

Modeling Annual Supreme Court Influence: The Role of Citation Practices and Judicial Tenure in Determining Precedent Network Growth

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Abstract. Using networks generated from the entire set of United States Supreme Court decision citations, this paper models yearly court influence as a function of system stability, complexity, precedent age and judicial tenure. The model demonstrates that decisions written in years when the mean judicial age is low and judges are more stable in their use of precedent, more conservative in terms of the age of precedent cited, and the yearly citation network is less complex are more likely to be cited in future years. By incorporating system endogenous variables in modeling efforts, this paper contributes to the development of complex legal systems studies, and proposes new ways to develop the field.

1 Introduction

Every year, the American Supreme Court contributes to its own body of precedent. Justices carefully craft decisions, situating them within the set of extant precedent by citing relevant prior decisions. This process generates a complex dynamic system that grows and changes from year-to-year as the Supreme Court issues more and more decisions generating ever more citation links between them.

Ostensibly, the Supreme Court's authority stems from its role as the judicial system's court of final appeal. Decisions serve as precedent, establishing the state of law for analogous disagreements in the future. This authority derives from the convention of *stare decisis*, assuring that lower courts conform to higher court precedent, while precedents stand as "good law" unless they are for some reason overturned.

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Before decisions become precedent judges must of course write them, and while they craft these decisions judges are expected to take into account existing precedent, citing it where relevant. From 1789 to 2004 the court issued approximately 35 000 decisions with over 200 000 citations between them. If we conceive of these decisions as nodes in a network, with their citations joining them together into a “web of law” [1] we can apply network analytic techniques to assess the court’s performance.

Given this web of law we can think of a court’s influence in terms of how often it is cited in future years. If the court writes important decisions that go on to influence future deliberations, that court will receive more citations than a court which – for whatever reason – writes decisions that are less important in future years. Past research has examined the court in terms of constitutional eras [2,3], interest group activity [4], judicial ideology [5,6], and from a host of other perspectives. The models that these works develop and rely upon tend to use factors exogenous to the precedent system to explain and understand court behavior.

There has been little work that has attempted to model court citation influence year-by-year that incorporates variables both endogenous and exogenous to the citation system. This study fills that gap by modeling court citation patterns from 1800 to 1990 as a function of variables drawn both from the citation system itself and from exogenous historical variation.

System-level analysis of court citations contributes to a growing literature that attempts to apply artificial intelligence to legal analysis [7,8] as well as an increasingly popular and capable field of legal citation analysis [9-11]. This study is amongst the first to use the record of complex Supreme Court behavior to construct new variables that help to explain the system’s functioning.

2 The Measures

The citation data used [12] comes from a set provided by Lexis-Nexis and used originally in Fowler *et al*’s [13] analysis of precedent centrality measures. It includes complete data on citations between Supreme Court cases from 1789 to 2005. The data started as a full-network edge list which was then parsed into a complete network. Subgraphs were then generated for every year including all of the decisions written that year and the citations for each.

Yearly citations. The dependent variable used below is the total number of citations received by decisions written in each year. Because of the central importance of precedent to the legal system, the number of citations that decisions written in each year go on to receive is a useful proxy for a year’s influence. Years

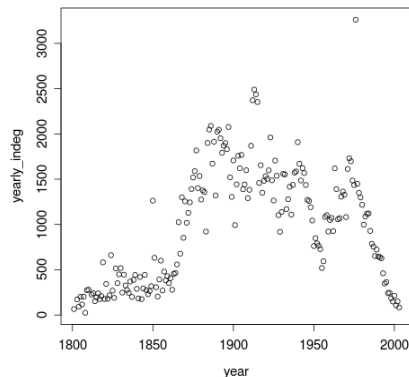


Fig. 1. Yearly in citations

during which many important decisions are written will go on to garner more citations as those decisions are deemed relevant in future years, and thus exert more influence on legal development.

The dependent variable plot (figure 1) shows a fairly low rate of citation for years prior to the civil war. Following the war, we see a sharp increase in the number of citations received per year. By start of the 20th century, the change has largely leveled off and each year receives somewhere between around one and two thousand citations. The mean number of citations received per year is 945 (sd 655), with a few outlying years. For instance, 1976 is situated well above the curve. In this instance the outlying behavior is caused by one particularly influential case - *Gregg v. Georgia* – that is often cited in reply to the many death penalty appeals that the Court receives.

There is a natural downward curve in more recent years as decisions written during this time period have had fewer opportunities to attract citations. Due to this consideration, the analysis below uses a subset of the data, excluding years prior to 1800 – which saw relatively little Court activity – and years after 1990, which have yet to reach citation maturity.

Precedent age. Mean precedent age was calculated by taking the mean of the age of all precedents cited in a given year. Throughout this paper, I will refer to this mean citation age as the *observed precedent age*. The observed age suggests how conservative or progressive a court is in terms of what precedent it cites – with older precedents suggesting a more conservative court and *vice versa*. However, it is difficult to compare years to one another because, as years go by, there are more old cases for judges to cite and they grow older every year. This creates a natural tendency for observed age to increase over time.

To control for this I also calculated the mean age of all extant precedent for each year. This variable, referred to below as *expected random age*, tells us what mean age we would expect if judges made citations at random. The difference between *expected random age* and *observed precedent age* provides a more nuanced perspective on how conservative or progressive a given court's citation patterns are.

Mean citation age across all years is 18.95 years (sd 7.95), while the mean expected random age is 35.56 years (sd 21.11). The mean difference between expected random age and observed citation age is 16.25 years (sd = 14.63). Looking at the observed mean citation age (figure 2) shows an unstable period prior to the civil war that is similar to what we observe in both the yearly citation and stability plots. Prior to the civil war, age steadily increases until leveling off around the mid 19th century at which

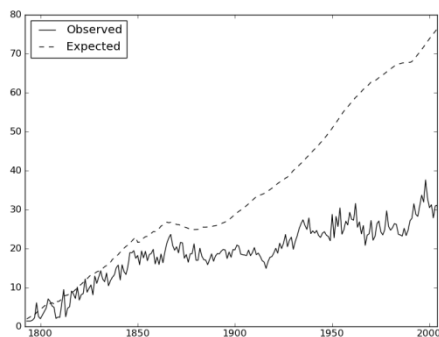


Fig. 2. Citation age

point mean age fluctuates between around 20 and 35 years. Meanwhile, we see random age steadily increase and move further and further from the observed age

curve. Prior to the mid 19th century, the mean age of Supreme Court citations remained very close to what we would expect to see if citations were made at random. As years go by, and especially after the start of the 20th century, Supreme Court citation age begins to diverge more and more from what we would expect to see given random citations.

Citation stability. Examining the contents of yearly citation subgraphs and comparing them to one another allows us to include measures of system stability in our model. We can consider the set of precedent used in a year as a court's precedent repertoire. We can measure how stable court repertoires are by comparing them to those used in preceding years. Some courts use very similar repertoires to those used in previous years, whereas others use sets of precedent that, for the most part, have not been used in recent years. Periods of changing repertoire denote either changes in the content of cases that the Supreme Court hears or changes in the body of precedent that the Supreme Court feels is good law.

To measure precedent stability we can calculate the proportion of precedent cited in any given year that was also cited in the preceding 5 years. To determine this we simply divide the total number of unique citations in each year by the number of those citations that were also used in the previous five year period. At a value of 1, this *stability* variable tells us that all of the precedent used in a given year was also used at some point during the previous 5 years. Similarly, a 0.5 *stability* level shows that half of a year's precedent was also used at some point during the previous 5 years.

Mean stability across years is 0.52 (sd 0.18). The stability plot (figure 3) shows that prior to the civil war, the court was significantly less stable – and more variable in its stability – in the set of precedent it used. Following the civil war, precedent stability levels off and tends to vary within a narrower range, with anywhere from 40-70% of precedent used in a given year also used in the preceding 5 years. This curve suggests behavior counter to what one would expect. During the Court's early years there was less precedent available for Supreme Court justices to cite. We would therefore expect that – all else being equal – these early years would exhibit *more* stability than the later years during which justices had a much larger body of precedent to draw on. However, we observe just the opposite, with stability increasing concomitantly with the available body of precedent.

Components. Yearly subgraphs tend to be made up of many disconnected components. In most situations the citations between case A and the body of precedent it cites and case B and the body of precedent it cites will form two distinct graph components. However, if case A cites case B or *vice versa* or the two cases share precedent, their ego networks will join to form one larger component. We can thus

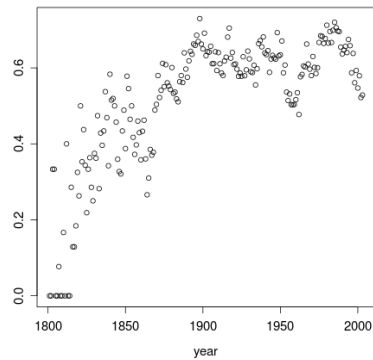


Fig. 3. Citation stability

measure the number of components in each yearly subgraph and use this measurement to infer how connected a year's precedent is. When there are many subcomponents in a given year, cases tend to be isolated from one another, each addressing its own body of precedent. However, when there are fewer components, the decisions within a year are more interrelated and – in a sense – more complex as they are more likely to depend on and interact with one another. The analysis below includes a *components* variable calculated by measuring the number of connected components in each yearly subgraph.

The number of *components* in the yearly citation subgraphs (figure 4) shows a striking inverted-U shaped curve (mean=32.8, sd=21.46). As the 19th century progressed, the Court's yearly citation networks consisted of an ever-growing number of components, until just before the turn of the century when component number peaked and subsequently declined for the duration of the 20th century. Substantively, this means that during the 19th century, yearly decisions became separated into distinct silos, each relying individually on its own body of precedent. During the 20th century we see the reverse, where each year's decisions become more related and are much more likely to rely on one another's findings and share precedent.

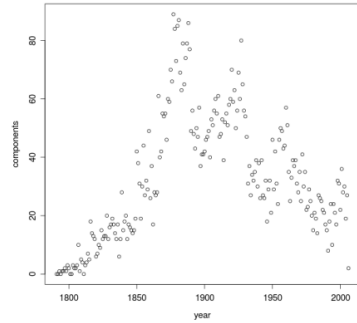


Fig. 4. Graph components

Judicial experience. There are numerous reasons to believe that judicial Supreme Court tenure is significantly related to court influence. Scholars have long noted “freshman effects” [14] [15] for Supreme Court justices. When we measure mean Supreme Court judicial experience we are in a sense measuring how “fresh” an entire court is. Courts with lower mean experience are likely to have worked together less than other courts and they lack the presence of more experienced justices who might serve as stabilizing factors within the court.

To measure judicial experience, the U.S. Supreme Court Justices database [16] was used to calculate mean judicial tenure for each year included in the model. Examining mean judicial tenure on a yearly basis shows quite clear court eras, during which the court builds up judicial experience before one or more particularly long serving justices leave the bench to be replaced by newcomers. Mean judicial tenure across all years is 11.71 (sd 3.48).

Cases: In addition to the above measures, the number of cases written in each year is included as a control variable.

Modeling yearly citations. While the descriptives above provide an interesting perspective on Supreme Court history, this paper's chief priority is to test whether or not variables endogenous to the citation system serve as meaningful predictors of eventual court influence. In order to do so, OLS regression was used

to model yearly citations as a function of stability, judicial experience, the difference between random expected age and real age and the number of decisions written that year. The results (table 1) are discussed below.

Table 1. Dependent Variable = Yearly in citations

	Estimate	St. Error	Beta Coef.	p-value
Intercept	284.21	119.94		0.019
Stability	709.11	222.57	0.188	0.0017
Age_Diff	-8.48	2.86	-0.172	0.0035
Judicial Tenure	-29.12	7.50	-0.144	0.0015
Components	5.95	1.59	0.197	<0.001
Cases	3.97	0.44	0.651	< 0.001
				Adj. R ² =0.75

3 Discussion

Overall the model accounts for a relatively high proportion of variability in yearly citations (adj. R²=0.75). All of the predictor variables, and the cases control variable, are significant predictors of yearly citations.

Stability. The positive coefficient demonstrates that years which use bodies of precedent similar to those used in the five preceding years are more likely to attract citations. That is to say, the less stable courts are with the body of precedent they use and the more they diverge from precedents that have recently been cited the less influence they have in future years.

Citation age. The negative citation age coefficient suggests that as the difference between mean citation age and expected random age increases (i.e. as courts stray from random expected age by citing more recent decisions) the court becomes less likely to attract citations in future years.

Components. The number of components a year's subgraph has and the number of citations that year goes on to garner are positively related. This could perhaps reflect a preference for less complexity *within* a year's precedent network. The *citation age* and *stability* findings above showed an aversion to change as measured from some baseline established *outside* the yearly subgraph. On the other hand, the *components* finding demonstrates that fewer relationships and less complexity *within* a year's decision network are also related to the number of citations a year's decisions will garner.

Judicial tenure. As the collective experience of a court grows, the decisions they write become less likely to attract future citations. Much of the literature on judicial tenure suggests that judges are more moderate early in their time on the bench. Perhaps this leads to more moderate decisions for courts that are made up of disproportionately short-tenure justices, and perhaps these moderate decisions are more palatable to future justices. Alternately, this effect could be related to the phenomenon of recent case preference that we observe in the citation age plot

(figure 4). It is conceivable that older, more experienced judges are more in touch with older jurisprudence, whereas younger, less experienced judges could be more in touch with newer case law, especially that which they helped create.

Cases. This control variable shows a significant positive relationship with yearly citations, and moreover a relatively large effect size. This is unsurprising as years during which more decisions were written are, all else being equal, more likely to attract citations.

The whole model. Stepping back from an examination of each variable's place in the model, we see a model that is itself significant, not only statistically but also methodologically. While scholars have long advocated for an increased focus on empirical studies of the legal system [i.e. 17], there has as yet been relatively few legal citation analyses. Most of the research done prior to this study has been descriptive in nature, and – to the author's best knowledge – none have used system endogenous variables as elements in an analytic model.

Court evolution. Another strength of this analysis is its ability to provide us with insight into how the Court's behavior has changed over time. Most of our variables demonstrate an "establishment" period prior to the civil war. During this period, court behavior had yet to reach a level of relative stability, showing more variability from year to year. Following the civil war, and especially after the start of the 20th century, we see a court that behaves much differently than it had in its early years. We see much less fluctuation in the set of precedent used, an increasing preference for more recent precedent and much more stability in the number of citations each year goes on to receive.

4 Conclusion

This study demonstrates that we can use citation networks to analyze Supreme Court influence. It shows that precedent stability, citation age, the number of components in a year's citation subgraph and judicial tenure are all significantly related to the number of citations a year's decisions will go on to garner. Years with less experienced Supreme Court justices at the bench, that are stable in regards to the body of precedent they cite, consistent when citing from across the age spectrum of available precedent, and relatively uncomplicated in terms of how many relationships exist between decisions are more likely to attract citations in future years. However, this study's most important contributions are not the substantial conclusions arising from its analysis. Rather, its contribution to the development of a new type of legal analysis variable - derived from measurements endogenous to the precedent citation system – and the demonstration that these variables are meaningful predictors of system behavior, will hopefully inspire similar studies in the future.

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