THE EVOLUTION OF LAW:

MAPPING INTER-COURT RELATIONS

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Abstract

Using the constitutional issue of regulatory takings as a testing ground, this paper analyzes citation patterns across all three tiers of the federal judiciary over a century of case law to test three models of judicial communication. We find some evidence to support the strong hierarchy model of judicial decision-making; however, we also observe patterns that challenge the implications of a strictly hierarchical judicial system. These findings suggest that two modifications must be made to the conventional hierarchical model. First, lower courts play a significant role in shaping judicial policy, beyond simply carrying out the mandates of the High Court. And, second, this role is not displaced by High Court intervention, but, rather, is enhanced by the intensified need to apply a growing body of precedents within a re-energized area of litigation.

The application of precedent, by which judges consider the legal principles expressed in previous opinions, is among the most significant concepts in American law. Due to the nature of the U.S. common law system, the emergence of guiding precedent can have tremendous impact on the development of policy across a broad spectrum of issues. However, unlike Spriggs and Hansford (2000), and Hansford and Spriggs (2006), who evaluated Supreme Court treatment of its own prior decisions in a series of terms, we are interested in legal development throughout all federal courts. Our goal is to assess the relationship dynamics among an array of courts that are interconnected not only by structural design, but also by mutual reliance (albeit, to varying degrees) upon a common set of reference points in the body of law. More broadly, we are concerned with the participation of various actors in the emergence, dispersion, alteration, and abolition of legal precedent throughout the U.S. judicial system. Of course, there are a number of agents in this process – judges, appellate clerks, amici, and the legal advocates representing the principal litigants, among others – but the official transmission device is the judicial opinion, publicly reported and permanently stored, to become a potential target of subsequent reference.

With few exceptions (e.g., Zorn and Bowie 2007), empirical judicial research has a single-court or single-layer focus (e.g., Haire, Lindquist and Songer 2003). To the extent that studies have considered inter-court relations, researchers have largely focused on whether lower courts have "complied with" U.S. Supreme Court precedents. This approach to judicial research is worthwhile, but limited in its application, for it assumes that the Supreme Court has offered substantial and relevant guidance on the particular legal issue under investigation. In fact, the justices can only address a small fraction of the myriad issues in lower court judges each year. What calls out for exploration is how the lower courts operate with relatively little or unclear High Court guidance. This study explores interactions among the U.S. Supreme Court, U.S.

Circuit Courts, and U.S. District Courts, by investigating the manner in which the entire federal judiciary has collectively developed the law on a high-stakes political issue, "regulatory takings."

Using the constitutional issue of regulatory takings as a vehicle, this paper analyzes citations across and within layers of the federal judiciary in order to assess patterns of communication and influence. The Supreme Court approved the concept of "regulatory takings" in 1922 (*Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393), but provided little direction as to its meaning until its 1978 landmark decision in *Penn Central Transportation Co. v. City of New York* (438 U.S. 104). Since Penn Central, the justices have remained actively engaged in shaping regulatory takings policy, issuing on average about two decisions per year. These developmental characteristics enable us to compare citation patterns during periods when the Supreme Court is relatively quiet with intervals of relatively high Supreme Court engagement. Consistent with hierarchical understandings of judicial decisionmaking, we find that citations to Supreme Court precedent remain robust throughout the time period examined (1922-2005). Other findings of our study, however, challenge the implications of a strictly hierarchical judicial model. The role of "persuasive authority," or "lateral citations" (i.e., citations by lower federal courts to the decisions of other Circuit Courts – by which they are not bound), is impressively strong. Most surprisingly, we find that the relative role of lateral citations actually increased after the Supreme Court re-entered the field of regulatory takings.

This observation contradicts the notion that the need for lateral authority is greater when the Supreme Court is relatively inactive. Rather, it indicates that lateral citations play a complementary role to the standard hierarchical reference structure, and we thus suggest two modifications to the conventional hierarchical model. First, lower courts play a significant role in shaping judicial policy, beyond simply carrying out mandates of the High Court. And, second,

this role is not displaced by High Court intervention, but, rather, is enhanced in a context of a growing body of precedent in an energized area of litigation.

Regulatory takings presents a comparatively narrow constitutional issue that has involved courts at every level. Because this area of jurisprudence is anchored by a relatively early Supreme Court landmark, it provides us with a long time horizon. The total universe of decisions is sufficiently large to capture both spatial and temporal variations, yet sufficiently small to be manageable with information technology analytics. Adapting a handful of tools from information science to our needs (see XXXX 2005), we created a dataset of 2,951 federal regulatory takings decisions (RTDs) from 1900 to 2005. We estimate that corpus to have a 92.1 percent accuracy rate (i.e., 7.9 percent false-positives[1]), based on stratified random samples of the queries from which it was constructed. The tools that facilitated our ability to develop this database have allowed us to automatically identify and map the 18,353 unique citations that weave this corpus into a distinct body of law. By assessing issue-specific activity across a more diverse set of institutions (structurally and geographically) than existing judicial scholarship, this line of research opens the door to gaining a better appreciation of the dynamics at play in the development of an emerging body of legal precedent.

[1] Given that a single decision can have a substantial impact on the subsequent development of caselaw, our principal concern in developing the dataset was to minimize the possibility of missing decisions (i.e., those we would consider relevant to regulatory takings, but which would be absent). Following this strategy, we originally identified 3,501 federal RTDs, which were then surveyed for false-positives (removed upon discovery).

EMERGENT CASELAW AND THE COMMUNICATION OF PRECEDENT

The concept of regulatory takings is rooted in the Takings Clause of the Fifth Amendment to the U.S. Constitution, which states, "nor shall private property be taken for public use, without just compensation." Justice Oliver Wendell Holmes, writing for the Court in 1922, held that this clause could be applied not only to physical seizure of property, but also to land-use regulation: "while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking" (*Pennsylvania Coal Co. v. Mahon*, 260 US 393).[2] In Mahon, then, the Court essentially gave its blessing to the notion that overly intrusive regulations could violate the Takings Clause, while saying almost nothing to define the concept, or to delineate its scope of application. Indeed, for more than fifty years after Mahon (1922 to 1978), the Court did little to specify the doctrine of regulatory takings, thus leaving lower courts with great latitude in developing and applying it. The responsibility was a significant one, for litigation on related questions expanded dramatically.[3] Writing in the mid-1970s, Bruce Ackerman (1977) remarked

[2] "The original understanding of the Takings Clause of the Fifth Amendment was clear on two points. The clause required compensation when the federal government physically took private property, but not when government regulations limited the ways in which property could be used" (Treanor 1995, at 782).

[3] The growth in regulatory takings litigation was spurred in part by the Court's decision, just four years after Mahon, upholding the authority of local governments to regulate land-use by enacting zoning ordinances under state police power. (*Village of Euclid v. Ambler Realty Co*., 272 US 365 (1926)). The Court noted in that case that zoning had become a necessity of modern life, stating: "Until recent years, urban life was comparatively simple; but, with the great increase and concentration of population, problems have developed, and constantly are

upon the virtual flood of environmental legislation produced in that era, aimed at protecting the environment and natural resources but without compensating property owners for the deprivations thus imposed upon them. He observed that the result had been "a set of confused judicial responses, reflecting the larger intellectual difficulty involved in setting limits on the activist state. ... compensation law – after a long period of neglect – is in need of a fundamental reconsideration" (p 3-4).

Ending its extended season of placidity on the issue, in 1978 the Court re-engaged to inaugurate a period of sustained involvement in regulatory takings questions that continues to the present day (*Penn Central Transportation Co. v. City of New York*). In the face of a long-flowing stream of litigation, and a variety of approaches developed in the courts below, the Court acknowledged that it had failed "to develop any 'set formula' for determining when 'justice and fairness' require that economic injuries caused by public action be compensated by the government, rather than remain ... concentrated on a few persons," relying instead on ad hoc, fact-specific inquiries. The Court articulated a list of relevant factors in evaluating whether the effects of a regulation amount to a constitutional taking:

The economic impact of the regulation on the claimant and, particularly, the extent to which the regulation has interfered with distinct investment-backed expectations are, of course, relevant considerations. So, too, is the character of the governmental action. A 'taking' may

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developing, which require, and will continue to require, additional restrictions in respect of the use and occupation of private lands in urban communities" (*Ambler Realty*, at 386-387). Coyle (1993) observes: "Between 1928 and 1974, the US Supreme Court did not even hear a zoning case, and most state courts gradually adopted the 'see-no-land-rights, hear-no-land-rights' attitude of the Court" (p. 4).

more readily be found when the interference with property can be characterized as a physical invasion by government . . . than when interference arises from some public program adjusting the benefits and burdens of economic life to promote the common good. (at 124).

A series of Supreme Court decisions since then has created a complex, often confusing, body of law governing what sorts of regulations cross the line to become a compensable taking. Clearly, determining what it means for government to "go too far" is not an easy task, and the High Court itself struggled to reconcile its own precedent; indeed, the ambiguity of this "standard" first stated in Mahon is a problem noted with great frequency in the law review literature (see Epstein 1985, at 64). What began with a vague precedent and an open invitation to lower court experimentation in the 1920s, followed by a half-century without firm direction from above, has yielded a highly contested area of law, even after the Court directly addressed the issue in Penn Central.

Citation to Precedent as Evidence of Influence

The precise contours of a legal rule established by Supreme Court precedent are not constant. In fact, determining the boundaries of a rule is generally an iterative process, in which the Court broadens, restricts, and or explains the rule in a series of cases (see Landes and Posner 1976, p 250). Legal rules thus exist in a state of ongoing evolutionary development, as changes in the larger context affect their efficacy with time, as the Court's personnel is perpetually renewed, and as new variations on each central theme present themselves in litigation – all resulting in continuous demand for re-interpretation and clarification.

For courts at every level of the federal hierarchy, the decisional norm of stare decisis imparts a trend towards historical consistency, in which change is based on reference to prior

cases that present similar or analogous questions.[4] Because of the centrality of precedent to the perceived authority of judicial decisions, and the importance placed upon transmission of legal principle – both to the process of legal argumentation and to sustaining the legal hierarchy – a network analysis of citations is particularly appropriate to the study of inter-court communication at the systemic level (Chandler 2005; Fowler et al. 2007; Fowler and Jeon 2008; Hansford and Spriggs II 2002). Citations to precedent are objective, statistically measurable evidence (Landes, Lessig, and Solimine 1998) of the institutional aspect of law – providing clues about factors that influence its development (Johnson 1986, p 538), including both binding and perceived authority. The method is well-established; scholars have used citation analysis to investigate a variety of dimensions of legal change for over seven decades (see Mott 1936). By studying links between decisions, we can identify zones of influence across geographical, hierarchical, and temporal dimensions (Harris 1982; Landes and Posner 1976; Walsh 1997).[5]

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[4] Goodhart (1930) notes that *stare decisis* was clearly established as a juridical norm by 1900, , and Fowler and Jeon (2008) estimate that by 1900 about 90% of all Supreme Court opinion writers cited at least one precedent.

[5] The combination of comprehensive commercial legal databases, such as Westlaw, and increasingly sophisticated information technologies has made it possible for us to conduct citation analysis on a scale of study that, to our knowledge, has not been done before – encompassing all of the reported federal judicial decisions on a particular constitutional issue, with the total decisions numbering in our database numbering nearly 3,000. For the reasons noted above, citations have long been accepted as a useful measure of relative influence within the judicial system. It must also be noted that the techniques and technologies of citation analysis continue to rapidly evolve. Future promising areas for advancement include

A common starting point for citation analysis is to examine the reasoning and frequency of citations to a given decision by subsequent courts, and the array of previous decisions that its author(s) cite as relevant precedent (Caldeira 1985). The basic framework is straightforward; references within a given decision are understood as "OUT-cites" to other cases.[6] Instances where a court reflexively cites earlier decisions within its own jurisdiction (e.g., when a Second

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the development of more precise appraisal of citations. Some citations, for example, may indicate strong approval of the cited opinion, while others might either wish to distinguish the cited opinion or to criticize its reasoning. Also, some citations may serve as a critical fulcrum for new analysis, where others might serve to acknowledge a long-established and relatively uncontroversial proposition. While developing feasible means of incorporating such considerations into the measure of thousands of citations is a worthy target for further methodological development, even without such potential refinements, judicial citations provide a rich source of information regarding the distribution and evolution of judicial influence. Regardless of the variation between individual citations in terms of their specific roles, the act of citation itself is a recognition that the decision of a previous court must be addressed in some fashion; even distinguishing or criticizing a precedent is to acknowledge its arguable relevance. The body of judicial interpretation, law and policy on particular legal issues is a form of ongoing conversation between judges at different layers of the hierarchy; citation patterns provide an important means of studying the relative prominence and activity of different judicial actors within that conversation.

[6] In fact, such links can be one of two broad classes: citations to earlier decisions within the text of a given decision are known as "OUT-cites," while subsequent citations to a given decision are referred to as "IN-cites."

Circuit Court of Appeals panel cites an earlier opinion by the Second Circuit), are referred to as *intra*-court citations or "AUTO-cites." *Inter*-court citations or "LATERAL-cites," denote references to a decision beyond normal jurisdictional boundaries (e.g., when a Second Circuit panel, or a district judge within the Second Circuit, cites a decision from the Ninth Circuit). Finally, citations to higher courts are identified as UP-cites (e.g., when a District Court judge cites a decision by the US Supreme Court, or a decision by her own Circuit Court) , with DOWN-cites describing those to lower courts (see Figure 1).

Figure 1: Elemental Inter-Court Structural Relations

Theories of Court Behavior

The Supreme Court's lead in the process of legal change is expected by both observers and practitioners. Such expectations have fed a rich vein of research that addresses compliance with and avoidance of Supreme Court precedent among lower court judges, especially where the controversy involves hot-button social issues, accompanied by serious division in policy and ideological preferences (e.g., Peltason 1961; Manwaring 1962; Beatty 1972; Baum 1978; Johnson and Canon 1984; Songer and Sheehan, 1990).

Judges clearly retain discretional latitude in deciding whether and how to apply a particular precedent to a controversy in progress, thus opening the door to individual policy preferences and other influences. There is considerable debate among scholars regarding the determinative role of precedent, as compared to other factors, such as ideology, policy inclination, and strategic maneuvering, in decision-making at the US Supreme Court. Yet, although there is evidence of non-legal influences throughout the judicial system, research points

to a general tendency among lower court judges to comply with Supreme Court precedent (e.g., Baum 1978; Johnson 1987; Songer, Segal, and Cameron 1994), rather than striking out on their own.[7] This comports with Kornhauser's (1995) understanding of the court system as a "resource-constrained team," in which judges at all levels are engaged in a collective effort to reach the right decisions, and where the court hierarchy is as conducive to error prevention as it is to error correction (also see Caminker 1994). Thus, legal principle is adjusted at the top, providing signals to judges below, who preside over the great bulk of the system's caseload.

Others have emphasized the relative independence and likely heterogeneity in policy preferences across the judiciary (e.g., Songer, Segal, and Cameron 1994; Cameron, Segal, and Songer 2000; and Vidal and Leaver 2007). Because the Supreme Court can, at best, only selectively monitor the lower courts, the real incentive for judges below is less to "toe the line" than it is to minimize the likelihood of review by not straying too far from the mark. Circuit judges might also want to remain fairly consistent with each other, since divergence among the Circuits appears to be a fairly strong cue for Supreme Court review (Songer, Segal and Cameron 1994).

While there are general expectations regarding reflexive precedent (i.e., AUTO-cites), vertical precedent (following rules articulated by higher courts) is expected to exert the strongest pull (i.e., UP-cites) (Phelps and Gates 1991; Topf 1992; Fowler, et al 2007). But what should we expect when the Supreme Court provides relatively little guidance? If caselaw is to develop further during such periods, might we expect the Circuits (individually, or as a whole) to assume a more prominent role? It may be that such periods reflect generally lower levels of court activity

[7] We do not mean to imply here that defiance among lower court judges does not occur (see, e.g., Peltason 1961; Manwaring 1962; Uchida and Bynum 1991), but the general tendency seems to be some degree of compliance.

(on a given question), but what patterns would we predict where this is not the case? Should silence by the High Court signal that a question of law is relatively "settled"? Such are the questions we attempt to answer, using citation to precedent as evidence of inter-court communication.

Models of Court Behavior

The existing scholarship on judicial behavior focuses heavily on the ideological perspective and psychology of the individual judge, effectively asking "*what variables make Judge A more likely to do X*"? Depending on the study, "X" may be defined, for example, as voting for a "liberal" versus a "conservative" outcome, or as "complying with" precedent versus "shirking" from the duty of compliance. That research sheds light on the variety of factors that may influence the individual judicial decisionmaker. Our study engages questions that cannot be fully addressed by focusing only on decisionmakers of one judicial tier.[8] We are interested in how the entire federal judiciary, as an interrelated system, develop policy over the long haul. To be sure, our line of inquiry may be affected by idiosyncratic decisionmaking preferences of individual judges, but our primary aim is to capture broader, systemic patterns.

Accordingly, we propose three overarching models of how the federal judiciary might operate. Legal practitioners and scholars alike hold certain assumptions about the federal judiciary, but the accuracy of these beliefs has not been systematically appraised. By explicitly identifying the assumptions inherent in specific models of court behavior, we can assess their value and begin to move from vague, impressionistic assumptions to testable and verifiable

[8] In their multi-tier investigation, Zorn and Bowie (2007) find that ideology and policy preference exert stronger influence at the federal appellate level, while facts and law are more important to decision-making at the district court level.

propositions. Below we describe the basic models that this study investigates: the conventional Strongly Hierarchical Model; a Non-Hierarchical Model; and two variants of a Cultivation Model, to reflect these differing views of the importance of hierarchy in the federal courts.

Strong hierarchy: As we all know full well, the federal judiciary is formally defined as a hierarchical system, with the Supreme Court at the apex, followed by the Circuit Courts of Appeals and their associated district courts. Indeed, the Supreme Court is the only court created by the Constitution. Article III vests judicial power in the Supreme Court and "in such inferior Courts as the Congress may from time to time ordain and establish." It is, of course, understood that lower federal courts are expected to comply with Supreme Court precedent, and on politically controversial issues, specialists as well as the general public look to the High Court for definitive legal directives. Similarly, the twelve geographically defined Circuits[9] are further divided into districts, whose judges are bound by decisions of their respective Circuit Court. It may be widely assumed that the judiciary operates according to a carefully defined hierarchy, but to what extent does strict hierarchy account for observable communication patterns across the system?

In order to investigate this question, we hypothesize a "Strongly Hierarchical Model," with an accompanying set of expected observations. For starters, virtually all citations should be UP-cites or AUTO-cites.[10] In a strictly hierarchical system, judges only cite opinions that are

[9] The First through Eleventh Circuits, plust the D.C. Circuit are defined geographically; the jurisdiction of Federal Circuit Court of Appeals is defined by subject matter.

[10] We say "virtually all" citations should be UP-cites or AUTO-cites, because a higher court, in describing the procedural background of a particular case, will sometimes cite a decision by a lower court in that same case. From the vantage point of a strictly hierarchical model, however, the percentage of all citations that consist of such DOWN-cites should be extremely low.

binding upon them. This model, then, expects UP-cites: district judges cite their own Circuit's decisions, and all "inferior courts" cite the Supreme Court. The hierarchical model also allows for AUTO-cites. In the US common law system, built on the doctrine of stare decisis, courts are generally guided by their previous decisions, and precedents are viewed as authoritative. Thus, even though it is true that the Supreme Court (and Circuit Courts, within the bounds of Supreme Court precedent) may reverse themselves, it is generally the case that judges view precedents as law, and AUTO-cites are therefore consistent with a strictly hierarchical model.

A critical implication of the Strongly Hierarchical Model is that a minimal number of LATERAL-cites are expected. LATERAL-cites do not constitute binding authority. If a lower court judge refers to precedent from another Circuit, the citation does not fall within the hierarchical lines of judicial authority. A court from the First Circuit, for example, is free to disregard, or even directly contradict, a ruling from the Second Circuit. Consequently, judges acting purely in accordance with hierarchy would have no need for LATERAL-cites. Of course, as a practical matter, legal scholars and practitioners alike know that LATERAL-cites occur, but hypothesizing a strictly hierarchical model allows us to measure the degree to which empirical observations deviate from what the Strongly Hierarchical Model would predict.

In addition to the formal structure of the federal judiciary itself, a number of scholars have offered accounts of judicial decision-making that may provide additional reasons to expect patterns of influence to track the hierarchical lines of authority. Indeed, following legal parameters in accordance with the judiciary's hierarchical structure reduces decision-making costs (e.g., Phelps and Gates 1991; Topf 1992). Moreover, socialization of judges into the legal community inspires appropriate role conceptions and a norm of respect for the authority of the formal judicial hierarchy (Tarr 1977; Howard 1977; Klein and Hume 2003). Given the relative

lack of power that the Supreme Court realistically can exert over subordinates directly, it is important to note that certain kinds of role conceptions might provide lower court judges with reasons to follow the justices even in the absence of tangible mechanisms of control. Johnson and Canon (1984: 46-48) observe, for example, that if circuit court judges view themselves as the justices' loyal agents, then they might seek to determine how the justices would rule, even when faced with issues which the High Court had not yet specifically addressed. Thus, lower court judges apply established principles to new policy areas.[11]

Non-Hierarchical (Persuasive) Authority: In contrast to a strictly hierarchical view, some scholars have posited that judges principally seek to arrive at legally accurate decisions (Klein 2002; Klein and Hume 2003; and see Talley 1999 (considering and rejecting a "herding" mentality); Kornhauser 1995 (suggesting a team model)). Under our "Non-Hierarchical" Model, we no longer assume that judges always look strictly to binding authority. Rather than viewing themselves entirely as implementing mandates of higher legal authority, lower court judges may

[11] In interviews with judges from the Seventh, Ninth and DC Circuits, for example, Cohen (2002) finds that fear of being overturned does not loom large in the decision-making process. Cohen's interviewees stress not only the mathematically negligible possibility of reversal, but also the instability of Court policies, noting a tendency to center decision-making around analysis of the best decision under the law (pp.44-45). Klein and Hume (2003), agree, concluding that "fear of reversal was not a major influence on judges' decisions" (p.600). Nonetheless, circuit judges tend to follow Supreme Court precedent far more often than not. Why? Klein and Hume offer two primary explanations. First, given the crush of cases in lower courts, judges find shorthand ways of dealing with it, and the *stare decisis* decision rule provides a useful way to simplify in addressing unexceptional cases. Indeed, "the desire to save time may promote decisional congruence even if judges do not care about congruence itself" (p.602). In addition, decisional convergence likely "flows from lower court judges' attempts to reach legally sound decisions" (p.602). (also see Howard 1973; 1977; 1981). Kitchin (1978) also reports similar attitudes and expectations among federal district judges.

view themselves as charged with responsibility to reason their own way to the best decisions, except where clearly constrained by High Court precedent. From this perspective, in searching for the most useful guidance to address a thorny problem, a judge may find utility in experience and reasoning of judges in other jurisdictions, whose decisions do not represent binding authority. Indeed, many of the earliest efforts to understand legal processes in terms of formal citation patterns (i.e., the "communication of precedent") focused on one variety of lateral citation – references between state Supreme Courts (e.g., Harris 1982; Caldeira 1983; Caldeira 1985; Caldeira 1988).

The Non-Hierarchical model does not deny an important role for UP-cites, and it does not suggest that judges are eager to evade or rebel against binding authority. Rather, it views judges as focused on identifying the best available reasoning to decide a case. Operating within a common law system, judges naturally will look to precedents supplying answers to similar or closely analogous legal questions. Judges will not wish to flout binding authority, but they are not so constrained by hierarchical thinking that they are unable to reach across jurisdictional lines quite readily to exploit the best available reasoning within a body of case law. A federal District Court judge may find that her own Circuit Court has not yet squarely addressed the issue at bar, but that another Circuit Court has done so. Even though the judge is not bound by the other Circuit Court's ruling, a well-reasoned precedent will serve her purposes well.

The crucial distinction between the Strongly Hierarchical and Non-Hierarchical Models is that only the latter anticipates a substantial volume of LATERAL-cites. If empirical observations come closer to approximating the Non-Hierarchial Model, we are led to another line of questions meriting further investigation. For example, some specific courts or judges may receive a disproportionate share of citations as persuasive authority. A number of scholars have

pursued this line of questions. One proposed theory, for example, suggests that certain jurists gain a reputation (or "prestige") for legal acumen in a particular area of jurisprudence. Previous studies (Caldeira 1985; Harris 1982), suggest that prestige is heterogeneously distributed across courts (Kosma, 1998; Landes et al., 1998), rather than being clustered within a single jurisdiction. These earlier studies examined citations en masse between courts, without regard to issue area; our study focuses on development of a specific question. Even if it is true that inter-court citations as a whole are heterogeneously distributed, it is possible that the apparent "random" distribution in fact masks interesting citation patterns within specific issue areas. That is, one court or judge might be prestigious within a particular area of law, while a different court or judge is considered the best authority on something else. In probing this model, then, we will look, not only for the overall pattern of lateral citations, but also for any notable concentrations in their distribution.

Cultivation Model: The systemic operation of the federal judiciary depends, of course, not only on the decisionmaking motivations of lower court judges, but also on the aims and strategies of the justices. Our generalized third model hypothesizes temporal factors in the relationship between the justices and the lower courts. Within a Strongly Hierarchical perspective, the "Cultivation Model" assumes that justices recognize that they cannot address all significant legal issues at once. The justices also recognize that, in the vast array of lower federal courts, they have at their disposal a remarkably potent source of judicial analysis. The justices, then, will, at times, intentionally allow the lower courts substantial leeway in developing various responses to a particular legal issue. As the lower courts adjudicate the controversies that come before them, they are not only resolving individual disputes, but also developing and testing different approaches to that issue. If, at a later time, the Supreme Court wishes to speak to the

issue, in doing so they may draw upon the previous work of the lower courts. Moreover, Cultivation within a Strong Hierarchy assumes that lower court judges in each Circuit will seek High Court guidance where they can find it, but in its absence will increasingly develop their own approaches – autonomously from their sister courts.

On the other hand, to the degree that lower court judges are regularly presented with novel conditions and questions – thus leaving significant ambiguity within the law – they may also choose to draw upon sources of judicial reasoning that extend beyond binding precedent. In other words, we might expect these judges to reach outside of their own hierarchical jurisdictions, to identify more relevant and persuasive precedent handed down by judges in other Circuits. Indeed, we might especially expect such LATERAL-cites to occur in periods when the High Court is relatively disengaged on a given issue. In other words, a Non-Hierarchical variation of the Cultivation Model would expect Circuit courts to increasingly cite each other in the absence of clear Supreme Court guidance. However, because the Non-Hierarchical Model still acknowledges the possibility of a critical role for UP and AUTO-cites, there are no clear expectations as to inter-Circuit citation behavior before or after the High Court re-engages an issue. This point is solidified even more by the strong likelihood (given the formally hierarchical nature of the court system) that even if a given legal rationale is based on persuasive, rather than binding precedent, once it is established within a given Circuit, it becomes binding within that jurisdiction. Thus, though persuasive precedent might be "borrowed" from other courts, in recording that exchange, judges then convert it to a binding form, under the decision norm of stare decisis.

In probing the accuracy of the Cultivation Model, one type of variable we explore is the average age of citations. As noted, the Supreme Court issued a landmark decision on regulatory

takings in 1922, but then remained relatively inactive on the issue until 1978. We report the full extent of the Court's decisional activity on this issue in Figure 2. What pattern should we anticipate with respect to the age of citations? Does the average age of citations increase over the entire time sequence? What is the age distribution during the interim period, when the Supreme Court provided relatively little guidance? When the Supreme Court re-enters the field in 1978, do older cases diminish in value, thus shortening citation age? The Cultivation Model predicts that, as the period of Supreme Court inactivity lengthens, we should see an increase in the average age of Supreme Court citations. The growing number and reach of administrative agencies in the post-New Deal era would certainly have created a context ripe with potential for an ongoing series of challenges. To the extent that this did occur, some of the legal effort would have been directed to state courts, but the federal courts would also have hosted a significant share of the litigation. With the Supreme Court taking a hands-off approach, lower courts would likely seek counsel from older cases. That is, as the period of inactivity lengthens, the lower court judges, eager to anchor their opinions in Supreme Court authority, will reach back to an aging body of Supreme Court precedents.[12]

[12] A number of scholars have examined the significance of the age of citations. Walsh (1997), for example, has suggested that citation patterns should reflect whether a court is developing a new legal doctrine (i.e., broader and more frequent references) or addressing a "settled" area of law. Similarly, Johnson has argued that the "age" of citations can be expected to vary according to whether an area of law is "typified by a high degree of consensus" (1985, p 321). In general, it has been observed that citations in well-established areas of law are much older than those in more dynamic areas (Landes and Posner 1976). This can vary, of course, when an old precedent is ultimately overturned (Fowler and Jeon 2008). Klein (2002, p 59-61) reports that subsequent favorable citation of new rules among circuit court judges varies slightly among the three issues included in his study, but that the average is about two-thirds. Moreover, he finds reason to suspect that judges will on occasion purposely ignore precedents with which they disagree and that some decisions failed to be cited because

Figure 2: Supreme Court RTDs Annually, and with 5-year Running Average

Close oversight by the Court is costly, since only a very few cases can be picked for full review from the unending flow of appeals and certiorari petitions, and the justices are quite cautious conducting such audits (e.g., Perry 1991; Armstrong and Johnson 1982; Cameron, Segal, and Songer 2000). However, if the Court withdraws from a set of questions for an extended period, as it did with regard to regulatory takings (see Section 2.3.2 below), the incentives for consistency below should be greatly reduced. A second prediction of the Cultivation Model is that, as the period of Supreme Court inactivity lengthens, AUTO-cites at the Circuit Court level should increase. Circuit Court judges would prefer to cite Supreme Court precedent; however, under these conditions Circuit judges will face an increasing need to develop their own set of jurisprudential principles to fill the vacuum and will cite their own precedents in an ongoing attempt to create a coherent and internally consistent body of doctrine.

A third prediction of the Cultivation Model is that, when the Supreme Court re-engages we should expect to see a decrease in the average age of citations to the Court. For similar reasons AUTO-cites should decrease. Given the opportunity, Circuit Court judges prefer Supreme Court guidance over any other precedents. As the Supreme Court re-enters the field to provide substantially enhanced guidance, lower court judges will feel less compelled to reach back to older High Court precedents or to develop their own body of principles.

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subsequent courts are simply unaware of them. Penetration of precedent is not always immediate, which, in addition to the above, can be attributed in part to differences in judicial taste, or intellectual curiosity for specific legal questions (e.g., McIntosh and Cates 1997).

It should be noted that, while the Hierarchical and Non-Hierarchical Models are competing models in the sense that they cannot both be entirely correct (it cannot both be true that LATERAL-cites are common and almost non-existent at the same time), the Cultivation Model operates on a different axis, in the sense that it could be consistent with either the Hierarchical or Non-Hierarchical Models. Combined with the Hierarchical Model, the Cultivation Model suggests that the Circuit Courts would look only to their own precedents for guidance in the absence of Supreme Court direction. On the other hand, combined with the Non-Hierarchical Model, the Cultivation Model suggests that Circuit judges will rely on LATERAL precedent. These models are summarized in Table 1, below.

Table 1: Summary of Hypotheses

EVIDENCE OF COURT BEHAVIOR

Strong Hierarchy: It is of no surprise that citations to the Supreme Court dominate (47.1 percent of all citations); its position at the head of a formally defined hierarchy in which actions below can be either supported or reversed from above virtually guarantees such an outcome. Moreover, since UP-cites in general are the dominant citation form throughout the dataset (see Table 2), there is substantial evidence to support the Strong Hierarchy model.

Table 2: RTD Citation Count and Percentage, by Directionality, 1900-2005

Still, the dominance of the Supreme Court is clearly not absolute. As we see in Figure 3, citations to the High Court have fallen as a proportion of all references in federal Regulatory

Takings caselaw more-or-less steadily after the 1930s (especially following the late 1950s). In fact, since 2003, the proportion of Circuit-to-Circuit citations has been *larger* than that of those directed to the High Court. But rather than being dominated by AUTO-cites (expected by a Strong Hierarchy model), as the courts are expected to refer heavily to their own case histories, most are LATERAL-cites. In other words, *inter*-Circuit references have been the dominant form of Circuit-to-Circuit citations. Such results are not predicted by a (purely) hierarchical model.

Figure 3: OUT-cites to the Supreme Court as a Proportion of all Annual OUT-cites

Non-Hierarchical Authority: As we have shown elsewhere (XXXX, 2006), the steadily increasing volume of LATERAL citations is not randomly directed. While AUTO-cites are by far the most dominant, controlling for such reflexive citations reveals the clear importance of the 9th Circuit as a source of relevant or persuasive (i.e., non-binding) precedent (see Figure 4). The data also show the 9th Circuit to have been a significant "consumer" of precedent from other Circuits after 1986.[13] Other Circuits (e.g., the 6th, 7th, and the 11th) also appear to be important sources of precedent, though such relationships are less-pronounced. The clear importance of the 9th Circuit, plus the fact that the volume of LATERAL citations is greater than AUTO-cites (by a ratio of 3:2) and are rapidly approaching that of UP-cites to the Supreme Court (see Figure 3), all support a Non-Hierarchical Authority model. Even in the presence of strongly hierarchical citation patterns, non-binding (i.e., Non-Hierarchical) authority clearly plays a significant role.

[13] 1986 was the first year in which lateral citations to a single court rose more than one standard deviation above the mean (95 percent likelihood of non-randomness) of all lateral citations since 1900.

Figure 4: Circuit Courts Receiving Disproportionate LATERAL OUT-cites

The literature on the history of the constitutional property rights movement (e.g., Epstein 1985; Coyle 1993), leads to an expectation that the 9th Circuit should be a major player in regulatory takings. Again, this is clearly supported by the data. From 1980-2005, the 9th Circuit received a quarter of all circuit-level citations. This may partially be a byproduct of volume; over the same period, the 9th produced 26 percent of all Circuit-level RTDs. However, while it seems plausible that "legal capital" (i.e., the cumulative regulatory takings caselaw, in citing or cited courts) plays a role, in practice isolating this factor (and others) has proven quite difficult.[14]

Cultivation: Given the importance of the High Court as the final arbiter of caselaw, during periods of reduced engagement, we have argued that it is reasonable to expect two basic citation dynamics. First, given the relative absence of contemporaneous Supreme Court caselaw, we would expect lower courts to cite themselves (AUTO-cites) with increasing frequency during such periods. Second, for related reasons, we would expect the average "age" of citations to Supreme Court RTDs to be relatively higher than that of periods of more active High Court involvement. Alternatively, during periods when the Supreme Court has been more engaged on an issue (pre-1940 and post-1980 for regulatory takings), we would expect a greater propensity

[14] Through a long period of trial-and-error, we have discovered that the 9th Circuit is an outlier not only as a "recipient" of LATERAL citation, but also on many of the variables we might plausibly expect to influence legal action on regulatory takings (e.g., ideology, ratio of public lands, income). Controlling for the 9th in statistical models often eliminates all significance and explanatory strength. In our ongoing efforts to explain the dominance of the 9th Circuit, we repeatedly encounter a "pink hat" effect – inasmuch as extreme values on our explanatory variables are so strongly correlated with the 9th that were the judges of that Circuit to don pink berets, we would achieve similar statistical traction, if not explanatory value.

of lower courts to cite the High Court (UP-cites), as well as a relatively lower average "age" of such citations. Finally, given its formal and evident importance, we should observe the High Court to dominate any and all Circuits as a "recipient" of OUT-cites, and LATERAL citations to decline or remain low when the Supreme Court is more engaged.

Evidence of the "directionality" of citations only partially supports the "Cultivation" model, but in ways we find both perplexing and fascinating. Circuit-level AUTO-citations are virtually non-existent during nearly the entire period of the Supreme Court's relative inactivity – in fact, AUTO-citations become common in federal regulatory takings caselaw only after 1980 (see Figure 5), simultaneous with the High Court's re-engagement. Meanwhile, while UP-cites to the Supreme Court generally increase throughout the century (despite dipping substantially from 1951-55 – see Figure 7), as a proportion of all OUT-cites, they have (more-or-less) steadily declined since the 1930s (see Figure 3).

Figure 5: Emergence of Circuit-level AUTO-cites

As we have already discussed, inter- and intra-Circuit citations as a whole have more-or-less steadily increased since at least the late-1950s, surpassing references to the Supreme Court as a proportion of all federal court OUT-cites in 2003. What is most interesting – and quite puzzling, at least from our initial perspective – is the emergence of a growing body of LATERAL citations after the mid-1970s (see Figure 6), an expansion that is simultaneous with the Supreme Court's re-entry into regulatory takings caselaw. In other words, contrary to the expectations of a Strong Hierarchy model, LATERAL citations to RTDs increase as the High

Court began to address that issue anew. It is as if the Court's actions re-invigorated (rather than re-directed) lower court activity.

Figure 6: Emergence of Circuit-level LATERAL-cites

The data also show a strong and clear "aging and renewal" dynamic. The average age of citations to the Supreme Court increases during sustained periods of inactivity, dropping again shortly after the Court re-engages the issue of regulatory takings (see Figure 7). Indeed, the average age generally increases until the early 1980s. Given the limited regulatory takings caselaw at the onset of the century (where jurisprudence on the issue was relatively "young"), we would generally expect citation age to grow during the earliest period. Moreover, evidence that the flow and ebb of citation age lags the period of relative inaction and re-entry is not surprising, especially when one considers that most dramatic changes in legal technologies (e.g., electronic caselaw indices) were introduced during the 1980s, thus rendering judicial decisions from all venues increasingly accessible (e.g., Gerson 1999). Still, the average age of citations is well above the mean during the period of (staggered) relative inactivity, dropping much closer to the mean during the past twenty-five years. Such a dramatic (and statistically significant) drop presents strong (initial) evidence in support of the Cultivation Model. Determining whether such dynamics genuinely reflect "caselaw stewardship" on the part of the Supreme Court will entail studying the corpus in greater detail, something we address in our concluding section.

Figure 7: 5-year Averages of Age of OUT-cites to Supreme Court RTDs

CONCLUSIONS

While our initial expectation was that the Cultivation Model could co-exist with both Strong Hierarchy and a Non-Hierarchical Authority models, we are genuinely puzzled by evidence that all of our general hypotheses are supported, albeit to varying degrees (see Table 3). Citation behavior in the federal courts – at least as concerns regulatory takings caselaw – is strongly hierarchical (67 percent of all citations), but we also observe non-hierarchical "persuasive" authority emerging at the Circuit level (with the 9th Circuit assuming a particularly important role). What we are having a difficult time reconciling with the literature (and our expectations) is the rise of concentrated LATERAL-cites (i.e., Non-Hierarchical Authority), contemporaneous with sustained re-involvement by the Supreme Court. Clearly, re-engagement by the High Court has not had the effect of "clearing the decks."

Table 3: Summary of Empirical Results about here

Perhaps what we are observing is an "authority-cost," resulting from an extended interval of non-engagement by the court generally expected to exert leadership in a hierarchical system. The interim period helped to create a context in which some Circuits, either by necessity (in addressing a significant and growing caseload), or by the policy preferences of individual judges, develop decision-making principles to which they and District judges within their jurisdiction (as well as sister Circuits), might refer in subsequent litigation. Once established, the prestige of being an acknowledged "persuasive authority" tends to have a long life.

Advocacy networks are also a likely driving force behind litigation efforts in specific jurisdictions, calling attention to the value of case law from any location, as well as serving a

"cross-fertilizing" role in communicating between courts at all levels. Indeed, a nascent legal effort may well have developed in the 1940s and 1950s, with advocates promoting challenges to the expanding regulatory state, searching for "friendly" courts among the various circuits, and, when successful, establishing favorable precedents to which they could subsequently refer when bringing cases in other jurisdictions (e.g., Tushnet 2005). To address this question will require further investigation on the specific actors and institutions associated with the development of regulatory takings case law.

Moreover, one possible explanation for the temporal patterns is that they result from "issue diversification" among the Circuits. It is possible (perhaps probable) that Circuits have found themselves addressing repetitive issue scenarios presenting similar types of questions (e.g., those related to environmental protection, historical preservation, waterway regulation, urban renewal projects, air traffic patterns), each of which falls within the general area of Fifth Amendment challenges to regulatory regimes, but each requiring a rather different approach. Unless the Supreme Court devotes considerable attention to the range of questions likely to occur, it will allow individual circuits to develop expertise and thus become acknowledged as sources of persuasive authority on specific sub-issues within the broader field. Assessing issue diversity will require further study at greater levels of resolution, including content analysis of the decision texts. Ideological and policy preferences may also play some role in this process, as judges may be more likely to "find" and reference decisions outside their own jurisdictional boundaries with which they agree (see Giles, Hettinger, and Pepper 2001; Zorn and Bowie 2007; Epstein, et al. 2007).

Another plausible explanation that merits further exploration is that Circuit Court and Supreme Court decisions play distinct roles within lower court opinions. It may be that Supreme

Court opinions typically operate at a higher level of generality, setting broad parameters, while lower court opinions more often operate at the level of application. For example, Mahon, the 1922 decision in which the High Court first declared that a regulatory taking had occurred, Justice Holmes's opinion for the majority did not so much articulate doctrine as invite lower courts to do so. After a half-century of relative quiet, when the Court re-entered the field in earnest with Penn Central in 1978, the Court again did not provide specific guidance, but, rather, set forth a set of factors to be taken into consideration – the language was so broad that it called out for elaboration through application to specific disputes. The lower courts, then, may not view Supreme Court decisions as competing with, substituting for, or eliminating the necessity of citations to Circuit opinions. Instead, Supreme Court opinions may operate as spurs to greater activity by the lower courts in applying highly general standards. In deciding these cases of application, the lower courts would naturally look for any guidance they could find from cases whose factual and legal contexts were most similar – these cases are far more likely to come from other lower courts. In short, Circuit Courts may look for a small number of Supreme Court opinions to cite by way of setting the broad parameters for decision, and a larger number of Circuit opinions that shed light on the application of those parameters to particular controversies.

Directions for future research

Our observations address several large questions regarding the relationships among courts and the manner in which they communicate in the process of developing a body of law. We have also laid out a number of questions that logically follow. In addition, we feel it is essential to establish comparable baseline data–-for both other issue areas, and for the federal system as a whole. While the first of these tasks will likely have to wait until we or other researchers are able to construct such a dataset, we believe it may be more immediately possible to generate more

general values from sources such as the Songer database of U.S. Circuit Court decisions, which was created based on stratified random sampling. Whether we re-test these models against other issue areas or random samples, we cannot know whether the effects we observed here are unique to our issue area (e.g., the importance of the Ninth Circuit), or are indicative of broader processes in the federal system. There is little to suggest that the dynamics of communication would differ from one broad issue field to the next. The advocacy network would likely show considerable variation across fields, but again, the process of advocacy and communication is likely to work similarly across networks.

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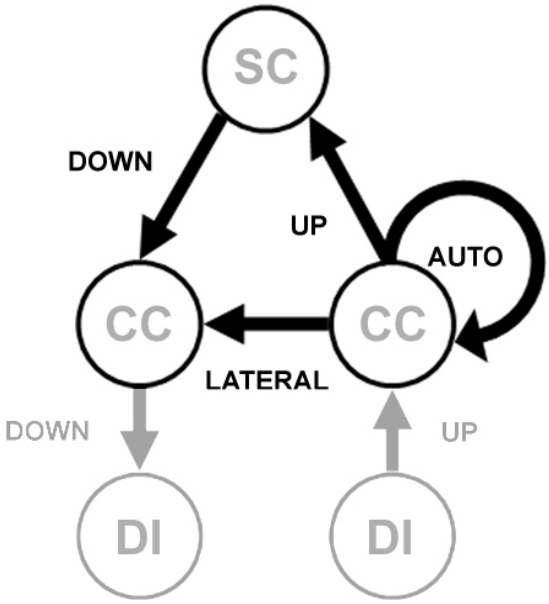
[Figure 1]

Elemental Inter-Court Structural Relations



[Figure 2]

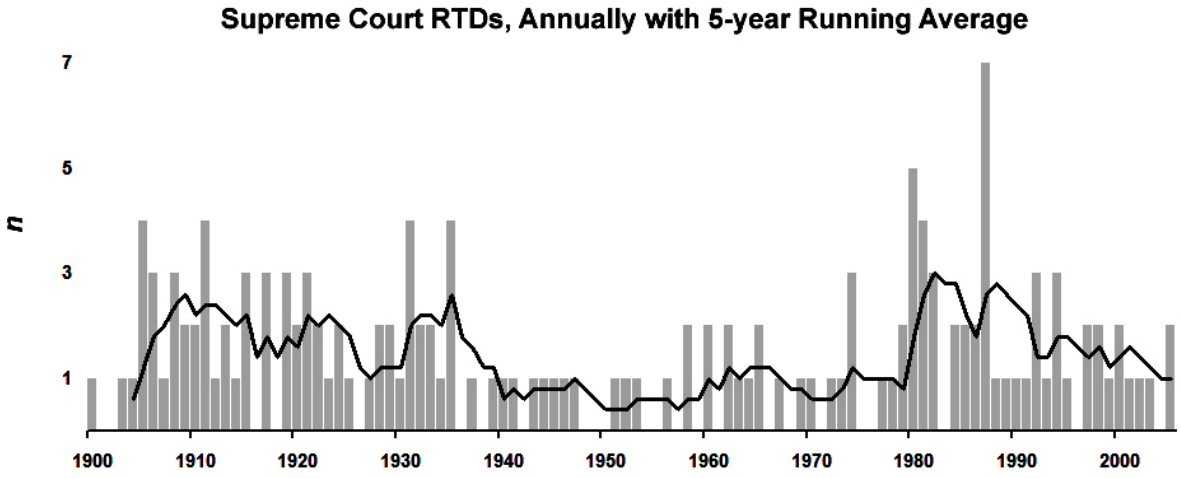

Supreme Court RTDs, Annually with 5-year Running Average
n
7
5
3
1
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

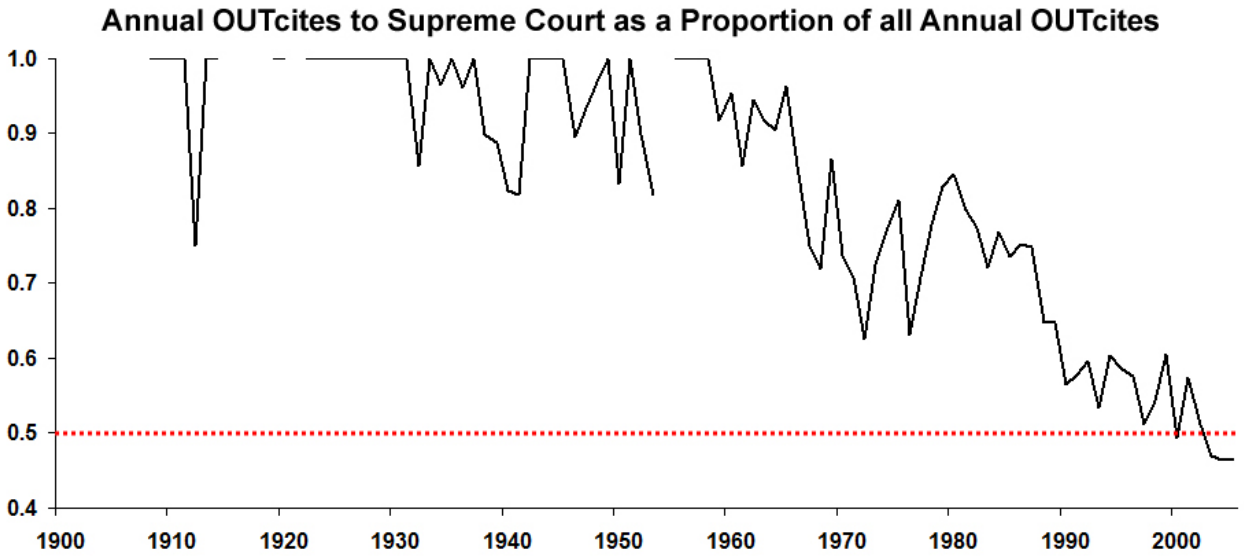
Table 1: Summary of Hypotheses

MODEL		UP/AUTO	LAT/DOWN	AGE
Strongly Hierarchical		UP- and AUTO-cites dominant/exclusive	DOWN-cites, but no LATERAL citations	*No expectations*
Disengaged Cultivation	**SH**	AUTO-cites increase	DOWN-cites only	(Average) age of OUT-cites to SC greater
	NH	*No clear expectations*	LATERAL-cites increase	*No clear expectations*
Engaged Cultivation	**SH**	UP-cites to SC increase	DOWN-cites only	(Average) age of OUT-cites to SC lower
	NH	*No clear expectations*	*No clear expectations*	*No clear expectations*
Non-Hierarchical		(Irrelevant)	Persistent (insensitive to SC activity) OUT-cites to ≥1 CC	*No expectations*

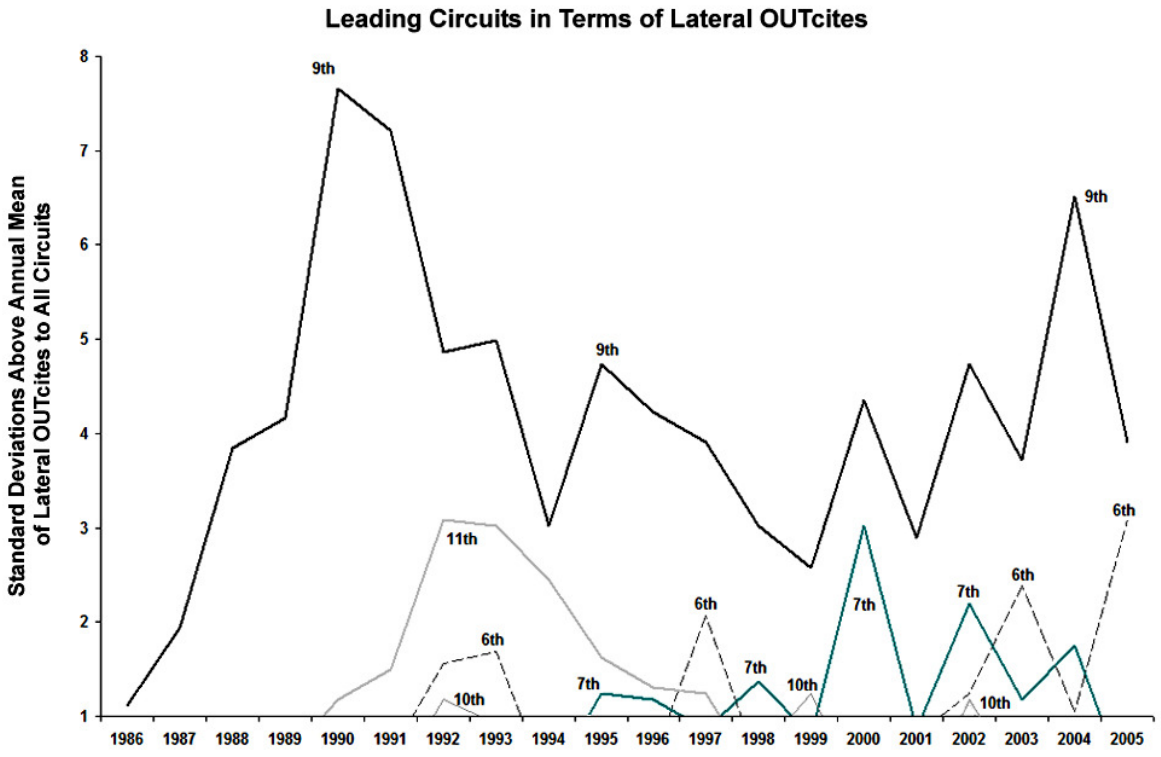
Table 2: RTD Citation Count and Percentage, by Directionality, 1900-2005

Citing:	Cited:	Supreme Court		Circuit Courts		District Courts	
	SC	643	(3.5%)	74	(0.4%)	60	(0.3%)
	CC	3,384	(18.4%)	2,537	(13.8%)	591	(3.2%)
	DI	5,269	(28.7%)	3,562	(19.4%)	2,233	(12.2%)
	UP-CITES	12,215	(67%)	**DOWN-cites**		725	(4%)

[Figure 3]

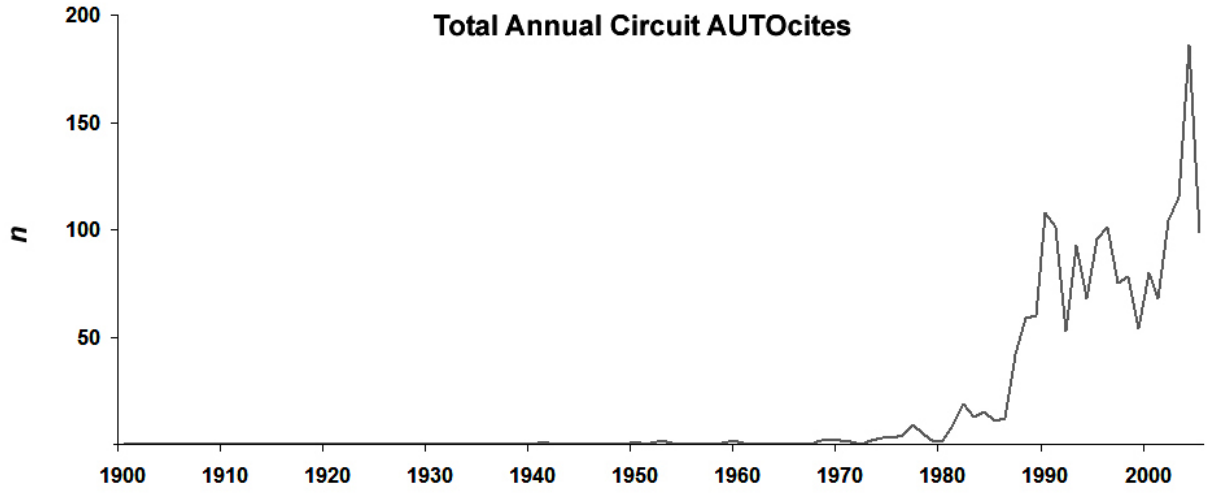

Annual OUTcites to Supreme Court as a Proportion of all Annual OUTcites
1.0
0.9
0.8
0.7
0.6
0.5
0.4
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

[Figure 4[15]]

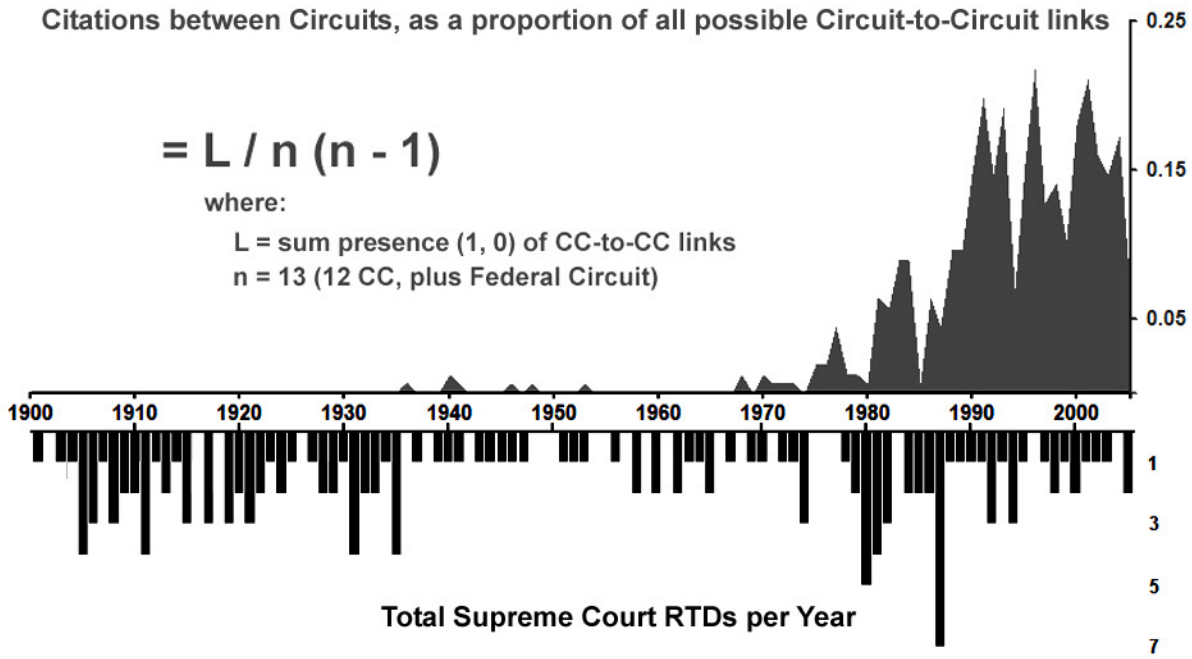


[15] Because the total number of decisions handed down each year varies considerably, and moreover, since the number of citations per decision has generally increased over the course of the 20th century, to understand the relative "importance" of a given Circuit (as a "target" for OUT-cites by other courts), it is possible for extreme values (e.g., the number of decisions or citations in a given year) to skew results. To prevent this, we calculate both the mean number of LATERAL OUT-cites (i.e., inter-Circuit citations) each year, as well as the standard deviation, which we then use to normalize the data, such that variance is identified as the number of standard deviations away from the mean of each year. Accordingly, a "leading" Circuit is one for which the number of LATERAL OUT-cites it received in a given year falls one or more standard deviation above that mean.

[Figure 5]

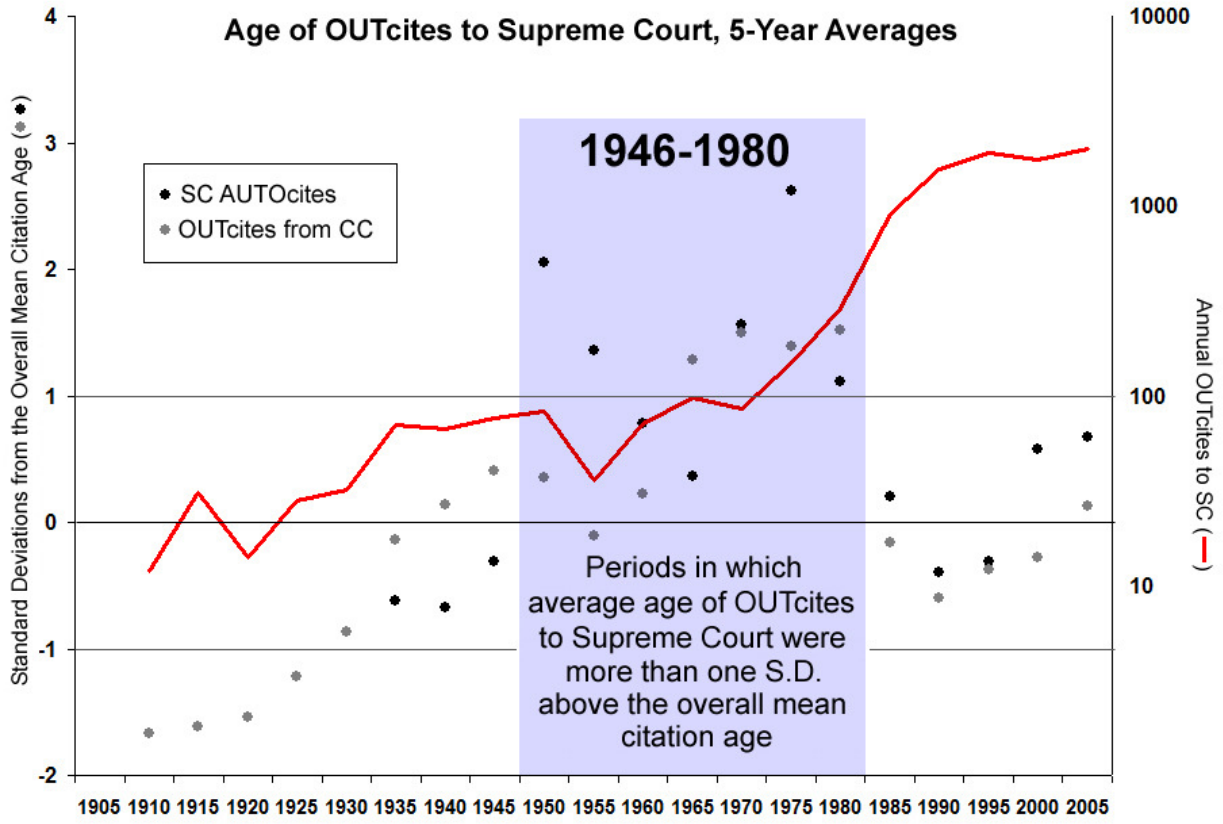

Total Annual Circuit AUTOcites
n
200
150
100
50
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

[Figure 6[16]]



[16] In structural terms, the relative importance LATERAL citations can be assessed by calculating the "density" of judicial communications between Circuits. A standard metric in formal network analysis (see Wasserman and Faust 1999, p 181), density is calculated by dividing the total number of links between actors by the number of possible linkages. Since the annual volume of LATERAL OUT-cites varies considerably over the full time period, we focus only on the presence (or absence) of such links, rather than the actual number (i.e., any Circuit-to-Circuit dyad in which the number of OUT-cites in a given year was non-zero is counted as "1").

[Figure 7[17]]



[17] As in Figure 4, we have normalized the data by standard deviations away from the mean, as a way to account for wide variation in the number of decisions (and citations) per year (see footnote 13). Here, we independently calculate the average age (and the standard deviations thereof) of citations to Supreme Court precedent over the full time period (1900-2005), from all Circuit Courts (UP-cites) and from the High Court itself (AUTO-cites). In addition, to emphasize the importance of controlling for variation, we plot the total number of OUT-cites to the Supreme Court each year (including AUTO-cites) against a logarithmic scale.

Table 3: Summary of Empirical Results

MODEL		UP/AUTO	LATERAL/DOWN	AGE
Strongly Hierarchical		**Supported**, but proportion of OUT-cites to SC decline over full period	**Not supported.** DOWN-cites minimal, but LATERAL-cites dominate at Circuit-level	*No expectations*
Disengaged Cultivation	**SH**	**Not supported.** AUTO-cites minimal until late 1980s	**Not supported.** LATERAL-cites persist (increase) after 1969	**Supported.** However, period of increased age is 1946-80
	NH	*No clear expectations*	**Partially supported.** LATERAL-cites persist (increase) after 1969	*No clear expectations*
Engaged Cultivation	**SH**	**Not supported**. OUT-cites to SC grow slightly 1933-49, gradual increase after late 1950s, rapid after 1973. SC declines as a proportion of all OUT-cites after late 1950s	**Partially supported.** OUT-cites to SC are greater than those to CC, but LATERAL-cites increase after 1969	**Supported.** However, period of increased age is 1946-80
	NH	*No clear expectations*	*No clear expectations*	*No clear expectations*
Non-Hierarchical		(Irrelevant)	**Supported.** LATERAL-cites show clear dominance of 9th CC across all CC, with other (less) dominant dyads. LATERAL-cites dominate Circuit-level communication	*No expectations*