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Judicial Influence: A Citation Analysis of Federal Courts of Appeals Judges

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I. Introduction

This paper uses the number of citations to the published opinions of judges on the federal courts of appeals to measure the influence of individual judges. A citation to an opinion of Judge X reflects either the precedential value of that opinion or its ability to influence the decision of another judge in a subsequent case. In either case, we assume that the more citations a judge receives, the greater his influence.

At the outset, a word of caution is in order. Citations are at best a crude and rough proxy for measuring influence. The drawbacks are well known so we set them out briefly.[1] Some weaknesses may be

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[1] These drawbacks of citation analysis have been discussed extensively in a large empirical literature. Most of this literature concerns the use of citations to study the influence of scholars not judges. The literature on judicial citations includes Caldeira, The Transmission of Legal Precedent: A Study of State Supreme Courts, 79 Am. Pol. Sci. Rev. 178 (1985) and On the Reputation of State Supreme Courts, 5 Pol. Behav. 83 (1983); Easterbrook, The Most Insignificant Justice: Further Evidence, 50 U. Chicago L. Rev. 481 (1983); Friedman, Kagan, Cartwright and Wheeler, State Supreme Courts: A Century of Style and citation, 33 Stan. L. Rev. 723 (1981) and The Evolution of State Supreme Courts, 76 Mich. L. Rev. 961 (1978); Johnson, Citations to Authority in Supreme Court Opinions 7 Law & Policy 509 (1985); Landes

particularly important with judicial citation studies; others become less important in large samples, such as ours; and some can be taken account of by statistical methods. Nonetheless, because previous studies of influence have used citation analysis with considerable success, we extend that work to the study of judicial influence.

Still, citation analysis remains an imperfect tool for quantifying, in a rough way, influence. Its possible drawbacks are as follows:

1. Influence may also reflect (rather than be measured by) the number of citations a judge receives. Other judges may be more likely to look for and cite the decisions of more influential judges.[2] An influential judge develops a "brand name" or "trademark" that signifies quality. Such a brand name reduces the cost of searching for high quality opinions to cite.[3] This factor does not invalidate the use of citations to measure influence but tends to magnify the relationship between the two variables.

2. There is an important difference between citations to opinions from within the citing opinion's circuit, and citations to opinions from outside the citing opinion's circuit. Within the same

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and Posner, Legal Precedent: A Theoretical and Empirical Analysis, 19 J. Law & Econ. 249 (1976) and Legal Change, Judicial Behavior, and the Diversity Jurisdiction, 9 J. Legal Stud. 367 (1980); Lessig, Appendix to Evaluation of the United States Court of Appeals for the Seventh Circuit, 43 DePaul L. Rev. 825 (1994); Merryman, The Authority of Authority: What the California Supreme Court Cited in 1950, 6 Stan. L. Rev. 613 (1954) and Toward a Theory of Citations: An Empirical Study of the Citation Practice of the California Supreme court in 1950, 1960 and 1970, 50 So. Cal. L. Rev. 381 (1977); Posner, Cardozo: A Study of Reputation (1990); Posner, The Learned Hand Biography and the Question of Judicial Greatness, 104 Yale L. J. 511 (1994) and Posner, Aging and Old Age: A New Theoretical Framework, ch. 8 (1995); and Solimine, The Impact of Babcock v. Jackson: An Empirical Note, 56 Alb. L. Rev. 773 (1993).

[2] That influence tends to feed on itself is well recognized in the citation literature used to measure the quality of scholars. For example, although Nobel prize winners are cited more heavily prior to winning a Nobel prize, the citations they receive increase after receiving the Nobel prize. See Cole & Cole, Measuring the Quality of Sociological Research: Problems in the Use of the Science Citation Index, 6 Am. Soc. 23 (1971).

[3] We thank Andy Trask for pointing out the connection between brand names for goods and for judges.

circuit, opinions have precedential effect; across circuits, they have only persuasive effect.[4] Thus, citations to an opinion from within a circuit may reflect either the opinion's precedential or persuasive effect; while citations to an opinion from another circuit will reflect its persuasive effect alone. For this reason, we focus mainly on inter-circuit citation, but as we discuss below, this distinction may have other less direct consequences.

3. We have not distinguished between favorable, critical or distinguishing citations. It is not clear that we should. Critical citations, in particular to opinions outside the citing circuit, are also a gauge of influence since it is easier to ignore an unimportant decision than to spell out reasons for not following it. The same may not be true, however, for critical or distinguishing citations within the same circuit. To distinguish or criticize an opinion from within a circuit may reflect the need to avoid its precedential (as opposed to persuasive) effect. Thus again, inter-circuit citation will track influence better.

4. A count of citations to a particular judge reflects, in part, longevity on the bench, and not just influence. Assume judges A and B will each serve for 25 years on the court of appeals but A has already served 20 and B 10 as of 1992. Judge A will have had a greater opportunity to be cited than B because he has had more years to collect citations and has published a greater number of opinions. Ultimately, A and B will collect about the same number of citations if they are equally able and productive. Hence it would be misleading to infer from the raw count of citations that A is more influential than B. By holding constant differences in judicial experience among judges, however, we can adjust for its role in generating citations.

5. Luck plays a role in the number of citations a judge receives. Consider a judge who is assigned an opinion interpreting a new statute in a growing area of litigation. His opinion may be

[4] Inside circuit citations allow us to estimate roughly the influence of a judge within his circuit. That is, we expect that the more same circuit citations a judge receives, the more influential he is among judges in the circuit in which he sits, other things constant.

extensively cited quite apart from its analysis. A related point is that some citations may just reflect "window dressing" rather than influence. For example, judge A may cite B's opinion not because it is influential but because it reaches a result that coincides with A's own beliefs. Since our study counts citations to the large number of published opinions of current appellate judges, it should largely eliminate any systematic effects of luck or "window dressing." Indeed, one way to understand the purpose of our study is to ask whether differences in citations are anything more than luck—whether, that is, the differences, holding certain factors constant, are significantly different.

6. Law clerks, not judges, are often the authors of opinions, and more recently this is true all the more often. To be sure, some judges still write their own opinions, others do extensive editing, and others write first drafts. But some judges delegate the entire opinion writing task to law clerks with minimal supervision and editing. Thus, citations may reflect the influence or quality of law clerks as "ghost writers" rather than that of judges, and thus may explain the judge's need, or reflect a judge's talent, for getting the best law clerks. This caveat must be kept in mind when we speak about judicial influence and quality. It is also a major difference between using citations to evaluate scholars as opposed to judges since academics do their own research and writing.[5]

7. We follow the usual practice of isolating self-citations within our tabulations. Here, however, self-citations may reveal something about a judge's involvement in the opinion writing process itself. It is not implausible that judges who write their own opinions will cite

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[5] Within legal academics, the differences may not be so great: law review editors provide a significant amount of the footnoted sources appearing within student-edited journals. Their function, then, may be the equivalent of the law clerk's function in judicial opinion writing. An analogous problem may occur for academic articles in science or medical journals in which the senior author is the head of a lab or group but may not be the person responsible for the ideas or experiments described in the article. Since most citation counts only record the citation to the first author of the article, senior authors may receive large number of citations in which their role was editing and general supervision, much like that of many appellate judges.

themselves more frequently than judges who do not—if only because they have a greater familiarity with their own prior opinions. It is also not implausible that judges who write their own opinions will be more influential, since their opinions will be more consistent, and if good, then more consistently good than law clerk written opinions. Self-citations may also be a way for judges to promote or advertise their own opinions. And successful advertising will generate more "sales" or citations.[6] Thus, we look separately at self-citations and ask whether judges who cite themselves more often are more influential than judges with more self-citation humility.

8. Counting citations might understate influence or precedential significance in the case of a "super" precedent—a precedent that is so effective in clearing up an unsettled area of law that future disputes settle rather than go to trial. But such examples would appear rare, especially when considering inter-circuit citations,[7] and hence are unlikely to be an important source of error in our analysis.

9. Citations have an important public goods aspect common to much intellectual property.[8] Unlike a private good, A's use (citation) of B's opinion does not prevent C, D, etc. from also citing B at the same time. Thus, if on a similar decision, B's reasoning is slightly better than A's, there is nothing to stop all judges from citing B and neglecting A. Small differences in the power or quality of opinions could then lead to large disparities in the number of citations,[9] thus magnifying the link between citations and influence.[10] The counter

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[6] We thank Richard Craswell for pointing out the advertising role of self citations.

[7] Since again, there is little inter-circuit precedential effect.

[8] See Landes and Posner, supra note 1.

[9] In the economics literature, this phenomena has been analyzed by Sherwin Rosen, The Economics of Superstars, 71 Am. Econ. Rev. 845 (1981), and its application to legal citations is discussed by Posner, Cardozo: A Study in Reputation 67 (1990)

[10] The public goods aspect means that differences in citations are better as an ordinal rather than cardinal measure of influence—i.e., if B receives 5 times as many citations as A, B ranks higher in influence but not necessarily five times more than A.

argument is that judges (or their law clerks) cite all relevant opinions not just influential ones. Hence, judge A may cite ten opinions but our count will not differentiate between the truly influential one and the nine "decorative" ones. Since cited opinions are a "free good" because judges neither pay the author of the cited opinion nor pay for the inputs (paper, clerks, computerized legal research, etc.), the ordinary market constraints that would tend to keep down the number of citations are not present.[11]

10. Judges are conservative citers—not in the sense that they cite conservative judges, but in the sense that they are unlikely to cite judges perceived to be at an extreme, even if they are following this extreme judge's views. Thus there may be a phenomenon of shadow citation: judges (or again, more likely their law clerks) find an opinion by extremist judge X that takes a position they want to take; but rather than incur the cost of citing extremist judge X, they find an opinion following the opinion by judge X and cite it. Thus the influence of well known judges at the extreme left or right may be undercut by this middling norm. (This point is of course related to the point above about the significance of citations that distinguish or criticize.[12])

11. Citation practices could be extremely sensitive to the technology (and hence cost) of citation searching. The effects here are difficult to isolate. Today every judge and clerk (and here we can be confident the work is done by law clerks) has access to Lexis and Westlaw at zero marginal cost. Lawyers don't have the same luxury.

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[11] Another possibility is that the culture of law schools and law reviews (from which many law clerks are selected) encourages "citation happy" behavior which carries over into practice and the judiciary. Note that "excessive" citing in law review articles is also related to the absence of market constraints in student edited journals. See Austin, Footnotes as Product Differentiation, 40 Vand. L. Rev 1131 (1987) and Footnote Skulduggery and Other Bad Habits, 44 U. Miami L. Rev. 1009 (1990).

[12] Herbert Hovenkamp discusses a related aspect of the conservative citation practice in judicial opinions in Enterprise and American Law, 269 (1991). Hovenkamp's claim is that while classical political economists were clearly influencing judicial opinions during the period he considers, citing them was contrary to judicial "etiquette."

Relative to a time when judicial chambers did not have this access to computerized searches, we might expect at least two changes. First, the proportion of citations in opinions supplied by the lawyers might fall, as it becomes easier for law clerks to locate other citations. Second, computer searches may yield a more egalitarian pattern of citation, since rather than relying upon influence as a tool in locating cases, the computer makes it easier to locate on point cases directly. There are of course counter arguments against each effect. At the same time that the cost of searching has fallen, the quantity of judicial work has increased. Also, as well as making it easier to locate opinions on point, computer searches make it easier to locate opinions by author. Thus, the effect of this change is difficult to predict.

Our paper is organized as follows. Section II describes the data in our sample. Section III presents our empirical analysis of citations which we use to derive rankings of the influence of individual appellate judges. We rank judges both on the basis of total influence (citations adjusted for experience) and average influence (citations per published opinion). In Section IV we extend our empirical analysis to the question of identifying factors relevant to explaining differences in the influence of individual judges. These factors include both characteristics of judges (e.g., self-citations, law school quality, prior judicial experience, ABA rankings, political affiliation, and so forth) and characteristics of the circuit in which they sit (such as the mix of cases for that circuit). Section V presents concluding remarks. In an appendix to the paper we use citations to published opinions in each circuit rather than to individual judges to measure the influence of circuits rather than individual judges.

II. Description of the Data

Federal judges publish opinions that cite other opinions of other federal judges. Our analysis tracks these citations. We do this by counting the citations in published (both signed and unsigned) federal court of appeals opinions, to signed[13] published[14] majority[15]

[13] Meaning an opinion that is reported to have been written by a particular

opinions of other federal courts of appeals judges. The former opinion is the *citing* opinion—that is, the opinion that is citing the citation that we are counting—and the latter is the *cited* opinion—again, the opinion being cited, and the citation that we are counting.

Our sample is designed to measure the influence of the 205 individual judges sitting on the courts of appeals in 1992 (including judges on senior status) who had six or more years tenure at the end of 1995.[16] Eighty-one of these judges were on senior status as of 1995; and 13 are no longer sitting on the courts of appeals (including Justices Ginsburg and Breyer). The sample of cited opinions collects all the opinions (as qualified above) written by these judges from the beginning of their tenure through 1995. For

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judge. We thus exclude per curiam opinions but that does not significantly skew the data since relatively few opinions are unsigned, especially of late. See Posner, The Federal Courts: Challenge and Reform 173–74 (1996) which finds that only 6 percent of published opinions in F.3d were per curiam; and Landes & Posner, supra note 1, at 304 which shows that such opinions are cited less frequently than signed opinions

[14] Meaning published in West's Federal Reporter, Second or Third Series.

[15] Meaning we do not count citations to concurring or dissenting opinions. We were forced to this limitation because of the limitations in Shepard's system. Sometimes, however, Shephard's attributes citations to concurring opinions to the author of the majority opinion. This would overstate citations to majority opinions and understate citations to judges who write a disproportionately large number of concurring opinions. Overall these data problems are small and, therefore, unlikely to affect our estimates of influence.

[16] Our initial sample contained 239 judges but we excluded thirty-two because they had less than six years experience through 1995. Although the choice of six years is somewhat arbitrary, we felt that five or fewer observations for a particular judge was not a sufficient number to allow us to estimate with confidence a judge specific influence coefficient in the regression analysis. We also dropped two other judges, John R. Gibson and Floyd R. Gibson, both from the 8th Circuit, because in most instances we were unable to tell which Gibson wrote a "Gibson" opinion. There are three other pairs of judges with the same last name who sit on the same circuit as of 1992 (Douglas and Ruth Ginsburg (DC), Emilio and Reynaldo Garza (5th) and Dorothy and Thomas Nelson (9th)). We were able to include these judges in our sample because Shephard's distinguished these judges by first name or initial. In the case of Gibson, Shephard had not yet adopted that practice.

example, if a judge sitting in 1992 was appointed in 1981 and resigned in 1994, then we collected all the signed and published majority opinions for that judge from 1981 through 1994. The earliest year any judge sitting in 1992 published an opinion in F.2d was 1955.

Next we calculated the number of citations to these opinions through the end of 1995 contained in Shephard's CD-ROM June 1996 edition. We recorded the F. 2d or 3rd volume, page numbers and circuit for both the cited and citing opinion.[17] Observe that the set of citing opinions include opinions written by our sample judges, by judges who were no longer sitting in 1992, and by judges whose tenure was too short to be included in our judge sample provided the citing opinion was published in West's Federal Reporter. For example, a judge who sat between 1960 and 1990 would not be within our sample of cited opinions (since he was not sitting in 1992), but citations in his opinions to judges sitting in 1992 would be included (since those citations indicate influence of a judge in whom we are interested).

We calculated citations to a particular judge as follows. First we collected citations to the signed majority published opinions (for short "opinions") for each judge in our sample.[18] Second, we included only opinions that had a cite in West's Federal Reporter, 2nd or 3rd Edition (parallel cites were ignored). Thus, citations to some opinions were excluded from our data base because they were awaiting publication and had no F.2d or F.3rd cite. Finally, we noted whether the citing opinion is written by the same judge as the

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[17] We calculated the year of a citing or cited opinion by assigning to each F.2d volume the year of the majority of its opinions. Thus, we assign a F.2d volume that contained 51 percent of opinions decided in 1990 and 49 percent in 1989 to the year 1990.

[18] In the appendix to this paper we examine the influence of individual circuits, as opposed to individual judges, by analyzing citations to the number of signed published majority opinions in circuits authored by all court of appeals judges who served between 1955 and the beginning of 1995 (not just those sitting in 1992) with six or more years experience in 1995.

cited opinion—i.e., whether this is a "self-citation" or not. Unless stated otherwise, our analysis of citations excludes "self" citations.[19]

Table 1 provides summary information by circuit from our sample. Judges in our sample have served on the federal court of appeals for an average of almost 17 years (as of 1995) with a range from six to 40 years, and publish about 26 signed opinions per year. Of the nine judges who publish on average over 50 signed opinions per year, five (Posner, Easterbrook, Flaum, Coffey and Ripple) are in the seventh circuit.[20] Looking across circuits, judges in the seventh publish the most signed opinions per year (over 45 per judge). The first and eight circuits are close behind (39 and 41 respectively) while judges in the sixth, federal and D.C. circuits publish the least.[21] Not surprisingly, there is a strong positive correlation between average annual citations and opinions.[22] The more opinions a judge publishes per year, the greater the opportunity to be cited, and the more cites he should receive. Finally, Table 1 shows that the

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[19] This follows other citation studies of influence that exclude, when possible, self citations. Self-citations are more a reflection of how A values A's work while non-self citations reflect how others value A's work.

[20] The other four are Selya (1st cir.), McMillian (8th cir.), Wollman (8th cir.) and Politz (5th cir.). The average number of signed opinions per year for the nine are Posner (81.5), Easterbrook (64.1), Flaum (60.9), Selya (55.1), Coffey (52.5), Ripple (51.6), McMillian (51.4), Wollman (51.3) and Politz (51.1). At the low end, there are 25 judges that publish less than 15 opinions per year; eight are in the Federal Circuit; and 14 are either on senior status or no longer on the courts of appeals both of which lowers their average number of opinions per year because they are recorded as having written very few or zero opinions for some years.

[21] Both the Federal and D.C. circuits have a relatively specialized workload. The Federal Circuit has exclusive jurisdiction for patent appeals and appeals from the Trademark Trial and Appeal Board. The D.C. circuit has a disproportionately large number of appeals from administrative agencies compared to other circuits (administrative appeals accounted for over 40 percent of proceedings in the D.C. circuit compared to less than 10 percent in other circuits) which, because of the length of the record, probably results in fewer signed opinions in the D.C. circuit.

[22] For the 205 judges in our sample, the correlations between average annual signed opinions per judge and average annual citations received are .78 (outside citations), .66 (inside citations) and .79 (total citations).

majority of F.2d cites to an appellate judge (about 63 percent on average) come from opinions within the judge's own circuit.[23]

III. Empirical Analysis of Citations

In using citations as a proxy for measuring influence or quality, we must first decide on the appropriate statistical method for analyzing citation data. Just counting total citations to a judge's opinions would be misleading because judges with longer tenure will have more opportunity to accumulate citations independent of their influence.[24] It might appear, therefore, that a more suitable measure would be average citations per year (citations divided by tenure).

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[23] There is some ambiguity about how to classify outside and inside citations in the 11th and 5th circuit because the 11th circuit was created from the 5th circuit in 1982. Since 5th circuit opinions (at least prior to 1982) have precedential authority in the 11th circuit, we counted citations to a judge in the 5th circuit from an 11th circuit opinion, and citations to a judge in the 11th circuit from a 5th circuit opinion as inside, not outside, circuit citations.

[24] Judicial tenure or longevity is not irrelevant in measuring influence. If judge A spends three years on the bench and receives a total of 600 citations while judge B spends thirty years on the bench and receives 6000 citations, B is more influential than A by virtue of having written more opinions. On the other hand, the major reason that judges in our sample have greater tenure is that they were appointed earlier (not that they were appointed at younger ages). Since judges receive life tenure and there are few resignations from the courts of appeals, we would expect that differences in tenure among our judges will be much smaller when we compare judges after they have left the bench than when we compare all sitting judges today. Thus, when we compare influence holding constant judicial tenure, we are implicitly assuming that the younger and less experienced judges today will have similar tenure at the end of their judicial careers to the more experienced judges in the current sample. On the other hand, although tenure will be more similar, older judges today may well have longer tenure at the end of their careers because of a selection bias in our sample—the fact that a judge has a long tenure as of 1992 suggests he was appointed at an earlier stage, may be healthier, have more of a taste for judging, have fewer attractive alternatives, etc. than the average judge appointed more recently.

TABLE 1
SUMMARY OF JUDICIAL DATA BY CIRCUIT JUDGE SAMPLE

Circuit	*Number of Judges*	*Average Years of Experience Per Judge*	*Average Number of Signed Opinions Per Judge Per Year*	*Total Circuit Citations Per Judge Per Year*	*Inside Circuit Citations Per Judge Per Year*	*Outside Circuit Citations Per Judge Per Year*
1st	8	18.75	38.85	307.40	180.02	127.38
2nd	16	17.75	25.80	194.43	105.61	88.82
3rd	15	15.60	21.51	164.24	88.43	75.82
4th	11	17.45	23.30	131.25	54.65	76.60
5th	18	15.28	32.39	231.24	160.49	70.75
6th	22	16.95	19.44	116.23	62.43	53.79
7th	14	16.86	45.14	390.51	268.45	122.05
8th	12	18.08	40.52	245.21	155.22	89.99
9th	36	16.92	22.13	184.50	127.45	57.05
10th	13	16.77	30.65	199.48	131.43	68.04
11th	18	20.89	22.96	216.16	147.08	69.08
DC	10	13.50	20.94	129.36	72.10	57.26
Federal	12	11.92	11.55	51.37	44.81	6.56
All	205	16.79	26.28	193.38	122.65	70.73

Such a measure still fails to control for differences in tenure. Consider two judges, A and B, and assume A has published twice as many opinions as B because A's tenure is twice that of B. Assume further that A's and B's opinions are equally well cited. Then A would have a greater number of citations per year (or in a single year) because in every year there are more accumulated opinions by A than B for other judges to cite.

We can partially control for differences in tenure by comparing citations per signed opinion rather than per year. But this also has problems. First, it penalizes a more productive judge who turns out more opinions per year. To see this, suppose judges A and B have identical tenure, their opinions are equally well cited but A publishes

twice as many opinions. Comparing average citations per opinion would lead to the misleading conclusion that A and B are equally influential (or even that B was more influential if B's opinions have a slightly higher probability of being cited). Second, older opinions have more citations because they have more years to accumulate citations. Hence, citations per opinion will tend to be greater for judges with longer tenure even assuming their opinions are equally influential. Another possibility is to look at average annual citations per opinion (i.e., total annual citations divided by total published opinions). But this approach makes no allowance for depreciation. A decision rendered twenty five years ago will be less influential today than one decided a few years ago because passage of time and changing circumstances will tend to make the earlier decision less applicable to current disputes. Depreciation means that the older the opinion, the fewer citations it should receive today. Hence, other things being equal, average annual citations per opinion should be lower, the greater a judge's tenure.

Multiple regression analysis enables us to develop more precise estimates of judicial influence because we are able to control for differences in tenure and other factors (discussed below) that may affect the number of citations a judge receives. We use two regression models. The first examines differences among judges in annual citations (holding constant tenure and other variables); the second looks at differences in citations per opinion (holding constant depreciation and other variables). We call the first "the total influence" model; and the second "the average influence" model. The former is a better measure of overall influence because it depends on both the average quality of a judge's opinions and the number of (quality adjusted) opinions he publishes. In principle, the two measures enable us to distinguish between the judge who publishes relatively few opinions but each a gem (i.e., the judge ranks high on the "average" but not the "total" scale), and the judge who ranks high in total influence mainly because he publishes a lot of opinions (i.e., the judge ranks high on the "total" but not the "average" scale).

A. Regression Models

Let C_{it} denote the number of citations to judge i in period t, and assume that C_{it} depends both on i's judicial capital at time t (cumulative signed opinions adjusted for depreciation) and the demand by other judges for that capital, as in

$$C_{it} = a_{it}K_{it} \quad (1)$$

where a_{it} (> 0) denotes the demand per unit of i's capital at time t and K_{it} the stock of that capital.[25]

1. Total Influence Model

In our first regression model, we approximate a_{it} and K_{it} as follows:

$$a_{it} = \exp (Sl_iJ_i + dD_t + w_{it}) \quad (2)$$

and

$$K_{it} = \exp (b_1E_{it} + b_2(E_{it})^2 + Sm_iJ_i + cX_{it} + e_{it}) \quad (3)$$

where exp (x) denotes *e* to the power x; J_i denotes a dummy variable that takes the value 1 for judge i and 0 otherwise; D_t denotes a set of other independent variables (discussed below) affecting the demand for judicial capital in period t; E_{it} denotes i's years of experience or tenure on the court of appeals at time t; X_{it} denotes other independent variables (discussed below) that influence the stock of i's capital; and w_{it} and e_{it} are random error terms.

Substituting (2) and (3) into (1), rewriting and taking logs yields the following regression equation:

$$\ln C_{it} = b_1E_{it} + b_2(E_{it})^2 + Sa_iJ_i + dD_t + cX_{it} + u_{it} \quad (4)$$

where u_{it} (= w_{it} and e_{it}) is a random error term, and $a_i = l_i + m_i$. Observe that a_i or the regression coefficient on judge i represents the

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[25] In the empirical analysis we add one citation to each judge per year because we use the log of citations and a few judges have zero citations in a particular year. Typically, this occurs for outside circuit citations in the initial years of judicial tenure.

combined effect on i's citations of both the demand of other judges for a unit of judge i's legal capital (accumulated signed published opinions adjusted for depreciation) and the stock of i's capital. Consider two judges, say m and n, who have equal tenure or experience on the courts of appeals. A larger value of l for judge m than n means that there is a greater demand for a unit of m's legal capital than n's—hence m is more influential than n holding constant the stock of capital. Stated differently, a unit of m's capital is more "valuable" than n's. But influence also depends on how many units of judicial capital m and n have produced in their (equal) time on the bench. For example, a greater m for m than n means that m has produced more units of legal capital than n over the same time period (since equation (3) has a separate tenure variable) and so receives more citations than n.[26] Equation (4) does not allow us to estimate separately l_i and m_i but rather the combined effect of both factors. In short, the greater are l_i and m_i, the greater is a_i, and the greater the influence of judge i.

Since i's judicial capital will tend to increase with tenure (E), we expect that the number of citations he receives will also increase ($b_1 > 0$) with E but probably at a decreasing rate ($b_2 < 0$) as depreciation of old opinions gradually overtakes additional new opinions.[27] In addition to experience or tenure and judge specific dummy variables in equation (4), we included several other independent variables.

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[26] There are two reasons why m might have a larger capital stock (tenure constant) than n. One is that m might publish more signed opinions per year than n. The other is that m's opinions might be more durable (i.e., have a lower depreciation rate) than n's even though both had published the same number of opinions. Our empirical analysis does not separate the effects of more opinions and lower depreciation for the individual judges.

[27] Since we define judicial capital as the stock of published signed opinions, the questions arises why we used tenure to approximate judicial capital rather than data on published signed opinions. To calculate the stock of capital from signed opinions requires that we know their rate of depreciation (which we do not). We add, however, that tenure or experience on the job is widely used as a proxy for human capital acquired on the job in empirical studies of earnings. See Jacob Mincer, Schooling, Experience and Earnings (1974) and Sherwin Rosen, Distinguished Fellow: Mincering Labor Economics, 6 J. Econ. Persp. 157 (1992).

Because tenure only roughly approximates a judges adjusted stock of opinions, we included as part of X_{it} (eqs. (3) and (4)) the following additional variables: a dummy variable (SS) that takes the value 1 if a judge is on senior status in period t and 0 otherwise;[28] a dummy variable (R) that takes the value 1 in periods after 1992 if a judge has retired or quit (hereafter, we call R the "retired" variable) and 0 otherwise; a dummy variable (SC) that takes the value 1 for Justices Ginsburg and Breyer in the periods after 1992 in which they were on the Supreme Court a 0 otherwise; and three dummy variables (Y(1), Y(2) and Y(3)) that take the value 1 for the first, second and third year of a judge's tenure respectively and 0 otherwise. Since judges on senior status or judges who are no longer on the courts of appeals publish fewer or no additional opinions, we expect such status to be associated with a lower capital stock (other things constant) and hence fewer citations. We include dummy variables for the first three years of tenure to allow for the fact that some judges serve less than a full year during the first year, and to help track other capital stock effects that may be associated with these years.[29]

We also include several demand variables (D) in eqs. (2) and (4). One is the aggregate number (in thousands) of federal court appeals opinions, which we denote by N, that are published each year. Since over our sample period 1955–1995 the number of signed opinions per year has increased by almost three-fold, we hypothesize that this would lead to an increase over time in the demand for judicial capital and hence an increase in citations to a judge's opinions.[30] There is, however, an offsetting factor. Since the number of appellate judges has also increased over this time period, there is more "competition"

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[28] "Senior status" means that the judge continues as a judge, but with a reduced workload, and reduced judicial resources.

[29] We measure the first year experience as the first calendar year (or any fraction thereof) that the judge served. And given the publication time lag, this would reduce further the number of first year citations.

[30] The number of published opinions increased steadily from 1725 in 1955 until it reached a peak of 5915 in 1991. Since 1991 it has declined to 5425 in 1992, 5440 in 1993, 5826 in 1994 and 5360 in 1995.

among judges to be cited and this could cancel the positive effect on citations of increase in N.[31] Another variable we include is the share (s) of published opinions produced by judge i's circuit in year t. We expect that the greater s, the fewer outside citations judge i receives (holding N constant). The larger i's circuit, the fewer outside judges will be available to cite i's circuit, lowering i's chances of being cited. On the other hand, we expect that the greater s is, the greater the number of citations i receives within his circuit because a greater s (holding N constant) indicates that i's circuit is producing more opinions.[32]

Other demand variables include the following. The dummy variable CJ takes the value 1 for periods in which a judge serves as chief judge of his circuit. Here we are testing whether chief judges are better cited because they may assign themselves the more important opinions.[33] The SC and year dummy variables (Y(1), Y(2) and Y(3)) may also reflect demand as well as supply factors. For example, if being on the Supreme Court increases the demand for a judge's appellate court capital, this would offset the reduction in this capital accompanying the appointment. And for the year dummies, consider what must happen for a judge i to receive citations in his first year. Since we only count citations to i's published opinions, i's opinion must appear in an F.2d volume in i's first year. (This is the supply effect noted above.) The citing case must also appear in an F.2d volume in i's first year. Hence, even if i's opinion is published in the same year, it will only count as a first year citation if the citing

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[31] But it is unlikely that the increase in the number of judges will completely cancel the positive effect of an increase in N because the opinions of recently appointed judges in say period t will primarily draw on opinions written in t - 1, t - 2. and so on (when the number of judges was lower). This, in turn, will tend to increase the number of citations an earlier appointed judge receives in period t notwithstanding the greater number of judges in period t.

[32] This is subject to the general qualifications noted above that an increase in the number of judges usually accompanies an increase in the number of published opinions. Hence, there is more competition among judges to be cited which can offset the positive effect of an increase in opinions.

[33] Alternatively, a chief judge may publish fewer opinions because he spends more time in administrative activities.

opinion is also published in that year. Since time lags in publication may make this unlikely, we will tend to underestimate the demand for i's opinions in the first year and possibly a few years thereafter.

2. Average Influence Model

In this model, rather than approximating K_{it} in (3) by tenure and other variables, we define K_{it} as accumulated published opinions (O) adjusted for depreciation (d) as in

$$K_{it} = O_{it} + (1 - d)K_{i(t-1)} \tag{5}$$

Although we cannot measure K or d directly, we can still use (5) to estimate average influence per opinion. Noting from (1) that $C_{i(t-1)} = a_{i(t-1)}K_{i(t-1)}$, substituting (5) into (1) and rewriting yields[34]

$$C_{it} = a_{it}O_{it} + (1 - d)C_{i(t-1)} \tag{6}$$

To simplify we use a linear (not exponential) specification for (3) which yields the following regression equation:

$$C_{it} = c + Sl_iJ_i\ O_{it} + dD_tO_{it} + (1 - d)C_{i(t-1)} + u_{it} \tag{7}$$

where c is the constant term, the regression coefficients Sl_i measure the judge specific effects on the average influence or quality per published signed opinion, and (1 - d) measures the survival rate (or one minus the depreciation rate) of judicial capital. Equation (7) includes the same demand variables as equation (4).

B. Regression Estimates

Our sample of 205 judges contains 3442 observations (about 17 per judge) and more than 740,000 courts of appeals citations to the

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[34] Strictly speaking (6) requires that $a_{it} = a_{i(t-1)}$ for substituting (5) into (1) yields $C_{it} = a_{it}O_{it} + (1 - d)C_{i(t-1)}(a_{it}/a_{i(t-1)})$. If a_{it} depended only on judge specific effects and not on demand effects that vary with time, then a_{it} would equal $a_{i(t-1)}$. However, since a_{it} may depend, for example, on the aggregate number of published appellate opinion, it may vary with time. Hence the assumption that $a_{it} = a_{i(t-1)}$ may not hold and this will alter our estimates of depreciation slightly.

published majority opinions of these judges. Eighty of the 205 judges are on senior status as of 1995; and 13 left the court between 1992 and 1995 (including Justices Breyer and Ginsburg).

1. Total Influence Regression Equations

Tables 2, 2A, 2B and 2C present the results of our total influence regressions (equation (4)). We estimated separate regressions for citations outside the circuit, citations inside the circuit, and total citations (equal to outside plus inside circuit citations). All regressions exclude self-citations. Table 2 presents regression estimates (and t-statistics) for all variables except the judge specific variables which are presented in Tables 2A, B and C (2A for outside, 2B for inside and 2C for total citations).[35]

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[35] The reader may find it helpful if we define the principal notation (without subscripts) used for the variables in our empirical analysis.

C	=	cites to judge i in year t
E	=	tenure or experience (in years) on the courts of appeals for judge i in year t ;
E^2	=	the square of tenure;
Y(1)	=	dummy variable that takes the value 1 for the first year of judge i's tenure and O otherwise;
Y(2)	=	dummy variable that takes the value 1 for the second year of judge i's tenure and O otherwise;
Y(3)	=	dummy variable that takes the value 1 for the third year of judge i's tenure and O otherwise;
SS	=	dummy variable that takes the value 1 for each year judge i is on senior status and 0 otherwise;
R	=	dummy variable that takes the value 1 for each year after 1992 that judge i is no longer a federal judge;
SC	=	dummy variable that takes the value 1 for Justices Ginsburg and Breyer for the years in which they are on the Supreme Court;
N	=	number of published opinions (in thousands) in the courts of appeals in year t;
s	=	share of published opinions in year t in judge i's circuit;
CJ	=	dummy variable that takes the value 1 for each year judge I is chief judge and 0 otherwise;
J	=	dummy variable that takes the value 1 for judge i and 0 otherwise; and
O	=	signed published opinions by judge i in year t.

TABLE 2
CITATIONS TO FEDERAL COURTS OF APPEALS JUDGES: TOTAL INFLUENCE REGRESSIONS

Independent Variables	Outside Circuit		Inside Circuit		Total	
	coeff.	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*
E	.13	(25.23)	.146	(29.06)	.141	(28.95)
E^2(x 10^{-2})	-.336	(-24.03)	-.329	(-24.45)	-.339	(-25.80)
Y(1)	-2.330	(-51.43)	-2.101	(-48.17)	-2.311	(-54.35)
Y(2)	-1.031	(-24.39)	-0.870	(-21.37)	-0.912	(-22.99)
Y(3)	-.481	(-12.00)	-.358	(-9.27)	-.388	(-10.30)
SS	-.386	(-11.16)	-.337	(-10.12)	-.381	(-11.72)
R	-.579	(-4.60)	-.511	(-4.21)	-.556	(-4.71)
SC	-.611	(-1.98)	-.642	(-2.16)	-.646	(-2.23)
N	.173	(13.04)	.148	(11.58)	.167	(13.34)
s	2.414	(5.70)	9.274	(22.72)	7.278	(18.30)
CJ	-.060	(-1.35)	-.084	(-1.95)	-.072	(-1.72)
	R^2 = .853		R^2 = .851		R^2 = .866	
	n = 3442		n = 3442		n = 3442	

Notes: R^2 = adjusted coefficient of variation; and n = number of observations. All regressions include judge specific effects which are presented in Tables 3A, 3B and 3C.

Our main interest is outside-circuit citations because, as noted earlier, they are more likely to reflect the persuasive power or influence of a judge's opinion rather than the precedential effect of an opinion. However, we also include regression estimates for inside-circuit citations for they may be a rough proxy of a judge's influence within his circuit given that judges in the same circuit (especially a large circuit) have some flexibility in choosing which decisions to cite. And for completeness, we also present regression estimates for total citations.

The signs and statistical significance of the regression coefficients on experience (E) and experience-squared (E^2) in Table 2 indicate that citations initially increase with tenure as judicial capital builds up but eventually begin to decline as depreciation of

prior opinions more than offsets additional new opinions. The regression coefficients on E and E^2 imply that annual citations (or judicial capital) peak for a typical judge at around 19 to 22 years experience and begin to decline thereafter.[36] Table 2 also shows that citations are significantly lower during the first three years of experience. The dummy variables Y(1), Y(2) and Y(3) are all negative and highly significant. Not surprisingly, the largest effect is for the first year in which the combined negative effects of supply (a lower measured capital stock) and demand (a lower measured demand for i's capital) should be most pronounced.

As expected, the senior status (SS) and retired (R) variables have large and significant negative effects on citations. Annual citations fall by about 38 percent for judges on senior status and by over 50 percent for judges who have left the bench. Since prior opinions depreciate by about 20 to 26 percent per year,[37] and retired judges publish no opinions while those on senior status greatly reduce the number they publish (12.2 published opinions per year compared to 28.6 for active judges), a judge's capital stock and hence the citations he receives would decline sharply after a few years of retirement or senior status. Regarding the Supreme Court (SC) and chief judge (CJ) variables, we find no evidence that either leads to an increase in demand for the judge's appellate capital. Indeed, the coefficients on the SC and retired variables are of comparable magnitude, indicating that the only effect on citations of Ginsburg's and Breyer's appointment to the Supreme Court is the negative one associated with not publishing any additional appellate opinions.

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[36] We calculate the year in which citations peak by taking the derivative of the regression equation with respect to experience and setting its value equal to zero. That is, we set

$$\partial \ln C / \partial Y = b_1 + 2b_2 Y = 0,$$

which yields a peak number of citations at 19.49 years experience for outside-circuit citations, 22.19 for inside-circuit citations, and 20.80 for total citations.

[37] The depreciation estimates come from the average influence regressions presented in Table 4. Assuming a depreciation rate of say 23 percent, a judge's capital stock would fall by over 50 percent after three years of retirement and by about 30 percent after three years on senior status.

Table 2 shows that the positive effect of the growth in published opinions (N) over time dominates any possible negative effect that could result from a greater number of judges competing for citations. The regression coefficients on N are positive and significant in all regressions and indicate that the number of citations a judge receives increases by about 15 to 17 percent per thousand increase in N. We also find that the circuit's share of signed opinions (s) has a positive and significant effect on both outside and inside circuit citations. We expect this for inside circuit citations because an increase in s (holding N constant) increases the number of opportunities a judge has to be cited within his circuit. But for outside circuit citations an increase in s (holding N constant) should mean fewer outside citation opportunities. A possible explanation for the positive coefficient on s in the outside circuit regression is that larger circuits may have on average more important cases which could offset the negative effect on citations of a smaller base of outside opinions.[38]

Turning to the regression coefficients (and t-ratios) for the individual judges in Tables 2A, 2B and 2C (2A for outside circuit citations, 2B for inside circuit citations and 2C for total citations), we observe that nearly all are significantly different from zero. Each regression coefficient measures the percentage increase (or decrease) in a judge's annual citations compared to the amount predicted by his tenure, status and other independent variables. By comparing these coefficients among different judges, we can rank judges by their overall influence. Tables 2A and 2C rank judges across cirucits, and Table 2B ranks judges within each circuit.

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[38] Notice that both the regression coefficient and significance of s are almost four times greater for inside than outside circuit citations which is consistent with our prediction that s should have a greater positive impact on inside than outside circuit citations.

TABLE 2A
JUDGE-SPECIFIC EFFECTS FOR OUTSIDE CIRCUIT CITATIONS: TOTAL INFLUENCE REGRESSIONS

Judge	*Circuit*	*Rank*	*Total coeff.*	*Total t-ratio*
posner	7	1	4.41	30.56
selya	1	2	4.09	24.62
easterbrook	7	3	3.92	24.58
coffin	1	4	3.83	39.54
campbell	1	5	3.74	34.65
cudahy	7	6	3.73	27.34
newman	2	7	3.69	27.82
bownes	1	8	3.67	30.43
flaum	7	9	3.64	23.66
oakes	2	10	3.62	32.35
rosenn	3	11	3.51	32.71
woodjr	7	12	3.51	28.41
becker	3	13	3.51	25.21
pell	7	14	3.51	31.78
smith	5	15	3.49	18.71
breyer	1	16	3.49	25.83
phillips	4	17	3.48	27.26
pratt	2	18	3.47	23.92
mcmillian	8	19	3.47	26.30
cummings	7	20	3.45	32.24
johnson	5	21	3.45	22.54
wilkinson	4	22	3.43	22.37
greenberg	3	23	3.42	19.56
coffey	7	24	3.42	23.64
aldisert	3	25	3.42	32.93
higginbotham	5	26	3.42	21.29
heaney	8	27	3.42	32.52
edwards	12	28	3.40	25.29
sneed	9	29	3.40	27.35
winter	2	30	3.40	24.25
bright	8	31	3.40	31.55
johnson	5	32	3.39	22.45
walker	2	33	3.38	17.04
garth	3	34	3.37	29.69
wright	9	35	3.37	28.87
lumbard	2	36	3.37	37.09
torruella	1	37	3.37	22.04
goldberg	5	38	3.36	26.31
wald	12	39	3.36	25.72
feinberg	2	40	3.35	32.68

Judge	Circuit	Rank	Total coeff.	Total t-ratio
wallace	9	41	3.33	27.09
kearse	2	42	3.32	25.72
sloviter	3	43	3.31	25.96
bauer	7	44	3.31	27.38
tuttle	11	45	3.31	29.20
arnold-r	8	46	3.30	24.41
russell	4	47	3.30	29.88
roney	11	48	3.30	24.64
contie	6	49	3.29	22.81
wisdom	5	50	3.29	28.25
boochever	9	51	3.29	22.72
cardamone	2	52	3.29	23.46
clark	11	53	3.28	21.71
cyr	1	54	3.27	16.60
henley	8	55	3.27	27.26
ebel	10	56	3.27	17.58
seymour	10	57	3.26	24.69
king	5	58	3.26	17.43
meskill	2	59	3.25	27.48
logan	10	60	3.25	25.94
bowman	8	61	3.25	21.42
hill	11	62	3.24	22.59
milburn	6	63	3.23	20.07

Judge	Circuit	Rank	Total coeff.	Total t-ratio
fletcher	9	64	3.22	22.74
lay	8	65	3.20	30.63
barrett	10	66	3.19	29.48
mahoney	2	67	3.16	18.86
butzner	4	68	3.16	31.05
tjoflat	11	69	3.15	21.92
weis	3	70	3.15	28.26
fernandez	9	71	3.15	15.43
ross	8	72	3.14	28.14
murnaghan	4	73	3.14	23.86
ervin	4	74	3.14	23.27
boggs	6	75	3.13	18.67
williams	12	76	3.12	18.81
kravitch	11	77	3.11	20.51
fay	11	78	3.11	21.22
miner	2	79	3.10	19.33
oscannlain	9	80	3.10	17.02
stapleton	3	81	3.09	19.33
mckay	10	82	3.08	24.59
manion	7	83	3.07	17.82
ripple	7	84	3.05	19.16
cowen	3	85	3.05	17.45
choy	9	86	3.05	25.80

Judge	Circuit	Rank	Total coeff.	Total t-ratio
kennedy	6	87	3.04	22.81
martin	6	88	3.04	22.80
garwood	5	89	3.04	19.25
wollman	8	90	3.03	18.62
pierce	2	91	3.02	21.61
higginbotham	3	92	3.01	23.92
beam	8	93	3.00	16.90
aldrich	1	94	3.00	34.19
reinhardt	9	95	3.00	20.62
thornberry	5	96	2.99	23.80
seitz	3	97	2.99	29.67
alarcon	9	98	2.99	21.13
merritt	6	99	2.98	23.70
rymer	9	100	2.98	14.59
canby	9	101	2.97	20.46
jones	5	102	2.96	17.58
vangraafeiland	2	103	2.96	25.20
lively	6	104	2.96	26.32
wiggins	9	105	2.96	18.24
wilkins	4	106	2.95	17.77
reavley	5	107	2.95	19.30
politz	5	108	2.95	19.25
mikva	12	109	2.95	22.50

Judge	Circuit	Rank	Total coeff.	Total t-ratio
keith	6	110	2.94	22.70
anderson	11	111	2.94	19.12
ryan	6	112	2.93	17.44
thompson	9	113	2.91	17.35
widener	4	114	2.90	25.81
wiener	5	115	2.89	13.95
fagg	8	116	2.89	19.72
baldock	10	117	2.89	18.05
timbers	2	118	2.89	25.89
krupansky	6	119	2.89	20.61
mansmann	3	120	2.89	18.08
magill	8	121	2.88	17.71
eschbach	7	122	2.88	20.01
tang	9	123	2.88	21.24
mackinnon	12	124	2.87	27.44
scirica	3	125	2.87	16.42
wellford	6	126	2.87	19.85
sprouse	4	127	2.85	21.72
ginsburg-d	12	128	2.85	17.20
brorby	10	129	2.85	16.19
tacha	10	130	2.84	17.70
godbold	11	131	2.83	22.53
sentelle	12	132	2.83	16.26

Judge	Circuit	Rank	Total coeff.	Total t-ratio
guy	6	133	2.83	17.58
anderson	10	134	2.82	17.60
jones	6	135	2.82	21.13
ferguson	9	136	2.81	19.96
morgan	11	137	2.81	21.62
duhe	5	138	2.81	14.33
hatchett	11	139	2.80	18.49
mcwilliams	10	140	2.79	25.83
celebrezze	6	141	2.79	27.82
fairchild	7	142	2.78	26.37
skopil	9	143	2.77	19.63
holloway	10	144	2.77	26.29
goodwin	9	145	2.76	23.22
chapman	4	146	2.76	19.93
hug	9	147	2.76	20.30
hall	4	148	2.75	22.55
peck	6	149	2.74	26.58
silberman	12	150	2.74	17.27
nelson-d	9	151	2.74	19.36
farris	9	152	2.71	19.13
nelson	6	153	2.70	16.11
pregerson	9	154	2.69	18.95
engel	6	155	2.68	23.29

Judge	Circuit	Rank	Total coeff.	Total t-ratio
jolly	5	156	2.68	16.99
moore	10	157	2.67	17.36
brown	6	158	2.66	19.95
altimari	2	159	2.66	16.54
williams	5	160	2.64	17.01
edmondson	11	161	2.61	14.55
garza-r	5	162	2.60	16.95
hutchinson	3	163	2.59	14.80
hall	9	164	2.58	15.90
suhrheinrich	6	165	2.58	12.99
ginsburg-r	12	166	2.57	18.48
seth	10	167	2.57	26.85
kanne	7	168	2.56	15.48
cox	11	169	2.53	12.93
trott	9	170	2.53	13.21
edwards	6	171	2.53	25.80
browning	9	172	2.53	23.60
weick	6	173	2.52	27.13
norris	9	174	2.50	17.25
beezer	9	175	2.49	15.88
barksdale	5	176	2.49	12.02
schroeder	9	177	2.49	17.54
kozinski	9	178	2.46	14.65

Judge	Circuit	Rank	Total coeff.	Total t-ratio
birch	11	179	2.45	11.81
nygaard	3	180	2.43	13.15
noonan	9	181	2.40	14.31
poole	9	182	2.39	16.84
dyer	11	183	2.33	18.59
buckley	12	184	2.31	14.52
henderson	11	185	2.30	15.27
davis	5	186	2.30	14.02
merrill	9	187	2.29	22.15
leavy	9	188	2.25	12.91
brunetti	9	189	2.20	13.11
norris	6	190	2.16	12.86
kilkenny	9	191	2.10	18.25
nies	13	192	1.81	12.79
chambers	9	193	1.61	16.09
friedman	13	194	1.37	10.00
jones	11	195	1.37	12.04
newman	13	196	1.26	8.58
bennett	13	197	1.15	8.13
mayer	13	198	1.10	6.35
michel	13	199	1.05	5.72
rich	13	200	1.00	7.04
archer	13	201	0.96	6.09
smith	13	202	0.81	5.70
miller	13	203	0.32	2.26
cowen	13	204	0.22	1.59
skelton	13	205	-0.12	-0.86

TABLE 2B
JUDGE-SPECIFIC EFFECTS FOR INSIDE CIRCUIT CITATIONS: TOTAL INFLUENCE REGRESSIONS

Judge	*Circuit*	*Rank*	*Total coeff*	*Total t-ratio*
selya	1	1	4.58	28.44
cyr	1	2	3.76	19.62
torruella	1	3	3.61	24.38
bownes	1	4	3.44	29.38
breyer	1	5	3.31	25.25
campbell	1	6	3.08	29.42
coffin	1	7	2.95	31.33
aldrich	1	8	1.98	23.26
mahoney	2	1	2.99	18.39
oakes	2	2	2.99	27.49
kearse	2	3	2.99	23.78
newman	2	4	2.97	23.07
cardamone	2	5	2.97	21.83
pratt	2	6	2.96	21.00
walker	2	7	2.93	15.17
winter	2	8	2.86	20.98
pierce	2	9	2.81	20.74
meskill	2	10	2.75	23.95
miner	2	11	2.71	17.41
altimari	2	12	2.58	16.57
feinberg	2	13	2.54	25.57
vangraafeiland	2	14	2.45	21.51
lumbard	2	15	2.40	27.27
timbers	2	16	2.37	21.86
becker	3	1	3.01	22.27
aldisert	3	2	3.00	29.74
mansmann	3	3	2.99	19.32
stapleton	3	4	2.98	19.23
sloviter	3	5	2.92	23.54
greenberg	3	6	2.91	17.13
garth	3	7	2.86	25.94
rosenn	3	8	2.78	26.62
cowen	3	9	2.69	15.86
scirica	3	10	2.65	15.59
higginbotham	3	11	2.58	21.08
hutchinson	3	12	2.57	15.11
nygaard	3	13	2.53	14.09
seitz	3	14	2.49	25.47
weis	3	15	2.44	22.55
wilkinson	4	1	2.79	18.77

Judge	Circuit	Rank	Total coeff	Total t-ratio
phillips	4	2	2.61	21.00
ervin	4	3	2.44	18.62
murnaghan	4	4	2.28	17.89
russell	4	5	2.19	20.42
wilkins	4	6	2.08	12.90
sprouse	4	7	2.03	15.91
butzner	4	8	2.00	20.22
chapman	4	9	1.99	14.79
widener	4	10	1.86	17.10
hall	4	11	1.79	15.12
king	5	1	2.92	16.10
duhe	5	2	2.88	15.17
smith	5	3	2.83	15.59
johnson	5	4	2.82	18.94
higginbotham	5	5	2.79	17.87
garwood	5	6	2.56	16.68
politz	5	7	2.50	16.77
barksdale	5	8	2.39	11.88
goldberg	5	9	2.36	19.02
jones	5	10	2.35	14.35
williams	5	11	2.26	15.02
reavley	5	12	2.23	15.04
wiener	5	13	2.23	11.05

Judge	Circuit	Rank	Total coeff	Total t-ratio
jolly	5	14	2.22	14.51
wisdom	5	15	2.20	19.41
garza-r	5	16	2.18	14.65
thornberry	5	17	2.16	17.72
davis	5	18	2.12	13.29
contie	6	1	2.94	20.96
milburn	6	2	2.86	18.30
ryan	6	3	2.81	17.22
boggs	6	4	2.70	16.58
kennedy	6	5	2.62	20.24
martin	6	6	2.55	19.73
keith	6	7	2.53	20.08
krupansky	6	8	2.51	18.48
guy	6	9	2.43	15.58
lively	6	10	2.27	20.83
wellford	6	11	2.22	15.81
jones	6	12	2.17	16.78
brown	6	13	2.17	16.74
nelson	6	14	2.15	13.19
merritt	6	15	2.13	17.43
engel	6	16	2.07	18.51
celebrezze	6	17	2.02	20.71
suhrheinrich	6	18	1.90	9.85

Judge	Circuit	Rank	Total coeff	Total t-ratio
peck	6	19	1.85	18.44
weick	6	20	1.85	20.48
edwards	6	21	1.61	16.90
norris	6	22	1.47	9.03
posner	7	1	4.05	28.89
easterbrook	7	2	4.01	25.90
flaum	7	3	3.78	25.36
coffey	7	4	3.52	25.05
ripple	7	5	3.39	21.89
manion	7	6	3.31	19.80
cudahy	7	7	3.25	24.53
eschbach	7	8	3.15	22.57
woodjr	7	9	3.14	26.17
bauer	7	10	2.89	24.63
kanne	7	11	2.76	17.21
pell	7	12	2.72	25.38
cummings	7	13	2.62	25.18
fairchild	7	14	1.94	18.94
bowman	8	1	3.41	23.18
mcmillian	8	2	3.24	25.35
beam	8	3	3.17	18.37
arnold-r	8	4	3.06	23.34

Judge	Circuit	Rank	Total coeff	Total t-ratio
wollman	8	5	3.03	19.21
henley	8	6	3.02	25.91
magill	8	7	2.93	18.52
heaney	8	8	2.85	27.93
ross	8	9	2.85	26.32
fagg	8	10	2.82	19.75
lay	8	11	2.77	27.25
bright	8	12	2.74	26.21
wallace	9	1	3.05	25.57
boochever	9	2	3.03	21.52
oscannlain	9	3	2.94	16.66
wiggins	9	4	2.88	18.31
fernandez	9	5	2.83	14.27
fletcher	9	6	2.82	20.48
wright	9	7	2.81	24.83
reinhardt	9	8	2.79	19.78
sneed	9	9	2.72	22.55
nelson-d	9	10	2.72	19.78
alarcon	9	11	2.71	19.76
skopil	9	12	2.69	19.64
thompson	9	13	2.65	16.24
beezer	9	14	2.64	17.35
canby	9	15	2.62	18.57

Judge	Circuit	Rank	Total coeff	Total t-ratio
pregerson	9	16	2.62	19.02
hall	9	17	2.58	16.39
rymer	9	18	2.54	12.83
norris	9	19	2.51	17.83
trott	9	20	2.49	13.41
choy	9	21	2.49	21.67
hug	9	22	2.48	18.80
tang	9	23	2.47	18.76
goodwin	9	24	2.42	20.95
ferguson	9	25	2.39	17.47
brunetti	9	26	2.35	14.44
farris	9	27	2.33	16.89
poole	9	28	2.32	16.87
kozinski	9	29	2.13	13.08
leavy	9	30	2.06	12.17
schroeder	9	31	1.94	14.07
noonan	9	32	1.80	11.06
kilkenny	9	33	1.67	14.98
browning	9	34	1.63	15.70
merrill	9	35	1.30	12.88
chambers	9	36	0.59	6.07
ebel	10	1	3.64	20.13
baldock	10	2	3.40	21.85

Judge	Circuit	Rank	Total coeff	Total t-ratio
seymour	10	3	3.19	24.94
brorby	10	4	3.14	18.41
anderson	10	5	3.10	19.95
logan	10	6	3.03	24.90
tacha	10	7	3.01	19.35
barrett	10	8	2.97	28.25
mckay	10	9	2.80	23.07
moore	10	10	2.66	17.76
holloway	10	11	2.47	24.18
mcwilliams	10	12	2.34	22.30
seth	10	13	2.01	21.61
johnson	11	1	2.72	18.58
clark	11	2	2.52	17.19
anderson	11	3	2.41	16.12
hill	11	4	2.41	17.29
tjoflat	11	5	2.40	17.22
fay	11	6	2.38	16.73
roney	11	7	2.38	18.30
kravitch	11	8	2.33	15.81
hatchett	11	9	2.14	14.52
edmondson	11	10	2.10	12.05
tuttle	11	11	2.06	18.70
godbold	11	12	2.05	16.79

Judge	Circuit	Rank	Total coeff	Total t-ratio
morgan	11	13	1.91	15.14
cox	11	14	1.85	9.73
birch	11	15	1.77	8.81
henderson	11	16	1.71	11.69
dyer	11	17	1.39	11.38
jones	11	18	0.37	3.38
edwards	12	1	3.26	24.93
wald	12	2	3.19	25.14
williams	12	3	3.06	18.98
sentelle	12	4	2.89	17.10
silberman	12	5	2.70	17.48
mikva	12	6	2.67	20.94
ginsburg-d	12	7	2.51	15.61
buckley	12	8	2.46	15.96
mackinnon	12	9	2.39	23.51
ginsburg-r	12	10	2.20	16.26
nies	13	1	3.29	23.92
rich	13	2	3.02	21.83
michel	13	3	2.70	15.10
bennett	13	4	2.59	18.83
smith	13	5	2.59	18.80
newman	13	6	2.57	17.99

Judge	Circuit	Rank	Total coeff	Total t-ratio
archer	13	7	2.52	16.35
friedman	13	8	2.35	17.63
mayer	13	9	2.33	13.80
miller	13	10	1.92	13.83
skelton	13	11	1.08	7.86
cowen	13	12	0.79	5.91

TABLE 2C
JUDGE-SPECIFIC EFFECTS FOR TOTAL CIRCUIT CITATIONS: TOTAL INFLUENCE REGRESSIONS

Judge	*Circuit*	*Rank*	*Total* *coeff.*	*t-ratio*
selya	1	1	5.11	33.82
posner	7	2	4.86	37.02
easterbrook	7	3	4.70	32.41
flaum	7	4	4.43	31.66
cyr	1	5	4.29	23.91
bownes	1	6	4.23	38.57
torruella	1	7	4.21	30.32
ebel	10	8	4.21	24.84
coffey	7	9	4.19	31.84
cudahy	7	10	4.12	33.21
coffin	1	11	4.11	46.58
breyer	1	12	4.08	33.20
campbell	1	13	4.08	41.48
bowman	8	14	4.06	29.39
edwards	12	15	4.01	32.77
mcmillian	8	16	4.01	33.41
newman	2	17	3.99	33.03
woodjr	7	18	3.98	35.40
ripple	7	19	3.98	27.43

Judge	*Circuit*	*Rank*	*Total* *coeff.*	*t-ratio*
oakes	2	20	3.95	38.74
wald	12	21	3.94	33.18
manion	7	22	3.92	25.04
baldock	10	23	3.92	26.87
becker	3	24	3.92	30.91
seymour	10	25	3.89	32.43
greenberg	3	26	3.88	24.34
pratt	2	27	3.87	29.32
aldisert	3	28	3.87	40.94
wallace	9	29	3.85	34.43
arnold-r	8	30	3.83	31.13
boochever	9	31	3.82	28.95
beam	8	32	3.81	23.57
logan	10	33	3.81	33.42
henley	8	34	3.81	34.90
rosenn	3	35	3.80	38.87
wilkinson	4	36	3.79	27.18
kearse	2	37	3.78	32.16
cardamone	2	38	3.78	29.67

Judge	*Circuit*	*Rank*	*Total coeff.*	*Total t-ratio*
winter	2	39	3.78	29.62
williams	12	40	3.78	25.05
garth	3	41	3.78	36.54
heaney	8	42	3.78	39.48
eschbach	7	43	3.77	28.83
walker	2	44	3.77	20.86
bauer	7	45	3.77	34.24
contie	6	46	3.77	28.67
barrett	10	47	3.76	38.13
sloviter	3	48	3.76	32.34
mahoney	2	49	3.74	24.56
pell	7	50	3.74	37.20
johnson	5	51	3.74	26.81
smith	5	52	3.74	21.98
king	5	53	3.73	21.97
phillips	4	54	3.73	32.07
wollman	8	55	3.73	25.19
wright	9	56	3.72	34.99
bright	8	57	3.71	37.83
higginbotham	5	58	3.71	25.38
stapleton	3	59	3.71	25.52
milburn	6	60	3.70	25.29
brorby	10	61	3.70	23.14

Judge	*Circuit*	*Rank*	*Total coeff.*	*Total t-ratio*
oscannlain	9	62	3.69	22.30
anderson	10	63	3.67	25.19
cummings	7	64	3.67	37.63
johnson	11	65	3.66	26.65
sneed	9	66	3.65	32.29
ross	8	67	3.65	35.99
fletcher	9	68	3.65	28.28
meskill	2	69	3.64	33.82
mansmann	3	70	3.64	25.05
fernandez	9	71	3.62	19.52
lay	8	72	3.61	37.97
mckay	10	73	3.61	31.65
wiggins	9	74	3.60	24.39
tacha	10	75	3.60	24.69
nies	13	76	3.59	27.85
duhe	5	77	3.59	20.14
pierce	2	78	3.58	28.11
feinberg	2	79	3.57	38.25
boggs	6	80	3.56	23.31
magill	8	81	3.56	24.03
miner	2	82	3.55	24.32
reinhardt	9	83	3.55	26.84
sentelle	12	84	3.55	22.37

Judge	*Circuit*	*Rank*	*Total coeff.*	*t-ratio*
cowen	3	85	3.54	22.21
ryan	6	86	3.53	23.11
fagg	8	87	3.53	26.42
clark	11	88	3.50	25.46
lumbard	2	89	3.50	42.33
alarcon	9	90	3.48	27.06
kennedy	6	91	3.47	28.62
mikva	12	92	3.46	28.98
ervin	4	93	3.45	28.14
higginbotham	3	94	3.45	30.12
weis	3	95	3.44	33.87
russell	4	96	3.44	34.23
nelson-d	9	97	3.44	26.66
canby	9	98	3.43	25.93
skopil	9	99	3.43	26.70
martin	6	100	3.42	28.23
silberman	12	101	3.42	23.67
scirica	3	102	3.42	21.49
thompson	9	103	3.42	22.38
garwood	5	104	3.42	23.80
goldberg	5	105	3.41	29.40
kanne	7	106	3.41	22.69
murnaghan	4	107	3.41	28.47

Judge	*Circuit*	*Rank*	*Total coeff.*	*t-ratio*
roney	11	108	3.40	27.94
hill	11	109	3.40	26.05
rymer	9	110	3.39	18.26
keith	6	111	3.39	28.69
seitz	3	112	3.39	36.94
choy	9	113	3.37	31.34
tjoflat	11	114	3.36	25.66
pregerson	9	115	3.36	26.01
politz	5	116	3.35	24.04
vangraafeiland	2	117	3.35	31.37
ginsburg-d	12	118	3.35	22.20
krupansky	6	119	3.34	26.18
fay	11	120	3.34	25.04
moore	10	121	3.33	23.75
anderson	11	122	3.31	23.65
kravitch	11	123	3.31	23.96
butzner	4	124	3.31	35.75
mackinnon	12	125	3.30	34.63
beezer	9	126	3.30	23.07
wisdom	5	127	3.29	31.04
holloway	10	128	3.28	34.28
tang	9	129	3.28	26.62
timbers	2	130	3.27	32.25

Judge	Circuit	Rank	Total coeff.	Total t-ratio
hall	9	131	3.27	22.15
altimari	2	132	3.27	22.38
guy	6	133	3.26	22.29
rich	13	134	3.26	25.16
hug	9	135	3.26	26.36
jones	5	136	3.25	21.18
lively	6	137	3.24	31.70
goodwin	9	138	3.24	29.96
hutchinson	3	139	3.24	20.33
mcwilliams	10	140	3.23	32.82
ferguson	9	141	3.23	25.15
norris	9	142	3.23	24.42
tuttle	11	143	3.21	31.11
aldrich	1	144	3.21	40.17
trott	9	145	3.20	18.35
merritt	6	146	3.19	27.86
wellford	6	147	3.19	24.27
reavley	5	148	3.18	22.83
thornberry	5	149	3.18	27.77
farris	9	150	3.15	24.37
wilkins	4	151	3.14	20.79
wiener	5	152	3.14	16.61
barksdale	5	153	3.13	16.56

Judge	Circuit	Rank	Total coeff.	Total t-ratio
nygaard	3	154	3.12	18.55
jones	6	155	3.12	25.74
williams	5	156	3.12	22.07
sprouse	4	157	3.11	26.03
hatchett	11	158	3.08	22.33
buckley	12	159	3.08	21.29
jolly	5	160	3.07	21.40
garza-r	5	161	3.07	21.97
nelson	6	162	3.06	20.05
celebrezze	6	163	3.06	33.56
widener	4	164	3.05	29.86
ginsburg-r	12	165	3.05	24.07
brown	6	166	3.05	25.12
chapman	4	167	3.04	24.17
poole	9	168	3.04	23.58
godbold	11	169	3.03	26.48
brunetti	9	170	3.03	19.82
engel	6	171	3.01	28.76
hall	4	172	2.98	26.86
fairchild	7	173	2.97	30.94
edmondson	11	174	2.96	18.12
michel	13	175	2.95	17.64
kozinski	9	176	2.94	19.26

Judge	Circuit	Rank	Total coeff.	Total t-ratio
morgan	11	177	2.93	24.76
seth	10	178	2.93	33.69
peck	6	179	2.93	31.19
bennett	13	180	2.92	22.64
davis	5	181	2.89	19.32
newman	13	182	2.88	21.51
smith	13	183	2.88	22.28
suhrheinrich	6	184	2.85	15.81
weick	6	185	2.82	33.36
schroeder	9	186	2.81	21.80
archer	13	187	2.80	19.41
cox	11	188	2.78	15.61
leavy	9	189	2.77	17.45
friedman	13	190	2.74	21.92
edwards	6	191	2.69	30.15
birch	11	192	2.67	14.15
noonan	9	193	2.67	17.47
browning	9	194	2.65	27.23
mayer	13	195	2.65	16.74
henderson	11	196	2.63	19.14
kilkenny	9	197	2.52	24.09
dyer	11	198	2.43	21.26
norris	6	199	2.42	15.84
merrill	9	200	2.37	25.18
miller	13	201	2.19	16.79
chambers	9	202	1.66	18.27
jones	11	203	1.40	13.51
skelton	13	204	1.36	10.51
cowen	13	205	1.16	9.24

Before discussing the rankings, a word of caution is in order. One should not attach great significance to the precise rankings or even small differences in rankings among judges. To be sure, the coefficient on Posner, the highest ranking judge in Table 2A, is significantly different at the .05 level from every judge below him but Selya (and from Selya too at the .10 level). But that is unusual. Consider, for example, the median judge (Vangraafeiland) in Table 2A.[39] He is significantly different from 109 judges (52 of those ranked in the top 53 and 57 of those ranked in the bottom 60) at the .05 level and 123 judges at the .10 level.[40] But this means that we cannot reject the hypothesis (at the .05 level) that judges ranked roughly from 54 to 145 are not significantly different from Vangraafeiland. To take another example, the 10th ranked judge (Oakes) in Table 2A is significantly different at the .05 level from the top two judges and almost all judges ranked below 35.[41] Hence we cannot reject the hypothesis that judges ranked between 3 and 34 are not significantly different from Oakes at the .05 level.

Consider the inside circuit coefficients in Table 2B. Here we find that a majority of judges (128 at the .05 level and 111 at the .10 level) are not significantly different from the median judge in their

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[39] To calculate whether judge A (say the median or Posner or the 10th ranked judge) differs significantly from other judges, we reestimate the regression equations in Table 2 deleting A's judge specific variable and adding a constant term. Then the regression coefficient for a particular judge measures the difference between that judge and A's total influence, and the t-ratio measures the significance of that difference.

[40] For the regression on total citations (outside plus inside), 90 judges (57 of the top 59 and 33 of the bottom 35) are significantly different from the median judge at the .05 level; and 104 (which include 62 of the top 69 and 36 of the bottom 45) at the .10 level. Note also that Selya is ranked first in Table 2C but is not significantly different from Posner or Easterbrook at the .05 level.

[41] Four judges ranked below 35 (those ranked 37, 39, 54, 56 and 58) are not significantly different from Oakes at the .05 level. In the regression on total citations, the 10th ranked judge (Cudahy) is significantly different from all judges ranked below 28 but two (those ranked 32 and 44). The reason that significance levels do not follow directly from the size of the regression coefficients is that the standard error tends to be greater for judges with fewer years of tenure (and hence, fewer observations).

respective circuit.[42] This varies from a high of 12 out of 14 judges in the 3rd circuit to a low of 5 out of 13 in the 7th circuit .[43]

Still, the fact that many of the regression coefficients on the individual judges are not statistically different from each other does not mean that we should ignore these coefficients.[44] First, they are the best estimates that we have of the differences in influence among judges. Second, many of the coefficients differ from each other by at least one standard error (which means that there is about a .67 probability that the difference is not due to chance). For example, 150, 138 and 130 judges differ from the median judge by at

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[42] Since there are 13 medians (one for each circuit), this leaves 192 judges to compare to the median judge in his circuit. To make these comparisons, we estimated the inside circuit regression 13 times, first leaving out the median judge in the 1st circuit, the median judge in the 2nd circuit and so forth. Then we tested whether the coefficients of the other judges in the circuit of the left out judge significantly differed significantly from zero (i.e., differed significantly from the left out or median judge). When there is an even number of judges in a circuit, we arbitrarily left out the higher ranked judge (e.g., if there are 8 judges, we left out the fourth rather than the fifth ranked judge).

[43] The table below lists for each circuit the number of its judges, and the number whose inside circuit regression coefficients are significantly different from the median judge in that circuit at the .05 and .10 level respectively.

	CIRCUITS												
judges	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
number	8	16	15	11	18	22	14	12	36	13	18	10	12
.05 level	4	4	2	2	4	10	8	3	9	5	5	3	5
.10 level	4	4	3	3	5	12	9	3	11	6	10	5	5

[44] Two judges, a and b, will differ from each other at the .05 level of significance if their regression coefficients differ by 1.96 times the standard error of the difference (or 1.65 times the standard error at the .10 level of significance). The standard error of the difference equals the square root of $[(s_a^2) + (s_b^2) - 2\text{cov}(ab)]$ where s_a and s_b denote the standard errors of the regression coefficients on judges a and b respectively and cov(ab) denotes the covariance of these error terms. Assuming that the covariance is zero, one can approximate the standard error of the difference from the data presented in Tables 2A, 2B and 2C by computing the square root of the sum of $[(a_a/t_a)^2 + (a_b/t_b)^2]$ where a and t denote the regression coefficients and t-ratios for the two judges. One would then multiply the standard error by either 1.96 or 1.65 and compare this to the difference between the estimated regression coefficients.

least one standard error in the outside, inside and total citation regressions respectively.[45] In short, we do not want to dismiss differences in these regression coefficients but we should be cautious about the inferences we derive from them. With that in mind, several interesting findings emerge from Tables 2A, B and C.

1. The 1st and 7th circuits dominate our top rankings of outside circuit and total citations. In Table 2A, four judges from the 1st and four from the 7th are in the top nine, and seven judges from the 7th circuit are in the top twenty. In Table 2C, five judges from the 7th circuit rank in the top ten, and seven from the 1st circuit rank in the top thirteen. The high rankings of many 7th and, to a lesser extent, 1st circuit judges reflect, in part, that they publish more signed opinions per year than do judges in other circuits (see Table 1). For example, Posner, Easterbrook, Flaum and Selya are the top four judges in number of signed opinions per year, and Cudahy is the tenth. Overall, the correlation between a judge's total influence coefficient and the average number of signed opinions he publishes in a year is positive—i.e., the more opinions a judge publishes per year, the greater his overall influence (holding constant tenure, current status, and so forth).[46]

2. Not surprisingly, judges in the federal circuit (denoted as the 13th circuit in our tables) are at the bottom of our outside circuit rankings. The ten lowest ranked judges are in the federal circuit, and 192 is the highest rank achieved by any federal circuit judge. The explanation is obvious. Their case mix is highly specialized and they publish the fewest opinions per year of any circuit. The federal circuit decides all patent appeals from the district courts and most appeals from the Trademark Trial and Appeals Board, which makes their decisions less useful to other circuits.[47] Judges in the D.C.

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[45] For the inside circuit regressions, the median refers to the median judge in each circuit.

[46] The simple correlation between the judge specific coefficients and average number of signed published opinions per year is .61 for outside circuit, .70 for inside circuit and .73 for total citations.

[47] This also shows up in Table 1 where 87 percent of the total citations per judge in the federal circuit are inside circuit compared to about 60 percent for

circuit (the 12th circuit in our tables) also tend to rank relatively low in outside circuit citations. These judges decide a disproportionately large number of appeals from administrative agencies,[48] which are less useful to other circuits, and they tend to publish fewer opinions per year than judges in other circuits. Judges Edwards and Wald rank 28 and 39 respectively but the remaining eight D.C. Circuit judges in our sample rank from 76 to 184.

3. Table 3 ranks the circuits by averaging the judge specific regression coefficients within each circuit for both outside and total citations. The 1st and 7th circuits rank highest on both scales followed by the 2nd (for outside citations) and the 8th (for total citations). Excluding the federal and D.C. circuits, the 6th, 9th and 11th rank at the bottom for outside and total citations.[49]

4. We estimated regression equations across the 13 circuits in which the dependent variable is the circuit's influence (computed by taking the average of the total influence coefficents of the judges in each circuit) and the independent variables are the number of signed published opinions per judge and the number of judges in each circuit. Consistent with our finding for individual judges (see footnotes 21 and 45), signed opinions per judge have a positive and significant effect on both outside and total citations.[50]

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other circuits. This suggests, of course, that federal circuits opinions are of little use to other circuits because of subject matter, not necessarily quality.

[48] See the 1992 Annual Report of the Director of the Administrative Office of the United States Courts 131 (Table B-1).

[49] The low ranking of the 11th circuit in the outside citations cannot be the result of counting 5th circuit citations to the 11th as inside not outside citations (see fn. 22) because the 11th also ranks low in total citations (which doesn't distinguish between inside and outside citations) and the 5th circuit ranks relatively high in outside citations (even though 11th circuit citations to the 5th are counted as inside citations). Recall that the 11th circuit was created out of the 5th circuit in 1981.

[50] The regression coefficients (and t-ratios) for the 13 observations are as follows:

$$\text{outside:}\quad \underset{(1.50)}{1.05} + \underset{(3.58)}{.06(S/n)} + \underset{(.50)}{.01n} \qquad R^2 = .49$$

$$\text{total:}\quad \underset{(6.33)}{2.33} + \underset{(4.83)}{.05(S/n)} - \underset{(.33)}{.004n} \qquad R^2 = .69$$

TABLE 3
TOTAL INFLUENCE RANKINGS BY CIRCUIT

		Outside Circuit		*Total*	
Circuit	*Number of Judges*	*Average Value of* α_i	*Ranking*	*Average Value of* α_i	*Ranking*
1st	8	3.56	2	4.17	2
2nd	16	3.23	3	3.65	4
3rd	15	3.12	6	3.60	6
4th	11	3.08	7	3.31	8
5th	18	3.16	5	3.33	7
6th	22	2.83	9	3.19	10
7th	13	3.63	1	4.27	1
8th	12	3.19	4	3.76	3
9th	36	2.74	10	3.23	9
10th	13	2.94	8	3.61	5
11th	18	2.64	11	3.02	12
DC	11	2.64	12	3.18	11
Federal	12	0.91	13	2.61	13
Total	205	2.88		3.40	

As expected, the number of judges per circuit—which approximates circuit size—is insignificant because the influence measures already control for differences in the relative size of circuits.[51]

5. To test whether judges who are more highly cited outside their circuit are also more highly cited within their circuit, we correlated the outside and inside circuit judge specific regression coefficients separately for each circuit. This gives us thirteen correlation coefficients. All coefficients were positive (ranging between .57 and .94) and significant at the .05 level except for the

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where (S/n) and n denote respectively the average annual number of published opinions per judge within each circuit and the number of judges in each circuit from our sample of 205 judges. We also estimated the above equations excluding the federal circuit which did not change our results.

[51] The influence measures are from the regression equations in Table 2 which includes a variable for the relative size of each circuit as measured by its share of published opinions.

8th circuit.[52] We also correlated the outside and inside circuit coefficients without regard to the individual circuits. This yielded a correlation of .58 which also confirms the positive relationship between outside and inside influence.

2. Average Influence Regression Equations

Tables 4 and 4A, 4B and 4C present our regression analysis of the average influence *per* published signed opinion or, roughly, the average times an opinion is cited. Each regression equation has 3237 observations (as opposed to 3442 for the total influence regressions) because we drop one observation per judge since citations lagged one year is an independent variable. As before, Table 4 presents the regression coefficients and t-ratios for all variables but the judge specific variables while Tables 4A and 4B present the judge specific effects for outside and inside citations.[53] (Since the coefficients in Table 4C are roughly the averages of the coefficients in 4A and 4B, Table 4C is not reproduced here but is available from the authors on request.)

Table 4 yields the following results.

1. The regression coefficients on lagged citations are highly significant in all equations and indicate that appellate opinions depreciate (which equals 1 minus the regression coefficient on lagged citations as shown in equations (5) through (7)) at around 20 to 26 percent per year. Somewhat counterintuitively, depreciation is higher for outside than inside citations.[54]

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[52] The correlation between the outside and inside influence coefficients for 8th circuit judges is positive (.13) but not significantly different from zero. The correlation coefficients for the other circuits are as follows: .62 (1st); .57 (2nd); .59 (3rd); .85 (4th); .58 (5th); .90 (6th); .67 (7th); .83 (9th); .67 (10th); .94 (11th); .83 (DC); and .86 (Fed).

[53] All independent variables in Table 4 but lagged citations are interacted with the individual judge's published opinions in that year. This specification follows directly from equations (5) - (7). To simplify, we discuss the regression coefficients without noting that they actually measure the effects of changes in the independent variables interacted with a judge's signed opinions.

[54] Although the difference in depreciation rates between outside and inside opinions is only three percent, this difference is statistically significant because the standard errors relative to the coefficients on past opinions is so small.

TABLE 4

CITATIONS TO FEDERAL COURTS OF APPEALS JUDGES: AVERAGE INFLUENCE REGRESSIONS

Independent Variables	Outside Circuit *coeff.*	Outside Circuit *t-ratio*	Inside Circuit *coeff.*	Inside Circuit *t-ratio*	Total *coeff.*	Total *t-ratio*
C_{it-1}	.738	(79.78)	.772	(94.05)	.797	(111.66)
$NO_{it}(x10^{-3})$	.075	(4.70)	.215	(8.09)	.222	(6.67)
sO_{it}	-.524	(-.91)	15.03	(14.82)	13.73	(11.16)
CJO_{it}	.013	(.27)	.040	(.48)	-.012	(-.11)
RO_{it}	-1.83	(-.75)	2.607	(.69)	.568	(.11)
SCO_{it}	.598	(.17)	.827	(.14)	1.61	(.22)
$Y(2)O_{it}$	-.423	(-8.87)	-.618	(-7.56)	-.838	(-8.27)
$Y(3)O_{it}$	-.281	(-6.52)	-.392	(-5.28)	-.496	(-5.41)
constant	9.71	(9.68)	14.60	(8.76)	17.74	(8.38)
	R^2 = .901 n = 3237		R^2 = .919 n = 3237		R^2 = .941 n = 3237	

Notes: The variable "O_{it}" denotes the number of published opinions by i in year t. R^2 = adjusted coefficient of variation; and n = number of observations. All regressions include judge specific effects which are presented in Tables 4A, 4B and 4C.

Since opinions cited outside a circuit tend to be less routine and fact specific than those typically cited within a circuit, they should be more durable and have a lower depreciation. Our regression analysis, however, does not support this hypothesis. A possible explanation is that a judge will usually be able to find many more recent outside than inside opinions to cite on a particular point simply because there are twelve outside circuits to choose from. Assuming a preference for citing more recent opinions, we would observe a systematic tendency for judges to cite newer outside than inside opinions and hence a higher depreciation rate for outside than inside citations.

2. The circuit's share (s) of total opinions has a negative but statistically insignificant effect in the outside circuit regression (which is weakly consistent with the hypothesis that a greater share means fewer opportunities to be cited outside the circuit). In contrast, s is positive and highly significant in the inside circuit regression because, as predicted, s increases the opportunities for such citations. We also find that the increase in number of published opinions (N) over time raises average influence. So any negative effect of greater competition associated with an increase in the number of judges over time is more than offset by the direct positive effect of a growth in opinions.

3. The coefficients on the second and third year experience variables (Y(2) and Y(3)) are negative and statistically significant This supports the presence of time lags between deciding a case, its publication with an F.2d cite, and publication of opinions in F.2d that cite the earlier opinion.[55]

4. Finally, the chief judge (CJ), retired (R) and Supreme Court (SC) variables are insignificant in all regressions. Thus, the negative coefficients of the R and SC variables on total influence in Table 2 are the result of a decline in the production of new opinions by judges no longer on the court or on senior status rather than by any decline in the average influence of their opinions.

Tables 4A and 4B list the judge specific regression coefficients on average influence.[56] More than half the coefficients (and about 80 percent in Table 4C) are not significantly different from zero at

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[55] The first observation for each judge is citations in his second year because we include lagged citations as an independent variable in the regression. Hence, Y(1) drops out of the regression.

[56] Although we refer to the regression coefficients on the individual judges in these tables as average influence measures, these coefficients alone do not measure average influence. Average influence equals the sum of the regression coefficients in Table 4 plus the judge specific regression coefficient and excluding the coefficient on lagged citations. The judge specific coefficients, therefore, measure the effect on average influence holding constant differences among judges in the other variables in the regression. That is why, for example, the regression coefficient on a particular judge can be negative even though his average influence is positive.

the .05 level. Those that are significant tend to be for judges at the high or low end of the rankings. Moreover, differences among judges in average influence are often not statistically significant. [57] For example, in Table 4A only 16 judges (the top five and bottom 11) are significantly different from the median judge at the .05 level. The number rises to 20 judges (the top 6 and bottom 14) at the .10 level. And only 41 judges (the top 25 and bottom 16) differ from the medium by at least one standard error.

Turning to the coefficients themselves, we observe that judges in the 7th circuit no longer dominate the top rankings as they did for total influence. In Table 4A, Posner and Easterbrook drop to 12th and 25th respectively, and no judge in the 7th circuit is among the top ten. The top ranked judges in Table 4A come from the 1st, 2nd and 3rd circuits. For example, four of the top five are from the 3rd circuit, three of the top nine are from the 1st circuit, and five of the top eighteen are from the 2nd circuit. Federal Circuit judges continue to rank at the bottom of the average influence scale for outside citations. Overall, there is a highly positive correlation between a judge's total influence (which depends on both average influence and the capital stock of published opinions) and his average influence.[58]

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[57] The standard error of the difference between two judge specific regression coefficients in Table 4A equals .374 using the formula $[(s_a^2) + (s_b^2) - 2cov(ab)]^{(1/2)}$), and assuming that both the covariance is zero and the variance of each regression coefficient equals .07 (which is a weighted average of the variances of the individual coefficients). Then, two judges will be significantly different from each other at the .05 level if the difference in their regression coefficients equals .733 (1.96 times .374), and at the .10 level if the difference equals .617 (1.65 times .374).

[58] The correlations between total influence (Tables 4A-C) and average influence (Tables 2A-C) are .86 for outside, .72 for inside and .53 for total citations.

TABLE 4A
JUDGE-SPECIFIC EFFECTS FOR OUTSIDE CIRCUIT CITATIONS: AVERAGE INFLUENCE REGRESSIONS

Judge	*Circuit*	*Rank*	*Total coeff.*	*t-ratio*
rosenn	3	1	1.226	5.732
aldisert	3	2	1.026	4.972
coffin	1	3	1.020	9.745
becker	3	4	1.017	5.687
garth	3	5	0.991	4.473
campbell	1	6	0.953	8.527
oakes	2	7	0.855	5.862
wilkins	4	8	0.848	2.411
selya	1	9	0.844	6.004
goldberg	5	10	0.828	4.331
feinberg	2	11	0.825	5.352
posner	7	12	0.803	6.567
meskill	2	13	0.792	4.500
pell	7	14	0.779	5.811
phillips	4	15	0.763	4.307
bownes	1	16	0.716	5.824
newman	2	17	0.705	4.381
kearse	2	18	0.694	4.363
roney	11	19	0.691	3.704
kravitch	11	20	0.666	3.329

Judge	*Circuit*	*Rank*	*Total coeff.*	*t-ratio*
russell	4	21	0.638	3.289
walker	2	22	0.638	2.384
tjoflat	11	23	0.631	2.970
sneed	9	24	0.631	3.757
easterbrook	7	25	0.628	4.540
wallace	9	26	0.622	3.779
wald	12	27	0.611	3.270
timbers	2	28	0.610	2.489
choy	9	29	0.603	3.180
sloviter	3	30	0.583	3.680
butzner	4	31	0.581	3.315
johnson	11	32	0.578	2.937
seitz	3	33	0.577	3.170
wright	9	34	0.574	3.587
johnson	5	35	0.569	2.871
cardamone	2	36	0.565	3.060
mackinnon	12	37	0.558	2.452
weis	3	38	0.543	2.814
celebrezze	6	39	0.540	2.289
cummings	7	40	0.530	4.073

Judge	Circuit	Rank	Total coeff.	Total t-ratio
bright	8	41	0.528	3.774
woodjr	7	42	0.526	3.777
pratt	2	43	0.525	2.270
heaney	8	44	0.506	4.323
hill	11	45	0.489	2.531
edwards	12	46	0.489	2.296
higginbotham	5	47	0.481	2.545
smith	5	48	0.477	2.300
wilkinson	4	49	0.474	2.317
flaum	7	50	0.469	3.352
seymour	10	51	0.467	2.799
lumbard	2	52	0.461	3.355
wisdom	5	53	0.459	2.857
contie	6	54	0.457	1.983
thornberry	5	55	0.451	2.205
cudahy	7	56	0.448	3.246
clark	11	57	0.437	2.085
reinhardt	9	58	0.434	2.137
alarcon	9	59	0.433	2.118
holloway	10	60	0.413	2.112
henley	8	61	0.411	2.700
fay	11	62	0.405	1.803
baldock	10	63	0.404	2.021

Judge	Circuit	Rank	Total coeff.	Total t-ratio
lay	8	64	0.401	3.005
greenberg	3	65	0.400	1.588
higginbotham	3	66	0.398	1.870
anderson	11	67	0.392	1.704
breyer	1	68	0.390	2.613
godbold	11	69	0.382	2.027
keith	6	70	0.382	1.405
cowen	3	71	0.371	1.165
boochever	9	72	0.371	1.613
vangraafeiland	2	73	0.368	1.645
skopil	9	74	0.365	1.274
cyr	1	75	0.362	1.794
fletcher	9	76	0.362	1.967
wiggins	9	77	0.362	1.489
morgan	11	78	0.359	1.570
barrett	10	79	0.350	2.395
ross	8	80	0.346	2.333
lively	6	81	0.337	1.616
tuttle	11	82	0.336	2.277
boggs	6	83	0.332	1.315
murnaghan	4	84	0.330	1.670
ervin	4	85	0.329	1.831
bauer	7	86	0.326	2.350

Judge	Circuit	Rank	Total coeff.	Total t-ratio
peck	6	87	0.321	1.392
logan	10	88	0.321	2.339
winter	2	89	0.320	1.922
fairchild	7	90	0.314	1.489
hug	9	91	0.314	1.516
kennedy	6	92	0.311	1.558
garwood	5	93	0.294	1.597
pierce	2	94	0.291	1.133
goodwin	9	95	0.283	1.591
torruella	1	96	0.282	1.813
reavley	5	97	0.271	1.180
tang	9	98	0.270	1.295
rymer	9	99	0.261	0.704
eschbach	7	100	0.258	1.355
milburn	6	101	0.257	0.961
mikva	12	102	0.256	1.180
ferguson	9	103	0.250	0.843
engel	6	104	0.247	0.960
martin	6	105	0.244	1.384
williams	12	106	0.241	0.937
dyer	11	107	0.237	1.033
miner	2	108	0.235	1.075
mcmillian	8	109	0.233	1.815

Judge	Circuit	Rank	Total coeff.	Total t-ratio
mckay	10	110	0.231	1.534
browning	9	111	0.227	0.770
coffey	7	112	0.218	1.554
widener	4	113	0.218	1.290
ripple	7	114	0.216	1.449
king	5	115	0.211	0.932
arnold-r	8	116	0.204	1.519
wiener	5	117	0.199	0.715
bowman	8	118	0.191	1.258
manion	7	119	0.190	1.064
stapleton	3	120	0.186	0.713
mansmann	3	121	0.186	0.681
pregerson	9	122	0.183	0.848
merritt	6	123	0.179	1.017
krupansky	6	124	0.178	0.718
ebel	10	125	0.177	0.868
tacha	10	126	0.174	0.994
hall	4	127	0.166	0.824
jones	6	128	0.162	0.654
altimari	2	129	0.161	0.682
henderson	11	130	0.140	0.469
nelson	6	131	0.138	0.427
kanne	7	132	0.134	0.851

Judge	Circuit	Rank	Total coeff.	t-ratio
nygaard	3	133	0.130	0.323
guy	6	134	0.130	0.502
thompson	9	135	0.124	0.523
hatchett	11	136	0.122	0.583
hall	9	137	0.121	0.510
anderson	10	138	0.121	0.675
politz	5	139	0.121	0.702
williams	5	140	0.117	0.535
beam	8	141	0.117	0.701
canby	9	142	0.112	0.601
jones	11	143	0.111	0.655
oscannlain	9	144	0.110	0.418
sentelle	12	145	0.097	0.349
brorby	10	146	0.094	0.509
weick	6	147	0.093	0.496
jones	5	148	0.091	0.456
aldrich	1	149	0.089	0.647
chapman	4	150	0.087	0.357
farris	9	151	0.083	0.361
sprouse	4	152	0.080	0.372
magill	8	153	0.078	0.497
edwards	6	154	0.078	0.444
scirica	3	155	0.077	0.200

Judge	Circuit	Rank	Total coeff.	t-ratio
nelson-d	9	156	0.075	0.329
kozinski	9	157	0.074	0.227
norris	9	158	0.073	0.252
mcwilliams	10	159	0.069	0.450
wellford	6	160	0.064	0.261
hutchinson	3	161	0.057	0.210
jolly	5	162	0.052	0.270
fagg	8	163	0.044	0.241
moore	10	164	0.042	0.174
duhe	5	165	0.039	0.188
birch	11	166	0.039	0.115
beezer	9	167	0.030	0.135
mahoney	2	168	0.026	0.100
ginsburg-r	12	169	0.025	0.081
schroeder	9	170	0.023	0.106
wollman	8	171	0.015	0.100
poole	9	172	0.004	0.017
seth	10	173	0.000	0.002
edmondson	11	174	0.000	0.000
trott	9	175	-0.004	-0.014
merrill	9	176	-0.005	-0.026
ryan	6	177	-0.015	-0.060
davis	5	178	-0.024	-0.111

Judge	Circuit	Rank	Total coeff.	Total t-ratio
kilkenny	9	179	-0.024	-0.082
ginsburg-d	12	180	-0.027	-0.088
leavy	9	181	-0.028	-0.090
suhrheinrich	6	182	-0.029	-0.067
garza-r	5	183	-0.029	-0.112
fernandez	9	184	-0.031	-0.067
silberman	12	185	-0.050	-0.179
barksdale	5	186	-0.075	-0.248
brown	6	187	-0.079	-0.219
noonan	9	188	-0.099	-0.411
buckley	12	189	-0.122	-0.429
brunetti	9	190	-0.136	-0.520
cox	11	191	-0.233	-0.407
norris	6	192	-0.385	-0.766
chambers	9	193	-0.406	-1.529
nies	13	194	-0.440	-1.659
friedman	13	195	-0.591	-2.025
newman	13	196	-0.591	-1.870
rich	13	197	-0.600	-1.813
michel	13	198	-0.629	-1.496
smith	13	199	-0.645	-1.447
bennett	13	200	-0.690	-1.520
archer	13	201	-0.708	-2.050
mayer	13	202	-0.794	-1.593
miller	13	203	-0.992	-1.188
cowen	13	204	-2.126	-1.655
skelton	13	205	-3.407	-1.789

TABLE 4B
JUDGE-SPECIFIC EFFECTS FOR INSIDE CIRCUIT CITATIONS: AVERAGE INFLUENCE REGRESSIONS

Judge	*Circuit*	*Rank*	*Total coeff.*	*Total t-ratio*
selya	1	1	1.889	6.402
bownes	1	2	0.460	1.766
coffin	1	3	0.396	1.780
campbell	1	4	0.332	1.400
cyr	1	5	0.013	0.030
torruella	1	6	-0.174	-0.531
breyer	1	7	-0.311	-0.985
aldrich	1	8	-0.881	-3.023
kearse	2	1	0.163	0.484
walker	2	2	0.081	0.144
cardamone	2	3	-0.162	-0.414
meskill	2	4	-0.172	-0.460
oakes	2	5	-0.241	-0.778
newman	2	6	-0.342	-0.996
feinberg	2	7	-0.435	-1.325
pratt	2	8	-0.441	-0.901
timbers	2	9	-0.449	-0.865
altimari	2	10	-0.550	-1.103
pierce	2	11	-0.593	-1.092
winter	2	12	-0.779	-2.204
vangraafeiland	2	13	-0.884	-1.863
mahoney	2	14	-0.901	-1.641
miner	2	15	-0.961	-2.081
lumbard	2	16	-1.131	-3.851
aldisert	3	1	0.532	1.218
rosenn	3	2	0.468	1.032
becker	3	3	0.364	0.959
garth	3	4	0.257	0.548
greenberg	3	5	-0.122	-0.230
sloviter	3	6	-0.310	-0.921
seitz	3	7	-0.391	-1.012
cowen	3	8	-0.521	-0.774
mansmann	3	9	-0.535	-0.931
higginbotham	3	10	-0.573	-1.270
nygaard	3	11	-0.573	-0.672
weis	3	12	-0.604	-1.473
stapleton	3	13	-0.613	-1.114
scirica	3	14	-0.788	-0.975

Judge	Circuit	Rank	Total coeff.	Total t-ratio
hutchinson	3	15	-0.940	-1.653
wilkins	4	1	-0.385	-0.517
phillips	4	2	-0.392	-1.037
wilkinson	4	3	-0.496	-1.144
russell	4	4	-0.736	-1.779
butzner	4	5	-0.756	-2.021
murnaghan	4	6	-0.877	-2.085
ervin	4	7	-0.889	-2.333
widener	4	8	-1.170	-3.251
hall	4	9	-1.275	-2.969
chapman	4	10	-1.277	-2.473
sprouse	4	11	-1.384	-3.040
goldberg	5	1	-1.170	-2.891
smith	5	2	-1.431	-3.260
king	5	3	-1.580	-3.301
johnson	5	4	-1.603	-3.832
wisdom	5	5	-1.632	-4.787
thornberry	5	6	-1.652	-3.816
garwood	5	7	-1.839	-4.727
wiener	5	8	-1.877	-3.186
higginbotham	5	9	-1.895	-4.728
duhe	5	10	-2.052	-4.623

Judge	Circuit	Rank	Total coeff.	Total t-ratio
barksdale	5	11	-2.058	-3.205
jones	5	12	-2.383	-5.650
politz	5	13	-2.401	-6.617
williams	5	14	-2.406	-5.191
reavley	5	15	-2.463	-5.075
davis	5	16	-2.489	-5.425
jolly	5	17	-2.495	-6.071
garza-r	5	18	-2.508	-4.619
milburn	6	1	-0.753	-1.332
contie	6	2	-0.801	-1.640
celebrezze	6	3	-0.866	-1.730
keith	6	4	-0.883	-1.535
boggs	6	5	-0.906	-1.699
kennedy	6	6	-0.948	-2.242
lively	6	7	-1.033	-2.332
engel	6	8	-1.095	-2.008
martin	6	9	-1.109	-2.961
krupansky	6	10	-1.150	-2.197
peck	6	11	-1.162	-2.372
jones	6	12	-1.222	-2.324
ryan	6	13	-1.252	-2.324
weick	6	14	-1.287	-3.239
guy	6	15	-1.297	-2.374

Judge	Circuit	Rank	Total coeff.	Total t-ratio
suhrheinrich	6	16	-1.368	-1.526
edwards	6	17	-1.412	-3.797
merritt	6	18	-1.427	-3.805
wellford	6	19	-1.509	-2.892
nelson	6	20	-1.573	-2.302
brown	6	21	-1.649	-2.155
norris	6	22	-2.328	-2.192
woodjr	7	1	0.055	0.189
pell	7	2	0.030	0.106
posner	7	3	-0.091	-0.350
flaum	7	4	-0.099	-0.338
easterbrook	7	5	-0.252	-0.864
coffey	7	6	-0.399	-1.354
eschbach	7	7	-0.477	-1.195
bauer	7	8	-0.514	-1.763
ripple	7	9	-0.596	-1.907
cummings	7	10	-0.610	-2.206
manion	7	11	-0.640	-1.702
kanne	7	12	-0.727	-2.196
cudahy	7	13	-0.728	-2.487
fairchild	7	14	-1.249	-2.787
bowman	8	1	-0.674	-2.105

Judge	Circuit	Rank	Total coeff.	Total t-ratio
henley	8	2	-0.762	-2.363
lay	8	3	-0.808	-2.851
ross	8	4	-0.851	-2.713
bright	8	5	-0.859	-2.879
heaney	8	6	-0.866	-3.467
mcmillian	8	7	-0.961	-3.535
arnold-r	8	8	-1.003	-3.525
magill	8	9	-1.017	-3.080
beam	8	10	-1.035	-2.947
wollman	8	11	-1.213	-3.759
fagg	8	12	-1.292	-3.353
wallace	9	1	0.039	0.111
reinhardt	9	2	-0.451	-1.054
skopil	9	3	-0.522	-0.866
sneed	9	4	-0.653	-1.836
choy	9	5	-0.658	-1.640
wright	9	6	-0.726	-2.148
wiggins	9	7	-0.760	-1.486
alarcon	9	8	-0.830	-1.927
boochever	9	9	-0.966	-1.994
rymer	9	10	-0.983	-1.257
fletcher	9	11	-1.006	-2.586
goodwin	9	12	-1.023	-2.726

Judge	Circuit	Rank	Total coeff.	Total t-ratio
pregerson	9	13	-1.054	-2.317
norris	9	14	-1.085	-1.788
tang	9	15	-1.163	-2.648
hug	9	16	-1.268	-2.903
nelson-d	9	17	-1.313	-2.752
hall	9	18	-1.334	-2.665
ferguson	9	19	-1.376	-2.197
poole	9	20	-1.412	-2.536
oscannlain	9	21	-1.473	-2.641
thompson	9	22	-1.477	-2.950
beezer	9	23	-1.521	-3.246
kilkenny	9	24	-1.615	-2.564
trott	9	25	-1.668	-2.462
farris	9	26	-1.680	-3.475
browning	9	27	-1.725	-2.766
canby	9	28	-1.731	-4.377
kozinski	9	29	-1.743	-2.527
leavy	9	30	-1.771	-2.712
fernandez	9	31	-1.921	-1.963
brunetti	9	32	-2.033	-3.694
schroeder	9	33	-2.112	-4.671
merrill	9	34	-2.163	-5.436
noonan	9	35	-2.328	-4.562
chambers	9	36	-2.987	-5.297
baldock	10	1	0.399	0.951
seymour	10	2	0.056	0.159
ebel	10	3	-0.152	-0.353
holloway	10	4	-0.173	-0.419
barrett	10	5	-0.381	-1.230
anderson	10	6	-0.383	-1.020
brorby	10	7	-0.422	-1.082
tacha	10	8	-0.495	-1.343
logan	10	9	-0.573	-1.972
mckay	10	10	-0.685	-2.153
moore	10	11	-0.857	-1.693
mcwilliams	10	12	-1.268	-3.906
seth	10	13	-1.499	-4.750
roney	11	1	-1.433	-3.633
tjoflat	11	2	-1.505	-3.354
godbold	11	3	-1.746	-4.380
anderson	11	4	-1.748	-3.596
kravitch	11	5	-1.751	-4.127
fay	11	6	-1.858	-3.913
johnson	11	7	-1.886	-4.523
morgan	11	8	-1.896	-3.919

Judge	Circuit	Rank	Total coeff.	Total t-ratio
dyer	11	9	-2.012	-4.143
hill	11	10	-2.041	-4.994
clark	11	11	-2.153	-4.855
tuttle	11	12	-2.157	-6.856
birch	11	13	-2.390	-3.383
jones	11	14	-2.465	-6.835
edmondson	11	15	-2.505	-3.357
cox	11	16	-2.542	-2.104
hatchett	11	17	-2.563	-5.783
henderson	11	18	-2.878	-4.556
wald	12	1	-0.032	-0.082
edwards	12	2	-0.122	-0.272
mackinnon	12	3	-0.367	-0.762
williams	12	4	-0.655	-1.206
sentelle	12	5	-0.704	-1.201
mikva	12	6	-0.715	-1.561
silberman	12	7	-0.978	-1.675
ginsburg-r	12	8	-1.031	-1.620
ginsburg-d	12	9	-1.107	-1.706
buckley	12	10	-1.124	-1.881
rich	13	1	-0.592	-0.853
nies	13	2	-0.678	-1.223
bennett	13	3	-0.837	-0.877
newman	13	4	-1.224	-1.845
smith	13	5	-1.243	-1.325
michel	13	6	-1.316	-1.487
archer	13	7	-1.568	-2.161
miller	13	8	-1.615	-0.918
mayer	13	9	-1.637	-1.561
friedman	13	10	-1.670	-2.723
cowen	13	11	-4.393	-1.623
skelton	13	12	-6.584	-1.641

We also find a strong positive correlation between average influence for outside and inside circuit citations—i.e., judges who are more heavily cited per opinion outside their circuit are also more heavily cited within their circuit. The overall correlation is .69 and ranges from .63 to .98 for the individual circuits.[59]

Table 5 averages the individual rankings and presents rankings by circuit of average influence or quality per opinion. The 1st and 3rd circuits rank highest in average influence for outside and total citations. The federal circuit continues to rank last in outside citations but not for total citations.

TABLE 5
AVERAGE INFLUENCE RANKINGS BY CIRCUIT

		Outside Circuit		*Total*	
Circuit	*Number of Judges*	*Average Value of Coefficients*	*Ranking*	*Average Value of Coefficients*	*Ranking*
1st	8	0.582	1	0.680	1
2nd	16	0.504	3	0.264	3
3rd	15	0.518	2	0.539	2
4th	11	0.410	5	-0.038	7
5th	18	0.252	8	-1.160	13
6th	22	0.179	12	-0.246	9
7th	13	0.417	4	0.090	6
8th	12	0.256	7	-0.355	10
9th	36	0.184	11	-0.413	11
10th	13	0.220	9	0.172	5
11th	18	0.321	6	-1.152	12
DC	11	0.208	10	0.179	4
Federal	12	-1.018	13	-0.108	8
Total	205	0.232		-0.219	

We also investigated the question whether there is a trade off between average influence or quality and the number of opinions a

[59] The correlation coefficients between the outside and inside average influence regression coefficients are as follows: .72 (1st); .68 (2nd); .93 (3rd); .94 (4th); .81 (5th); .90 (6th); .63 (7th); .70 (8th); .90 (9th); .77 (10th); .84 (11th); .96 (DC); and .98 (Fed).

judge publishes each year. There are two reasons to think this might be so. One is that judges who write fewer opinions per year may well devote greater time and effort to each opinion and, thereby, produce higher quality opinions compared to judges who write more opinions per year. The other is that circuits have different publication policies. The 7th circuit, for example, opts to publish most of its opinions while the 9th circuit chooses to publish a smaller fraction of its opinions. Since circuits that publish a smaller fraction of their opinions would publish the more significant ones, this factor could produce an inverse relationship between published opinions and average influence per judge. To test this hypothesis, we regressed the judge specific effects from Tables 4A, 4B and 4C on the average annual number of signed opinions for the 205 judges in our sample. We find no evidence of a trade-off between quality and quantity. Quite the opposite. The regression coefficient on signed opinions is positive in all three regressions and significant in two, suggesting that the dominant effect is that more able and energetic judges produce both more and higher quality opinions.[60]

IV. Factors Explaining Influence

In this section we look at a variety of variables that may help explain differences in influence among judges. Table 6 summarizes this data for the 205 judges in our sample. For each judge we have information on race, sex, quality of law school,[61] undergraduate record (was the judge a member of Phi Beta Kappa), law school performance (e.g., was the judge a law review editor and did he graduate with honors—order of the coif or magna or summa cum

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[60] Regressing average influence on the average number of signed opinions per year, yields the following regression coefficients (and t-ratios) on signed opinions: .015 (5.65), .027 (5.18) and .0031 (.77) for outside, inside and total citations.

[61] Law school rankings are derived from *US News & World Report*, March 22, 1993. For another source of data on the attributes of circuit judges, see Haire, Gryski, Zuk and Barrow, An Intercircuit Profile of Judges on the U.S. Courts of Appeals, 78 Judicature 101 (1994).

TABLE 6
BIOGRAPHICAL VARIABLES IN JUDICIAL SAMPLE

Demographic Variables	
White	92.20%
Male	90.73%
Law School	
Harvard	17.07%
Yale	7.32%
Columbia	3.41%
Chicago	2.93%
Stanford	2.44%
Top 20 School	24.88%
Academic Honors	
Law Review Editor	20.49%
Law School Honors	22.93%
Phi Beta Kappa	16.59%
Work Experience	
Federal Clerk	12.20%
Prior Judicial Experience	52.68%
Law Professor	15.61%
ABA Rating	
Not Qualified	0.98%
Qualified	32.20%
Well Qualified	46.34%
Exceptionally Well Qualified	16.59%
No Rating	3.89%
Other Variables	
Conservative	45.85%
Degree of Circuit Specialization	0.32
Ratio of Self Cites to Opinions Written	0.52

laude), prior experience (e.g., did the judge clerk on the courts of appeals or Supreme Court, sit on a district or state court, or serve as a law professor), and ABA rating prior to confirmation on the courts of appeals. From Table 6, we observe that 58 percent of the judges

in our sample graduated from a top 20 law school including 17 percent from Harvard. More than half the judges had previous judicial experience either as district court or state judges, and 16 percent had been law professors. With respect to the ABA ratings, most judges (63 percent) were rated "well" or "exceptionally well" qualified prior to confirmation, and only two were deemed unqualified.

Table 6 also includes a "conservative" variable denoting whether the judge was appointed by a Republican President; a circuit specialization variable which compares the case mix of each circuit to the "average" circuit; and a self citation variable defined as the number of times a judge cites himself per opinion he publishes. (Recall that self citations are excluded from the influence measures.) It is unclear whether political affiliation will have any effect, but it might. If "conservatives" prefer the opinions of other "conservatives", and "liberals" prefer the opinions of other "liberals," then we would expect a negative coefficient on this variable because less than half the sample are "conservatives."[62] The more specialized a circuit is, the less useful its opinions to other circuits and the lower should be its influence (as measured by outside citations).[63] There is, however,

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[62] On the other hand, "conservatives" have on average greater tenure so that a weighted (by tenure) average yields 57 percent not 46 percent "conservatives." The main difficulty with measuring "conservatives" at single point (1992) in time is that a conservative or liberal bias that effects annual citations would depend on the composition of the judiciary each year. Since the composition changes over the sample period (1955–1995), no single "conservative" measure will do. Still, if the weighted average more accurately reflects the conservative make-up of the courts of appeals over the relevant time period, then a "conservative" bias would yield a positive not negative regression coefficient on this variable.

[63] We estimate circuit specialization by first calculating the fraction of each circuit's terminations after oral argument in each of eight broad categories (e.g., criminal, administrative, bankruptcy, and so forth) listed in Table B-1 of the 1991 Report of the Director, Administrative Office of the United States Courts. Next we sum up the absolute difference between the circuit's share in each category and the aggregate share for all circuits. The maximum value for a completely specialized circuit would approach 2 (= 1 in a category in which there are close to zero terminations elsewhere and minus 1 in the seven other categories). We arbitrarily assigned the value 2 to the Federal Circuit. Note

a counter argument. If a circuit has a relatively large number of cases in a particular area of law, then other circuits may cite it whenever they have a case in that area. Conceivably, this factor could increase the number of outside citations. In addition, greater specialization might also increase inside circuit influence because the opinions outside the circuit would tend to be less useful than those of the citing circuit. We expect self citations to be positively related to influence. Self citations are a rough indicator of a judge's involvement in opinion writing. And (not implausibly) judges who write their own opinions will be more influential because their opinions will be more consistent and they will care more about their quality.[64] Since self citations are also a form of "advertising" or self-promotion, this would also lead to a positive relationship between self-citations and influence.

We regressed the above variables on our estimates of judicial influence. Each regression contains 205 observations. The dependent variables are the judge specific coefficients from the total influence (Tables 2A and 2B) and average influence (Tables 4A and 4B) regressions.[65] Table 7 presents the regressions on total influence (our best measure of overall influence because it reflects both average influence and output of opinions) for both outside and inside citations. Table 8 presents the results on average influence. For each measure of influence, we estimate two regressions: one includes the circuit specialization variable; and the other includes dummy

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that our estimates of the judge specific effects in Tables 2 and 4 do not include a specialization variable for the circuit in which the judge sits. Indeed, we could not include such a variable because it could be written as a linear combination of the 205 judge specific dummy variables and, therefore, we would not be able to estimate the regression equations in Tables 2 and 4.

[64] Although the mean number of self citations per opinion is .5, it ranges from .06 to over 6. The top five self citers are Selya (6.72), Posner (2.83), Easterbrook (2.23), Coffey (2.19) and Cyr (1.71).

[65] All regressions are weighted by the number of years of experience per judge. Since the dependent variables in Tables 7 and 8 come from the regression coefficients on the individual judges in the influence regressions, the standard errors of the latter estimates will tend to be smaller, the greater the number of observations on a judge.

TABLE 7
BIOGRAPHICAL REGRESSIONS: TOTAL INFLUENCE MEASURE

	Outside Citations				*Inside Citations*			
	Coeff	T-stat	Coeff	T-stat	Coeff	T-stat	Coeff	T-stat
Demographic Variables								
White	-.049	-0.46	-.069	-0.72	-.162	-1.38	-.174	-1.63
Male	-.105	-0.90	-.108	-1.06	-.185	-1.44	-.254	-2.22
Law School								
Harvard	.283	3.47	.204	2.66	.167	1.87	.105	1.22
Yale	.300	2.45	.143	1.24	.254	1.89	.140	1.09
Columbia	.075	0.45	.100	0.66	.231	1.27	.233	1.38
Chicago	.183	0.94	.117	0.67	.102	0.47	.098	0.50
Stanford	-.540	-2.88	-.395	-2.21	-.329	-1.60	-.391	-1.96
Other Top 20	.024	0.32	.101	1.45	.080	0.97	.120	1.55
Academic Honors								
Law Review Editor	.119	1.39	-.021	-0.27	.053	0.56	-.009	-0.10
Law School Honors	.151	1.87	.148	2.02	.145	1.65	.141	1.73
Phi Beta Kappa	-.085	-1.03	-.050	-0.66	-.070	-0.77	-.076	-0.90

Work Experience								
Federal Clerk	.010	0.10	.095	1.04	.095	0.84	.156	1.53
Prior Judicial Exp.	-.025	-0.37	-.027	-0.44	.002	0.03	.019	0.28
Law Professor	.144	1.59	.038	0.47	.195	1.96	.113	1.24
ABA Rating								
Not Qualified	-.003	-0.01	.134	0.54	.171	0.58	.051	0.19
Qualified	.134	1.03	.146	1.20	.484	3.37	.340	2.51
Well Qualified	.288	2.33	.313	2.81	.596	4.37	.544	4.39
Exceptionally Well	.194	1.47	.174	1.42	.431	2.97	.322	2.37
Other Variables								
Self Citations	.399	6.45	.290	4.74	.577	8.49	.454	6.66
Conservative	.063	1.00	.028	0.49	.246	3.56	.212	3.37
Cir. Specialization	-.010	-13.32			-.001	-0.72		
Cir. Dummies			X	X			X	X
Constant	2.790	13.45	2.985	12.19	1.787	7.83	2.297	8.41
Adjusted R^2	.596		.698		.480		.599	

TABLE 8
BIOGRAPHICAL REGRESSIONS: AVERAGE INFLUENCE MEASURE

	Outside Citations				*Inside Citations*			
	Coeff	T-stat	Coeff	T-stat	Coeff	T-stat	Coeff	T-stat
Demographic Variables								
White	-.030	-0.50	-.001	-0.01	-.101	-0.77	-.020	-0.27
Male	-.002	-0.02	.056	0.95	.142	1.00	-.020	-0.25
Law School								
Harvard	.081	1.79	.054	1.23	.154	1.55	-.020	-0.33
Yale	.123	1.79	.003	0.05	.233	1.55	-.028	-0.30
Columbia	.024	0.25	.020	0.23	.201	0.99	.042	0.35
Chicago	.050	0.46	-.016	-0.16	.114	0.48	-.213	-1.54
Stanford	-.125	-1.19	-.110	-1.07	.189	0.82	-.236	-1.67
Other Top 20	.051	1.22	.029	0.73	.193	2.10	.049	0.89
Academic Honors								
Law Review Editor	.020	0.43	-.018	-0.41	-.136	-1.31	-.073	-1.19
Law School Honors	-.062	-1.38	-.038	-0.91	-.190	-1.93	.015	0.26
Phi Beta Kappa	-.003	-0.06	.005	0.10	.187	1.85	-.056	-0.94

Work Experience								
Federal Clerk	-.056	-0.97	-.007	-0.14	-.034	-0.27	-.011	-0.16
Prior Judicial Exp.	-.005	-0.14	-.030	-0.86	.086	1.05	-.019	-0.39
Law Professor	.017	0.33	-.039	-0.83	.168	1.52	-.049	-0.76
ABA Rating								
Not Qualified	.281	1.86	.297	2.10	.897	2.72	.135	0.70
Qualified	-.038	-0.52	.083	1.19	.487	3.05	.035	0.36
Well Qualified	.056	0.81	.117	1.84	.408	2.70	.083	0.95
Exceptionally Well	.047	0.64	.086	1.23	.505	3.12	.087	0.90
Other Variables								
Self Citations	.146	4.21	.146	4.16	.509	6.73	.339	7.04
Conservative	-.012	-0.35	-.050	-1.55	.155	2.02	.030	0.69
Cir. Specialization	-.003	-8.16			.004	4.66		
Cir. Dummies			X	X			X	X
Constant	0.747	6.43	0.507	3.61	-2.092	-8.25	-0.739	-3.83
Adjusted R^2	.324		.469		.357		.800	

variables for the individual circuits.[66] The first approach allows us to estimate the effect of specialization on influence while the dummy variable approach enables us to pick up all circuit effects (including but not limited to specialization) on influence that are not accounted for by the other independent variables in the regression.

The main results of Tables 7 and 8 are the following.

1. Self citations have a positive and highly significant effect in all regressions. This suggests that judges who have a greater involvement in writing their own opinions (which we believe is positively related to self citations) or engage in more "advertising" or self-promotion produce higher quality opinions. These judges will be cited more frequently and hence will be more influential. To see the importance of self citations, imagine that a judge who becomes more involved in writing his opinions increases his self citations from .5 (the mean) to 1.5. This, in turn, would add about .35 (the average of .290 and .399 in Table 7) to his total influence coefficient on outside citations and increase his ranking in Table 2A by more than 50 places (from 103 to 45). Notice also that the regression coefficients on self citations are of even greater value and significance in the inside than outside circuit regression in both Tables 7 and 8.[67]

2. As expected, circuit specialization has a negative and highly significant effect on outside citations in Tables 7 and 8. In contrast, circuit specialization has either no effect (Table 7) or a highly significant positive effect (Table 8) on inside citations. A positive effect supports the hypothesis that the more specialized circuits find their own opinions more useful relative to opinions in other circuits. But we also know that judges in the more specialized circuits (the

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[66] We cannot estimate a regression equation with both the circuit specialization and dummy variables because circuit specialization can be expressed as a linear combination of these dummy variables.

[67] To estimate the effect of an increase in self citations on inside citations, one should see how it changes a judges ranking within his circuit. To illustrate, an increase of 1 in self citations, increases total influence for inside citations by about .52 (the average of .577 and .454). This would raise a judge's rank from the median in his circuit to rank 2 in the 1st circuit, rank 1 in the 2nd circuit and rank 4 in the 7th circuit.

federal and D.C. circuits) also tend to publish fewer opinions which lowers total influence. Hence, it is not surprising that in the inside circuit regressions, specialization has no effect in Table 7 but a positive effect in Table 8 .

3. Although Tables 7 and 8 do not reproduce the individual coefficients on the 12 circuit dummy variables (the left-out variable is the 1st circuit), many of the coefficients are statistically significant, and an F-test reveals that taken together they are jointly significant in all regressions. The individual circuit dummies in Table 7 indicate that the 6th, 9th, 10th, 11th, D.C. and federal circuits are less influential (holding constant the other variables in the regression) than the 1st circuit whereas there are no significant circuit effects for the 2nd, 3rd, 4th, 5th, 7th and 8th circuits. This is consistent with our findings on circuit specialization. The two most specialized circuits, the D.C. and federal circuits, have the largest negative coefficients on outside citations. In the inside circuit regressions, the 4th, 6th, 11th, and federal are significantly lower than the 1st while the other circuit dummy variables are insignificant in Table 7. For average influence (Table 8), only the 2nd (positive), 3rd (positive) and federal circuit (negative) are significant in the regression on outside citations; while the 4th through 9th and 11th are all negative and significant in the inside regression. The fact that neither the D.C. or federal circuit is significant is consistent with our finding that circuit specialization has a positive effect on average influence inside the circuit.

4. Judges who graduated Harvard and Yale Law Schools rank higher in total and average influence although only the effects on total influence in the outside circuit regressions are statistically significant at the .05 level.[68] In contrast, graduates of the other top 20 law schools appear to be no more influential than graduates of lower ranked law schools, and Stanford (ranked among the top five) has a negative and often statistically significant effect in Table 7

[68] In Table 7, the coefficient on Yale is not significant in the outside citations that includes the circuit dummy variables. And in Table 8, the coefficients on both Harvard and Yale are negative but insignificant in one regression.

(although only five judges in our sample are Stanford graduates). One explanation for the positive coefficients on the Harvard and Yale variables is that these schools have on average more able students (though it is not obvious that judges from these schools would be more able than judges from other schools). But another factor may be the interaction among "networking," size and the geographic diversity of Harvard and Yale. Suppose graduates of the same law school are more likely to hold similar views because of similar backgrounds, exposure to the same law professors and contacts with other graduates through alumni magazines, reunions, and law school gatherings. Since thirty five judges in our sample graduated from Harvard and fifteen from Yale, a graduate of Harvard or Yale will be part of large network of "like-thinking" judges who will tend to cite each other more often than they cite other judges. And since judges from Harvard and Yale are probably distributed across many circuits rather than concentrated in a single circuit, we would predict and find that the regression coefficients on the Harvard and Yale variables are more significant in the outside than inside circuit regressions in both Tables 7 and 8.

5. The coefficients on the race and sex variables imply no "discrimination" in citing. On the contrary, most of the coefficients are negative but only one is statistically insignificant.

6. Our measures of academic achievement do not have consistent effects on influence. Undergraduate performance and law review editorship are insignificant in all regressions. In contrast, graduating with honors from law school has a positive and marginally significant effect on total influence but a negative and insignificant effect on average influence.

7. Most coefficients on prior experience are insignificant. In particular, prior judicial experience does not raise influence. But prior experience as a law professor may increase overall influence but the coefficients, at best, are marginally significant.

8. Conservative judges are not significantly more influential outside their circuit although they appear more influential within their circuit. These effects show up in both total and average influence suggesting that if there is a "conservative" bias, it is limited

to citing "like-minded" judges within but not outside a judge's circuit.

9. ABA ratings have some predictive power but only with respect to the five percent of judges in our sample who received an unqualified rating (or for which no information on rating was available). ABA ratings are unable to discriminate among the remaining 95 percent of judges in our sample. For these judges, there are no significant differences among the qualified, well qualified and exceptionally well qualified. In fact, judges who received a "well qualified" rating appear to be more influential than judges receiving either an "exceptionally well qualified" or just "qualified" rating in Table 7.

V. Concluding Remarks

Although citation analysis provides only a proxy for quantifying judicial influence, it offers some significant advantages over more conventional literary and historical approaches to the study of influence. First, citation analysis relies less on subjective and non-quantifiable factors and, instead, employs quantitative measures of influence using well known statistical techniques. Second, it enables one to compare differences in influence among a large number of judges, and to test the statistical significance of these differences. Third, citation analysis can be integrated into the standard economic model of human capital which allows one to test hypotheses on the importance of factors such as tenure, case mix, judicial involvement in opinion writing and judicial background (e.g., prior experience, law school record and so forth) on influence. And, finally, the human capital approach developed here suggests other hypotheses and statistical studies to pursue. Below we suggest a few such studies.

1. One can use other sources of citation data to estimate the influence of appellate court judges. For example, one might tabulate citations to these judges from district (and possibly state) courts and the U.S. Supreme Court, and see how these additional citation measures correlate with our rankings of influence. Or consider how the influence of appellate court judges might bear on their citations

in the Supreme Court. One hypotheses is that the Supreme Court rarely takes cases decided by our top ranked judges because these judges not only get things "right" but their decisions are more likely to be followed in other circuits. But when the Court takes a case by a top ranked judge it is more likely to reverse his decision in order to prevent the "error" from spreading to other circuits. Another study might relate our measures of influence to state court citations to federal appellate decisions in diversity cases. Since state courts are not bound by a federal court's interpretation of state law, a citation to a federal appellate judge would (like citations outside a circuit) be a tribute to the persuasiveness of the opinion and the influence of the judge.

2. We suspect that the most influential courts of appeals judges also tend to get the best law students as clerks (which, in turn, may make the judges even more influential) and that these same students have a higher probability of obtaining Supreme Court clerkships. Law clerks receive the same salaries so it would not be surprising that they would choose to clerk for the more influential and prestigious appellate court judges. This suggests an independent measure of influence. By looking at Supreme Court clerkship appointments we can measure the influence of appellate court judges among both law students (or their professors) and judges on the Supreme Court.

3. One could extend our approach to judges on the Supreme Court. Here one might analyze whether judicial influence is related to factors such as age at appointment, prior experience, and whether the President and the majority in Congress are of the same party and influence and so forth.[69]

4. An issue we merely touched is "the sociology of citation practices." Can one identify networks of judges and circuits? We hypothesized that networking might be a factor explaining why, for example, judges who graduated from Harvard Law School tended to be more influential (see Tables 7 and 8) or why judges from the 1st, 2nd and 3rd circuits tend to cite each other more frequently than they cite other circuits (see the Appendix). Is this the result of a

[69] See Montgomery Kosma (forthcoming article in *JLS).*

similar case mix or do these judges share certain characteristics in common that lead them to hold similar views on judging and case outcomes. A thorough study of judicial networks might look for citation patterns among judges grouped by age, sex, political preference, previous experience and other variables.

5. Finally, one could examine in some detail the characteristics of the opinions of the judges who rank high and low in our sample. Can one identify, for example, whether longer opinions or opinions with more footnotes or with more citations bear on our measures of influence?

APPENDIX

In this section we analyze citations in and to published courts of appeals opinions during the 1982-1995 period. The purpose of this "circuit sample" (as opposed to the "judge sample" in the main body of the paper) is to investigate the influence of circuits without regard to the individual judges. Recall that Tables 3 and 5 used the judge sample to generate estimates of circuit influence by averaging the judge-specific coefficients for each circuit. These tables, however, exclude two groups of judges who are relevant to measuring the influence of circuits over the same time period as the judge sample: judges who left the court before 1992 but served after 1982; and recently appointed judges who had less than six years experience as of 1995. So it is possible that the averages in Tables 3 and 5 are not sufficiently representative of the judges in each circuit.

Of course, the influence of a circuit and its judges are closely connected. Indeed, one could argue that a circuit's influence is nothing more than the average of the influence of its judges. Still, it is possible that citing an opinion from circuit X is more or less attractive than citing one from circuit Y merely because circuit X has a better or worse reputation in general. Thus, a circuit's reputation might depress or enhance a judge's personal influence. But even assuming a circuit effect exists (maybe because of the prominence of judges no longer sitting), it would be difficult to disentangle it from the influence of the individual judges in the circuit. For example, how would one decide if circuit X is cited because of the influence of

judge A or if A is cited because of the reputation of circuit X?[70] Still, we believe that there is a value to considering influence at the circuit level. It allows us to investigate cross-circuit citation effects such as whether the 11th cites the 5th circuit more frequently than it cites other circuits. And strategic behavior at the circuit level is likely to be less prominent than at the individual judge level. Judges might engage in strategic reciprocal citation practices which could inflate their apparent influence but this would tend to cancel out at the circuit level. Moreover, the high cost of the collective action that would be required for two circuits to collude makes it extremely unlikely that circuit citations would be exaggerated.[71]

Our circuit sample collects the published opinions (including per curium and other unsigned opinions) of the courts of appeals from 1982 to 1995.[72] For each circuit we counted the number of citations to its 1982-1995 opinions and noted the citing circuit. Table A–1 gives the total number of opinions collected for each circuit. The 9th circuit is the largest followed by the 8th, 7th, 5th

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[70] If judges changed circuits (as when some judges on ocassion sit by designation outside their circuit), it might be possible to disentangle these effects. Then, one could see if and how citations to Judge A changed as A changed from circuit X to Y. Note that the regressions in Tables 7 and 8 show that circuit specialization and circuit dummy variables are significant factors in explaining differences in influence or influence among the individual judges. Although causation runs from specialization to measured influence rather than the reverse, we cannot say which way it runs in the case of the dummy variables.

[71] Lewis A. Kornhauser & Laurence G. Sager, *The One and the Many: Adjudication in Collegial Courts*, 81 Cal. L. Rev. 1, 51-56 (1993). Also, circuit courts tend to rely upon citations provided in the briefs. We expect that lawyers would show a bias toward a particular circuit only if the court was well-known to show a similar bias. In an earlier citation study, Howard (see Courts of Appeals in the Federal Judicial System: A Study of the Second, Fifth, and District of Columbia Circuits 142-44 (1981)) found that the 9th circuit was cited most often by the 2nd, 3rd and D.C. circuits, while the rest of the circuits (including the 2nd) were cited at about the same rate. The D.C. circuit came in last.

[72] We started with citations after 661 F.2d, since the Eleventh Circuit only began publishing decisions in that volume. See Bonner v. City of Prichard, 661 F.2d 1206 (11th Cir. 1981) (en banc).

and 11th. The 1st, 3rd, 4th, D.C., and Federal circuits are the smallest, averaging under 5,000 opinions.

TABLE A–1
COURT OF APPEALS OPINIONS, 1982-1995

Circuit	Opinions
1st	4814
2nd	7106
3rd	4603
4th	4816
5th	8878
6th	6482
7th	9810
8th	10773
9th	12665
10th	5786
11th	8142
D.C.	4201
Federal	2625

Table A–2 presents data on the number of citations each circuit receives, broken down by the citing circuit. Each entry in the table denotes the number of times the column circuit cites the row circuit. For example, column 1 and row 2 indicates that in the 1982–1995 time period (for both citing and cited opinions), the 1st circuit cites the 2nd circuit 1854 times and the 9th 2440 times. The entries lying along the main diagonal are the circuits' inside citations; the sum of the citations in a given column (circuit) equal the total citations in that circuit's opinions; and the sum of the citations in a given row (i.e., circuit) equals the total citations that circuit receives during the 1982 to 1995 period.

TABLE A–2
COURT OF APPEALS CITATIONS, 1982-1995

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	27589	1181	1042	831	1123	986	1792	1073	1515	1100	795	746	145
2	1854	28085	2011	1183	1808	1501	2890	1566	2620	1581	1315	1154	185
3	1239	1428	20114	1017	1359	1316	2210	1271	1810	1325	1042	722	165
4	915	933	1028	10889	1114	1090	1631	1153	1468	1104	935	647	92
5	1615	1417	1541	1343	42093	1647	2743	1815	2599	2239	3661	936	172
6	1149	1111	1266	1043	1378	20349	2232	1275	1762	1434	1047	696	132
7	2051	1940	2020	1684	2335	2359	69492	2369	3129	2498	1621	1431	342
8	1342	1143	1301	1110	1677	1567	2751	38174	2364	1920	1280	807	150
9	2440	2459	2314	1847	2995	2581	4284	2693	71743	3416	2118	1657	470
10	951	789	873	779	1232	912	1695	1219	1644	27661	854	556	127
11	1659	1440	1519	1368	2751	1728	2813	1911	2615	2081	33492	936	205
12	895	1008	871	778	1054	902	1540	877	1757	946	651	16598	333
13	87	105	110	68	111	105	185	107	222	101	117	178	13257
	Note: Each entry is the number of times the column circuit cites the row circuit.												

Consistent with our sample of individual judges (see Table 1), inside circuit citations are much greater than outside citations.[73]

To analyze which circuits receive relatively more cites from other circuits, we must control both for the size of the citing and cited circuit. (We exclude the Federal circuit from these calculations because Table A–2 shows that the Federal circuit (row 13) receives relatively few citations from other circuits.) Initially, we calculate the number of citations that each circuit i receives from circuit j divided by j's total cites to other circuits. We exclude self citations from these calculations (i.e., cites that i receives from j when i = j). Let C_{ij} denote this percent or share where i denotes the cited and j the citing circuit. Table A–3 presents these percentages for each circuit. As before, each column represents the citing circuit and the row the cited circuit. For example, the entry in row 2 column 1 or C_{21} indicates that the 2nd circuit receives 11.4 percent of the 1st circuit's outside citations. (The sum of the entries under a given column equals 100 percent.) To take another example, the entry in row 1 column 9 indicates that the 1st circuit receives 6.4 percent of the 9th circuit's outside citations. Other things the same, we expect and find that circuits which publish the most opinions (the 9th, 7th, 5th, and

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[73] All circuits have more inside than outside citations, except the 4th circuit, which has 0.83 inside to outside citations. The 9th and Federal circuits receive the highest ratio of inside to outside citations at 3.05 and 5.26 respectively. Putting to one side the high ratio for the Federal circuit (which is due to its specialized subject matter), we expect larger circuits to have a greater ratio of inside to outside citations because they would have a greater selection of inside opinions to cite from. This is confirmed by the following regression (which excludes the federal circuit) of inside to outside citations (I/O) on circuit opinions in thousands (N):

$$(I/O) = .342 + .205N \qquad R^2 = .76$$
$$(1.28)\ (5.94)$$

Recall that in our regression analysis of individual judges we included a circuit size variable on the theory that, other things the same, judges in large circuits would have fewer opportunities to receive outside citations. We found, however, that the coefficient on this variable (see Table 2) was positive not negative (though, consistent with our expectations, its size was smaller in the outside than inside circuit regressions).

11th but, surprisingly, not the 8th) receive a larger percentage of a circuit's outside citations while smaller circuits (e.g., the 1st, 3rd, 4th and 12th or D.C. circuit) receive a smaller percentage of these citations. This is confirmed by a correlation of .89 between the average share of outside citations that a circuit captures in Table A–3 and the number of opinions it publishes (Table A–1). Finally, note that Table A–3 confirms the close relationship between the 5th and 11th circuits. Nearly 24 percent of the 11th circuit's outside citations are to the 5th and about 15 percent of the 5th's are to the 11th circuit.

To adjust for the size of the cited circuit, we divide each entry in Table A–3 by the number of opinions published by circuit i divided by the total number of circuit opinions excluding circuit j (and the Federal circuit). This is shown in Table A–4. To illustrate the effect of this adjustment consider the outside citations by the 1st circuit (column 1 in Tables A–3 and A–4). From Table A–3 we observe that the 2nd and 9th circuits receive 11.4 and 15.1 percent of the 1st circuit's outside citations. But the 9th published about 75 percent more opinions than the 2nd during the time period under study. When we adjust for this size difference, the 2nd is now much more likely than the 9th to be cited by the 1st—i.e., the entries under column 1 for rows 2 and 9 are 1.35 and 1.00 respectively. Indeed, the 9th is cited by the 1st in roughly the same proportion as its size for it accounts for both 15 percent of the 1st circuit's outside citations and 15 percent of published opinions (excluding 1st circuit opinions).

Several entries in Table A–4 immediately stand out.

1. The cross-citation effect between the 5th and 11th circuits appears as expected. Although the 11th circuit was bound by pre-1982 5th circuit decisions, none of those opinions or citations are included in the sample. Still the 11th circuit cites the 5th roughly twice as much as any other circuit, and the 5th cites the 11th roughly 40 percent more than it cites any other circuit. One explanation for this assumes that many judges search for familiar and respected authors of opinions to cite. Then it follows that since many 11th and 5th circuit judges served on the same court

TABLE A-3
PERCENTAGE SHARES OF OUTSIDE-CIRCUIT CITATIONS

	1	2	3	4	5	6	7	8	9	10	11	12
1		7.9	6.6	6.4	5.9	5.9	6.7	6.2	6.4	5.6	5.2	7.1
2	11.4		12.7	9.1	9.5	9.0	10.8	9.0	11.1	8.0	8.5	11.0
3	7.6	9.5		7.8	7.2	7.9	8.3	7.3	7.7	6.7	6.8	6.9
4	5.6	6.2	6.5		5.9	6.5	6.1	6.7	6.2	5.6	6.1	6.2
5	10.0	9.5	9.7	10.3		9.9	10.2	10.5	11.1	11.3	23.7	8.9
6	7.1	7.4	8.0	8.0	7.3		8.3	7.4	7.5	7.3	6.8	6.7
7	12.7	13.0	12.7	12.9	12.3	14.1		13.7	13.3	12.7	10.5	13.7
8	8.3	7.6	8.2	8.5	8.9	9.4	10.3		10.1	9.7	8.3	7.7
9	15.1	16.4	14.6	14.2	15.8	15.5	16.0	15.5		17.3	13.7	15.8
10	5.9	5.3	5.5	6.0	6.5	5.5	6.3	7.0	7.0		5.5	5.3
11	10.2	9.6	9.6	10.5	14.5	10.4	10.5	11.0	11.1	10.5		8.9
12	5.5	6.7	5.5	6.0	5.6	5.4	5.8	5.1	7.5	4.8	4.2	

Each entry is the percentage of the column circuit's outside citations captured by the row circuit. For example, the 2nd and 7th circuits receive 11.4 and 12..7 percent respectively of the 1st's outside citations.

TABLE A-4
RELATIVE SHARE OF OUTSIDE CITATIONS ADJUSTED FOR CIRCUIT SIZE

	1	2	3	4	5	6	7	8	9	10	11	12
1		1.34	1.14	1.11	.98	1.01	1.10	1.00	1.02	.96	.86	1.26
2	1.35		1.50	1.07	1.07	1.04	1.20	.99	1.19	.93	.97	1.32
3	1.39	1.69		1.42	1.24	1.41	1.41	1.24	1.27	1.21	1.18	1,28
4	.98	1.06	1.13		.97	1.11	1.00	1.07	.99	.96	1.01	1.10
5	.94	.87	.92	.97		.91	.91	.92	.95	1.06	2.15	.86
6	.92	.93	1.03	1.03	.89		1.01	.88	.88	.93	.84	.88
7	1.08	1.08	1.09	1.10	1.00	1.18		1.08	1.03	1.07	.86	1.19
8	.64	.58	.64	.66	.65	.72	.75		.71	.75	.62	.61
9	1.00	1.06	.97	.94	.99	1.00	1.00	.95		1.13	.87	1.07
10	.85	.74	.80	.86	.90	.78	.86	.95	.92		.77	.78
11	1.05	.96	.99	1.08	1.42	1.04	1.02	1.05	1.04	1.07		.94
12	1.10	1.31	1.10	1.19	1.06	1.06	1.08	.94	1.35	.94	.81	

Note: Each entry is the entry in A–3 divided by the row circuits share of published opinions excluding the column and Federal circuits.

with each other before the split, they would tend to favor each other's opinions over those authored by judges from other circuits.

2. We also observe strong cross-citation effects among the 1st, 2nd and 3rd circuit. Each of the three circuits receive a disproportionately large share of the outside citations of the other two circuits (adjusted for the relative size of the cited circuit). For example, the 2nd and 3rd circuits receive 35 to 39 percent more citations from the 1st than would be expected if the number of citations a circuit received depended only on its relative size. The 2nd and 3rd circuits appear to have a particularly close connection. The 2nd receives 50 percent more citations from the 3rd and the 3rd receives 69 percent more citations from the 2nd adjusted for the relative size of the two circuits. Factors related to geographical proximity (e.g., personal ties and similar types of cases) may explain part of the cross-citation effects among the three circuits but other factors (e.g., better judges) must contribute as well. Notice that the three circuits also receive a disproportionately large share of citations from the D.C. circuit as well.

3. When we turn from the cross-citation effects to the performance of circuits as a whole, we find that 3rd circuit (adjusted for the number of opinions it produces) tends to have the greatest influence followed by the 2nd, 3rd, D.C. and 7th circuits. Since the numbers in Table A-4 are adjusted for differences in the number of opinions each circuit produces during the 1982-1995 time period, they are comparable to the calculations of average influence (roughly, average outside citations circuit i receives per opinion of circuit i) in the main body of the paper. For example, the results in Tables 5 and A-4 indicate that the 1st, 2nd and 3rd circuits rank highest in average influence.

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