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The authority of Supreme Court precedent

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Abstract

We construct the complete network of 30,288 majority opinions written by the U.S. Supreme Court and the cases they cite from 1754 to 2002 in the *United States Reports*. Data from this network demonstrates quantitatively the evolution of the norm of *stare decisis* in the 19th Century and a significant deviation from this norm by the activist Warren Court. We further describe a method for creating *authority scores* using the network data to identify the most important court precedents. This method yields rankings that conform closely to evaluations by legal experts, and even predicts which cases they will identify as important in the future. An analysis of these scores over time allows us to test several hypotheses about the rise and fall of precedent. We show that reversed cases tend to be much more important than other decisions, and the cases that overrule them quickly become and remain even more important as the reversed decisions decline. We also show that the Court is careful to ground overruling decisions in past precedent, and the care it exercises is increasing in the importance of the decision that is overruled. Finally, authority scores corroborate qualitative assessments of which issues and cases the Court prioritizes and how these change over time.
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Institutionally, the United States judiciary is the weakest of the three branches of government. In the words of Alexander Hamilton, the U.S. Supreme Court was founded in the idea that they would have "no influence over either the sword or the purse, no direction either of the strength or the wealth of the society... to have neither Force nor Will, but merely judgment; and must ultimately depend upon the aid of the executive arm for the efficacy of its judgments" (Madison et al., 1966 [1788]). It did not fare well for the Court's authority that, in addition to this institutional limitation, the newly founded 18th and early 19th Century judiciary was openly political and

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had virtually no established norms and procedures (Allen, 1964; Kempin, 1959). As a result, the Court suffered a crisis in institutional and decisional legitimacy, virtually powerless without the ability to enforce and implement their substantive decisions. Refusing nomination to the Court as chief justice, former Chief Justice John Jay wrote to President Adams in 1800, "I left the bench perfectly convinced that under a system so defective [the Court] would not. . .acquire the public confidence and respect which, as the last resort of justice in the nation, it should possess" (Baker, 1974, p. 332).

Legal historians suggest that justices in the 19th Century responded to the crisis of legitimacy by strengthening the norm of *stare decisis*, a legal norm inherited from English common law that encourages judges to follow precedent by letting the past decision stand (Friedman, 1985, pp. 127–133). In order to foster compliance and enhance the institutional reputation of the Court, *stare decisis* was implemented to place decision-making in the domain of neutral legal principles and the "accumulated experience of many judges responding to the arguments and evidence of many lawyers" (Landes and Posner, 1976, p. 250) rather than at the whim of the personal preferences of individuals. To this day, the justices of the Supreme Court are aware of the inherent weakness of the federal judiciary and place high value on maintaining their institutional and decisional legitimacy through the use of precedent (Ginsburg, 2004; Powell, 1990; Stevens, 1983). Recognizing that legitimacy is essential to achieve their policy objectives, the members of the Court justify their substantive rulings through court opinions, which allow the justices to demonstrate how their decisions are consistent with existing legal rules and principles established in prior cases (see Hansford and Spriggs, 2006, pp. 24–30). Because it is the application of existing precedents that creates the perception of judicial decision-making to be procedurally neutral and fair (Tyler and Mitchell, 1994), these opinions are often considered to be the source of the Court's power (Epstein and Knight, 1998; Segal and Spaeth, 2002).

Unfortunately, the exact role of law in Supreme Court decision-making is still quite unclear. Due to the complexity of law and the difficulty in quantifying the concept of precedent, the "[judicial] literature continues to present an underdeveloped theoretical and empirical understanding of why and when law changes" (Hansford and Spriggs, 2006, p. 6). This problem has often pushed judicial specialists to rely on the ideology of decisions and judges rather than the content of court opinions and the role of law itself to analyze judicial decision-making (George and Epstein, 1992). This is unfortunate not only because of the vital function of court opinions, but also because the literature has ignored a rich source of accessible information about the role of precedent—the assessments of the justices themselves. Each *judicial citation* contained in an opinion is essentially a latent judgment about the case cited. When justices write opinions, they spend time researching the law and selecting precedents to support their arguments. Thus, the citation behavior of the Court's provides information about which precedents serve important roles in the development of American law. This paper is an attempt to utilize the quantity and quality of judicial citations in Supreme Court majority opinions to understand how legal policies are formulated in the judiciary.

We use the complete *network of citations* in all 30,288 majority opinions contained in the U.S. Reports from 1754[1] to 2002 to demonstrate how network data can aid in the study of precedent and its influence in judicial decision-making. First, we analyze how the norm of *stare decisis* has evolved over time by focusing on changes in the average number of citations per opinion. Over the course of the 19th Century, the number of citations rose – as did the fraction of cases

[1] Although the first reported U.S. Supreme Court decision was in 1792, the first volume of the U.S. Supreme Court Reporter contains decisions of the Supreme Court of Pennsylvania, which goes back to 1754.

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citing others at least once – suggesting that the Court gradually learned to ground its rulings in the facts and opinions of previous decisions. In concord with past qualitative observations by legal scholars (Goodhart, 1930, p. 180), the quantitative data indicate that the norm of *stare decisis* was fully adopted by about 1900. The data also shows a significant deviation from the norm of *stare decisis* that coincides with the tenure of the activist Warren Court. During this period, majority opinions tended to cite fewer cases. There was also a sharp decrease in the number of opinions that contained at least one citation to another case. Thus, network analysis helps illuminate the concept of judicial activism.

Second, we describe a network analysis procedure based on a recently developed method from computer science (Kleinberg, 1998) that aggregates the latent judgments in the citation network into *authority scores* and *hub scores*. The authority score of a case depends on the number of times it is cited and the quality of the cases that cite it. Symmetrically, the hub score of a case depends on the number of cases it cites and the quality of the cases cited. Thus, authority scores indicate the degree to which a case is thought to be important for resolving other important issues that come before the Court, while hub scores indicate the degree to which a case is well-grounded in previous important rulings. We show that cases with high authority scores are much more likely than others to appear on lists of "landmark" cases chosen by legal experts and political scientists for their "importance" and "salience." Authority scores also predict which cases experts will identify as important in the future—all without incorporating any information about the content of these decisions. As a result, we can use authority scores to classify the importance of every case in the network with a fraction of the time and effort and without the ideological bias that might be present in expert surveys.

Another virtue of the network analysis approach is that we can determine which rulings were thought to be most important and which were most carefully grounded in prior precedent *at any point in time*. This allows us to test several hypotheses about the rise and fall of precedent. For example, we show that reversed cases are usually thought to be much more important than other decisions, and the cases that overrule them quickly become and remain even more important as the reversed decisions decline. We also show that the Court is careful to ground overruling decisions in past precedent, and the care it exercises is increasing in the importance of the decision that is overruled. Finally, authority scores corroborate qualitative assessments of which issues and cases the Court prioritizes and how these change over time.

This is not the first analysis of Supreme Court citations, but previous attempts to use citation network analysis in judicial research have largely been narrow in scope. With few exceptions, these studies aimed to measure the prestige of judges (Kosma, 1998; Landes et al., 1998) or to understand the citation behavior of appellate courts (Caldeira, 1985; Harris, 1985), rather than focusing on *stare decisis* or the dynamics of legal change. Two recent papers also apply network analysis to American law, but fail to fit their analysis into a general theory of judicial decision-making (Chandler, 2005; Smith, 2005). Landes and Posner (1976), McGuire and MacKuen (2001) and Ulmer (1970a,b) mark efforts to use the judicial citations of court opinions to assess the role of legal rules, but they do not employ a broad sample of precedents, nor do they consider the *quality* of judicial citations in their research. The work presented here is an effort to move beyond these tentative steps towards the utilization of network analysis in judicial research.

1. The network of precedents in majority opinions

We restrict our focus to the legal citations found in majority opinions of the Supreme Court. Majority opinions not only reflect the Court's rulings on a given case—they also cite legal rules

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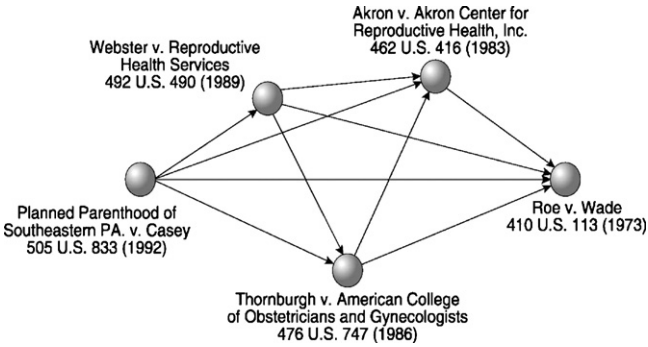

Fig. 1. Network of selected landmark abortion decisions.

and principles founded in preceding cases. These cases build on one another within a complex network of Supreme Court precedents which can be constructed formally by examining the cases cited in each opinion. To analyze this network, it will be useful to establish some terminology. Each case can be thought of as a *vertex* or *node*, and each citation an *arc*, where there exists an arc from case i to case j if and only if case i cites case j in its majority opinion. An arc from case i to case j represents an *outward citation* for case i and an *inward citation* for case j. The total number of arcs leading to and from each vertex is the *degree*, where the *indegree* is the total number of inward citations and the *outdegree* is the number of outward citations. To provide a simple example of such a network, Fig. 1 depicts the precedent network for a set of five landmark abortion decisions. Although these cases cite and are cited by many other decisions that are not shown, we limit our focus to these five cases for purposes of illustration.

Each case in Fig. 1 is a vertex. The arrows represent citations and point from the citing case to the case that is cited. Notice that each decision cites *Roe versus Wade* (1973) and that *Roe* does not cite any other cases shown. This means that *Roe* has four inward citations and zero outward citations. In contrast, *Planned Parenthood of Southeastern PA versus Casey* (1992) cites all the other cases shown but is not itself cited since it is the last of the five cases to be decided. Thus, *Casey* has zero inward citations and four outward citations. The other three cases in Fig. 1 fall in between these extremes. For example, *Webster versus Reproductive Health Services* (1989) has one inward citation and three outward citations.

Of course, we need not limit ourselves to five cases—using the full text of all cases listed in the U.S. Reports (available from Howe Electronic Data, Inc.) we can create the complete precedent network by finding all legal citations to other decisions. To do this we utilize the open source statistical software R and its PERL-like capabilities to write a simple computer program that locates all cases cited in the text of each majority opinion from 1754 to 2002. This program identified citations not only in their U.S. form (e.g., XXX U.S. YYY), but also those recorded with early Supreme Court reporter names (Dallas, Cranch, Wheaton, Peters, Howard, Black, Wallace).[2] To avoid duplicates and make sure that previously misnumbered cases were correct,

[2] The U.S. Reports include *per curiam* decisions and a small number of state court decisions. Non-U.S. Supreme Court cases make up approximately 0.7% of the cases in the U.S. Reports, 0.03% of the inward citations, and 0.0004% of the outward citations (i.e. just 1 of the 220,500 outward citations). Since only citations have an effect on the measures we develop below, excluding them has no significant impact on any of the substantive findings in this article. We retain both *per curiam* and non-U.S. Supreme Court cases in the data because our inclusion criterion is presence in the U.S. Reports (see Fowler et al. (2007) for an analysis that excludes *per curiae*).

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these older cases are changed to their U.S. form using the Supreme Court's Ashmore (2006). The result is a list of 30,288 cases connected together by 220,500 citations.

Of course, not all judicial citations represent a reliance on authority. It is possible that opinion writers sometimes cite a case just to mention it in passing or because they disagree. However, regardless of the content, each citation is a latent judgment by the justice who authors it about which cases are most important for resolving questions that face the Court. Since legal rules are cited to provide convincing legal justifications, the fact that the opinion writer choose to cite a case in an opinion rather than leave it out suggests that the citation, even if it is not a reliance on authority, provides applicable information about the role of various precedents in the legal network. For example, an overruled case like *Plessy versus Ferguson* 163 U.S. 537 (1896) is surely a more important case in American Law than an overruled case like *Crain versus United States* 162 U.S. 625 (1896), although neither has been cited as a legal authority in the last 100 years. Thus, we include all judicial citations in our analysis and remain attentive to the various types of citations that could link cases together.

2. Patterns in the precedent network

There are a number of ways in which we can summarize the network data in Supreme Court citations. Fig. 2 shows the distribution of inward citations (number of times each case was cited) and outward citations (the number of other cases each case cites) in the judicial precedent network on log-log plots. Notice that the vast majority of decisions are cited by only a few cases, but there are a few decisions that are widely cited. Similarly, most decisions contain only a few citations, but there are a few decisions that cite a large number of cases. This feature is common to large scale networks (Albert and Barabasi, 2001; c.f. Fowler, 2006a,b; Christakis and Fowler, 2007) and to scientific citation networks in particular (Boerner et al., 2004; Borgatti and Everett, 1999; Redner, 1998; Vazquez, 2001; White et al., 2003).

We can also use citation patterns in the precedent data to analyze how the norm of *stare decisis* has changed over time. Fig. 3 shows the average number of inward and outward citations per case in the precedent network by year. Prior to the 19th Century, both inward and outward citations were rare. This reflects the fact that during this period there was no "firm doctrine of *stare decisis*" (Kempin, 1959, p. 50). Justices typically did not refer to other cases and the cases they wrote did

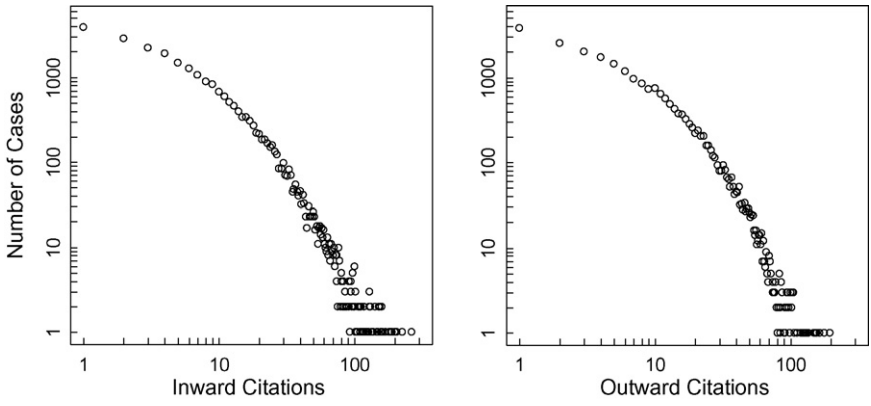

Fig. 2. Distribution of inward and outward citations in the precedent network.

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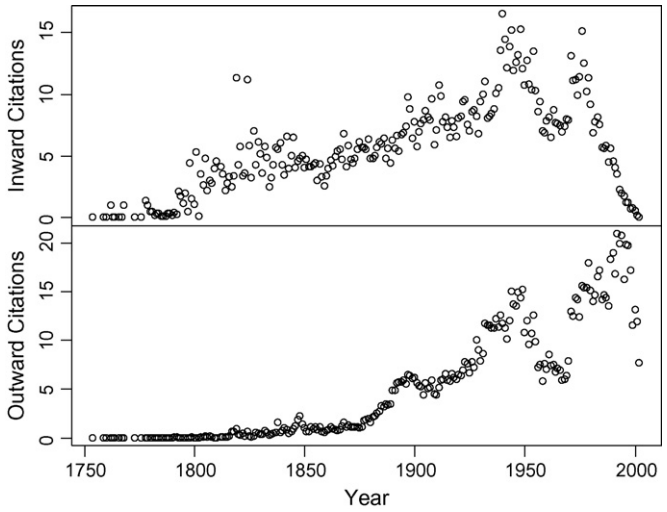

Fig. 3. Mean inward and outward citations by year.

not inform future courts about how to decide the law. The average number of outward citations slowly rises in the 19th Century as the norm takes hold and the number of previous cases that could potentially be cited increases. The average number of inward citations also rises as justices begin writing more broadly applicable legal rules. The number of inward citations remains relatively high until we reach the present, when the small number of inward citations results from cases being too new to know the full extent to which they will be cited in later decisions.

Goodhart argues that by 1900, the doctrine of *stare decisis* was in full effect (1930, p. 180). However, Fig. 3 shows that the average number of inward and outward citations continued to rise in the 20th Century. To what extent does this rise signify a further strengthening of *stare decisis*? The continued increase in the average number of citations might simply be the result of an increasing number of cases that are available to be cited. To investigate the development of this norm a bit more closely, Fig. 4 plots for each year the percentage of cases that cite *at least* one other case. As the norm of *stare decisis* becomes better established, there should also be

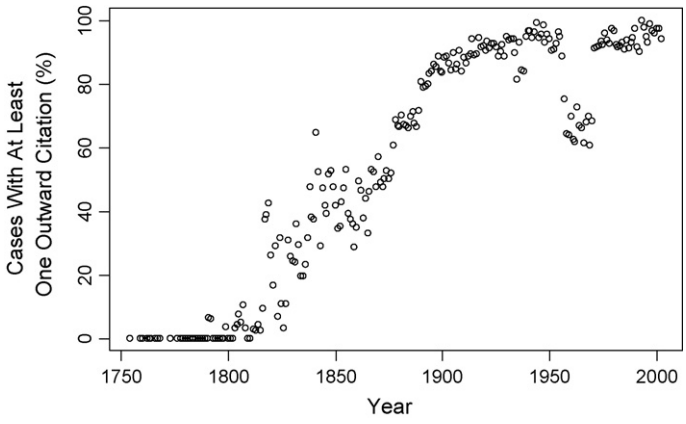

Fig. 4. Percentage of cases with at least one outward citation by year.

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an increasing number of cases which cite at least one precedent in order to justify the decision. Notice that hardly any 18th Century cases cited at least one precedent, but starting in about 1800 there is a slow and steady increase in the practice. This increase levels off by 1900, when about 90% of the cases are citing precedent. Thus, justices were clearly in the habit of connecting their decisions to previous rulings by the turn of the century.

3. *Stare decisis* and the Warren Court

Figs. 3 and 4 also show a sharp decrease in average number of outward citations and the portion of cases that do not cite any precedents during the Warren Court (1953–1969). These changes are consistent with our understanding of the Warren Court as an "activist" court that not only overruled more precedents than any other court (Brenner and Spaeth, 1995, p. 47), but revolutionized Constitutional law (see Horwitz, 1998; Powe, 2000; Schwartz, 1996). Since the process of creating new law frequently involves breaking with existing precedent, it is no surprise that the Warren Court cited fewer cases in their opinions and handed down a greater number of cases without any citations.

The only two courts that could have cited Warren Court precedents are the more conservative Burger (1969–1986) and Rehnquist (1986–2005) Courts. Although the opinions written by these Courts contained some of the highest average outward citations in the history of the Supreme Court, the Warren Court precedents nonetheless experience a sharp drop in *inward* citations. This suggests that there is something about precedents established during the period that is causing them to be neglected in subsequent cases. From a legal perspective, one possible explanation may be the weak legal basis of the Warren Court precedents resulting from the lack of outward citations. In the words of one scholar, "Warren Court decisions did not articulate specific doctrinal analyses, and therefore did not provide firm guidance for future Courts" (Strossen, 1996, p. 72). It would follow, then, that subsequent courts would have trouble following the Warren Court's "many ambiguities, loopholes, and loosely formulated rules" (Emerson, 1980, p. 440). An alternative explanation may lie in understanding the justices as policy oriented actors. That is, in creating conservative legal policies, the Burger and Rehnquist Courts were unable to justify their policy choices with liberal Warren Court precedents, forcing them to cite more conservative rules that were more consistent with their preferences, such as their own or pre-Warren precedents.

4. The most important precedents

The precedent network provides valuable aggregate information about the norms of the Court, but what can it tell us about individual decisions? One possibility is that we can extract from this network the decisions that are most important for establishing precedent. A number of publications rely on expert opinions to identify landmark cases in the Supreme Court's history. For example, Congressional Quarterly's *Guide to the United States Supreme Court* (Biskupic and Witt, 1997), the *Oxford Guide to Supreme Court Decisions* (Hall, 1999) and the Legal Information Institute (2005) compile lists of the most important Supreme Court decisions based on opinions of judicial specialists. In such rankings, legal experts evaluate a case's importance on its historical and/or social significance, its importance to the development of some area of law, its impact on the development of American government, and relatedly, its prevalence in legal textbooks.[3] These

[3] This information was provided in email correspondence with the authors (May 2005).

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lists vary in length at 2500, 440, and 600, respectively, but they all represent just a small fraction of the 30,000+ majority opinions that have been written by the Court.

However, why rely on third parties to evaluate which cases are most important when the network contains the evaluations of the justices themselves? Each judicial citation in an opinion is essentially a latent judgment by the justice who authors it about which cases are most important for resolving questions that face the Court, and social network theory suggests a number of ways to use these citations to determine which cases are most important. At the most basic level one might use the number of inward citations, or *degree centrality*, to measure the importance of a given decision (Proctor and Loomis, 1951; Freeman, 1979). For example, *Roe* is the most important case in Fig. 1 because it has the largest number of inward citations. In fact, this is how InfoSynthesis (http://www.usscplus.com/) determines which cases are included in its CD-ROM containing the 1000 "most important" cases decided by the Supreme Court. However, this measure does not fully use information in the precedent network because it treats all inward citations in exactly the same way. Ideally, we should be able to use information we obtain about the importance of cited cases to improve our estimate of the importance of the cases that they cite. For example, suppose decision i is cited by a case that is considered to be very important and decision j is cited by a case that is not. This suggests that decision i may itself be more important than decision j.

In order to estimate simultaneously the importance of all cases in the network we might instead use a measure called *eigenvector centrality*, which supposes that the importance of a case is *proportional* to instead of *equal* to the importance of the cases that cite it (Bonacich, 1972).[4] However, there are substantive reasons why we might not want to use eigenvector centrality to measure the iterated importance of each Supreme Court case. The eigenvector centrality approach to identifying important cases assumes that only inward citations contain information about importance. However, outward citations may provide a clue to importance as well. Some cases cite only the most important precedents while others cast the net wider, relying on less well-known decisions. If we know how well-grounded a case is in important precedents, we can use this information to distinguish between important and less-important cases. For example, suppose decision i is cited by a case that is considered to be well-grounded in precedent and decision j is cited by a case that is not. This suggests that decision i may itself be more important than decision j.

A recent advance in social network theory (Kleinberg, 1998) allows us to draw on both inward and outward citations for assessing importance. This procedure relies conceptually on two different kinds of important cases, *hubs* and *authorities*. A *hub* is a case that cites many other decisions, helping to define which legally relevant decisions are pertinent to a given precedent, while an *authority* is a case that is widely cited by other decisions. Most cases act as both hubs and authorities, and the degree to which cases fulfill these roles is mutually reinforcing within the precedent network. A case that is a *good hub* cites many *good authorities*, and a case that is a *good authority* is cited by many *good hubs*.

The extent to which each case fulfills these roles can be determined using a method closely related to eigenvector centrality. Suppose x is a vector of authority scores, y is a vector of hub scores, and that these vectors are normalized so their squares sum to 1. Let each case's authority score x_i be proportional to the sum of the hub scores of the cases that cite it: $x_i \propto a_{1i}y_1 + a_{2i}y_2 + \cdots + a_{ni}y_n$ and let each case's hub score be proportional to the sum of the authority scores that they cite: $y_i \propto a_{i1}x_1 + a_{i2}x_2 + \cdots + a_{in}x_n$. This yields $2n$ equations which we can represent in matrix format

[4] The PageRank algorithm used by Google (Brin and Page, 1998) is also closely related to eigenvector centrality.

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as $\lambda_x = A^T y$ and $\lambda_y = Ax$. Kleinberg (1998) shows that the solution to these equations converges to $\lambda x^* = A^T A x^*$ and $\lambda y^* = A A^T y^*$, where λ is the principal eigenvalue and x^* and y^* are the principal eigenvectors of the symmetric positive definite matrices $A^T A$ and $A A^T$, respectively. The resulting hub and authority scores allow us to identify the key precedents in the network—precedents that are influential (authorities) and precedents that are well founded in law (hubs).

5. Landmark abortion cases revisited

Notice that authority and hub scores are *context dependent*. These values can change depending on which cases are included in the network. In the set of selected landmark abortion cases depicted in Fig. 1, it is fairly easy to identify the good authorities and hubs since the network is small. In this case, the authority and hub scores do not provide much more information than the relationships implied by the direct inward and outward citations. However, suppose we increase the size of the network to include all 92 decisions that cite *Roe*. As Fig. 5 shows, the five landmark abortion cases are now embedded in a complex network of precedent that makes it more difficult to establish intuitively which precedents are most important. Considering their role in the whole network of 30,288 cases is obviously even more challenging.

To illustrate how the network context affects hub and authority scores, Table 1 shows values calculated for the five landmark abortion decisions from Fig. 1 under three different network assumptions. The first set of values assume these five cases are the only cases in the network, the second set assumes they are embedded in the network of 92 abortion decisions that cite *Roe*, and

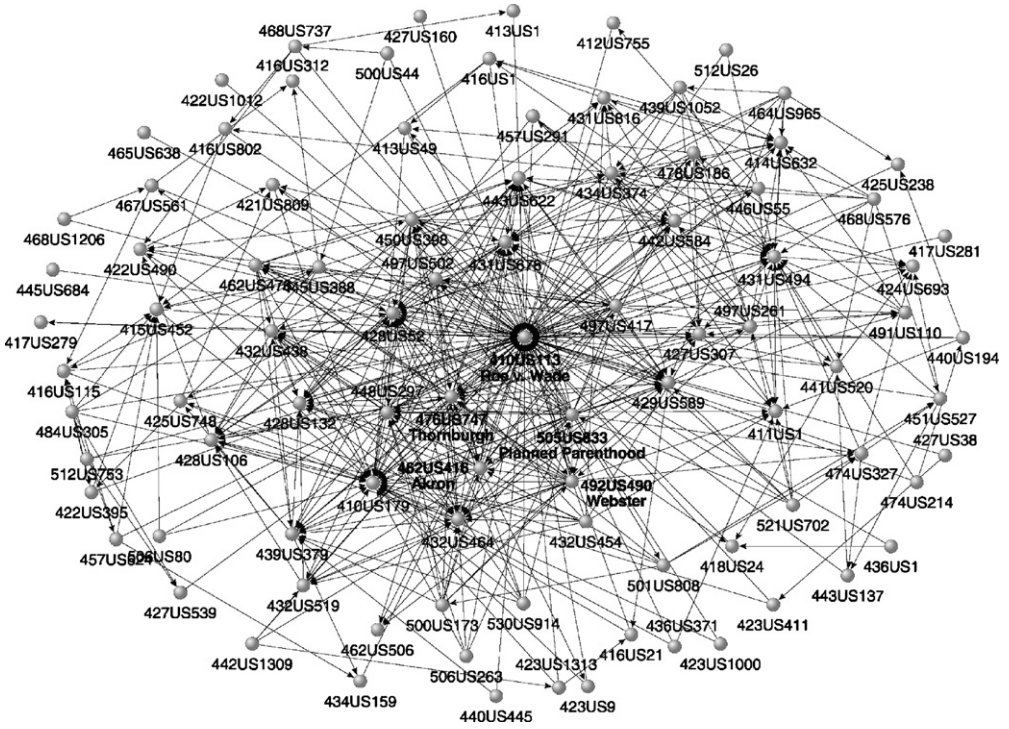

Fig. 5. Extended network of abortion decisions.

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Table 1
Authority and hub scores of selected landmark abortion decisions

Decision	5 case network (Fig. 1)				92 case network (Fig. 5)				Complete network (30,288 cases)			
	Authority score	Hub score	Inward citations	Outward citations	Authority score	Hub score	Inward citations	Outward citations	Authority score	Hub score	Inward citations	Outward citations
Roe *vs.* Wade, 410 U.S. 113 (1973)	0.66	0.00	4	0	0.61	0.27	91	1	0.058	0.059	91	66
Akron *vs.* Akron Center for Reproductive Health, 462 U.S. 416 (1983)	0.58	0.23	3	1	0.11	0.21	7	14	0.009	0.026	12	37
Thornburgh *vs.* American College, 476 U.S. 747 (1986)	0.43	0.43	2	2	0.12	0.25	10	18	0.008	0.056	11	74
Webster *vs.* Reproductive Health Services, 492 U.S. 490 (1989)	0.23	0.58	1	3	0.08	0.22	5	16	0.005	0.045	6	84
Planned Parenthood of Southeastern Pennsylvania *vs.* Casey, 505 U.S. 833 (1992)	0.00	0.66	0	4	0.02	0.28	3	27	0.005	0.066	12	101

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Table 2
Top 10 authorities as of 2002

Case	Authority score		Important?		
	Raw	Percentile	Oxford	CQ	LII
Cantwell *vs.* Connecticut, 310 U.S. 296 (1940)	0.19	100.00	Y	Y	Y
Schneider *vs.* Irvington, 308 U.S. 147 (1939)	0.16	100.00	N	Y	N
N.A.A.C.P. *vs.* Button, 371 U.S. 415 (1963)	0.15	99.99	Y	Y	Y
Thornhill *vs.* Alabama, 310 U.S. 88 (1940)	0.15	99.99	Y	Y	Y
New York Times Co. *vs.* Sullivan, 376 U.S. 254 (1964)	0.14	99.99	Y	Y	Y
N.A.A.C.P. *vs.* Alabama, 357 U.S. 449 (1958)	0.13	99.98	Y	Y	Y
Speiser *vs.* Randall, 357 U.S. 513 (1958)	0.13	99.98	N	Y	N
Lovell *vs.* City of Griffin, GA., 303 U.S. 444 (1938)	0.12	99.98	Y	Y	N
Chaplinsky *vs.* New Hampshire, 315 U.S. 568 (1942)	0.11	99.97	Y	Y	Y
Roth *vs.* United States, 354 U.S. 476 (1957)	0.11	99.97	Y	Y	Y

Note: Importance is determined by *The Oxford Guide to United States Supreme Court Decisions* (Hall, 1999), Congressional Quarterly's *Guide to the United States Supreme Court* (1979, Biskupic and Witt, 1997), and the Legal Information Institute (2005), which is denoted *Oxford*, *CQ*, and *LII*, respectively.

the third set assumes they are part of the complete network of 30,288 cases.[5] Notice that in the network of five cases the number of inward citations directly implies the authority score rank and the number of outward citations directly implies the hub score rank. Authority scores follow the same pattern in the 92 case network, but hub scores do not—*Roe* cites just its companion case (*Doe versus Bolton* 1973) but it is sufficient to move its hub score past three of the four other cases.

When we take the whole network into account, *Roe* has fewer outward citations than *Thornburgh* and *Webster*, yet maintains a higher hub score than the two succeeding cases. Since good hubs are cases which cite good authorities, we can deduce from this information that *Roe* cites better authorities than *Thornburgh* and *Webster*. A look at the citations confirms this: 62% (41/66) of *Roe*'s, 47% (35/74) of *Thornburgh*'s, and 42% (35/84) of *Webster*'s outward citations are to cases that are considered important by the *Oxford Guide* or the Legal Information Institute. Similarly, *Webster*, although it has half the inward citations, has the same authority score as *Casey*. This suggests that the cases which base their decisions on *Webster* are more important than those which cite *Casey*. The data shows 66% (4/6) of *Webster*'s and 58% (7/12) of *Casey*'s inward links are considered important by the *Oxford Guide* or the Legal Information Institute. Thus hub and authority scores appear to be performing as intended, adding weight to those cases which cite and are cited by more important cases.

6. Comparing authority scores with expert rankings

How do authority scores compare to expert rankings? Table 2 lists the scores and percentile ranks of the cases with the 10 highest authority scores in the complete network and indicates whether these cases are thought to be important by expert evaluators. All 10 are considered to be important by either Congressional Quarterly, the Legal Information Institute, or the *Oxford Guide*. Worth noting is our identification of *Speiser versus Randall* (1958) as an influential decision.

[5] Finding the principal eigenvector of such a large matrix is not trivial. Fortunately the matrix is sparse, so we can rely on methods developed in ARPACK (http://www.caam.rice.edu/software/ARPACK/).

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Speiser, which is considered by the American Civil Liberties Union (ACLU) as one of the 100 most important Supreme Court decisions in which they played a major role (ACLU, 2000), was not featured in the 1979 first edition of Congressional Quarterly's *Guide to the U.S. Supreme Court* (1979) as an important decision. Although partitioning our network to cases before 1979 still automatically identifies *Speiser* as one of the top 10 authorities, it has taken judicial specialists 18 years with the publication of the 1997 third edition of the *Guide*, to recognize the significance of *Speiser*.[6] Our method was able to predict the identification of *Speiser* as a vital case based on its role in the precedent network.

Another way to compare authority scores with expert evaluations is to see how cases fared within different issue areas considered by the Court. The Spaeth database (2001) categorizes all Supreme Court decisions from 1953 to 2000 into cases that deal with Civil Rights, Criminal law, First Amendment law, and Privacy law, among others. Table 3 lists the top five decisions with the highest authority scores for each of these areas of the law and shows whether they were considered important by expert evaluators. Once again there is a strong correspondence between authority scores and expert opinion.

While the top performing cases suggest that the authority score measure has face validity, how closely does the measure conform to expert opinion on the whole set of cases? In Table 4 we report the results of several logit models that regress expert evaluations by the *Oxford Guide* and the Legal Information Institute on various network measures and the year the case was decided.[7] Notice that the model with the authority rank measure yields the lowest deviance of any of the models. Moreover, the coefficient is quite large—a one standard deviation increase in the authority rank score increases the odds a case is considered important by the Oxford Guide by 4.33 (4.43 for cases considered important by the Legal Information Institute). To put these results in more perspective, the model suggests that a case ranked at the 95th percentile by authority score is 123 times more likely to be considered important than a case ranked at the 5th percentile.

Notice that the hub scores also do well. Cases that are well grounded in the law by citing many important decisions have a much higher chance of making it onto the experts' lists of top cases. By comparison, the raw number of inward and outward citations has a positive but much less strong effect on importance. Time also behaves the way we would expect—although older cases are sometimes more revered, recent cases are more likely to appear on expert lists since they are more relevant to recent controversies in the law.

The models in Table 4 reflect the simple bivariate relationships between network measures and importance. Given that we have already seen in Fig. 3 that the number of citations has increased over time, it is possible that part of the relationship between the network measures and importance results from their relationship with time. Thus, it is important to control for time in a multivariate model to see how much value the network measures add in predicting which cases are most likely to be important. Table 5 shows four such models. The first two columns report the results of

[6] Scholars have suggested that *Speiser* served as a foundation for endless First Amendment decisions (Killian, 1988, p. 1073), and that the Court's willingness to overprotect free speech in landmark cases such as *New York Times Co*. v. *Sullivan* (1964) and *NAACP* v. *Button* (1963) originated from the *Speiser* precedent, "which broadened the Court's First Amendment horizon and adumbrated a conception of the Court's function that requires the justices to be engineers of a system of free speech rights. . . [it] implicitly set out not merely to preserve formal freedom but to encourage – or at the very least not predictably to discourage – its exercise" (BeVier, 2000, p. 200).

[7] We also experimented with eigenvector centrality and betweenness centrality, but these results are not shown. In general, eigenvector centrality performs better than degree centrality in predicting important cases but not nearly as well as hub and authority scores. Betweenness centrality performs worse than all other network measures we tried.

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Table 3
Top five authorities (post-1953) as of 2002 by issue area

Case	Authority score		Importance		
	Raw	Percentile	Oxford	CQ 3	LII
Civil rights					
Brown *vs.* Board of Education, 347 U.S. 483 (1954)	0.07	99.88	Y	Y	Y
Shapiro *vs.* Thompson, 394 U.S. 618 (1969)	0.06	99.83	Y	Y	Y
Baker *vs.* Carr, 369 U.S. 186 (1962)	0.06	99.79	Y	Y	Y
Reynolds *vs.* Simms, 377 U.S. 533 (1964)	0.05	99.74	Y	Y	Y
United States *vs.* Raines, 362 U.S. 17 (1960)	0.05	99.70	N	Y	N
Criminal cases					
Mapp *vs.* Ohio, 367 U.S. 643 (1961)	0.08	99.89	Y	Y	Y
Gideon *vs.* Wainwright, 372 U.S. 335 (1963)	0.06	99.83	Y	Y	Y
Miranda *vs.* Arizona, 384 U.S. 436 (1966)	0.06	99.81	Y	Y	Y
Katz *vs.* United States, 389 U.S. 347 (1967)	0.05	99.77	Y	Y	Y
Duncan *vs.* Louisiana, 391 U.S. 145 (1968)	0.04	99.66	Y	Y	Y
First Amendment					
N.A.A.C.P. *vs.* Button, 371 U.S. 415 (1963)	0.15	99.99	Y	Y	Y
New York Times Co. *vs.* Sullivan, 376 U.S. 254 (1964)	0.13	99.99	Y	Y	Y
N.A.A.C.P. *vs.* Alabama, 357 U.S. 449 (1958)	0.13	99.98	Y	Y	Y
Speiser *vs.* Randall, 357 U.S. 513 (1958)	0.13	99.98	N	Y	N
Roth *vs.* United States, 354 U.S. 476 (1957)	0.11	99.97	Y	Y	Y
Privacy					
Griswold *vs.* Connecticut, 381 U.S. 479 (1965)	0.08	99.90	Y	Y	Y
Roe *vs.* Wade, 410 U.S. 113 (1973)	0.06	99.80	Y	Y	Y
Eisenstadt *vs.* Baird, 405 U.S. 438 (1972)	0.05	99.71	Y	Y	N
Doe *vs.* Bolton, 410 U.S. 179 (1973)	0.04	99.56	N	Y	Y
Carey *vs.* Population Services Int'l, 431 U.S. 678 (1977)	0.03	99.28	N	Y	Y

Note: Importance is determined by *The Oxford Guide to United States Supreme Court Decisions* (Hall, 1999), Congressional Quarterly's *Guide to the United States Supreme Court* (Biskupic and Witt, 1997), and the Legal Information Institute (2005).

Table 4
Bivariate relationship between importance and network data

Outcome variable	Oxford Guide				Legal Info. Institute			
	Coefficient	S.E.	Effect size	Deviance	Coefficient	S.E.	Effect size	Deviance
Authority rank	11.739	0.505	4.33	3864	12.065	0.485	4.43	4228
Hub rank	6.308	0.282	2.79	4517	11.191	0.451	4.17	4321
Inward citations	0.068	0.002	1.84	3996	0.062	0.002	1.77	4758
Outward citations	0.060	0.002	1.68	4580	0.068	0.002	1.78	4876
Year	0.010	0.001	1.49	5334	0.025	0.001	2.19	5517
Null				5443				6073

Note: $N = 29{,}553$. Each coefficient (β_1) and standard error calculated using a separate logit model for each variable (x), $y = (1 + \exp(-(\beta_0 + x\beta_1)))^{-1}$, constant term ($\beta_0$) not shown. Outcome variables indicate whether each case is included in *Oxford Guide's* list and the Legal Information Institute's list of important cases. Effect size represents the multiplicative increase in odds given a one standard deviation increase in the independent variable.

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Table 5
Multivariate relationship between importance and network data

Outcome variable	GLM Logit						GAM Logit				
	Oxford Guide			Legal Info. Institute			Oxford Guide			Legal Info. Institute	
	Coefficient	S.E.	Effect size	Coefficient	S.E.	Effect size	Coefficient		S.E.	Coefficient	S.E.
Authority rank	6.739	0.581	2.91	4.393	0.531	2.25		7.647	0.461	5.482	0.382
Hub rank	0.830	0.458	1.24	2.960	0.605	1.84		3.815	0.371	6.069	0.569
Inward citations	0.027	0.002	1.34	0.028	0.002	1.34	Knots	−0.317	30.273	−1.111	26.481
								0.190	0.063	0.176	0.061
								−0.251	1.757	−1.051	1.375
								0.112	0.031	0.120	0.024
								0.098	0.277	−0.144	0.209
								−0.174	0.040	−0.064	0.030
								0.304	0.147	0.202	0.107
								−0.072	0.012	−0.053	0.009
								0.423	19.159	−0.040	18.110
								0.417	0.078	0.525	0.080
Outward citations	0.023	0.003	1.26	0.016	0.002	1.18	Knots	2.985	56.410	2.065	17.355
								−0.361	0.272	−0.166	0.102
								−1.398	4.994	−1.379	1.640
								−0.357	0.130	−0.156	0.045
								1.486	0.719	0.460	0.241
								0.447	0.151	0.243	0.052
								0.465	0.343	0.098	0.111
								0.147	0.047	0.020	0.014
								1.610	31.728	0.430	10.053
								−0.412	0.184	−0.179	0.065
Year	−0.011	0.002	0.48	0.013	0.002	1.61	Knots	2.556	208.131	8.158	28.231
								6.702	3.909	3.344	0.633
								1.815	15.295	2.262	2.284
								−1.316	0.913	−0.376	0.182
								1.028	1.783	0.860	0.351
								1.983	0.428	0.898	0.108

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Table 5 (*Continued*)

Outcome variable	GLM Logit						GAM Logit			
	Oxford Guide			Legal Info. Institute			Oxford Guide		Legal Info. Institute	
	Coefficient	S.E.	Effect size	Coefficient	S.E.	Effect size	Coefficient	S.E.	Coefficient	S.E.
							−0.318	0.605	−0.229	0.193
							1.317	0.186	0.055	0.071
							4.108	121.678	−3.562	16.152
							9.786	15.848	2.973	2.184
Constant	10.092	3.664		−34.712	4.331		−13.187	0.330	−13.354	0.357
Resid./null deviance	3468/5443			3744/6073			2971/5443		3314/6073	

Note: $N = 29{,}553$. Coefficients and standard errors calculated using GLM and GAM logit. Coefficients for each of 10 "knots" in cubic spline for GAM model shown next to each smoothed covariate. Outcome variables indicate whether each case is included in *Oxford Guide's* list of "salient" cases and the Legal Information Institute's list of "important" cases. Effect size represents the multiplicative increase in odds given a one standard deviation increase in the independent variable.

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ordinary logit specifications using the generalized linear model (GLM). Notice that even when we control for the raw number of inward and outward citations and the year the case was decided, the authority rank continues to have a strong effect on the probability that a decision is considered important by the *Oxford Guide* and Legal Information Institute.

However, it is possible that we have not adequately controlled for the other measures because we have mis-specified their relationship with the outcome variable. For example, the relationship between inward citations and importance may not be linear. The second two columns present results from logit specifications using the generalized additive model (GAM—see Hastie and Tibshirani, 1986). The GAM setup relaxes the linearity assumption by estimating a cubic spline to "smooth" the relationship between each of the controls and the outcome variable. The "knots" for these splines indicate the estimated mean values of the relationship at increasing values of the independent variable. Notice that even when we use this more flexible assumption for inward and outward citations and the year a case was decided, the relationship between importance and the authority score continues to be strong. In fact, the coefficients are somewhat larger for both the authority and hub score in the GAM models than the GLM models, suggesting that their correspondence to expert evaluations about the importance of each decision is even stronger.

7. The dynamics of a precedent's influence

Although expert evaluations tell us which cases are presently considered most important, we do not have information about how these evaluations have changed over a long time period. One virtue of the authority score method is that we can use it to examine the rise and fall of a precedent's importance with respect to the continuously evolving legal network. To do this, we partition the network by terminal year. For example, one partition would be all the cases from 1754 to 1800, the next partition would be all the cases from 1754 to 1801, and so on up to the whole network of cases from 1754 to 2002. Each of these partitions contains all information that was available at the terminal year for determining which cases were most important at that point in time. We then compute hub and authority scores for each case for each partition. Using this method we can see how the importance of each decision changes through time, and perhaps more importantly, the *speed* at which precedents become *legally influential*.

For example, Fig. 6 depicts the rise of *Brown versus Board of Education* (1954) and *Roe*. The difference between the speeds at which these precedents rose to a level of significant influence is

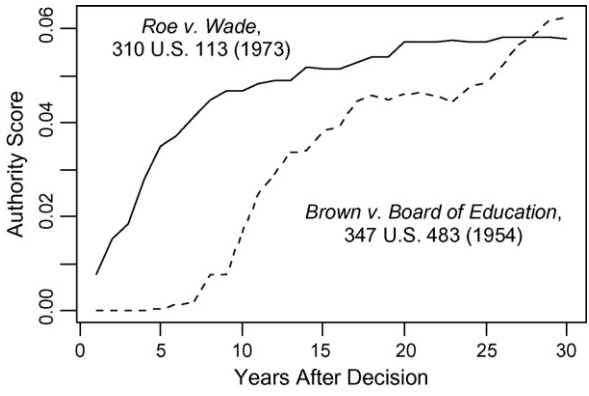

Fig. 6. Rise of *Brown* and *Roe*.

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noteworthy. Judicial specialists often point towards the ruling issued in *Brown* as an example of a precedent that was legally weak when first issued, and was strengthened through the Civil Rights Act of 1964 and its application in subsequent civil rights cases (Baum, 1985, p. 231; Epstein and Walker, 2004, p. 676; Johnson and Cannon, 1984, p. 258; O'Brien, 2003, p. 1389). Johnson and Cannon (1984) emphasize this point by saying that "the judiciary itself was ambivalent about the [*Brown*] policy. . . the original *Brown* opinion [revealed] little judicial commitment to a philosophy of racial equality" (p. 257).

In fact, *Brown* did not set a legal standard. That is, though the Court ruled separate but equal schools to be unconstitutional, they did not establish a legal rule to be followed in subsequent cases. *Roe*, on the other hand, "restricted state regulation of abortion and set a compelling interest standard for future cases," voiding laws in every state that prohibited or limited abortion (Segal and Spaeth, 1996, p. 976). With barely more than 1% of schools desegregated in 1964, 10 years after *Brown*, and 181,140 abortions performed in the first 3 months after *Roe*—more than 8 times the number of abortions performed in all of 1969 (Rosenberg, 1991, p. 180; see also Bond and Johnson, 1982)—it is difficult to argue that *Brown*'s legal influence rose as quickly as *Roe*, at least in the immediate years following their decisions. The authority scores illustrate this difference quantitatively—10 years after their decisions, *Roe*'s importance in the legal network was more than twice that of *Brown*.

8. The rise and fall of precedential authority

Of course, most decisions have not followed the continuously upward trajectory exhibited by *Brown* and *Roe*. Since a single decision will tend to be narrow in scope, a precedent's authority generally rises gradually to its peak through its interpretation in subsequent cases. It then loses influence either because it is superceded by other rulings or because the area of law it governs becomes so settled that the Court no longer hears cases that fall under the scope of the precedent. Table 6 shows that the average time to the peak is about the same (25–27 years) for both cases classified as important by human experts and other cases. However, important decisions rise much higher and decline much more slowly, suggesting that their role in the network of precedent tends to endure.

How does the act of overturning a previous ruling affect the rise and fall of precedential authority? Overrulings are extremely rare in the history of the U.S. Supreme Court. Brenner and Spaeth (1995) identify 154 overruled precedents since the Warren Court, and this total only increases to 252 if we include cases overruled by pre-Warren decisions (Congressional Research Service, 1987). The decisions that overruled these cases are even rarer since several of them overruled more than one previous decision. We can use authority scores to test hypotheses about these important moments in the history of the Court. For example, Hansford and Spriggs (2006) argue that the Court is more likely to overturn precedents of higher authority, which they define as *precedential vitality*. Cases that have not received much attention in the network of precedent are less likely to have an influence over future decisions and less in need of revision. Thus, we hypothesize that when the Court overrules previous decisions, it tends to choose cases with high authority scores. A brief look at the data confirms this expectation—cases that were overturned had an average authority score of 0.016 (S.E. 0.002) at the time they were overturned compared to an average authority score of 0.004 (S.E. 0.000) for other cases.

Although decisions that are overturned are likely to be important, the fact that they have been replaced by new case law means their importance should fade after being reversed. Moreover, the overruling cases that set new legal standards should surpass the importance of the cases

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Table 6
The rise and fall of a precedent's authority score

Type of case	Average years to reach peak	Average authority score at peak	Average % decline in authority score after peak				
			5 years	10 years	15 years	20 years	30 years
Important cases	25.50 (0.69)	0.029 (0.002)	17.4 (1.1)	26.5 (1.2)	34.3 (1.2)	40.0 (1.3)	53.4 (1.4)
Other cases	27.20 (0.13)	0.004 (0.000)	25.2 (0.2)	36.4 (0.2)	46.5 (0.2)	54.3 (0.2)	68.8 (0.1)

Note: Standard errors of the mean in parenthesis. Important cases are those in the list of top cases published by *The Oxford Guide* (Hall, 1999) and the Legal Information Institute (2005).

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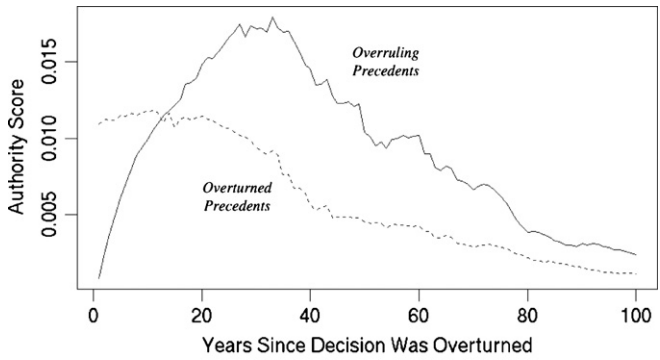

Note: Standard Error of the mean for both series is 0.002 or less.

Fig. 7. Authority scores of overturned and overruling precedents. *Note*: S.E. of the mean for both series is 0.002 or less.

they replaced and should continue to be considered more important by future courts as time passes. Fig. 7 shows the average authority score of overturned precedents in the year they were overturned and how this average changes over time. Notice that they do not decline right away. This probably reflects the fact that the Court continues to cite both the overruling and overruled cases as the new standard is applied to other cases. Fig. 7 also shows that within about 10 years, the average importance of the overruling cases rises to exceed the average importance of the overruled decisions. After that the overruled cases start to decline and the overruling cases continue to rise in importance until about 30–40 years after the overruling decision was handed down. Then both sets of decisions decline, though overruling cases continue to be considered more important than the cases they overturned.

We can also use hub scores to test hypotheses about court reversals of past decisions. Recall that hub scores indicate how well-grounded a decision is since they are proportional both to the number of cases cited and the importance of the cases they cite. What kinds of cases might we expect to be more firmly connected to existing precedents? One possibility is that, because the justices work harder to justify their decisions when they are reversing a past decision, we should expect overruling precedents to have higher hub scores than other kinds of cases. Table 7 shows two models of the relationship between the hub scores of cases at the time they are handed down and other variables related to case reversals. Since hub scores are always positive we use a general linear model with a negative binomial link function.

The first model regresses hub scores on a dummy variable that indicates whether or not the case is an overruling precedent. This model shows that overruling precedents tend to have hub scores that are about five times larger than other cases. The second model adds a year variable to ascertain whether this relationship might be epiphenomenally related to temporal changes in both variables, and several other variables to determine whether features of the precedent being overturned influence hub scores. In this model overruling precedents continue to have higher hub scores, though the introduction of controls substantially weakens the relationship. The year variable appears to have little effect. In contrast, the authority score of the overturned precedent is strongly related to the hub score. One might argue that this is merely the result of our technical procedure for finding hub and authority scores since good hubs are posited to point to important authorities. However, hub scores are based on the authority scores of *all* cited cases, not just the overturned cases. An alternative substantive explanation for the strength of the relationship is that justices may feel compelled to ground their decisions more extensively in existing case law when

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Table 7
Testing hypotheses about well-founded cases

	Outcome variable: hub scores					
	Coefficient	S.E.	Effect size	Coefficient	S.E.	Effect size
Overruling precedent	1.788	(0.169)	4.98	0.546	(0.287)	0.73
Year				0.003	(0.000)	0.15
Authority score of overturned precedent				0.038	(0.008)	1.48
Hub score of overturned precedent				0.008	(0.007)	0.27
Age of overturned precedent				0.000	(0.007)	0.01
Constant	1.235	(0.014)		−4.392	(0.581)	
Theta	0.199	(0.002)		0.200	(0.002)	
Deviance/null dev.	28867/29080			28858/29205		

Note: $N = 28{,}787$. Coefficients and standard errors calculated using logit. Outcome variables indicate the hub score of each case at the time it was handed down. Theta indicates the estimated degree of dispersion in the model (values significantly different from 0 suggest the negative binomial model is more appropriate than a Poisson model where theta is assumed to be 0). Effect size represents the factor increase in a decision's hub score given it is an overruling precedent or given a one standard deviation increase in the other independent variables.

the case they are reversing is considered to be very important in the network of precedent. Indeed, this suggestion is at the heart of judicial legitimacy theory—to minimize the legitimacy costs of departing from precedent, the justices exert extra effort to justify their decisions by citing higher quality precedents when the norm of *stare decisis* is broken. Finally, the age of the overturned precedent and its own hub score appear to have little effect.

9. Authority scores and the Court's issue priorities

Although hub and authority scores allow us to test hypotheses using a large number of cases, they also permit us to illustrate through consideration of a smaller number of cases some important changes that have affected the Court. As we noted above, the *Brown* and *Roe* precedents are still very influential in present day law, and their decline as authorities has yet to occur. However, once highly influential decisions like *Bank of Augusta versus Earle* (1839), *Gibbons versus Ogden* (1824), and *Minnesota Rate Cases* (1913) have declined substantially from their peaks as the legal rules settle beyond controversy. Fig. 8 depicts the rise and fall of these authorities, as well as the rise of the leading authority in 2000, *Cantwell versus State of Connecticut* (1940). Changes in the importance of these individual cases reflect (in part) changes in the types of legal issues that the Court has chosen to address over the years.

In the words of Biskupic and Witt (1997), "[f]or the first 150 years of its history, the Supreme Court exerted its greatest influence on the states of the Union through its decisions on matters of economic interest. In case after case – as the justices construed the contract clause, the commerce clause, and defined the state's power of taxation – the Court determined the relationship of state to federal power" (p. 322). In particular, the contract clause was the principal means of establishing federal powers before the Civil War because "many laws may [have been] attacked on the ground of infringement of property rights" (Warren, 1926, p. 96). Partitioning our network to identify the important decisions of the mid to late 19th Century confirms this account: joining *Bank of Augusta* in the 99.99th percentile of the most influential decisions during the mid to late 19th Century are

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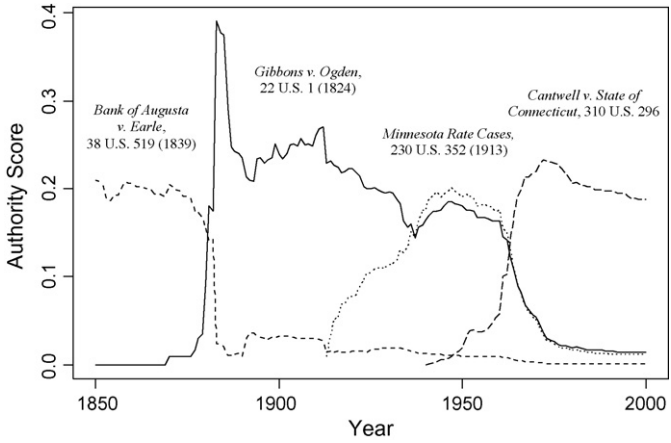

Fig. 8. Rise and fall of authorities.

New Jersey versus Wilson (1812), *Dartmouth College versus Woodward* (1819), *Providence Bank versus Billings* (1830), and *Charles River Bridge versus Warren Bridge* (1837), each considered to be seminal contracts rulings by *Congressional Quarterly* (Biskupic and Witt, 1997) and *Oxford* (Hall, 1999).

After the Civil War, we observe a new line of legal issues becoming salient in Court. The Court's reliance on the contract clause deteriorated as "the Industrial Revolution brought a growth in the number of corporations and economic problems that could not be accommodated even with a broad reading of the contract clause" (O'Brien, 2003, p. 227). Replacing the contracts clause was the due process guarantee of the Fourteenth Amendment, which was used extensively to regulate interstate and foreign commerce. As depicted in Fig. 8, the importance of *Bank of Augusta* declines as the historic commerce decision in *Gibbons* rises to become the leading authority. In fact, *all* the influential contracts cases are replaced by commerce rules during the laissez-faire period of the late 19th Century and early 20th Century. By 1886, *New Jersey*, *Dartmouth College*, *Providence*, and *Charles River Bridge* are replaced by *Gibbons*, *Brown versus Maryland* (1827), and *Cooley versus Board of Wardens of the Port of Philadelphia* (1852) in the 99.99th percentile of decisions with highest authority scores. These replacements are also considered to be the seminal commerce decisions by Congressional Quarterly (Biskupic and Witt, 1997) and Oxford (Hall, 1999).

The establishment of state and federal powers remained the focus of the Court's efforts until shortly after the Great Depression and the New Deal. When Warren became Chief Justice of the Court in 1953, the due process cases still held important positions in the precedent network: the top five authorities were *Gibbons*, *Brown*, *Cooley*, and *Minnesota Rate Cases* (1913), and Chief Justice John Marshall's most influential decision, *McCulloch versus Maryland* (1819), which "determined the distribution of powers between the federal government and the states" (Hall, 1999, p. 182). However, as Fig. 9 illustrates, the civil rights revolution changes the Court's focus once again as *Minnesota*, *Gibbons*, and *McCulloch* decline and First Amendment cases like *Cantwell* and *Thornhill versus Alabama* (1940) begin to rise. What is striking in this figure is how sensitive the authority scores are to general changes in the issue focus of the Court. Notice how the authority of the commerce rules decline nearly in unison as the civil liberties rules become more influential.

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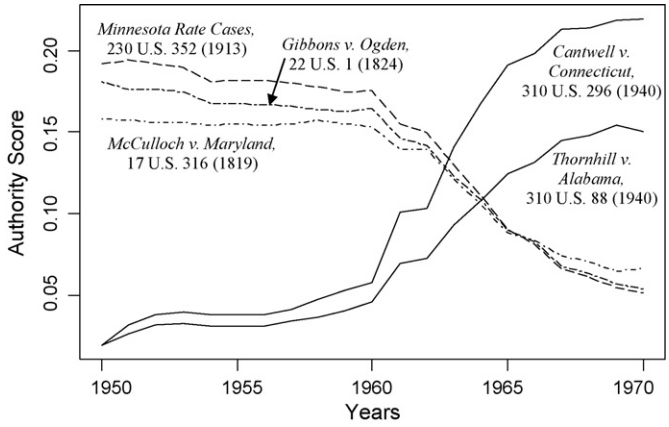

Fig. 9. Importance of commerce and civil rights issues.

10. Authority scores and the evolution of specific case law

In addition to using authority scores to analyze changes in the Court's issue priorities, we can also use them to study changes in the importance of competing legal rules within a given area of law. Fig. 10 plots the authority scores of several judicial decisions that have had important implications for the interpretation and application of legal rules related to the Fifth Amendment of the U.S. Constitution.

Until the 1960s, Fifth Amendment precedents did not set clear guidelines as to how far a police interrogation can go without violating the suspect's Fifth Amendment right. One of the earliest Fifth Amendment cases was *Brown versus Mississippi* (1936) where the Court ruled unconstitutional the use of extreme physical torture to obtain confessions. *Brown* was limited in scope, providing no firm guidelines as to how future cases should be decided. However, until Warren became Chief Justice, the Court was "reluctant to establish a 'bright line"' (O'Brien, 2003, p. 1009), and applied existing criminal law on a case by case basis (see *Brown versus Mississippi* 1936; *Crooker versus California* 1958; *Spano versus New York* 1959). Thus, *Brown versus Missis-*

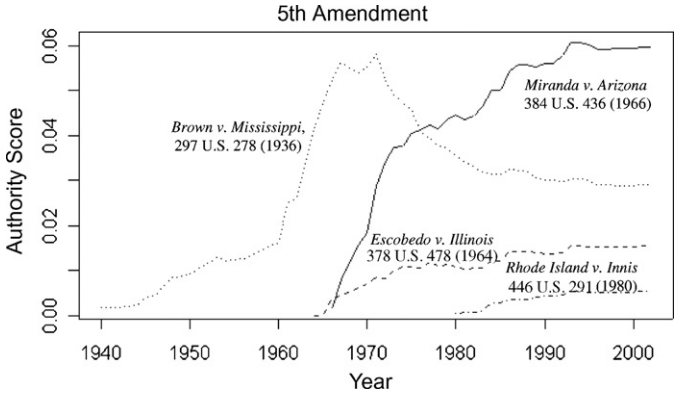

Fig. 10. The evolution of Fifth Amendment case law.

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sippi, although limited in scope, represents the authoritative Fifth Amendment precedent before the Warren Court's rulings in Fig. 10.

Notice how the leading precedent's authority increases *before* the landmark *Miranda versus Arizona* (1966) decision. This increase is a reflection of the state of law that built up to *Miranda*. That is, *Brown*, being one of the relatively decisive precedents, received a surge of citations as the Court began reviewing self-incrimination cases to find a way to protect the rights of the accused while giving enough discretion to the police to carry out their tasks effectively. It is important to note that *Brown* can serve as such an indicator because it is the leading authority. Since, for legitimacy reasons, citations are directed towards precedents with greater legal weight, it is only the authority scores of legally vital precedents which will fluctuate in accordance with the state of law.

When *Miranda* was handed down, "the totality of circumstances standard was replaced by *Miranda*'s bright line rule" (O'Brien, 2003, p. 1010). In fact, *Miranda* required all states to change their laws in light of *Miranda*'s rule. Because *Miranda* upheld the suspect's rights in a much more encompassing and binding fashion than *Brown*, subsequent criminal rights cases relied on *Miranda* rather than *Brown* to legitimize their policies. As a result, we observe *Brown*'s authority score decreasing as *Miranda* becomes the authoritative precedent.

Furthermore, the constant changes in *Miranda*'s authority score reflect the condition of Fifth Amendment law. As one scholar notes, "If *Miranda* is not the most controversial decision by the Warren Court, it is close enough, and it is the most controversial criminal procedure decision hands down" (Powe, 2000, p. 394). The decision turned crime into a domestic issue, "galvanizing opposition to the Warren Court into a potent political force" (Kamisar, 1996, p. 119). By the time Warren left the bench, over a fifth of the Court's caseload consisted of criminal cases. Since *Miranda* is the leading self-incrimination precedent, these substantive developments are reflected in the constant fluctuation of its influence levels. For example, cases like *Escobedo versus Illinois* (1964) and *Rhode Island versus Innis* (1980), though important Fifth Amendment decisions, were inherently geared towards establishing and clarifying the *Miranda* precedent, respectively (Epstein and Walker, 2004, pp. 556, 570). As a result, both cases are comparatively lower in their authority than *Miranda*.

11. Conclusion

In this article we describe methods for quantifying the role of U.S. Supreme Court precedents. These methods rely on the decisions of the justices, themselves, as they choose which cases to cite in their legal arguments. A simple analysis of the full network of majority opinions demonstrates quantitatively that the Court gradually adopted the norm of *stare decisis* during the 19th Century. By the turn of the 20th Century the norm had taken hold, though there is strong evidence that the activist Warren Court later deviated from it. Later courts also tended to skip over decisions made by the Warren Court, reaching back in time to rulings that were more firmly rooted in precedent.

The simple analysis of inward and outward citations is useful for understanding the evolution of *stare decisis*, but we can use information from the whole network of precedent to evaluate the importance of each case. We describe a method for creating *authority scores* and *hub scores* that identify the most important court precedents and the decisions that are most firmly rooted in prior opinions. Authority scores yield rankings that conform closely to evaluations by legal experts, and even predict which cases they will identify as important in the future. An analysis of these scores over time allows us to test several hypotheses about the rise and fall of precedent. We show that reversed cases tend to be much more important than other decisions, and the cases that

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overrule them quickly become and remain even more important as the reversed decisions decline. We also show that the Court is careful to ground overruling decisions in past precedent, and the care it exercises is increasing in the importance of the decision that is overruled. Finally, authority scores conform to qualitative assessments about which issues and cases the Court prioritizes and how these change over time.

We hope that the methods described in this article will motivate future study on a number of important questions. We are especially interested in the degree to which the importance of prior precedents may constrain justices from adopting their (ideologically) preferred legal rules. When the Supreme Court is faced with a decision, there is often more than one relevant precedent, and an equal number and weight of relevant precedents supporting both sides of the argument (Baum, 1985, p. 123; Spaeth, 1979, p. 53). This observation has often led researchers to diminish the role of law and claim that judicial policies are merely post-hoc justifications of judges' preferences (Segal and Spaeth, 2002). However, "such doubts are easily fueled by the lack of empirical inquiry into the role of precedent" (McGuire and MacKuen, 2005, p. 6). In the future we hope to combine ideology scores with authority scores to assess the extent to which judges are influenced by precedent and ideological preferences when they decide which cases to cite and when to overturn past decisions.

We would also like to examine the role of context in the citation network. Although justices frequently use citations to *support* their arguments, they sometimes use them to point out controversies, argue against previous opinions, and even overturn past decisions. We believe that a contextual exploration of the positive and negative nature of each citation (c.f. Hansford and Spriggs, 2006) may yield additional insights into the network of precedent and its effect on the relative importance of cited decisions. For example, we noted above that the authority of a precedent does not immediately decline when it is overturned, in part because it continues to be cited as an overturned precedent. Better methods may help us to use the network data to identify these negative citations and account for them in the evaluation of the importance of each ruling.

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