Chapter 3: What Do Judges Want? How to Model Judicial Preferences

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Abstract

We discuss a central question in the study of courts: What do judges want? We suggest three different domains that might serve as the basic preferences of a judge: case dispositions and rules, caseloads and case mixes, and social consequences. We emphasize preferences over dispositions on the grounds of plausibility and tractability. We then identify desireable properties of dispositional utility functions and the relationship between dispositional utility and expected utility for rules. We examine the impact on expected rule utility from case distributions that are sensitive to the enforced rule. We illustrate how to combine diposi-tional utility with efforts costs and time constraints. We provide examples of case spaces, dispositional utility functions, and expected utility functions for enforced rules.

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

Introduction

Every rational choice model has the same structure: it identifies (1) the agents and their preferences, (2) the choices available to the agents, and (3) the environment in which the agents choose. The prior chapter addressed the second element of a rational choice model. We argued that judges and courts always render judgment and sometimes announce rules. In addition, we described one key feature of the environment in which courts decide: cases. At the very least, cases are the *occasion* for a judicial decision that announces or modifies a rule. More than that, in many models the case environment strongly affects the content of rules. And of course cases are an essential part of case dispositions. Subsequent chapters move beyond the case environment to explore the varied settings in which judges act: in splendid isolation, as one of a sequences of judges, within a hierarchy, as one of several judges on a panel, or as a member of one political institution among many.

In this chapter we address the first element: What do judges want? This is perhaps the single most vexed element in rational choice accounts of adjudication.

There are at least three reasons why this question has proven so thorny. The first (and least important) involves a confusion between the normative and the positive. Vast literatures address the question, what *should* judges want? Some of this literature is deeply philosophical; other parts, merely partisan. But in either case, this is not our question. Rather, our focus is on useful ways to think about what judicial preferences are, not what they should be (though on occasion we discuss the normative implications of a positive analysis).

The second and more profound difficulty arises from the nature of the labor contracts under which judges typically operate. Consider federal judges in the United States. These judges have life tenure, their salaries cannot be decreased, they do not receive performance rewards or bonuses, and they have little prospect of promotion. The standard assumption of narrow economic self-interest thus provides little purchase on the preferences and choices of federal judges. What about state judges? In many states, judges are elected for a term.

But even here we might be skeptical that the standard assumption in political science, that elected officials are single-minded seekers of re-election, offers more than partial leverage on understanding judicial behavior. After all, most decisions in most cases by most judges impinge very little on the electorate or interest groups.[1] Finally, judges in civil law jurisdictions are typically civil service bureaucrats. There, we might question to what extent prospects for promotion or plum assignments rather than professional norms or other factors drive their decisions.[2] In sum, typical judicial labor contracts imply that intrinsic motivations rather than purely extrinsic ones are apt to loom large. But how should we model the intrinsic motivation of judges?

Third, taking judicial actions seriously creates challenges. As discussed in Chapter 2, courts often take two actions – rendering judgment and creating rules – not one. A judicial utility function must therefore connect to both classes of actions. But how? How does one model preferences over case dispositions? Are preferences over rules for disposing cases distinct from preferences over the dispositions themselves? Or are the two linked in some fashion? Should we think of judicial motivations over dispositions and policy as expressive and short-sighted, or consequentialist and deeply strategic? Finally, is there more to judicial utility than judgments and policy, for example, a taste for leisure?

In this chapter, we try to offer clear and logical answers to these questions. Here, in a nutshell, is the essence of our approach.

First, we reject the idea that judges are near-omniscient social planners whose decisions are tightly linked to anticipated social consequences. Instead, we treat judges as primarily concerned with the cases in front of them. This means that the basic building block of

[1] There are exceptions, for example Caldarone et al 2009 and Canes-Wrone et al 2014 show that the sentencing behavior of state supreme court judges in abortion and capital punishment cases follows the election cycle. In rare cases, such as the infamous retention election of Rose Bird as chief justice of the California Supreme Court, a specific decision or series of decisions – in Bird's case, the striking down of the death penalty – plays a central role in the election. Bird was not retained; and, there is evidence that this result influenced the behavior of other Justices of the California Supreme court. See Brown 2007.

[2] Ramseyer and Rasmusen 1997 study the Japanese judiciary and argue that promotion and assignment to courts in desirable jurisdictions with desirable dockets in fact plays a substantial role in explaining judicial behavior. However, Haley 1995 contests their claim.

judicial utility is a *dispositional utility function* evaluating the treatment of the instant case. However, embedded in a dispositional utility function is a value judgment about the "correct" or the "best" disposition of possible cases – in essence, a notion of an ideal rule. This embedded judgment – in our models, often in the form of a particular cut-point – may reflect conceptions of morality, ethics, ideology, or social engineering but we take it as a primitive. Second, though judges are primarily motivated by disposing of cases "correctly," it is often sensible to think of them anticipating the application of a dispositional rule to future cases. We show how this anticipation gives rise to a policy evaluation of a rule. The anticipation approach thus unifies dispositional utility and policy utility – the two are not at all separate but simply two sides of the same coin.

The chapter proceeds in the following way. First we ask, what do judges value? We identify three possibilities: dispositions and rules, case loads and case mixes, and social consequences. We discuss how implausible the third possibility is, and provide a simple example in the Appendix. Instead, we argue that judges should be seen as judicial workers rather than social planners. We then turn to dispositional utility and its relationship with rule utility. We lay out desirable properties for dispositional utility functions and demonstrate how the anticipation approach unifies dispositional utility and rule utility. We provide numerous examples both in the text and in the Appendix, showing how to derive policy utility from dispositional utility – and why the converse approach is unsatisfactory. We then turn to what is sometimes called a "labor market" theory of judging, in which judges face time constraints and effort-costs and may value leisure. We provide a simple illustration showing how to set such models in case space with dispositional utility. In the penultimate section, we briefly discuss expressive and consequential utility and distinguish models with common values from those with private values. Later chapters return to those themes many times. We conclude by briefly discussing some implications of our approach for debates about "legal formalism" versus "legal realism" and "law versus politics." The Bibliographic Notes indicates landmark papers.

We do not claim to offer the final word on the subject of what judges want. Indeed, we believe no one answer or approach can be completely satisfying. We try to be candid about the limitations of our approach. But we do believe the reader will leave this chapter equipped with a flexible, powerful, and imminently usable apparatus for modeling judicial motivations.

What Do Judges Value?

A clear connection between judicial preferences and judicial actions is a *sine qua non* for any positive political theory approach to courts. But should we view judicial preferences over dispositions and rules as primary, or as induced by fundamental preferences over some other entity such as social behavior?

To grasp the point, consider again Figure 3 from Chapter 2, reproduced here as Figure 1. As shown in the figure, one can distinguish three inter-linked entities: 1) judicial actions (disposing cases and creating rules), 2) judicial cases including the volume and mix of cases, and 3) social behaviors. We claim that a theorist may ground models of judicial behavior on any one of these three entities. For example, one may take judicial preferences as primarily about social behavior, with induced preferences about case loads, dispositions, and rules. One might call this the "social planner" view of judges. Or, one could view judicial preferences as fundamentally about case loads and case mixes, with induced preferences for dispositions and rules, and with consequences for social behavior. One might call this the "judicial administrator" view of judges. Or, one may take judicial preferences as primarily about dispositions and rules. Then, dispositional utility and rule utility shape judicial actions, with consequences for the mix and volume of cases and for the behavior of individuals and firms in society. One might call this the "judicial worker" view of judges.

Which of the three possible views is the correct or best one for building models of judicial behavior? We strongly favor the judicial worker view, primarily on grounds of plausibility

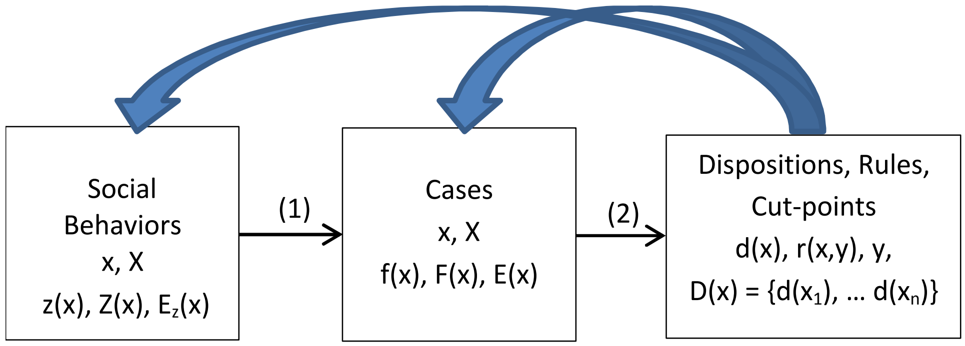

Figure 1: Judicial Actions and Social Consequences. Social behaviors generate cases, via law enforcement and private legal actions. In turn, cases generate judicial actions. Then, via feed back (the larger arrows in the figure) judicial actions affect social behaviors and cases.

and simplicity. But the others are genuine contenders as well. Of these, perhaps the most intriguing is the social planner view, in which judges have fundamental preferences over social behaviors and only induced preferences over dispositions and rules. This view may be particularly appealing to those trained in the utilitarian social planner tradition of public economics and welfare economics. So let's take a closer look at this approach, if only to show how implausible it truly is, before turning to the theory of judicial workers.

Social Planners in Black Robes?

Suppose judges were social planners in black robes. In other words, imagine them as deeply strategic, almost omniscient social engineers dedicated to improving society. How would they set rules and dispose of cases? It easy to see that judges would need to:

- Identify socially optimal behavior,
- Evaluate the costs and benefits of departures from optimal behavior,
- Appreciate the intensity of law enforcement and accuracy of case dispositions, given a judicial rule,
- Understand the sensitivity of social behaviors to the intensity of law enforcement and judicial case dispositions,

- Grasp the costs of law enforcement, and
- Appreciate the costs of case processing.

The judge would use this knowledge to set a rule and decide cases to best shape social behavior. A judge capable of these feats makes Ronald Dworkin's super-human philosophical wrangler "Judge Hercules" look like a piker! So, let's call this figure Judge Zeus.

In the Appendix we present a simplified model of Judge Zeus at work. What is the principal take-away from this example, as contrived and incomplete as it is? First, the knowledge required to identify the best of all possible worlds and trace back from that desired state, through a chain of implementation, to an expressed judicial rule is formidable. More than that, the mental gymnastics involved seem to violate descriptions of what judges actually do – including first-hand accounts by judges themselves (O'Brien 2012). This does not mean that judges have no notions about socially desirable rules, and indeed some judges explicitly address such matters in their opinions (Ursin 2009). Nonetheless, the "top-down," social planner view of judging seems badly amiss. Let's try again, starting much closer to what judges actually do.

Dispositions, Rules, and Consequences

Assume instead that judges care fundamentally about dispositions. What would this mean, and what are the implications?

Valuing Dispositions

Suppose a judge values the correct and incorrect disposition of cases. Obviously, *ceteris paribus*, Judge i prefers a correct to an incorrect disposition. We can thus describe her utility function over the entire case space X by recalling from Chapter 2 the definition of the judge's ideal rule $r(x_t; \overline{y}^i)$ which simply identifies Judge i's preferred disposition in case

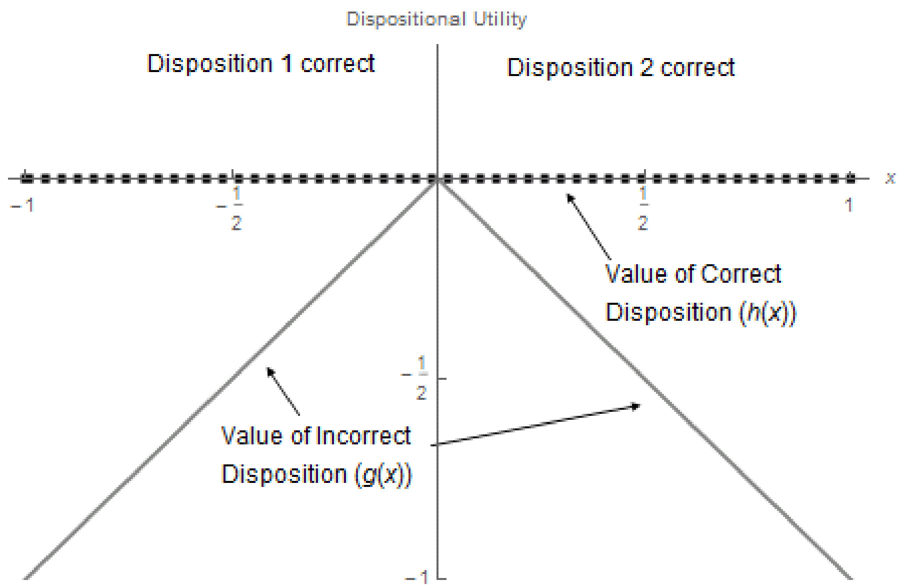

Figure 2: A Dispositional Utility Function. The x-axis is the case location. The judge's most-preferred cut-point $\overline{y} = 0$. Cases to the left of $\overline{y}$ should receive $d = 1$ while those to right of $\overline{y}$ should receive $d = 2$. The utility value of a correct disposition is 0 (shown by the black dashed line). The utility value of an incorrect disposition is $-|x - \overline{y}|$, shown by the solid gray line.

x_t. Specifically, utility for Judge i in each period t is determined by the *dispositional utility function*

$$u_t^i(d_t, x_t; \overline{y}^i) = \begin{cases} h(x_t; \overline{y}^i) \text{ if } d_t = r(x_t; \overline{y}^i) \\ g(x_t; \overline{y}^i) \text{ if } d_t \neq r(x_t; \overline{y}^i) \end{cases} \tag{1}$$

where $\overline{y}^i$ connotes Judge i's most-preferred partition of the fact-space, for example, her most-preferred cut-point.[3] In words, Judge i receives $h(x_t; \overline{y}^i)$ if she disposes of the case "correctly," that is, she reaches the *same disposition as if she employed the rule incorporating her most-preferred cutpoint* $\overline{y}^i$. Conversely, Judge i receives $g(x_t; y^i)$ if she disposes of the case "incorrectly," that is, she reaches a different disposition from the one indicated by the rule incorporating Judge i's preferred cutpoint.[4]

[3] The formalism here is not restricted to cut-point rules. Rather, $\overline{y}^i$ could represent any partition. The key feature is that the judge receives $h(x_i, \overline{y}^i)$ when the court's disposition corresponds to the disposition she would have reached under the partition $\overline{y}^i$; she receives $g(x_i, \overline{y}^i)$ otherwise.

[4] We might, that is, understand each judge as having a state-dependent utility function according to which she always better off with a correct dispostion (state 1) than with an incorrect disposition (state 2). However, the judge makes a choice over the "states."

In what follows we shall generally take dispositional utility functions of the form of Equation 1 as fundamental. They are the building block for modeling preferences in action.

To make matters more concrete, Figure 2 displays a typical dispositional utility function. As drawn in the figure, the judge's ideal cut-point $\overline{y} = 0$. Thus, all cases to the left of the cut-point (so $x < \overline{y}$) should receive one disposition while all cases to the right of the cut-point ($x > \overline{y}$) should receive the other disposition. In this particular function (the linear loss function) $h(x) = 0$ and $g(x) = -|x - \overline{y}|$. So, if the judge renders the correct disposition, she receives a payoff of 0 (the dark dashed line in the figure) But if she renders an incorrect disposition, she receives a loss that is linearly increasing in the distance between the case and the judge's ideal cut-point (the solid gray line in the figure). In some sense, an incorrect disposition in an "easy" or clear-cut case is worse than an incorrect disposition in a "hard" case, one that almost legitimately could have received the other disposition. The linear loss function turns out to be quite an attractive dispositional utility function but we discuss several other possibilities shortly.

Induced Preferences over Policy

A dispositional utility function indicates the utility value of possible *dispositions* of a case. In contrast, policy utility indicates the utility value of different *rules* for disposing of cases. How should one ground policy utility? One possibility, sometimes employed in early models, was simply to express an arbitrary policy utility function, for instance, a function yielding a quadratic loss in the distance between the ideal cut-point and an existing or enforced cut-point. Thus, a judge would receive some utility from disposing of cases correctly or incorrectly, and would also receive a separate utility from announcing a policy. One might call this the "dual utility" approach to dispositions and rules. The dual utility approach faces a logical problem: if disposing of cases is fundamental, there ought to be a close relationship between dispositional utility and policy or rule utility. They should not be unconnected entities.

Fortunately, the two can be linked very tightly, by using what we call the "anticipation approach." The essential intuition is that the value of a rule derives from the actual dispositions (correct or incorrect) that the rule induces. For example, consider two "speeding" rules, one with a cut-point (speed limit) of 100 m.p.h. and one with a cut-point of 120 m.p.h. Suppose that all cars travel less than 100 m.p.h. Then application of both rules yields exactly the same dispositions. If so, the utility value of the two rules ought to be the same. However, if there were cars with speeds between 100 and 120, some cases would be disposed of differently under the two rules and, to the extent this is true. their utility values ought to differ.

How can one implement these simple intuitions? Rather simply, the dispositional utility function in Equation 1 extends straightforwardly to expectations, to yield the expected value of dispositions given the rule and a distribution of cases. So, we may speak of the expected utility of the rule $r(x;y)$ employed by the judge to decide the cases.More specifically, assume each case is drawn from a distribution of cases $F(x)$ with density $f(x)$ and support $S = [\underline{s}, \overline{s}]$. The distribution of cases before the judge reflects the behavior of private agents given their circumstances and the prevailing legal rules, the operation of law enforcement, and the dynamics of litigation. The expected utility of dispositions from employing rule $r(.)$ is then

$$v^i(r(x_t, y)) = \int_S u_t^i(d_t, x_t; \overline{y}^i | d_t = r(x_t, y)) f(x_t) dx \tag{2}$$

This is the expected utility from deciding cases using the rule, given the distribution of cases. If the judge is able consistently to dispose of cases using a rule with her most-preferred cut-point $\overline{y}^i$, this expression becomes $\int_S h(x_t; \overline{y}^i) f(x_t) dx$, in words the expected value of correct dispositions given the distribution of cases. (The value of a correct disposition may vary across cases because it may be more important to correctly decide some cases than others – we return to this point below). But if the judge is obliged to decide some cases using a rule that employs a cut-point other than her most-preferred one – that is, she must implement $r(x_t; y)$ rather than $r(x_t; \overline{y}^i)$ – then $v^i(r(x_t, y))$ may involve a mix of the payoffs $h(x_t; \overline{y}^i)$ and $g(x_t; \overline{y}^i)$, with the expected mix depending on the distribution of cases relative to the two cut-points. We provide some concrete examples shortly.

The central point to grasp is: dispositional utility depends on the treatment of cases, while expected policy utility depends on both the treatment of cases required by a rule *and* the distribution of cases to which the rule will be applied.

To go further, we must impose more structure on the dispositional utility function $u_t^i(d_t, x_t; \overline{y}^i)$ and consider plausible distributions of cases.

Properties of Dispositional Utility

We return to treating preferences over dispositions as fundamental and consider in more detail desirable properties of dispositional utility functions. We identify three properties as important: 1) Correct distributions are better than incorrect dispositions (CDAB), 2) Increasing differences in dispositions (IDID), and 3) Policy consistency (PC). A fourth property is also implicit: a given dispositional utility function plus a distribution of cases implies a single expected utility of rules function, but a given expected utility of rules function may be generated by many dispositional utility functions and case distributions. We discuss each property in turn.

Property 1: Correct Dispositions are Better (CDAB)

The following property is surely the most fundamental property of dispositional utility:

- $h(x_t; \overline{y}^i) \geq g(x_t; \overline{y}^i)$ for all x_t

In words, the correct disposition of a case is (weakly) better than the incorrect disposition of the same case. Call this the CDAB condition. We will typically employ a slightly stronger version of CDAB: $h(x_t; \overline{y}^i) > g(x_t; \overline{y}^i)$ for all $x_t \neq \overline{y}^i$.

Preferences that violate CDAB would be very strange; indeed such preferences would call into question what the judge could possibly mean by a correct disposition.

Valuing Dispositions and Rules with a CDAB Utility Function

Here is an example of a dispositional utility function that displays CDAB:

$$u_t^i(d_t; x_t, \overline{y}^i) = \begin{cases} 0 \text{ if } d_t = r(x_t, \overline{y}^i) \text{ [correct dispositions]} \\ -\left|\overline{y}^i - x_t\right| \text{ if } d_t \neq r(x_t, \overline{y}^i) \text{ [incorrect dispositions]} \end{cases} \tag{3}$$

This utility function, a linear loss function, displays CDAB because the value of a correct disposition of case x_t has value 0 while the incorrect disposition of the same case yields $-\left|\overline{y}^i - x_t\right|$, which is less. So the correct disposition of cases is better than an incorrect one, for all cases except when the case lies exactly at the cutpoint. This is the function shown in Figure 2.

Note that Judge i's utility depends upon the actual disposition d_t of the instant case. But this disposition reflects the rule applied by the judge to the case, and that rule may not be her most-preferred one. For example, she may be obliged to decide the case using a rule formulated by the Supreme Court or imposed by Congress in legislation. What the dispositional utility function indicates is how the judge evaluates the disposition she made.

Figure 3 uses the utility function in Equation 3 to illustrate dispositional utility. In the figure judge L has a most-preferred cut-point of $\overline{y}^L = 0$. In other words, her most-preferred rule is

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

But in the example the governing rule she must apply to the case has the cutpoint $y^C = \frac{1}{2}$.

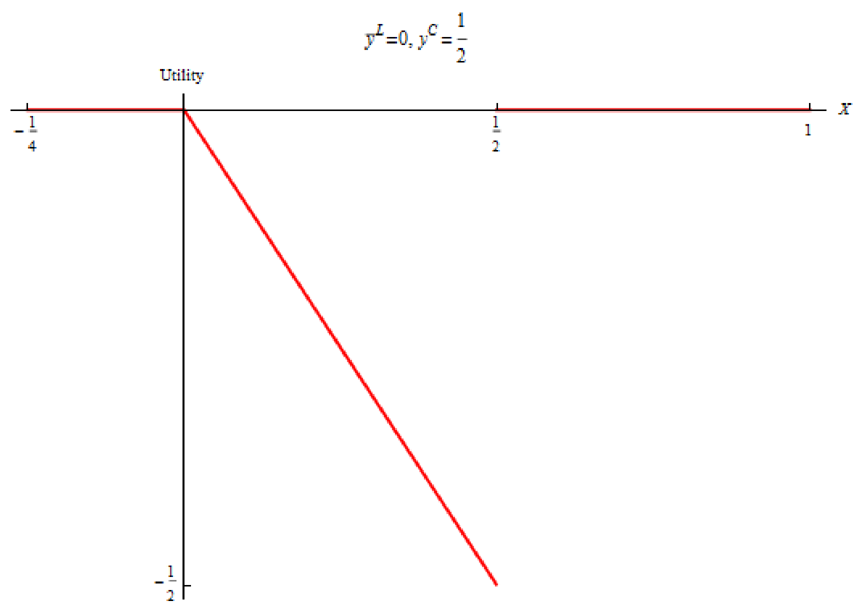

Figure 3: Dispositional utility function for Judge L when cutpoint y^C is required. The case space is the horizontal axis, X; a particular case x is a point on the line. Judge L's ideal cutpoint is $\overline{y}^L = 0$. For cases to the left of this cutpoint, L would prefer disposition 0; for cases to the right, she would prefer disposition 1. Given the required cutpoint y^C, L sees the disposition of cases $x < 0$ and $x > \frac{1}{2}$ as correct, hence yielding utility of 0. But L sees cases falling in the conflict region $[0, \frac{1}{2}]$ as incorrectly decided and therefore yielding utility $-\left|x - \overline{y}^L\right|$.

In other words, the rule she is obliged to follow is

$$r(x;y^C)=\begin{cases} 1 \text{ if } x \geq \frac{1}{2} \\ 0 \text{ otherwise} \end{cases}$$

As shown in the figure, for a case actually located at the most-preferred cutpoint itself the judge is indifferent between the two dispositions. But farther from the most-preferred cutpoint, the utility differential between a correct and incorrect disposition is larger and increases in the distance between the case and the most-preferred cutpoint $\overline{y}^L = 0$. A case far from the cutpoint that is incorrectly decided (e.g., a case $x_t = \frac{1}{4}$) creates more disutility than an incorrectly decided cases closer to the most-preferred cut-point. For cases located above $y^C = \frac{1}{2}$, however, Judge L can render a disposition she views as correct, so her utility returns to that for a correct disposition.

Figure 3 displays the dispositional utility Judge L receives from case-by-case application of the rule with cut-point $y^C = \frac{1}{2}$. But this case-by-case dispositional utility is not the same for the judge as the expected utility from application of the rule to cases. To calculate the expected utility to Judge L from the rule with cut-point $y^C = \frac{1}{2}$, we need to know the distribution of cases the judge faces. So, suppose that distribution $F(x)$ is uniform on $\left[-\frac{1}{4}, \frac{5}{4}\right]$. This distribution has density $\frac{2}{3}$.Then Judge L's expected utility from the $y^C = \frac{1}{2}$ rule is: $\int_{-\frac{1}{4}}^{0} \frac{2}{3}(0)dx + \int_{0}^{\frac{1}{2}} -\left|\overline{y}^i - x_t\right| (\frac{2}{3})dx + \int_{\frac{1}{2}}^{\frac{3}{4}} \frac{2}{3}(0)dx = -\frac{1}{2}$.

More generally, let $F(x) = U[m-\varepsilon, m+\varepsilon]$, with ε large enough so that the uniform distribution straddles both $\overline{y}^i$ and y^C.Then, using the dispositional utility function in Equation 3, the expected utility to Judge i from using the y^C rule is $\int_{\overline{y}^i}^{y^C} -\left|\overline{y}^i - x_t\right| (\frac{1}{2\varepsilon})dx = -\frac{1}{4\varepsilon}\left(\overline{y}^i - y^C\right)^2$. Thus, the expected utility of the rule is a scaled quadratic loss function using the two cut-points. This utility function over policies is rather special but it is very convenient.

Property 2: Increasing Differences in Dispositions (IDID)

The second property, Increasing Differences in Dispositions (IDID), is intuitively plausible and often is important, for example, in our simple model of stare decisis. presented in Chapter 5 and in Beim, Hirsch and Kastellec's whistle-blowing model presented in Chapter 7. In fact, IDID is important whenever it is important to distinguish not simply correctly from incorrectly decided cases, but more incorrectly decided cases among the incorrectly decided ones (or, more correctly decided cases among the correctly decided ones). We have already seen this property in the dispositional utility function in Equation 3, the linear loss dispositional utility function. The property is easily stated:

- $h(x_t; \overline{y}^i) - g(x_t; \overline{y}^i)$ is strictly increasing in $\left|x_t - \overline{y}^i\right|$, that is, the utility difference between the payoff for a correct disposition of a case and the payoff for an incorrect disposition of the same case, is increasing in the distance of the case from the ideal cut-point

IDID can arise from either or both of the following subsidiary conditions (with at least one condition holding strictly):

$h(x_t; \overline{y}^i)$ is (weakly) increasing in the distance $\left|x_t - \overline{y}^i\right|$ (a correctly disposed case far from the preferred cutpoint yields (weakly) greater utility than a correctly disposed case closer to the preferred standard); and

$g(x_t; \overline{y}^i)$ is (weakly) decreasing in the distance $\left|x_t - \overline{y}^i\right|$ (an incorrectly disposed case far from the preferred cutpoint yields (weakly) less utility than an incorrectly disposed case closer to the preferred cutpoint).

As an example, the constant gain dispositional utility function from Example 4 (below)

$$u_t^i(d_t; x_t, \overline{y}^i) = \begin{cases} h(x_t; y^i) = 1 \text{ if } d_t = r(x_t, \overline{y}^i) \text{ [correct dispositions]} \\ g(x_t; y^i) = 0 \text{ if } d_t \neq r(x_t, \overline{y}^i) \text{ [incorrect dispositions]} \end{cases}$$

displays CDAB and policy consistency but violates the IDID property. The functions $h(x_t; y^i) = 0$ and $g(x_t; y^i) = -(x_t - y^i)^2$ display CDAB, policy consistency, and IDID.

Property 3: Policy Consistency (PC)

The third property is more subtle. It requires that the rule yielding the judge her greatest utility in expectation corresponds to the rule incorporating her (supposed) most-preferred cut-point as applied case-by-case in adjudication, hence, "policy consistency" (PC). If PC holds, correct case-by-case adjudication of disputes (according to her own lights) is consistent with a judge's selection of the "best" rule considered as a policy choice. If policy consistency holds, the judge faces no incentive to deviate from correct case-by-case correct judgments in order to implement a "better" rule, nor would she wish to deviate from the "best" rule when confronted with the realities of case-by-case dispositions required by the rule.

Policy consistency might seem to follow automatically from case-by-case adjudication using the most-preferred cut-point. That is, one may ask, what rule could be better than correctly deciding all cases, i.e., the rule that yields $v^i(r(x_t, y)) = \int_S h(x_t; \overline{y}^i) f(x_t) dx$? The answer involves an important subtlety: *agents change their behavior in response to legal rules.*

A fundamental assumption underlying much of the social scientific analysis of law is that private agents alter their behavior in response to the legal rules being enforced. If not, the administration of law simply becomes organized revenge! This altered behavior provokes a new set of disputes; and from this set of disputes, the dynamics of enforcement, settlement, and litigation yield a distribution of cases appearing before the court. As a result, the distribution of cases brought before judges is apt to change when the judges change the rule in effect. This aspect of law is potentially quite important in the case-space approach to modeling courts because when evaluating and choosing among rules, *the expected utility of* *a rule to a judge should reflect the new distribution of cases induced by the rule.*[5]

We do not explicitly model the response of private agents to changes in legal rules, nor the operation of law enforcement and dynamics of litigation which together yield cases before magistrates. In fact, we sometimes assume for tractability that the distribution of cases is fixed or that judges ignore the long-run impact of rule changes on case distributions. Instead, for simplicity we assume case distributions shift in sensible ways reflecting changes in the legal rule. For example, one might assume the distribution $F(x; y)$ is centered at the enforced cutpoint y. So, a higher cut-point shifts the distribution of cases upwards.

The distribution of cases around y may take many forms. If the cases cluster tightly around y, the case-generation process is in the spirit of a Priest-Klein model of disputing. However, the case-generation process may yield many cases far from the expected prevailing rule so that some agents' behaviors are quite egregiously illegal (perhaps they hoped not to be caught). Assumptions about the shape of the distribution of cases turn out to be surprisingly important.

When case distributions shift with a judge's rule, the issue of policy consistency arises because if the judge deviates from the rule employing her (supposed) most-preferred cut-point, the ensuing change in the distribution of cases may yield greater expected utility for the judge than adhering to the rule with the (supposed) most-preferred cut-point. In that sense, her most-preferred policy is inconsistent with her most-preferred cut-point.

Consider again Equation 2 but now note the dependency of the distribution on the enforced cut-point

$$v^i(r(x_t, y)) = \int_S u_t^i(d_t, x_t; \overline{y}^i | d_t = r(x_t, y)) f(x_t; y) dx$$

Define $y^* = \arg\max v^i(r(x_t, y))$. In words, y^* is the expected utility maximizing cut-point, taking into account the induced shifts in case distribution. The PC property is

[5] More strongly, the evaluation of the legal rule would depend on the social consequences which include all of the changes in behavior, not simply the changes in the set of disputes that arrive in court.

- $y^* = \overline{y}^i$

In words, the judge's ideal cut-point in case-by-case adjudication corresponds to the ideal rule taking into account the response of cases to rules, and the ideal rule given the response of cases to rules reflects the judge's most-preferred cut-point in case-by-case adjudication.[6]

To better grasp what policy consistency means, consider two rules, the first incorporating the most-preferred cut-point $\overline{y}^i$ and the second an alternative cut-point $y\prime$ with $\overline{y}^i < y\prime$. For example, in Figure 2 in Chapter 2, imagine $\overline{y}^i$ corresponds to $y^L$and $y\prime$ corresponds to y^R. It will be seen that if the judge employs the former rule and hence receives the "correct disposition" payoff in the conflict zone as well as the consensus regions on the left and the right, she receives in expectation:

$$v^i(r(x_t, \overline{y}^i)) = \int_{\underline{s}}^{\overline{y}^i} h(x_t; \overline{y}^i) f(x_t; \overline{y}^i) dx + \int_{\overline{y}^i}^{y\prime} h(x_t; \overline{y}^i) f(x_t; \overline{y}^i) dx + \int_{y\prime}^{\overline{s}} h(x_t; \overline{y}^i) f(x_t; \overline{y}^i) dx$$

However, suppose she employs the $y\prime$ rule so she receives the "correct disposition" payoff in both consensus regions but the "incorrect disposition" payoff in the conflict zone, hence

$$v^i(r(x_t, y\prime)) = \int_{\underline{s}}^{\overline{y}^i} h(x_t; \overline{y}^i) f(x_t; y\prime) dx + \int_{\overline{y}^i}^{y\prime} g(x_t; \overline{y}^i) f(x_t; y\prime) dx + \int_{y\prime}^{\overline{s}} h(x_t; \overline{y}^i) f(x_t; y\prime) dx$$

Using the rule with $y\prime$ necessarily imposes utility losses in the conflict zone, relative to using the rule with $\overline{y}^i$. But, the two distributions are *not* the same so that there may be utility gains in the consensus regions. The requirement for policy consistency is that

$$\int_{\overline{y}^i}^{y\prime} h(x_t; \overline{y}^i) f(x_t; \overline{y}^i) dx - \int_{\overline{y}^i}^{y\prime} g(x_t; \overline{y}^i) f(x_t; y\prime) dx \geq \int_{\underline{s}}^{\overline{y}^i} h(x_t; \overline{y}^i) f(x_t; y\prime) dx + \int_{y\prime}^{\overline{s}} h(x_t; \overline{y}^i) f(x_t; y\prime) dx$$
$$- \left(\int_{\underline{s}}^{\overline{y}^i} h(x_t; \overline{y}^i) f(x_t; \overline{y}^i) dx + \int_{y\prime}^{\overline{s}} h(x_t; \overline{y}^i) f(x_t; \overline{y}^i) dx \right) \forall y\prime > \overline{y}^i \quad (4)$$

In words, the losses in the conflict zone must outweigh any gains in the consensus regions,

[6] If a set of cut-points maximizes Equation 2 then the requirement is that $\overline{y}^i$ be a member of the set of maximizers.

for all $y\prime > \overline{y}^i$ (a similar condition must hold for all $y\prime > \overline{y}^i$).

Two analytic results are immediate. The first is rather trivial.

Proposition 1. If the distribution of cases $F(x)$ is invariant to the enforced partition y, policy consistency is necessarily satisfied under CDAB (i.e., $y^* = \overline{y}^i$).

Proof. If $F(x; \overline{y}^i)$ is identical to $F(x; y\prime)$, then from inspection of Equation 4 the RHS of the equation must be 0 and the LHS must be positive (from CDAB). So the policy consistency condition is satisfied. ■

The following result is more useful.

Proposition 2. If the distribution of cases $F(x; y)$ shifts with the enforced partition y, the following condition on dispositional utility is sufficient to assure policy consistency: 1) the value of correctly disposed cases $h(x_t; \overline{y}^i) = 0 \; \forall x_t$ and 2) the value of incorrectly disposed cases $g(x_t; \overline{y}^i) < 0 \; \forall x_t \neq \overline{y}^i$.

Proof. From inspection of Equation 4, if $h(x_t; \overline{y}^i) = 0 \; \forall x_t$ then the condition becomes: $-\int_{\overline{y}^i}^{y\prime} g(x_t; \overline{y}^i) f(x_t; y\prime) dx \geq 0$. And this must be true if $g(x_t; \overline{y}^i) < 0 \; \forall x_t \neq \overline{y}^i$. ■

Some examples of dispositional utility may be helpful.

Example 1: Linear Rewards for Correct Disposition, Uniform Distribution Centered on y

Suppose the judge's dispositional utility function is:

$$u_t^i(d_t; x_t, \overline{y}^i) = \begin{cases} \left|\overline{y}^i - x_t\right| \text{ if } d_t = r(x_t, \overline{y}^i) \text{ [correct dispositions]} \\ 0 \text{ if } d_t \neq r(x_t . \overline{y}^i) \text{ [incorrect dispositions]} \end{cases}$$

With this dispositional utility function, the judge receives 0 for an incorrectly decided case but receives a benefit from a correctly decided one, a benefit that increases linearly in the distance between the case and the cut-point. In some sense, the judge receives more satisfaction from correctly deciding an easy case than a hard one.

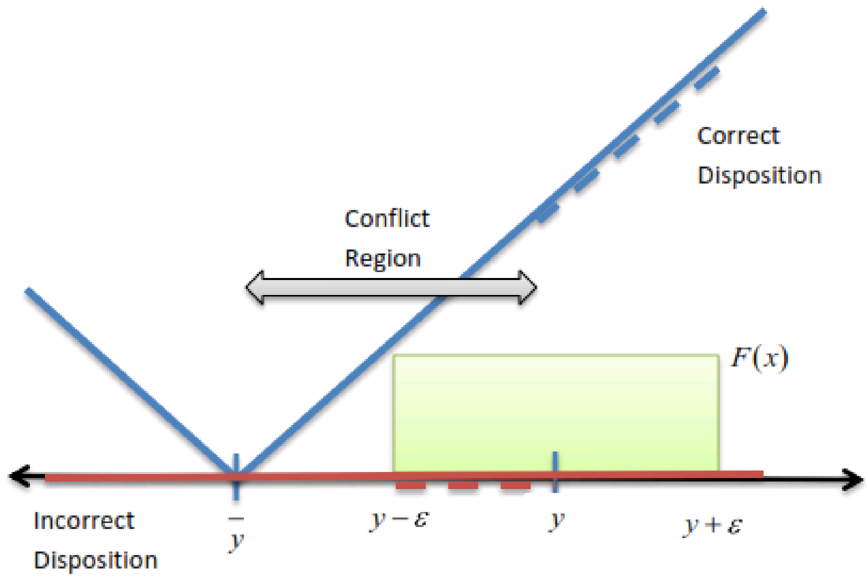

Figure 4: Policy Inconsistency.

Let us further suppose that the distribution of cases takes the very simple form $F(x,y) = U[y-\varepsilon, y+\varepsilon]$. In evaluating the expected utility of a rule, there will be 4 cases to consider: 1) $y+\varepsilon < \overline{y}^i$ (the entire distribution is below $\overline{y}^i$), 2) $y < \overline{y}^i < y+\varepsilon$ (the distribution straddles $\overline{y}^i$ and $y < \overline{y}^i$), 3) $y-\varepsilon < \overline{y}^i < y$ (the distribution straddles $\overline{y}^i$ and $y > \overline{y}^i$), and 4) $\overline{y}^i < y-\varepsilon$ (the entire distribution lies above $\overline{y}^i$). Some algebra shows that

$$v^i(r(x_t, y)) = \begin{cases} \int_{y-\varepsilon}^{y+\varepsilon} \frac{\overline{y}^i - x}{2\varepsilon} dx = \overline{y}^i - y \text{ (case 1)} \\ \int_{y-\varepsilon}^{y} \frac{\overline{y}^i - x}{2\varepsilon} dx + \int_{\overline{y}^i}^{y+\varepsilon} \frac{x - \overline{y}^i}{2\varepsilon} dx = \frac{\left(\overline{y}^i - y\right)^2 + 2\varepsilon^2}{4\varepsilon} \text{ (case 2)} \\ \int_{y-\varepsilon}^{\overline{y}^i} \frac{\overline{y}^i - x}{2\varepsilon} dx + \int_{y}^{y+\varepsilon} \frac{x - \overline{y}^i}{2\varepsilon} dx = \frac{\left(\overline{y}^i - y\right)^2 + 2\varepsilon^2}{4\varepsilon} \text{ (case 3)} \\ \int_{y-\varepsilon}^{y+\varepsilon} \frac{x - \overline{y}^i}{2\varepsilon} dx = y - \overline{y}^i \text{ (case 4)} \end{cases}$$

It is easily seen that when $y < \overline{y}^i$ (cases 1 and 2), the Judge's expected utility is decreasing in y – in other words, he would prefer to use as low a cut-point as possible, not the supposed ideal cut-point $\overline{y}^i$. And, when $y > \overline{y}^i$ (cases 3 and 4), the Judge's expected utility is increasing in y – in other words, he would prefer as high a cutpoint as possible, again not the supposed ideal cut-point $\overline{y}^i$. So this example violates policy consistency.

The logic behind the example is easy to understand. Because the judge receives increasing utility from correctly deciding cases far from his ideal cut-point, he wishes to move as many of the cases as far away possible. He can do this by making the enforced rule as extreme as possible. But then his supposed ideal cut-point isn't really his most-preferred cut-point, a contradiction.

Example 2: Linear Gain for Correct Dispositions, Normal Distribution with Mean y

We leave as an exercise demonstrating that the same perverse behavior emerges with the same utility function and a normal distribution of cases with mean y and variance σ.

Example 3: Linear Losses for Incorrect Dispositions, Uniform Distribution Centered on y

Suppose the judge's dispositional utility function is essentially flipped from that in Example 1, to wit:

$$u_t^i(d_t; x_t, \overline{y}^i) = \begin{cases} 0 \text{ if } d_t = r(x_t, \overline{y}^i) \text{ [correct dispositions]} \\ -\left|\overline{y}^i - x_t\right| \text{ if } d_t \neq r(x_t, \overline{y}^i) \text{ [incorrect dispositions]} \end{cases}$$

We examined this utility function earlier as Equation 3, illustrated in Figure 2. Under this function the judge receives dispositional utility 0 from a correct disposition but a loss from an incorrect one, a loss that increases in the distance of the case from the judge's ideal cut-point. In effect, the judge receives a greater loss from incorrectly deciding an easy case, which has a certain intuitive quality.

From Proposition 2, it is clear that this utility function must display policy consistency. But it may be helpful to see the closed form solutions for the expected utility of a rule (we

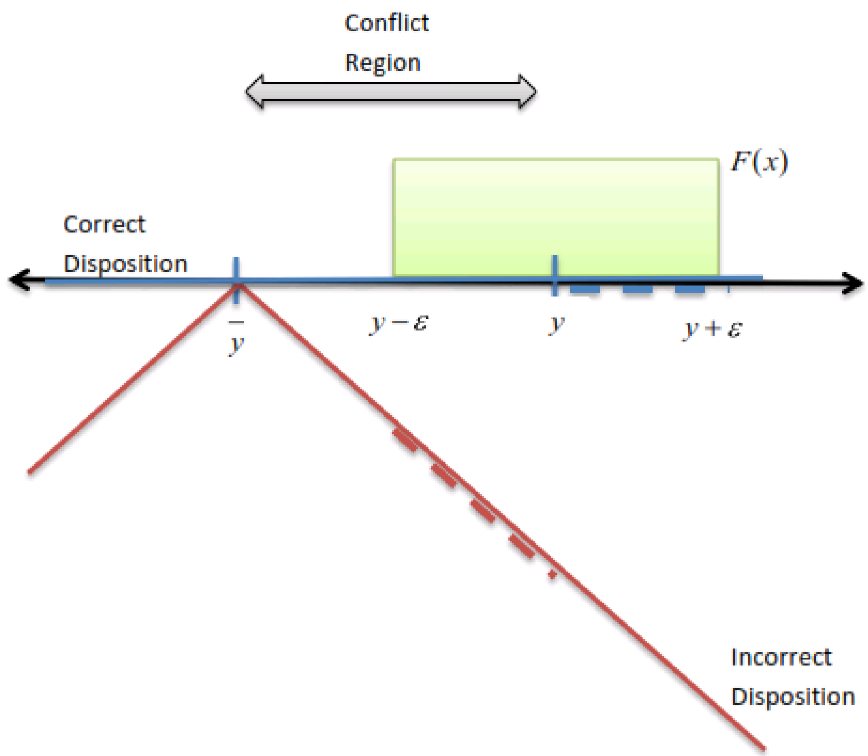

Figure 5: Policy Consistency.

derived one earlier). The 4 cases are the same as in Example 1, leading to:

$$v^i(r(x_t,y)) = \begin{cases} \int_y^{y+\varepsilon} \frac{\overline{y}^i - x}{2\varepsilon}(-1)dx = \frac{\varepsilon}{4} - \frac{\overline{y}^i - y}{2} \text{ (case 1)} \\ \int_y^{\overline{y}^i} \frac{\overline{y}^i - x}{2\varepsilon}(-1)dx = -\frac{\left(\overline{y}^i - y\right)^2}{4\varepsilon} \text{ (case 2)} \\ \int_{\overline{y}^i}^{y} \frac{\overline{y}^i - x}{2\varepsilon}(-1)dx = -\frac{\left(\overline{y}^i - y\right)^2}{4\varepsilon} \text{ (case 3)} \\ \int_{y-\varepsilon}^{\overline{y}^i} \frac{x - \overline{y}^i}{2\varepsilon}(-1)dx = \frac{\varepsilon}{4} - \frac{y - \overline{y}^i}{2} \text{ (case 4)} \end{cases}$$

This can be re-written as

$$v^i(r(x_t,y)) = \begin{cases} \frac{\varepsilon}{4} - \frac{1}{2}\left|\overline{y}^i - y\right| \text{ (cases 1 and 4)} \\ -\frac{1}{4\varepsilon}\left(\overline{y}^i - y\right)^2 \text{ (cases 2 and 3)} \end{cases}$$

The expected utility function in cases 1 and 4 is a scaled "city block" or "tent" policy utility function. The expected utility function in cases 2 and 3 is a scaled quadratic loss policy utility function. These utility functions are by far the most frequently used utility functions when considering policy choices, for instance, in the spatial theory of voting (Enelow and Hinich 1984). The use of those functions to consider judicial preferences over rules can thus be rationalized via the linear loss dispositional utility function in Equation 3, combined with a uniform distribution of cases responsive to the rule employed.

What about policy consistency? It is apparent that in Case 1 the judge prefers to raise y toward $\overline{y}^i$. The border line of Case 1 occurs when $y + \varepsilon = \overline{y}^i$ which (using the above expression) affords the judge expected utility $\frac{\varepsilon}{4} - \frac{1}{2}|\varepsilon| = -\frac{\varepsilon}{4}$. Further increasing y toward $\overline{y}^i$ creates Case 2 and here the judge moves to set $y = \overline{y}^i$, affording expected utility of 0. Similar reasoning with respect to Cases 4 and 3 leads to the same conclusion: $y^* = \overline{y}^i$ so policy consistency is satisfied. With this dispositional utility function and distribution of cases, the judge's most preferred rule corresponds to dispensing justice case-by-case using her most-preferred cut-point.

Example 4: Constant Gain for Correct Dispositions, Uniform Distribution Centered on y or Continuous Distribution with Mean y

The previous example exploited Proposition 2 to create a dispositional utility function that must display policy consistency. The condition in Proposition 2 is sufficient to assure policy consistency but it is not necessary as the following example shows. Suppose the dispositional utility function is:

$$u_t^i(d_t; x_t, \overline{y}^i) = \begin{cases} 1 \text{ if } d_t = r(x_t, \overline{y}^i) \text{ [correct dispositions]} \\ 0 \text{ if } d_t \neq r(x_t, \overline{y}^i) \text{ [incorrect dispositions]} \end{cases}$$

and again suppose $F(x,y) = U[y-\varepsilon, y+\varepsilon]$. Again the same 4 cases exist, leading to:

$$v^i(r(x_t,y)) = \begin{cases} \int_{y-\varepsilon}^{y+\varepsilon} \frac{1}{2\varepsilon}dx = \frac{1}{2} \text{ (case 1)} \\ \int_{y-\varepsilon}^{y} \frac{1}{2\varepsilon}dx + \int_{\overline{y}^i}^{y+\varepsilon} \frac{1}{2\varepsilon}dx = 1 - \frac{\overline{y}^i - y}{2\varepsilon} \text{ (case 2)} \\ \int_{y-\varepsilon}^{\overline{y}^i} \frac{1}{2\varepsilon}dx + \int_{y}^{y+\varepsilon} \frac{1}{2\varepsilon}dx = 1 - \frac{y-\overline{y}^i}{2\varepsilon} \text{ (case 3)} \\ \int_{y-\varepsilon}^{y+\varepsilon} \frac{1}{2\varepsilon}dx = \frac{1}{2} \text{ (case 4)} \end{cases}$$

which can be re-written as

$$v^i(r(x_t,y)) = \begin{cases} \frac{1}{2} \text{ (cases 1 and 4)} \\ 1 - \frac{1}{2\varepsilon}\left|\overline{y}^i - y\right| \text{ (cases 2 and 3)} \\ \\ \end{cases}$$

The best policy for the judge is clearly $y = \overline{y}^i$ so PC holds even though the condition in Proposition 2 is violated.

Suppose the distribution of cases is a continuous distribution $F(x;y)$ with mean $\mu = y$. Then using the dispositional utility function, the expected utility of cutpoint y is

$$\begin{aligned} v^i(r(x_t,y)) &= F(\overline{y}^i;y) + 0[F(\mu) - F(\overline{y}^i;y)] + 1 - F(\mu) \\ &= 1 + F(\overline{y}^i;y) - F(\mu) \end{aligned}$$

and clearly the Judge would most prefer $y = \overline{y}^i$. In essence, he wishes to make the conflict zone as small as possible. So PC obtains again.

Example 5: Linear Loss for Incorrect Dispositions, Normal Distribution with Mean y

As a final example we return to the dispositional utility function in Equation 3 but now assume a normal distribution of cases, a Gaussian distribution with mean $\mu = y$ and variance σ. Suppose $y > \overline{y}^i$. In this case, expected utility is

$$\begin{aligned} v^i(r(x_t, y)) &= -\int_{\overline{y}^i}^{y} f(x; \mu = y, \sigma) \left| \overline{y}^i - x_t \right| dx \\ &= \frac{1 - e^{-\frac{\left(y - \overline{y}^i\right)^2}{2\sigma^2}}}{\sqrt{2\pi}} + \left(y - \overline{y}^i\right) \frac{1}{2} \operatorname{erf}\left(\frac{y - \overline{y}^i}{\sqrt{2}\sigma}\right) \end{aligned}$$

where erf(.) is the Gaussian error function. The term $\frac{1}{2} \operatorname{erf}\left(\frac{y - \overline{y}^i}{\sqrt{2}\sigma}\right)$ may be interpreted as the probability that a case falls into the conflict region.

Although this expected utility appears complicated, it is easily evaluated by machine and has some interesting properties. Clearly $\lim_{y \to \overline{y}} v^i(r(x_t, y)) = 0$, which is the largest this expression can be, so policy consistency is maintained. More interestingly, $\lim_{\sigma \to 0} (v^i(r(x_t, y)) = -\frac{1}{2}(y - \overline{y}^i)$. In other words, as the mass of the cases become focused tightly around the enforced cut-point y, expected utility converges to the "tent" policy utility noted in cases 1 and 4 of Example 3 (the same dispositional utility function with a uniform distribution of cases), with $\varepsilon = 0$. One can think of this limiting case as reflecting a Priest-Klein model of adjudication, in which rational agents narrow their litigated behavior to close to the cut-point.

Non-uniqueness of the Pre-image of Policy Preferences

We have shown how to derive preferences over rules from preferences over case dispositions. We have also identified a set of conditions that one might want to impose on preferences over dispositions. So, the route from dispositional utility to rule utility is clear. But what about the converse? We now show that policy preferences are not uniquely defined. Rather, the same policy preferences may derive from different dispositional preferences that are associated with different distributions of cases. We illustrate our claim with a simple example.

Consider the following expected policy utility function: $u(y; \overline{x} = 0) = -y^2$. How might this policy utility function arise from the underlying primitives of case distribution and most-preferred case partition? The answer is, in many ways. Here are two. Let the case space $X = [0,1]$.

In the first case, suppose the dispositional utility function is the linear loss function

$$u_t^i(d_t; x_t, \overline{y}^i) = \begin{cases} 0 \text{ if } d_t = r(x_t, \overline{y}^i) \text{ [correct dispositions]} \\ -2\left|\overline{y}^i - x_t\right| \text{ if } d_t \neq r(x_t, \overline{y}^i) \text{ [incorrect dispositions]} \end{cases}$$

And, assume cases are uniformly distributed on the unit interval. Let the most-preferred cut-point be 0. So expected policy utility is:

$$v_t^i(r(x_t; y) = \int_0^y -2x(1)dx = -y^2$$

Now let the dispositional utility function be the unit loss function

$$u_t^i(d_t; x_t, \overline{y}^i) = \begin{cases} 0 \text{ if } d_t = r(x_t, \overline{y}^i) \text{ [correct dispositions]} \\ -1 \text{ if } d_t \neq r(x_t, \overline{y}^i) \text{ [incorrect dispositions]} \end{cases}$$

But let cases be distributed according to density $f(x) = 2x$ (so the distribution is a right-triangle with apex 2). Then expected policy utility is

$$v_t^i(r(x_t; y) = \int_0^y -1(2x)dx = -y^2$$

The same expected policy utility function thus results from two very different dispositional utility functions (in combination with different case distributions). Notice that both of the underlying utility functions satisfy both CDAB and PC but only the first utility function, the linear loss utility function, satisfies IDID. So the results in case space models that require IDID for their results may not be replicable in policy space models that rely on the derived preferences for policies as these policy preferences might rest on preferences over dispositions that do not satisfy the requisite conditions.

In sum, once one takes dispositions and cases seriously, treating expected policy utility as a primitive seems rather perverse.

"Labor Market" Models: Effort-Costs and Time Constraints

Dispositional utility functions provide the basis for a judicial worker view of judges. Using a dispositional utility function, one can meaningfully model choices over dispositions and choices over rules. Some analysts have argued strongly the one should also view judicial workers as time-constrained or leisure-valuing. Proponents of this position sometimes invoke a "labor market" theory of judging, one that would explicitly consider judicial labor. Can one incorporate costly effort and limited time in models employing the case-space approach? The answer is "yes, quite easily." But implementing such models requires clear thinking about the relationship between judicial inputs, like a judge's time and effort, and judicial outputs, namely, case dispositions and rules. In other words, one needs to incorporate an explicit *production function for dispositions and rules.*

There are many possible production functions that one could employ. For example, disposing a case requires learning the facts in the case (in our formalism, its spatial location). This may be costly of time and effort. So, in this approach, a production function translates judicial effort into a belief about case location. How then should a judge allocate adjudicatory effort across different cases? And, what are the implications for observed dispositions and reversal rates in different kinds of cases? Or, consider the production of rules as formulated in opinions. Greater expenditure of time and effort writing the opinion may result in a more precise expression of the rule and hence greater consistency in its implementation in the future. So, a production function translates judicial effort into a reduced variance in the implementation of a rule. Again, how should a judge allocate time and effort in opinion writing across different cases? When should we expect to see painstakingly crafted opinions and when rather cursorily drafted ones?

In the Appendix, as a demonstration we offer a very simple labor market model set in case space. In the model, a judge expends costly effort at trial in order to avoid reversible procedural error. Thus, a production function translates adjudicatory effort into a probability of reversible error. We study the incentive effects of two possible institutions, in the event of procedural error. In the first, the case is simply dismissed so that the "incorrect" litigant prevails. In the second, the judge is required to re-try the case, and continue doing so until he produces a disposition unmarred by procedural error. What levels of effort do these institutions induce and what overall levels of error over a series of trials? "Labor market" models set in case space allow one to analyze questions like this.

Ends and Means/Teams and Political Agents

Two antinomies deserve brief discussion.

Expressive vs. Consequential Utility

A judge may value dispositions and rules in one of two ways: she may value them *expressively* or she may value them *consequentially.* A judge values expressively when her concern stems from her *own* action, i.e., her own vote on the disposition or the policy that she endorses either through writing her own opinion or joining, and hence endorsing, the opinion of another judge.[7]

A judge values consequentially when her concerns stems from the results of her choices on the *court's* action. On this account, she cares about the ultimate disposition of the case rather than her vote on the disposition per se. Or she cares about the policy announced by

[7] Expressive preferences over dispositions are defined over the domain of the judge's set of strategies, i.e. the set of dispositions for which she can cast her vote. Consequential preferences over dispositions is defined over the set of dispositions that the *court* can reach. Both these domains are defined by the same outcome set D but differ in their interpretation.

the court not the policy she nominally endorses. In other words, her vote or other action is a means to an end rather than an end in itself, and the valued end concerns the definitive action of the court. A third possibility is the social planner view discussed earlier: the judge cares about the social consequences that follow from the court's disposition and announced policy.[8] In this sense again, the court's dispositions and policies are a means to an end rather than an end in themselves.

When a judge decides in isolation, as will be the case in the models presented in Chapter 4, one cannot distinguish expressive from consequential preferences over dispositions and policies. The judge's disposition *is* the disposition of the court and her announced policy *is* the policy of the court. When, however, the judge sits with other judges or faces a superior court, her decisions are not necessarily the decisions of that court. A lower court may be overruled; a judge on a collegial court may dissent from the disposition or favor a different policy than the one announced by a majority of the court. In these instances, the judge may face trade-offs between advancing her expressive preferences and advancing her consequential ones. Some of the models in Chapters 8-9, which address collegial courts, illustrate this tension.[9] In Chapter 5, we consider a sequence of judges, each sitting alone. In this context, expressive preferences mean that the judge cares only about the decisions she renders; if she has consequential preferences, she also cares about the decisions that her successors render.

The relative importance of expressive and consequential preferences may also vary across cases. A judge deciding a death penalty case may refuse to be complicit in the execution of the defendant before her though, perhaps, if she altered her dispositional vote she might induce the court to announce a policy that reduced the number of executions in the future. In other words, her immediate expressive preference trumps her consequential one. However, a

[8] As the judge affects social consequences only through the actions of the court, she cannot have expressive preferences over consequences. Note that it is possible that the judge's own disposition or the rule she endorses individually (say in dissent) has consequences so that she might in fact value her own vote or opinion consequentially even when it differs from the disposition or opinion of the court. In this case, however, she has to have great foresight to understand how her opinion or dispositional vote will influence the development of the law in the future.

[9] We ignore for the moment problems that arise from thinking about policy and social consequences over time.

case with far lower immediate moral stakes, such as raising the reach of diversity jurisdiction, may trigger no such intense expressive concerns.

Common Values and Private Values: Team Models and Political Models

Many models of courts feature multiple judges interacting with one another. Examples include multi-member courts, courts within a hierarchy of courts, or courts acting serially over time. In such models the analyst must make a critical decision: whether to endow all the judges with the same utility function, or force heterogeneity in primitives such as ideal cut-points. Using the language of auction theory, the first approach models judges in a *common values* setting, the second in a *private values* setting. We often refer to models with common values as *team models*, and models with private values as *political models*. Neither setting is intrinsically right or wrong but the two approaches lead to very different analytical questions.

Models with private values typically do not ask why different judges favor different partitions of a fact space, that is, where a preferred partition comes from. Of course, common sense suggests different preferences over partitions may be related to judges' political ideologies, moral values, or understandings of the social consequences of different rules. But the focus of the model is typically the *consequences* of different values. For example, the private-values approach leads to principal-agent models of hierarchy in which nominal superiors attempt to extract doctrinal compliance from rebellious subordinates. This approach also leads to models of multi-member courts that feature bargaining between judges over the content of a rule. It also leads to models of horizontal *stare decisis.* in which judges with different preferences from their forbears nonetheless enforce the rules established earlier, perhaps from fear of doctrinal retaliation by judges in the future. And, the private values setting leads to models of statutory interpretation in which judges may push against the boundaries of legislative tolerance in order to shape the law as the judges see fit. Thus, the analytic questions are often, Why do judges with putatively different preferences over rules enforce the same rule? Or, how do the rules of decision aggregate different judicial preferences into specific dispositions and rules? Needless to say, political scientists often find private value models rather intriguing.

Models exploring common values often focus instead on why judges with the same preferences make different rulings. For example, why might successor judges with the same preference as their predecessors opt to change a rule created by those earlier judges? Models of this variety often feature learning or dynamic optimization in the face of social change. Or, why might judges on a multi-member court vote for different dispositions even though they all share the same doctrinal preference? Here, the focus is typically on private signals, information, deliberation as well as individual skill. Or, how do judges attempt sincerely to implement the uncertain and ambiguous desires of a legislature, for example, by formulating rules to best complete optimally incomplete "contracts" (laws)? Thus, in common values settings preferences over rules are often endogenous, reflecting learning or private information. Or, judicial action may reflect information aggregation rather than preference aggregation. A third theme is the efficient allocation of resources. Perhaps not surprisingly, economists are often drawn to common value models of courts.

Conclusion: Positive Models and Theories of Adjudication

The modeling tools outlined in this chapter and the preceding one do not explicitly favor one theory of adjudication over another. For example, a formalist theory of adjudication holds that judges should (perhaps do?) simply apply the appropriate legal rule to the facts and render judgment. Moreover, the formalist theory holds that, in common law adjudication, the applicable legal rule is a more-or-less explicit rule, reasonably clearly articulated by, or immanent in, the prior case law. In contrast, realist theories of adjudication deny that judges, in common law adjudication, follow explicit rules. In moderate forms, such as that developed and espoused by Karl Llewellyn, realism holds that judges do follow rules, just not those articulated in the prior case law and commentary (Llewellyn 1960). In more radical forms, such as that espoused by Jerome Frank, the realist judge acts on raw ideology or mere whim (Frank 1930).

The choice of environment and judicial preferences determine the theory of adjudication embedded in a model. The next chapter, for instance, considers a simple environment in which one immortal judge hears all the cases in the jurisdiction.[10] In this model, a judge can implement her ideal rule and thus adhere to a formalist theory of adjudication. Formalist accounts of adjudication can emerge in other models as well. In Chapter 5, for instance, we offer a model in which it is in the interest of all, ideologically diverse judges to adhere to a rule that differs from the ideal rule of each of them. Again, though, we could understand the judges within this political model as formalist.

At the other extreme, in some environments with some attributions of preferences, the case-space approach can accommodate extreme realist theories of adjudication. We discuss some early median judge models of decision-making on collegial courts in Chapter 8. In the implicit bargaining game of these models, judges have policy preferences and they act only on this policy preferences.[11] Some of the models of hierarchy we discuss in Chapters 6 and 7 might similarly be seen as reflecting extreme realist theories of adjudication.

The identification of the theory of adjudication that judges actually follow is an empirical question. Empirical investigation, however, must be guided by theory that allows the possibility of a broad spectrum of behaviors. Too often, "tests" of the claim that judges do not adhere to a "legal" account of adjudication rest on a strawman, a mere caricature of "legal behavior." This bootless practice arises in part because the empiricist's theoretical model is not framed in a language that can even allow the development and investigation

[10] This structure implicitly underlies many normative theories of adjudication.

[11] In that chapter, we embed these models in case space rather than the policy space in which they were initially formulated.

of working formalist models of adjudication. We believe the approach developed in this and the prior chapter provide a framework that can accommodate a spectrum of positive theories of adjudication that range from the formalist, rule-bound ones supposedly prevalent in the 19th and early 20th centuries to the extreme realist ones that some atttitudinalists endorse.

The famous British anthropologist Mary Douglas once observed, "Utility theory is empty, so we can fill it any way we wish." The case-space approach to modeling courts is hardly empty. Rather, it provides a modeling vocabulary specifically tailored to the practices of courts and the concepts of jurisprudence. Nonetheless, it can be "filled" or deployed in many, many different ways.

Bibliographic Notes

As we noted in the Bibliographic Notes to Chapter 2, the case-space approach to modeling courts was first formalized in the early 1990s (Kornhauser 1992a and Kornhauser 1992b). But the early efforts did not consider judicial utility in any detail. Instead, over the next two decades analysts innovated various utility functions, offering specific functions on intuitive grounds or for reasons of tractability. This chapter is to our knowledge the first systematic review of dispositional utility and the first detailed explication of the anticipation approach to linking dispositional utility and policy utility.

Broadly speaking, early papers posited rule utility while ignoring dispositional utility. In this regard, early efforts treated courts as purely policy-making bodies essentially identical to legislatures. An ambitious example of this approach is Hammond et al 2005 .

Later papers tried to come to grips with cases and case dispositions, often innovating dispositional utility functions to link judicial actions with judicial preferences. Table 1 presents the dispositional utility functions discussed in this chapter along with papers employing the function; generally, the earliest cited paper is the original source of the function. For example, Cameron et al 2000, the first application of the case space approach in Political

Type	Utility Function	Employed In
Constant Loss	$u(d;x) = \begin{cases} 0 \text{ if correct} \\ -\lambda \text{ if incorrect} \end{cases}$	Badawi and Baker 2015
Constant Gain	$u(d;x) = \begin{cases} 1 \text{ if correct} \\ 0 \text{ if incorrect} \end{cases}$	Cameron et al 2000 Cameron and Kornhauser 2006 Carrubba and Clark 2012
Linear Loss	$u(d;x) = \begin{cases} 0 \text{ if correct} \\ -\left\|\overline{y}^i - x_t\right\| \text{ if incorrect} \end{cases}$	Fischman 2011 Cameron and Kornhauser 2015
Linear Gain	$u(d;x) = \begin{cases} \left\|\overline{y}^i - x_t\right\| \text{ if correct} \\ 0 \text{ if incorrect} \end{cases}$	Lax 2003
Symmetric linear	$u(d;x) = \begin{cases} \left\|\overline{y}^i - x_t\right\| \text{ if correct} \\ -\left\|\overline{y}^i - x_t\right\| \text{ if incorrect} \end{cases}$	Callander and Clark 2013 Beim et al 2014

Table 1: Varieties of Dispositional Utility Functions

Science, innovated the constant gain dispositional utility function. The original source of the linear loss utility function appears to be Fischman 2011.

As noted in the text, some recent papers allow appellate courts both to decide cases and create policy. However, to address both actions they include distinct dispositional and policy utility functions (the dual utility approach to dispositions and policy). An important example of this approach is Carrubba and Clark 2012. The dual utility approach is also employed in the sequential bargaining model Cameron and Kornhauser 2013, presented in Chapter 9. The integration of dispositional and policy utility through the anticipation approach did not occur until very recently. An example is Carrubba et al 2015.

A notable paper in the development of the "labor market theory" of judging was Posner 1983, which argued strongly that judges face effort-costs and value leisure. This position receives further elaboration in Epstein, Landes, and Posner 2014. However, the formalism offered there did not actually connect judicial utility with case dispositions or policy choices, nor inputs with those two outputs. Consequently, it cannot serve as a formal framework for models of judging. This lacuna was filled by Ash and MacLeod 2015. Though inspired by Posner 1983, it draws clear linkages between judicial preferences, outputs, and choices over inputs. Their specific approach, which emphasizes time constraints, can be seen as an application to judges of Becker's household production approach to utility theory (Becker 1965). The Ash-MacLeod model also distinguishes judges who must seek periodic re-election from those with lifetime appointment; and it is clear about the role of intrinsic motivation. Thus, their theory also advances the analysis of judicial labor contracts. The model allows differential degrees of intrinsic motivation across judges but does not incorporate different evaluations of dispositions and rules (nor is the model clearly set in case space). Accordingly, it is in the spirit of a team model rather than a political model. Remarkably, Ash and MacLeod structurally estimate their formal model on a large data set of decisions by state supreme court judges, utilizing within-state variation to achieve clear identification of effects such as greater discretion or a change in judicial selection mechanisms. They find considerable evidence of intrinsic motivation.

The distinction between "team" (common value) models of judges and "political" (private value) models of judges is due to Kornhauser 1994. Examples of political models are (inter alia) Cameron et al 2000, Carrubba and Clark 2012, and Fischman 2011. Examples of team models include Beim 2017 and Iaryczower and Shum 2012. Some authors set models in one setting or the other without being particularly self-reflective about the choice. In the following chapters, we try to be quite clear about which setting is used in which model, and why.

In a similar way, some models are not explicit whether they view judicial actions as expressive or consequential, though one may discern the difference upon close reading. An example of a model of a collegial court with judges whose utility is expressive is Carrubba and Clark 2012. Cameron and Kornhauser 2013 is an example of a model of a collegial court with judges whose utility is consequential.

Appendix

1. A Simplistic "Social Planner" Model: Judge Zeus At Work

Let's work through the calculations of Judge Zeus in a overly simplified, highly parameterized setting. In this setting, there is a social behavior $x \in X = \mathbb{R}_+$. One might think of a behavior as the level of negligence in manufacturing, or speed of cars on interstate highways. We assume a density of behaviors in society $z(x)$. In fact, we will assume that behaviors are uniformly distributed on the interval $[0, x^u]$, with the highest possible bound being 1. We further imagine that a level of behavior gives rise to social costs and benefits according to $b(x) = x$ and $c(x) = x^2$. For instance, greater negligence in manufacturing increases product injuries (a cost), but reduces manufacturing costs (a benefit). Or, faster travel times on highways increases the tempo of economic transactions (a benefit) but boosts accidents and injuries (a cost). The net benefit of a level of behavior is simply $NB(x) = b(x) - c(x)$.

To evaluate the social costs and benefits of behaviors, we integrate net benefits over the distribution of behaviors,

$$NB(x, x^u) = \int_0^{x^u} (b(x) - c(x))\, z(x) dx = \left(\frac{1}{2} - \frac{1}{3}x^u\right) x^u \tag{5}$$

This net benefit function is shown in the left-hand panel of Figure 5. The value of the upper bound on behavior that maximizes the net benefit function is $x^{u*} = \frac{3}{4}$. In words, society would be best off if it could eliminate the behaviors in the range $(\frac{3}{4}, 1)$. We assume Judge Zeus can undertake this analysis himself and well-appreciates the value x^{u*} and the social costs from an upper bound the departs from it.

Judge Zeus aims to eliminate undesirable behaviors through the selection and enforcement of an appropriate judicial rule. In a well-specified model, one would need to show that

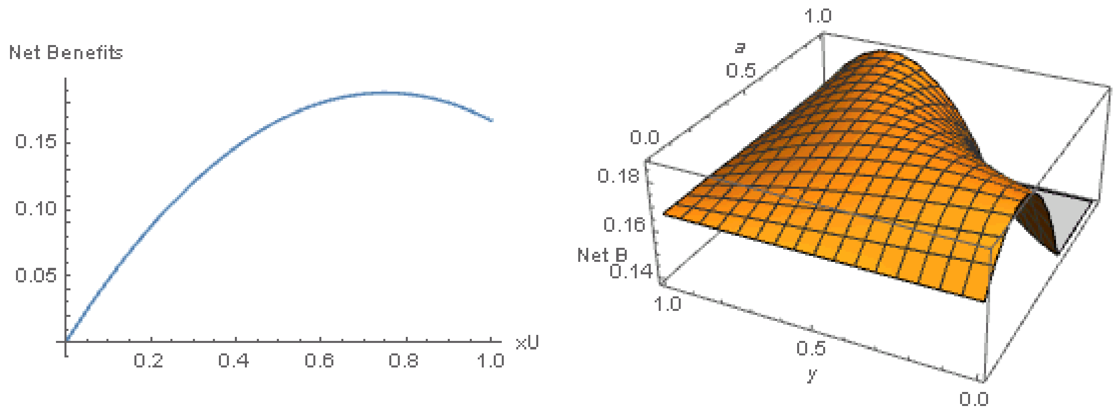

Figure 6: The Social-Planner Judge's View of Behavior: A Net Benefit Function. The left-hand panel shows an evaluation of social behavior parameterized by x_u (see Equation 5). The right-hand panel shows the same function taking into account the production function for producing x_u. This panel related the announced cut-point y and social sensitivity parameter a.

rational calculations by individual agents responding to Zeus's rule lead to particular outcomes. In the interest of simplicity, though, we abstract from the calculations of individual agents. Instead, we just assume a kind of production function

$$x^u = 1 - a(1 - y) \tag{6}$$

where y is (as usual) the cut-point in a rule defined over the case-space X . The parameter a measures the social impact or intensity of enforcement of the promulgated cut point. Obviously, a great deal of work is being done by a! Buried within it are law enforcement, individual legal actions (for instance, to sue), as well as judicial prosecution of cases. We assume $0 \leq a \leq 1$. If $a = 0$ then promulgation of the judicial rule is not actually enforced and thus has no effect on social behavior. In this case, $x^u = 1$ (so behaviors are uniform on the unit interval). Conversely, if $a = 1$ then the judicial rule is completely efficacious so that $x^u = y$. Cut-points set at or higher than 1 have no impact on behavior. But, provided $a > 0$, cutpoints in $[0, 1)$ do lower the upper bound of behavior.

If one substitutes Equation 6 into the net benefit function (Equation 5) one obtains

$$NB(y,a) = \frac{1}{6}\left(1 - a(1-y)\right)\left(1 + 2a(1-y)\right)$$

This function is shown in the right-hand panel of Figure 6. In some sense, this is the function that Judge Zeus must have in mind as he acts. First, he can choose cutpoint y directly. His ability to influence a is surely more limited since he has little direct control over law enforcement or social norms. But he can process cases faster or more meticulously, and this is part of a. So for simplicity let's imagine Judge Zeus choosing both parameters. In examining the right-hand panel of Figure 6, it will be seen that if $y = 1$ or $a = 0$ there is a "natural" level of net social benefits, corresponding to $x^u = 1$. But as Judge Zeus ratchets y downward and a upward, net benefits rise. Beyond a certain point, however, net benefits crash (x^u falls below $\frac{3}{4}$).

Many combinations of y and a yield the same level of net benefits, a point emphasized in Figure 7 by portraying level curves (isoquants) of the net benefit function. (For the moment, ignore the thick black line). Along each curve, the level of net benefit is fixed but the (a, y) pairs vary. Note that as one moves from the northwest corner of the figure to the southwest corner, the value of net benefits first increases to a maximum value ($\frac{3}{16}$ or .1875), then decreases (compare the contour map with the right-hand panel of Figure 6.)

Though we endow Judge Zeus with super-human knowledge and insight, we do not credit him with super-human speed or endurance. So, as he sets his rule and processes cases he faces limits on his time and effort. We incorporate these crudely via a budget constraint. More specifically, assume he faces the linear constraint

$$M = p_a a + p_y y$$

where p_a is the marginal cost of the implementation parameter and p_y is the marginal cost of the cut-point. Both costs may be rationalized as arising from his case load though we do

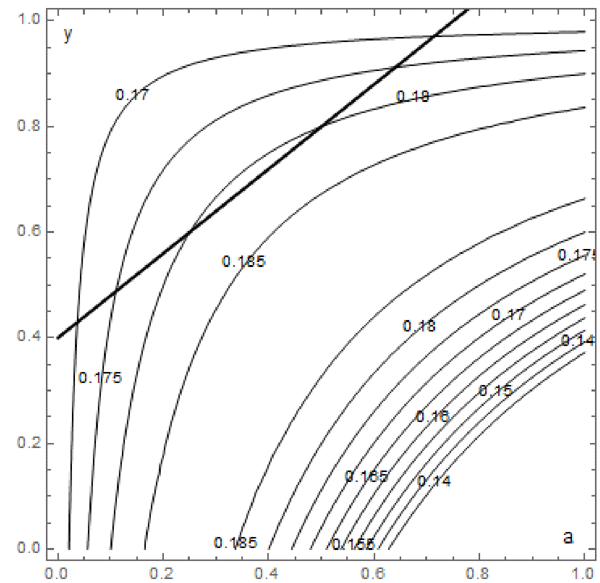

Figure 7: A Contour Map of the Net Benefit Function. The x-axis shows values of implementation factor a while the y-axis shows possible values of rule cut-point y. Many combinations of cutpoint y and implementation factor a yield the same net social benefits. Which pair should Judge Zeus pick?

not actually model the relationship.

Given this constraint, Judge Zeus's problem is to choose y and a to maximize

$$\frac{1}{6}\left(1-a(1-y)\right)\left(1+2a(1-y)\right)-\lambda\left(M-p_a a-p_y y\right)$$

where λ is a Lagrangian multiplier. Some algebra yields

$$y^*=1-\frac{M}{2p_y}, a^*=\frac{M}{2p_a}, \lambda=\frac{Mp_a p_y-M^2}{12(p_a)^2(p_y)^2}$$

These results are easy to understand using Figure 7. In the figure, the thick black line indicates the budget constraint (note we require $\frac{M}{p_a}, \frac{M}{p_y} \leq 1$). The highest attainable net benefit occurs just at the tangency point between the budget constraint and a level set. The values for y^* and a^*. The value of λ indicates the incremental gain in net benefit that would result from a marginal increase in the budget constraint. As a numerical example, if $B=6$, $p_a=8$, and $p_y=10$ then $y^*=.7$ and $a^*=.375$ yielding a top end on social behavior of

$x^u = .8875$. So Judge Zeus sets a cut-point rule that is nominally lower than the social ideal but because of imperfect and costly implementation, this rule only modestly reduces undesirable behavior. And, there is considerable rule violation in the society.

2. Additional Examples of Dispositional Utility and Induced Policy Utility

Here we derive preferences over rules from dispositional preferences with more complex partitions of case-space or rule-sensitive distributions of cases. These examples continue those from the Appendix to Chapter 2.

A Two-Dimensional Case Space with a One-Parameter Rule[12]

Recall our example from Appendix A in the prior chapter in which the case space X had two dimensions. In this example a given case is a vector (x_1, x_2) (subscripts denote dimensions). For concreteness, imagine the case space as the unit square, so the space is $X = [0, 1] \times [0, 1]$. We restricted attention to the class of rules indexed by the parameter b as in the following

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

Assume that the judge's ideal rule is the 45 degree line, i.e. sets $b = 0$. We assume all other doctrines simply alter the intercept b Employing the same style of notation as above, call judge i's most-preferred partition $\overline{b}^i$.

The case space and two cutting lines are shown in Figure 8.

We need to modify the dispositional utility function in Equation 1 for this more complex case space. This extension is immediate for the constant loss function $h(x; \overline{b}^i) = 0$ and

[12] Note to self: The figures are in the Mathematica notebook "Policy Consistency" in Chapter 5

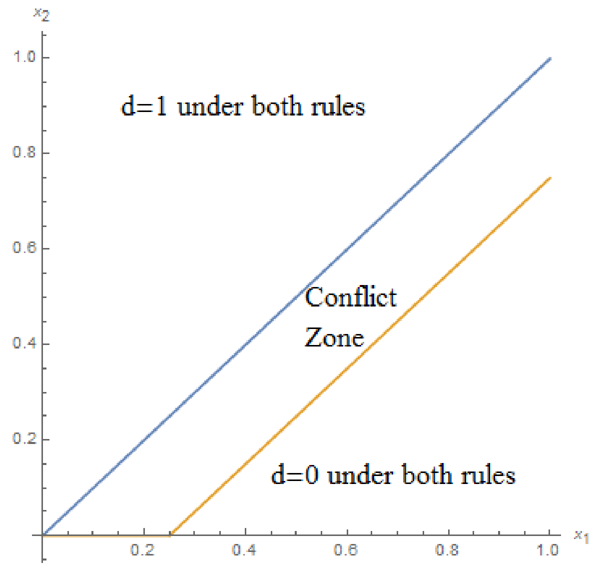

Figure 8: Two dimensional case space with a one parameter rule. The case space is the unit square. The dark line ($x_2 = x_1$) represents the most-preferred rule of the judge. An alternative rule is $x_2 = \max\{x_1 - b, 0\}$. The conflict zone is the space between the two cutting lines. In the figure, $b = \frac{1}{4}$.

$g(x; \overline{b}^i) = -1$. Under this dispositional utility function the judge receives the payoff 0 for a correct disposition and the payoff -1 for an incorrect one.

Suppose however we wish to use the linear loss function or a similar function. In that case, we must characterize not simply whether the case was wrongly decided but "how wrong" it was. In the one dimensional case, we took that measure to be the distance between the wrongly decided instant case and the doctrinal cut-point. The obvious extension here is the distance between the wrongly decided two-dimensional case and the cutting line. But there are many such distances – which one to use? Here is one answer. For a given wrongly decided case $x^0 = (x_1^0, x_2^0)$ consider the closest point on the cutting line to the case using the standard Euclidean distance. Call this closest point $x' = (x_1', x_2')$. We can regard the distance between the two points as "how wrong" the case is since this distance is the distance from the instant case to the nearest case that would be correctly decided if it received the same disposition as the instant case.

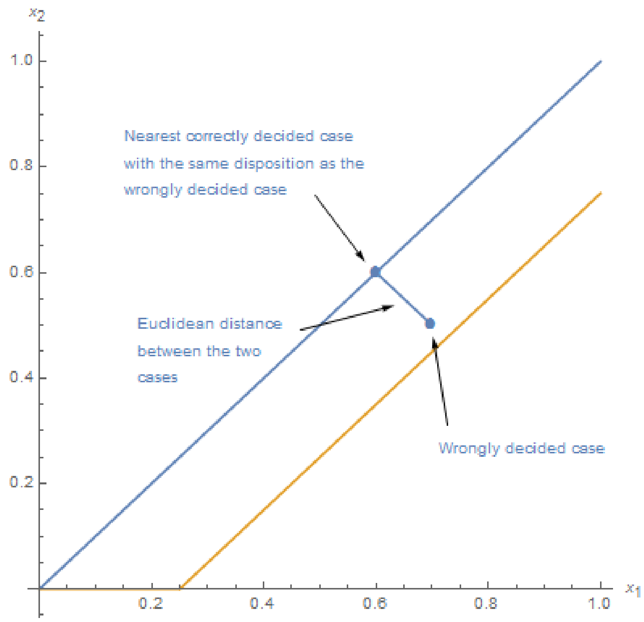

Figure 9: The distance to a wrongly decided case.

The Euclidean distance between the two points is:

$$\delta(x^0, x\prime) = \sqrt{(x_1^0 - x_1')^2 + (x_2^0 - x_2')^2}$$

Because x' must lie on the "correct" cutting line $x_2 = x_1$ we can re-write this distance as $\sqrt{(x_1^0 - x_1')^2 + (x_2^0 - x_1')^2}$. To find the closest case on the cutting line to the instant case, we seek the value of x_1' that minimizes this distance. Some algebra shows that the closest case $x' = \left(\frac{x_1^0+x_2^0}{2}, \frac{x_1^0+x_2^0}{2}\right)$.[13] See Figure 9.

Substituting $x' = \left(\frac{x_1^0+x_2^0}{2}, \frac{x_1^0+x_2^0}{2}\right)$ into the Euclidean distance gives us $\delta(x^0, x\prime) = \frac{\left|x_1^0 - x_2^0\right|}{\sqrt{2}}$.If we use this as the loss from an incorrect disposition of the case, the linear loss dispositional

[13]Minimizing $\left(x_1^0 - x_1'\right)^2 + \left(x_2^0 - x_1'\right)^2$ leads to the same result as minimizing $\sqrt{(x_1^0 - x_1')^2 + (x_2^0 - x_1')^2}$, The derivative of the former with respect to x_1' is $-2\left(x_1^0 + x_2^0 - 2x_1'\right)$. Setting equal to 0 and solving for x_1' yields the indicated result for x_1'. Then $x_2' = x_1'$.

utility function becomes:

$$u^i(d_t; x, \overline{b}^i) = \begin{cases} 0 \text{ if } d = r(x, \overline{b}^i) \text{ [correct dispositions]} \\ -\frac{|x_1^0 - x_2^0|}{\sqrt{2}} \text{ if } d \neq r(x, \overline{b}^i) \text{ [incorrect dispositions]} \end{cases} \tag{7}$$

Cases may be distributed over X in many ways, according to some distribution $F(x_i, x_2)$ with density $f(x_i, x_2)$. An easy distribution is a uniform distribution over the entire space, the unit square. In that case $f(x_i, x_2) = 1$. A slightly more general distribution is a uniform distribution centered on $(\widehat{x}_1, \widehat{x}_2)$ with support $[\widehat{x}_1 - \varepsilon, \widehat{x}_1 + \varepsilon] \times [\widehat{x}_2 - \varepsilon, \widehat{x}_2 + \varepsilon]$. Using this notation, the uniform distribution on the entire unit square is centered on $\left(\frac{1}{2}, \frac{1}{2}\right)$ with $\varepsilon = \frac{1}{2}$. In order to consider distributions of cases that move with the rule (that is, that move as b shifts).

Expected Utility of a Rule with a Fixed Distribution of Cases

Let's return to the expected utility of rules given a fixed distribution of cases. The simplest baseline uses the constant loss utility function and a uniform distribution over the entire case space. Here, the expected utility of a rule is simply (minus 1 times) the area of the conflict zone shown in Figure 8. This is:

$$v(b) = \int_{\max\{0, x_1 - b)}^{x_1} \int_0^1 (-1)(1) dx_1 dx_2 = -\left(1 - \frac{b}{2}\right) b$$

When $b = 0$ (so the judge employs her most-preferred partition) expected utility is zero. When $b = 1$, all cases below the judge's most=preferred cutting line must be decided incorrectly, yielding expected utility $-\frac{1}{2}$. The geometric interpretation of expected utility as (minus one times) the area of the conflict zone should be clear.

Suppose we employ the linear loss dispositional utility function instead. Then we have for positive b:

$$v(b) = \int_{\max\{0, x_1 - b)}^{x_1} \int_0^1 (-\frac{|x_1^0 - x_2^0|}{\sqrt{2}})(1) dx_1 dx_2 = -\frac{b^2(3-2b)}{6\sqrt{2}}$$

Now let's consider a slightly different distribution of cases, centered on $\left(\frac{1}{2}, \frac{1}{2}\right)$ and uniform on $\left[\frac{1}{2} - \varepsilon, \frac{1}{2} + \varepsilon\right] \times \left[\frac{1}{2} - \varepsilon, \frac{1}{2} + \varepsilon\right]$. The support thus forms a box around $\left(\frac{1}{2}, \frac{1}{2}\right)$, with the most-preferred cutting line running from the lower left-hand corner of the box to the upper right-hand corner. The density of the distribution is $\frac{1}{4\varepsilon^2}$. Again assuming $b > 0$ the possible enforced doctrines are cutting lines lying below the most-preferred doctrine and running through the box or lying entirely below it. One must take some care with the limits of integration:

$$\begin{aligned} v(b) &= \int_{\max\{\frac{1}{2}-\varepsilon, x_1 - b\}}^{x_1} \int_{\frac{1}{2}-\varepsilon}^{\frac{1}{2}+\varepsilon} (-\frac{|x_1^0 - x_2^0|}{\sqrt{2}})(\frac{1}{4\varepsilon^2}) dx_1 dx_2 \\ &= \begin{cases} -\frac{\varepsilon}{3\sqrt{2}} \text{ if } b \geq 2\varepsilon \\ \frac{b^2(3\varepsilon - b)}{12\sqrt{2}\varepsilon^2} \text{ otherwise} \end{cases} \end{aligned}$$

The first result occurs when the enforced doctrine lies entirely below the box containing the cases so that one-half of the cases must be decided incorrectly. The second result reduces to the earlier result, $-\frac{b^2(3-2b)}{6\sqrt{2}}$, when $\varepsilon = \frac{1}{2}$.

Expected Utility of a Rule When the Distribution of Cases Is Sensitive to the Rule

We represent this situation with the stylized distribution, the "box of cases" centered on the middle of the *enforced cutting line*. So, this example is similar to the previous example but the "box of cases" moves within the case space depending on b, the parameter characterizing the enforced doctrine. The essential idea of the distribution is that "centrally located" cases are rather likely, while those in the far edges of the case space are quite unlikely. What counts as "central" to the case space depends on which doctrine is enforced. In addition, half the cases lie below and half above the enforced cutting line. If ε is large, the judge may face cases far from the enforced doctrinal cutting line. But if ε is small, she faces only cases rather close to the doctrinal cutting line.

The center of the enforced doctrine is $\left(\frac{1+b}{2}, \frac{1-b}{2}\right)$.[14] There are limits on how large ε can be in order to keep the entire "box of cases" in the case space. In particular, we require $\frac{1+b}{2} + \varepsilon \leq 1$ and $\frac{1-b}{2} - \varepsilon \geq 0$; both imply $\varepsilon \leq \frac{1-b}{2}$. Again taking some care with the limits of integration we have:

$$\begin{aligned} v(b) &= \int_{x_1-b}^{\min\{x_1, \frac{1-b}{2}+\varepsilon\}} \int_{\frac{1+b}{2}-\varepsilon}^{\frac{1+b}{2}+\varepsilon} \left(-\frac{|x_1^0 - x_2^0|}{\sqrt{2}}\right)\left(\frac{1}{4\varepsilon^2}\right) dx_1 dx_2 \\ &= \begin{cases} -\frac{3b-2\varepsilon}{6\sqrt{2}} \text{ if } b \geq 2\varepsilon \\ -\frac{b^2(6\varepsilon-b)}{24\sqrt{2}\varepsilon^2} \text{ otherwise} \end{cases} \end{aligned}$$

The first of these results, the "small ε" case, occurs when b is sufficiently large and ε sufficiently small that the entire "box of cases" lies below the preferred doctrinal cutting line. This implies that one-half of the cases lie in the conflict zone. The second case is the "large ε" case in which a portion of the "box of cases" lies above the most-preferred cutting line and only a band of cases lie in the conflict zone. Note that the second result goes to 0 as b goes to zero, in other words, as the enforced doctrine approaches the most-preferred doctrine expected losses go to zero.

Figure 10 displays the expected utility of rules for various values of b between 0 and one-half, for three values of ε. Not surprisingly, when cases are concentrated in the conflict zone and distributed farther from the most-preferred cutting line, expected utility is lower.

[14] To see this note that the enforced doctrine intersects the right edge of the case space at $1-b$. Hence the height of the center location half this height hence $x_2 = (1-b)/2$. The corresponding horizontal location is given by $\frac{1-b}{2} = x_1 - b$, so $x_1 = \frac{1-b}{2}$.

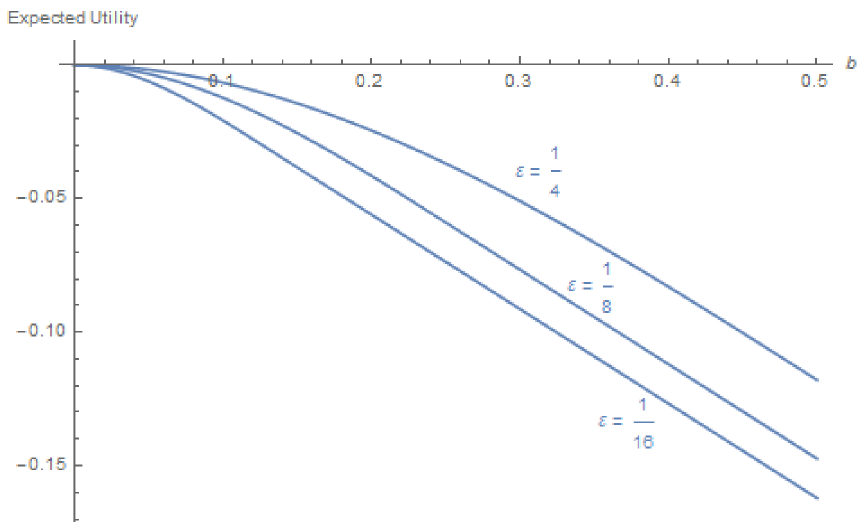

Figure 10: Expected utility of rules in the two-dimensional example, with the distribution of cases sensitive to enforced rule.

3. Procedural Effort at Trial: A Simple "Labor Market" Model

We consider two different procedural error regimes, the "One-shot" regime and the "Do-over" regime.

One-Shot Regime

The sequence of play in the One-shot regime is as follows. First, Nature draws a case x from a uniform distribution on the unit interval. Second, the trial judge processes this case using her preferred rule; we assume the resulting disposition is the correct one from the judge's perspective. In addition, the judge exerts costly effort e (with $0 \leq e \leq 1$) whose effect is to reduce the possibility of reversible procedural error in the trial. Reversible procedural error is denoted by the variable $\varepsilon = \{0, 1\}$ where $\varepsilon = 1$ connotes a reversible procedural error. The cost of effort is $c(e) = e^2$. Third, Nature determines whether a procedural error occurred in the trial. In the event of procedural error the court's disposition is dismissed and in effect the incorrect disposition prevails. Nature draws ε using known distribution

$p(\varepsilon = 0|e) = e$ (so $p(\varepsilon = 1|e) = 1 - e$). Fourth, the judge receives her payoff and the game ends.

The dispositional utility function for the judge is:

$$u(d, \varepsilon; x) = \begin{cases} \lambda \text{ if disposition correct and no procedural error } (\varepsilon = 0) \\ -\lambda \text{ if disposition incorrect or if procedural error occurred } (\varepsilon = 1) \end{cases}$$

with $0 < \lambda \leq 1$. The parameter λ can be seen as a judge-specific parameter denoting the judge's scrupulousness. Or, it can be seen as a case specific parameter, related to case importance. Note that this is a constant, symmetric gain/loss function.

We may write the judge's expected payoff as

$$\begin{aligned} Eu &= p(e)u(d, x|\varepsilon = 1) + (1 - p(e))u(d, x|\varepsilon = 0) - c(e) \\ &= -\lambda(1 - e) + \lambda e - e^2 \\ &= -\lambda(1 - 2e) - e^2 \end{aligned}$$

Via calculus, the optimal procedural effort level is $e^*_{os} = \lambda$. Thus, the total effort expended is λ, the probability of reversible error is λ, procedural effort is increasing in λ (case importance or judicial scrupulousness), and procedural effort is independent of case location x.

Do-Over Regime

The sequence of play in the Do-Over regime is exactly the same as in the One-Shot regime with one exception: in the event of reversible procedural error, the judge must re-try the case. And, he must keep doing so until the case terminates unmarred by reversible procedural error. Thus, the game has an infinite horizon and belongs to the class of models considered in more detail in Chapter 4. We assume the following per-period dispositional utility function:

$$u(d_t, \varepsilon_t; x) = \begin{cases} \lambda \text{ if disposition correct and no procedural error that period } (\varepsilon_t = 0) \\ 0 \text{ if procedural error occurred that period } (\varepsilon_t = 1) \\ -\lambda \text{ if disposition incorrect and no procedural error that period } (\varepsilon_t = 0) \end{cases}$$

Note that this unusual dispositional utility function arises because there are three possible case outcomes, two of which are final outcomes and one of which is an interim outcome. We assume discounting across time periods, which are discrete and begin with $t = 0$. The discount rate is δ.

We first derive the judge's objective function. We exploit the stationarity of the problem and focus on a history-independent allocation of effort. So, in each period with probability e the judge receives λ and the game terminates. With probability $1-e$ he receives the interim payoff 0 and the discounted continuation value of the game. Call the continuation value V. But in either case the judge must pay e^2. So the per-period payoff is:

$$\begin{aligned} Eu &= e\lambda + (1-e)0 + \delta V - e^2 \\ &= e(\lambda - e) + (1-e)\delta V \end{aligned}$$

The accumulated expected per-period payoffs are:

$$EU = \sum_{n=0}^{\infty} (\lambda - e)\, e\, (\delta(1-e))^n$$

But this is simply the net present value of a perpetuity of $(\lambda - e)\, e$ discounted at $\delta(1-e)$. From finance, this is:

$$EU = \frac{(\lambda - e)\, e}{\delta(1-e)}$$

Via calculus the optimal per-period effort expenditure is:

$$e_{do}^{*} = 1 - \frac{1 - \sqrt{(1-\delta)(1-\delta(1-\lambda))}}{\delta}$$

We omit proofs but the comparative statics of optimal effort are intuitive, e.g., greater λ leads to greater per-period effort while greater δ (more future orientation) leads to lower per=period effort. In essence, the availability of the future "do-over" reduces per-period effort. In addition, $\lim_{\delta\to 0} e^{*} = \frac{\lambda}{2}$ while $\lim_{\delta\to 1} e^{*} = 0$. From probability theory, the expected number of rounds until the first error-free adjudication is simply $\frac{1}{e^{*}}$.

Comparison of Incentive Effects

For a case, in the one-shot regime the total judicial effort exerted is just $e_{os}^{*} = \lambda$.What about under the do-over regime? Here, the total expected effort is:

$$\begin{aligned} TEe &= e(e) + (1-e)e(2e) + (1-e)^{2}e(3e) + ... \\ &= \sum_{n=1}^{\infty} (1-e)^{n-1} e^{2} n \end{aligned}$$

And, $\lim_{n\to\infty} TEe = 1$.

In words, the do-over regime induces the judge to work as hard, in expectation, as would only the most scrupulous possible judge ($\lambda = 1$) in the one-shot regime. Or, equivalently, it induces the judge in the do-over regime to treat every case the same way that a one-shot judge would treat only the most-important cases. This finding, while quite striking, is not equivalent to saying that the do-over regime is unquestionably better than the one-shot regime. For that conclusion, we would also need to model the resources needed to identify reversible error (for a systemic analysis with that flavor, see Chapter 6). But this analysis of the incentive effects of institutional design displays one application of a "labor market" model set in case-space.

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