**A complex systems framework for understanding distortions in representation in the United States**

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**BG SUGGESTIONS IN BOLD**

**In the United States, representation can become unreflective of public opinion. Institutional arrangements and their purposeful manipulation create situations in which political polarization can either arise or be inflated. The resulting distortions can lead to polarized institutions and a democracy that privileges a faction of voters at the expense of the majority. Here we organize causes and possible repairs for these distortions into a complex systems framework. A fundamental component of a responsive democracy is a feedback control mechanism: the capacity for elections to remove legislators whose actions are opposed by their constituents. When legislators manipulate their own legislative district boundaries, this feedback mechanism is disrupted, leading to undue strength to the political party in charge (gerrymandering); conversely, independent redistricting commissions and statutory rules restore beneficial feedback. Another component of democracy is the ability of deliberative bodies to achieve outcomes that are agreeable to a large segment of the population. However, plurality winner-take-all voting rules can give electoral advantages to a cohesive, extreme faction to take charge, leaving moderate voters without representation, forced to choose between candidates representing opposite extremes. Voting reforms such as ranked-choice voting and open primaries, when properly designed, have the potential to ~~reduce extreme deviations~~ such polarization. Similarly, majority rules processes within a legislature can lead to choices only between two extreme policies. An understanding of these feedback mechanisms can help both reformers and scholars understand corrective actions that may attenuate the consequences of political polarization.**

**THE SCIENCE AND ENGINEERING OF REPRESENTATIVE DEMOCRACY**

Any system of government has a combination of engineered and naturally-arising features, including institutions, geography, and demographics. We propose to describe the U.S. system of representative democracy in terms of how these features interact to form a complex system. This approach will draw upon individual political science investigations, which often concern themselves with identifying and quantifying effects and causality of individual components of the system. A systems approach seeks to assess the emergent behavior that arises when such features work together. It can identify nonlinear interactions and even help understand events that go outside past experience.

Such an approach resembles many topics in engineering or biology. In these disciplines, one often encounters complex systems of interacting parts. Systems can be designed, such as a power grid or a mechanical clockwork, or they can arise through selection mechanisms, such as animal population dynamics or the evolution of new species. In both cases, a full understanding of a system’s behavior requires understanding both individual rules, network interactions, and the effects of exogenous factors.

A complex-systems approach has the potential for practical application. In the face of record distrust and dissatisfaction with respect to American institutions, interest in reform measures has exploded. Ideas for reform range from ranked-choice voting to redistricting reform to changes in the judiciary. However, no matter how well-intended such reforms may be, their consequences are not always easy to predict. We hope to provide a perspective that can enhance the efforts to date of reformers and academics, and create a framework for diagnosing bugs in democracy - and evaluating the advisability of bug fixes. And it can identify which steps might have the most leverage in achieving the intended goals, while avoiding undesirable, unexpected outcomes. In short, a complex-systems approach can expand the science of politics to encompass the conceptual goals of engineering.

One of the difficulties of understanding reforms is that symptoms are distant from causes. Just as a fever in a patient may indicate infection or the effects of recent exercise, dysfunctions in representative democracy can reflect a variety of causes. Coming up with a treatment for what ails democracy requires some understanding of how remedies may lead to an abatement of symptoms – and whether the treatment is beneficial in the long run, or interferes with other treatments.

An engineering-inspired approach must include measures of functionality. Here we will focus on three features of representative democracy: (1) representation that is commensurate with public opinion, (2) responsiveness of legislators and other public officials to changes in opinion, and (3) deliberation in the production of policy outcomes. Such ideals are implicit in the Constitution, federal, and state law. We will use them as measures to diagnose the system’s health.

**DEEP CAUSES: POLARIZATION, RACE, AND GEOGRAPHY**

Formal institutions are embedded in wider society. A central design challenge arises from the fact that the United States is continually changing. In 1790, voters comprised white male landowners and slaveowners in a nation of 4 million. Today, nearly all **adult** citizens can in principle vote in a nation of 330 million. Institutional changes have included the establishment of modern Electoral College rules, direct election of Senators, and a host of constraints on equal voter power. Those same institutions now face a set of challenges rooted in current conditions.

The Republican Party has become increasingly a party of white, mostly non-college citizens. This is a shrinking group relative to the rest of the population. Surveys of K-12 students and younger voters show that younger voters are turning away from the Republican Party, and will likely continue to do so for the next decade. More are **identifying as political independents, though often** throwing in their lot with the Democratic Party, which is shaping up as a coalition of ethnic minority groups and college-educateds, and tilting toward women. The growth of this coalition supports the view of many scholars (for example see Balkin) that at some point in the future, the dominant party is likely to be the Democrats, **though evidence of some weakening of minority support for the Democrats in 2020 casts some doubt on this prediction.**

However, the phrase “at some point in the future” is limited by the institutions and rules of democracy. In the absence of a strategy to expand its base, the Republican Party has chosen a route to political survival that centers on engineering advantages for itself in the rules of government. Advantages like partisan gerrymandering and lifetime appointments to the judiciary are attempts to hold back the tide of a natural force, demographic change. Such maneuvers diminish the responsiveness of government to both Democratic and Republican voters, by building institutions that are unresponsive to voter sentiment.

**Root causes of voter polarization.** A central feature of discussions of modern U.S. politics is polarization, defined as sorting of political stances along a single dimension, especially with bimodality and/or a high standard deviation. Since the 1970s, elected representatives have been sorted more reliably along a single dominating ideological dimension (McCarty, Poole, & Rosenthal 2008). This tendency toward single-dimension ideology has converged with the US system of single member districts, which creates strong incentives to reduce party structures to two major competing choices (Duverger 1954).

Institutions alone cannot explain polarization, since the recent increase in polarization (Putnam and Garrett 2020) has occurred with few major changes in the rules of democracy. Other causes include increasing distrust in institutions, the advent of long-distance rapid communication, demographic change, and increasing economic inequality. These factors may act through institutions to create governmental polarization – and even be amplified to exacerbate polarization. **However, it is not clear if these root factors are the cause of polarization, or a symptom of polarization. The feedback loops between them and across them complicate a causal diagram (Duca and Saving 2016; Putnam and Garrett 2020; Stewart, McCarty, and Bryson 2020).**

The nature of communication in all domains has become simultaneously nationalized and fragmented. Political communication is no exception. The old ABC-CBS-NBC triad of television has been supplanted with a variety of communications channels, starting from talk radio, cable news, email and social media. Each of these mediums facilitates narrowcasting of political communication, and a potential loss of a commonly defined factual basis for civil society (Wattenberg 2004; Prior 2007; Groeling 2008; Prior 2013).

A second source of fragmentation comes from demographic change. The population structure of the nation has been driven by the Hart-Celler Immigration and Naturalization Act of 1965. The ability of nonwhite citizens to engage in the political process has been driven by the Voting Rights Acts of 1965 and its later modifications (Alt, 1990). Consequent changes in race-conscious redistricting (Davidson and Grofman, 1992) have shaped representation, especially in the South in shaping white perceptions of the Democratic party as the party of minorities.

The deep divisions with respect to race lead to what one of us has called an *ethnicized party system*, with whites on one side and minorities on the other. Ideological lines have hardened, with partisans holding correlated issue positions across seemingly independent issues such as environmental protection, immigration, taxation, and gay marriage (Fiorina and Abrams 2008). Voters who identify with the Republican party also have very different beliefs about factual matters such as the extent of racial discrimination or the evidence for global warming (Tesler 2012), or fraud in the 2020 election[[1]](#footnote-1), than voters who identify as Democrats. Geographic patterns of immigrant location **(Massey 2007)**, and the continuing economic decline of rural areas have meant that Democratic cities face a Republican countryside, with the areas “in play” mostly suburban ones (Rodden 2019). These divisions re accompanied by a rise of negative partisanship (Abramowitz and Webster 2018), or the dislike of the other political party, and “affective polarization”, which is dislike of individuals who identify with the other party (Iyengear et al 2019). This has led to an increase in the percentage of parents unwilling to see their children marry across party lines (﻿Iyengar, Sood, and Lelkes 2012).

Another key factor is a change in the nature of jobs and the economy. These include a widening gap in income between the college-educated and the non-college-educated, a concentration of wealth in the hands of the super-wealthy corresponding with only very modest gains among those in the middle of the income distribution (Piketty and Saez 2003), and job loss that was geographically concentrated and largely disproportionately affecting the working class.

**The urban-rural divide and partisan skewness.** Despite the reduction of dimensionality of politics to a single polarized axis, one feature has remained heterogeneous: geographic variation in political stances. Indeed, political polarization has taken on a spatial dependence that in turn creates representational distortions. Patterns of which states are safely Democratic and Republican have varied dramatically over the last 100 years. Despite those shifts, one trend has become increasingly apparent: a correlation between population density and partisan preference starting around 1960, and continuing through the present day. By 1968, the distribution of partisan preference showed a strong skew, with high-density states much more Democratic than the Republican tendency of low-density states (skewness=0.68 to 2.68, average 1.31, 1968 to 2020).

In a winner-take-all system, such a pattern would give advantages to Republicans because their votes are distributed to obtain wins by smaller margins.The advantage conferred by this geographic-partisan association confers an advantage upon the Republican candidate in the Electoral College, such that a popular-vote loss by 3 points still gives an even-odds chance of winning the Presidency (**Cervas and Grofman 2020b)**. The same density-partisanship correlation persists at a county and precinct level. Thus a partisan advantage also accrues when Congressional or legislative districts are drawn purely on the basis of compactness and preserving county/city boundaries. This inequity can be counteracted or intensified if redistricting is done to satisfy other criteria such as racial fairness or equal treatment of the major political parties.

The urban-rural advantage is largest of all in the Senate (Dahl **2003**; **Cervas and Grofman 2020**), which has two Senators per state irrespective of population. In 2016, 2018, and 2020, the advantage for Republicans (defined as above) is more than 9 points; Republicans won 53 Senate seats with just 45% of the vote.

**Close partisan divisions.** If the two parties are closely divided in strength, more advantage may be gotten by regaining partisan control of government. This would tend to increase the stakes further. Such close partisan division has occurred for two extended periods in Congressional and Presidential politics, the first Gilded Age (1876-1896) and modern times, which can be construed as a second Gilded Age (1994 to present). With so much at stake, tactics may take a more confrontational tone of “Constitutional hardball” (Tushnet **2004**) in which governing norms are broken and rules are bent and even broken in the service of gaining advantage. Any institutional rules that would give a long-lasting advantage, such as lifetime judicial appointments, would provide an incentive to engage in hardball tactics. And incivility and norm violation by one side will ultimately be met with further incivility and norms violation when the other side returns to power. That, too, is a feedback loop that is hard to break.

**BUGS IN DEMOCRACY: DECISION RULES, FEEDBACK, AND HYSTERESIS**

**American political institutions did not cause polarization, since a constant cannot be the causal mechanism. These institutions, however, failed to prevent polarization.** Citizen-level polarization is translated into defective government through electoral institutions. Those institutions, established over a period of many years, establish the composition and operation of all three branches of the federal government, as well as state-level officials. The rules by which the institutions operate can amplify or reduce the effects of voter polarization, and even influence voter polarization itself. The rules can also add distortions that impede the deliberative process.

These rules are the object of considerable study. We will describe deficiencies in the rules in terms of principles found in complex systems and behavioral science.

**1. AMPLIFICATION AND DISTORTION THROUGH VOTING RULES**

**Translating voter polarization to representational polarization.** If polarized voters elect polarized legislators, incentives for compromise are reduced. With issue positions are correlated with one another along a single axis of variation, fewer opportunities arise to pursue legislative outcomes that can command bipartisan support. Thus electoral mechanisms that generate legislative polarization might be expected to lead to gridlock and partisan warfare.

The standard rule for electing legislators in the United States is by plurality, or first-past-the-post. Under this rule, winners are only guaranteed to command majority support if there are two candidates. However, if the candidates represent extreme ideological positions, a polarized legislator is elected. If there are more than two candidates, as often occurs in a partisan primary nominating election, the nominee can prevail with less than half of the vote. Those votes can come from a determined minority at any point in the ideological spectrum of a single party. To put it another way, in partisan primaries and plurality voting, *the pivotal voter in determining a winner can be different from the median voter*.

A quintessential example of such a nominee is former President Donald Trump, whose support in the early primary season of the 2016 campaign began in the 30-40% range, more than any rival. His nomination, considered unthinkable at the time even by many Republicans, was driven by a determined minority of the Republican base. **Minority support translated into majoritarian outcomes through a disproportionate allocation of delegates.** Space does not permit a review of the polarized actions undertaken by President Trump. It is sufficient to note the first presidential debate between Trump and President Joe Biden, in which Trump shouted for much the debate, and Biden eventually asked “will you shut up man?”. The loss of civility in political discourse is perhaps the most striking feature of contemporary American politics. It contrasts sharply with 1960, when Vice-President Richard Nixon said to Senator John F. Kennedy “we differ on means, not on ends.“ Later in that debate Nixon asserted that Kennedy’s motives, like his own, “are sincere.” Such statements are inconceivable in today’s hyperpolarized climate.

In some sense, institutions now have a new job, the amelioration of polarization. Academics and politicians in the past have neglected the role of electoral mechanisms in causing elite polarization. We suggest that when the median voter is not the pivotal voter, within-party processes work to elect more extreme politicians. This view is not yet accepted widely, and considerable work is needed to test the point. The work will need to draw on behavioral and cognitive science, simulation, and game theory.

**2. UNCONTROLLED FEEDBACK THROUGH GERRYMANDERING**

A core theme of complex systems is that of feedback. Neurons, the signaling cells of the brain, are constantly battling between forces that bring them back to rest and forces that cause runaway signaling. These forces can lead to orderly trains of thought. But the wrong amount of feedback can lead to seizures.

Unlike other political properties that are often self-correcting, gerrymandering is circular: a partisan gerrymander that ensconces a party in power creates representational distortions that put a political party in a position to re-gerrymander, 10 years later. In this way, like the legendary Baron Munchausen, legislators can lift themselves up by their own bootstraps to stay in power indefinitely. In this way, gerrymandering is an example of uncontrolled positive feedback.

Gerrymandering also creates unresponsive legislators. Gerrymandering may also enhance the polarization of individual legislators through reciprocal causality (Grofman, Merrill, Brunell). Gerrymandering creates safe seats for both parties, making it easier for politicians on all sides to become extremists. In the other direction, polarization changes the incentives for gerrymandering. The more polarized the politics, the less willing is a political party to share control with the opposition, and more particularly, the less likely to see bipartisan sweetheart deals that lead to the easy reelection of incumbents of both the majority party and the minority. Rather, polarization leads to "go for broke" politics and, in its extreme form, the view that anything goes, including egregious gerrymandering.

Divided government could rein in partisan gerrymandering, but in the last two decades this negative-feedback mechanism has weakened. A record number of states have partisan trifectas in which both chambers of the legislature and the governor are of the same party. In these states, and in states where the governor has relatively little say over redistricting such as North Carolina and Kentucky, legislation toward an ideological extreme can run unfettered.

One particular form of gerrymandering, by race, has dual effects of reducing representation for both a racial group and their preferred party. Mechanisms for constraining racial gerrymandering have been weakened by *Shelby County v. Holder* (570 U.S. 529, 2013), a case that effectively struck down the racial protections of Section 5 of the Voting Rights Act. Further erosion of the Voting Rights Act, particularly Section 2, will make racial gerrymanders even easier. And since the Supreme Court has declined to get involved in partisan gerrymandering cases (*Rucho v. Common Cause* (588 U.S. \_\_\_, 2019), any racial gerrymander can be defended by calling it a partisan move. In effect, the Supreme Court has established that when it comes to racial gerrymandering, few, if any constraints apply. **The constitutionality of independent commissions has been litigated previously (*Arizona State Legislature v. Arizona Independent Redistricting Commission*, 576 U.S. 787, 2015), ~~and~~ but a dissent by Justice Roberts indicates that the case could be resurrected in the future.**

**3. HYSTERESIS: THE JUDICIARY**

The President’s political party appoints members of the federal bench, usually of similar ideological and political outlook, and those judges can reinforce or impede the operation of the other branches of government. Since federal judgeships are currently lifetime appointments, courts accumulate and retain the effects of changes in other branches of government for decades. In this way, even a one-term President can have persistent effects that take decades to reverse. In physical sciences, such stickiness is called hysteresis.

The long-lasting nature of judicial appointments creates incentives to intensify polarized conflict. Confirmation of judicial appointments used to require the approval of both of an appointee’s home-state Senators as well as supermajority support on the floor of the Senate. However, partisan conflict has led these checks on the executive branch to be removed. Confirmation votes now routinely follow partisan lines.

Some formal but internal aspects of institutions are both consequences of polarization and act to reinforce it. For example, the desire to end the Senate filibuster for judicial appointments was triggered by polarization, but the consequences of allowing one party to control judicial appointments without input from the other party operate to raise still further the stakes of partisan control of congress and the presidency.

**Judicial appointments are an integater. – SAM to complete**

**WHAT WILL MAKE THINGS BETTER?**

Electoral rules can have important effects. However, the size and durability of those effects is unknown. For example, allowing all voters to participate in party primaries is very likely to produce fewer extreme candidates than **closed** primaries, but the mean difference may not be that large **(McGhee, Masket, Shor, Rogers, and McCarty 2014; Grofman, Troumpounis, and Xefteris 2019)**. In the past, reformers have exaggerated expectations of what institutional reforms can do. It was said that women's suffrage would bring universal peace.

Any reforms should be evaluated in the context of the history of electoral reforms in the U.S. beginning with the progressives before World War I (at-large elections, initiative, and recall), popular election of Senators, the civil rights era, and advocacy for proportional representation (Hallett **1984**, Guinier **1994**). The current crop of US reforms include instant runoff (ranked-choice voting), cumulative voting, single transferable vote, open primaries, top-two or top-four primaries, and approval voting. In some cases, reforms have been passed, only to be repealed at a later date. Remarkably, one generation's reform is sometimes another generation's mistake to correct.

Difficulties that face any reform are knowing the size and variability of a reform’s effects, how it would perform in a particular local political environment. In addition, one has to evaluate a political environment to assess what metrics are needed to gauge improvement. Solutions, above all, should solve actual problems. Finally, reforms should be designed with a thought to how they will respond to future change. Inevitably, these reforms will have be revisited as America changes yet again.

A leading goal should be to un-cement recently-engineered advantages which fall into the negative category of entrenchment (Starr 2020). Government should represent, in some facsimile, the wishes of the majority of the governed, while addressing the structural disadvantages felt by minority groups. These reforms constitute a form of positive entrenchment. Some reforms can take place at a state level, such as the ~~progress on~~ **attempts to limit partisan gerrymandering by taking redistricting out of the hands of the state legislature and shifting them to non-partisan or bipartisan commission with explicit redistricting criteria, and the willingness in** last few years **shown by some state courts to use state law to restrict gerrymandering (see below)**. Another entrenched consequence is an expected long-term dominance of the judiciary by judges that continue the impact of the Republican Presidencies of 2001-2008 and 2017-2020 – Presidencies that began with popular-vote losers.

Importantly, we think that a complex systems-based theory can provide a natural vocabulary for evaluating the effectiveness of any given reform. Does the reform increase representational coupling? Does it increase responsiveness? Does it increase deliberation? Can it increase one outcome while decreasing others? Do effects vary according to where a polity is in parameter space? What happens when the polity moves? These questions are not new, but we suggest that a framework can make it easier to analyze them.

**REFORM 1: BETTER DECISION RULES FOR SELECTING WINNERS**

One broad category of reform seeks to generate outcomes that elect the Condorcet winner, i.e. the candidate who would win every one-on-one paired comparison (Grofman and Feld, 2004). An increasingly popular reform aimed at this outcome is ranked-choice voting (RCV; also known as instant-runoff voting or the alternative vote). RCV requires voters to rank the alternatives. In a common implementation, if no alternative receives a majority of first place votes, then the candidate with the fewest first place preferences is dropped and her votes are assigned to the next candidate on the preference list of the voters who ranked her first. This process continues until a candidate receives a majority of the votes on the still eligible ballots. A number of distinguished scholars have endorsed RCV (Sen and Maskin, **2018**). RCV is argued to have a number of specific advantages.

Fundamentally, RCV allows voters flexibility to show support for a candidate unlikely to win without hurting the election chances of a less preferred-~~choice~~ candidate who has a higher likelihood of electoral success , and without inadvertently helping an even less-preferred candidate.

RCV may foster the election of moderate candidates **even though this is not guaranteed (Fraenkel and Grofman 2004; 2006)**. ~~That is less certain, since~~ **However,** a centrist candidate who is acceptable to most voters may not have enough first or second place preferences to survive to a later round of the balloting (Fraenkel and Grofman **2005**). On the other hand, extremist candidates may be motivated to appeal to the center in the hope of picking up second or third round support, thus changing electoral incentives. Last but not least, RCV changes the likely set of options that voters will be given, since minor parties are more likely gather support to “send a message” – and **might** eventually become genuinely competitive.

Currently only Maine and Alaska elect federal representatives under this protocol. Maine adopted it before the 2018 midterm election. In 2018, a Democratic candidate received fewer first place votes, but after votes for the two third-party candidates were redistributed in the second round, ~~they~~ received a majority and were elected to Congress. Alaska passed an initiative in the 2020 election, and will hold its first ranked-choice voting elections in 2022.

The use of alternative voting systems invites several questions for future research. Currently, the evidence for moderation of ideology **or diminution of ethnic polarization** arising from **use of** RCV **rather than plurality** is mixed (Fraenkel and Grofman **2005).** Another question is whether RCV ~~decreases turnout or~~ deters voter participation **because of the need to rank order the multiple candidates on the** ~~through the complexity of the~~ ballot **(McDaniel 2016)**. The answers to these questions may well depend on the specific political culture of a jurisdiction, including the degree of partisanship, level of citizen engagement, and diversity. In the long term, the increasing implementation of RCV will determine whether third-party candidates can eventually increase in strength, or whether issue stands can moderate over multiple elections, even in the face of continued national polarization.

**REFORM 2: RESTORE FEEDBACK THAT LIMIT THE CONSEQUENCES OF REDISTRICTING.**

As was the case in the 2010 redistricting round and earlier, the best predictor of where we can expect extreme partisan gerrymandering is in those settings where one party has complete control of the redistricting process. Republicans controlled Congressional redistricting in eighteen states in 2010, compared to the six states the Democrats had control in. In 2020, Democrats have the ability to dominate districting in six states, while Republicans have control in seventeen states.

Some states have taken redistricting way from the legislature and put it into the hands of a commission during the past decade. State courts, finding the abdication by the U.S. Supreme Court of any responsibility for partisan gerrymandering, will motivate some state courts to step up to the plate (Grofman and Cervas 2018; Wang et al 2019) in this year’s redistricting. Pennsylvania Supreme Court did so by asserting that its own state’s constitutional provisions allowed it to protect against partisan gerrymandering in a way that a federal court said was beyond its legal authority to do under the U.S. Constitution. State courts, too, will often opt out of the supposed political thicket of partisan gerrymandering cases. This too may only be an option when the justices of the state court agree that the partisan gerrymandering occurring is a constitutional violation, not guaranteed considering in many states state court judges are themselves elected. This leaves an initiative (or possibly a referendum) as the only real route forward by taking line drawing out of the hands of the legislature. **These reforms are not available in all states.** In summary, courts, governors, and citizen initiative are ways to restore the negative feedback.

The principal consequence of independent redistricting is representational: it changes the number of elected officials from each party to a number that is commensurate with neutral districting. Thus, the key moderating effect of reform might be to reduce the number of elected **representatives** who are unrepresentative of the state as a whole. However, the polarization of individual winners is not reduced, especially in the short term. Examining a broad range of districts, the policy platform distance between Democratic and Republican candidates from the median voter is not closer in more competitive races (see **Figure M, adapted and extended from Hussey and Zaller, 2012**). Further study would be needed to determine how these effects are distributed in different types of districts, ~~i.e. naturally vs. gerrymandered uncompetitive districts~~ **e.g., in constituencies that have been deliberately gerrymandered versus those whose lines were drawn more with respect to good-government criteria**.

**[Figure M about here]**

Other problems arise from independent or other non-legislature-based commissions. Commissions may still draw bipartisan gerrymanders which protect incumbents of both parties. And, because there is natural gerrymandering caused by the concentration of Democratic voters in the cities, reforms should look beyond compactness and maintaining city/county boundaries (Rodden 2018; **Nagle 2019**; Cervas and Grofman 2019). It may be more promising to examine new criteria for fairness, such as maintaining communities of interest.

**EPILOGUE: LIMITS TO REFORM**

Representation, responsiveness, and deliberation are separate problems. The reforms we have described may address some but not all of these problems. And none are likely to have strong effects on a fundamental driver of modern politics, polarization of the electorate. In the long term, one of the best repairs to democracy will be to find ways to disrupt both the consequences of polarization – and perhaps even to defuse polarization itself. In the early 20th century, congressional voting patterns suggest that decreases in polarization took over 60 years to decline. In the 1950s-1970s, polarization increased slowly first for Democrats and then for Republicans, a trend that by now has lasted 50 years (see **Figures S and H**). Thus, polarization trends predate and will outlive the disruptive presidency of Donald Trump. A return to a more civilized universe may well take another fifty years for polarization to decrease on its own.

**[Figures S and H about here]**

An alternative might be to identify interventions that can reduce polarization. One approach would be to increase the dimensionality of political issue stands. Contests for the U.S. Congress have become increasingly nationalized, so that the destiny of a candidate for federal office is tied to national political forces (Abramowitz and Webster 2016; Carson et al 2019; Jacobson 2019). But much less well understood is that the tightness of the national party constraint on congressional candidates has varied over time in a way that can create a self-reinforcing pattern of increasing polarization (Merrill, Brunell, and Grofman 2014; Brunell, Grofman and Merrill, 2016). An example of “dimensionality increase” would be the introduction of an all-party top-four primary system in Alaska, which removes the pressure for major-party nominees to conform to the standard liberal-conservative axis. These four candidates then go on to a ranked-choice final election. Such a system, which requires an engaged electorate, may be well-suited to Alaska, which has a strong independent political culture and re-elected Senator Lisa Murkowski in 2016 in a write-in campaign.

Going forward, the broader problem is how to reach a stable outcome in which all citizen groups feel bought into a shared system of governance. A number of other reforms and changes have been suggested: changing voting rules, preventing racial and partisan gerrymanders, admitting new states to the Union, changing the rules of the Senate, and a form of national popular vote for the Presidency. These changes seem like they will help make the system more responsive (i.e. more little-r republican) and more representative (i.e. more little-d democratic) in decades to come.

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**Figures S & H**

**Figure S**



**Figure H**

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**Note: Median member, by party shown with solid black line. 95% confidence limit shown in gray.**

**Figure M - Presidential Vote Share and DW-NOMINATE Ideology Scores for U.S. House Members in**

**Different Time Periods with Regression Lines for Democrats and Republicans**

**Fitted Separately**



Note: District partisanship based on presidential vote, collected at the congressional district level. DW-Nominate are first dimension scores of the representative elected in the presidential year.

1. **A December 10, 2020 poll found that 77% of Republicans believe there was widespread fraud in the 2020 Presidential election, compared to just 3% of Democrats. (Source: Quinnipiac University Poll, December 10, 2020; https://poll.qu.edu/national/release-detail?ReleaseID=3685)** [↑](#footnote-ref-1)