THE COST OF JUDICIAL CITATION: AN EMPIRICAL INVESTIGATION OF CITATION PRACTICES IN THE FEDERAL APPELLATE COURTS

Casey R. Fronk†

ABSTRACT

Since the early 1960s, computerized legal research technology has enabled judges and their law clerks to access legal information quickly and comprehensively. Particularly for appellate judges, who rely on wide-ranging legal research when writing opinions, this technological change has had special resonance. This Article attempts to quantify the effects of computer-assisted legal research on the federal judiciary by empirically analyzing citation patterns over the past fifty years. The results of this analysis suggest that the digitization of legal research has had statistically significant effects on the amount and style of citation in judicial opinions. Although the average number of cases cited in opinions has doubled between 1957 and 2007, the number of cases cited only in string citations has decreased by nearly the same percentage. This Article argues that such results can be explained by a basic economic theory of judicial citation in which judges respond to the decreasing cost of opinion production by discarding string citation for more effective communicative techniques.

I. INTRODUCTION

It has long been suspected that computer-assisted legal research, by substantially altering the cost structure of the legal research process, has fundamentally changed the way lawyers and judges use precedent. In 1960, reflecting on the future of early electronic data retrieval systems, one commentator predicted that “the day will surely come when the judge . . . [can] devote a greater part of his working time to the professional function of analyzing and applying the law, and much less of it to the slow, laborious and expensive process of gathering the materials.”† Later commentators, less

† Law clerk, Judge Jay S. Bybee, Ninth Circuit Court of Appeals. B.A. 2005, The Ohio State University; J.D. 2008, The University of Chicago Law School. Many thanks to Tom Miles for helpful comments on this and earlier drafts.

1. Vincent P. Biunno, History of Electronic Methods for Legal Research, 2 MOD. USES LOGIC L. 99,
optimistic, blamed electronic searching methods for obscuring relevant authority by allowing litigants (and courts) to use “string citations to great gobs of cases” rather than “finding a relevant precedent or two and exploring the universe of cases around them.”2 Similarly, others have asserted that “electronic research . . . introduces new temptations to motivated researchers (readily available moribund cases, low costs for conducting frolics and detours to identify marginally supportive authority, immediate access to ambiguous case text, a temptation to false confidence in electronically located research results)” that result in more convoluted but less enlightening legal documents.3

Nonetheless, while many have speculated on the effect of the digitization of precedent, few have attempted to quantify it. Commentators have proposed that the effects of technological innovations in searching precedent should be visible in judicial citation,4 but no studies have utilized the large data sets or sophisticated statistical techniques necessary to confirm expansive hypotheses about the shifting nature of citation technique. In some cases, these failings were temporally imposed: the early citation studies that appeared in the 1970s and 1980s,5 for example, did not have the historical data necessary to draw

---

1. See, e.g., Lee Loeyneger, The Industrial Revolution in Law, 2 MOD. USES LOGIC L. 56, 57–60 (1960) (hypothesizing a futurist electronic “Law Digest Machine” with a “control panel looking something like the console of an organ” containing “an immensely intricate maze and mass of switches, relays, transistors, diodes, and printed and solid state electrical circuits” that search[es] and print[s] case law on demand. But see also Roy N. Freed, Prepare Now for Machine-assisted Legal Research, 47 A.B.A. J. 764, 766 (1961) (“Substantial advantages are in store for lawyers from the use of machines and appropriate indexing techniques to aid in legal research . . . . By finding relevant references faster and by reducing the percentage of irrelevance, machines will contribute real economies, unless the price for their service is out of line with their greater speed or accuracy.”); Irving Kayton, Retrieving Case Law by Computer: Fact, Fiction, and Future, 35 GEOR. WASH. L. REV. 1, 8 (1966) (describing the dual value of computerized legal research as “enabl[ing] us to obtain the relevant case law more effectively” and “cut[ting] down on the inordinate amount of time necessarily spent on legal research.”).


4. Although citation analysis has typically been exploited to investigate judicial influence and prestige, see, e.g., Stephen J. Choi & G. Mitu Gulati, Ranking Judges According to Citation Bias (As a Means to Reduce Bias), 82 NOTRE DAME L. REV. 1279, 1288–89 (2007) (suggesting future empirical studies should analyze appellate judges’ citations to opinions written by an opposite political party as a means of ranking bias amongst federal appellate judges); Stephen Choi & Mitu Gulati, A Tournament of Judges?, 92 CAL. L. REV. 299, 299 (2004) (using citation analysis to rank judges’ suitability for the Supreme Court); Stephen J. Choi & G. Mitu Gulati, Choosing the Next Supreme Court Justice: An Empirical Ranking of Judge Performance, 78 S. CAL. L. REV. 23, 32 (2004) (mentioning how citation analysis is used to rank judges’ suitability for the Supreme Court), commentators have also recognized its usefulness in assessing the impact of technology on judicial behavior. See, e.g., William M. Landes, Lawrence Lessig, & Michael E. Solimine, Judicial Influence: A Citation Analysis of Federal Courts of Appeals Judges, 27 J. LEGAL STUD. 271, 275–76 (1998) (theorizing that “[c]itation practices could be extremely sensitive to the technology (and hence cost) of citation searching,” and proposing two potential consequences of technological advancement in legal research: “[f]irst, the proportion of citations in opinions supplied by the lawyers might fall, as it becomes easier for law clerks to locate other citations,” and “[e]cond, computer searches may yield a more egalitarian pattern of citation since rather than relying on influence as a tool in locating cases, the computer makes it easier to locate on point cases directly”).

5. See, e.g., Lawrence M. Friedman et al., State Supreme Courts: A Century of Style and Citation, 33 STAN. L. REV. 773, 773 (1981) (discussing the style of state court opinions in relation to caseload and historical legal-philosophical movements); Charles A. Johnson, Follow-up Citations in the U.S. Supreme Court, 39 POL. RES. Q. 538, 538 (1986) (studying Supreme Court decisions on which cases to cite in opinions); Charles A. Johnson, Citations to Authority in Supreme Court Opinions, 7 J.L. & POL’Y 509, 509 (1985) (researching Supreme Court’s citation decisions within judicial opinions); John H. Merriman, Toward a Theory of Citations: An Empirical Study of the Citation Practice of the California Supreme Court in 1950,
conclusions about the recent advent of computerized legal research. In other cases, technological restraints limited feasibility: several later analyses explicitly aimed to isolate the effect of computer databases on citation practices, but none had the requisite database size to draw statistically significant conclusions about the widely-suspected correlation. It is only recently, after the introduction of more advanced case analyses by the online commercial legal databases, that a systematic study of judicial citation practices has become methodologically feasible.

This Article is the first to exploit these novel methodological options in an attempt to fill the existing empirical gap. Specifically, this Article analyzes the quantitative and stylistic change in citation practices in the federal appellate courts over the past fifty years, finding that judicial citation in these courts has changed dramatically over that time period. This analysis utilizes two datasets: first, a collection of 1200 U.S. Circuit Courts of Appeals opinions from 1957 to 2007 in ten-year intervals; and second, a compilation of 688 cases written by two of the longest-serving federal appellate judges. The second dataset is employed primarily to buttress the first: specifically, to demonstrate that the results found in the main dataset are not primarily influenced by the changing


7. Citation analysis, meanwhile, has become popularized as a method of investigating judicial psychology and behavior. James Leonard, An Analysis of Citations to Authority in Ohio Appellate Decisions Published in 1990, 86 LAW LIBR. J. 129, 137–139 (1994) (analyzing recent Ohio appellate opinions which indicated a statistically significant relationship between complex issues and citations to older cases, nonbinding precedents, and secondary authorities in supreme court opinions, and to secondary authorities and other courts of appeals cases in courts of appeals cases); Andrew P. Morriss, Michael Heise & Gregory C. Sisk, Signaling and Precedent in Federal District Court Opinions, 13 SUP. CT. ECON. REV. 63, 64 (2005) (discovering that federal district court judges are more likely to use written opinions rather than non-written dispositions “to communicate their rulings in Sentencing Guidelines cases where the potential for promotion to the circuit court of appeal [is] greater”); Frederick Schauer & Virginia J. Wise, Nonlegal Information and the Delegalization of Law, 29 J. LEGAL STUD. 495, 501–503 (2000) (documenting changes in judicial citation practices through an analyses of citation to non-legal information in the Supreme Court of the United States, in the Supreme Court of New Jersey, and in selected other courts); Frederick Schauer & Virginia J. Wise, Legal Positivism as Legal Information, 82 CORNELL L. REV. 1080, 1091–1102 (1997) (discussing an empirical study of legal positivism); Louis J. Sirico, Jr., & Beth A. Drew, The Citing of Law Reviews by the United States Courts of Appeals: An Empirical Analysis, 45 U. MIAMI L. REV. 1051, 1054–56 (1991) (studying the citation practices of the United States Courts of Appeal as they pertain to the citing of legal periodicals); Emerson H. Tiller & Pablo T. Spiller, Strategic Instruments: Legal Structure and Political Games in Administrative Law, 15 J.L. ECON. & ORG. 349, 354–358 (1999) (conceptualizing an economic model in which agencies occasionally choose higher-cost methods of promulgating their decisions in order to insulate such decisions from court review); David J. Walsh, On the Meaning and Pattern of Legal Citations: Evidence from State Wrongful Discharge Precedent Cases, 31 LAW & SOC’Y REV. 337, 348 (1997) (examining citation data to determine if judges use citations as indicators of substantive influence on their decision making or to legitimize their decisions); Michael Abramowicz & Emerson H. Tiller, Judicial Citation to Legislative History: Contextual Theory and Empirical Analysis, at 14–25 (Northwestern University Law and Economics Research Paper Series No. 05-11, 2005) (reporting connections between panel composition and citing of legislative history), see, e.g., Steven J. Choo & G. Mitu Gulati, Bias in Judicial Citations: A Window into the Behavior of Judges?, 37 J. LEGAL STUD. 87, 91 (2008) (finding that federal judges are more likely to cite judges of their own political party in opinions dealing with highly-charged political issues such as individual rights and campaign finance).
composition of the federal judiciary. Accordingly, the results of the analysis can be seen to approximate the effect of the dramatic change in the cost of producing judicial opinions created by the onset of computer-assisted legal research.

This empirical analysis produced several remarkable conclusions. In contrast to the generally accepted hypothesis—that the use of string cites would increase as computer-assisted research techniques and massive legal databases reduced the costs of search—this analysis indicates that the opposite has occurred. Rather than simply increasing string citation, federal appellate judges have instead expanded their qualitative analysis of cited cases—leading to significantly longer opinions with more meticulous discussion of each cited case. In empirical terms, the average percentage of cases cited only in string citations has declined from above 24 percent in 1957 opinions to only 8 percent in 2007 opinions. Likewise, the percentage of cases cited in depth over the same period has increased from approximately 9 percent in 1957 opinions to 23 percent in 2007 opinions. More remarkably, most of the decrease in the percentage of unique string-cited cases and much of the increase in the amount of cases cited in depth occurs between 1977 and 1987, which parallels the proliferation of cost-effective computer-assisted legal research in law firms and courts. Specifically, the average percentage of unique string-cited cases in 1987 is only slightly over half that of 1977, and the average percentage of cases cited in depth nearly doubles over the same decade. This result is also borne out in the opinions of two individual judges over the same period, indicating that the decline in string citation is not attributable to a changing judicial workforce.

In general, this empirical analysis of judicial citation indicates that the citation style of judicial opinions can be conceived in simple microeconomic terms. As the costs of producing a judicial opinion decline, judges will be able to produce more both on a quantitative and qualitative level. More specifically, the analysis indicates that string citation is probably an inferior good—as the costs of creating a string citation decline, judges are less likely to use them to support legal analysis. Thus, the evidence suggests that, contrary to previous assumptions, the rise of computerized legal research probably has had a significant role in reducing the prevalence of string citation by limiting the string citation’s communicative value.

This Article proceeds in several parts. Part II discusses the technological transformation beginning in the late 1950s that considerably reduced the cost of writing federal appellate opinions, and hypothesizes about possible effects on citation styles over that period. Parts III and IV present evidence for these microeconomic hypotheses—analyzing data from an aggregate sample of federal courts of appeals cases between 1957 and 2007 and from two specific samples of appellate opinions by long-serving circuit court judges to argue that the cost of an opinion is largely determinative of its style. Finally, Part V
concludes, arguing that the availability of digital precedent has actually reduced the attractiveness of string citation in legal practice.

II. THE HISTORICAL EXPERIMENT: COMPUTERIZED RESEARCH AND THE COST OF JUDICIAL CITATION

If judicial opinions represent merely the product of a number of economic inputs, the revolutionary change in the cost of one input (citation) brought about by the advent of computer-assisted legal research should have a measurable effect on the amount (or perhaps form) of judicial output. Matching the change in output to the historical development of electronic research devices, however, would be impossible without a general outline of the rate and type of technological advances most likely to affect judicial productivity. This Part, therefore, attempts to sketch the historical situation in which judicial production operated: Part II.A gives a general historical overview of the rise of computer-assisted legal research; Part II.B focuses more specifically at the judicial recognition and use of these alternative production methods; and Part II.C. outlines a microeconomic theory of judicial citation practices that may explain some of the historical variation in citation style.

A. The Historical Experiment

Although it is tempting to characterize the advance of computer-assisted legal research as an instantaneous change in the cost structure of opinion production—in which even the earliest computers “could scan the legal wisdom of the ages in instants, green glyphs etching precedents across the screen to suit any need,”12 the actual story is one of slow progression from print to digital searching. Primarily due to physical constraints, the first computer research systems were only able to query a small universe of statutory materials manually preprogrammed into an accompanying database.13 In these early manifestations, programmers converted each relevant statute into punch-card form and then entered these into the computer’s database, which compiled the information to create an alphabetical list of every statutory word.14 In order to locate relevant materials, a legal researcher would input a list of words (or combinations of words), and the computer would print a list of

14. See F. Reed Dickerson, The Electronic Searching of Law, 47 A.B.A. J. 902, 903 (1961) (detailing the punch-card input method). According to Dickerson, the Horty-designed computer system employed “a comprehensive word concordance, an alphabetical index of the words actually used in all the statutes on the [computer’s magnetic] tape.” Id. at 903. For example, “all uses of the word ‘partnership’ were collected and each use was identified by a number representing the particular section of the statute in which it appeared.” Id.


15. See id.
16. See id. at 904 fig.1 (depicting a sample result list).
17. Id. at 903. Several solutions were soon proposed, however. See, e.g., William B. Eldridge & Sally F. Dennis, The Computer as a Tool for Legal Research, 28 LAW & CONTEMP. PROBS. 78, 85–94 (1963) (illustrating several alternatives to basic full-text searching); Jessica S. Melton & Robert C. Bensing, Searching Legal Literature Electronically: Results of a Test Program, 45 MINN. L. REV. 229 (1960) (detailing a system in which syntactical codes were used to return similarly used words in full-text searches).
18. The Horty system, for example, initially included only state public health statutes. See Harrington, supra note 13, at 544. It was not until 1970 that the system, by then commercialized under the name Aspen Systems Corporation, contained the entire statutory output of all fifty states. J Roger Hamilton, Comment, Computer-assisted Legal Research, 51 ORT. L. REV. 665, 674 (1972). Some more ambitious projects did flourish early in the 1960s, however. See, e.g., Automating the Archives, Time, Dec. 13, 1963, at 82 (describing the Law Research Service system, which used a Univac III computer and three years of manual labor to index over a million rulings of the New York state courts). Nevertheless, it was not until 1989 that a complete library of any one state’s law was completed. LEXISNEXIS, THE LEXISNEXIS TIMELINE (2003), http://www.lexisnexis.com/anniversary/30th_timeline_fulltxt.pdf.
19. See, e.g., Consulting the Computer, Time, May 4, 1970, at 68 (remarking that a fifty-state search on Horty’s Aspen system required about eight hours).
20. For example, the earliest machine would have cost, in 1961 dollars, around $600,000 (or about $12,000 per month to rent). Dickerson, supra note 14, at 905.
21. Two early noncommercial systems, FLITE (“Federal Legal Information Through Electronics”) and JURIS(“Justice Retrieval and Inquiry System”), are also relevant for this Article, since they had most of the same capabilities of LEXIS or Westlaw and provided research to government lawyers who often filed briefs before the federal appellate courts. These systems developed at approximately the same rate as the commercial systems, although there were some notable differences. FLITE, for example, which was used primarily by the military sector, contained a much larger database of materials than LEXIS or Westlaw, but continued to use a punch-card system for searching long after other systems had adopted computer terminals. See John T. Soma & Andrea R. Stern, A Survey of Computerized Information for Lawyers: Lexis, JURIS, Westlaw, and FLITE, 9 RUTGERS COMPUTER & TECH L.J. 295, 304–10 (1983) (describing the history and capabilities of FLITE and JURIS). JURIS, developed in part by NASA and eventually operated by the Department of Justice, contained a database similar in size to the commercial systems and used the terminal system for research. Id. at 305–07. JURIS also contained a litigation support system that allocated storage of memoranda, briefs, evidentiary material, and other litigation files. Id. at 305. See also Stanley O. Croydon, Jr., JURIS: A Tool for Legal Research, in LEGAL AND LEGISLATIVE INFORMATION PROCESSING 163 (Beth Krevitt Eres ed., 1980) (briefly describing the history, nature, and operation of JURIS).
22. Harrington, supra note 13, at 552–53. See also LEXISNEXIS, THE LEXISNEXIS TIMELINE, supra note 18, at 4 (noting that LEXIS was the first computerized research system to obtain a complete library of any state’s law when it finished building its collection of Ohio law in 1989). Since LEXIS was originally developed in Ohio, several Ohio law firms were already using the system before its national introduction. See Harrington, supra note 13, at 553. Robert C. Berring, Full-Text Databases and Legal Research: Backing into the Future, 1 HIGH TECH. L.J. 27 (1986) [hereinafter Full-Text Databases] (describing the role of LEXIS in promoting the full-text search method of computer research and giving a brief overview of the commercial services’ early history).
23. Harrington, supra note 13, at 553.
limited and expensive. LEXIS, for example, originally had a minimum use cost of $36,000 per year, and did not provide access to a large volume of information. Although the system provided content such as the U.S. Code, Supreme Court cases, federal appellate and district cases, as well as decisions in certain specialized legal fields, by 1980 only the cases of eleven states were available for research. Likewise, for several years Westlaw provided researchers with only the West headnotes rather than the full text of cases—it was not until as late as 1976 that Westlaw offered a substantial full-text database. Even though the LEXIS minimum charge was reduced to $18,000 in 1975 and then was waived in 1976, moderate usage during that time period was estimated to cost between $20,000 and $25,000 per year.

Because of the expenses and technical complexities of the commercial computer research systems, widespread commercial usage of LEXIS and Westlaw did not appear until nearly a decade later. The LEXIS system in the late 1970s and early 1980s required the use of a dedicated computer terminal connected via telephone line to the LEXIS main computer in Dayton, Ohio. When using the system, the user would connect from his terminal to the LEXIS mainframe to conduct the searches—the results of which would be displayed on the office terminal. Training attorneys and paralegals on the technical complexities of these terminals was rather expensive: Westlaw estimated the cost of user education in the early 1980s at “approximately $100 per day”—and around $2700 total to train an average-sized law firm. Law firms’ typical searches were also quite costly. In 1976, using the LEXIS system required expenditures of around $100 per hour—primarily due to LEXIS costs of inputting and storing its vast conglomeration of legal information—and the searches were often rather slow. Even by 1983, the

25. By 1977, these included “specialized libraries of federal tax law, federal securities law, federal patent and copyright law, federal trade regulation law, and federal and state cases construing the Delaware corporation law.” Karlyn D. Stanley, LEXIS: Legal Research and Litigation Support, in LEGAL AND LEGISLATIVE INFORMATION PROCESSING 149, 150–51 (Beth Krevitt Eres ed., 1980).
26. Id. at 151. The states were California, Florida, Illinois, Kansas, Kentucky, Massachusetts, Missouri, New York, Ohio, Pennsylvania, and Texas. Id.
27. The West headnotes are short abstracts of particular points of law in each case. An editor assigns a specific indexing number (the Key Number) to each headnote. The Key Number designates the relationship of a particular point of law with others in the database. See Full-Text Databases, supra note 22, at 31–33 (explaining the headnote process). Thus, while the headnote-only system allowed users to correlate found cases with others in the database, it did not necessarily reduce research time or cost, since the researcher would subsequently be forced to find the case within a printed Reporter in order to obtain the full-text version. LEXIS’ early full-text system, however, also had disadvantages, since it was not indexed. See generally James A. Sprowl, Computer-assisted Legal Research—An Analysis of Full-Text Document Retrieval Systems, Particularly the LEXIS System, 1 AM. B. FOUND. RES. J. 175 (1976) (critiquing the non-indexed LEXIS system).
28. Harrington, supra note 13, at 553–54. Harrington also lists a number of technical glitches in the early Westlaw system, ranging from difficulties with the sequencing of search results to the unreliability of the overall system. Id.
29. Ebersole, supra note 24, at 139.
31. Id. at 191.
32. Soma & Stern, supra note 21, at 299.
33. Sprowl, supra note 27, at 187–88. According to one commentator, given to the size of LEXIS at the time, and “[u]sing standard IBM disk storage units of the type available in 1975, it would cost over $1 million
estimated cost of such computerized queries for a law firm was between $2 and $4 a minute. Accordingly, most law firms were slow to adopt the service. LEXIS, for example, had slightly less than two hundred subscribers in 1976. Even by 1983, observers reported only intermittent use at law firms.

Business usage increased substantially in the late-1980s after several technological improvements augmented search scope and efficiency on LEXIS and Westlaw. Both commercial services introduced a larger variety of search terms throughout the 1980s: for example, by 1986, both systems offered the universal character and the root expander to enable searches for partial words. Additional new search queries permitted users to not only search a single library of cases, but the entire federal case database or the entire state law database. Users were also able to search these new massive databases topically for specific areas of law. Both services also offered further infrastructure options: Westlaw began selling dedicated terminals, and LEXIS enabled access through non-proprietary computers (as Westlaw had for several years). Subscribers responded positively to these search improvements. By 1988, analysts were predicting growth for each commercial service of between 20 and 30 percent a year; by 1989, the one millionth LEXIS user identification code was issued; and by 1990, over 100,000 searches were conducted on LEXIS in a single day.

As has been noted elsewhere, much of the explosive growth in computerized legal research in the late 1980s and early 1990s can be attributed to the success of the commercial services’ aggressive grassroots marketing campaign. When LEXIS and Westlaw began to compete for users, each attempted to gain long-term subscribers by subsidizing the costs of student

per year just to store this much data.” Id. at 188 n.28. See also Jerome S. Rubin & Robin L. Woodard, LEXIS: A Progress Report, 15 JURIMETRICS J. 86, 86 (1975) (noting that by 1975 the LEXIS system consisted of around four billion characters).

34. See Harrington, supra note 13, at 551 (recalling that on early systems, “searches typically ran five minutes, often twenty or thirty minutes, and sometimes more than an hour—and still the lawyers thought the system marvelously fast”).

35. N.Y. Times Financial Desk, Computers a Boon to Lawyers, N.Y. TIMES, Oct. 20, 1983, at D1. Of course, these searches were still marginally less costly than the traditional alternative. While the average single search in 1986 cost between $9.66 and $207.31 on the commercialized services, a full set of case reporters bought in the same year was priced at $111,914.00. Full-Text Databases, supra note 22, at 40 n.43.

36. See Sprowl, supra note 27, at 188 n.30 (noting that costs will be better spread among users as the number of subscribers increased). See also Rubin & Woodward, supra note 33, at 86 (stating that only 100 Lexis terminals had been installed in 1974).

37. See Soma & Stern, supra note 21, at 313 (“Despite the current availability of [computer-assisted legal research], usage is low. This could be attributed to a high degree of entrenchment in the legal community that ‘cut its teeth’ on manual research.”). In many law firms, however, a few computerized research users became specialists who facilitated use for other members of the firm. See id. at 314 n.26 (“Interestingly enough, the authors have noticed in law firms, government offices and academic environments that one person in the organization becomes the ‘computer-assisted legal research’ person.”)

38. See Lynne B. Kitchens, A Thousand Days, A Billion Bytes: Computer Assisted Legal Research Revisited, 47 ALA. L. W. 312, 314 (1986) (recognizing that after a user learns a few connectors, searching is fun and easy).

39. See id. (enabling users to narrow their search).

40. See id. (noting that Lexis and Westlaw were creating more convenient options for customers to use their systems).

41. See Stephen Labaton, Lawsuits over Legal Research, N.Y TIMES, Apr. 20, 1988, at D1 (stating that the market for research services had already reached $200 million annually).

42. LEXISNEXIS, THE LEXISNEXIS TIMELINE, supra note 18.
Both bestowed free-access passwords on student users and provided law school libraries with subsidized computer equipment—beginning with terminals and continuing with dedicated printers and personal computers.

Accordingly, students began to use the online systems more often and more exclusively in law school and later, in law practice. As one commentator noted in 1994, “[f]or many American law students the only common research training experience they receive is the training provided by LEXIS and Westlaw, a training experience that will follow the student into practice if he or she works in a large law firm environment.”

External and internal technological improvements in the 1990s further refined the commercial systems’ usability. One such advancement was the personal computer, which permitted LEXIS and Westlaw users to operate the electronic legal research program in tandem with a word processing program. Researchers could copy and paste paragraphs of text from the research program into the word processing program—significantly decreasing the editorial demands of legal research.

Access to the Internet also increased general usability: in 1996, LEXIS subscribers were able to research online through the LexisNexis Office software suite. Both LEXIS and Westlaw also began to provide more comprehensive user assistance. In the early 1990s, the commercial systems began offering twenty-four hour telephone assistance with trained researchers providing research tips and advice. Later during that decade, LEXIS introduced pay-per-use access as an alternative to subscription service for smaller firms and solo practitioners.

These varied technological developments encouraged research growth. By 1998, LEXIS was processing over 600,000 searches and adding over twelve million documents to its online service every day.

Although this explosive growth did not continue unabated to the present day, several substantial additions to the online commercial databases after the turn of the century have significantly increased the availability of legal research materials. First, both systems began to publish a greater number of cases—including cases not published within the federal reporters. Second, Westlaw in particular began to make available a larger variety of legal materials, including briefs and other trial documents. In fact, Westlaw

43. Digital Information, supra note 2, at 32.
44. See id. at 32–33 (stating that in 1992, LEXIS spent $600,000 on subsidizing paper and ink at law schools).
45. Id. at 32.
47. See id. (“For the legal researcher, however, let me pose a simple example. You sign onto WESTLAW and conduct your research. The paragraph is right on point. You mark and copy that paragraph on your PC screen while connected to WESTLAW. You switch immediately to your word processor and the memo that is in preparation and insert the paragraph at the point in the text where it is relevant.”).
49. Digital Information, supra note 2, at 32.
51. Id.
52. THOMSON WEST, WESTLAW ADVANTAGE OVERVIEW (2007), http://west.thomson.com/pdf/westlaw/
recently enabled new queries that allow researchers to explore over 1.4 million federal and state briefs and 2.75 million trial documents. Access to such briefs enables users to use prior research to find analogous cases more efficiently. Perhaps due to these new services, usage continued to increase after the 1990s. Now, each service processes hundreds of thousands of searches per day and adds over 1.2 million cases per year.

In sum, the growth of computer-assisted legal research is best divided into three periods. The first period, between 1960 and around 1977, saw the introduction and (limited) use of primitive legal research systems as a viable alternative to manual research. The second period, between 1977 and around 1993, witnessed the proliferation of the commercial research systems and vast technological improvements in the structural architecture and interfaces of such systems. The final period, between 1993 and the present, exhibits slow but steady growth in both the type of content available on the commercial systems and the number of users, but not the same significant technological advancements of the second period. Thus, if the cost of research is reflected in legal citation practices, the imprint of these three eras of computerized legal research should be reflected in the style of judicial opinions written within those periods.

B. Computerized Research Systems in the Federal Courts

Early in the development of computer-assisted legal research, federal judges recognized the time-saving function of digitalized precedent. In 1961, Judge John R. Brown of the Fifth Circuit wrote an article describing the advantages of computer research. Presciently, Brown claimed that computers could solve the increasing problem of storing and accessing relevant precedent. Although recognizing that the current print-focused organization system was innovative, Brown concluded that the system’s requisite rigidity “makes search a time-consuming and expensive proposition.” Computers, he thought, would “save precious professional time in the routine low-order search which finally uncovers the few pieces calling for close study and lawyer-like judgment.”

Occasionally, as in First National Bank of Birmingham, Alabama v. United States, federal judges explicitly mentioned computerized research in their opinions. In First National Bank, for example, Judge Brown specially

WLAdvantageOverview.pdf.

53. Id.


56. Id. at 253 (“The lawyer’s problem is becoming increasingly like that of the scientists: It is not that we do not know; rather, we do not know what we know.”).

57. Id.

58. Id.

concerned in order to “focus professional attention on another effective use of the marvels of electronic machines in the vastly expanding business of litigation and its disposition.” In that case, a question arose over whether the facts of the tax case under appeal consisted of “an isolated case of an isolated set of taxpayers in an isolated non-repetitive setting, or [whether it was] one of those test cases so often tenderly coveted by tax counsel, private and government.” The Fifth Circuit utilized an IRS computerized data system to establish that “the appeal really involves no true question of estate tax law,” and thus could be decided on state rather than federal grounds. Other early mentions were less grandiose. In Holcomb v. United States, for example, the Seventh Circuit noted the ineffectiveness of the LEXIS system in finding an unknown case citation.

Despite these professed uses of computerized legal research, an early study of actual federal court research methods indicates that computer consultation was the exception rather than the norm before the late 1970s. A Federal Judicial Center study shows that between January 1 and May 31, 1976, use of computer-assisted research systems by federal appellate law clerks ranged from 0.26 to 7.33 hours per month. Usage rates for district court clerks were even less—ranging from 0.00 to 3.15 hours per month. For the appellate sample, these hours of use translates to an average of between 1.00

60. Id. at 631 (Brown, J., concurring).
61. Id. See also Hamilton, supra note 18, at 677–78 (discussing this case as an early example of court-initiated computer research).
62. First Nat’l Bank of Birmingham, Ala., 358 F.2d at 626. Judge Brown could not help but opine on the amazing effectiveness of computerized search methods:

The task of searching the tens of thousands of cases pending within the Internal Revenue Service and parallel court structures presenting an almost infinite number of legal issues would have been both impracticable and impossible but for the machine. The machine, suspect as it is for the supposed lack of judgmental capacity essential to adjudication, bears out again the hopes and predictions now bearing fruit in a variety of ways that it serves a useful, indeed perhaps indispensable, function in the judicial process as the world, and the people in the world, face the increasing complexities of an expanding social and economic structure.

Id. at 632 (Brown, J., concurring).
63. See Holcomb v. United States, 543 F.2d 1185, 1188 n.1 (7th Cir. 1976) (“We put the name of this case through the entire federal tax library of the Lexis computer system and it came up with only four cases none of which had any bearing whatever here.”). See also Helms v. Jones, 621 F.2d 211, 213 n.11 (5th Cir. 1980) (“In preparing this opinion we learned first through LEXIS and then from the Georgia Attorney General’s office that the Georgia Supreme Court decided on February 26, 1980, that in its view the questioned Georgia statute is constitutional.”); Diaz v. Weinberger, 361 F.Supp. 1, 14 n.19 (Fla. Dist. Ct. App. 1973) (“A key word computer search of all but Title 8 of the 1970 edition of the United States Code which focused on the terms ‘alien’ and ‘eligible’ and variants thereon failed to reveal the existence of any pre-1965 legislative provision then in force that links permanent residence and durational residency elements.”); Miller & Rhoades v. West, 442 F.Supp. 341, 343 (E.D. Va. 1977) (“Neither party has cited case authority constraining the statute within the context of this application. After extensive research, including the use of the LEXIS computer system, the Court is satisfied that no such case exists.”); Carter v. Telelectron, Inc., 452 F.Supp. 944, 989 (S.D. Tex. 1977) (“Finally, the Court used the services of LEXIS computer legal research now installed in the Southern District of Texas and searched the available federal and state court libraries for published opinions and citations which list Albert Carter as a named party.”).

64. ALAN M. SAGER, AN EVALUATION OF COMPUTER ASSISTED LEGAL RESEARCH SYSTEMS FOR FEDERAL COURT APPLICATIONS 77 tbl.25 (1977). Not surprisingly, the highest reported use was by clerks to Sixth Circuit judges—demonstrating perhaps that familiarity with computer-assisted legal research was an important factor in determining research levels. See id. (reporting usage rates of 5.25 and 7.33 hours per month for clerks on the Sixth Circuit). LEXIS, of course, was based in Ohio at this time. See Harrington, supra note 13, at 552–53 (describing computer usage patterns).
65. SAGER, supra note 64, at 78 tbl.26.
and 16.20 research sessions per month. Although the caseload of circuit court judges was not at that time nearly as substantial as current levels, this amount of computer-assisted research seems almost negligible by today’s standards. For example, assuming that law clerks spend only 10 percent of their work hours researching and that most law clerks endure a forty-hour work week (both rather conservative assumptions), today’s clerks would spend at least four hours a week researching on computerized research systems—a fourfold increase from the 1970s average. (Interestingly, anecdotal evidence suggests that in the late 1970s, appellate clerks were significantly more likely to rely exclusively on appellate briefs as a source for the relevant research. Moreover, late-1970s usage levels between judges varied remarkably: on the D.C. Circuit, for example, clerks for one appellate judge were over twenty times more likely to employ computer-assisted legal research than the clerks of another appellate judge. This variance suggests that many appellate judges and clerks had not yet adopted computerized research as a consistent research method.

Access is an important factor explaining the computerized research usage levels of appellate courts in the late-1970s. At this time LEXIS, the more widely available commercial service, required a dedicated terminal in order to access its databases—and accordingly only judges “on-site” at the terminal’s location had access. Even after May of 1976, when “call-in centers” were installed in the Fifth and Ninth Circuits, enabling appellate judges to telephone from non-terminal locations to use the computerized research systems, appellate judges exhibited some reticence over taking advantage of their access to the terminals. Between July and December of 1976, for example, Fifth Circuit judges utilized the call-in center only eighty-six total times: an average of only five times per judge, and only 0.8 times per judge per month. Although the Ninth Circuit experiment was more successful, it too failed to encourage widespread adoption of computer-assisted legal research. Specifically, between June 1 and November 30, 1976, appellate judges in the circuit used the system a total of 170 times. This translates into an average of

66. Id. at 77 tbl.25.
67. In 1975, the number of cases filed in the federal appellate courts was 11,440, and by 1980, the number had increased to 16,571. See ASHLYN K. KUEHSTEN & DONALD R. SONGER, DECISIONS ON THE U.S. COURTS OF APPEALS 28 tbl.1.6 (2001) (providing a table of cases filed in the U.S. Courts of Appeals, which illustrates the increasing number of cases filed over the years: 2,525 cases were filed in 1925 compared to 51,991 cases filed in 1996). In 2007, the number of cases filed was 58,410. ADMINISTRATIVE OFFICE OF THE UNITED STATES COURTS, 2007 ANNUAL REPORT OF THE DIRECTOR: JUDICIAL BUSINESS OF THE UNITED STATES COURTS 885 tbl.B (2008) [hereinafter ADMINISTRATIVE OFFICE ANNUAL REPORT], available at http://www.uscourts.gov/judbus2007/JudicialBusinesspdfversion.pdf (last visited Nov. 24, 2008). Notably, the number of cases filed in 2007 was actually a 12.3 percent decrease from the previous year, in which 66,618 cases were filed. Id. at 13. This rare decrease in caseload could be due to a variety of factors. See id. at 17–18 (providing reasons for the decrease in appeals).
68. See SAGER, supra note 64, at 76 n.1 (noting that “according to some law clerks, the briefs filed in many cases are so complete that independent research is not necessary”).
69. Id. at 76.
70. Id.
71. Id. at 88–90.
72. Id. at 90 tbl.33. Notably, usage increased after October 1976, when the terminal was able to process full-text in addition to headnote searches. See id. at 88.
73. Id. at 93 tbl.35. The number of uses from individual judges ranged from 0 to 33 in that same time
around 10.6 uses per judge in the sample time period, or only 1.8 uses per judge per month. Anecdotally, these low usage numbers are probably best explained by judges’ lack of familiarity with the terminal system and the frequent technical glitches in early operation. At the time, one Ninth Circuit judge noted that the call-in system was “sometimes tied up for days which precludes our use of [the system] for short-term ‘rush’ projects.” Another remarked that his “clerks simply have not developed the habit of [using the call-in system].”

A helpful proxy in determining the attitudes of the federal courts to computerized legal research is the judicial mention of such research as part of “reasonable attorney’s fees” under cost-shifting statutes. Beginning in the later 1970s, several courts began to note (and even laud) the use of computerized research as part of a reasonable fee recovery. In Pitchford Scientific Instruments Corp. v. PEPI, Inc., for example, the court noted that although “[d]efendants object to the charge for the use of Lexis computer service, describing it as ‘an impermissible anthromorphism,’” the cost was reasonable since “[t]his service . . . replaces by instantaneous and supposedly infallible retrieval, many hours which would be billable if performed by human talent.”

Likewise, the District Court of Rhode Island, in 1983, concluded that although it was “unable to find any authority directly in point anent the recoverability of computer charges for the use of computer-aided legal research systems, this Court believes that such charges should be recoverable in certain cases” since ruling otherwise “would be an open invitation to law firms to use high-priced attorney time to perform routine research tasks that can be accomplished quicker and more economically with Lexis.” The Third Circuit, in an earlier case, declared that “use of computer-aided legal research such as LEXIS, or WESTLAW, or similar systems, is certainly reasonable, if not essential, in contemporary legal practice.” Although such statements are almost nonexistent before 1977, they are found in increasing quantity afterwards.

Thus, while computer-assisted legal research is unlikely, before at least the late 1970s, to have widely altered the research or citation practices of most judges on the federal appellate courts, evidence from early surveys indicate that judges had a remarkably positive attitude toward such systems and their

span. Id.
74. Id. at 101–102.
75. Id. at 102.
78. United Nuclear Corp. v. Cannon, 564 F. Supp. 581, 591–92 (D. R.I. 1983). See Independence Tube Corp. v. Copperweld Corp., 543 F. Supp. 706, 723 (N.D. Ill. 1982) (“Even without a specific showing of cost effectiveness in this case, therefore, an award of such [computerized research] costs is appropriate, and, based on the list of the subjects researched, which is contained in the plaintiff’s supplement to its bill of costs, $5,093.33 is a reasonable amount.”); Fressell v. AT&T Techs., Inc., 103 F.R.D. 111, 112–15 (N.D. Ga. 1984) (discussing computer-assisted legal research and whether the expense of computer-assisted legal research may be included in an award for attorney’s fees).
further proliferation. In fact, judges in the late 1970s were not primarily concerned about the efficiency or reliability of computerized research systems but instead with their cost-effectiveness. Judges responding to a Federal Judicial Center inquiry about computer-assisted legal research nearly uniformly cited cost-effectiveness as the only remaining barrier to adoption. One judge found the computerized research system “generally to be a very effective efficient and easy system of legal research especially useful for certain types of work,” but worried, “I have no idea of the cost charged, however, and therefore cannot state that it is more economical than traditional ‘book’ research.”

Another judge responded that computer-assisted legal research “is extremely useful—but, in terms of cost, it doesn’t do the job of another clerk, or even half a clerk.” Other judges, however, were less worried about the cost. One judge, for example, reported that computerized legal research was “a great time saver” and that his office “has come to rely on it substantially.”

It was not until the early 1980s that judges would wholeheartedly adopt these electronic researching mechanisms. By 1982, computerized research had proliferated to an extent that one federal court felt confident concluding, “[t]he bulk and complexity [of legal resources] have grown to such an extent that even experienced lawyers cannot function efficiently today without the support of special tools, such as the computer research systems of FLITE, JURIS, LEXIS and WESTLAW.” By 1985, the commercial systems had become so integrated into the research patterns of the federal courts that one judge used the phrase “sitting hunched over a LEXIS or WESTLAW terminal” as a metaphor for legal research.

Although the process was rather laborious, the ultimate result of integrating computer-assisted legal research into the judicial system was a significant reduction in the costs of research. While no studies have yet estimated the actual reduction in costs over the entire period between the early 1960s and the present brought about by the computerized research revolution, an early survey conducted by the Federal Judicial Center in federal appellate courts supports the traditional story hypothesizing substantial time savings created by computer-assisted legal research. In 1976, only three years after

82. SAGER, supra note 64, at 48.
83. Id. at 49.
84. Id.
85. Notably, the introduction of word processing programs around this same time period might also have played an important role in reducing the costs of opinion-writing. A 1979 study of the use of word processing in the Third Circuit calculated that early word-processing machines reduced secretary-typing time by half. See J. Michael Greenwood & Larry Farmer, THE IMPACT OF WORD PROCESSING AND ELECTRONIC MAIL ON THE UNITED STATES COURTS OF APPEALS (1979), reprinted in MANAGING APPEALS IN THE FEDERAL COURTS 749, 770 (Federal Judicial Center ed., 1988). A follow-up study found that word processing and electronic mail reduced total time to prepare signed opinions by nearly 40 percent. J. Michael Greenwood, A FOLLOW-UP STUDY OF WORD PROCESSING AND ELECTRONIC MAIL IN THE THIRD CIRCUIT COURT OF APPEALS (1980), reprinted in MANAGING APPEALS IN THE FEDERAL COURTS 801, 816–20 (Federal Judicial Center ed., 1988).
88. See generally SAGER, supra note 64 (discussing the history and use of computerized legal databases).
the commercial introduction of computerized legal research systems, appellate judges and their clerks participating in a pilot testing project of such systems estimated that the systems could save between 4.1 and 4.4 hours of legal research time per week of use if used regularly.89 Since these users also estimated that they spent between 21.6 and 25 hours per week conducting legal research before the introduction of the computerized systems, even the very early research systems had the potential to save a substantial amount of time—around 17–19% of total research time. Once the computer systems became more common and more sophisticated, this reduction in research time would seem to produce substantial cost savings for federal courts—especially in the domain of judicial citation.91

C. A Simple Microeconomic Theory of Citation

The production of judicial citation is an especially labor-intensive task. Although in many cases the vast majority of this labor is borne by the appellant and appellee, who must provide thoroughly-researched briefs to the appellate court, a judge must also research separately in order to find strands of precedent the parties may have missed or to buttress a decision not directly aligned with the argumentation in the briefs. Especially in the era before computerized research systems, legal research was one of the most time-consuming aspects of a judge’s work: one early study estimates that over 30 percent of an appellate judge’s time was spent on finding and verifying applicable precedent.92

In this sense, appellate judges are not only producers, but consumers of citation, constrained in their consumption of opinion inputs by budgetary (primarily temporal) restraints. According to this simple microeconomic model, each federal appellate judge has a fixed amount of wealth (time) with which he can purchase inputs for an opinion. Although with an unlimited income a judge would consume citation until the marginal value of the next citation is negative, physical constraints inhibit a judge’s ability to muster precedent flippantly. Thus, like consumers, judges must allocate limited resources among a variety of products—including, perhaps, court administration,93 pro bono work,94 and even moonlighting or leisure.95

89. See SAGER, supra note 64, at 36 tbl.8.
90. Id. at 35 tbl.7.
91. A comprehensive survey of Third Circuit judges in 1974 revealed that 48% of the time judges devoted to cases (and nearly 30% of total working time) was dedicated to the creation of opinions. A 20% reduction in legal research would thus appear to have a substantial effect on a judge’s total working time. See Federal Judicial Center, Division of Research, A Summary of the Third Circuit Time Study, in MANAGING APPEALS IN FEDERAL COURTS 299, 302–03 (Federal Judicial Center ed., 1988).
92. Id.
93. See id. at 302 (reporting that judges in the Third Circuit Time Study spent 16.7% of their time on court administration).
94. See id. (reporting that judges in the Third Circuit Time Study spent 7.7% of their time on pro bono work).
95. See Richard A. Posner, What Do Judges and Justices Maximixe? (The Same Thing Everybody Else Does), 3 SUP. CT. ECON. REV. 1, 31–34 (1993) [hereinafter Judges and Justices Maximixe] (analyzing the effect of income on leisure, including income from moonlighting, and predicting that the reduction of moonlighting income, plus the increase in judicial salaries, has increased judges' consumption of leisure).
change in judicial income should accordingly create interesting effects on judicial consumption, since a judge must reevaluate his consumption patterns in lieu of his newfound windfall.  

When the cost of legal research declines, consumer theory predicts two potential effects: an income effect, and a substitution effect. The reduced cost of research essentially creates a positive shift in a judge’s budget constraint—he can now consume more of any number of goods (including leisure, for example). This is the income effect, whereby a judge will consume more total citations (or perhaps more pro-bono work or leisure). Notably, the decreasing cost of legal research may also produce a substitution effect. As the cost of some types of legal citation decline relative to other types of legal citation, a judge may reallocate consumption between the two types of citation (or even more generally between two types of activities, such as opinion-writing and leisure).

Moreover, increasing aggregate judicial purchasing power might have the effect of altering the relative demand for different types of citation. For example, if expository citation (in which a judge details the reasons for citing a case in paragraph form) becomes less expensive relative to string-citation (in which cases cited for a proposition are merely listed, without explanation), perhaps the demand for expository citation will rise, and the demand for string citation will fall. Depending on the levels of consumption after the budgetary constraint is lifted, it may be possible to characterize certain types of citation as either normal or inferior goods. While commentators speculating on the effects of technology on judicial citation have generally assumed that citation is a normal good, and thus that the use of citation will rise as the cost of creating the citation falls, the empirical evidence, detailed in the next Part, indicates that not all types of citation can be construed in this manner.

III. CITATION PRACTICES IN THE FEDERAL APPELLATE COURTS, 1957–2007

In order to investigate the effects of technological advancement on judicial citation, this Article conducts an empirical analysis on federal appellate cases from 1957 to 2007. Part III.A establishes the empirical

---

96. See id. at 32 (describing how a higher judicial income will affect leisure by reducing time devoted to household production and increasing the utility generated by pleasurable leisure activities).


98. In standard microeconomic theory, the type of consumption in a two-good market is illustrated by indifference curves, which measure the consumer’s willingness to substitute one of the goods for the other. Since a consumer will choose the indifference curve representing the greatest level of consumption of the goods, an increase in income allows the consumer to in effect “jump” to an indifference curve representing higher levels of consumption. Represented graphically, this is the highest indifference curve tangent to the consumer’s budget constraint.

99. As the cost of one good declines relative to another good, the slope of the consumer’s budget constraint changes, allowing the consumer to allocate consumption along a different indifference curve (or at a different point on the same indifference curve)—which will normally cause substitution.

100. A good is normal if it has a positive income elasticity of demand, i.e. where demand increases when income increases. In contrast, a good is “inferior” when demand for that good is negatively correlated to an increase in income.
methodology. The following part, III.B, surveys the increases in total citation over the past fifty years and correlates these significant increases to the technological milieu in which they occurred. Then, Part III.C analyzes the incidence of string citation in opinions over the relevant time period, concluding that the changes in string citation can be directly correlated with the technological advancements detailed in Parts II.A and II.B. Finally, Part III.D investigates the broader stylistic variances that gave rise to the string citation effects, and concludes that these too can be explained predominantly through the microeconomic framework.

A. Data and Methodology

This empirical analysis uses data from 1200 federal courts of appeals cases decided in the fifty years between 1957 and 2007. Specifically, twelve sets of one hundred circuit court cases were gathered: 600 published opinions in which one judge concurred and wrote a separate opinion, and 600 published opinions in which one judge dissented and wrote separately. These opinions were collected at ten-year intervals. Thus, the complete data set consisted of one hundred concurring and dissenting opinions for 1957, 1967, 1977, 1987, 1997, and 2007. In some cases, due to a dearth of concurring or dissenting federal circuit court opinions in the year allotted, additional opinions were compiled from the preceding year in order to create a consistent set of one hundred opinions.

Each set of opinions in the main data set was analyzed by counting the number of unique case citations within both the majority and concurring (or dissenting) opinion. This was accomplished by means of Westlaw’s “Table of

---

101. Only those opinions published within the Federal Reporter were included. An exception was made for several opinions in the 2007 sample for which publication in the F.3d was forthcoming.

102. Concurring opinions were gathered by searching the Westlaw Court of Appeals (“CTA”) database for the phrase “concurring opinion” within the case syllabus and within the relevant time period. The 1957 concurring opinions sample, for example, was retrieved by searching for “SY(‘concurring opinion’) & da(aft 01/01/1957 & bef 01/01/1958).” Where the search yielded greater than 100 results, the cases were selected at random intervals to create a sample representative of the entire year of federal appellate decisions. En banc decisions, per curiam decisions, decisions in which another judge wrote a dissenting opinion, and decisions in which the concurring judge concurred only in the result and did not write separately were discarded from the resulting samples. The results, categorized as “concurring opinions” below, include the combined number of citations from both the majority and concurring opinion.

103. Dissenting opinions were collected by searching the Westlaw CTA database for the phrase “dissenting” within the case syllabus and within the relevant time period. For example, the 1957 dissenting opinions were gathered by searching for “SY(‘dissenting’) & da(aft 01/01/1957 & bef 01/01/1958).” Where the search yielded greater than 100 results, the cases were selected at random intervals to create a sample representative of the entire year of federal appellate decisions. As in the case of concurring opinions, certain opinions omitted from the sample, including per curiam opinions, en banc opinions, opinions with a separate concurring judge, and opinions in which the dissenting judge did not write an opinion. Like the “concurring opinions,” the citations catalogued from these opinions include (for purposes of Part III) the combined number from the majority and dissenting opinion.

104. Specifically, the 1957, 1967, 1977, 1987, 1997, and 2007 concurring samples contain opinions decided within the preceding year. This method of selecting opinions might create a small bias toward certain circuits, such as the D.C. circuit, in which there are a higher than average number of concurring or dissenting opinions. See KUERSTEN & SONGER, supra note 67, at 169 tbl.3.9 (listing the percentage of dissenting and concurring opinions per published opinions for each circuit between 1925 and 1996, and finding that the D.C. circuit contained much larger percentages of both between 1951 and 1980).
Authorities,” feature, which compiles an exhaustive list of the cases cited in a judicial opinion. Even if a case is cited more than once in the opinion, the case appears only once in the Table of Authorities, and thus is only counted once in the final calculation. Notably, because multiple citations to a single case are not necessarily indicative of the amount of research used in creating an opinion, the resulting number of “unique” cases cited in an opinion probably better approximates the cost of the opinion than a measure of raw citations. In every dissenting opinion, but not in every concurring opinion, the number of unique dissenting case citations (those appearing only in the dissenting opinion, and not in the affiliated majority opinion) was also computed. The final dataset of 1200 appellate opinions contained 27,490 case citations.

For purposes of further analysis, the case citations in each relevant opinion were divided into four classes that approximate the analysis each case received in the opinion. This was accomplished by using Westlaw’s “depth-of-treatment” rating, which divides cited authorities into four categories. The first category, “one-star” authorities, indicates cited authorities that are cited only in a string citation—cases this Article classifies as “unique string-cited cases.” The second category, denoted by a depth-of-treatment rating of two stars, includes cases cited as the primary authority for a proposition in at least one point in the majority or concurring/dissenting opinions.

The three-star category includes cases cited several times within an opinion, usually accompanied by at least a paragraph of textual analysis in the opinion. The final category, four-star cases, designates only those cases that are considered in a significant amount of depth—usually accompanied by several paragraphs of analysis when cited.

Finally, to determine the overall depth-of-citation percentages within each sample, the mean of the percentage of cases cited in each depth classification within the sample was calculated. There are a number of advantages to this percentage-based approach that are not present in a simple citation count. Since this is an attempt to measure the somewhat ephemeral notion of judicial citation “style,” merely counting the number of unique string-cited cases and calculating the mean number of such citations per opinion would not illuminate differences in the percentage of string citation, since the amount of cases cited

---

105. WEST, USING WESTLAW (WESTLAW RESEARCH GUIDE) 46 (2008) [hereinafter WESTLAW RESEARCH GUIDE].
106. Westlaw’s Table of Authorities feature indicates unique case citations only in dissenting opinions.
107. See WESTLAW RESEARCH GUIDE, supra note 105, at 29 (using a star system to categorize citing cases).
108. See id. According to Westlaw, one star indicates that a case is “mentioned,” or more specifically that the opinion “contains a brief reference to the cited case, usually in a string citation.” Id.
109. Westlaw categorizes a case as “cited” and assigns it a depth of treatment of two stars where the opinion “contains some discussion of the cited case, usually less than a paragraph.” Id.
110. A case assigned three stars in Westlaw’s Depth of Treatment system is considered to be “discussed” in the opinion—meaning that the opinion “contains substantial discussion of the cited case, usually more than a paragraph but less than a printed page.” Id.
111. These cases are considered “examined” under the Depth of Treatment system, since the opinion citing them “contains an extended discussion of the cited case, usually more than a printed page of text.” Id. Although these categories do not always correspond exactly with the amount of coverage a given case receives within an opinion, they appear to be no less reliable than other potential coding methods. Id.
in the mean opinion has escalated dramatically in the last fifty years.\textsuperscript{112} Thus, while in some cases the mean number of unique string-cited cases may rise slightly in the later samples, this is not necessarily indicative of an increase in “junk” citations; instead, the increase in the total number of cited cases may overwhelm (at least in percentage terms) the increase in the raw number of string citations.

The result of this analysis is to yield, perhaps for the first time, a quantifiable measure of judicial citation style. Previous citation studies have debated, more specifically in the context of the average age of cited opinions, whether a judge’s method of citation is more closely correlated to personal “taste” or external considerations.\textsuperscript{113} The differences in the mean number of cases cited, the percentage of string citation, and the percentage of expository citation identified below support the external economic account of judicial citation. Namely, the results indicate that external factors—most distinctively the costs of legal research—have nearly determinative influences on most aspects of judicial citation style.

\textbf{B. Total Citation, 1957–2007}

Perhaps the most obvious indicator of external coercion on judicial citation style is the number of cases cited within an opinion. If, as is suggested by the history of computerized legal research, appellate judges are able to more cost-effectively research applicable precedent, their purchasing power has concomitantly increased. In effect, computer-assisted legal research allows judges to consume more utility-producing activities. Although, as Judge Posner’s judicial utility function suggests,\textsuperscript{114} judges might allocate this increased purchasing power across a variety of products—including leisure, moonlighting, and other utility-generating activities—one important avenue for consumption is opinion-writing. Likewise, if judicial clerks are driving the citation process, their increased ability to consume citations should also have an important effect on the citation style of their judicial employer.

It is not surprising, given the tremendous research advantages conferred by computerized research systems, to find that judicial consumption of citations has increased radically in the last five decades. More specifically, there have been two remarkable modifications in the mean number of unique cases cited in the federal appellate opinions since 1957. First, in the decade between 1967 and 1977, the mean number of cases cited per opinion jumps substantially: from 17.85 in 1967 to 23.94 in 1977, an increase of over 6 cases (over 34 percent) per opinion.\textsuperscript{115} The second statistically significant increase

\textsuperscript{112} See infra Table 1.

\textsuperscript{113} Compare Johnson, supra note 5, at 511, 514 (finding strong relationships between the author of the opinion and total citations in U.S. Supreme Court opinions), with William M. Landes & Richard A. Posner, \textit{Legal Precedent: A Theoretical and Empirical Analysis}, 19 J.L. & ECON. 249, 259 (1976) (“We, of course, question the premise that citation practice is largely a matter of personal preference (and implicitly therefore not capable of being studied scientifically). The economist expects citation practices to be basically uniform across judges, just as he expects different business firms to pursue similar investment policies in the face of similar economic conditions.”).

\textsuperscript{114} See Judges and Justices Maximize, supra note 95, at 31.

\textsuperscript{115} See infra Table 1.
occurs between 1997 and 2007, when the mean number of cases cited per opinion swells from 24.19 to 31.14—an increase of nearly seven cases (nearly 29 percent) per opinion.\textsuperscript{116}

<table>
<thead>
<tr>
<th>Opinion Type</th>
<th>Year</th>
<th>Total</th>
<th>Concurring Opinions</th>
<th>Dissenting Opinions</th>
<th>Year–10 Total to Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1957</td>
<td>15.66 (13.14)</td>
<td>15.64 (14.87)</td>
<td>15.67 (11.23)</td>
<td>N/A N/A N/A</td>
</tr>
<tr>
<td></td>
<td>1967</td>
<td>17.85 (13.36)</td>
<td>16.86 (14.20)</td>
<td>18.84 (12.46)</td>
<td>1.22 3.17 2.20</td>
</tr>
<tr>
<td></td>
<td>1977</td>
<td>23.94 (18.15)</td>
<td>22.65 (17.40)</td>
<td>25.22 (18.87)</td>
<td>5.79 6.38 6.09</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>24.69 (19.82)</td>
<td>24.22 (22.50)</td>
<td>25.16 (16.79)</td>
<td>1.57 -0.06 0.76</td>
</tr>
<tr>
<td></td>
<td>1997</td>
<td>24.19 (15.07)</td>
<td>23.88 (12.10)</td>
<td>24.49 (17.60)</td>
<td>-0.34 -0.67 -0.51</td>
</tr>
<tr>
<td></td>
<td>2007</td>
<td>31.14 (20.01)</td>
<td>29.05 (19.01)</td>
<td>33.22 (20.84)</td>
<td>5.17 8.73 6.95</td>
</tr>
</tbody>
</table>

Note: All numbers are means. The standard deviation is in parentheses, and the confidence interval (at the 5 percent level) is in italics. * denotes difference significant at 10 percent level, ** denotes difference significant at 5 percent level, and *** denotes difference significant at 1 percent level.

These findings confirm the results of previous citation studies estimating the mean number of cases cited over the same period. A study by Judge Posner in 1985, for example, found that the average federal appellate opinion in 1960 contained 12.4 citations, and that the average 1983 opinion contained 24.7 citations—both findings remarkably close to this Article’s results.\textsuperscript{117} Whether these increases are due specifically to technological advances, however, is open to question. Prior studies of citation indicate that the mean number of cited cases per opinion began to increase dramatically beginning as early as the 1940s, perhaps because an increasing stock of precedent created more opportunities for citation, or because changes in judicial staffing levels

\textsuperscript{116} See infra Table 1.

\textsuperscript{117} See Federal Courts, supra note 87, at 72 tbl.3.6 (analyzing only majority opinions, however, whereas this study conglomerates majority opinions with their accompanying concurring and dissenting opinions).
increased opinion production capacity.\textsuperscript{118}

Interestingly, this analysis did not uncover a significant discrepancy between the mean number of cases cited in concurring and dissenting opinions within any single sample year. Although in both 1977 and 2007, where the most significant growth in mean cases cited is observed, the measured difference between the mean cases cited in concurring and dissenting opinions is larger than in any other sampled year; these differences are not statistically significant. This suggests that the income effect observed in Table 1, in which judges consume more citations as their income increases, does not engender a significant substitution effect between raw citations in concurring and dissenting opinions. Instead, citation increases in both types of opinions, and judges allocate relatively similar amounts of research time to concurring and dissenting opinions before and after their purchasing power increases.

More importantly, however, the data in Table 1 suggest that a technological explanation cannot fully account for the observed increases in mean number of cited cases. For example, one major increase in total citation occurred between 1967 and 1977, before the widespread adoption of computerized legal research systems in the federal courts and private practice. Likewise, the second major increase occurs between the 1997 and 2007 samples, although no major computer-assisted research developments transpired during that decade.

One alternative to the technological explanation deserves mention: some commentators have suggested that the increase in the number of available law clerks for each court of appeals judge is directly responsible for the recent increase in citation.\textsuperscript{119} Federal circuit judges received one law clerk in 1930.\textsuperscript{120} This number was doubled in 1970, when circuit judges were given a salary allowance that enabled them to hire more clerks.\textsuperscript{121} Although circuit judges received enough money to hire three clerks since 1974,\textsuperscript{122} this was not commonly done before 1980, when a congressional enactment that increased staff salary allowances enabled federal judges to hire three clerks at normal pay levels.\textsuperscript{123} Shortly thereafter, in the early 1990s, judges were given the option of employing four clerks and one secretary instead of three clerks and

\textsuperscript{118} See, e.g., Friedman et al., supra note 5, at 796 tbl.6 (calculating the use of cited authority in state supreme court opinions between 1870 and 1970, and finding that unique citation increased from a mean of 5.8 cites in 1870–1880 to 14.3 cites in 1960–1970). The latter estimate particularly is similar to this Article’s calculations, which find federal appellate courts citing an average of 17.85 unique cases in 1967 (including the accompanying concurring and dissenting opinions). See infra Table 1.

\textsuperscript{119} See, e.g., FEDERAL COURTS, supra note 87, at 115–116 (arguing that law clerks “are the proximate cause of the enormous increase in the federal judicial output of separate opinions, footnotes, citations, and above all words.”). \textit{Id.} at 115 This is because, over the period studied by Judge Posner, there was a “fourfold increase in law-clerk and staff-attorney assistants per judge.” \textit{Id.} at 119 The increase in judicial services is partially a product of supply and demand forces. \textit{Id.}

\textsuperscript{120} \textit{See} JOHN B. OAKLEY & ROBERT S. THOMPSON, LAW CLERKS AND THE JUDICIAL PROCESS 18, (1980) (“Congress supplied a law clerk to each federal circuit judge in 1930.”). \textit{See also} Act of June 17, 1930, ch. 509, 46 Stat 774. (authorizing the hiring of a law clerk and specifying salary).

\textsuperscript{121} OAKLEY & THOMPSON, supra note 120, at 91, n.5.110.

\textsuperscript{122} \textit{Id.}

two secretaries. Notably, these changes in potential staffing levels only roughly correspond to Table 1’s findings: between 1967 and 1977, when potential clerk levels doubled, the total number of cited cases increased most dramatically (by slightly over 34 percent). The second major increase in mean total citation, however, fails to correspond to the increased staffing levels: the increase from two to four clerks occurred before 1997, but the second major increase in case citations (around 29 percent) did not appear until after the 1997 sample. Moreover, even if clerking levels may roughly approximate the changes in total citation, they are much less helpful in rationalizing the discrepancies in string citation over the same period.

C. String Citation, 1957–2007

Judges have often derided excessive string citation, characterizing the practice as needlessly justificatory and occasionally harmful. Judge Posner castigates law clerks’ writing style as making “an ostentatious display of the apparatus of legal scholarship—string citations, copious footnotes, abundant references to secondary literature.” Judge Posner finds law clerk’s reliance on string citations “superfluous” and often “inaccurate.” Other judges have railed against the practice in appellate briefs. According to Judge Harry Pregerson of the Ninth Circuit, for example, using string citation is “the third sin” of appellate brief writing, since such cites “are rarely useful or impressive.” Despite these misgivings, however, the data shows that string citation has actually fallen out of favor in appellate opinions over the last fifty years—becoming nearly a novelty in recent years.

Two measures of string citation are informative for temporally assessing the influence of economic factors on such citation. First, the percentage of cases in an opinion cited only within a string citation, and not further analyzed, might respond significantly to changes in the cost of legal research or legal writing: if the cost of either declines, judges would have more time to analyze each case in further depth and present their findings in expository fashion.

---

124. See Alex Kozinski, The Real Issues of Judicial Ethics, 32 Hofstra L. Rev. 1095, 1098–99 (2004) (remarking that judges often took advantage of this option when it was made available).

125. It is important to note that this rough approximation of law clerk staffing levels does not account for the increase in caseload over the same period. For example, between 1965 and 1975, the number of cases filed in the federal appellate courts rose from 6,597 to 16,571. KEERSTEN & SONGER, supra note 67, at 28 tbl.1.6. The number of federal appellate judgeships over the same period grew from 78 to 97. Id. at 30 tbl.1.8, and the average number of clerks per judge increased from one to two. Thus, the approximate number of clerks increased from 78 to 194—and the average number of cases filed per clerk actually increased slightly, from 84.5 to 85.4. Staffing alone, then, does not necessarily explain the increase in mean total citation between 1967 and 1977. Likewise, between 1975 and 1985, the caseload increased from 16,571 to 33,360. Id. at 28 tbl.1.6, while the number of authorized judgeships increased from 97 to 168. Id. at 30 tbl.1.8. Since over this period the allowable number of law clerks increased from two to three, the average number of cases filed per clerk in 1985 (66.19) was much less than in 1975 (85.4). Although this differential should produce a significant change in the Table 1 data, no such change is shown—indicating that law clerks are probably not responsible for much of the change in citation levels.


127. See id. at 108–9.

128. Harry Pregerson, The Seven Sins of Appellate Brief Writing and Other Transgressions, 34 UCLA L. Rev. 431, 435–36 (1986) (“If the issue has already been decided by the Ninth Circuit, one or two recent cites from our circuit will suffice to prove black-letter law. In one recent case, counsel wasted an entire page citing fifteen cases for a very minor, well-settled point.”).
Likewise, the average number of cases cited uniquely in string citations within an opinion generates a similar approximation of the costs of legal citation. Accordingly, both measures were analyzed to determine whether significant patterns arose over time.

The striking results of this analysis of unique string-cited cases are found below in Table 2, which displays the number of string-cited cases in an average federal appellate opinion as a percentage of the total number of cases cited in the average opinion. Specifically, the first column reports, in ten-year increments, the mean percentage of unique string-cited cases in the total sample of opinions analyzed in each sample year. The two following columns display the same data for the relevant samples of concurring and dissenting opinions, and the final two columns show the same results for dissenting opinions in which the ideology of the majority opinion (as measured by party of appointing President) was either the same or the opposite of the dissenting judge.

<table>
<thead>
<tr>
<th>Type of Opinion</th>
<th>Year</th>
<th>Total</th>
<th>Concurring Opinions</th>
<th>Dissenting Opinions</th>
<th>SME Dissenting Opinions</th>
<th>OPP Dissenting Opinions</th>
<th>Change from Year–10 Total to Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1957</td>
<td>0.242</td>
<td>0.248</td>
<td>0.236</td>
<td>0.236</td>
<td>0.235</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.189)</td>
<td>(0.202)</td>
<td>(0.177)</td>
<td>(0.154)</td>
<td>(0.197)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.026</td>
<td>0.039</td>
<td>0.035</td>
<td>0.044</td>
<td>0.054</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1967</td>
<td>0.248</td>
<td>0.239</td>
<td>0.257</td>
<td>0.271</td>
<td>0.241</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.165)</td>
<td>(0.173)</td>
<td>(0.156)</td>
<td>(0.161)</td>
<td>(0.151)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.023</td>
<td>0.034</td>
<td>0.031</td>
<td>0.043</td>
<td>0.044</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1977</td>
<td>0.251</td>
<td>0.237</td>
<td>0.266</td>
<td>0.264</td>
<td>0.268</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.147)</td>
<td>(0.154)</td>
<td>(0.140)</td>
<td>(0.143)</td>
<td>(0.138)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.020</td>
<td>0.030</td>
<td>0.027</td>
<td>0.038</td>
<td>0.040</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>0.149</td>
<td>0.146</td>
<td>0.151</td>
<td>0.143</td>
<td>0.156</td>
<td>-0.103 ***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.122)</td>
<td>(0.119)</td>
<td>(0.127)</td>
<td>(0.108)</td>
<td>(0.136)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.017</td>
<td>0.023</td>
<td>0.027</td>
<td>0.036</td>
<td>0.033</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>1997</td>
<td>0.097</td>
<td>0.102</td>
<td>0.091</td>
<td>0.101</td>
<td>0.083</td>
<td>-0.052 ***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.094)</td>
<td>(0.092)</td>
<td>(0.095)</td>
<td>(0.094)</td>
<td>(0.096)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.013</td>
<td>0.018</td>
<td>0.019</td>
<td>0.027</td>
<td>0.026</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>2007</td>
<td>0.082</td>
<td>0.094</td>
<td>0.069</td>
<td>0.089</td>
<td>0.057</td>
<td>-0.015 *</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.091)</td>
<td>(0.098)</td>
<td>(0.081)</td>
<td>(0.106)</td>
<td>(0.059)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.013</td>
<td>0.019</td>
<td>0.016</td>
<td>0.030</td>
<td>0.015</td>
<td></td>
</tr>
</tbody>
</table>

Note: All numbers are means. The standard deviation is in parentheses, and the confidence interval (at the 5 percent level) is in italics. * denotes difference significant at 10 percent level, ** denotes difference significant at 5 percent level, and *** denotes difference significant at 1 percent level. SME Dissenting Opinions refers to the group of dissenting opinions in which the dissenter and the majority-opinion writer are appointed by presidents of the same political party; OPP Dissenting Opinions refers to the group of dissenting opinions in which the dissenter and the majority-opinion writer are appointed by presidents of the opposite political party.
At first glance, several interesting trends emerge. A comparison of the columns reporting string-citing concurring and dissenting opinions reveals that only minimal (and non-significant) differences exist between the mean percentage of unique string-cited cases in the concurring and dissenting sample opinions within the sample years. For example, the greatest difference between these two samples in a given year is only 2.9 percent, between the 1977 dissenting opinions and the 1977 concurring opinions. There is a dramatic difference, however, between the percentage of unique string-cited cases in 1957 and in 2007. In the case of concurring opinions, the mean percentage drops from nearly 25 percent in 1957 to below 10 percent in 2007; and in the dissenting opinion samples, the percentage drops nearly as radically, from over 23 percent in 1957 to slightly under 7 percent in 2007. Even more interesting is the nature of this change: in the first two decades considered in the sample, the total percentage of unique string-cited cases varies almost imperceptibly—indeed, the changes from 1957 to 1977 are not statistically significant. In the twenty-year period between 1977 and 1997, however, the mean percentage of string-cited cases drops precipitously; declining by over 15 percent in those years.

The large standard deviations in each measured sample indicate, of course, that these results are not necessarily predictive of any single opinion within the sample. Although, as noted above, opinions from 1957 are generally distinguishable from contemporary opinions, the wide variance in individual cases creates some ambiguity. These variations are most likely the result of two factors. First, a large number of opinions in each sample were simply not long enough to include string cites. In fact, 24 percent of the opinions in the 1957 concurring opinions sample, and 25 percent of the 2007 concurring opinions, did not employ string cites. These are predominately those opinions that are only a few pages long and contained only a few cases that were cited expositorily. Second, judges within the samples generally revealed divergent citation styles. Thus, while the sample as a whole demonstrated a general coherence, individual literary styles created large discrepancies within the individual opinions.

129. This is not necessarily the result of differences in the type of cases being considered by the courts. Analysis of a small sample of abortion cases in federal appellate courts citing Roe v. Wade, 410 U.S. 113 (1973), between 1973 and 2007 found a statistically significant difference in string citation between the 1978–1987 sample and the 1988–1997 sample. String citation declined across the samples: from 21.0 percent in the 1973–1977 sample to 17.0 percent in the 1978–1987 sample, to 9.7 percent in the 1988–1997 sample, and finally to 7.4 percent in the 1998–2007 sample. Due to the small sample size (only sixty-three cases between 1973 and 2007), the only significant drop (at the 10 percent level) was between the 1978–1987 and 1988–1997 sample. Cf. FEDERAL COURTS, supra note 87, at 117–18 (finding an enormous increase in the mean number of citations in D.C. Circuit opinions between 1960 and 1983). Judge Posner’s data shows that in 1960, the D.C. Circuit cited an average of 12.4 cases (and secondary materials) per opinion; but in 1983, the average opinion from the same circuit cited 52.1 cases (and secondary materials). Id. at 118 tbl.4.4. This may be due in large part to the increase in complicated administrative law cases over the period. See 1 KENNETH CULP DAVIS & RICHARD J. PIERCE, JR., ADMINISTRATIVE LAW TREATISE § 1.3 (Little, Brown & Company 3d ed. 1994). However, Judge Posner argues that “[t]he growth in complexity cannot explain all or even most of the growth in the length and scholarly appurtenances of the opinions.” FEDERAL COURTS, supra note 87, at 119. Also, it is important to note that Judge Posner’s study counted average total citations, rather than the percentage of different levels of citation—which, as shown by the results in Table 1, do not necessarily correlate.

130. For example, the percent of unique string-cited cases in each opinion in the 1957 samples ranged from a low of 0 to a high of 68.4 percent; in the 2007 samples, the percentage ranged from 0 to 50 percent.
nevertheless, are remarkable.

In particular, Figure 1’s graphical representation of the mean percentage of unique string-cited cases demonstrates the suddenness of the 1977–1997 decline. The mean percentage of unique string-cited cases is relatively constant both before and after the large drop in that twenty-year period, suggesting that the cause of the drop was confined to a significant external change within those two decades. Notably, the decrease in the percentage of string citation directly parallels the increased proliferation of computerized research systems: there is no significant change in string citation until the 1980s, after computer-assisted legal research was widely adopted, and the decrease tapers off after 1997 when new advancements in computer-assisted legal research and word processing were not as revolutionary.

In contrast to the change in the total number of cases cited over the five decade period, these changes in the mean percentage of string citation are more amenable to this technological explanation. Law clerk allotments, for example, cannot explain the observed changes in string citation. Since the single largest percentage increase in clerk staffing levels arose in 1969, when the permissible number of law clerks was doubled, a “law clerk” influence should significantly affect the 1977 sample. In contrast, however, the 1977 sample showed no statistical difference from either the 1967 or 1957 sample, suggesting that the number of law clerks does not have a determinative influence on the percentage of string citation employed in federal appellate opinions.

The analysis of the mean number of unique string-cited citations revealed similar results. Between 1957 and 1977, the mean number of unique string-cited opinions increased slightly, from 4.58 to 6.44 citations per case. While
this increase over the first twenty years was statistically significant at the 1 percent level, neither change in the included ten-year periods was significant. Overall, however, the trend in these years was slightly upward. The change in mean string citations between 1977 and 1987, however, was remarkably similar to the percentage change detailed above in Table 2: the mean number of citations in that ten-year period diminished substantially, from 6.44 to 4.06 per appellate opinion. Another significant decrease in mean string citation occurred between 1987 and 1997, when the string-cited cases decreased from 4.06 to 2.57 per opinion.

In sum, these results imply a significant change in the costs of the inputs of opinion production between 1977 and 1997. Specifically, judges appear to produce much less string citation in the 1997 opinions, in both percentage and real numbers. More importantly, as is shown below in Part III.D, judges were not only engaging in fewer string citations, but also analyzing cited cases in significantly greater depth. In effect, computerized research appears to create a substitution effect in judicial citation consumption: as income increases, judges consume less string citation, and more expository citation. This suggests that string citation is an inferior good—one that judges consume less as income rises.

D. Depth of Citation, 1957–2007

Although this analysis of string citation suggests that string citation practices correlate closely with the use of computer-assisted legal research, whether the observed decrease in string citation is meaningful depends to an extent on the nature of the citation substituted for it. If, for example, judges write single-sentence descriptions of each cited case rather than conglomerate these cases into a string citation, the change in string citation might be significant, but not meaningful. In contrast, if judges are substituting paragraph-long descriptions of cited cases for string citation, it would appear that judicial style has changed in a meaningful fashion.

In an attempt to measure the import of the substitution effect tangentially observed in the string citation data, the same sample of cases was analyzed to approximate the amount of legal analysis accompanying each citation. Accordingly, each cited case was coded according to the depth of its accompanying analysis, in four increments. Depth I cases represent those cited cases cited only within string citations; Depth II represent those cases cited more directly for a given proposition; and Depth III and IV cases signify those cases cited and discussed “expositarily” within the opinion. In contrast to a change from Depth I to Depth II citation, which may represent only a marginal change in judicial style, a substitution of expository citation for Depth I citation represents a significant transformation in style—from string citation to cases discussed over at least a paragraph.

As depicted in Table 3, the increase in expository citation almost directly

131. As discussed above, large standard deviations caution against broad generalizations about individual judges or individual cases. In several cases, the standard deviations were larger than the mean number of string citations, suggesting a wide variance in citation practices in individual cases.
parallels the decrease in string citation displayed in Tables 1 and 2, with some noteworthy exceptions. Specifically, the greatest change in expository citation occurred between the 1977 and 1987 samples, paralleling the most significant drop in string citation. Numerically, the total percentage of Depth III cases increased 5 percentage points—from 11.5 percent in 1977 to 16.5 percent ten years later. Likewise, Depth IV citations also increased substantially, growing from just over 2 percent of the total citations in 1977 to well over 5 percent of the total citations over the next decade. Taken together, these changes represent an 8.5 percent increase in total expository citation over that period—a change that nearly directly corresponds to the 10.3 percent decrease in unique string-citations from 1977 to 1987. Notably, however, there is no similar parallelism between the 1997 results: while the percentage of string citation declined sizably between 1987 and 1997 (by slightly over 5 percent\textsuperscript{132}); the percentage of cases cited expository did not change significantly over the same period (a net loss of only 0.1 percent). Yet, expository citation shows a statistically significant change in the decade prior to 1977. Between 1967 and 1977, the percentage of such citation increased a statistically significant 3.3 percent (2.3 percent in Depth III citations, and 1 percent in Depth IV citations).

\textsuperscript{132} See supra Table 1.
### Table 3

**Percentage of Cases Cited Expositarily in Federal Appellate Court Opinions, by Year and by Type of Opinion**

<table>
<thead>
<tr>
<th>Year</th>
<th>Opinion Type</th>
<th>Depth</th>
<th>Total</th>
<th>Concurring Opinions</th>
<th>Dissenting Opinions</th>
<th>Change from Year–10 Total to Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1957</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>III</td>
<td>0.089</td>
<td>(0.140)</td>
<td>0.007</td>
<td>(0.029)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV</td>
<td>0.004</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>III</td>
<td>0.092</td>
<td>(0.114)</td>
<td>0.011</td>
<td>(0.026)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV</td>
<td>0.004</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>III</td>
<td>0.115</td>
<td>(0.101)</td>
<td>0.021</td>
<td>(0.039)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV</td>
<td>0.014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>III</td>
<td>0.165</td>
<td>(0.123)</td>
<td>0.056</td>
<td>(0.080)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV</td>
<td>0.017</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>III</td>
<td>0.156</td>
<td>(0.112)</td>
<td>0.064</td>
<td>(0.079)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV</td>
<td>0.016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>III</td>
<td>0.161</td>
<td>(0.103)</td>
<td>0.069</td>
<td>(0.069)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV</td>
<td>0.014</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All numbers are means. The standard deviation is in parentheses, and the confidence interval (at the 5 percent level) is in italics. * denotes difference significant at 10 percent level, ** denotes difference significant at 5 percent level, and *** denotes difference significant at 1 percent level. Depth III refers to cases categorized as “discussed” under Westlaw’s Depth of Treatment analysis. See supra note 107 and accompanying text. Depth IV refers to cases categorized as “examined” under the Depth of Treatment analysis. See supra note 108 and accompanying text.

These results suggest that computerized legal research had the greatest effect on judicial citation practices between 1977 and 1987. The substitution of Depth II citation for expository citation between 1967 and 1977 is potentially the result of advances in word processing in that time period, which allowed judges to manageably increase the length of an opinion. Word processing fails to explain the substitution of expository citation for string citation in the 1980s, however. Specifically, the choice to include cases in a string citation is based primarily on the costs of research. Although a judge might be able to credibly appropriate a string cite from the text of another case, investigating whether the cases cited therein are especially analogous requires a substantial amount of additional research.

The decline in string citation since the 1980s is especially surprising

---

133. See Greenwood & Farmer, supra note 85, at 770 (discussing productivity increases due to word processing).
considering the dramatic increase in the federal appellate caseload over the five decades surveyed. Between 1955 and 2005, the number of cases filed in the federal appellate courts increased over 1800 percent: from 3,544 cases in 1955 to 68,473 cases in 2005. Although the number of judgeships also increased over the same time span, from 68 in 1955 to 179 in 2005, these additional judges did not offset the caseload explosion. Specifically, there were an average of 52.1 cases filed per appellate judge in 1955, and 382.5 per judge in 2005 (an increase of over 630 percent). Despite the overwhelming nature of the caseload increase however, judges continued to write longer, more expositive opinions between 1957 and 2007. Additionally, as is demonstrated by Part IV, these stylistic changes are not unique to the aggregate sample of federal appellate opinions, but also appear within the citation patterns of individual judges.

IV. INDIVIDUAL CITATION PRACTICES OF TWO FEDERAL APPELLATE JUDGES, 1961–2007

Several commentators have recognized a profound disconnect between the process of judicial decisionmaking and the act of opinion writing. Some suggest that this dichotomy is psychological—arguing that the judicial process can be bifurcated into a “process of discovery” and a “process of justification,” neither of which necessarily informs the other. Others posit a physical disconnect—proposing that although a few appellate judges derive utility from “the intrinsic pleasure of writing” and from “exercising and displaying analytical prowess or other intellectual gifts” through the publication of opinions, most judges now delegate this function almost entirely to their clerks. Both theories suggest that an analysis of the stylistic vagaries of judicial citation patterns is likely to reveal common tendencies in citation, since individual stylistic quirks are unlikely to influence actual citation practices.

Although the data from comprehensive samples of circuit court opinions arrayed in Tables 1 through 3 above demonstrate the significant effect of declining citation costs on aggregate judicial style, whether this change is

134. See KUERSTEN & SONGER, supra note 67, at 28 tbl.1.6.
135. See ADMINISTRATIVE OFFICE ANNUAL REPORT, supra note 67, at 19 tbl.1.
136. See KUERSTEN & SONGER, supra note 67, at 30 tbl.1.8.
137. KUERSTEN & SONGER, supra note 67, at tbl.1.
indicative of alterations in individual judges’ citation practices is not entirely transparent. Indeed, several institutional accounts of the federal court system may explain the aggregate citation data. Perhaps individual judges, for example, display rather static citation patterns, and the decrease in string citation is a result of a changing judicial workforce. Likewise, perhaps judicial clerks, chosen from among a few elite law schools and generally much younger than the judges they serve, exert determinative influence on overall judicial citation patterns.

This Part attempts to answer such objections to the simple economic citation theory through an analysis of two judges over the relevant time period, concluding that although psychological idiosyncrasies might account for a portion of any one judge’s citation patterns, the changing cost structure of legal research in the 1970s and 80s had a significant effect on the persistence of such patterns. Accordingly, Part IV.A outlines the empirical methodology and reports the citation practices of two long-serving federal appellate judges. Then, Part IV.B analyzes these results, hypothesizing that while some individual judges may follow a unique citation style, the vast majority responds directly to changes in the cost of legal research.

A. Data and Methodology

The judge-specific portion of this Article examines the citation patterns of two of the longest-serving federal appellate judges to discover whether the patterns observed in the aggregate sample are also present in the practices of individual judges. Initially, the depth of citation of 291 majority opinions authored by James R. Browning, a Ninth Circuit judge, between 1961 and 2006 (a total of 6,233 citations) was evaluated to investigate individual citation patterns. Additionally, 397 majority opinions (4,393 citations) of Judge H. Emory Widener, Jr. of the Fourth Circuit were similarly analyzed. The results obtained appear to generally corroborate the inferences of the main

141. Several previous citation studies have established idiosyncratic patterns among the amount of cases cited by judges. See, e.g., Merryman, The Authority of Authority, supra note 5, at 653, 664 (finding large disparities between the number and type of authorities cited in opinions of the judges of the California Supreme Court).

142. A comprehensive discussion of this point can be found in Federal Courts, supra note 87, at 102–10.

143. Indeed, law clerks may have been especially adept at navigating the emerging technological landscape of legal research. For example, Seventh Circuit judge William Bauer remarked in 1989 that “[o]ne of the great advantages of having law clerks now is, of course, the familiarity the new lawyer is likely to have with the latest computer technology.” William J. Bauer, The Changing Character of Legal Clerkships, in The Federal Appellate Judiciary in the Twenty-First Century 29, 30 (Cynthia Harrison & Russell R. Wheeler, eds., 1989).

144. These opinions were collected by searching the Westlaw court of appeals (“cta”) database for “Browning” in the “judge” field (“JU(Browning)”). This search generated 391 results, of which those opinions with a corollary concurring or dissenting opinion, those written per curiam or en banc, and those authored by judges other than James Browning of the Ninth Circuit were discarded.

145. These opinions were collected by conducting four searches within the Westlaw court of appeals database for “Widener” within the judge field: the first search between the dates 01/01/1972 and 01/01/1978; the second between 01/01/1978 and 01/01/1988; the third between 01/01/1988 and 01/01/1998; and the final between 01/01/1998 and 01/01/2008. After each search, a random sample of 100 published opinions within the date ranges was assembled. All en banc opinions, per curiam opinions, and opinions with a corollary concurring or dissenting opinion were excluded from the samples.
sample, although there are certain distinctive differences.

1. Judge James R. Browning (Ninth Circuit)

Due to his remarkably long tenure on the federal appellate bench, Judge James R. Browning is a perfect test-case for evaluating the impact of technological research methods on individual citation practices. Judge Browning is one of the longest-serving judges on the federal appellate bench. He began his career on the Ninth Circuit in 1961, when he was appointed by John F. Kennedy after a long and distinguished career in government and private practice.\footnote{See Federal Judicial Center, Judges of the United States Courts, http://www.fjc.gov/public/home.nsf/thisj (last visited Apr. 28, 2008) (providing biographical information about federal judges). See also Mary M. Schroeder, A Celebration Honoring James R. Browning, 63 MONT. L. REV. 251, 252–76 (2002) (celebrating the fortieth anniversary of Judge Browning on the Ninth Circuit); Daniel W. Fessler, A Year with the Honorable James R. Browning, 21 ARIZ. ST. L.J. 9, 9–12 (1989) (describing a law clerk’s experience with Judge Browning); Mary M. Schroeder, Jim Browning as a Leader of Judges: A View from a Follower, 21 ARIZ. ST. L.J. 3, 3–8 (1989) (describing the experience of Judge Browning throughout the years); James Weinstein, Chief Judge James R. Browning: A Clerk’s-Eye View, 21 ARIZ. ST. L.J. 13, 14 (1989) (describing a law clerk’s experience with Judge Browning).} In 1976, he was appointed to the position of Chief Judge of the Ninth Circuit, where he continued to serve until 1988. He continued working as an active judge on the circuit until September 1, 2000, when he took senior status.\footnote{Federal Judicial Center, supra note 146.} Thus, Judge Browning served from the shaky inception to the firm establishment of computer-assisted legal research—and these external changes should be reflected in his citation patterns.

Judge Browning’s specific citation practices, detailed below in Table 4, illustrate that at least some appellate judges altered their citation practices significantly within the last five decades. For example, Judge Browning’s data indicates a steep decline in the amount of string citation over at least the last thirty years. As displayed in Table 4, Judge Browning was once a chronic string-citer: cases cited only in string citations composed more than 37 percent of his early opinions (those between 1961 and 1967). Although the percentage of unique string-cited cases in his opinions declined somewhat in the 1970s (dropping to just below 33 percent in opinions written between 1968 and 1977), the most dramatic changes occurred between 1977 and 1997, when the percentage of string-cited cases in his opinions was approximately cut in half. Specifically, this percentage declined from 32.9 percent in the 1968–1977 opinion sample to 24.6 percent in the 1978–1987 sample; and further to only 15.2 percent in the 1988–1997 sample—significant drops that somewhat parallel the distinctions observed between the 1977, 1987, and 1997 opinions in the aggregate sample.\footnote{See supra Table 2.}
PERCENTAGE OF CITED CASES IN THE FEDERAL APPELLATE OPINIONS OF JUDGE JAMES R. BROWNING, BY YEAR AND BY DEPTH OF CITED CASES

<table>
<thead>
<tr>
<th>Years</th>
<th>Number of Opinions</th>
<th>Depth of Cited Cases</th>
<th>Change in I From Year–10 to Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>1961–1967</td>
<td>112</td>
<td>0.370 (0.180)</td>
<td>0.586 (0.174)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.033</td>
<td>0.032</td>
</tr>
<tr>
<td>1968–1977</td>
<td>69</td>
<td>0.329 (0.144)</td>
<td>0.580 (0.144)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.034</td>
<td>0.034</td>
</tr>
<tr>
<td>1978–1987</td>
<td>47</td>
<td>0.246 (0.174)</td>
<td>0.636 (0.189)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.050</td>
<td>0.054</td>
</tr>
<tr>
<td>1988–1997</td>
<td>54</td>
<td>0.152 (0.126)</td>
<td>0.656 (0.144)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.034</td>
<td>0.039</td>
</tr>
<tr>
<td>1998–2007</td>
<td>9</td>
<td>0.077 (0.095)</td>
<td>0.808 (0.165)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.062</td>
<td>0.108</td>
</tr>
</tbody>
</table>

Note: All numbers are means. The standard deviation is in parentheses, and the confidence interval (at the 5 percent level) is in italics. * denotes difference significant at 10 percent level; ** denotes difference significant at 5 percent level; and *** denotes difference significant at 1 percent level. “Number of Opinions” refers only to the number of opinions analyzed for purposes of this analysis, not the total number of opinions issued by Judge Browning over the relevant period.

Judge Browning’s individual citation practices, however, are not necessarily identical to the aggregate sample. His use of string citation continues to decline significantly after 1997, dropping from 15.2 percent in the 1988–1997 sample to only 7.7 percent between 1998 and 2007.149 While this specific discrepancy might be attributable to the differences in temporal measurement between Judge Browning’s individual samples and the aggregate sample, it is unlikely that this distinction alone will account for all of the variations found between the two analyses. Notably, unlike the aggregate sample, Judge Browning’s use of expository citation does not consistently increase throughout his time on the bench. Instead, his use of Depth III citation climbs from around 4 percent of cases cited in his earliest opinions (1961–1967) to slightly over 16 percent in his more recent opinions (1988–1997) before suddenly declining to 8 percent after 1997.150 Likewise, his use of Depth IV citation, which was virtually nonexistent in the 1960s, rises only to slightly over 3 percent of his opinions in the 1980s, but remains essentially the same over the next two decades.151 In contrast, the aggregate sample reports more consistent gains in both types of citation practices over the same

149. See supra Table 4.
150. Id.
151. Id.
Despite these differences, the overall trends in the citation practices of Judge Browning buttress the implications of the aggregate sample and signify a noteworthy change in the cost structure of opinion writing over the sample period. Indeed, Judge Browning’s string citation practices changed enormously between his first and last years as an active judge on the federal appellate bench—his unique string citations in the final sample, for example, were only one-fifth of those in the earliest sample. Barring a significant change in judicial ideology, such differences indicate larger economic factors were influencing the judge’s citation practices over his many years of service. Perhaps it is not coincidental that Judge Browning was among the most stalwart advocates of advancing computer technology in the Ninth Circuit—since his opinions appear to validate evidence of a changing production cost structure.

Figure 2’s graphical depiction of Judge Browning’s string citation patterns portrays the exact nature of these remarkable variations. Although the changes are somewhat subtle, the graph does illustrate the gradual waning of string citation in the judge’s opinions. Specifically, although unique string citation in Judge Browning’s 1960s opinions seem to cluster between 30 and 60 percent, after the early 1980s only one opinion contained over 50 percent.

---

152. See supra Table 3 (demonstrating the stability of Depth IV citation and the gains in both types of citations over time). Of course, some of the change in expository citation in the final sample may be due to Judge Browning’s decision to take senior status in 2000, and the relatively miniscule sample size of opinions between 1998 and 2007.

153. For many years, Judge Browning promoted the use of “paperless dockets” and telecommunications as methods to streamline the administration of the unwieldy Ninth Circuit. See Schroeder, supra note 146, at 7 (remarking that Judge Browning’s “affinity for technology is immense”).
string citation. In fact, string citation declines continuously throughout the 1980s and 1990s—so that by the mid-1990s Judge Browning’s opinions show string citation clustering around the 10 to 15 percent levels. Remarkably, although many opinions throughout the sample contained no string citation whatsoever, those opinions with enormous levels of string citation are almost nonexistent after the late-1970s.

2. **Judge H. Emory Widener, Jr. (Fourth Circuit)**

   Like Judge Browning, Judge H. Emory Widener was one of the longest serving appellate judges in history. He was appointed to the federal appellate bench in 1972, by Richard Nixon, after three years on the federal district court for the Western District of Virginia. He served for thirty-five years on the Fourth Circuit and was an active member of the bench until 2007, when he took senior status, and was at the time of his death in 2007 the longest-serving active member of that court. Over that time, he published a large number of opinions—which provide a wealth of information about his citation practices.

   Judge Widener’s citation patterns, found in Table 5 below, almost directly parallel those of the aggregate sample. Beginning in 1972, his use of string citation steadily declines over the next three decades: dropping from over 21 percent in the 1972–1977 sample to slightly under 9 percent in the 1998–2007 sample. Unlike Judge Browning, and similar to the results of the aggregate sample, Judge Widener’s use of expository citation (especially Depth IV citation) progressively increases throughout his time on the bench. His use of Depth III citation increases from 9.4 percent in the 1972–1977 sample to over 15 percent in the 1998–2007 sample (almost exactly corresponding to the results in Part I, which found increases from around 9 to 16.1 percent over the same period). Likewise, the judge uses Depth IV citation more frequently in later years: Depth IV citation swells from less than 1 percent of cited cases to almost 5 percent of cited cases between 1972 and 2007.

---


155. *Id.*

156. *See supra* Table 3.
Interestingly, there are also some idiosyncrasies within Judge Widener’s citation patterns that are not found in the aggregate sample. For example, Judge Widener’s use of Depth II citation does not change significantly over his years on the bench—ranging between 68 and 71 percent in all four samples. Also, his use of expository citation peaks between 1988 and 1997, and declines marginally in between 1998 and 2007 (although this may simply be the result of age effects on citation). Also, as graphically portrayed below in Figure 3, Judge Widener’s rate of string citation declines rather suddenly after 1980—quite unlike the slow decline in string citation found in Judge Browning’s opinions. Specifically, there are very few differences between Judge Widener’s mid-1980s and mid-2000s opinions—all seem to cluster between the 10 and 20 percent levels. Most of the differences between the 1978–1987 sample and subsequent samples, in fact, appear to arise from the amount of opinions without any string citation, which seem to increase substantially in the 1990s and 2000s.\footnote{157}

<table>
<thead>
<tr>
<th>Years</th>
<th>Number of Opinions</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>Year–10 “I” to Year “I”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972–1977</td>
<td>100</td>
<td>0.215</td>
<td>0.682</td>
<td>0.094</td>
<td>0.009</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.178)</td>
<td>(0.210)</td>
<td>(0.137)</td>
<td>(0.039)</td>
<td></td>
</tr>
<tr>
<td>1978–1987</td>
<td>100</td>
<td>0.154</td>
<td>0.684</td>
<td>0.111</td>
<td>0.051</td>
<td>-0.061***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.157)</td>
<td>(0.224)</td>
<td>(0.136)</td>
<td>(0.144)</td>
<td></td>
</tr>
<tr>
<td>1988–1997</td>
<td>100</td>
<td>0.111</td>
<td>0.683</td>
<td>0.154</td>
<td>0.055</td>
<td>-0.043**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.125)</td>
<td>(0.218)</td>
<td>(0.184)</td>
<td>(0.123)</td>
<td></td>
</tr>
<tr>
<td>1998–2007</td>
<td>97</td>
<td>0.088</td>
<td>0.710</td>
<td>0.152</td>
<td>0.049</td>
<td>-0.022</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.107)</td>
<td>(0.171)</td>
<td>(0.134)</td>
<td>(0.090)</td>
<td></td>
</tr>
</tbody>
</table>

Note: All numbers are means. The standard deviation is in parentheses, and the confidence interval (at the 5 percent level) is in italics. * denotes difference significant at 10 percent level, ** denotes difference significant at 5 percent level, and *** denotes difference significant at 1 percent level. “Number of Opinions” refers only to the number of opinions analyzed for purposes of this analysis, not the total number of opinions issued by Judge Widener over the relevant period.

\footnote{157} Also notable are the number of Judge Widener’s opinions which, even as late as 2005, contain high levels of string citation. In comparison to Judge Browning, Judge Widener’s use of string citation seems more variable in later years, which might indicate that Judge Widener is more likely to allow clerks to draft opinions. \textit{Cf. supra} Figure 2 (showing that the amount of Judge Browning’s opinions with string cites decreased over his years as judge).
B. The Death of Individual Style?

This large amount of data on individual judges’ citation practices over the last fifty years illustrates that the cost of citation has a measurable effect on citation patterns and indeed, on judicial literary style. As Judge Posner has suggested, perhaps this is the result of the influence judicial clerks exert on the opinion-writing process. Posner argues that “[a]lthough . . . delegation of opinion drafting to law clerks may result in a change of literary style with every change of law clerks, the dominant effect is stylistic uniformity rather than variety.” While Posner attributes this to the “uniform educational experience” of law schools and the concomitant indoctrination into the ponderous writing style of law reviews, the data on citation of individual judges suggests that this “culture” is not temporally uniform, and is based to a large extent on the costs of citation. Like judicial opinions, law review articles have ballooned in both subject matter and citation over the years, as law professors have gained increased access to other legal scholarship, and

---

158. Of course, it is hard to disentangle the effects of citation cost from more idiosyncratic factors, such as age or senior status that may foster changed citation patterns—but the fact that expository citation (which requires more intensive research and drafting) is more prevalent in both Judge Browning and Judge Widener’s later opinions indicates that aging is perhaps not a significant determinant of citation patterns.


160. See id. (noting that most federal judicial clerks are from prestigious law schools and are members of law review). See also Diana Gribbon Motz, A Federal Judge’s View of Richard A. Posner’s The Federal Courts: Challenge and Reform, 73 Notre Dame L. Rev. 1029, 1034–36 (1998) (book review) (comparing judge-written opinions with those written by law clerks). Judge Motz claims, regarding Posner’s efforts to prove the involvement of law clerks in opinion-writing: “All one needs to do is to read the heavily footnoted, citation laden, characterless, apppellate opinions prevalent today to be convinced that these are the work of intelligent and careful, but inexperienced, lawyers.” Id. at 1034.
technological advancements have made the editing process less onerous.\footnote{See Michael J. Saks et al., \textit{Is There a Growing Gap Among Law, Law Practice, and Legal Scholarship?: A Systematic Comparison of Law Review Articles One Generation Apart}, 30 Suffolk U. L. Rev. 353, 3643–66 (1996) (finding that mean article page lengths increased by 86\% between law review volumes from 1960 and from 1985).}

As the data demonstrates, the effects of computer-assisted legal research (and other cost-saving research and writing methods) on different judges’ citation patterns may actually be conforming. For example, consider the differences between the citation patterns of Judge Browning and Judge Widener before and after the advent of computerized legal research systems. Before 1977, Judge Browning’s Depth I and Depth II citation patterns are statistically distinct from Judge Widener’s—but afterwards both judges appear to move towards a common mean. In fact, the two judges’ citation patterns in the 1978–1987 sample show only one significant difference (in Depth I citation), and their citation patterns in the 1988–1997 sample show none.\footnote{See supra Parts III.A.1–2 (presenting data on the two judges’ citation patterns). All differences were analyzed at the 1 percent level. A Student’s t-test analysis indicated that in each subsequent sample after the 1968–1977 sample the judges’ use of Depth I, Depth II, and Depth III citation became less distinct. Notably, however, Depth IV citation became more distinct (albeit not statistically significant) in the subsequent samples.} In this sense, each judge has become more similar in citation over their years on the bench. Whether this effect is beneficial or worrisome depends on its underlying causes: perhaps, for example, appellate judges simply adapt to the opinion form most accessible to their audience; or, perhaps, as Judge Posner suggests, computerized legal research has an indoctrinating effect on law clerk (and hence judicial) writing style. As Part V argues, however, this conformity might actually be beneficial, because it indicates that judges are less likely to communicate the strength of their opinions through citation, and more likely to communicate their position through direct legal analysis.

\section*{V. CONFIRMING THE MICROECONOMIC HYPOTHESIS}

In sum, the empirical evidence appears to confirm the microeconomic hypothesis. As the cost of citation falls, judges will generally consume more of it. More importantly, the evidence indicates that string citation is not—contrary to what many commentators have suspected—a normal good. Though judges now have the ability to create long string citations cheaply, they have not done so with the frequency many would have suspected. In fact, the number of “junk” citations has declined dramatically as the cost of opinion production has fallen, indicating that string citation may in fact be an inferior good that is less frequently consumed as its price falls.

If, as the evidence suggests, string citation is an inferior good, the microeconomic approach to citation correlates nicely with the communicative theory of citation proposed by some courts and commentators, which understands citation (and opinion-writing generally) as an attempt by judges to signal to some audience both the basis and the amount of support for their decisions.\footnote{See Walsh, supra note 7, at 357–58 (finding evidence of both information exchange and legitimation, after examining citation in state wrongful discharge cases); cf. G. Nigel Gilbert, \textit{Referencing as}...
doctrinal necessity and thereby guarantee public confidence. As the Supreme Court recently remarked in Rita v. United States: “Judicial decisions are reasoned decisions. Confidence in a judge’s use of reason underlies the public’s trust in the judicial institution.” Therefore, “[a] public statement of those reasons helps provide the public with the assurance that creates that trust.” Less public-oriented communicative theories of citation, however, have also been proposed. For instance, some commentators have suggested that lower court judges use written opinions to indicate their suitability for promotion, and others have, especially in the context of dissenting opinions, argued that citations are an indicator to future judges of the strength of alternative reasoning. Whether judges are communicating to their peers, their superiors, or to the general public, however, this communication must have some inherent cost. Indeed, the cost of the communication is precisely what creates its informational value by differentiating among potential communicators.

In particular, the substitution of string citation for more expositive citation between 1977 and 1987 seems to support the communication theory of judicial citation. Specifically, the pseudo-income effect of cheap, available legal research predicts an increase in consumption of both string and expositive citation, but not necessarily a substitution between the two. One possible explanation for the substitution of expository citation for string citation is that the cost of citing a large number of cases had not only declined in absolute terms, but had declined relative to the cost of citing a lower number of cases. Notably, early computerized research systems did not make opinion writing

---

Persuasion, 7 SOC. STUD. SCI. 113, 116 (1977) (“A scientist is rewarded through recognition for producing results which are seen as new, important and true. But these qualities are not normally self-evident to the readers of a research paper… accordingly, authors [use citation to bolster their findings and persuade their audience of the validity of their work].”).

164. But see Frederick Schauer, Opinions as Rules, 62 U. CHI. L. REv. 1455 (1995). Schauer introduces the argument that legal opinions should be used to educate the public, only to refute it in short order. id. at 1463; he maintains, instead, that judicial opinions are aimed primarily at lower courts and informed legal actors, id. at 1469–70, 1472.


166. Id.


168. See, e.g., Frank B. Cross & Emerson H. Tiller, Judicial Partisanship and Obedience to Legal Doctrine: Whistleblowing on the Federal Courts of Appeals, 107 YALE L.J. 2155, 2173 (1998) (identifying a “whistleblowing” effect whereby partisan judges with a panel majority are less likely to rule in a partisan manner when a judge of the opposite ideology can police the decision by filing a dissenting opinion to “identify the majority’s disobedience to doctrine”); Virginia A. Hettinger et al., Comparing Attitudinal and Strategic Accounts of Dissenting Behavior on the U.S. Courts of Appeals, 48 AM. J. POL. SCI. 123, 123–27 (2004) (discussing the signaling function of dissent as a judicial strategy); Steven R. Van Winkle, Dissent as a Signal: Evidence from the U.S. Courts of Appeals (Aug. 29, 1997) (unpublished manuscript, on file with author) (finding that those judges with an ideological majority on the circuit were more likely to dissent to bring the majority’s reasoning to the attention of other circuit judges and perhaps induce en banc review).
less arduous (which would arrive only later with the advent of personal computers and sophisticated text-editing programs), but did provide law clerks with a broader array of relevant precedential materials. Thus, judges who had once differentiated their opinions through a parade of precedent could no longer do so, since even a judge with a relatively weak position could string-cite dozens of cases at least tangentially supporting his decision. Instead, judges began to prefer expository citation, which laid bare a judge’s rationalization and revealed the exact nature of his reliance on “analogous” cases.  

Although this substitution hypothesis suggests that the reduced costs of legal research have made judicial opinions more honest (since string citation can no longer hide incongruous precedents), it is also possible that the increase in expository citation is merely conspicuous consumption by judges concerned with perceived status. Perhaps expository citation, simply because it is more costly than string citation, creates Veblen effects on judicial consumption of citations. Namely, because expository citation is highly visible and also quite costly (relative to string citation), judges might be attracted to such citation not because it necessarily reveals any more substantive information than string citation, but simply because it is costly and overt. Thus conceived, expository citation devolves into an arms race in which judges compete to have the longest and most thoroughly-cited opinions—perhaps because these serve to impress and awe other judges or the legal public through their ostentatiousness.

Thus, whether technological advancements in legal research have served to improve or degrade judicial opinions depends in large part on whether expository citation is a more effective method of informing the public of the rationale for a decision than string citation. Unfortunately, it is beyond the scope of this Article to provide a definite answer to this question, and judges themselves appear to disagree over the answer. This Article’s contribution, however, is not in answering the question but proposing it, thereby overturning...

169. This account is especially compelling in the context of concurring and dissenting opinions. In the pre-electronic database age, it was rather difficult for a concurring or dissenting judge to evaluate the cases cited in a majority string-cite in depth—making the string-cite an effective signal. After the advent of computer-assisted legal research, however, concurring or dissenting judges on a panel could easily locate cases within the majority’s string-cites that were not as strong, and attack these cases in their opinion. Judges thus had an especially powerful incentive in such cases to clarify the exact nature of each case in the string cite.

170. See Laurie S. Bagwell & B. Douglas Bernheim, Veblen Effects in a Theory of Conspicuous Consumption, 86 AM. ECON. REV. 349, 349 (1996) (arguing that the “leisure class” acquire expensive goods to signal their status). See generally THORSTEIN VEBLEN, THE THEORY OF THE LEISURE CLASS: AN ECONOMIC STUDY OF INSTITUTIONS (1899) (hypothesizing that the wealthy engage in conspicuous consumption (buying high-priced and highly-visible goods) in order to increase social status by advertising their wealth and that some consumers may be willing to pay a higher price for a functionally equivalent good in order to overtly display their consumption); Richard H. McAdams, Relative Preferences, 102 YALE L.J. 1 (1992) (discussing the drive to own property to gain distinction in society).

171. First Circuit Judge Bruce M. Selya makes a variation of this argument in Publish and Perish: The Fate of the Federal Appeals Judge in the Information Age, 55 OHIO ST. L.J. 405, 408 (1994). Specifically, he hypothesizes that just as laundry machines increased the standards of cleanliness and forced the public to wash clothing more frequently, “[a]s [computer-assisted legal research makes] cases remotely on point . . . ever easier to find, the expectations for research rise, courts crank out more opinions, lawyers write more briefs (citing more opinions), and opinions cite more opinions. The cycle then begins anew. All too often, the judges are drained.” Id.
long-held beliefs about the effect of computer-assisted legal research and other technological advancements on judicial citation.

VI. CONCLUSION

This Article proposes that a simple microeconomic approach can describe judicial citation practices over the last fifty years. It provides empirical evidence that judges use citations in part as a communication device, and that the cost of legal research is intimately connected with the effectiveness of this communication (and therefore with judicial citation patterns). The empirical results in this Article not only demonstrate the effectiveness of the microeconomic approach in describing judicial opinion style, but also provide a foundation for future research into the effects of judicial ideology on citation practices.