Measuring the Win-Set: Intersections of Judicial Panels in Two Dimensions

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Abstract

Most currently used models of Federal judicial behavior are operationalized along a single liberal-conservative dimension. The same holds true for the applications of those models. Research has shown, however, that ideological measures alone do not fully explain judicial decision-making in the lower Federal courts, especially in important policy areas. Legal and strategic considerations often interact with attitudinal preferences in a complex and ever-changing landscape. Considerations of judicial branch legitimacy, and collegiality among judges, also play a significant role. We propose a method of analyzing the behavior of Federal circuit court three-judge panels in two dimensions, as a way of bringing the complexities of the intermediate Federal courts into greater focus. We specify a series of spatial models with emphasis on the intersections of indifference curves, and describe a mathematical algorithm to calculate the areas of overlap. Using simulated data, we then demonstrate how the models might operate, and suggest some possible applications.

How and why judges decide cases is one of the most widely studied areas of judicial politics. The primary variable of interest is the ideological preference of the individual judge, either acting alone or with a panel of colleagues. Almost all models of judicial decision-making use a single liberal-conservative policy dimension, with the underlying assumption that each and every legal case outcome can be categorized in this manner.

Recent scholarship, however, has revealed a more complex process especially where the lower Federal courts are concerned. While the Justices of the Supreme Court may be more free to vote their preferences in almost every case, Circuit and District Court judges are not. We argue that the interaction of individual preferences with multiple constraints, both self-imposed and institutionally created, suggests that a two-dimensional approach to the lower courts is better.

We focus our attention herein upon the three-judge panels of the Circuit Courts of Appeals. We first give a brief account of the single-dimensional models currently used, and of the limitations associated therewith. We then proceed to explain our two-dimensional approach, first through an abstract generalized model, and then with a variation better suited to specific case outcomes. We then present some examples drawn from simulated data, and discuss some possible applications.

Judicial preferences and decision-making

Over the past several decades, judicial scholars have proposed a number of theories related to decision-making by individual judges. Generally speaking, each revolves around one of three elementary aspects of judicial behavior: the *legal*, the *attitudinal*, and the *strategic* (Bailey and Maltzman 2008; Epstein and Knight 1998; Segal and Spaeth 2002). The legal aspect refers to judges' level of adherence to long-standing principles of interpretation with regard to existing law and precedent (that is, rulings by previous courts), whereas the attitudinal is concerned solely with judges' individual policy preferences. The strategic theory sees each judge as an individual rational actor, attempting to maximize personal outcomes, whether policy or professionally oriented. The question of which theory best describes the majority of judicial behavior has been the subject of much debate. We argue that a new approach is needed, one in which the elements of each theory work in concert with the others.

Attempts to discover evidence that one of these theories has superior explanatory power have met with varying degrees of success (Black and Owens 2009). Some court researchers have argued that an integration of the three models as a unified whole is the proper approach (McNollgast 1995), especially where the Federal circuit courts are concerned (Giles et al. 2007). It appears clear to us that, regardless of the methodology employed, no single theory can explain the majority of outcomes in appellate cases, especially of the lower Federal courts. We therefore adopt the view of these scholars and proceed to develop a combined model that presents the best potential to explain the observed variation.

The most logical option, conceptually speaking, is that *attitudes shape legal reasoning*, and the results are subject to institutional constraints. In other words, scholars should begin with the theory that all three elements of the decision-making process are at work to varying degrees. In this view, legal precedent may act as a constraint in certain cases, and a motivation in others, depending on the preference of the individual judge. Any given particular situation may call for strategic behavior on the part of the court as a whole, an individual, or the three-judge panel hearing the case. Some judges may be attitudinal to a fault, but many may believe they are acting in conformity with their legal training even when making decisions based on preferences. This much is evident from even a casual perusal of written opinions, unless we are prepared to say that judges and justices are being dishonest in their writings, which is untenable.

In addition, it has rarely been possible to show that the legal constraints of our system of government do not matter, at least to some degree. For example, courts may or may not consider the possibility that their rulings might be overturned, but it certainly must remain in the back of their minds. If courts and judges desire to maintain legitimacy, then they must to some degree see themselves as members of a legitimate system. Taking judicial preferences as a starting point, we then add on the various other factors mentioned, to arrive at a way of analyzing outcomes in a spatial modeling environment. By focusing on coalition formation, we suggest this method as a way to integrate both individual preferences and group dynamics in a single framework.

Single-dimensional models

Researchers have developed a number of different individual methodologies to discern the policy attitudes and preferences of Federal judges. Each is primarily concerned with discovering judges' ideal preference points, placing them into a spatial model, and measuring the level of success at predicting results. One of the first attempts in this arena was the effort by Segal and Cover (1989), who used newspaper editorials as the source data, coding statements about each judge as demonstrating a liberal or conservative lean. More recently, improved technology borrowed from Congressional scholars allowed Martin and Quinn (2002) to use dynamic item response theory methods to ascertain the preferences of Supreme Court justices, using the individuals' own votes over their tenure on the Court.

Turning to the lower Federal courts, Giles, Hettinger and Peppers (2001) estimated ideal points for U.S. Circuit Court judges by relying upon the average of the NOMINATE[1] scores for the appointing President, as well as the Senators from the judge's home state.[2] Epstein et al. (2007) improved

[1]Method used by Poole and Rosenthal (2007) to estimate ideal points of members of Congress in a two-dimensional space.

[2]Under U.S. Senate procedure and by custom, the Senators from a judicial appointee's home state are given an informal opportunity to object to the nomination prior to the beginning of the confirmation process. This procedure is not used for Supreme Court

upon the GHP method by combining it with Martin-Quinn's scores into the Judicial Common Space (JCS).

Additional considerations

Group dynamics can and often do affect individual decisions, often reducing the effect of policy preferences or overriding them entirely. Collegiality and respect for the judicial hierarchy are important considerations for any lower court judge (Kastellec 2011; Maltzman, Spriggs and Wahlbeck 2000). Many court members may operate under additional personal incentives or constraints, such as ambition for higher office, re-election (if they are state judges), and a professional desire to write opinions that are well-regarded by their fellow members of the legal community (Baum 1994). Court legitimacy, the opinion of the public that the legal system is fair and equitable and performs a valuable function, can be an additional factor of varying importance depending on the profile of the court and the salience of the case. It may affect how judges rule individually, by court, or it may register as a system-wide concern (Epstein, Landes and Posner 2013; McNollgast 1995).

All of these considerations may limit the ability of judges or courts to obtain outcomes in line with their policy preferences. We argue that a two-dimensional model is better able to capture the complexity and nuance of judicial behavior. The flexibility of this approach allows for alternative definitions of the two dimensions, depending on the motivation of the researcher.

justices.

For instance, judges have varying degrees of plaintiff lean and defendant lean depending on the subject matter of the case, that might not necessarily map onto traditional ideological preferences. Of course, for many projects a liberal-conservative continuum as the first dimension, and a case-specific procedural or substantive preference as the second, will be appropriate.

Spatial models in two dimensions

The process of deciding an appeal in the Circuit Courts is relatively simple. Each case is heard by a randomly selected panel of three, drawn from a pool of between 11 and 17 judges, with the exceptions of the First and Ninth Circuits, which have 6 and 29 judges respectively. Following submission of the case (or oral argument if there is one), the panel meets in chambers and privately votes on the outcome. The result will either be a unanimous 3-0 decision, or a 2-1 with a dissenting judge. One member of the majority is assigned to write the opinion of the court. The other two judges may choose to write separately if they so desire.

Individual cases may therefore be modeled as a one shot game[3] with complete information. We assume single peaked symmetric Euclidean preferences and circular indifference curves. We place the ideal points in the xy plane and generate a model based on the relationships between each set of two

[3]It is possible that strategic actions may result in several rounds of voting or opinion amendment, depending on the internal procedures used by the court. However, in the lower appellate courts this is almost never the case (Gulati and Choi 2008).

judges.

Abstract model

Suppose player 1 has ideal point (x_1, y_1), player 2 has ideal point (x_2, y_2), and player 3 has ideal point (x_3, y_3). For the abstract case, we assume that the radii for the indifference curves are all equal, represented by r. The Euclidean distances between the ideal points (x_i, y_i) and (x_j, y_j) are found by

$$d_{ij} = d(i, j) = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2} \tag{1}$$

where $i, j \in \{1, 2, 3\}, i \neq j$ and order does not matter (i.e., $d_{12} = d_{21}$ is the distance between ideal points for player A and player B). Assuming two circles overlap, we denote the points of intersection by (x_{ij}, y_{ij}) and (x'_{ij}, y'_{ij}) if they both exist. It is possible for there to be either zero, one, or two points of intersection.

If all three circles have at least one point in common, the decision of the players should be unanimous and occur within the overlapping region. There are two conditions which must be met for this to occur. Let $d = max(d_{12}, d_{13}, d_{23})$, and then to satisfy the first condition, $r \geq \dfrac{d}{2}$ must be true. This condition is necessary but not sufficient for all three circles to intersect. In addition, we need to ensure that at least one of the intersection points of any two circles lies on or inside the third circle. For instance, player A and player B's indifference curves intersect at points (x_{12}, y_{12}) and (x'_{12}, y'_{12}). Considering the distances between these intersection points and player C's ideal point, let $d_{min} = min\{d((x_{12}, y_{12}), (x_3, y_3)), d((x'_{12}, y'_{12}), (x_3, y_3))\}$. The second condition then becomes $d_{min} \leq r$.

If either of the above conditions fail, then we check each pair of circles using

$$r \geq \frac{d_{ij}}{2} \tag{2}$$

again, where $i, j \in \{1, 2, 3\}, i \neq j$. If equation 2 is false, then those two circles do not intersect. We then compare the areas of any overlapping regions. The region with the larger area should represent the most probable two-player coalition.

Let A_{12} be the area of intersection for Circles A and B. Let A_{13} be the area of intersection for Circles A and C. Let A_{23} be the area of the intersection for Circles B and C. For these areas, we assume

$$\frac{d_{ij}}{2} < r < d_{ij} \tag{3}$$

If this is not the case for a given pairwise set, then the two ideal points lie on or within each other's indifference curves. In this situation, we would conclude that the player pair for which equation (3) is false will represent the winning coalition with a probability of 1.

In developing the formulas for the area of the intersection, we assume that one of the ideal points is at the origin and that the other ideal point is located on the positive y-axis. (Note that we can always obtain this situation through translating and rotating the axes.) In this case, the two circles intersect when

$$x_{ij} = \frac{\pm\sqrt{4r^2 - d_{ij}^2}}{2} \tag{4}$$

and we compute the area using the integral

$$A_{ij} = \int_0^{m_{ij}/2} \left(4\sqrt{r^2 - x^2} - 2d_{ij}\right) dx \tag{5}$$

where

$$m_{ij} = \sqrt{4r^2 - d_{ij}^2} \tag{6}$$

It is important to note that our model does not depend on the coordinate location of the ideal points. The areas of overlap are computed purely in terms of the Euclidean distance between the ideal points and the radii of the indifference curves.

Description of outcomes

The region inside each judge's indifference circle represents the the zone of acceptability for a majority opinion (case ruling). Proposals by the other judges which fall outside the region create an indeterminately low probability of coalition formation; in these situations a dissent is possible.[4] In fact, available evidence suggests that dissents occur in precisely the situation assumed by our model (Hettinger, Lindquist and Martinek 2004). Any area of pairwise intersection represents a zone in which a coalition is possible; if there is more than one, the larger will have a greater probability of prevailing.

A three-way intersection indicates a unanimous decision within the overlap zone. Because of the fact that a decision *must* be made, even if our model indicates no intersections at all, there will be an outcome. In such a case, we argue the result is indeterminate; it is invalid to simply state that the Euclidean distance will determine the coalition. This is because if sufficient space exists between the judges' ideal points ($r < \delta/2$), a coalition cannot be guaranteed with any degree of significant probability. Assuming a coalition from a tiny difference in distance, or where the ideal points are for all practical purposes equidistant, is imprecise at best and can lead to poor predictive performance of the model. Euclidean distances are also by their nature deterministic rather than probabilistic, and we argue that the latter is more descriptive of reality.[5] Simple Euclidean distance works well for large groups

[4]It has been noted by some scholars that dissents in the Circuit Courts are rare events. However, this may be an artifact of several different factors working together, including the generally large number of appeals heard and the routine nature of a many of them, as well as the opportunity cost of writing a dissent (Kastellec 2007). A study of dissents in cases with potentially precedent-setting implications might be warranted.

[5]In fact, one might question why our analysis does not collapse into a simple Euclidean distance measurement in every case. We argue that it does not, for the reasons stated above. The key point in the analysis is not the distance between the ideal points themselves, but the distance from one judge to the midpoint of the other two. It is possible to conceive of a situation where one judge is closer to the midpoint of the other two than to each of the others' ideal points. In such a case, simple Euclidean distance may generate

(NOMINATE-style), where the effect of a single incorrect classification is minimal for the overall chamber. However, in a 3-judge panel any pairwise coalition is an absolute veto and is therefore outcome-determinative.

One of the main advantages of the model is that it promotes probabilistic analysis of case results. We do not automatically assume the formation of a coalition based upon deterministic criteria. Instead, we attempt to approach how real-world outcomes are actually generated. If our model indicates two possible coalitions, for example, we do not characterize the result as binary; i.e., that the largest area of overlap wins. Rather, we intend to assign weights to each possible coalition based upon the differential of the area of intersection of each, and to use Bayesian MCMC methods to produce a probability distribution. We can, in this way, compare preferences across different panels, and we can even aggregate them across different circuits.

Ideal points may be obtained by any acceptable estimation method in two dimensions (such as the GHP method). Measuring the radius of indifference curves for each Circuit might be accomplished by the calculation of a Circuit-level Collegiality score, perhaps an index based on the number of 3-0 decisions in each Circuit over a defined period of time. Our model allows us to see these between-court differences with greater precision and provides a method for comparison between different panels within the same court. For example, if there is a linear relationship between the three ideal points, such would indicate a high probability of dissent. Conversely, a non-linear relationship

an incorrect result.

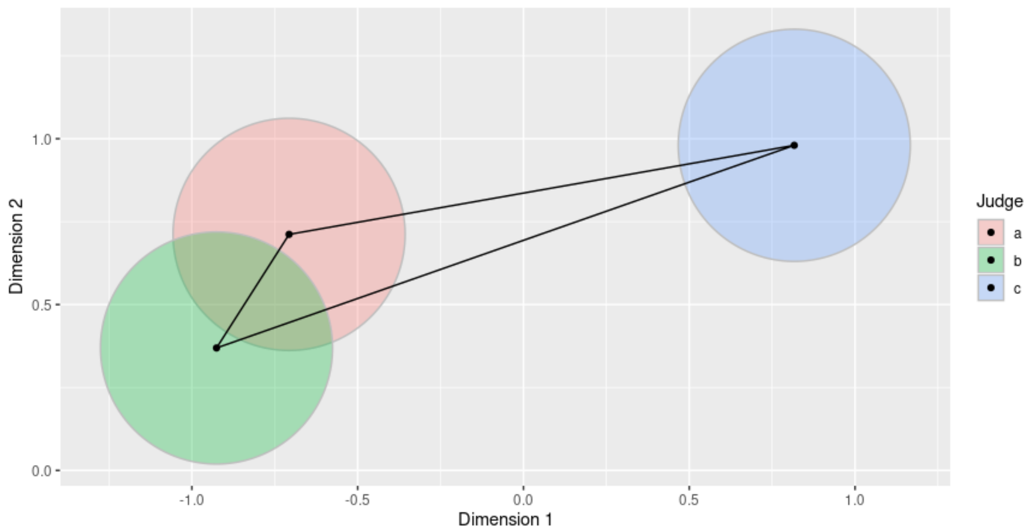

Figure 1: Mixed panel

might mean a lower probability of dissent, and a higher probability of the third judge joining a unanimous ruling on a narrow issue.

Simulation

Below, we provide two visualizations of possible model results. To create these graphs, we simulated a set of ideal points where $(x, y) \in [-1, 1]$, and created a software algorithm to analyze sets of three. The following are examples of the results.

In Figure 1, the ideal point estimates represent disagreement among the players along the first (x) dimension. In the second (y) dimension, there

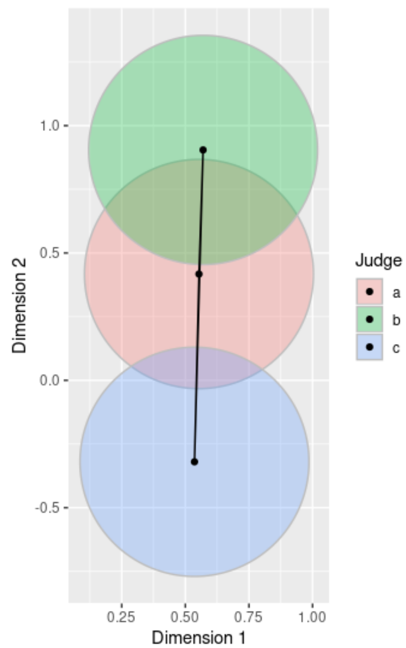

Figure 2: Homogeneous panel with second dimension difference

exists a certain amount of agreement between the three (shown as all positive). The radius of the indifference circles is set at .35. This scenario can be described as a mixed panel with moderate collegiality. The area of intersection between players A and B is .117 square units, and because this is the only intersection indicated, we would conclude that this coalition is highly probable.

In Figure 2, the ideal points are quite different, with the players sharing a nearly unified preference in dimension one, but disagreeing in dimension two. The radius of the indifference circles is here set at .45, which represents a more homogeneous panel with better collegiality. The players do differ on some dispositive issue described by the second dimension. The areas of the two intersections are .22 (AB) and .057 (BC). In this case we would predict a higher probability of an AB coalition, and a lower probability of BC.

Specific case model

The foregoing abstraction is interesting from a theoretical perspective, but suppose our desire is to predict the probable outcome of a specific legal case, based upon the three judges selected to hear it. For this purpose, it is necessary to add an additional element to the model. The status quo point represents the current state of the law for whichever case we are analyzing. Stated differently, all else equal, the status quo is the expected value of the outcome if the court rules in favor of the Respondent (the party defending an appeal).

In this version of the model, the indifference curves do not serve the same purpose. Instead, their radii reflect the distance from the judges' ideal points to the status quo.[6] We therefore re-situate the circles so that each intersects the status quo, and use the overlap areas to measure not only coalition probabilities, but also the strength of the opinion as indicated by the relative distance of the overlap from the status quo point.

Given a choice between two outcomes, each judge strictly prefers the outcome that is closest to their ideal point, and prefers any outcome inside their indifference circle to one that is outside. If the status quo is closer to a

[6] Although it is theoretically possible, we assume that no judge's ideal point is exactly equal to the status quo.

certain judge than any possible outcomes, that judge will opt for the status quo (in real world terms, this would mean a vote to affirm the lower court decision). If none of the circles overlap, the result should be equivalent to the status quo. Otherwise, the case outcome may reflect a ruling for either party, depending on the subject matter, the location of the ideal points, and the predicted coalition.

Any pairwise area of overlap may be calculated using the following integral, where r_1 represents the larger of the two radii.

$$A = 2\int_0^{\alpha_2} \left(\sqrt{r_1^2 - x^2} - d + \sqrt{r_2^2 - x^2}\right) dx \tag{7}$$

where

$$\alpha_2 = \frac{\sqrt{4r_1^2 d^2 - (r_1^2 - r_2^2 + d^2)^2}}{2d} \tag{8}$$

Figure 3 shows one possible visualization of a case where a 2-1 decision in a conservative direction is the most probable result. Note that the ideal points form a triangle around the status quo; this configuration tends to generate a 2-1 coalition. If all three ideal points were located to one side (i.e., the status quo was not "surrounded"), the outcome would likely be 3-0.

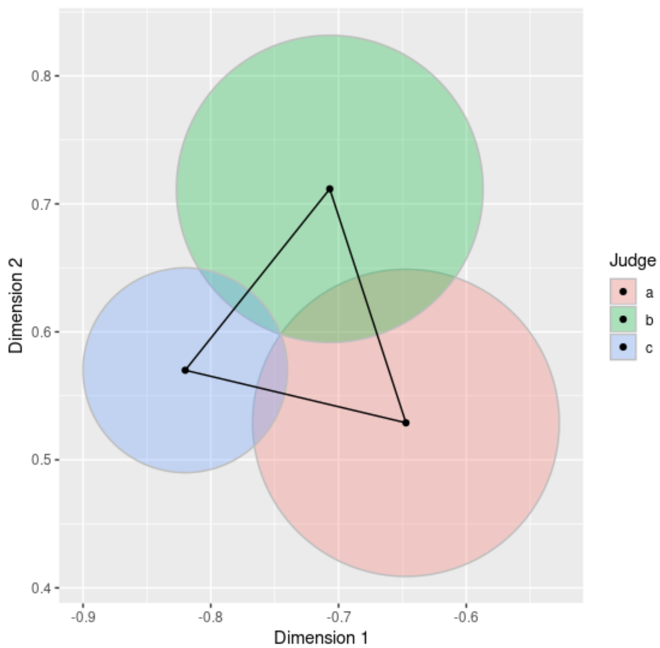

Figure 3: Specific case model

Discussion

This method can be used in a number of applications, such as researching forum shopping, the existence of court legitimacy concerns in the Federal judiciary, preferences for arbitration panels, and so on. Because of the second dimension, legal area or case-specific study is more nuanced than the straight liberal-conservative single dimension most often used (as with the JCS). For example, we can examine whether attitudinal or strategic considerations are more prevalent in different types of litigation. We can also measure the impact of the participation of certain parties or "repeat players," such as the U.S. Justice Department, or interest groups (see McGuire 1995).

Most legal and political science researchers agree that forum shopping takes place in the lower Federal courts. When considering a case that may have multiple venues available, Plaintiffs may perform an analysis or (more often) rely on anecdotal information to decide in which jurisdiction they will file. Theoretically, these Plaintiffs (usually organizations or members of a class) seek the venue with the highest likelihood of a favorable outcome, based on the ideology and preferences of the judges. There have, however, been few studies done to confirm whether there is a pattern to this practice, and if so, whether it has a measurable effect. Our method should provide a way to analyze court data that may be used for this purpose.

Binding arbitration is another legal venue where three-judge panels are often used. Because of selection rules, arbitration panels usually have one judge who is centered between the other two in terms of preferences. It is therefore more likely that larger intersections of indifference circles will be present, leading to outcomes that would be more palatable to both parties (this is, in fact, the point of arbitration). Arbitrators are also evaluated on their neutrality, so they are less likely to have extreme preferences, and more likely to have higher collegiality scores. This state of affairs should result in better intersections and a larger win set. Our method could be used to test whether increased use of arbitration has the potential to reduce the level of dependence upon "adversarial legalism" that results from political reliance upon the Federal court system to solve an ever-expanding menu of social and economic ills.

Future projects will be directed toward three different extensions of this model. First, we will explore the area calculation for a three-way intersection of indifference circles. While not particularly enlightening in the context of a specific court, this addition to the model would facilitate comparison across different courts and probabilistic measurement of 3-0 outcomes. Second, we would like to create a method to measure indifference curves for individual judges. This will involve some heavy lifting in regard to data collection, and the mathematics of a general case where the three radii are unknown and not identical is complex. Additional research is needed into both the available data, as well as the methodology. Finally, it is our hope that this model will operate as a launching point for a larger research agenda aimed toward advancing the potential for a synthesis of judicial behavior paradigms.

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