Legal Constraint in the US Courts of Appeals

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Existing evidence of law constraining judicial behavior is subject to serious endogeneity concerns. Federal circuit courts offer an opportunity to gain leverage on this problem. A precedent is legally binding within its own circuit but only persuasive in other circuits. Legal constraint exists to the extent that use of binding precedents is less influenced by ideology than use of persuasive precedents. Focusing on search and seizure cases, I construct a choice set of published circuit cases from 1953 to 2010 that cite the Fourth Amendment. I model the use of precedent in cases from 1990 to 2010, using matching to ensure that binding and persuasive precedents are otherwise comparable. The less visible decision of which cases to cite shows no evidence of legal constraint, while there is consistent evidence that the more readily observable act of negatively treating a cited precedent is constrained by the legal doctrine of stare decisis.

To most people, the claim that law is central to judicial decision making hardly seems controversial. The idea that judges neutrally apply law to specific factual situations is foundational in our legal system. Yet empirical evidence of judges' actions being constrained by law is a different matter. One of the most consistently observed factors in empirical work has not been law but a judge's ideology. Isolating evidence of legal constraint poses several difficulties. Scholars have crafted insightful techniques designed to tease out such evidence in the face of complexities created by judicial discretion, observational equivalence, and endogeneity concerns. I contribute to this line of work by developing a new approach to grappling with the problem of endogeneity. Changes in the law and subsequent changes in judicial behavior may both be driven by unmeasured forces rather than a change in law directly effecting an observed subsequent change in behavior. This article formulates a test of legal constraint designed to exclude such spurious findings.

The institutional structure of the US Courts of Appeals (a.k.a. circuit courts) and the doctrine of stare decisis combine to create simultaneous variation in legal rules rather than the variation across time scholars often face. Precedents are simultaneously legally binding in their own circuit and only persuasive in other circuits. When a relevant precedent is binding, a judge is required to apply it, but a persuasive precedent provides the option to choose. There is no expectation that a judge will use a relevant persuasive precedent unless he/she determines it contains convincing logic. The characterization of a precedent as binding or persuasive is a useful feature because it provides information on the counterfactual question of how a judge would behave if not constrained by law. If judges are constrained by the doctrine of stare decisis, ideology should have a reduced impact on how they deal with binding precedents compared to persuasive precedents. In short, differing levels of ideological influence, which scholars routinely measure, shed light on legal constraint, which is difficult to measure directly. The fact that each precedent is both binding and persuasive substantially mitigates concerns about unmeasured characteristics driving differences in how judges use the two types of precedent. In addition, I conduct empirical testing using matched data to further ensure the similarity between binding and persuasive precedents.

Looking for differences in how circuit judges use precedent requires going beyond the traditional focus on case outcomes. The text of court opinions provides an abundance of additional information, including when and how judges cite particular precedents. Scholars have noted that citation

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analysis can be an invaluable tool to explore a variety of interesting questions (Caldeira 1985; Hume 2009). This information is especially relevant for examining how judges are influenced by law. Citation analysis in the circuit courts is a fruitful area to study, not only because institutional rules provide a convenient counterfactual but also because this mode of analysis gets at the heart of judicial law making.

I have constructed an expansive search and seizure data set containing 13,345 precedents published by circuit courts from 1953 to 2010 that cite the Fourth Amendment of the US Constitution. Starting with this extensive list of possible cases a judge might cite, I import a well-established measure of document similarity from the field of machine learning to construct a narrower choice set of cases a judge might more realistically cite. This allows me to analyze not only how judges discuss cited cases but also which cases they choose to cite. I analyze these citation and treatment decisions in cases from 1990 to 2010. The less visible decision of which cases to cite shows no evidence of legal constraint, while there is consistent evidence that the more readily observable act of negatively treating a cited precedent is constrained by the legal doctrine of stare decisis. Judges are significantly less ideological when deciding whether to negatively treat binding precedents than persuasive precedents, and they are also substantially less likely to negatively treat binding precedents overall.

UBIQUITOUS YET ELUSIVE: THE PARADOX OF LAW

How does law influence judges? This basic question is at the heart of studying judicial behavior. There is no shortage of theoretical explanations for why judges might be influenced by law. These range from role perceptions that following law is how a judge ought to act (Gibson 1978; Kim 2006) to strategic explanations focused on legal compliance as a way to avoid reversal (Klein and Hume 2003) or preserve judges' own power to have an enduring impact when new legal issues arise (Rasmusen 1994). Nevertheless, finding persuasive empirical evidence of legal constraint has proven a challenging task. The strong professional and societal expectation that judges rely on the law gives judges a powerful motivation to write their opinions and describe their behavior as if they are doing exactly that (Cross 2003). Moreover, the considerable amount of discretion inherent in the process of judging makes it difficult to isolate conduct based on legal doctrine and differentiate it from conduct based on other motivations.

The challenges of isolating evidence of legal constraint are highlighted by considering the relationship between constraint and compliance. Studies have shown that circuit courts demonstrate a fairly high degree of compliance with Supreme Court doctrine (e.g., Benesh and Reddick 2002; Songer and Haire 1992; Songer, Segal, and Cameron 1994). This finding is suggestive of legal constraint, but it may be consistent with other explanations as well. Klein and Hume (2003) discuss several possible reasons lower court decisions might comport with Supreme Court preferences, including underlying similarity among federal judges either ideologically or in terms of professional socialization and training. Another possibility is that a pattern of legal compliance may emerge as a result of a change in the type of cases litigants choose to appeal (see, e.g., Songer 1982).

Scholars have developed a variety of methods to examine whether law constrains judicial decision making. Fact pattern analysis has been used to show a correlation between legally relevant facts and case outcomes (see, e.g., George and Epstein 1992; Segal 1984). Richards and Kritzer identify key regime changes in the Supreme Court and note significant differences in case outcomes pre- and post-regime change (Kritzer and Richards 2003, 2005; Richards and Kritzer 2002; Richards, Smith, and Kritzer 2006). Bailey and Maltzman (2011) approach the question of legal constraint by comparing actions of Supreme Court justices to those of political actors from other branches, finding that justices act less ideologically than their elected counterparts (Bailey and Maltzman 2011). Other scholars have pointed to different outcomes in cases that apply different legal standards (Bartels 2009), higher win rates in cases with better-quality legal arguments (Lindquist and Klein 2006), and reliance on jurisprudential considerations in agenda-setting decisions (Black and Owens 2009) as evidence that judges are influenced by law.

These innovative studies are primarily directed at establishing a correlation between legal doctrine and judicial decisions. Such evidence is necessary, but not sufficient, for establishing legal constraint. Endogeneity continues to pose a serious obstacle. This is evident in even the most cutting-edge work. For example, the work of Bailey and Maltzman, which shows that Supreme Court justices act less ideologically than elected officials, may reflect unmeasured differences in the individuals who pursue those different types of careers rather than the constraining effect of law. This and other studies have laid important groundwork by finding links between law and judicial decisions. This article builds on and extends that work by developing a test of legal constraint explicitly structured to exclude spurious findings.

In the circuit courts, the legal doctrine of stare decisis generates quasi-counterfactual data that provide the opportunity to examine citation decisions, the fundamental building blocks of judicial opinion writing. Leveraging this opportunity requires first clarifying key features of the various types of opinions circuit courts issue. Litigants have a right to appeal at least once, so circuit courts resolve a considerable

number of routine cases each year (Boyd and Spriggs 2009). This is accomplished through dividing the caseload among a series of rotating, randomly selected, three-judge panels within each circuit (Collins and Martinek 2011; Hooper, Miletich, and Aneglia 2011). The full circuit may review panel opinions in an en banc proceeding, but such review is rare, usually occurring in less than 1% of cases (Giles et al. 2007; Giles, Walker, and Zorn 2006). Another practice designed to deal efficiently with routine cases is a panel's ability to designate an opinion "unpublished," which is a (somewhat misleading) term of art indicating that the opinion has no precedential value (Barnett 2002). Since only published opinions carry precedential weight, they are the sole focus here.[1]

Published circuit opinions are binding in their own circuit but only persuasive in other circuits (Cross 2003; Klein 2002). If legal doctrine influences judges' behavior, citation decisions will vary based on whether a precedent is from the same circuit or not. In the case of binding precedents, stare decisis imposes substantial limitations on judges' citation decisions. The only valid reason for not discussing or applying a binding precedent is lack of relevance (Aldisert 1989). Conversely, legal doctrine imposes no such constraint on citation decisions with regard to a precedent that is merely persuasive. A judge may choose to disregard a persuasive precedent simply because he/she does not agree with the reasoning (Aldisert 1989; Klein 2002). Comparing the use of two separate groups of precedent, one binding and another persuasive, would raise concerns about unmeasured differences between the two types of cases. Such concerns are substantially ameliorated when judges consider every precedent under two different conditions that occur during the same period of time. Cases from the same circuit generate data on how judges use a particular precedent when required by law to follow it. Cases from other circuits provide data on how judges use the same precedent when its authority is only persuasive. Any discrepancy between the two situations provides insight into the extent to which law constrains circuit judges' citation behavior.

EXPLORING CITATION BEHAVIOR

While work focusing on case outcomes understandably accounts for the preferences of all three judges on a panel, looking at citation decisions calls for a more author-centric approach. In circuit courts, micro-level decisions about the content of each opinion are almost entirely under the discretion of the opinion author (Cross et al. 2010). This does not preclude the possibility that other panel members will request changes or additions from the author in the same way that Supreme Court justices negotiate over opinion content (Maltzman, Spriggs, and Wahlbeck 2000). Undoubtedly such modifications do take place from time to time. But time constraints and caseload pressures make this the exception rather than the rule. Choi and Gulati (2007) provide evidence that while case outcomes tend to reflect the ideological composition of the panel, the precedents cited reflect the author's ideology. Consequently, I make the simplifying assumption that the author has sole control over citation decisions.[2]

For analytical purposes, I decompose a judge's decision about each potential precedent into two distinct elements. First, will the precedent be cited? Second, if the precedent is cited, will it be treated positively or negatively?[3] Positive treatments are those that go beyond simply referring to a precedent and expand the scope of the legal rule it sets forth. An example would be extending a particular standard of review to an additional context, as the First Circuit did in *United States v. Diehl* (276 F.3d 32 [2002]) with the following language: "Even before the Court's decision in *Ornelas*, we had utilized this dichotomous standard of review for constitutional questions involving a mix of fact and law. . . . We therefore explicitly extend this approach to findings that particular locations are within or outside a home's curtilage" (citations and quotations omitted). Conversely, negative treatments restrict the scope of a legal rule. The following is an example from the same case: "In *United States v. Roccio* we upheld the seizure by IRS agents of a vehicle that was parked on an unobstructed driveway and thus was easily visible from the street. . . . Here, by contrast, the significant portion of the driveway was far from public view" (citation omitted). This discussion narrowed the scope of the treated precedent by making it clear that not all warrantless driveway searches are constitutional, only a subset involving driveways visible from the public road. These brief examples illustrate how the discussion of a precedent can result in that precedent applying to more cases, or fewer cases, in the future.

Scholars have demonstrated that ideological distance between a court and a precedent influences citation and treatment of that precedent (Hansford and Spriggs 2006; Johnson 1987; Spriggs and Hansford 2002). This relationship is attributed to the long-recognized impact ideological preferences have on judicial decision making. An author is more

1. Prior to 2007, some circuits prohibited citation to unpublished opinions (Gant 2005).

2. The author's extensive control over the content of the opinion suggests the importance of opinion assignment. The assignment is typically made by the most senior active (i.e., not retired) judge on the panel (Cheng 2008).

3. Following Hansford and Spriggs (2006), I refer to the case where a judge is making these decisions as a treatment case to distinguish it from a precedent.

likely to cite and positively treat a precedent that is ideologically proximate and more likely to ignore or negatively treat a precedent that is ideologically distant. Consequently, I hypothesize that an increase in ideological distance should decrease the probability of both citation and positive treatment while increasing the probability of negative treatment.

Next I consider how the status of a precedent as binding or persuasive influences citation and treatment decisions. The most obvious influence is through legal doctrine itself. Stare decisis requires application of relevant binding precedents. Consequently, a judge may benefit from a citation to (or positive treatment of) a binding precedent because such an action overtly demonstrates compliance with legal doctrine. Such compliance may generate reputational gains, personal satisfaction, or greater future compliance with the opinion being drafted. Negative treatment of a binding precedent carries with it a risk of potentially subjecting the author to criticism or even reversal. Stare decisis does not preclude all negative treatment. A judge may distinguish a precedent from the case at bar without violating stare decisis. Therefore, a certain baseline amount of negative treatment is expected even where judges are constrained by law. When discussing a persuasive precedent, judges are free to negatively treat a precedent on ideological grounds as well.[4] This would result in a higher overall incidence of negative treatment of persuasive precedents. As a result, I hypothesize that to the extent that legal doctrine influences judges, they will be more likely to cite and positively treat (and less likely to negatively treat) binding precedents compared to persuasive precedents.

While differential citation and treatment patterns would be consistent with the explanation of legal constraint, other factors may also produce similar patterns. The cost of citing a binding opinion is likely to be lower. Judges are more likely to be aware of cases from their own circuit, and lawyers are more likely to cite such cases. Either reduces the cost of simply becoming aware of a precedent. Furthermore, the decision to research broadly requires significant additional time, even with the benefit of computerized legal research. Limiting a Westlaw or Lexis search to one's own circuit will invariably lead to a smaller list of search results than casting a wider net for precedents from all circuits. Therefore, to the extent that cost is a factor, judges should be more likely to cite binding precedents.[5]

Policy motivations may also lead judges to rely more on binding precedents. Each time a judge writes an opinion in a common law system, he has the opportunity to shape the future impact of existing precedents. Policy-minded judges may prefer to discuss binding precedents since they provide an opportunity to more directly shape the law of their own circuit. Discussing a precedent from another circuit will not directly change the impact of that case in its own circuit. Since a precedent's authority will be influenced more by a citation or treatment from within its own circuit, a policy-motivated judge would be more likely to cite, positively treat, and negatively treat such cases more frequently than persuasive precedents.[6]

Explanations based on legal doctrine, cost, and policy motivations all predict higher levels of citation to and positive treatment of binding precedents compared to persuasive precedents. This pattern is a necessary, but not sufficient, condition to provide evidence of legal constraint. However, legal doctrine uniquely predicts that judges will be less likely to negatively treat binding precedents. Maximizing policy influence would result in the opposite pattern. Consequently, a lower rate of negative treatment of binding precedents is both a necessary and sufficient condition for evidence of legal constraint.

Interacting the effects of ideology and the doctrinal status of a precedent provides a key insight. The idea that law constrains judges simply means that they act differently—that is, less ideologically—than they would in the absence of legal doctrine mandating adherence to binding precedents. I hypothesize that, to the extent that law constrains judges, ideology will have a reduced impact on citation and treatment decisions when a precedent is binding. For citation and positive treatment, evidence of such ideological dampening provides the sufficient condition for establishing legal constraint. Neither policy motivation nor cost considerations would result in such a pattern. Policy motivation would lead to ideological amplification rather than ideological dampening since greater policy gains can be achieved through addressing binding precedents. The cost factor should be unrelated to ideological distance since the cost of finding a precedent must be incurred before its ideological location is

4. For example, circuit judges are free to explictly reject a legal standard that is currently the law in another circuit. See, e.g., "We reject the argument of Cummins and Akins [about] the applicable test. . . . Only the Tenth and the Eleventh Circuits have adopted this test, and we expressly decline to join them" (*U.S. v. Cummins*, 920 F.2d 498 [8th Cir., 1990]). A similar statement flatly refusing to apply this legal standard by a Tenth or Eleventh Circuit panel would be prohibited by the doctrine of stare decisis.

5. Once a precedent is cited, the cost of treating binding versus persuasive precedents should be virtually indistinguishable.

6. As a practical matter, this difference may be small. However, my goal is to isolate evidence of legal constraint, so I err on the side of caution by accounting for even tenuous alternative explanations that may generate the same empirical patterns.

discovered. In the case of negative treatment, ideological dampening is a separate pattern that can independently establish legal constraint. Figure 1 illustrates each of the hypothesized patterns that would provide evidence of the doctrine of stare decisis constraining judges.

Stare decisis does not necessarily constrain citation and treatment decisions to the same extent. On the one hand, treatment decisions are generally of higher visibility and can be evaluated by outside observers with relatively little cost because the treatment (or lack thereof) appears within the four corners of an opinion. On the other hand, citation decisions are much more difficult to evaluate because outside knowledge of which cases could have been cited is necessary. Just looking at the opinion is insufficient. Consequently, treating a binding precedent negatively may be more likely to raise a red flag than simply ignoring an unfavorable precedent. The higher visibility of a negative treatment could increase the probability of backlash. This backlash could range from general criticism to the case being overturned en banc or by the Supreme Court. As a result, a judge facing an inconvenient binding precedent may be more inclined to not cite the opinion than to treat it negatively. While the citation and treatment decisions are similar, it is important to bear in mind the difference in the level of accountability for these two types of decisions.

DATA AND RESEARCH DESIGN

In order to evaluate whether precedents are cited, it is necessary to identify not only a set of treatment cases to study but also a relevant choice set of potentially applicable precedents that a judge may choose to cite in a treatment case. My strategy is to focus on one particular issue area: Fourth Amendment search and seizure law. This topic incorporates a discrete set of legal issues that are routinely raised in liti-

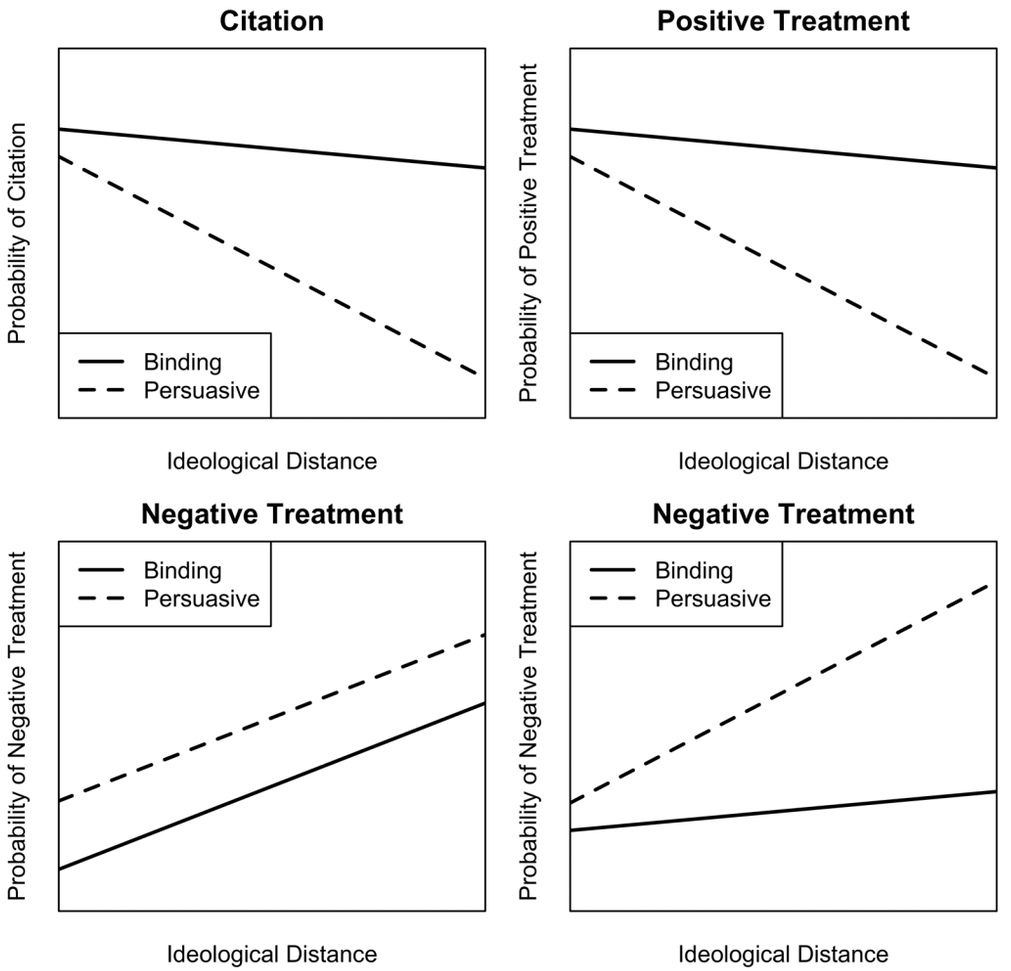

Figure 1. Patterns consistent with legal constraint. These graphs depict the general expectations of what the empirical results will look like if the legal doctrine of stare decisis constrains circuit judges. For citation and positive treatment, both a difference in intercept and slope are necessary to provide evidence of legal constraint. For negative treatment, either a simple difference in intercept or an interactive effect would provide evidence of legal constraint.

gation. Moreover, the bulk of search and seizure cases has been litigated since the early 1950s. Such timing is key because the measure of judicial ideology employed here is not widely available for cases decided before 1953. Search and seizure provides an area of law where it is possible to incorporate almost the entire body of circuit precedent within the scope of the study.

Using Lexis, I identified every published circuit case from 1953 to 2010 that cites the Fourth Amendment of the United States Constitution and contains the word "search" or "seizure" (or derivations thereof) at least once.[7] After excluding all opinions that do not address the merits (e.g., denial of a motion for rehearing en banc), the resulting data set contains 13,345 cases. I analyze the use of this body of precedent in panel cases from 1990 to 2010.[8] These treatment cases contain more than 46,000 citations to cases in the full data set. These actual citations provide the data for the second-stage analysis of how cited precedents are treated, but the first stage requires building a choice set of cases a judge might cite. One approach would be to include every previously decided case in the data set. However, even within one issue area, many precedents will remain uncited simply because they raise different legal questions. For example, cases involving searches will likely not cite precedents concerning the constitutionality of a seizure. One theoretical solution is to use the cases cited in briefs as the choice set (Spriggs and Hansford 2002). However, for circuit cases, briefs are readily available for only a very small (and disproportionately salient) sample of cases.[9] Judges can also decide to cite cases not raised in the briefs (Spriggs and Hansford 2002). In order to solve the fundamental problem of identifying those precedents (among thousands of cases) that are so dissimilar from a treatment case that citation is exceedingly unlikely, I turn to the field of machine learning.

When you type a query into Google, the results are not produced based on hand-coded topics laboriously assigned by an army of research assistants. Just as Google uses mathematical formulas to perform an automated ranking of how similar the text of a query is to each website, I calculate how similar each treatment case is to every case preceding it in the data set.[10] These scores were calculated using the text of the majority opinion in each case after removing citations, words shorter than three letters, and stopwords (commonly used words such as "a," "and," and "the"). These similarity scores for each treatment case are then sorted to create a ranking of all possible precedents, from most similar to least similar. For the sake of computational efficiency, the scoring does not take the order of words into account. Similarity is assessed based on the number and importance of words that occur in both opinions. Words that appear in fewer cases within the entire data set are given a higher weight since they carry more information. For example, the appearance of the word "curtilage" in two cases would increase the similarity score more than the appearance of the word "defendant" in both. Two search and seizure cases that discuss curtilage are more likely to be similar cases than two search and seizure cases that mention a defendant.

This method provides a feasible way to objectively assess a large body of case law involving millions of pairwise combinations and narrow down the choice set for each treatment case in a principled way. Although choosing a cutoff point is necessarily somewhat arbitrary, the potential precedents ranked in the bottom half in terms of similarity to a treatment case are not viable candidates for citation. Therefore, I utilize only the precedents in the top 50% of the similarity ranking as the choice set for the first-stage analysis of which cases judges choose to cite (and which they ignore).[11] This leaves a fairly large choice set in play, which will still include many cases that are not very similar to the treatment case. I err on the side of retaining a substantially large choice set because using the text of a treatment case to calculate similarity means that there may be some endogeneity in this measure. While it would be preferable to use text generated prior to the citation/treatment decision (e.g., the district court ruling being appealed or legal briefs submitted by the parties), this type of information is not readily available for most cases in the data set. Consequently, I ensure that a related precedent will be included in the choice set by setting the similarity threshold fairly low.[12]

The unit of analysis for both stages of analysis is the treatment case-precedent pair. The first-stage decision of

7. Cases are obtained from the 11 numbered geographical circuits and the District of Columbia Circuit Court (DC Circuit).

8. En banc cases are excluded because a circuit sitting en banc has the authority (not held by a panel) to overturn a ruling from its own circuit (Hellman 2007).

9. In this data set, even the most recent year, 2010, has only nine cases (of 375) with briefs available on Lexis. One of those cases was ultimately heard by the Supreme Court, and another generated multiple amicus briefs at the circuit level. Both signal an unusually high level of case salience.

10. Specifically, I use cosine similarity scores, a standard scoring method for comparing the text of two documents (Manning, Raghavan, and Schütze 2008, 111–12).

11. The empirical results are robust to selection of different threshholds, including constructing a choice set with the top 35%, the top 25%, or even the top 10% of the most similar precedents.

12. I also control for the similarity ranking itself to address the variation in similarity within the choice set.

whether to cite a precedent in the choice set is modeled using a probit model. Since each treatment case appears in the data set multiple times paired with each precedent in its choice set, I estimate robust standard errors clustered on the treatment case. For the treatment case-precedent pairs where the precedent was cited, I use a multinomial probit model to model whether the precedent was negatively treated, positively treated, or neither (the baseline category).[13]

I obtain data on whether and how a precedent is treated from *Shepard's Citations*, a legal publication dedicated to summarizing when and how court opinions cite one another. Some treatment categories in *Shepard's* can be both ambiguous and heterogeneous, so I follow the advice of Spriggs and Hansford (2000) and only utilize treatment categories that clearly indicate either positive or negative treatment (Spriggs and Hansford 2000). I employ their classification of which treatments are positive and negative. "Followed" is the only *Shepard's* treatment classified as positive, while negative treatments are the following: "Distinguished," "Criticized," "Limited," "Questioned," "Overruled," and "Disapproved." The (rare) *Shepard's* treatment "Superseded," while negative in character, actually signals a precedent that has been rendered irrelevant due to a subsequent statute. Consequently, I exclude such superseded precedents from the choice set of all subsequent treatment cases.[14]

The first key explanatory variable is the ideological distance between a treatment case and a precedent. As discussed above, I focus on the author in the treatment case as the actor most directly responsible for making decisions about citation and treatment. For the sake of symmetry, I also quantify the ideological location of the precedent using the author.[15] The variable *Ideological Distance* is the absolute value of the difference between the Judicial Common Space (JCS) score of the author of the treatment case and the author of the precedent.[16] This variable has a theoretical range from zero to two, and higher values indicate greater ideological disparity. The second key explanatory variable is whether a precedent is binding or persuasive. This variable, *Binding Precedent*, takes a value of one if the precedent is from the same circuit as the treatment case and zero otherwise.[17] The interaction between *Ideological Distance* and *Binding Precedent* rounds out the key explanatory variables.

Existing research demonstrates that a range of factors influence citation and treatment of precedent, and several of these may also be correlated with *Binding Precedent* or *Ideological Distance*. First, the similarity between a precedent and the treatment case is likely to play a role. The variable *Similarity Percentile* is the percentile of a precedent's similarity to the treatment case compared to all other possible precedents in the data set. A precedent in the 99th percentile of a treatment case's similarity ranking should be much more likely to be discussed than a precedent in the 50th percentile.[18] In addition to the relationship between a treatment case and precedent, several static and dynamic features of a precedent are important (Hansford and Spriggs 2006; Spriggs and Hansford 2002). Cases with a dissenting opinion, those decided en banc, or those written by a particularly prominent jurist may generate more interest, while per curiam opinions often signal a case of lesser importance. Most of these factors are straightforward to code, with the exception of the prominence of the author. I rely on the prestige scores calculated by Klein and Morrisroe (1999). *Elite Author* equals one if a precedent is penned by a judge with a top-25 prestige score and zero otherwise.

The development of law is dynamic; the role of a precedent changes over time based on how other courts have cited and treated it. Following previous research, I control for the quantity and quality of how a precedent has been used at the time it is considered for inclusion in the treatment case (Hansford and Spriggs 2006). I control for the total number

13. A two-stage decision-making process such as this sometimes raises the problem of correlated residuals between the two stages biasing the estimates at the second stage (Heckman 1979). One solution is to use a Heckman selection model, but the categorical outcome variable in the second stage complicates this approach. Recent research indicates that estimation of selection models with categorical outcomes in the second stage are particularly problematic (Freedman and Sekhon 2010). The central substantive conclusions presented in this paper can be reproduced using a Heckman model with a continuous variable for treatment ranging from −1 (negative treatment) to 1 (positive treatment). This suggests that correlated residuals are not biasing the results.

14. A panel opinion also ceases to be legally relevant on the rare occasion the circuit decides to rehear the case en banc. I drop such cases from the pool of precedents at that point, since they are replaced by the relevant en banc opinion.

15. Per curiam cases (where authorship is anonymous) are classified based on the median panel member.

16. JCS scores are based on the ideology of the political elites who appointed a judge and are located on a scale from −1 (liberal) to 1 (conservative). (See Epstein et al. 2007; Giles, Hettinger, and Peppers 2001; Poole 1998.) Even though there is good reason to expect that the opinion author has significant (although not unlimited) discretion regarding opinion content, using the panel median of both cases to calculate *Ideological Distance* produces very similar substantive conclusions about the role of legal constraint.

17. When the Fifth Circuit was split in 1981, the judges agreed that all precedents from the old Fifth Circuit would be binding in the new Eleventh Circuit as well (Barrow and Walker 1988, 245). The coding of *Binding Precedent* reflects this agreement.

18. As discussed above, precedents ranking lower than the 50th percentile are excluded.

of times a precedent has been both cited and treated (either positively or negatively). I control for the directionality of any treatments with a variable, *Vitality*, that is the number of positive treatments minus the number of negative treatments. Research also shows that the simple age of a precedent matters; both very new and very old cases are less likely to be cited (Black and Spriggs 2013). I control for both the age of a precedent and age squared to account for this possibility. Several other contextual factors may also be important. Longer treatment cases simply contain more room for citation generally, while longer precedents may discuss more topics, which might make them more relevant to a wider range of future cases. Measures of the logged number of words of both cases are, therefore, included. Precedents utilizing a higher proportion of quoted text may be of greater quality, leading subsequent judges to rely on them more heavily (Hume 2009). Furthermore, if a judge has more binding precedents available in the choice set, any given precedent will be less likely to be cited due to the larger selection. Finally, the greater the caseload in a circuit, the less time an author will have to cite extensively in his/her opinions.[19] These latter two factors are only related to the citation model, but the rest concern both citation and treatment.

Controlling for all of these potential confounders is undoubtedly important, but it may not be sufficient. This research design relies heavily on the institutional feature that the exact same precedents are binding in some instances and persuasive in others. While this goes a long way to solving the endogeneity problem that haunts the search for empirical evidence of legal constraint, there is still a possibility that these observational data contain systematic differences between binding and persuasive precedents. A stark example is the fact that when a judge considers a precedent he/she wrote himself/herself, it is nearly always a binding precedent. Consequently, my first step to address this concern is to exclude all observations in which the precedent was written by the author of the treatment case. This is a very small amount of data (0.26%), but excluding it removes an important difference between the two types of precedent. As a result of this step, the analysis addresses the question of how judges cite and treat precedents written by a different judge, but this qualification does not detract from the substantive importance of the question.

The second step I take to ensure maximum similarity between binding and persuasive precedents is to follow the advice of Ho et al. (2007) and preprocess the data using matching before applying appropriate parametric techniques to the matched data. This type of technique is increasingly used in judicial politics research to investigate a variety of questions (see, e.g., Boyd, Epstein, and Martin 2010; Kastellec 2013; Sen 2014). Since there are several variables, I match on the propensity score, which is simply the predicted probability of a particular observation being binding (Rosenbaum and Rubin 1983). This provides a single variable that summarizes the values of all the explanatory variables (except *Binding Precedent*) for each observation (Ho et al. 2007). I estimate these propensity scores using a probit model and all the explanatory variables. Next, I perform one-to-one nearest neighbor matching with replacement, which pairs each binding precedent with the persuasive precedent that has the closest propensity score.[20] The resulting matched data, while considerably smaller than the full data, provide the opportunity to evaluate differences in how judges deal with the two different types of precedent with greater confidence that the data are similar in all other important respects. Figure 2 illustrates the improvement in balance achieved by the matching process. The plots on the left show the distribution of the propensity score for binding and persuasive precedents in the full data sets. While the balance is not terrible, the plots on the right show that the matched data exhibit noticeably better balance.[21]

RESULTS

The first element of deciding how to deal with a precedent is simply determining whether it will be cited. Legal constraint manifests itself in this decision when binding precedents are both cited more frequently and *Ideological Distance* has a smaller impact on the decision for binding precedents. Table 1 presents the results of the citation model for both the matched and full data sets, but I focus on discussing the model using the matched data.[22] As hypothesized, binding precedents are significantly more likely to be cited than persuasive

19. The *Caseload* variable is the average number of cases terminated per active judge in the circuit and year of the treatment case. The Federal Court Management Statistics are available online at http://www.uscourts.gov/Statistics/FederalCourtManagementStatistics/FederalCourtManagementStatistics_Archive.aspx.

20. For the treatment analysis, persuasive precedents are rarer, so I match one binding precedent to each persuasive precedent. I match using the psmatch2 command in Stata (Leuven and Sianesi 2003).

21. The particular matching technique employed here was selected by following the advice of Ho et al. (2007, 216) that "one should try as many matching solutions as possible and choose the one with the best balance as the final preprocessed data set."

22. The similarity of results using the full data does not negate the importance of matching (Boyd et al. 2010).

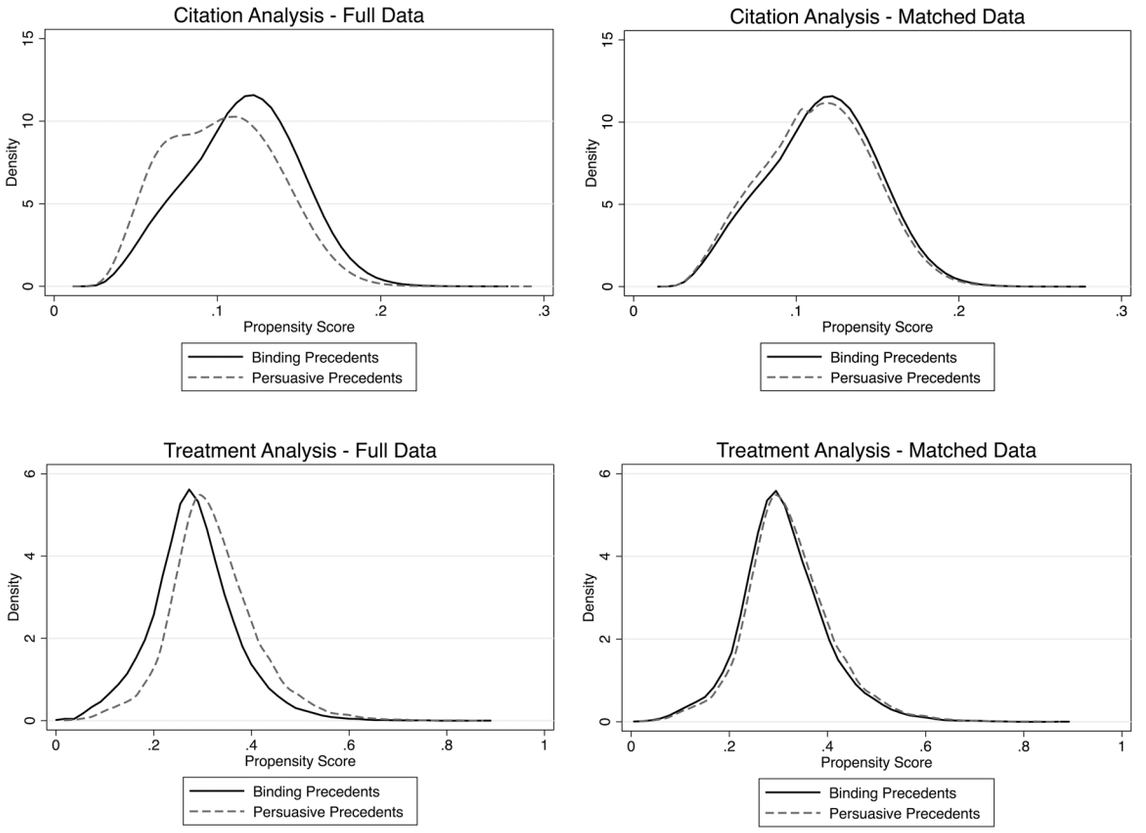

Figure 2. Kernel density plots of estimated propensity scores. The top panels contain the kernel density plots for citation data, while the bottom panels show the same plots for the treatment data. The solid black lines depict the density for binding precedents, and the gray dashed lines depict the density for persuasive precedents. The panels on the left represent the full data sets, while the panels on the right show the matched data.

precedents.[23] However, there is no evidence of ideological dampening. Rather the reverse pattern is evident. For persuasive precedents, the effect of *Ideological Distance* is not statistically significant, but for binding precedents it has a significant, negative effect ($p < .001$). Opinion authors are less likely to cite more ideologically disparate precedents from their own circuit. This pattern suggests that even after accounting for noncitation due to ignorance or patent irrelevance of a precedent (neither of which should be correlated with ideology), judges sometimes choose to ignore binding precedents for ideological reasons.

Figure 3 shows the predicted probability of citation for binding and persuasive precedents at different values of *Ideological Distance* (holding all other variables constant at their median) with accompanying 95% confidence intervals.[24] The effect of ideology on citing binding precedents is fairly modest, though the difference between citing binding and persuasive precedents is quite substantial (albeit on a small scale due to the large choice sets). The predicted probability of citing an average binding precedent is .0015 when *Ideological Distance* equals 0, and it falls to .0013 at the maximum value of *Ideological Distance* in the data set. The median predicted probability of citing a persuasive precedent is considerably lower, merely .00002. The effect sizes are more intuitive to evaluate substantively when considered in terms of the average cited precedent. When the control variables are set to their median values, conditional on citation, there is a 1% chance of citing a persuasive precedent, and the chance of citing a binding precedent ranges from 13% to 11% over the range of *Ideological Distance*.

The second aspect of a judge's decision is how to treat cited precedents. The hypothesis for the positive treatment

23. All discussion of statistical significance is at the .05 level. The large N does not change the probability of type I error, but it does facilitate uncovering small effects. Consequently, the distinction between statistical and substantive significance is particularly important.

24. I generated these predicted probabilities and associated confidence intervals using stochastic simulations (Brambor, Clark, and Golder 2006; King, Tomz, and Wittenberg 2000).

Table 1. Citation Model

	Matched Data		Full Data	
	Coefficient	SE	Coefficient	SE
Ideological distance	−.036	.032	−.041*	.011
Binding precedent	1.119*	.017	1.101*	.008
ID distance × Binding	−.022	.033	−.026	.013
Similarity percentile	.036*	.000	.038*	.000
Elite author (precedent)	−.028*	.010	−.007	.007
Dissent (precedent)	.023*	.007	−.016*	.005
Per curiam (precedent)	−.101*	.014	−.088*	.010
En banc (precedent)	−.111*	.017	−.089*	.013
Vitality	.010*	.002	.002	.001
Total treatments	.016*	.002	.022*	.001
Total citations	.012*	.000	.010*	.000
Age	−.069*	.001	−.057*	.001
Age^2	.001*	.000	.000*	.000
Length (precedent)	.004	.004	−.009*	.003
Proportion quoted (precedent)	−.364*	.043	−.476*	.034
Length (treatment)	.231*	.006	.220*	.006
Size of binding choice set	−.104*	.010	−.125*	.009
Caseload	.000*	.000	.000	.000
Intercept	−7.244*	.095	−7.051*	.083
N	6,750,768		35,121,288	

Note. Probit regression estimates of the effect of *Ideological Distance*, whether a precedent is binding, their interaction, and a range of control variables on the decision of whether to cite a precedent for both the matched and full data. The reported standard errors are robust standard errors that are clustered on the treatment case.
* $p < .05$.

decision is the same as for citation. Legal constraint can only be established by the combination of more frequent positive treatment of binding precedents and evidence of ideological dampening when the precedent is binding. However, negative treatment provides the opportunity to establish legal constraint in two separate ways, through reduced treatment of binding precedents or ideological dampening. Table 2 contains the results of the treatment models. While positive treatment is not significantly correlated with the key explanatory variables, the patterns of negative treatment provide evidence of legal constraint.

Neither the type of precedent nor ideology (nor their interaction) has a statistically significant impact on positive treatment. The fact that not even *Ideological Distance* has any explanatory leverage indicates that the lack of findings may be due more to measurement shortcomings than a lack of any relationship between the underlying concepts. Specifically, it is likely that in practice the distinction between a positive treatment and a neutral treatment (or mere citation) is more a matter of degree than being different in kind. The graph of predicted probabilities in the left panel in figure 4 illustrates that the lack of significance persists across all values of *Ideological Distance* when all other variables are held at their median.

Unlike positive treatment, negative treatment is distinctly different from simply citing a precedent. Perhaps because this distinction lends itself to more accurate classification, the model provides consistent evidence that judges' decisions about whether to negatively treat a cited precedent are constrained by the legal doctrine of stare decisis. First, the fact that binding precedents are significantly less likely to be negatively treated than persuasive precedents provides evidence of legal constraint. The right panel of figure 3 illustrates that this difference is statistically significant for nearly all values of *Ideological Distance*, the only exception being when an authoring judge is very closely aligned with a precedent (*Ideological Distance* < .08). At median values of all variables, a binding precedent is treated negatively 3.1% of the time, while a persuasive precedent is treated negatively 6.9% of the time. Second, legal constraint is further evidenced by

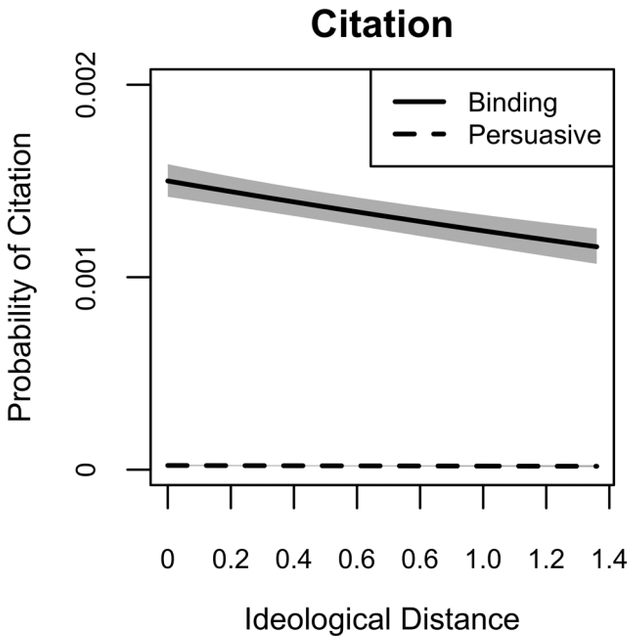

Figure 3. Effect of *Ideological Distance* on citation. This graph provides the predicted probability of citation and 95% confidence intervals for each type of precedent (binding and persuasive) at different values of *Ideological Distance*. All other variables are held at their median.

the statistically significant ideological dampening evident when judges are dealing with binding precedents. The steeper slope for persuasive precedents in the right panel of figure 4 demonstrates that judges rely more on ideological considerations in such cases than when deciding whether to negatively treat a binding precedent. This difference is substantively significant as well. Over the range of *Ideological Distance*, the predicted probability of negative treatment for binding precedents is initially .012 lower than for persuasive precedents and this difference increases all the way to .079 at the maximum value of *Ideological Distance*.

Across both models the control variables tend to perform as expected. For example, precedents that are most similar to the treatment case and precedents with a history of more extensive treatment overall are more likely to be cited, positively treated, and negatively treated. A precedent with greater vitality and more total citations is more likely to be cited and less likely to be negatively treated. Age has the expected curvilinear relationship to citation. Precedents that are per curiam, en banc, contain a dissent, or are written by an elite jurist are all less likely to be cited. This result for elite authors and en banc precedents is unexpected. Perhaps variation in the length of the treatment cases explains this curiosity since such cases tend to be longer and longer treatment cases exhibit higher levels of citation and treatment.

DISCUSSION

Examining how circuit judges use circuit precedents provides a new type of insight into when and how law constrains judicial behavior. Not only does this study provide evidence of a correlation between legal rules and judicial behavior, it does so while excluding important noncausal explanations for this correlation. Every precedent in the data set being binding under some circumstances and persuasive under others addresses concerns created both by unmeasured variation over time and unmeasured differences in the characteristics of the two types of precedent. The additional step of preprocessing the data by using matching to identify the most similar pairs of observations further ensures the comparability of the two types of precedent. As a result, comparing use of precedents and the effect of ideology based on a precedent's doctrinal status (as binding or not) provides a straightforward test of legal constraint that addresses the complex problem of endogeneity. A higher rate of citing or positively treating binding precedents in combination with ideological dampening is evidence of legal constraint. For negative treatment, either ideological dampening or a lower rate of negative treatment of binding precedents is individually sufficient to indicate that judges are constrained by the doctrine of stare decisis. Only negative treatment reveals the hypothesized evidence of legal constraint, but the lack of any such apparent effect on the citation decision is suggestive about why law constrains circuit judges.

As expected, ideology plays a role in the selection of precedents. Precedents located farther from the opinion author are less likely to be cited. However, this effect is only statistically significant when the precedent is from the same circuit. Rather than showing legal constraint, this finding indicates that the doctrine of stare decisis does not have any diminishing effect on the ideological nature of a judge's choice about which binding precedents to cite in an opinion. This result is most intuitive when considered in terms of a judge's ability to ignore a relevant, yet ideologically distant, precedent in spite of the legal doctrine of stare decisis. Ignoring such a case makes it more difficult (although not impossible) for actors higher in the judicial hierarchy to observe, and potentially punish, departure from legal doctrine.

In contrast to ignoring a precedent, the way a judge treats a cited case is clearly visible within the four corners of an opinion. This makes it relatively easier for reviewing courts to observe a departure from stare decisis. Consequently, it would make sense for judges to be constrained by legal doctrine in terms of treatment even though no such pattern emerges for the citation decision. There is no evidence of ideological dampening in the case of positive treatment. In

Table 2. Treatment Model

	Negative Treatment		Positive Treatment	
	Matched	Full	Matched	Full
Ideological distance	.363*	.361*	.049	.045
	(.077)	(.078)	(.075)	(.075)
Binding precedent	−.152*	−.203*	.100	.057
	(.067)	(.053)	(.057)	(.046)
ID distance × Binding	−.354*	−.289*	−.016	−.011
	(.127)	(.096)	(.107)	(.084)
Similarity percentile	.021*	.026*	.019*	.017*
	(.002)	(.002)	(.002)	(.001)
Elite author (precedent)	.003	.017	−.138*	−.093*
	(.062)	(.046)	(.055)	(.039)
Dissent (precedent)	.056	.093*	−.004	.009
	(.050)	(.036)	(.042)	(.028)
Per curiam (precedent)	.055	.109	.070	.073
	(.096)	(.074)	(.083)	(.056)
En banc (precedent)	−.024	−.058	.032	.021
	(.113)	(.079)	(.091)	(.060)
Vitality	−.097*	−.087*	.051*	.060*
	(.013)	(.009)	(.011)	(.008)
Total treatments	.105*	.105*	.060*	.051*
	(.015)	(.011)	(.012)	(.008)
Total citations	−.019*	−.021*	−.021*	−.018*
	(.005)	(.004)	(.004)	(.002)
Age	.007	.019*	.012	.015*
	(.007)	(.006)	(.006)	(.005)
Age^2	.000	.000	.000	.000
	(.000)	(.000)	(.000)	(.000)
Length (precedent)	−.060	−.073*	.033	.011
	(.033)	(.024)	(.028)	(.019)
Property quoted (precedent)	.220	.097	1.006*	1.077*
	(.353)	(.242)	(.293)	(.193)
Length (treatment)	.190*	.198*	.121*	.164*
	(.040)	(.031)	(.038)	(.027)
Intercept	−4.968*	−5.432*	−4.556*	−4.593*
	(.456)	(.352)	(.395)	(.271)
N	27,356	46,555	27,356	46,555

Note. Multinomial probit regression estimates of the effect of *Ideological Distance*, whether a precedent is binding, their interaction, and a range of control variables on the decision of whether to negatively, neutrally, or positively treat a cited precedent for both the matched and full data. Neutral treatment is the baseline category. The reported standard errors (in parentheses) are robust standard errors that are clustered on the treatment case.
* $p < .05$.

fact, there is no evidence that ideology is a significant factor in the positive treatment decision at all. Most likely this lack of traction is due to similarity between a simple citation and a positive treatment. In practice, merely citing a precedent is a type of soft positive treatment. Within the context of legal writing, a citation to a precedent is understood to tacitly indicate acknowledgment and applicability (although this signal might be quite weak if a precedent is merely included in a long string citation referencing multiple authorities). The time pressures under which opinions are drafted in the circuit courts may lead to authors putting less effort into the relatively fine distinction between mere citation and positive

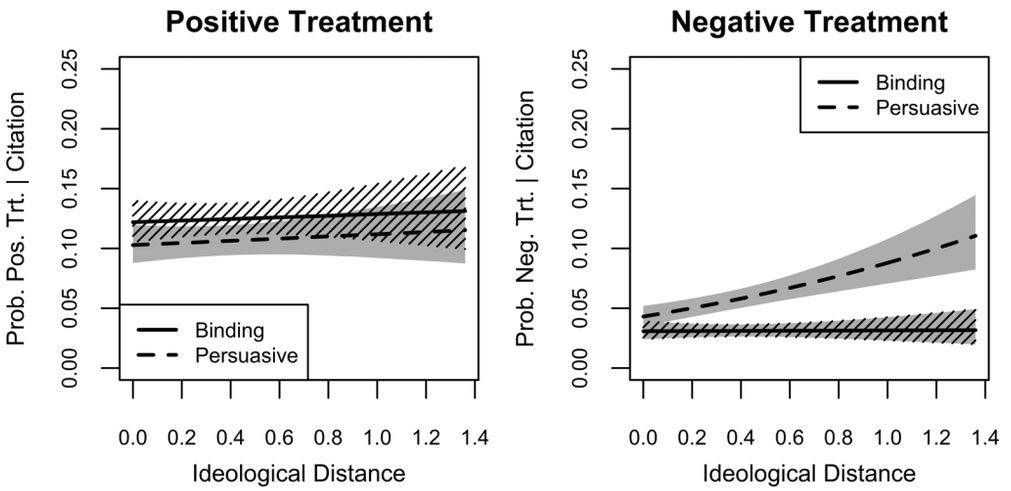

Figure 4. Effect of *Ideological Distance* on positive and negative treatment. This graph provides the predicted probability and 95% confidence intervals of positively and negatively treating a cited precedent for each type of precedent (binding and persuasive) at different values of *Ideological Distance*. All other variables are held at their median.

treatment. The fact that most of the control variables also fail to reach statistical significance for positive treatment further supports this conclusion.

Negative treatment is subject to legal constraint. Both hypothesized patterns emerge to support this conclusion. There is both ideological dampening and an overall lower likelihood of negatively treating binding precedents. Judges are more than twice as likely to negatively treat an average cited precedent when it is persuasive (6.9%) than when it is binding (3.1%). There can certainly be purely legal reasons to criticize or distinguish a precedent. But judges may have ideological reasons for doing so as well. The lower rate of such negative treatment of binding precedents suggests that judges refrain, at least to some extent, from negatively treating for ideological reasons when a precedent is binding. Furthermore, a judge's predisposition to negatively treat more ideologically disparate precedents is significantly dampened when the precedent in question is binding. That is, judges act less ideologically when considering precedents that are binding as a matter of legal doctrine. In fact, for binding precedents the impact of *Ideological Distance* on negative treatment is not statistically significant ($p = .23$). For persuasive precedents, the probability of negative treatment varies quite a bit depending on the ideological relationship between the precedent and the author in the treatment case. When these two are aligned, the predicted probability of negative treatment is only 4.3%, but it increases all the way to 11.1% when the ideological distance between the two is maximized.

On the one hand, law dictates that published precedents from one's own circuit have virtually the same legal status as US Supreme Court opinions (as long as there is no conflicting Supreme Court case). On the other hand, published precedents from other circuits are simply persuasive. Similar to a law review article, judges may refer to such a source if they find the reasoning persuasive or helpful, but they have no obligation to do so under the law. These rules have an effect on judges' negative treatment decisions when citing the opinions of their fellow circuit judges. The patterns uncovered here may also apply to the other types of binding and persuasive authorities circuit judges may cite. Negative treatment of Supreme Court opinions may be similarly constrained by the legal doctrine of stare decisis, while circuit judges may be able to continue to let their ideology govern the less visible citation decision. Moreover, this article demonstrates that investigation of such questions constitutes yet another strand of judicial politics research in which matching plays an important role.

While the primary purpose of this study is to look for evidence of legal constraint rather than distinguish among causes of legal constraint, the results are suggestive about the latter question. If judges act within the constraints of the law based on their role perceptions about how judges ought to act, such constraint should manifest in a relatively consistent manner without respect to how likely a departure is to subject the judge to reversal or censure. However, the results here suggest that legal constraint manifests under conditions when departure from the doctrine of stare decisis is easiest for other actors to observe. This distinction suggests that legal constraint in the circuit courts is driven by strategic concerns such as fear of reversal, desire for promotion, or preserving legitimacy to consolidate policy-making power in future cases.

The evidence of legal constraint provided here addresses a significant challenge in the study of how law influences

judges. The institutional structure of the US Courts of Appeals combines with the legal doctrine of stare decisis to create a unique research opportunity. Not only does it address endogeneity concerns, it also provides key insight into the role of a fundamental legal principle in the context of an institution with broad policy-making power. In spite of extensive discussion of the distinction between binding and persuasive precedents, there is little systematic empirical analysis of the effects of the doctrine on judicial behavior. This paper sheds light on the role this distinction plays among judges who create a substantial proportion of federal case law. The very range of circuit courts' influence makes it a challenge to study these important courts because of the sheer bulk of opinions they produce. The extensive data collected for this project illustrates the challenges involved but also highlights the possibilities created by turning our attention to the US Courts of Appeals.

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