r(x_1, x_2; a, b) = \begin{cases} 1 \text{ if } x_2 \geq ax_1 + b \\ 0 \text{ otherwise} \end{cases}$$

We normalize the judge's most-preferred partition as $x_2 = x_1$, the 45-degree line running from the lower-left corner to the upper-right corner. In other words, the judge's most-preferred rule is $r(x_1, x_2; a = 1, b = 0)$. We assume all other doctrines simply alter the intercept b while retaining the slope parameter $a = 1$. This reduces the characterization of cutting lines to the single parameter, b.

The case space and two cutting lines are shown in Figure 4.

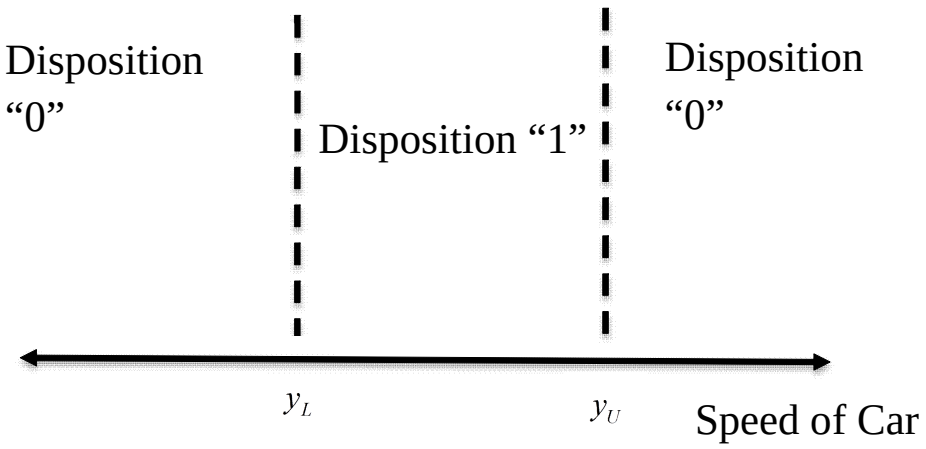

Figure 5: One-Dimensional Case Space with a Two-Parameter Rule. A simple example is minimum and maximum speeds on interstate highways.

B. A One-Dimensional Case Space with a Two-Parameter Set of Rules

Our work horse setting involves a one-dimensional case space with a single cut-point. But single dimension case spaces may be partitioned in more complex ways. A simple example is the speed limits on interstate highways: there is both a floor and ceiling, so that all vehicles must go faster than the minimum speed limit but less than the maximum speed limit. Such a rule is shown in Figure 5.

Here, the parameter y_L denotes the minimum speed limit (a floor) while the parameter y_U denotes the maximum speed limit (a ceiling). Under the indicated rules, cars traveling too slow or too fast are to recieve disposition "0" while cars traveling between the two speed limits are to receive disposition "1."

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Notes

*For helpful comments we thank Sephir Shahshahani and Ben Johnson.

[1]The analysis of legislation might also benefit from a case space approach. As we define below, a rule is simply a partition of case space; statutes are rules and they provide complex partitions of case space. The Internal Revenue Code, for example, partitions a very complex case space into equivalence classes defined by the amount of tax owed.

[2]Both intermediate and supreme appellate courts in common law systems also decide only questions of law while in civil law systems intermediate appellate courts often have the power to find facts as well. International courts similarly address concrete disputes.

Some constitutional courts, however, do not always decide cases. The french Conseil Constitutionelle, for example, initially had only the power to decide the constitutionality of bills referred to it by the Pariliament. These references did not entail the review of concrete dispute.

[3]This approach thus excludes certain constitutional "courts" from consideration or some actions of constitutional "courts" from consideration. The French Conseil Constitutionnel is called a "council" not a "court" for a reason. At its origin, it had only authority for ex ante review of statutes; it thus did not decide cases.

[4]Typically, the choice of remedy is delegated to the finder of fact and hence gives rise to no legal issue on appeal other than whether the fact finder exceeded its discretion. This question is dichotomous and fits within the doctrinal framework developed below

[5]It is worth noting that legislatures do something very different from courts. When a legislature enacts a statute it *defines* a case space and a mapping into some outcome space that need not be D. For instance, statutes define a case space and then a map into an outcome space often R. The internal Revenue Code, for example, maps a complex fact space into an amount of tax owed (which might be negative). The restriction to the outcome space D is thus another characteristic feature of adjudication.

[6]The regions of conflict and consensus are a feature of general rules as well. Consider

two rules R and S each of which partitions the case space X. Let 1^J be the set of points in X, that rule J assigns the value 1 and 0^J the set of points in X that rule J assigns the value 0. Then the region of consenus is simply $(1^R \cap 1^S) \cup (0^R \cap 0^S)$ while the conflict region is simply $(1^R \cap 0^S) \cup (0^R \cap 1^S)$

[7]The fact finder does not have unlimited discretion. A court may hold that on given evidence E no reasonable person could have concluded that defendant was negligent (or in the alternative not negligent). But within the bounds developed by the court the fact finder is unconstrained.

[8]Opinions in actual (colloquiual) cases present even more complex situations than the text suggests. Often an opinion resolves multiple disputes. Two criminal defendants may have been tried together. When each appeals a conviction, the appeals may be joined in a single "case." But the facts relevant to each defendant differ; the opinion thus renders judgment in two distinct cases in the technical sense of case space.

Similarly, a single dispute between the same parties may involve multiple instances of the same cause of action. Consider, for example, *Thornburgh v. Gingles*, 478 US 30 (1986), in which black citizens of North Carolina challenged the state's redistricting plan. More precisely, the plaintiffs contended that seven districts – House Districts 8, 21, 23, 36 and 39 and Senate Districts 2 and 22 – violated section 2 of the Voting Rights Act of 1965 as amended. The dispute thus consisted of 7 identical causes of action. The District Court agreed with plaintiffs and rejected the borders of all seven districts. The Attorney General of North Carolina appealed the District Court decision with respect to five of the seven voting districts. The Supreme Court, in a set of long, complex and contested opinions, affirmed in part and reversed in part. That is, it affirmed the District Court's judgment that four of the five districts at the center of the appeal violated section 2 but reversed with respect to House District 23. Each of the five districts constituted a distinct incident (or case) as each represented a distinct concatenation of legally relevant facts under the statute as interpreted by the Supreme Court of the United States. Indeed, the case yielded

two distinct dispostional majorities: For House District 23, the dispostional vote was 6-3 (Justices Brennan, White, O'Connor, Burger, Powell and Rehnquist in the majority), whereas the dispositional majority was unanimous for the other six voting districts. Thus the statement "affirmed in part, reversed in part" refers to the outcomes in the distinct incidents; for each incident the outcome space is dichotomous.

[9]Doctrine like this might have two distinct forms. The issues might ground the cause of action. Some scholars, for example, understand contract as grounded in the morality of promise. The legal issues thus correspond to moral concerns that promise address.

Alternatively, doctrine may simply be a heuristic that presents the legal rule in a manner that is more easily understood than a list.