# The emergence and perils of polarization

Delia Baldassarria,b,1,2 and Scott E. Page<sup>c,d,1,2</sup>

Edited by Simon Asher Levin, Princeton University, Princeton, NJ, and approved October 26, 2021 (received for review September 13, 2021)

We provide commentaries on the papers included in the Dynamics of Political Polarization Special Feature. Baldassarri reads the contribution of the papers in light of the theoretical distinction between ideological partisanship, which is generally rooted in sociodemographic and political cleavages, and affective partisanship, which is, instead, mostly fueled by emotional attachment and repulsion, rather than ideology and material interests. The latter, she argues, is likely to lead to a runaway process and threaten the pluralistic bases of contemporary democracy. Page sees the contribution of the many distinct models in the ensemble as potentially contributing more than the parts. Individual papers identify distinct causes of polarization as well as potential solutions. Viewed collectively, the papers suggest that the multiple causes of polarization may self-reinforce, which suggests that successful interventions would require a variety of efforts. Understanding how to construct such interventions may require larger models with greater realism.

political polarization | complex systems | affective polarization

## Baldassarri: The Perils of Affective Polarization: When Partisan Identity Trumps Social Cleavages

Inspired by democratic political theories, scholars have extensively studied public opinion polarization (in the United States and abroad), looking for signs of increased extremism on ideological and issue dimensions and alignment/consolidation of interests along multiple social cleavages (1, 2). By these measures of ideological polarization, US public opinion has not really become more divided. US citizens have instead heavily sorted into partisan camps: Among both Democrats and Republicans, we observe a greater correspondence between political views and party identification, even though the overall public has not become more extreme on most political issues (3, 4). According to some, however, this partisan sorting has had dire consequences for the political fabric (5). Both parties have become ideologically more homogeneous, and distinct from each other, and images of their supporters have become almost stereotypical.

Political labels–Democrat, Republican, Conservative, Liberal–nowadays elicit stronger emotional reactions, in terms of both in-group identification and, particularly, out-group hostility, compared to a few decades ago. Affective polarization informs the framing of political opinions, including new issues, like COVID-19, as well as stated preferences and actual behavior on disparate aspects of social life, such as the willingness to talk to, date, and live close to people who support a different party (6), and extends to domains of life that would generally be considered removed from politics, such as the health-related decisions to wear a mask or get vaccinated (7).

According to some, this new form of partisan identification is mostly fueled by emotional attachment/repulsion rather than political ideology and material interests (8, 9), although others have, instead, pointed out the policy-based nature of partisan animosity (10), or concluded that both partisan identity and policy disagreement may affect interpersonal affect (11). In this commentary, I first explain

Author contributions: D.B. and S.E.P. wrote the paper.

The authors declare no competing interest.

This article is a PNAS Direct Submission.

Published under the PNAS license.

Published December 6, 2021.

<sup>&</sup>lt;sup>a</sup>Sociology Department, New York University, New York, NY 10003; <sup>b</sup>Dondena Centre for Research on Social Dynamics, Bocconi University, 20100 Milan, Italy; <sup>c</sup>Department of Management and Organizations, Ross School of Business, University of Michigan, Ann Arbor, MI 48109; and <sup>d</sup>Santa Fe Institute, Santa Fe, NM 87501

 $<sup>^{1}</sup>$  D.B. and S.E.P. contributed equally to this work.

<sup>&</sup>lt;sup>2</sup>To whom correspondence may be addressed. Email: delia.b@nyu.edu or scottepage@gmail.com.

aded by guest on December 20, 2021

the difference between a form of partisan identification that is rooted in political cleavages and material interests and a partisan identity driven by group attachment dynamics, in which the political identity in itself takes primacy over sociodemographic background and related material and symbolic interests. Both in terms of ideological alignment and in terms of social networks dynamics, it makes a difference whether partisan identity is built on and constrained by socioeconomic characteristics and related social identities (e.g., class, race, gender, religion, sexuality) or whether it becomes a mobilizing identity in itself, capable of trumping other, contrasting identities and interests. I will then read the essays in this special issue in light of this analytical distinction, and use their insights to understand how affective polarization might become a self-sustaining, runaway process, as well as identify the aspects that might contain it.

Social Cleavages vs. Partisan Identity. Consider ideological polarization. US parties and candidates have become more divided on a large set of political issues, including economic, civil rights, and moral issues, thus making their issue positions more distinctive. According to some, this has made it easier for voters to identify with the political agenda of either party, and to sort between parties. However, party alignment along different issue dimensions has made it difficult for certain sociodemographic profiles to define their political allegiance: Will a wealthy, secular individual identify with the Republican Party's economic views, or with the Democratic Party's moral views?

In fact, research shows little evidence of opinion alignment (consolidation) across issue domains in the general public (12), although some increase is visible in recent years, especially among politically engaged citizens (13). If one considers heterogeneity in political belief systems, the findings are even more controversial: While a third of US citizens organize their political views in conformity with the ideological mainstream, another third is either economically liberal and morally conservative, or the other way around, thus displaying a combination of preferences that is alternative to the party offerings (14). This apparent inconsistency, however, is easily explained by their sociodemographics and social identities, supporting the widespread political theory assumption that voters' attitudes and policy preferences map into well-established socioeconomic cleavages. As long as the underlying social cleavages (e.g., race, class, religion, sexuality) are cross-cutting, increasing the number of dimensions of social division should contribute to integration. Indeed, it is the consolidation (aka alignment) of dimensions of potential conflict that is considered a threat to social and political cohesion (15, 16).

While ideological polarization appears to be constrained by the multiplicity of interests, identities, and social networks that individuals experience in complex societies, the nature of affective polarization and its relationship to other domains of social life is less obvious. More than past forms of partisanship in the United States, the current wave of partisan identification seems to be heavily characterized by group attachment dynamics, including ingroup solidarity, and marked out-group hostility. It is not clear yet the extent to which Republican and Democratic partisan identities acquired primacy over sociodemographic identities and related material and symbolic interests, but there is scattered evidence that partisan affiliation has started to drive the formation of political attitudes and inform political behavior, as well as behavior in other domains of social life, including where to live and whom to date. "As attention is increasingly paid to party, this will induce sorting of group identities along party lines" (17).

This is a crucial aspect in our understanding of polarization dynamics, and it directly informs any attempt at modeling not only ideational but also relational dynamics. For instance, most formal models of opinion change and polarization include a certain amount of partisan homophily: On average, Democrats tend to interact more often with other Democrats, and Republicans interact more often with other Republicans. It makes a huge difference, however, whether this pattern is the by-product of homophily along sociodemographic dimensions, like class, ethnicity, religiosity, age, gender, etc.—which are correlated with partisanship, but do not coincide with it—or, instead, patterns of relationships are largely driven by political partisanship. In the first case, sociodemographic homophily is not likely to bring about complete political isolation—most people would carry multiple, conflicting identities, such as, for instance, rich, nonreligious city dwellers, morally conservative ethnic minorities, or educated stayat-home mums, and thus experience some exposure to different political views. In contrast, if political partisanship becomes dominant in informing associational patterns, partisan homophily would be inevitable. Even the people that would rather choose their partners, friends, and acquaintances on the basis of a heterogeneous set of characteristics will have to conform to a world in which people wear their red or blue political shirts in various domains of life.

Taken together, these considerations have serious implications for the unfolding of polarization dynamics, including whether polarization is likely to become a self-sustaining, runaway process or, instead, is better understood as an ephemeral manifestation, an outburst, that might end as abruptly as it has emerged. Partisan identifications rooted in sociodemographic identities and political cleavages would generally limit political polarization, to the extent that enough voters have cross-cutting identities that do not make it too easy for them to align with either party. In contrast, affective partisan identities might trigger a runaway process in which individuals become increasingly polarized. The complexity of their sociodemographic profiles and interests becomes secondary to the overarching partisan identity, and the process of group identification and self-selection into politically homogeneous social networks could continue indefinitely. Questions remain, however, concerning the possibility of maintaining political identities and interparty animosity without a strong, coherent political narrative. The essays in this special issue greatly contribute to solidify and expand our understanding of these dynamics, including the factors that trigger as well as those that may contain polarization.

Stewart et al. (17) model the coevolution of group polarization and party sorting, assuming that economic interactions with the out-group are riskier, and that adverse economic conditions increase risk aversion. As expected, the alignment of group and party identity reduces the likelihood of out-group interaction, thus leading to greater polarization. Coupling polarization to growing economic inequality leads to a runaway process. In contrast, when group and party identity are not strongly aligned, the risk of polarization is reduced. Importantly, high levels of wealth redistribution, through the provision of public goods, can mitigate polarization.

Kawakatsu et al. (18) support Madison and Blau's intuition that increasing the number of issues, as well as decreasing the number of issues each individual cares about, both have the effect of reducing political polarization. At the same time, through a gametheoretical model, they highlight the inherent tension between within-group cooperation and social integration in the presence of strong partisan identities. Namely, party bias reduces issue dimensionality through party assortment, which leads to greater pairwise cooperation but also social polarization. Notably, the way

in which partisan bias is implemented in Kawakatsu et al.'s (18) work captures the mechanism of primacy of party identification at its core: When political bias is maximum, people imitate, exclusively, the issue preferences of those in their own party. Excluding the possibility of cross-partisan influence, within party alignment increases, de facto reducing the dimensionality of the issue space to a single, partisan dimension.

Similarly, Axelrod et al. (19) assume that affective polarization reduces tolerance for opponents, and show how low levels of tolerance inevitably lead to the erosion of the moderate majority and thus to polarization. While a few ideological extremists might have the effect of reinforcing the existence of a moderate majority, too many can push moderates to the extreme. Linking this finding to the current US context, while affective polarization has not yet produced increased ideological extremism, this might be what to expect next. Stemming from the assumption that interactions with people that are different might lead to negative outcomes, the authors demonstrate how assortment-the likelihood of interacting with different others-might lead to greater division. However, echoing findings from Baldassarri and Bearman (20) and Szymanski et al. (21), increasing the dimensionality of the political space might reduce polarization: If assortment occurs in one dimension, it prevents polarization on other dimensions. Finally, introducing considerations about self-interest (and assuming that this is normally distributed, with many people favoring moderate policy positions) has a valuable effect in containing polarization.

Taken together, these contributions broaden our understanding of the interaction between ideological polarization, issue dimensionality, and partisan animus. They also highlight the conditions under which anchoring political ideology to economic interest might prevent extreme polarization (17). Finally, they make clear how a complex systems approach is needed in order to capture the nonlinearity of these processes. For instance, both Szymanski et al. (21) and Leonard et al. (22) highlight the existence of tipping points and self-reinforcing dynamics which lead to phase changes and make polarization an irreversible process.

Other contributions complement this picture by considering a host of contextual factors, including the role of partisan media, the nature of fake news, geographic (mis)representation, spatial segregation, and sorting. First of all, consider the information environment. The ascent of online media and social networks has facilitated the personalization of both content and interpersonal contacts, the emergence of new influencers, and the spread of misinformation.

Santos et al. (23) consider the role of matching algorithms in affecting individual sorting in homogeneous online social networks. Matching algorithms, which generally tend to preferentially establish links with structurally similar nodes, are likely to enhance online sorting, and, given the role of online social networks in the diffusion of opinions and information, this is likely to exacerbate opinion polarization. Similarly, Tokita et al. (24) show how social networks are reshaped by polarized media ecosystems and information cascades: In an ideologically polarized information environment, people lose their cross-cutting connection and sort themselves into homogenous social networks.

Not only online media but also physical segregation and external shocks could enhance mass polarization by making certain political issues salient. For instance, Chu et al. (25) document how the wave of protests opposing the Ukrainian government decision to halt the process of European Union integration had the effect of increasing geographic polarization. In particular, the local context influences both opinion changes and the reshuffling of

social networks. Zooming in into relational dynamics, Vasconcelos et al. (26) show how network segregation contributes to hampering cooperation.

Overall, several contributions conclude that partisan divisions tend to inhibit the global provision of public goods. In fact, the polarization of national public opinions, and political stakeholders, makes it harder to pass reform policies as well as international treaties (27).

Finally, as Wang et al. (28) argue, a series of institutional and other factors are contributing to alter political representation: When the median voter is not the pivotal voter, within-party processes work to elect more extreme politicians. To remedy this distortion of US democracy, the authors argue for institutional fixes, such as ranked-choice voting and campaign finance and redistricting reforms.

Conclusions. Despite the fact that most of us live in political bubbles, chances are that, if asked to think of the few members of the opposite party that we actually know, we would likely provide a description that deviates from the stereotypical views of Democrats and Republicans: "My cousin is a Republican, but she is married to a minority, and volunteers for environmental causes," or "my friend is a Democrat, but he goes to church and is not keen on gays." Indeed, most people do not map into the stereotypical image of a Republican or a Democrat, because those are, indeed, stereotypical views, and do not reflect the complexity of the word we all inhabit. However, this nuance is lost when people relate to Democrats and Republicans in the abstract, for instance, in answering feeling thermometer questions, voting, or deciding where to live. As many of the papers in this special issue suggest, the interplay between social cleavages and partisan identities is a complex dynamic that can lead to very different equilibria. Certainly, when party identity acquires primacy over personal traits in determining political views and patterns of social interactions, political polarization will ensue.

In general, it is not a good sign for democracy when people start wearing politics on their sleeves. To work, political pluralism presumes that individuals and their patterns of relationships determine their political allegiances: Party politics is expected to remain in the background, organizing interests and identities, but it does not dictate everyday life and social relations. In contrast, when political identities and partisanship take over, and substantially affect the social networks people select into, the identities they adopt, and the preferences people voice in public, partisan polarization is likely to become a runaway process. It is too early to understand whether the current wave of affective polarization is going to permanently reshape the US political and social landscape, or whether, instead, it is an ephemeral manifestation, an infatuation, that might soon recede, possibly taken over by other, similarly short-lived, intense identifications. The essays in this special issue provide us with several insights about what to look out for.

# Page: A Complex Adaptive Systems Perspective on Many Models

Increasing polarization transformed American society from a mangle of overlapping communities of interest into two noninteracting tribes that stress our political institutions to an extent that consensus building appears all but impossible. Policy makers struggle to compromise, wreaking havoc domestically and making international agreements difficult to negotiate or maintain (27). At the interpersonal level, polarization has become so pronounced that interactions at schools, workplaces, volunteer organizations,

aded by guest on December 20, 2021

and social gatherings have become as likely to amplify discord as to build a shared sense of purpose and identity.

As shown in these articles, polarization can be measured along two axes: one ideological-beliefs about how the world works and over policies-and one affective-distrust, dislike, and lack of social connections between ideological groups. As is clear from these papers, these polarizations do not result from a collection of reversible additive effects gone wrong. Instead, each type of polarization strengthens the other through feedbacks (19, 21, 22). As a result, standard linear or diminishing returns intuitions do not apply; no sequence of small interventions will likely reverse our course.

Understanding the stickiness of polarization requires understanding feedbacks. Positive feedbacks mean that small effects can accumulate to make large changes (29). Negative feedbacks enable a system to absorb large shocks or interventions. Polarization, as these papers explain, arises through positive feedbacks: Divergence promotes divergence. It remains in place through negative feedbacks that stifle attempts to build bridges across groups.

That simple characterization offers a window into the logics underpinning this collection of papers. Each paper offers mechanisms that produce and support polarization through positive and negative feedbacks. Each paper also makes distinct policy recommendations for how to escape our situation. All suggest the path to a more tolerant society may be long and rocky; we may remain a house divided for some time (21).

Each paper in this impressive collection provides powerful insights and intuitions. Engaging the full set rewards the reader with a nuanced understanding of competing and complementary social forces at play. If I have one criticism, it is that the collection lacks a high-granularity model that includes multiple forces that takes aim at realism with the explicit goal of policy evaluations (30). That omission limits our ability to chart a comprehensive course of action.

All of the papers take, as a given, the rise in affective polarization, as found in the bimodal distribution of politicians' voting behavior and in the clustering of individuals in both the physical world and infosphere. As a rule, a bimodal distribution for anything, whether it be preferences over the tax rate or immigration policies, suggests that something strange is afoot. One way to produce a bimodal distribution is to assume two forces: one that brings people together and one that pushes them apart. Begin with a uniform or normal distribution of ideologies (ignore, for the moment, how we started there), and assume that people become more like those near to them and move away from those farther away (19). To no great surprise, these assumptions produce polarization. Less obviously, they produce two, and not three, peaks, the shift from one peak to two happens in an instant (a tipping point), and, once in a polarized state, well-intentioned attempts to improve interaction between groups may increase rather than decrease polarization, by encouraging the behaviors that pull people

A second type of model relies on networks to generate bimodality (21, 25). These models explain polarization as due, in part, to changes in technology that enable linkages with similar people and distancing from those with whom we disagree. The resulting networks consist of two clusters with only a small percentage of links between them. Counterintuitively, the desire to distance ourselves from those unlike us may be less of a force for polarization than the comforting pull of those like us—our self-assembled echo chambers (23).

Polarized networks limit our information and reduce trust in nonconfirming information. While polarized networks do not preclude convergence on the truth or a compromise, they can slow convergence beyond any practical time scale (31).

Both of these first two types of models rely on homophily–like bonds with like–to generate polarization. A third type of model explains polarization as a response to the increasing dimensionality of the modern world. In the past, policy debates played out on just a few dimensions: equity vs. efficiency or short term vs. long term. Current policies must take into account myriad effects. The United Nations promotes 17 Sustainable Development Goals. Each goal subdivides into approximately 10 targets, each with several empirical indicators. Citizens cannot possibly monitor all of these variables, nor can they (or do they) care about all of them.

James Madison believed that a multiplicity of issues would be beneficial in that it would prevent polarization by creating crosscutting cleavages: Each issue would produce distinct coalitions of supporters (18). When communities of interests differ across issues, we get the aforementioned mangle in which everyone both agrees with and disagrees with everyone else. We all agree to both agree and disagree. We may all get along, but we also do not split into two disconnected ideological tribes. Instead, each of us develops a level of trust and mutual respect with a wide swath of society.

Madison failed to anticipate how electoral and media incentives might take advantage of the overwhelming dimensionality of the modern world and funnel us into ideological clusters. The logic goes as follows: Incapable of deciding issue by issue, citizens look to elites and political leaders to simplify–to tell us how to think. Party leaders, ratings-driven media, and social influencers have incentives to build loyal, ideologically clustered networks of supporters. Rather than a diversity of overlapping factions, we get a pernicious dimensional reduction in which each person, politician, and proposal chooses all red or all blue (18).

As these papers make clear, it is the combination of ideological and affective polarization that proves so dangerous. Ideological polarization (which has not increased that much) by itself need not undermine our institutions. We might hold different ideas as to whether to rely on the public or private sector to reduce poverty, yet still get along and expect our institutions, formal and informal, to produce wise policy based on compromise. When paired with affective polarization, ideological polarization results in a world where we cannot agree on facts (or pretend not to), and we cross that bright line that separates marching on the National Mall from storming the Capitol Building.

In our affectively polarized society, we make decisions and take actions that strengthen the connections within our own clusters. Those clusters, for reasons mentioned, become increasingly ideologically homogeneous. As we cease to interact with the other group, we lose the economic and social benefits that would accrue in an integrated, diverse society (17). Conservatives do not buy birthday cakes from left-wing bakers. Liberals do not join pickleball leagues with right-wing bankers. As a result, we lack access to a diversity of knowledge that may improve our ability to make sound decisions in other aspects of our lives (24).

So what is to be done? How do we escape our current situation? First, we must be aware of why we cannot chip away at this problem. We must take substantial actions. For intuition as to why, consider a model with two aggregate variables: one representing the degree of ideological polarization and the other representing the degree of affective polarization, with feedbacks between the two that have the potential to both stabilize and polarize. Suppose that such a system produces two equilibria: one tolerant and one polarized.

aded by guest on December 20, 2021

In the tolerant equilibrium, we trust, listen, and get along. We reach consensus on issues. Further, our low ideological polarization builds trust.

In the affective and ideologically polarized equilibrium, we limit the functionality of our political and social institutions (22). The less we agree with the other group, the less we interact, and the less we interact, the less we trust and the less we believe what they say. Our echo chambers remain entrenched.

Each of these equilibria have basins of attraction: Push the system to any point within an equilibrium's basin of attraction, and the system will go right back to the equilibrium. Consider a model with a single variable, a tolerance level. A society in the polarized equilibrium can only escape and move to the tolerant equilibrium if a series of shocks increase tolerance above a threshold, a tipping point. An increase in tolerance that does not exceed the threshold will result in the reemergence of the polarized equilibrium. In other words, well-intentioned efforts to reduce ideological and affective polarization that remain in the basin of attraction of the polarized equilibrium will have no long-term effect.

As shown in several of the papers in this collection, the size of a basin for the polarized equilibrium depends on the number and strength of self-reinforcing processes. In the best-case scenario, the threshold to produce tolerance is the same as the threshold required to exit it. However, if there exist multiple forces in play, to exit the high polarization state, tolerance may have to exceed the threshold that society fell below that led to polarization. In other words, the system might have a thick boundary: Getting out of the polarized state may take more effort than it took to get into it. This is true for reasons similar to why losing 10 pounds proves harder than gaining them: Our body resists losing the weight through self-reinforcing feedbacks. Once we gain weight, we add cells that demand food.

In the political realm, boundaries can become so thick as to make an equilibrium all but impossible to exit, at least according to one paper (21). Under some conditions, a system can exhibit irreversibility. Even if we could turn tolerance up to 11, so to speak, the polarized equilibrium cannot be escaped.

Ideally, our political system would not be polarized but rest in a tolerant equilibrium with a large basin of attraction such that, under the normal buffeting of the political system, shocks that increase polarization would be absorbed, and tolerance would be reestablished. Unfortunately, that is not the case.

Getting out of our polarized state requires an understanding of how we got there. And, as already described, these papers offer different causes of polarization. Rather than frame the distinct insights these papers offer as in competition with one another, better that we see each as shining a light on particular dimensions of a complex process (32). Surely, all of the forces these papers cover are in play to some extent, and they likely mutually reinforce. As we pull apart, we form networks with like-minded people, who are more likely to accept convenient, unchallenged, simple frames.

The interdependence of these various effects suggests the potential value of a more granular model that includes more types of individuals, along with meso-level structures like community organizations. For the most part, the relatively stark models in this collection characterize polarization as a stable equilibrium. In doing so, they ignore the complexity of political, economic, and social systems. In contrast, more-granular agent-based models, in which individuals adapt in response to information and events, conceptualize our polarized society as alive, as constantly responding to and absorbing new actors and ideas. These adaptations imply a

sequence of ever-changing connections, beliefs, behaviors, and norms and not, necessarily, equilibrium.

In complex system models, the concept of a stable equilibrium is replaced with the notion of a robust configuration: a collection of features or attributes that adapt in order to maintain core functionalities. A policy change produces responses from the system. Individuals adapt their ideologies, change their networks, and possibly even switch loyalties. Within a federal system, state level politicians may experiment with policies with an eye to maintaining their support. The configuration perpetually changes. If the system is robust, it retains key features and components (33).

To see the difference between the equilibrium and complexity viewpoints, consider the effects of the storming of the Capitol. Although a major event, it did not shock us out of our polarized state. Nor did it have no effects. We now find ourselves in a very different situation. Group memberships have changed. Some people left the Republican Party. Others became more attached. Thus, our polarization should not be seen as fixed but as in constant flux.

I do not mean to downplay the insights derived from equilibrium models. Quite the opposite: These models generate substantial food for thought and provide the building blocks upon which one could construct more-granular, complex systems models.

To identify a path out of our current polarized configuration, a collection of more-granular models—models that categorize people by race, place, income, and ideology—may be necessary, for, as the papers in this collection show, our polarization has multiple causes. It, therefore, stands to reason that effective policies to improve tolerance will require multipronged interventions. Some of these are top down: reduce gerrymandering, rid ourselves of single-member districts with ranked-choice voting (34), and remove people and bots who spread disinformation from social media. Others, such as building meaningful, sustained interactions across groups, are bottom-up.

Higher-fidelity models—those that include multiple causes and multiple communities—offer the potential to explore how policies interact. Which are complements and which are substitutes? In other words, when does one plus one equal three, and when does it equal one? Building that shining city on the hill in which our variety of interests, political beliefs, economic frameworks, and cultural identities cross-cut and overlap to produce a vibrant, innovative, sustainable, and tolerant society will require a nuanced knowledge of how to construct interventions that self-reinforce.

In sum, these papers succeed in identifying the many causes of polarization, revealing the complexities of its reversal, and characterizing a collection of potential tools. A collection of larger models, which combines them, could help us to determine which set of policies work best together, and the order and scale in which to apply them.

#### **Baldassarri: On the Limits of Models**

With his characteristic analytical acumen, Page goes to the essence of the various models of political polarization proposed in this special issue, and identifies the various building blocks upon which they are based. The next step, in a complex adaptive system perspective, is a comprehensive approach, namely a "high-granularity model... that takes aim at realism" and helps us understand how different factors work together. The first challenge, in my view, consists in making reasonable assumptions concerning the functioning of every single dynamic, as well as the interaction between them, and empirically calibrating the model.

This is made difficult by the fact that extant empirical research has not provided enough reliable information on core aspects, including 1) the conditions under which contact with people that hold different political views and/or belong to the opposite party will increase or decrease social division; 2) the extent to which there is a feedback between elite, opinion leaders and mass polarization, and what are the drivers of each; 3) the dimensionality of the political space (models show it matters, but it is not clear whether we should model dimensions in terms of political issues, or social cleavages, or sociodemographic fractures); and 4) the extent to which sorting into social networks and information environments is driven by partisan identities or, instead, stems from everyday life experiences that are not necessarily political in nature.

A second challenge consists in striking the right balance between being comprehensive and parsimonious. For instance, in his review, Page identifies three ways in which bimodality could be produced (attraction–repulsion, social networks, and multiplicity of issues). Which one should our model be based on? Or should all of them go into the model? Answering these questions requires embracing a specific theory of what the causes of mass polarization are, as well as determining, a priori, which feedback loops are relevant, and which could be ignored. Similarly, should we account for ideological change across generations? The self-identified Republicans (or Democrats) of 30 y ago are quite different from those of today, in terms of their political views and some sociodemographics. Does this matter for a multilevel model that aims at realism?

These are only a few of the many things that come to mind when we contemplate what should be included in a granular model of political polarization. Paradoxically, if we knew all these things with absolute certainty, we might not need the model. Our best course of action then becomes moving forward on multiple grounds, with formal models and empirical research feeding off each other.

## **Page: Beyond Politics**

Baldassarri highlights the dire ramifications of a world in which our political ideologies play the predominant role in how we build social connections. If, rather than be responsive to the interests and concerns generated by pluralistic society, parties determine the policy agenda and force us to choose between two extreme solutions to most policies, America becomes a less desirable place to live. Our social interactions will, as often as not, be contentious. Our understandings of the world will be slanted by ideologies. And our ability to meet the challenges of reducing inequality, producing sustainable growth, and managing the response to the pandemic will be limited.

Her perspective can be broadened to consider how other societal changes might indirectly amplify the influence of political ideologies. Consider, first, masking and vaccination choices during the current pandemic. These strongly, although not perfectly, correlate with political ideology, with Republicans less likely to promote either.

Unlike, say, positions on income subsidies for families with children, positions on masking cannot be avoided with a family, organization, or social network. We can choose not to talk about Afghanistan or even whether we support abortion. We cannot avoid decisions on masks and vaccines; one person's failure to wear a mask or get vaccinated imposes costs on others.

Within, say, a family or organization, we face the age-old choice between exit or voice. If we are part of a family of antimaskers, we can choose to exit. Or we can exercise our voice. How much we do so depends on our loyalty to the relevant group (35). As our affiliations to either a red or blue ideological group become more salient, does this reduce our loyalty to other groups? If so, the implications may be even more dire.

Consider, also, the growing segregation in our places of work. The academy increasingly skews to the left, especially so in liberal arts departments and among staff. Cattle ranchers, loggers, dentists, and surgeons skew right. And, based on these papers, we have every reason to think that segregation by job classification will only increase. Left-wing citrus growers and right-wing local booksellers may become the stuff of public radio profiles and Internet clickbait sites.

All joking aside, the fact that the Marines have become solidly right wing and our psychiatrists almost exclusively left wing should provoke concern. Not only may we not want to call in the Marines to prevent a right-wing cabal, we also might not want psychiatrists deciding on whether markets should be used to allocate some medications. Ideological diversity is necessary for good decisions not just in the political realm but in nearly all realms.

Complicating matters further, in places of work that remain mixed by party identification—banking, insurance, wholesaling, sales, personal services, medical support staff, business operations, and (yes) economics—the ability to work at home means that people in those spheres may not need to work across differences to the extent they had to in the past.

Polarization may even be exerting force on matters of the heart. In 2014, whether a potential partner shared your belief in market solutions to pollution through cap-and-trade policies may not have been a deal breaker, but whether he wears a mask and believes in the 2020 presidential election results likely would be now. To the extent that political identity enters into our choices of life partners, undoing polarization becomes even more challenging.

To end on a more positive note, polarization may, in the end, prove its own undoing. As Baldassarri notes early in her article, ideological polarization has not increased that much. If enough of us desire a more tolerant society, we can act. We can build bridges across groups and reduce polarization. Interacting with the other cluster, difficult as it may seem, becomes easier if we proceed with humility: if we recognize that none of us has all the answers to the complex challenges and opportunities before us and that we all benefit by taking the time and putting forth the effort to listen to the ideas of others.

Data Availability. There are no data underlying this work.

<sup>1</sup> P. DiMaggio, J. Evans, B. Bryson, Have American's social attitudes become more polarized? Am. J. Social. 102, 690-755 (1996).

<sup>2</sup> M. P. Fiorina, S. J. Abrams, Political polarization in the American public. Annu. Rev. Polit. Sci. 11, 563–588 (2008).

<sup>3</sup> M. Levendusky, The Partisan Sort: How Liberals Became Democrats and Conservatives Became Republicans (University of Chicago Press, 2009).

<sup>4</sup> D. Baldassarri, A. Gelman, Partisans without constraint: Political polarization and trends in American public opinion. AJS 114, 408–446 (2008).

<sup>5</sup> S. W. Webster, A. I. Abramowitz, The ideological foundations of affective polarization in the U.S. electorate. Am. Polit. Res. 45, 621–647 (2017).

<sup>6</sup> S. Iyengar, Y. Lelkes, M. Levendusky, N. Malhotra, S. J. Westwood, The origins and consequences of affective polarization in the United States. *Annu. Rev. Polit. Sci.* 22, 129–146 (2019).

- 7 J. N. Druckman, S. Klar, Y. Krupnikov, M. Levendusky, J. B. Ryan, Affective polarization, local contexts and public opinion in America. Nat. Hum. Behav. 5, 28–38 (2021).
- 8 S. Iyengar, G. Sood, Y. Lelkes, Affect, not ideology: A social identity perspective on polarization. Public Opin. Q. 76, 405-431 (2012).
- 9 L. Mason, Uncivil Agreement. How Politics Became Our Identity (University of Chicago Press, 2018).
- 10 L. V. Orr, G. A. Huber, The policy basis of measured partisan animosity in the United States. Am. J. Pol. Sci. 64, 569-586 (2020).
- 11 N. Dias, Y. Lelkes, The nature of affective polarization: Disentangling policy disagreement from partisan identity. Am. J. Pol. Sci., 10.1111/ajps.12628 (2021).
- 12 B. Park, How are we apart? Continuity and change in the structure of ideological disagreement in the American public, 1980–2012. Soc. Forces 96, 1757–1784 (2017).
- 13 A. C. Kozlowski, J. P. Murphy, Issue alignment and partisanship in the American public: Revisiting the 'partisans without constraint' thesis. Soc. Sci. Res. 94, 102498 (2021).
- 14 D. Baldassarri, A. Goldberg, Neither ideologues nor agnostics: Alternative voters' belief system in an age of partisan politics. AJS 120, 45–95 (2014).
- 15 P. Blau, Parameters of social structure. Am. Sociol. Rev. 39, 615-635 (1974).
- 16 D. Baldassarri, M. Abascal, Diversity and prosocial behavior. Science 369, 1183–1187 (2020).
- 17 A. J. Stewart, J. B. Plotkin, N. McCarty, Inequality, identity, and partisanship: How redistribution can stem the tide of mass polarization. *Proc. Natl. Acad. Sci. U.S.A.* 118, e2102140118 (2021).
- 18 M. Kawakatsu, Y. Lelkes, S. A. Levin, C. E. Tarnita, Interindividual cooperation mediated by partisanship complicates Madison's cure for "mischiefs of faction." Proc. Natl. Acad. Sci. U.S.A. 118, e2102148118 (2021).
- 19 R. Axelrod, J. J. Daymude, S. Forrest, Preventing extreme polarization of political attitudes. Proc. Natl. Acad. Sci. U.S.A. 118, e2102139118 (2021).
- 20 D. Baldassarri, P. Bearman, Dynamics of political polarization. Am. Soc. Rev., 72, 784-811 (2007).
- 21 M. W. Macy, M. Ma, D. R. Tabin, J. Gao, B. K. Szymanski, Polarization and tipping points. Proc. Natl. Acad. Sci. U.S.A. 118, e2102144118 (2021).
- 22 N. E. Leonard, K. Lipsitz, A. Bizyaeva, A. Franci, Y. Lelkes, The nonlinear feedback dynamics of asymmetric political polarization. *Proc. Natl. Acad. Sci. U.S.A.* 118, e2102149118 (2021).
- 23 F. P. Santos, Y. Lelkes, S. A. Levin, Link recommendation algorithms and dynamics of polarization in online social networks. *Proc. Natl. Acad. Sci. U.S.A.* 118, e2102141118 (2021).
- 24 C. K. Tokita, A. M. Guess, C. E. Tarnita, Polarized information ecosystems can reorganize social networks via information cascades. *Proc. Natl. Acad. Sci. U.S.A.* 118, e2102147118 (2021).
- 25 O. J. Chu, J. F. Donges, G. B. Robertson, G. Pop-Eleches, The microdynamics of spatial polarization: A model and an application to survey data from Ukraine. *Proc. Natl. Acad. Sci. U.S.A.* 118, e2104194118 (2021).
- 26 V. V. Vasconcelos et al., Segregation and clustering of preferences erode socially beneficial coordination. Proc. Natl. Acad. Sci. U.S.A. 118, e2102153118 (2021).
- 27 C. Perrings, M. Hechter, R. Mamada, National polarization and international agreements. Proc. Natl. Acad. Sci. U.S.A. 118, e2102145118 (2021).
- 28 S. S.-H. Wang, J. Cervas, B. Grofman, K. Lipsitz, A systems framework for remedying dysfunction in US democracy. *Proc. Natl. Acad. Sci. U.S.A.* 118, e2102154118 (2021).
- 29 S. E. Page, P. J. Lamberson, Tipping points. Quart. J. Polit. Sci. 7, 175–208 (2012).
- 30 J. Geanakoplos et al., Getting at systemic risk via an agent-based model of the housing market. Am. Econ. Rev. 102, 53-58 (2012).
- 31 B. Golub, M. O. Jackson, How homophily affects the speed of learning and best-response dynamics. Q. J. Econ. 127, 1287–1338 (2012).
- 32 S. E. Page, The Model Thinker (Basic, 2018).
- 33 E. Jen, Robust Design: A Repertoire of Biological, Ecological, and Engineering Case Studies (Santa Fe Institute Studies on the Sciences of Complexity, Oxford University Press, 2005).
- 34 K. Gehl, M. Porter, The Politics Industry: How Political Innovation Can Break Partisan Gridlock and Save Our Democracy (Harvard Business Review Press, 2020).
- 35 A. Hirschman, Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States (Harvard University Press, 1970).