Divergence or Dysfunction? Using LLMs to Measure Disagreement on the U.S. Supreme Court

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Abstract

For institutional decision-making bodies like the U.S. Supreme Court, interpersonal dynamics are central to the decision-making process, and the ability of even minimally empowered leaders is crucial in managing those dynamics. Prior research has extensively explored these questions, but measurement difficulties have limited scholarly consensus. Here we propose a novel methodological approach to these questions, leveraging large language models (LLMs) to score the sentiment of judicial opinions, with a specific focus on differentiating normal jurisprudential disagreements from more personal / targeted criticisms within the Court's opinions. Employing LLMs, we are able to differentiate between general and targeted criticism, then employ targeted criticism as a variant of aspect-level sentiment analysis over all majority, concurring, and dissenting opinions issued by the Court between 1954 and 2010. In doing so, we develop a measure of the degree of consensual and discordant content for each opinion, justice, and term of the Court. Our approach addresses the limitations of prior methods in distinguishing between what are generally regarded as healthy and unhealthy disagreements, and examining data at the opinion level provides further leverage on uncovering leadership effects. Our results provide new evidence of the chief justice's role in building and maintaining consensus on the Court, and suggest a historically unique modern Court increasingly willing to publicly express disagreement, with implications for understanding institutional debates more generally.

Introduction

Dissenting in *Obergefell v. Hodges*, U.S. Supreme Court Justice Antonin Scalia launched a searing critique of the majority opinion, delivering a dissenting opinion filled with sharp and deeply personal attacks. Scalia called out the "hubris reflected in today's judicial putsch", a majority opinion "lacking even a thin veneer of law" and full of "mummeries and straining-to-be-memorable passages." He stated the opinion was, "couched in a style that is as pretentious as its content is egotistic", and that if he had signed on to the opinion he would "hide [his] head in a bag" (576 U.S. 644 (2015)) The sometimes-mocking, always-scathing tone of Scalia's attack was a marked departure from the language employed by Justice Anthony Kennedy in the Court's majority opinion, in which he went to great lengths to prioritize a tone of respect and civility. Kennedy specifically sought to disclaim concerns of attacking the beliefs of others, noting that, "[m]any who deem same-sex marriage to be wrong reach that conclusion based on decent and honorable religious or philosophical premises, and neither they nor their beliefs are disparaged here." The majority opinion thus avoided directly engaging in a tit-for-tat exchange with the sharp criticisms of the dissenting Scalia, maintaining a commitment to high standards for decorum.

The stark contrast in rhetorical style illustrates a critical dynamic of institutional decisionmaking: the presence of variation in the ways in which disagreement is expressed, and how that expression matters not just for the individuals but for the institution itself. In deliberative bodies like the U.S. Supreme Court, disagreement is inevitable, even essential; through disagreement and debate, justices refine their reasoning and develop better legal doctrine. Shifts towards more deeply negative critiques, though, can erode trust between the members of the body, depress the institution's ability to build through deliberation, and ultimately damage the public's trust in the institution. As the passages from *Obergefell* demonstrate, how justices choose to frame disagreements reflects both interpersonal dynamics on the Court and broader institutional dynamics, while suggesting important questions about the state of functional deliberation and constructive disagreement within

the Court.

In this paper, we address these questions by developing a novel methodological approach to measuring the scope and tone of judicial (dis)agreement. While prior work examined the dynamics of dissent and consensus on the U.S. Supreme Court, significant gaps remain in scholarly and popular understanding of how jurisprudential disagreement manifests and how that has changed over time. Instead, prior work has largely focused on differences in case outcomes, and on decisions to author separate opinions or variation in voting blocs. Here, in contrast, we are particularly interested in the manner and extent of Supreme Court disagreement at a more granular level. Specifically, we ask: As the justices engage with one another when they disagree (or agree), how does their language change towards their colleagues and other decisions of the Court?

To address this, we leverage large language models (LLMs) as part of a classification pipeline for judicial opinions. Our approach focuses on identifying specific relevant passages from the text that are most relevant for understanding the Court's interpersonal environment. Our approach echoes prior work on aspect-level sentiment analysis, but with a much more specific focus on identifying passages that relate to how justices are interacting. In using LLMs to identify and code the sentiment of these most relevant passages, we gain a scalable and better-identified measure of the tenor of disagreement on the Court as expressed through the justices' own words. Our approach thus moves beyond course dichotomous measures like dissents and concurrences to a deeper, finer-grained understanding of the actual rhetoric being used.

We employ this approach across a substantial part of the modern Court era, covering the period from *Brown v. Board of Education* in 1954 through the end of the 2010 October term. Our results reveal important changes in how disagreement has been expressed over time, shedding light on the Court's evolving institutional work. For example, we find evidence of a trend toward more negative disagreement, particularly in the most recent eras of the Court, a finding which complements a growing chorus of concerns about the Court's ability to operate in an era of hyperpolarization.

Beyond the Supreme Court, our work also contributes to a growing literature on institutional

outputs by offering and demonstrating the utility of a systematic framework for analyzing disagreement at a granular level using LLMs. In addition to the Supreme Court, our work has implications for understanding how the expression of disagreement manifests across other high-stakes decision-making bodies. Our demonstration of the utility of LLMs at capturing this granular measure of how disagreement is expressed, rather than coarse dichotomous measures of disagreement, offers an important new pathway for studies on the factors contributing to or detracting from functional deliberation.

The Value of Disagreement

Disagreement and conflict are at the core of American law. Milton's *Areopagitica* famously captures the philosophical intuition of the common law's adversarial justice system: "(A)nd though all the windes of doctrin were let loose to play upon the earth, so Truth be in the field, we do injuriously, by licencing and prohibiting to misdoubt her strength. Let her and Falshood grapple; who ever knew Truth put to the wors, in a free and open encounter. Her confuting is the best and surest suppressing." (Milton 1644/1918, p. 58). Arguably the most prominent contemporary account of the American legal system centers the concept of "adversarial legalism," where "the clash of adversarial legal argument has a larger influence on decisions than in other countries' regulatory systems" and which "as a matter of day-to-day practice is far more common in the United States than in other democracies" (Kagan 2019, p. 16). Institutionally, disagreement abounds (and flourishes) in the judicial system: among lower courts (e.g. Vines 1964, Beim and Rader 2019), within the federal judicial hierarchy (Bowie and Songer 2009, Strayhorn 2020), and between federal and state court systems (e.g. Nagel 1993, Logan 2014).

This same dynamic holds at the U.S. Supreme Court, where disagreement has been an institutional feature of the Court almost since its origins. To consider the most prominent example, the justices' practice of issuing dissenting opinions traces its roots to the chief justiceship of John

Marshall, who upon ascending to the bench in 1801 abolished the justices' previous practice of authoring individual (*seriatim*) opinions in each case in favor of unified opinions from the entire Court (Ray 2002). Even as that practice helped consolidate the Court's institutional prestige and power, it had its detractors. One such critic was President Jefferson, who in 1822 penned a letter to his first Supreme Court appointee, the slave-owning South Carolinian Justice William Johnson. There, he noted that:

> "(T)he Judges holding their offices for life are under two responsibilities only. i. Impeachment. 2. Individual reputation. But this practice compleatly withdraws them from both. For nobody knows what opinion any individual member gave in any case, nor even that he who delivers the opinion, concurred in it himself. Be the opinion therefore ever so impeachable, having been done in the dark it can be proved on no one. As to the 2d guarantee, personal reputation, it is shielded compleatly. The practice is certainly convenient for the lazy, the modest & the incompetent. It saves them the trouble of developing their opinion methodically and even of making up an opinion at all. That of seriatim argument shews whether every judge has taken the trouble of understanding the case, of investigating it minutely, and of forming an opinion for himself, instead of pinning it on another's sleeve. It would certainly be right to abandon this practice in order to give to our citizens one and all, that confidence in their judges which must be so desirable to the judges themselves, and so important to the cement of the union." (cited in Morgan 1953, pp. 355-356)

By the early 1820s, Jefferson was not alone in his criticism of the Court's practice of issuing opinions without concurrence or dissent. The seemingly-unanimous decisions in such landmark cases as *Fletcher v. Peck* (1816), *McCulloch v. Maryland* (1819), *Dartmouth College v. Woodward* (1819), and *Cohens v. Virginia* (1821) had nonetheless led to considerable public controversy, including (arguably) worsening the Panic of 1819. For his part, Justice Johnson had long understood

the reality of disagreement among the justices, even as they issued decisions in *per curiam* form. As far back as 1807 he had issued the Court's first *de facto* dissent, albeit in the form of a separate opinion. In *Ex Parte Bollman and Ex Parte Swartwout*, a habeas corpus case arising from then-colonel Aaron Burr's "conspiracy" in the Louisiana Territory, Chief Justice Marshall noted that "a division of opinion has taken place in the Court" (8 Cranch at 130). Johnson's opinion began by noting that he had "the misfortune to dissent from the majority of my brethren," marking the first instance of the usage of that term by a member of the Court. Over the next fifteen years, Johnson would author 15 of the 30 dissenting opinions written by the justices during that time (Morgan 1953).

Nonetheless, by the time Jefferson's letter reached him, Johnson's practice of authoring (dissenting) separate opinions had fallen off somewhat. However, his exchanges with Jefferson seemed to renew his energy for dissent (Morgan 1953, pp. 367-375), and over the next dozen years until his death in 1834 he helped to institutionalize the practice of separate concurring and dissenting opinions, earning the moniker of the Court's "First Dissenter." But while the practice of dissent grew somewhat over the Court's next hundred years (e.g., Post 2001), it wasn't until passage of the 1925 "Judges' Bill" that the practice of authoring dissenting opinions reached anything like its modern degree of prominence. It is widely understood that the Judiciary Act of 1925 – which largely removed the Court's non-constitutional mandatory jurisdiction – led to a decline in the Court's workload, and a concomitant rise in the justices' expression of disagreement. As Halpern and Vines note:

> "(E)liminating the right of appeal in many minor and uncontroversial cases freed the court to concentrate in obligatory appeals on only those cases raising salient national issues. Granting the justices much wider discretion to choose from among the cases appealed to them, the number and nature of those they wished to decide, provided greater opportunity to choose difficult and disputatious cases. Greater dissent was made more likely not only by the specific reforms of the Act but by the expectation as

> to how the justices would utilize their new powers. The Act's supporters advanced a conception of the Court as an institution which should reserve its judgment only for the most important national policy questions" (Halpern and Vines 1977, pp. 480-481)

Beginning in the late 1930s, the Court saw a precipitous rise in the incidence of concurring and dissenting opinions (Walker, Epstein and Dixon 1988, Haynie 1992, Caldeira and Zorn 1998), as well as an increased use of "in part" concurrences and dissents. In addition to the institutional changes wrought by the Judges' Bill, these shifts also reflected increased ideological tension, both at the individual level (e.g., Mendelson 1961) and on the Court as a whole (Urofsky 1999). In addition, norms among the justices themselves had shifted; owing in part to the vindication of the first Justice Harlan and his forceful dissents in the *Civil Rights Cases* (1883) and *Plessy v. Ferguson* (1896), dissent was no longer culturally disfavored on the Court. In its place came Chief Justice Charles Evans Hughes' romanticized characterization of dissents as "appeals to the brooding spirit of the law"[1]

The growth of open disagreement (in the form of separate opinions) led to a number of institutional changes in the Court: the growth in the number and professionalization of Supreme Court clerks (Peppers 2006), the expanded use of citations to law reviews and other external sources (Post 2001), and increases in the practice of justices reading their dissents from the bench (Guinier 2008). Partly in response to this, in 1977, in *Marks v. U.S.*, the Court established that a plurality opinion could establish precedent, noting that "the holding of the Court may be viewed as that position taken by those members who concurred in the judgments on the narrowest grounds" (Thurmon 1992).

[1]The full quote is "A dissent in a court of last resort is an appeal to the brooding spirit of law, to the intelligence of a future day when a later decision may possibly correct the error into which the dissenting justice believes the court to have been betrayed" (Hughes 1928).

By the dawn of the 21st century, open disagreement among the justices – in their opinions, in their public writings, and in oral argument – was widespread and largely accepted. Moreover, a growing practice among the justices was to use separate opinions – dissents and concurrences alike – to address each other directly, and in many cases to criticize what they believed to be weak, faulty, or nonexistent reasoning in the opinions of their colleagues. Justice Scalia's practice of doing so (discussed in the introduction) was but one example, and far from the most extreme; a prominent recent example occurred in *Students for Fair Admissions v./ President and Fellows of Harvard College* (2023), which largely eliminated the practice of race-based affirmative action in university admissions. In a six-page section of his concurring opinion, Justice Clarence Thomas specifically references Justice Ketanji Brown Jackson and her dissent, calling her out by name 18 times and claiming that "on her view, almost all of life's outcomes may be unhesitatingly ascribed to race," and that Jackson "uses her broad observations about statistical relationships between race and select measures of health, wealth, and well-being to label all blacks as victims." In her dissent, Justice Jackson references Thomas' concurrence, noting that it "responds to a dissent I did not write in order to assail an admissions program that is not the one (the university) has crafted," "demonstrates an obsession with race consciousness that far outstrips (hers)," and "ignites too many more straw men to list, or fully extinguish, here" (fn. 104).

A causal reading of the Court's recent jurisprudence suggests that such exchanges have grown more common and widespread, and that they often take on a specifically ideological bent. Their frequency and vituperativeness have even led the current Chief Justice to comment. Writing for a 6-3 conservative majority in *Biden v. Nebraska* (2023), Chief Justice Roberts expressed concern that "(I)t has become a disturbing feature of some recent opinions to criticize the decisions with which they disagree as going beyond the proper role of the judiciary...Reasonable minds may disagree with our analysis – in fact, at least three do. We do not mistake this plainly heartfelt disagreement for disparagement. It is important that the public not be misled either. Any such misperception would be harmful to this institution and our country" (600 U.S. ___ at 25-26). Yet in a footnote on

the same page, he notes that "(T)he dissent complains that our application of the major questions doctrine is a 'tell' revealing that 'normal' statutory interpretation cannot sustain [our] decision... Not so."[2]

From an academic perspective, scholars have long recognized the role of disagreement in shaping Supreme Court decisions (Pritchett 1945). As the Court has evolved, research has considered the myriad ways in which disputes on the Court are manifested, from concurrences (e.g., Caldeira and Zorn 1998, Bennett et al. 2018) to the practice of dissenting from the bench (Johnson, Black and Ringsmuth 2009, Blake and Hacker 2010), to intra-Court discussion of dissenting opinions (Corley and Ward 2020). Central to those studies is recognition of the the double-edged nature of Supreme Court discord. Writing about the Court four decades ago, Judge Frank Easterbrook noted that "(D)isagreement is not necessarily a bad thing. It may be healthy or even necessary if the Court is to fulfill its assigned function" (Easterbrook 1984, p. 389).

Such disagreement may arise due to differences in legal perspectives (Gillman 2001), ideological commitments (Segal and Spaeth 2002), strategic considerations (Epstein and Knight 1998), or other concerns. Moreover, the justices work within a small, personalized decision-making body, navigating complex legal, political, and social disputes of the highest importance. They do so after hearing and reading finely-honed arguments from both sides of the controversy in question, and in many cases by extensive outside participants as well. At its best, such disagreement and debate

[2]A similar sentiment was expressed by Justice Amy Coney Barrett in her one-page concurrence in *Trump v. Anderson* (2024). There, she writes "The majority's choice of a different path leaves the remaining Justices with a choice of how to respond. In my judgment, this is not the time to amplify disagreement with stridency. The Court has settled a politically charged issue in the volatile season of a Presidential election. Particularly in this circumstance, writings on the Court should turn the national temperature down, not up. For present purposes, our differences are far less important than our unanimity: All nine Justices agree on the outcome of this case. That is the message Americans should take home."

is likely to promote the quality of judicial reasoning and to enhance the clarity of resulting legal doctrines. At the same time, as we note above while even today justices regularly acquiesce in decisions with which they have fundamental agreements (Goelzhauser 2015), it is now seen as not only acceptable but even laudable for the justices to express those disagreements, and at times to do so vehemently. Such expression of disagreement also reflects (and is reflected in) the Court's internal dynamics, and may have negative effects on the social cohesion of the justices.

Here, we follow previous research and focus on the manifestation of disagreement in judicial opinions, the justices' written justifications of the controversies they resolve. Judicial opinions are the central vehicle for announcing the outcome of a case *and*, critically, explaining the reasoning behind those outcomes. They are, therefore, a rich source for understanding disagreement. Justices' opinions necessarily articulate positions related to the specific disagreement between the parties, and thus reflect that jurist's choice to adopt one interpretation of the law or another. But they also often articulate positions with respect to disagreements among the justices, addressing and critiquing one another's arguments in the instant case as well as prior cases used as authorities. Such disagreement can be beneficial, by clarifying areas of uncertainty in the law, encouraging justices to develop legal doctrine to address such grey areas, and generally strengthening the rationales set forth. At the same time, negative or personal attacks may undermine the Court's collegiality and social cohesion, with potential long-term consequences for how the Court conducts its business and how the public perceives the Court.

Prior work on Supreme Court disagreement has generally focused on large, aggregate measures. One body of work analyzes the impact of disagreement on case-level outcomes, including the analysis of dissenting opinions relative to majority opinions; much of that research suggests that justices who lose on their preferred policy outcome may seek to realign towards a reframing of the dispute (Wedeking 2010, Rice 2017). A focus on dissents, in particular, is common in the literature; the general thrust of this research is in trying to understand why justices write a separate dissenting opinions (Wahlbeck, Spriggs and Maltzman 1999, Ura and Flink 2016). While valuable,

such work fails to capture the substantive content of Supreme Court disagreement. At the same time, prior studies that have sought to analyze changes in the substance of the disagreement have operated at a similarly high level of generality, capturing (for example) the sentiment of the entire opinion (Rice and Zorn 2016; 2019). Such work introduces noise into the measurement strategy, primarily in the form of emotional language that is not reflective of differences in the manner of disagreements.

We thus move beyond this existing research by, crucially, distinguishing between language in an opinion that reflects procedural, jurisprudential, or policy disagreement and language that serves other purposes. For example, negative sentiment in procedural discussions or factual summaries – such as references to capital punishment in death penalty cases – may not indicate disagreement but rather the heavy emotional undercurrent of the case. By limiting analysis to the passages of opinions where disagreement is most likely to manifest, we advance recent work on text-as-data for legal and political analysis and better structure our empirical analyses.

Measurement Pipeline

To accomplish the above, we develop a novel computational approach using large language models for text classification. Building from the disagreement argument, our process aims to identify specific references to other justices or opinions, and then to measure whether the specific reference offers support or opposition. In so doing, our approach builds from classical approaches to aspect-level sentiment analysis. The fundamental insight is that we can better identify changes in the decorum of justices by focusing on the the specific instances where changes in positive and negative language actually matter with respect to the social environment of the Court.

We specify a classification pipeline that operates as follows. In the first stage, we segment each judicial opinion into sentences. In doing so, we are better able to identify and classify relevant references. This approach recognizes that not all sentences within a judicial opinion contribute

equally towards the measurement of disagreement. Judicial opinions are a complex mix of factual backgrounds, procedural details, and legal reasoning. It is the latter that carries the most information of a Court's social environment. In focusing on the sentence level, then, we are better able to identify high-relevance passages while minimizing the noise that would be introduced by less pertinent content. Because we can aggregate the (relevant) sentences to document-level measures, we gain much stronger identification over the underlying construct of interest.

To this end, in the second step, each statement is then evaluated for references to other justices or to separate opinions of the Court. This step acts as a filter, more precisely identifying relevant passages and ignoring irrelevant discussions. Through our focus on these references, we capture the moments where justices directly engage with one another's reasoning or with prior decisions, crucial elements of the Court's dynamics of legal argumentation. Through these textual interactions, the justices reveal areas of consensus or disagreement, providing insight on support for or opposition related to the Court's decision. Likewise, these elements are naturally analogues to legal reasoning, as they are unlikely to feature procedural descriptions or peripheral factual summaries. The second step, therefore, ensures our estimates of polarity are more precise, isolating the areas of the opinions where justices are most likely to indicate their perspectives and differences.

Finally, each statement is then evaluated for sentiment, with possible values of *Positive*, *Negative*, or *Neutral*. The sentiment label captures the tone of the sentence; because the relevant sentences feature passages related to other justices or other opinions, the tone likewise reflects the stance of those passages. Positive sentiment, for instance, may reflect agreement or approval of an argument or opinion, while negative sentiment may signal disagreement or criticism. Neutral sentiment is included to capture instances where there is no evaluation or expression of support or opposition. Coding individual sentences provides a granular representation of the document that can then be aggregated to the level of the document, as we will do below, but also opens the possibility for more granular analyses of individual or sets of opinions.

Data

The data for this study consist of the complete corpus of U.S. Supreme Court opinions spanning the entire history of the Court through 2010. Each opinion was separated and categorized by opinion type–majority, concurring, dissenting, or other–allowing for precise association of the text with the author of the text. These opinions were then linked with the vote-level and case-level metadata available from the Supreme Court Database Spaeth et al. (2024), providing information on term, justice votes, and case outcomes. In this paper, we present findings from a pilot analysis, focusing on the modern Supreme Court era, defined as the period from 1954 (post-*Brown v. Board of Education* to 2010. The era is one of vast legal and historical significance, during which the Court is a highly influential political institution in American politics, and an era during which the Court is increasingly playing the role of a policymaker (Silverstein 2009, Rice 2020).

Because this is a pilot, we employed a stratified random sampling approach to build the corpus for preliminary analysis. For each term between 1954 and 2010, we randomly identified 10 *cases*, ensuring representation across the Court's docket over time. For each selected *case*, we included all associated *opinions*–majority, concurring, and dissenting–capturing the full spectrum of perspectives and reasoning within each case. Our sampling strategy for this preliminary cut balances breadth and depth, allowing us to provide a view of the Court's exchanges in opinions during a term while maintaining a manageable scope. In total, the sample consists of 1,202 opinions, representing a relatively robust cross-section of the Court's behavior over a long time period. Once we solidify and finalize our analytical approach based on insights gained through this pilot analysis, we plan to expand out to a comprehensive overview of all Supreme Court opinions.

We process each through the ChatGPT API, using `GPT-4.0mini`. The prompt for each sentence is as follows:

> *Analyze the following judicial statement: [statement].*
>
> *Classify the statement as follows:*

- If it does not refer to another justice or another opinion of the U.S. Supreme Court, label as 0.

- If it refers to another justice of the U.S. Supreme Court by name, label as 1.

- If it refers to another judicial opinion of the U.S. Supreme Court, either in that or a previous case, label as 2.

Additionally, classify the sentiment as 'Positive', 'Negative', or 'Neutral'.

Return your answer in the following JSON format: [formatting]

After cleaning and labeling, the resulting corpus comprises 142,203 distinct statements. Of those, 1,475 are identified as referring to another justice of the U.S. Supreme Court by name (category 1), while 38,009 are identified as referencing another judicial opinion of the Court (category 2).

Results and Analysis

Validation

We begin our analyses of these data by validating our measure of sentiment. To do so, we examine whether the machine coding corresponds with theoretical expectations about how different types of judicial opinions should reflect disagreement. For the first of these, we consider opinion type. Specifically, we expect that separate opinions – particularly dissenting opinions – should reflect the greatest amounts of disagreement.

Figure 1 visualizes the average statement polarity across four opinion types: majority, concurring, dissenting, and "in part". As the plot makes clear, and as we would expect, majority opinions exhibit the highest average statement polarity, reflecting their position as the product of the Court's agreement among the greatest number of justices. In steep contrast, dissenting opinions – whether dissenting in full or in part – show the lowest average statement polarity. Crafted from a losing

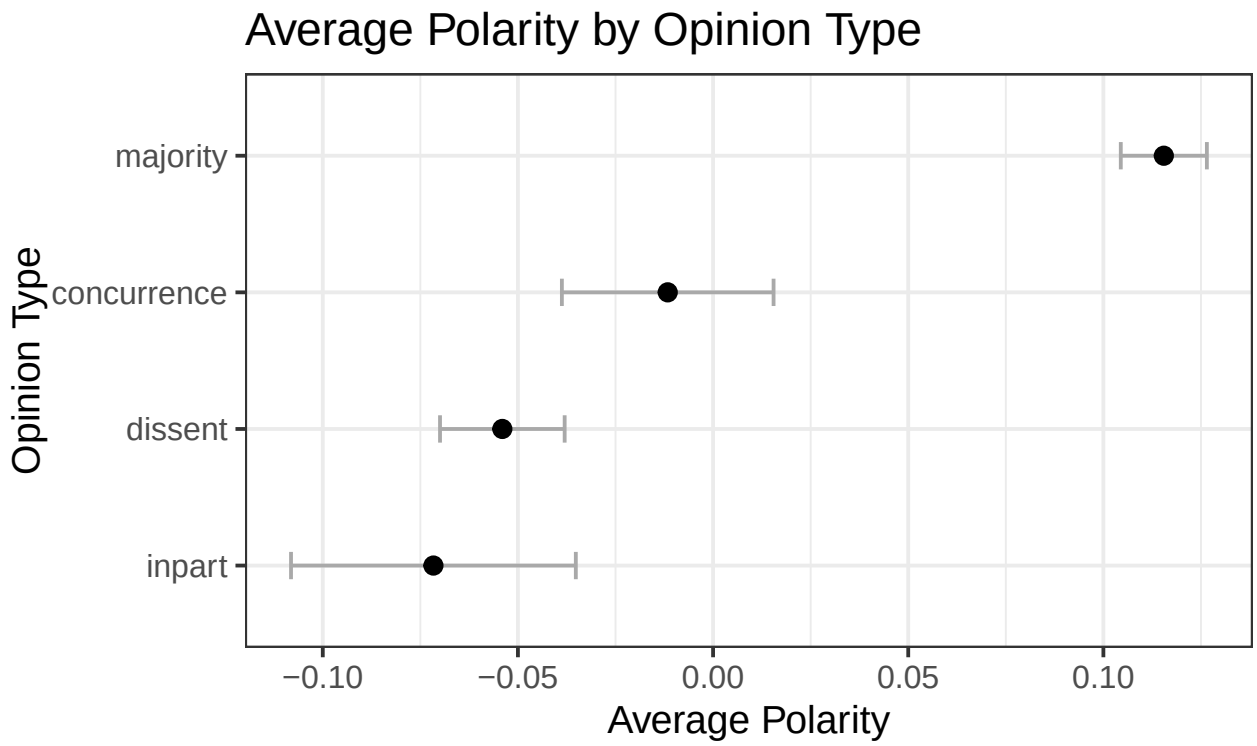

Figure 1: *Average Polarity by Supreme Court Opinion Type.* Average statement sentiment (points) and associated 95% confidence intervals (grey bars) across different categories of opinions.

position, these are necessarily critical of the majority opinion, leading to associated declines in polarity. In between, concurring opinions, which only partially agree with the majority, fall between majority and dissenting opinions in average statement polarity. The clear patterns across opinion types demonstrates that our measure captures meaningful differences in disagreement in opinions.

Beyond differences in opinion types, we might also expect differences in opinions based on the size of the majority coalition. Consider the difference between a unanimous Court and a Court divided 5-4; one would expect the latter to express heightened disagreement among the justices' opinions. On this, Figure 2 provides further support for our measurement approach along with evidence of convergent validity, demonstrating the relationship between the average polarity of majority opinion statements and the size of the majority coalition. The X-axis presents the average polarity of majority opinion statements, while the Y-axis indicates the number of members in

the majority coalition. Each point represents the mean polarity of majority opinion statements associated with a given majority size, with horizontal error bars denoting 95% confidence intervals. The plot provides clear evidence in favor of our measurement approach; as the size of the majority coalition increases, the average polarity of majority opinion statements increases as well, becoming more positive. The pattern suggests that more unified courts are more likely to produce majority opinions featuring statements that are more positive. The pattern aligns with prior work on judicial coalition-building and collegiality (e.g., Maltzman and Wahlbeck 1996, Maltzman, Spriggs and Wahlbeck 2000).

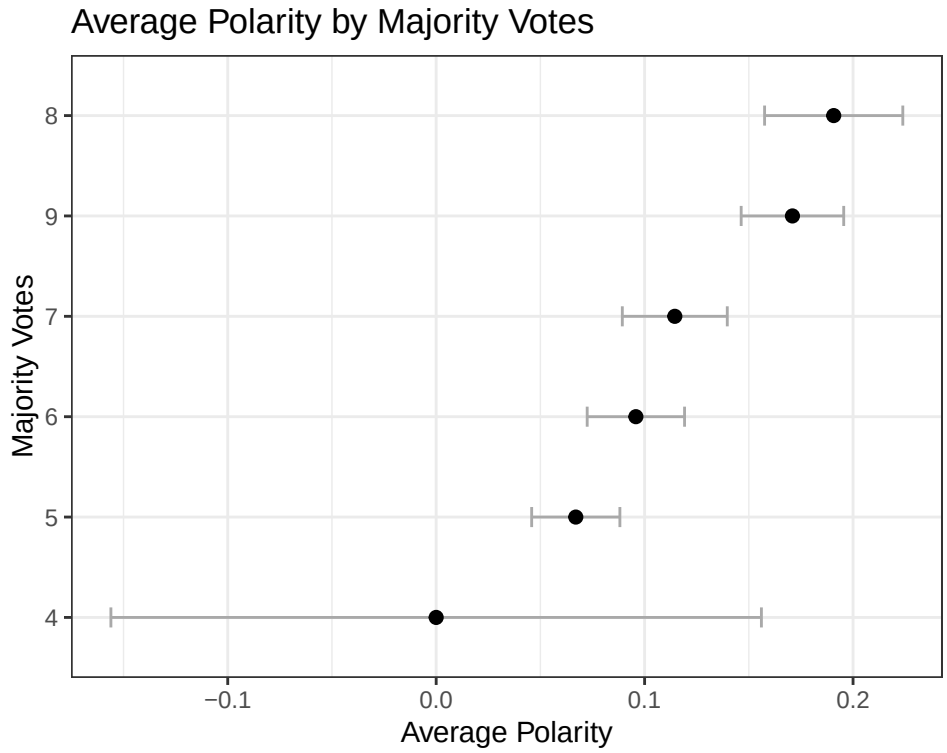

Figure 2: *Average Polarity by Supreme Court Opinion Type.* Average statement sentiment (points) and associated 95% confidence intervals (grey bars) across different categories of opinions.

Taken together, the results presented in Figures 1 and 2 provide strong evidence of the validity and utility of our measurement approach. Those results match with the theoretical expectations

about the roles of different opinion types as well as the size of majority opinion coalitions. The plots demonstrates the value of our approach to measuring sentiment across judicial opinions. In the next section, we therefore turn towards analyzing how disagreement and cohesion evolve within the Court over time and across chief justice eras.

Influence of the Chief

We turn next to examining how patterns of disagreement on the Court have evolved over time, with particular attention to the role of the Chief Justice in shaping the social environment of the Court and the Court's deliberations. Understanding these dynamics furthers our understanding of how the institutional design of the Court's internal structure may or may not shape the Court's collegiality.

To begin, in Figure 3 we plot the average polarity of the relevant statements in judicial opinions over time, calculated as the mean polarity statement for each October Term of the Court, along with a smoothed loess fit and shaded 95% confidence intervals. Immediately noticeable is a decline in average polarity from the mid-20th to the early 21st century. Though the Warren Court era (the 1950s and 1960s) is often identified as a period of particular contention *around* the Court, the data generally suggest the Court's output and expressions of agreement or disagreement reflected a more positive tone. The generally positive pattern continues through the Burger Court, with a noticeable decline then associated with the arrival of William Rehnquist as Chief Justice, and continuing through the early years of the Roberts Court. The pattern suggests that, heading into the 2000s, engagement between the justices and between justices and prior opinions reflects increasingly negative language and stronger expressions of disagreement.

Of course, the membership of the Court likewise changes across these time periods, and the replacement of justices likely plays a role in the shifting tone of engagement among them. To capture this, in Figure 4, we plot average statement polarity by justice, along with 95 percent two-tailed confidence intervals. For the justice-level averages we use only concurring, dissenting, or other

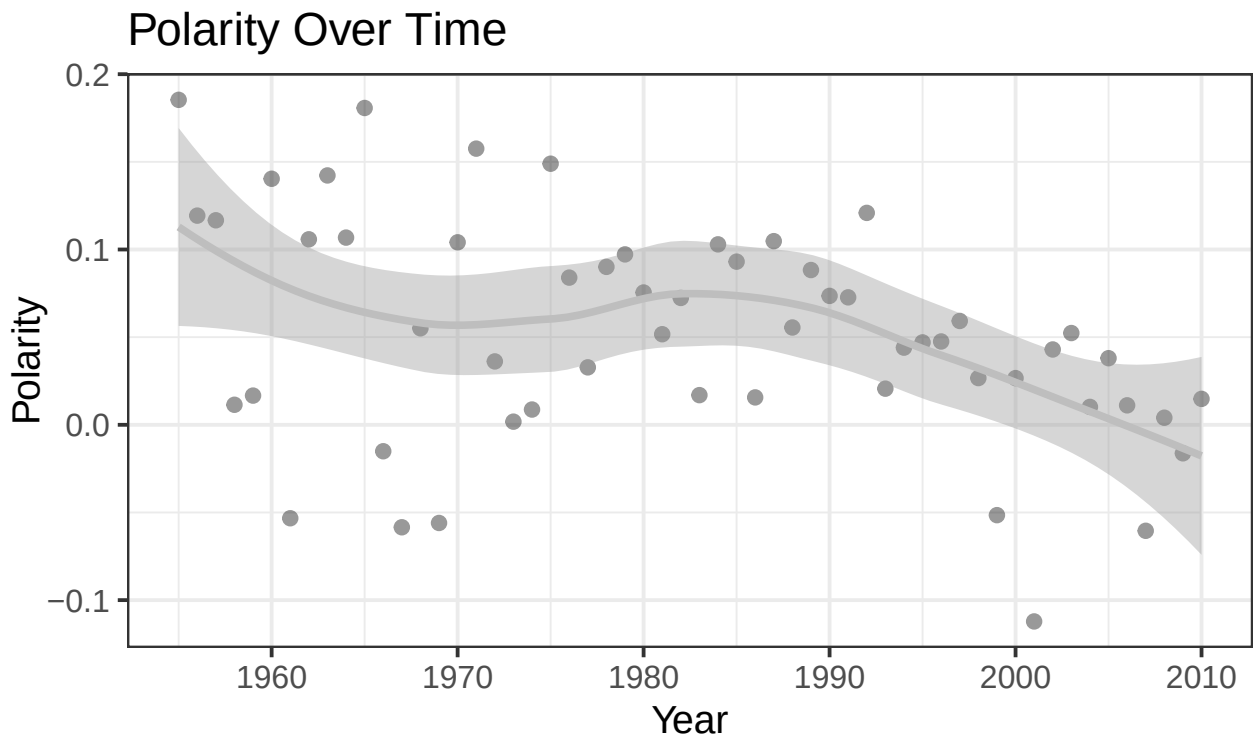

Figure 3: *Average Polarity by Supreme Court Term.* Average statement sentiment (points) and associated 95% confidence intervals (grey bars) across each October Term.

separate opinions. We do so because majority opinions often require negotiation among the members of the majority; separate opinions, on the other hand, provide significantly greater freedom for the authoring justices to express their own opinions. Because our interest is in understanding the propensity of the justice themself, the separate opinions therefore offer the best approach for measurement.

The plot reveals substantial variation across justices, suggesting important differences in individual approaches to crafting opinions and ways of engaging with colleagues and other opinions. At the top of the polarity scale, Justices Burton and Ginsburg exhibit consistently positive sentiment when interacting, indicating more collegial or constructive approaches, even when expressing disagreement. The pattern aligns with prior work, as Justice Burton, for instance, was noted for his affable and collegial personality (Atkinson 1978, p. 2). Interestingly, justices on the lower end of the scale, such as Chief Justice Warren and Justice Black, display more negative sentiment in their

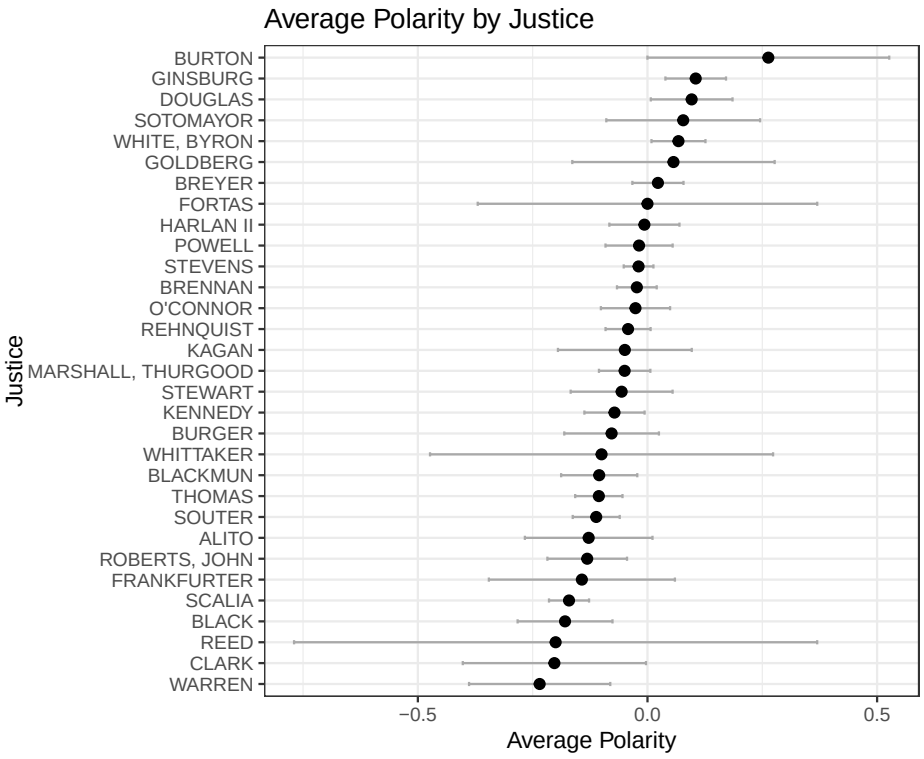

Figure 4: *Average Polarity by Supreme Court Justice.* Average statement sentiment (points) and associated 95% confidence intervals (grey bars) for each U.S. Supreme Court justice, 1954-2010.

statements engaging with other opinions. Another notable dynamic emerges here in that many of the modern conservative justices (Justices Thomas, Scalia, and Alito in particular) are rated among the most negative in their opinion sentiment.

Once again, our findings suggest that a shift is ongoing in the way that members of the Court express disagreement. Finally, we turn in 5 to illustrate the average polarity of opinions across the tenures of each of the chief justices in our preliminary dataset. The figure demonstrates how the tone of agreement and disagreement on the Court has shifted across the tenures of the four chiefs: Warren, Burger, Rehnquist, and (early-term) Roberts. Chief Justice Warren's tenure was marked by the highest average polarity, a pattern anecdotally supported by Warren's leadership and emphasis on cohesion in *Brown v. Board of Education*. Burger's tenure is marked by a similarly high level of positivity in engagement, notable particularly given the increases in ideological division and perceived workload challenges on the Court (e.g., O'Brien 1985).

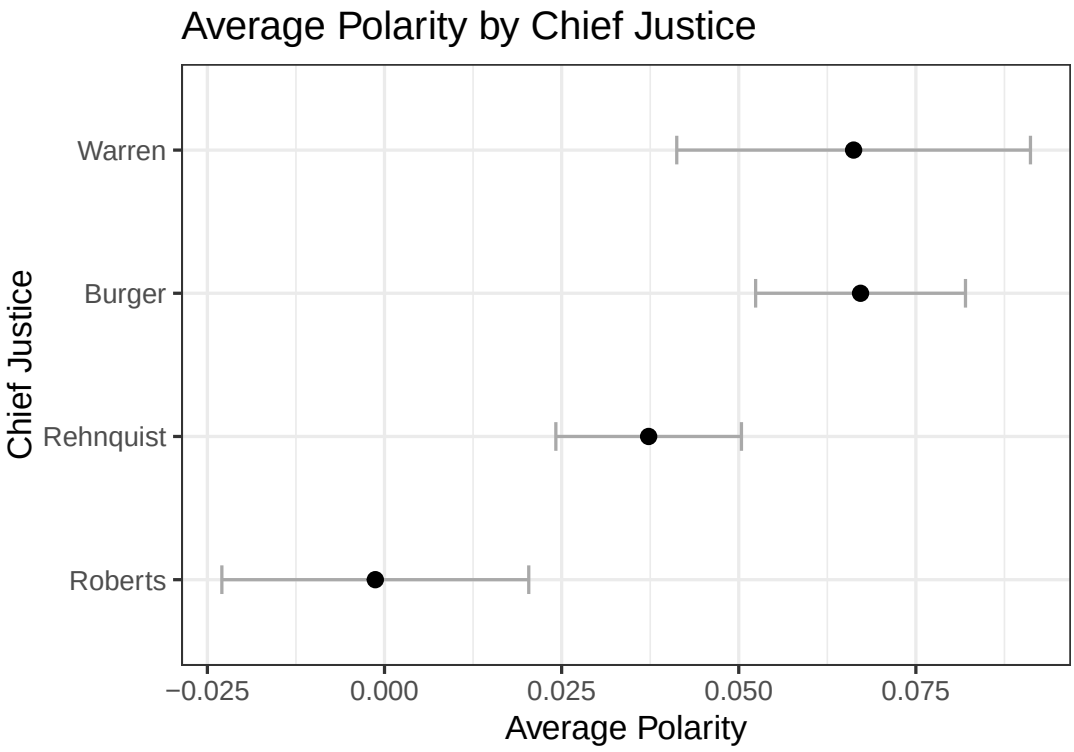

Figure 5: *Average Polarity by Chief Justice Eras.* Average statement sentiment (points) and associated 95% confidence intervals (grey bars) for majority opinions across each Chief Justice era.

In contrast to the positivity of his predecessors, the tenure of Chief Justice Rehnquist coincides with a decline in the tone of engagement in opinions. This period, of course, coincides with a period of heightened polarization and sharper ideological divisions on the Court (Segal and Spaeth 2002). Yet the biggest declines occur as the Court moves into the tenure of Chief Justice John Roberts, as average polarity approaches zero across opinions. As Chief Justice Roberts wrestles with a Court with deeply polarized perspectives, his efforts to maintain cohesion run against justices increasingly expressing more negative forms of engagement with one another in their opinions. The results suggest that Chief Justice Roberts, widely regarded as an institutionalist concerned with the perceived legitimacy of the Court's decisionmaking, is either unwilling or unable to address the evolution in the ways justices increasingly debate and engage with one another.

Discussion and Conclusion

In this study, we examine the way in which disagreement is expressed on the U.S. Supreme Court through judicial opinions, and how the way that disagreement is expressed has changed over time. Leveraging a novel methodological approach using LLMs, we demonstrate new dynamics related to justice-level and court-level dynamics related to the ways in which disagreement manifests at the Court. Our analysis offers two key findings related to the Court's interpersonal environment and institutional output. First, the overall tone of disagreement has moved more negative and critical in recent decades, particularly during the Rehnquist and Roberts Court eras. The trend reflects both membership changes on the Court and the modern Court's struggle to maintain decorum amid as it, and the broader political system, become more ideologically polarized. Second, the Chief Justice–though institutionally privileged in managing the Court's business–may be limited in preventing a decline in the state of the Court's deliberation and expressions of disagreement. Despite the general understanding of Chief Justice Roberts intention to maintain the Court's institutional standards, the Court has (during the years covered by our dataset) suffered a marked decline in rhetorical collegiality. That decline, therefore, speaks to either the limits on, or the unwillingness to act under the rubric of, the powers of the Chief as the Court wrestles with its role in a hyperpolarized environment.

Beyond the Court, our work has implications for other deliberative bodies in similar situations, as disagreement is a necessary and inevitable component of political decisionmaking and an important marker of institutional health. Constructive disagreement can enhance institutional outputs and strengthen decision-making. However, more negative disagreement can undermine trust in institutions, exacerbate existing divisions, and contribute to worse institutional performance as it reduces the possibility of collective action. Our preliminary findings suggest the Court may itself be wrestling with these challenges.

The preliminary results also point to important avenues for future research. First, how do these

patterns of disagreement influence public perceptions of the Court? Research suggests the Court maintains public trust in part through evaluations of its institutional performance, not specifically its policy outputs (see, e.g., Caldeira and Gibson 1992, Gibson, Caldeira and Spence 2003). Understanding how different approaches to disagreement in judicial opinions shape changes in the perspective of the public matters for this in the first place, but the ways in which the more general trend towards justices on the Court behaving this way – and how it influences the Court's ability to carry out the work of the institution – could also lead to changes in public support. Second, the work opens the door to new questions about how the changes in the Court's behavior compares to other deliberative institutions in U.S. politics. On this, our methodological approach is generalizable and well-tailored to a host of institutional settings, like congressional committee hearings or executive speeches. Finally, future work can, within the legal space specifically, examine how differences in the tone of disagreement influence legal development; if justices are attacking one another, does it lead to long-term declines in the viability of the established legal rules?

Throughout, our work demonstrates the utility of contemporary LLMs for advancing our understanding of the U.S. Supreme Court and other deliberative institutions. Such tools enable us to adopt an approach to analyzing the justices' opinions that is simultaneously fine-grained and scalable, one that would be nearly impossible for systematic human coders to conduct efficiently and reliably. This in turn allows us to develop a more nuanced and precise measurement strategy for capturing different qualities of disagreement from text. Such an approach opens new paths for future research on the Court and suggests important new insights related to the decline in the Court's functioning in the modern era, work that we plan to expand out as we build upon this analysis in future work.

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