

Panel Composition and Judicial Compliance on the US Courts of Appeals

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This article integrates the literatures on judicial compliance, panel decision making, and case selection in the federal judiciary hierarchy. Many studies have speculated that “panel effects”—the phenomena under which an individual judge’s vote may depend on her colleagues on a three-judge panel—can be tied to a “whistleblower effect,” through which a lower court judge can constrain a panel majority from disobeying with Supreme Court precedent by threatening to dissent. However, no study has systematically found such a relationship. I present a game-theoretic model of circuit court-Supreme Court interaction that demonstrates how panel composition might affect the likelihood of lower court compliance to Supreme Court doctrine. The model illustrates how three-judge panels, while not inducing perfect doctrinal control of lower courts by the Supreme Court, significantly increases the latter’s ability to see its preferred doctrine carried out by its subordinates in the judicial hierarchy.

1. Introduction

The vast majority of cases on the US Courts of Appeals are heard by a panel of three judges sitting as a collegial court.¹ After either reading briefs or hearing arguments, or both, these panels are tasked with issuing a legal opinion that declares either the appellant or the appellee to be victorious in her claims, with voting following majority rule. There are two basic dynamics to this process: first, each judge on the panel must consider the views of at least one other colleague and second, as a subordinate member of the federal judicial hierarchy, the panel must consider the existing doctrine of both the circuit as a whole and the Supreme Court in the particular area of the law covering the case at hand.

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1. Fewer than 1% of cases are decided en banc by either all the members of a circuit or a subset of members (George 1999, 214).

These two dynamics have received much attention by judicial scholars in recent years. Studies have sought to demonstrate and explain the existence of “panel effects,” in which the outcome of both an individual judge’s vote and the panel’s decision may differ from what we might expect if a single judge had decided the same case (Revesz 1997; Massie et al. 2002; Farhang and Wawro 2004; Sunstein et al. 2004). These studies show that the composition of a panel has a significant effect on the outcomes in a wide range of appeals court decisions, even after we take into account that judges with differing judicial philosophies may often come to different conclusions in the same case.² Farhang and Wawro (2004), to give one example, find that the presence of a female judge on a panel significantly increases the likelihood that the panel will rule for the plaintiff in employment discrimination cases, controlling for judicial ideology.

One of the more plausible explanations for such behavior might be the relationship between panel effects and the second, hierarchical dynamic of appeals court decision making. Scholars interested in this dynamic have examined the Supreme Court’s potential problem of enforcing compliance among circuit courts with only limited tools at its disposal, focusing on how lower courts’ fear of reversal may help the Court induce greater compliance (Songer et al. 1994; McNollgast 1995; Cameron et al. 2000; Spitzer and Talley 2000; Lax 2003). If circuit court judges do seek to avoid reversal, we would expect the composition of a circuit court panel to influence the likelihood that the panel’s decision follows the precedent established by the Supreme Court in a given area of the law.³ Indeed, this theory is set forth in Cross and Tiller (1998), who argue that in certain cases a judge who is in the ideological minority of a three-judge circuit court panel can constrain the two members of the ideological majority by threatening, either explicitly or implicitly, to act as a “whistleblower” and signal the Supreme Court to review that particular case. The threat of this signal, which comes in the form of a dissent, may cause the majority to moderate its position or even vote against its preferred outcome.

Despite, however, the apparent prevalence of panel effects, no study has systematically tied their occurrence to a desire by appeals courts to follow Supreme Court precedent. Some studies speculate that the presence of a whistleblower may contribute to panel effects, but focus mainly on the personal characteristics of judges, such as ideology (Sunstein et al. 2004), gender (Massie et al. 2002; Farhang and Wawro 2004), and race (Cameron and Cummings 2003). Accordingly, these studies have sought to explain the occurrence of panel effects from a more sociological perspective; Farhang and Wawro (2004), for instance, argue that the effect of the personal experience of women judges on her male

2. More explicitly, the studies show that panel outcomes differ from what we would predict if we simply aggregated the expected votes of the judges on a panel and took the overall outcome to be the position (i.e., the liberal or conservative outcome in a case) generating the support of the majority of the panel.

3. Many circuit court panels feature one (and in some cases two) district court judges who sit by designation. In the interest of exposition throughout the article, I refer only to decisions by “circuit court judges” in panel decision making, but readers should take this to include district court judges who sit on a panel.

colleagues drive their findings. Sunstein et al. (2004) speculate that group polarization dynamics may be a major cause of panel effects.

In this article, I seek to integrate the literatures on certiorari, judicial compliance, and panel effects in a manner that allows for the examination of whether panel effects contribute to compliance. I argue that in treating the lower courts as unitary actors, the literature on compliance and certiorari—the Supreme Court’s decision to hear a case—has left unrealized how panel decision making can help reduce the high court’s informational problem in surveying thousands of decisions by lower courts each year and choosing which ones to review. In turn, I argue that an empirical test of whether panel effects are related to compliance must employ a fact-based model of judicial decision making and Supreme Court precedent in order to postulate when exactly we should expect panel composition to influence compliance. Building on the informal model presented in Cross and Tiller (1998) and the formal models presented in Cameron et al. (2000) and Lax (2003), I present a game-theoretic model of circuit court-Supreme Court interaction that demonstrates how panel composition affects the likelihood of lower court compliance to Supreme Court doctrine. The model illustrates how three-judge panels, while not inducing perfect doctrinal control of lower courts by the Supreme Court, increases the latter’s ability to see its preferred doctrine carried out by its subordinates in the judicial hierarchy. In addition, the model allows me to delineate conditions under which a falsifiable empirical test of whistleblowing could be performed.

The article proceeds as follows. Section 2 reviews the literature on certiorari and compliance, noting how it has treated lower courts as unitary actors. Section 3 discusses the implication of this limitation by discussing recent work on panel effects, as well as why we would expect panel decision making and compliance to be related. Section 4 presents a model of judicial whistleblowing illustrating how panel effects might affect compliance. Section 5 discusses the empirical implications of the model and establishes conditions for suitably testing the theory. Section 6 offers some concluding thoughts.

2. Compliance in the Judicial Hierarchy

The stylized facts are well-known: the US Supreme Court sits atop a large hierarchical system, and many of its subordinates have incentives to disobey its precedents. Unlike most superiors in a hierarchy, however, the Court has few formal tools with which to compel compliance (Cameron et al. 2000, 102). Moreover, the Court hears only a tiny fraction of the cases appealed to it each year. Despite this apparent enforcement problem, studies generally find widespread, albeit imperfect, compliance by lower courts (Gruhl 1980; Songer and Sheehan 1990; Songer et al. 1994; Benesh 2002; Benesh and Reddick 2002, *inter alia*).

Two possible explanations for this high rate of compliance immediately stand out. First, due to the nature of the appointment process, at any given time, a large percentage of the judges in both district courts and the Courts of Appeals will share the judicial values of a majority of the Supreme Court, mitigating the compliance problem. A large number of judges will

nevertheless differ in their values with their superiors, thereby leaving open the possibility of compliance problems in a wide range of cases. Second, lower court judges, whatever their individual judicial philosophy, might strictly adhere to the norm of vertical *stare decisis* and follow Supreme Court precedent even if they disagree with it. Indeed, many appeals court judges say that this is exactly what they practice.⁴ Nevertheless, studies have consistently shown that Democratic-appointed judges vote systematically differently from Republican-appointed ones (Pinello 1999), suggesting that appeals court decisions rendered by judges whose ideological attributes differ from those of a majority of the Supreme Court may be more likely to disobey precedent.⁵

Given this potential for noncompliance, most judicial politics scholars have sought to explain the phenomenon of compliance by employing the tools of principal-agent analysis, treating the appeals courts as the latter and the Supreme Court as the former. Although the Supreme Court has no formal sanctions it can levy against its subordinates, it does have the ability to review and reverse the decisions of lower courts, which it can use as an informal tool to promote compliance. Cameron (1993) and McNollgast (1995), for instance, posit that the structure of the federal judiciary places lower courts in an implicit “tournament” with one another, allowing the Supreme Court to focus its limited discretion on reversing the most egregious decisions (from its perspective), thereby forcing would-be deviant lower courts to vote against their preferred outcome or to moderate their majority opinions. Similarly, Cameron et al. (2000) argue that the Supreme Court uses its discretionary docket to strategically audit cases decided by ideologically distant lower courts, the outcome with which it is likely to disagree. This strategy, in turn, causes lower courts in some cases to rule against their preferred legal outcome and in favor of the Supreme Court’s. Whereas the aforementioned work treats the Supreme Court as a unitary actor, Lax (2003) extends this analysis so as to consider politics within the Supreme Court. He argues that the Court’s “Rule of Four”—under which only a submajority of four justices is needed to decide to hear a case—serves as a commitment device for auditing lower courts, thus increasing the power of the Court to induce compliance.

Understandably, for reasons of parsimony and tractability, these studies have treated lower courts as unitary actors, assuming away any strategic properties that may result from the fact that three-judge panels (with the rare exception of *en banc* decisions) decide appellate cases instead of a single judge. Indeed, assuming a single left-right ideological continuum to judicial decision

4. See, for example, the interviews in Howard (1981), Cohen (2002), and Klein (2002).

5. Indeed, there have been instances where lower courts have flagrantly disobeyed Supreme Court precedent, the most famous example perhaps being the judges in the South who were reluctant to enforce the desegregation of schools in the wake of *Brown v. Board of Education* (Peltason 1961). More recently, the Supreme Court was compelled in December 2004 to rehear the appeal of a Texas death row inmate from the 5th Circuit Court of Appeals, which, according to Justice Sandra Day O’Connor, was “paying lip services” to the Court’s death penalty jurisprudence and had issued a ruling with “no foundation in the decisions of this court” (Liptak and Blumenthal 2004).

making with single-peaked preferences, the median voter theorem would suggest the median member of a panel should be decisive, and thus lower courts can indeed be considered unitary actors (Farhang and Wawro 2004, 305). The literature on panel effects, however, calls into question this assumption, and suggests that to fully understand lower court compliance, we need to consider the nuances of decision making within three-member panels.

3. Panel Composition, Dissents and Anticipatory Behavior

The literature on certiorari has long recognized, if only implicitly, that panel decision making influences how the Supreme Court “decides to decide” (Perry 1991). In particular, the presence or absence of a dissent may provide the Court with key information as to whether a lower court is complying with the high court’s precedent. In their seminal work, Tanenhaus et al. (1963) hypothesized that dissension on a lower court was one of the four cues that Supreme Court justices used in granting certiorari.⁶ Although the merits of cue theory have been debated (see, e.g., Ulmer et al. 1972), scholars have consistently found empirical evidence demonstrating that dissent on lower courts acts as a “cue” to the Supreme Court and makes it more likely that the Court will grant certiorari in a given case (Songer 1986; Perry 1991; Caldeira et al. 1999).

The reason that dissent has this effect on certiorari likely stems from its informative value. In deciding which cases it will review out of the thousands appealed to it each year, the Supreme Court faces an informational problem: it is looking for cases that stand out from the pack and are worth devoting its limited resources to, yet it can only make an informed conjecture as to which those cases might be. Moreover, each case taken carries an opportunity cost of deciding another, perhaps more worthy, case, or in leisure time lost (Cameron et al. 2000, 103). A dissent can signal the court that a case is worthy of hearing on appeal, thereby mitigating this opportunity cost. Frank Coffin (1994, 227–8), a judge on the 1st Circuit Court of Appeals, writes that a judge should dissent if he or she “feels that a *serious mistake of law* has been made on a *significant issue* that is *likely to recur*. . . . The dissent in such a case alerts the non-panel members of the court of a likely petition for rehearing *en banc* and serves also as a flag to the Supreme Court if further review is sought” (emphasis in original). In turn, justices use dissents to gain information about a lower court case and the potential merits of granting certiorari to a petition for review. In his influential study on certiorari, Perry finds that the presence of a dissent on a circuit court decision is of interest to all nine members of the Court. “When there is a dissent, all justices want to know that; and when there is a dissent, clerks and justices are much more likely to focus on the opinions below rather than on the [certiorari petition]” (Perry 1991, 125).⁷ This fact suggests that

6. The others were whether the federal government seeks review, whether a civil liberties issue is present, and whether an economic issue is present.

7. Litigants also seem to be aware of the influence of dissent on the Court’s certiorari decisions: Songer et al. (1995) find that losing litigants are more likely to appeal circuit court decisions with nonunanimous votes.

dissent lowers the opportunity cost to the Court of reviewing a particular case, in that it can guide the justices (and their clerks) in reviewing the particular disputes in hand, allowing them to spend less time in reviewing the merits of a particular certiorari petition.

The information that panel composition and panel voting provides to the Supreme Court gives lower court judges an incentive to act strategically in certain cases, which has not always been recognized in the literature on certiorari. Perry (1991, 123), for example, applying Jervi's (1970) seminal work on signaling in international relations, distinguishes between "signals," which are manipulable characteristics of lower court cases that appellants can use to sway the Supreme Court's decision to grant or deny, and "indices," which are nonmanipulable. Perry labels the vote of the panel, including whether there is a dissent or not, as an index (125). Whereas the panel's vote is nonmanipulable with respect to a litigant deciding how to frame his appeal for certiorari, it is manipulable by the lower court judges themselves, as they determine how a case is decided and whether a unanimous or split decision is issued. It is thus more accurate to call the presence of a dissent a signal that is endogenous to the strategic calculations of the judges on a panel.

Given the importance that the justices place on dissent and the subsequent strategic incentive for lower court judges to write dissents, we might expect to see appeals court judges dissent much more frequently than they do.⁸ There are several possible explanations for this low rate of dissent. One, if the majority of circuit decisions were indeed compliant with Supreme Court precedent, there would be no opportunities for appeals court judges to dissent strategically. Second, appeals court judges may operate under a norm of unanimity, choosing to go along with the decision of the panel majority rather than publicly announce their disagreement with the decision (see, e.g., Songer 1986). Third, dissent is not a costless activity—as Revesz (2001, 1110) notes, judges "on the Courts of Appeals are monitored with respect to the timeliness of their opinions and receive 'credit' for writing majority opinions. No such credit is awarded for dissenting opinions, which do not reduce the workload that is otherwise assigned to the judge." Fourth, as noted above, a dissent may raise the probability of Supreme Court (or en banc) review, but by no means does it guarantee that a higher court will grant review. Fifth, and most relevant to this article, the absence of dissent may not reflect an absence of strategic behavior; it may simply mean that we are looking in the wrong place for it.

The potential for dissent to trigger anticipatory behavior is central to the whistleblowing theory of Cross and Tiller (1998, 2156), who argue that

[w]hile there is undoubtedly more than one valid explanation for principled adherence to legal doctrine, . . . the prospect of a "whistleblower" on the court—that is the presence of a judge whose policy preferences differ from the majority's and who will expose the majority's

8. Although it has increased over time, the rate of dissent has generally been no greater than 10% of cases taken across all circuits (Songer et al. 2000).

manipulation or disregard of the applicable legal doctrine (if such manipulation or disregard were needed to reach the majority's preferred outcome)—is a significant determinant of whether judges will perform their designated roles as principled legal decisionmakers.

According to this theory, an appeals court judge does not necessarily have to dissent to expose deviance by a panel majority, because the *threat* of dissent may be enough to constrain the majority in the first place. For this threat to be credible, of course, the potential dissenter must have Supreme Court doctrine on her side.

To test this theory, Cross and Tiller (1998) examined every decision of the D.C. Circuit Court of Appeals between 1991 and 1995 that cited *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, a 1984 Supreme Court decision that directed lower courts to grant federal agencies considerable leeway in interpreting federal statutes. Examining the partisan composition of each panel—that is whether the judges hearing the case were appointed by Democratic or Republican presidents—they found that panel effects manifested themselves frequently. In particular, in cases heard by divided panels (those composed of at least one Republican-appointed judge and one Democratic-appointed judge) in which it was in the panel majority's ideological interest not to defer to the agency, they nevertheless did so 62% of the time. In contrast, in cases heard by unified panels (those in which all three judges were appointed by a president of the same party), the panel deferred to the agency only 33% of the time. These results would seem to provide strong support for the whistleblower theory—composition significantly affected the probability that the panel would defer to the agency and, accordingly, adhere to the doctrine stated in *Chevron*. But, as Cross and Tiller (1998, 2174) note, this modulating effect was seen mostly in panels in which Republican-appointed judges constituted a majority. Given the fact that the Supreme Court was conservative throughout the period of study, it is difficult to attribute the behavior by these circuit court judges to a desire to avoid being exposed as having deviated from the Supreme Court's preferred doctrine. Seeking an alternative explanation for the panel effects they find in the study, Cross and Tiller (1998, 2174) suggest that the “minority member in such panels may simply force the majority to acknowledge its subconscious disobedience to doctrine and therefore to mend its ways.”

Indeed, no study has found systematic evidence that a whistleblowing effect increases compliance on the courts of appeals. Moreover, Hettinger et al. (2004) find no evidence that dissent on three-judge panels is used to signal the entire circuit of an outlying decision, a result that also casts doubt on a whistleblowing explanation of lower court-higher court interaction. It is certainly possible that the whistleblower theory's predictions about the relationship between panel composition and compliance may not be borne out. But extant research, I argue, is inadequately suited to provide such falsification. To do so, it is necessary to: (1) take a fact-pattern-based approach to evaluating compliance with Supreme Court precedent (i.e., to consider the nature of the cases being decided) and (2) to consider the Supreme Court's role in the judicial

hierarchy (i.e., to consider interactions between all the levels of the hierarchy). I turn now to a formal model that illustrates why this is the case.

4. The Model

In this section, I present a game-theoretic model that integrates the literatures on panel effects and compliance in the judicial hierarchy in a unified manner. Although still preserving their basic structure, the model builds on those presented in Cameron et al. (2000) and Lax (2003) by treating the lower court as a three-member panel instead of a unitary actor. The model is designed to explain neither the Supreme Court's certiorari decisions nor the decision by an appeals court judge to dissent, though it does capture the incentives thereof. Instead, its goal is to illustrate the conditions under which panel composition will affect the likelihood of compliance by a lower court.

4.1 Players and Cases

There are initially four players in the model: a high court, H , and a lower court, L , composed of three judges, j_1, j_2 , and j_3 . The play of the game determines the outcome of a search-and-seizure case, at which the final outcome is that the search or seizure in question is held either reasonable (the "liberal" outcome) or unreasonable (the "conservative" outcome).⁹ The facts of the case map into a unidimensional space X that determines how intrusive the case is, with x denoting the case's level of intrusiveness.¹⁰

4.2 Preferences and Sequence of Play

Following Lax (2003), each player has an indifference point x_i , in which she prefers that all searches or seizures that map to the right of this point be found unreasonable, and thus excluded (i.e., those that are more intrusive than x_i), and all to the left be found reasonable, and thus admitted (i.e., those that are less intrusive than x_i). If the case is ultimately decided correctly according to a player's preferences (i.e., after H has moved), she receives in utility $|x_i - x|$; that is, the absolute difference between her indifference point and the case. Otherwise, she receives a zero. To ease the exposition, I assume, without loss of generality, that at least two members of the lower court are more liberal than

9. I follow Cameron et al. (2000) and Lax (2003) in using search-and-seizure cases as a contextual example in order to facilitate comparison with their models. Nothing, however, prevents these models from being generalized to any set of cases in which we can consider the issue space to be unidimensional, such as, for example, free-speech cases or affirmative action cases.

10. Following Lax (2003), I treat the true value of x as common knowledge available to both the lower court and H , even if the latter does not agree to hear the case. In contrast, Cameron et al. (2000) divide the case facts into a publicly and privately observable component, with the former revealed to the Supreme Court only if it grants cert. Lax (2003, 74, fn. 32), in advancing his "cert-pivot" model, argues that the strategies of rational litigants (who would not appeal if they knew they would lose), would perfectly reveal the true intrusiveness of the search in question. The dynamics of strategic information revelation are set aside in the present model, in order to focus on dynamics within the lower court.

H (i.e., $x_J < x_H$ for at least two j_i).¹¹ However, I allow the indifference point of the third member of the panel to fall anywhere on X in order to examine how different configurations of preferences lead to different outcomes and different possibilities for whistleblowing.

The game begins when the lower court panel hears an appeal of a search-and-seizure case (the district court's decision is not modeled here). The location of the x —the intrusiveness of the search or seizure—in combination with each judge's ideal point determines whether there will exist an opportunity for whistleblowing. The panel's voting procedure is determined by the following rules: If all three judges' indifference points lie to the same side of x , then the panel forms a single voting bloc, producing a 3-0 decision of either "reasonable" or "unreasonable." The bloc is denoted by L , with x_L denoting the indifference point of the median member of the panel. Note that, consistent with the theory of Cross and Tiller (1998), under this scenario there is no potential for whistleblowing since all three panel members agree about the case. With a panel with homogenous preferences deciding a case, we would not expect the threat of dissent to significantly influence collegial decision making.

On the other hand, if x falls between a pair of indifference points (e.g., $j_1 < j_2 < x < j_3$) and two of the judges' indifference points fall to the left of x , those same two judges become the "majority" of the panel.¹² In this case, the majority is also denoted by L , with x_L denoting the indifference point of the median member of the panel. The judge whose indifference point lies on the opposite side of x relative to the majority becomes a possible dissenter and thus a potential whistleblower, denoted by W , with her indifference point denoted by x_W . If this configuration occurs, the sequence of play by the members of the lower court is as follows: L decides first whether to find the search in question reasonable or unreasonable. W then decides whether to concur with L 's decision, which would produce a 3-0 decision, or to write a dissent, which would produce a 2-1 decision. The players' preferences, as well as whether and how L and W arise under different possible scenarios, are depicted in Figure 1.

Note that if the first scenario occurs and no potential whistleblower exists, the game reduces to the basic model in Lax (2003, 63–7), as the lower court effectively becomes a unitary actor. Therefore, unless otherwise noted, in the rest of the article I do not consider the redundant cases where no whistleblowing can exist and examine only cases in which there is the potential for whistleblowing.¹³

11. Results are symmetric. That is, in all the results that follow, if one makes the majority of the lower court more conservative than H and then transposes "reasonable" for "unreasonable" and vice versa, the results will still hold.

12. The latter condition (applying majority formation only to instances where two judges are to the left of x) stems from the assumption, made without loss of generality, that $x_L < x_H$.

13. Note that by definition, this preclusion covers the substantively uninteresting case where $x_W < x < x_L$. Because W is more liberal than L , there are no opportunities for her to act as a whistleblower because in all cases where she disagrees with L about the outcome of the search, L agrees with H . At the same time, whenever L disagrees with H (i.e., when $x_L < x < x_H$), so does W , giving her no incentive to dissent.

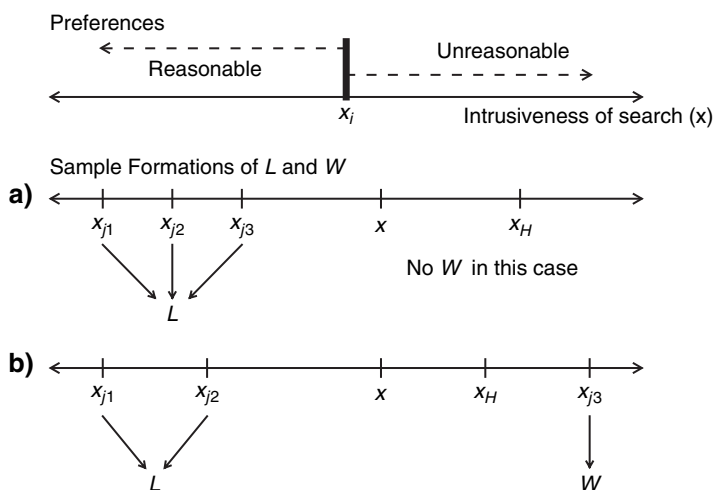


Figure 1. Preferences and L and W 's Formation.

Following the vote of the lower court, the game moves to H , which then must determine whether to grant certiorari or not. Since the game is one of the complete and perfect information, H is aware of x , the preferences of the lower court judges, and the vote of the lower court. If H declines to review the case, L 's decision stands. If H grants certiorari, it hears the case and decides, based on its preferred legal rule, whether to affirm or reverse L 's decision. The sequence of play is summarized in Figure 2.

4.3 Actions and Costs

To formalize the actions available to each player: L can find the search reasonable ($l = r$) or unreasonable ($l = \sim r$). W can dissent ($w = d$) or concur ($w = c$). H can grant ($h = g$) or deny ($h = \sim g$) certiorari.

In addition to utility over outcomes, each player faces potential costs. If L is reversed by H , it suffers an $\varepsilon > 0$ reversal cost (Caminker 1994, 77–8; Cameron et al. 2000, 102).¹⁴ In addition, if W concurs and L 's decision is reversed by H , she also suffers a reversal cost of $\varepsilon > 0$. If W dissents, she suffers a cost of

14. The assumption that lower courts fear reversal of higher courts is not uncontroversial. Although there is substantial evidence that lower courts generally follow the precedents of higher courts, some argue that they do so out of a desire to follow the law rather than a fear of reversal, which is typically remote in any one case (Cross 2005). Empirical evidence can be found on both sides: Klein and Hume (2003), for instance, find that circuit courts are not more likely to comply with Supreme Court precedent in cases in which the Court seems more likely to grant certiorari, whereas Clark (2006) argues and finds support for the contention that predominantly liberal circuits sitting under a conservative Supreme Court are less likely to reverse conservative panel decisions via an en banc decision compared to predominantly conservative decisions reviewing liberal panel decisions, a result that could seemingly only be explained by liberal circuits' fear of reversal. Even if the fear of reversal does not apply uniformly across all circuits and all appeals court judges, it has proved to a very useful theoretical tool in studying decision making in the federal judiciary, and I continue in that tradition.

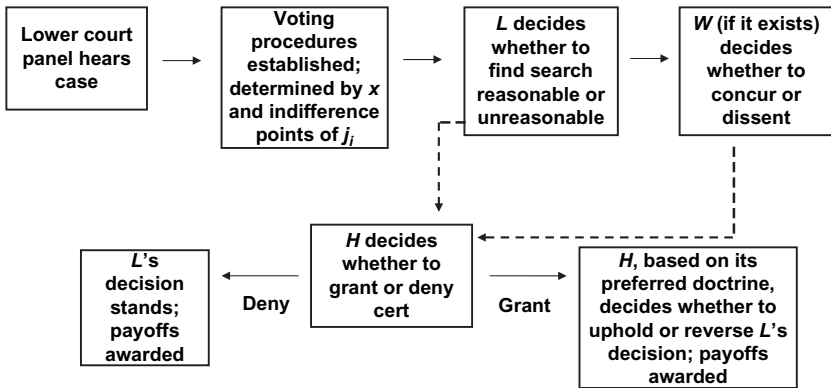


Figure 2. Sequence of Play.

$\lambda > 0^{15}$ that reflects the extra effort and time required to craft a dissent.¹⁶ Finally, H suffers a cost of $k > 0$ if it grants certiorari that reflects the opportunity cost of hearing a case and leisure time forgone. However, if W writes a dissent, that dissent reduces the opportunity cost of hearing the case, for reasons discussed above. Let the cost of review equal $k(1 - \tau)$ if W dissents, where $\tau \in (0, 1)$. τ can be thought of as the value of a dissent in reducing H 's costs in reviewing L 's decision; as $\tau \rightarrow 1$, $k \rightarrow 0$.¹⁷

4.4 Strategies and Utility Functions

The strategy of each player differs according to the order in which they move and the actions available to them. As the first player, L 's strategy is contingent on its expectations regarding W and H 's future actions in each case. W , moving second, conditions its strategy on L 's vote and her expectation of H 's action. Finally, as the last player, H 's strategy is contingent on L and W 's prior actions.

A strategy for L is a function

$$s_L: X \rightarrow [0, 1],$$

where $[0, 1]$ denotes the set of probability distributions over a finite set. Let s_L give the probability that L finds the search reasonable, given x , the intrusiveness of the search. A strategy for W is a function

15. Note that W cannot suffer both reversal and dissenting costs. If W dissents and H upholds L 's decision, this is not treated as a "reversal" of W 's dissent.

16. It is, of course, possible for an appeals court judge to write a "costless" dissent in which she simply states "I dissent" and gives no legal reasoning for her decision. I assume such a dissent is deemed to be completely uninformative by the Supreme Court (and other legal actors) in assessing the majority opinion. I explore below how increases or decreases in the cost of dissent affect equilibrium behavior.

17. As a further simplification, I follow Lax (2003) and assume that $x_L < x_H - k$.

$$s_W: X \times \ell \rightarrow [0, 1].$$

Let s_W give the probability that W dissents, given x and L 's decision to find the search reasonable or unreasonable. Finally, a strategy for H is a function

$$s_H: X \times \ell \times w \rightarrow [0, 1].$$

Let s_H give the probability that H grants certiorari given the intrusiveness of the search, L 's decision to find it reasonable or not, and W 's decision to concur or dissent.

The utility functions for L and H are presented below. Note that the functions for both are the same as in Lax (2003), although the notation I use is slightly different.

$$U_L = \begin{cases} |x_L - x| & \text{if } \begin{cases} x \leq x_L & \& \quad l = r \\ x_L < x < x_H, & l = \sim r & \& \quad h = \sim g \\ x \geq x_H & \& \quad l = \sim r \end{cases} \\ |x_L - x| - \varepsilon & \text{if } \begin{cases} x \leq x_L, & l = \sim r & \& \quad h = g \\ x > x_H, & l = r & \& \quad h = g \end{cases} \\ 0 & \text{if } \begin{cases} x_L \geq x, & l = \sim r & \& \quad h = \sim g \\ x_L < x < x_H & \& \quad l = r \\ x \geq x_H, l = r & \& \quad h = \sim g \end{cases} \\ -\varepsilon & \text{if } x_L < x < x_H & \& \quad l = \sim r & \& \quad h = g \end{cases}$$

$$U_H = \begin{cases} |x_H - x| & \text{if } \begin{cases} x \leq x_H, & l = r & \& \quad h = \sim g \\ x > x_H, & l = \sim r & \& \quad h = \sim g \end{cases} \\ 0 & \text{if } \begin{cases} x \leq x_H, & l = \sim r & \& \quad h = \sim g \\ x > x_H, & l = r & \& \quad h = \sim g \end{cases} \\ |x_H - x| - k & \text{if } h = g \end{cases}$$

The utility functions for H and L are relatively straightforward. H would prefer to see its doctrine upheld by L without having to expend the cost of reviewing. L would prefer to follow its preferred doctrine, even if it conflicts with H 's, while avoiding review, and would prefer not to vote against its preferred doctrine in any case.

W 's utility function is much more involved since there are many possible states of the world depending on where her indifference point lies relative to the other two players and where x falls in a particular case. It is thus easier to represent her utility function in tree form (see Figure 3). W 's payoffs depend both on whether she prefers to admit or exclude the evidence and on H 's preferences in a given case. Thus, it is necessary to consider four possible scenarios in constructing her utility function: both H and W prefer to find the search unreasonable; both prefer to find it reasonable; H prefers to find it unreasonable, whereas W does not; and H prefers to find it reasonable, whereas W does not.

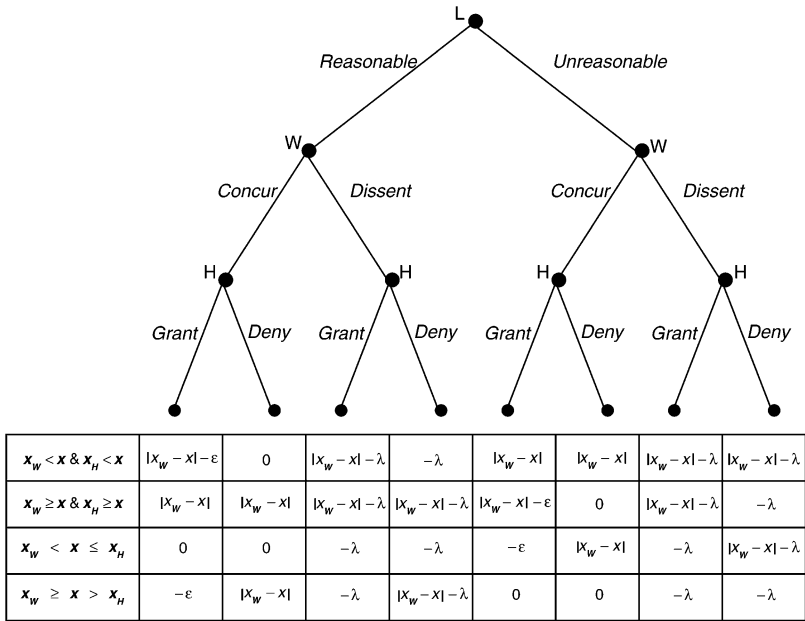


Figure 3. *W*'s Utility Function. The cells of the table indicate the payoff awarded to *W* if the play of the game ends at the node above a given row, contingent on the configuration of *W*, *H* and *x*, the four combinations of which are given in the first column.

4.5 Results

Proposition 1. If *W* exists, the following is the subgame-perfect Nash equilibrium to this game:¹⁸

$$s_L^* = \begin{cases} 0 & \text{if } \begin{cases} x \geq x_H - k(1 - \tau) \\ (x_H - k) \leq x < [x_H - k(1 - \tau)] \end{cases} \text{ \& } \begin{cases} x_W < x, \text{ or} \\ x_W > x \text{ \& } |x_W - x| < \lambda \end{cases} \\ 1 & \text{otherwise} \end{cases}$$

$$s_W^* = \begin{cases} 1 & \text{if } \begin{cases} l = \sim r \text{ \& } \begin{cases} x_W > x, (x_H - k) \leq x < [x_H - k(1 - \tau)] \\ \text{\& } |x_W - x| > \lambda, \text{ or} \\ x < (x_H - k) \text{ \& } \lambda < \epsilon \end{cases} \\ l = r \text{ \& } \begin{cases} x_W < x, [x_H + k(1 - \tau)] < x \leq (x_H + k) \\ \text{\& } |x_W - x| > \lambda, \text{ or} \\ x > (x_H + k) \text{ \& } \lambda < \epsilon \end{cases} \end{cases} \\ 0 & \text{otherwise} \end{cases}$$

18. Recall that if *W* does not exist, the game reduces to the basic model in Lax (2003, 66, Proposition 1).

$$s_H^* = \begin{cases} 1 & \text{if } \begin{cases} l = \sim r & \& \begin{cases} x < (x_H - k), & \text{or} \\ (x_H - k) \leq x < [x_H - k(1 - \tau)] & \& w = d \end{cases} \\ l = r & \& \begin{cases} x > (x_H + k), & \text{or} \\ [x_H + k(1 - \tau)] < x \leq (x_H + k) & \& w = d \end{cases} \end{cases} \\ 0 & \text{otherwise} \end{cases}$$

In equilibrium, H never reviews the lower court's decision and W never dissents because of anticipatory behavior by L and W . When L and H agree on the disposition of the case, L always complies regardless of W 's preferences and incentives. When L and H disagree, L 's decision to comply depends on the location of the case, W 's preferences, and the cost parameters in the model. As in Lax (2003), there is a zone of noncompliance surrounding H 's ideal point in which it does not pay for H to expend the cost to review and reverse L 's erroneous decision. However, the presence of W shrinks that noncompliance zone to an extent that depends on the value of the potential dissent and the cost of dissenting.

The equilibrium demonstrates how panel decision making can influence the outcome of appellate cases even if the final vote gives the appearance of a general agreement over the disposition of the case among the members of the panel; the nonoccurrence of dissent does not mean the lack of its influence. W 's threat to dissent in certain cases where L would prefer to follow its own legal rule instead of H 's is enough to constrain L from deviating. Depending on the costs of dissent, as the value of a dissent to H increases (i.e., as $\tau \rightarrow 1$), the opportunity cost for H to hear the case approaches zero, thereby preventing L from deviating in cases where it otherwise would be able to do so. Figure 4 illustrates how the presence of a whistleblower with incentive to dissent shrinks the zone of noncompliance. Note that the figure only reflects the assumed case where L is more liberal than H . The same effect is found in the symmetric case where L is more conservative than H but is potentially constrained by a would-be liberal whistleblower.

Whether W will, in fact, have this incentive, depends on the relative costs of dissent (λ) and the value of dissent (τ), as well as how important it is to W that the case be decided correctly.¹⁹ The model's predictions are intuitive: W will have a greater incentive to dissent as the cost of doing so decreases, as the value of a dissent increases, and as the intrusiveness of the case moves farther away from her indifference point, meaning she cares more about the outcome of the case. Figure 5 offers a more nuanced illustration of how W 's calculus changes as the parameters vary when L and H disagree on the case; in turn, this calculus will affect when L will comply when it disagrees with H . The x axis corresponds to how far the case is from H 's indifference point, whereas the y axis corresponds to how far the case is from W 's indifference point. In the two left-hand regions, it never pays for W to dissent, because the case is not compelling enough for H to review L 's erroneous decision even if W lowers its opportunity

19. The cost of reversal (ϵ) only affects W 's decision when L plays off-the-equilibrium path.

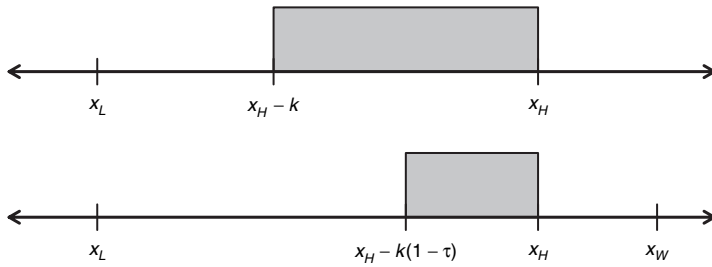


Figure 4. Equilibrium results, with and without the whistleblower effect. The shaded areas indicate the region of cases in which L does not comply with H 's doctrine.

costs by dissenting. As x moves farther away from H into the region between $x_H - k(1 - \tau)$ and $x_H - k$, W 's calculus changes. Here, a dissent would induce H to review L 's erroneous decision. However, whether it is worth the cost to dissent depends on how much the case matters to W ; if it is close to her indifference point, W will concur with L 's decision, saving the extra work of writing a dissent.²⁰ As the cost of dissenting increases (decreases), W has less (more) of an incentive to dissent, holding $x_W - x$ constant.²¹

Figure 5 also illustrates how the value of dissent as an informative signal to H will affect W 's calculus. Again the results are intuitive: the more valuable a dissent in helping H to grant certiorari to correct a noncompliant decision, the more likely W is to dissent. Formally, as τ approaches one (i.e., as the vertical line above $x_H - k(1 - \tau)$ moves to the right), a dissent will completely alleviate H 's informational cost, thereby increasing the likelihood of compliance. Conversely, as τ approaches zero, a dissent loses all value, giving W little incentive to disagree with L . Extending this result to a Supreme Court overseeing multiple courts suggests that the value of τ would decrease as the number of dissents increased—in the limit, if every case featured a dissent, the informational benefits to the high court would completely disappear since a dissent would offer the court no comparative advantage in reducing opportunity costs. Although dissents are off-the-equilibrium path in the model, this result suggests that the low rate of dissents on the Courts of Appeals may stem from circuit court judges' desire to "get the most" out of their dissenting opinions.

5. Discussion: Empirical Implications

The model presented here leads to a similar prediction to that offered by Cross and Tiller (1998): that under certain conditions panel composition will increase the likelihood of compliance. The formal model, however, provides

20. This result accords with another possible explanation for the "norm of unanimity" on the Courts of Appeals. Because the workload of circuit judges is so much greater than that of the Supreme Court, they may only have time to write or threaten dissents in cases where they greatly disagree with the panel majority's decision.

21. In the two rightmost regions, if the costs of reversal are high enough, W will dissent if L plays off-the-equilibrium path and chooses not to comply with H even though the case lies outside of the zone of noncompliance. This result suggests that panel decision making may work to prevent "mistakes" by lower courts in interpreting Supreme Court doctrine.

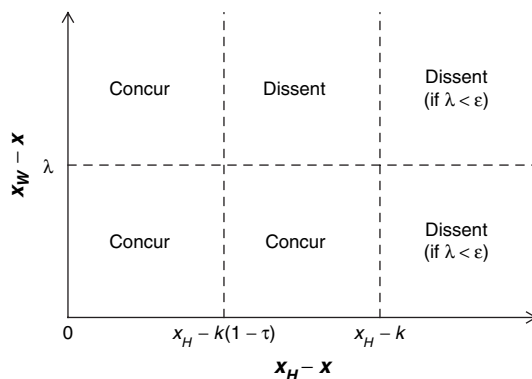


Figure 5. Each cell depicts whether W 's best response is to concur or dissent, depending on the value of other parameters in the model and assuming that L does not comply with H 's preferred doctrine.

a stronger theoretical grounding for this result, placing it squarely within the recent literatures on panel composition, compliance, and certiorari.

More importantly, the model provides for a delineation of the conditions under which we should expect potential whistleblowing to have an effect on lower court decision making. First, although judicial outcomes are frequently measured using the dichotomy of “liberal” versus “conservative,” in assessing compliance it is not accurate to say that a “conservative” Supreme Court will always favor “conservative” outcomes. This is essentially the argument given by Cross and Tiller (1998) (and endorsed by Klein and Hume [2003, 583–4]) in their conclusion that a whistleblower effect cannot explain the panel effects they find in their study. But as Cross and Tiller (1998, 2169) themselves note, “politics lie upon a continuum, and some policies may be too conservative for a given ‘conservative’ court or too liberal for a ‘liberal’ court.”

As judicial scholars have long recognized, legal doctrine may only be understood by understanding the mapping from case facts to judicial outcomes (Kornhauser 1992). Accordingly, one must take a case fact–based approach to evaluating compliance, thereby allowing for a prediction of how the Supreme Court would decide a case given its circumstances (Songer et al. 1994; Benesh 2002; Klein and Hume 2003). There are some police searches, for instance, that even a very conservative Supreme Court would strike down because they are too intrusive,²² and vice versa.²³ Using a case fact–based approach allows

22. For example, in the 1999 case of *Kaupp v. Texas*, 538 U.S. 626, the Rehnquist Court unanimously ruled unreasonable the 3:00 a.m. search of a Texas man in which police, lacking both probable cause and a warrant, handcuffed the man and took him to the scene of an alleged crime although still in his underwear.

23. In the 1966 case of *Lewis v. United States*, 385 U.S. 206, for instance, by an 8–1 margin the Warren Court found reasonable a search in which a federal drug agent misrepresented his identity to gain an invitation into the defendant’s home and conduct a narcotics sale, the evidence of which was used to convict him.

one to estimate exactly how far the circumstances of the case are from the Supreme Court's indifference point, and on what side of this point the case lies.

Second, it is important to consider not only the general movement of Supreme Court preferences but also the relevant ideological distance between the members of a panel and the Supreme Court. Studies that seek to measure the influence of the Supreme Court on circuit court behavior by using crude preference measures such as Segal-Cover scores or percentage of liberal decisions are useful for finding general tendencies, but they cannot capture the equilibrium strategies predicted by the model. These strategies are a function (in part) of the distance between the members of the panel as well as between the panel and the justices in a given area of the law.²⁴

Finally, the model demonstrates that a determination of the strategic behavior of lower court judges must be made with respect to their relationship to Supreme Court precedent, and not solely the preferences of their circuit as a whole (see, e.g., Hettinger et al. 2004). If a panel member's calculus of dissent was based *solely* on a determination of what the entire circuit would do if it heard the case en banc—that is, without regard for how the Supreme Court would rule if it heard the case—both that member's vote and the entire panel's vote might turn out differently, compared to the calculus that includes the Supreme Court's preferred doctrine. Whether the Supreme Court's position at the end of the game matters depends on the respective indifference points of the panel members, the circuit median, and the Supreme Court. Without Supreme Court review, for instance, a liberal whistleblower in a liberal circuit would have a greater incentive to dissent from a conservative outlying decision in order to signal the entire circuit (Van Winkle 1997). However, a conservative Supreme Court acting as the final player in the federal judicial hierarchy changes that potential whistleblower's calculus (Clark 2006). Accordingly, what might look like sincere behavior if only the relationship between the panel and the circuit is considered might actually be strategic behavior, given the Supreme Court's doctrine. Thus, although the presence of a dissent on a panel makes it significantly more likely for circuit to hear the case en banc (George 1999), the strategic nature of dissenting behavior cannot be assessed without placing the panel and its constituent judges within the context of all the levels of the judicial hierarchy above them, including the Supreme Court.

6. Conclusion

This article has integrated the literature on judicial compliance, panel composition, and case selection using a formal model that makes explicit when we

24. Cross (2005), for instance, finds that as the current Supreme Court median becomes more conservative, panels become *less* likely to issue a conservative decision. Although not accounting for either case facts or the relative difference between the circuit court and the Supreme Court, Cross nevertheless concludes that appeals court judges act as if they do not fear reversal by the upper court. Setting aside the theoretical implausibility of this finding—elsewhere Cross (2003) himself notes that it is “a result no theory would predict”—without taking these factors into account, it is impossible to conclude whether a whistleblowing effect is helping to compel compliance in cases where we otherwise would not expect it.

should expect whistleblowing effects to influence panel decision making. Given that multiple studies have demonstrated the pervasive presence of panel effects, the model provides a theoretical advancement for understanding how such effects might influence the level of compliance in the federal judiciary.

At the same time, the model here is just a first step toward understanding panel decision making in the context of a judicial hierarchy, and many future avenues for research seem available. Like Cameron et al. (2000) and Lax (2003), the model emphasizes compliance by lower courts with existing Supreme Court precedents in established areas of the law. Although this mode of decision making constitutes the majority of circuit court cases, many cases involve unsettled areas of the law (Klein 2002). Panel effects in such cases may arise in qualitatively different ways. In addition, the model allows for only the starkest form of whistleblowing: a minority causing a panel majority to vote in one direction when they sincerely prefer the other. Equally likely, or perhaps even more so, is that panel composition may affect the content and scope of the majority's opinion rather than its direction. Such effects might be captured by modeling bargaining over policy within the panel.

Appendix

Proof of Proposition 1. The proof proceeds by backward induction.

1. H 's strategy

- (a) For $s_H^* = 1$: First, consider cases where $x < (x_H - k)$. $u_H(g \mid \sim r) = |x_H - x| - k$, which is greater than $u_H(\sim g \mid \sim r) = 0$. Next consider cases where $(x_H - k) \leq x < [x_H - k(1 - \tau)]$. $u_H(g \mid \sim r, w = d) = |x_H - x| - k(1 - \tau)$, which is greater than $u_H(\sim g \mid \sim r, w = d) = 0$. By symmetry, the same holds when $(l = r)$ and either $x > (x_H + k)$ or $[x_H + k(1 - \tau)] < x \leq (x_H + k)$ and W dissents.
- (b) For $s_H^* = 0$: First, consider cases where L complies with H 's doctrine (i.e., $l = r$ if $x < x_H$ or $l = \sim r$ if $x > x_H$). $u_H(g) = |x_H - x| - k$ if W concurs or $|x_H - x| - k(1 - \tau)$ if W dissents, both of which are less than $u_H(\sim g) = |x_H - x|$, for $k > 0$. Next, consider cases where L does not comply with H 's doctrine, but $[x_H - k(1 - \tau)] \leq x \leq [x_H + k(1 - \tau)]$. $u_H(\sim g) = 0$, which is greater than $u_H(g) = |x_H - x| - k$, if W concurs, or $u_H(g) = |x_H - x| - k(1 - \tau)$, if W dissents. If L does not comply, W concurs and either $(x_H - k) \leq x < [x_H - k(1 - \tau)]$ or $[x_H + k(1 - \tau)] < x \leq (x_H + k)$, $u_H(\sim g) = 0$, which is greater than $u_H(g) = |x_H - x| - k$.

2. W 's strategy

- (a) For $s_W^* = 1$: First, consider cases where $x < (x_H - k)$. $u_W(d \mid \sim r, x_W \geq x) = |x_W - x| - \lambda$, which is greater than $u_W(c \mid \sim r, x_W \geq x) = |x_W - x| - \varepsilon$, for $\lambda < \varepsilon$. $u_W(d \mid \sim r, x_W < x) = -\lambda$, which is greater than $u_W(c \mid \sim r, x_W < x) = -\varepsilon$, for $\lambda < \varepsilon$.
Next, consider cases where $(x_H - k) \leq x < [x_H - k(1 - \tau)]$. $u_W(d \mid \sim r, x_W > x, |x_W - x| > \lambda) = |x_W - x| - \lambda$, which is greater than $u_W(c \mid \sim r, x_W > x, |x_W - x| > \lambda) = 0$.

Next, consider cases where $[x_H + k(1 - \tau)] < x \leq (x_H + k)$. $u_W(d \mid r, x_W < x, |x_W - x| > \lambda) = |x_W - x| - \lambda$, which is greater than $u_W(c \mid r, x_W < x, |x_W - x| > \lambda) = 0$.

Finally, consider cases where $(x_H + k) < x$. $u_W(d \mid r, x_W \geq x) = -\lambda$, which is greater than $u_W(c \mid r, x_W \geq x) = -\varepsilon$, for $\lambda < \varepsilon$. $u_W(d \mid r, x_W < x) = |x_W - x| - \lambda$, which is greater than $|x_W - x| - \varepsilon$, for $\lambda < \varepsilon$.

- (b) For $s_W^* = 0$: It is easiest to proceed with this part of the proof by considering several possible states of the world, based on L 's action and W 's preference in a given case.

First, consider the scenario where $l = \sim r$ and $x_W \leq x$. $u_W(c \mid x_H - k \leq x) = |x_W - x|$, which is greater than $u_W(d \mid x_H - k \leq x) = |x_W - x| - \lambda$, for $\lambda > 0$. $u_W(c \mid (x_H - k) > x) = -\varepsilon$, which is greater than $u_W(d \mid (x_H - k) > x) = -\lambda$, for $\lambda > \varepsilon$.

Next consider the scenario where $l = \sim r$ and $x_W > x$. $u_W(c \mid [x_H - k(1 - \tau)] \leq x) = 0$, which is greater than $u_W(d \mid [x_H - k(1 - \tau)] \leq x) = -\lambda$, for $\lambda > 0$. $u_W(c \mid (x_H - k) \leq x < [x_H - k(1 - \tau)]) = 0$, which is greater than $u_W(d \mid (x_H - k) \leq x < [x_H - k(1 - \tau)]) = |x_W - x| - \lambda$, for $\lambda > |x_W - x|$. $u_W(c \mid (x_H - k) > x) = |x_W - x| - \varepsilon$, which is greater than $u_W(d \mid (x_H - k) > x) = |x_W - x| - \lambda$, for $\lambda > \varepsilon$.

Next consider the scenario where $l = r$ and $x_W < x$. $u_W(c \mid [x_H + k(1 - \tau)] \geq x) = 0$, which is greater than $u_W(d \mid [x_H + k(1 - \tau)] \geq x) = -\lambda$, for $\lambda > 0$. $u_W(c \mid [x_H + k(1 - \tau)] < x \leq (x_H + k)) = 0$, which is greater than $u_W(d \mid [x_H + k(1 - \tau)] < x \leq (x_H + k)) = |x_W - x| - \lambda$, for $\lambda > |x_W - x|$. $u_W(c \mid (x_H + k) < x) = |x_W - x| - \varepsilon$, which is greater than $u_W(d \mid (x_H + k) < x) = |x_W - x| - \lambda$, for $\lambda > \varepsilon$.

Finally, consider the scenario where $l = r$ and $x_W \geq x$. $u_W(c \mid [x_H + k(1 - \tau)] > x) = |x_W - x|$, which is greater than $u_W(d \mid [x_H + k(1 - \tau)] > x) = |x_W - x| - \lambda$, for $\lambda > 0$. $u_W(c \mid [x_H + k(1 - \tau)] < x \leq (x_H + k)) = |x_W - x|$, which is greater than $u_W(d \mid [x_H + k(1 - \tau)] < x \leq (x_H + k)) = -\lambda$, for $\lambda > 0$. $u_W(c \mid (x_H + k) < x) = -\varepsilon$, which is greater than $u_W(d \mid (x_H + k) < x) = -\lambda$, for $\lambda > \varepsilon$.

3. L 's strategy

- (a) For $s_L^* = 0$: First, consider cases where $(x_H - k) \leq x < [x_H - k(1 - \tau)]$. $u_L(\sim r \mid x_W < x) = |x_L - x|$, which is greater than $u_L(r \mid x_W < x) = 0$. $u_L(\sim r \mid x_W > x, |x_W - x| < \lambda) = |x_L - x|$, which is greater than $u_L(r \mid x_W > x, |x_W - x| < \lambda) = 0$.

Next, consider cases where $[x_H - k(1 - \tau)] \leq x \leq [x_H + k(1 - \tau)]$. $u_L(\sim r) = |x_L - x|$, which is greater than $u_L(r) = 0$.

Next, consider cases where $[x_H + k(1 - \tau)] < x \leq (x_H + k)$. $u_L(\sim r \mid x_W < x, |x_W - x| \leq \lambda) = |x_L - x|$, which is greater than $u_L(r \mid x_W < x, |x_W - x| \leq \lambda) = 0$. $u_L(\sim r \mid x_W < x, |x_W - x| > \lambda) = |x_L - x|$, which is greater than $u_L(r \mid x_W < x, |x_W - x| > \lambda) = |x_L - x| - \varepsilon$, for $\varepsilon > 0$. Finally, consider cases where $x > x_H + k$. $u_L(\sim r) = |x_L - x|$, which is greater than $u_L(r) = |x_L - x| - \varepsilon$.

- (b) For $s_L^* = 1$: First, consider cases where $x < (x_H - k)$. $u_L(r \mid x_L \leq x < (x_H - k)) = 0$, which is greater than $u_L(\sim r \mid x_L \leq x < (x_H - k)) = -\varepsilon$, for $\varepsilon > 0$. $u_L(r \mid x < x_L) = |x_L - x|$, which is greater than $u_L(\sim r \mid x < x_L) = |x_L - x| - \varepsilon$, for $\varepsilon > 0$.
- Next, consider cases where $(x_H - k) \leq x < [x_H - k(1 - \tau)]$. $u_L(r \mid x_W \geq x, |x_W - x| > \lambda) = 0$, which is greater than $u_L(\sim r \mid x_W \geq x, |x_W - x| > \lambda) = -\varepsilon$, for $\varepsilon > 0$.

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