

BY:

PAUL KRAMER
RACHEL WARNER
JACKSON REHM
ZACH BUCHANAN
LUCAS REHM

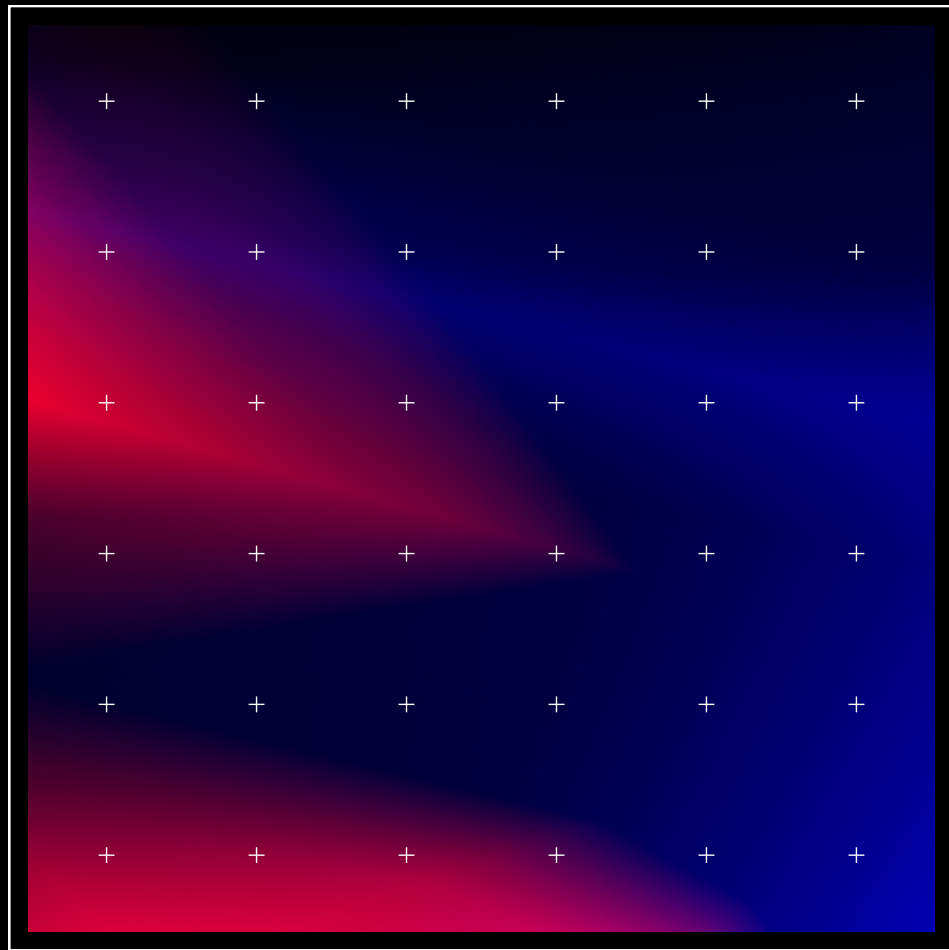
SUBMITTED TO:
**THE
WOND'RY**

VANDERBILT'S
INNOVATION
CENTER

IN PARTNERSHIP WITH:

**VANDERBILT
UNIVERSITY**

**INSTITUTE FOR
YOUTH IN POLICY**



POLITICAL POLARIZATION



MAP THE SYSTEM

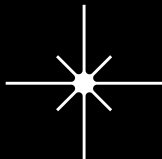
VANDERBILT UNIVERSITY

Institute for Youth in Policy

theWOND'RY

map THE SYSTEM

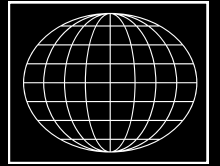
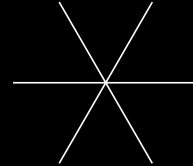
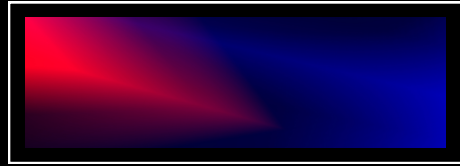
Saïd Business School UNIVERSITY OF OXFORD



MORE INFORMATION: WWW.YIPINSTITUTE.ORG/POLARIZATION

TABLE CONTENTS

- OF -



03

MOTIVATIONS & INTRODUCTION

04

ACKNOWLEDGEMENTS

05

CHALLENGE LANDSCAPE

08

SOLUTIONS LANDSCAPE

10

GAPS & LEVERS OF CHANGE

14

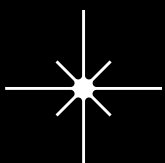
KEY INSIGHTS & LESSONS LEARNED

15

APPENDIX

16

REFERENCES



MOTIVATIONS - AND - INTRODUCTION



Executive Summary

The United States is currently navigating a landscape deeply scarred by political polarization, a phenomenon that has quintupled since 1930 (Cinolesi et al., 2022). This escalating division is not merely a divergence of political ideologies but has evolved into affective polarization - characterized by increasing animosity and distrust between major political parties, Democrats and Republicans. A crucial aspect of this divide is the demographic shift, with the Democratic Party becoming more diverse while the Republican Party maintains a predominantly white and conservative base. Political elites play a significant role in amplifying group identities, thereby activating stereotypes and reinforcing partisan understanding. This trend fuels the increasing affective polarization among the public (Wilke et al., 2022).

The goal of our research is to explore and begin mapping the complex web of political polarization in the United States. Collectively, this information will help us create a series of concept maps and ultimately, identify levers for change.

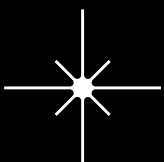
"WHEN EXTREME PARTISANSHIP IS PROMOTED BY [...] LEADERSHIP, WE DEVIATE FROM THE PRINCIPLES OF FREE INQUIRY WHICH MAKE OUR INSTITUTIONS GREAT."

- DR. CONDOLEEZZA RICE, FRMR. SECRETARY OF STATE



Research Method

In our research on political polarization, we employed a design-thinking methodology, drawing insights from scholarly journals, relevant books, and reputable news outlets. We also conducted a series of interviews with 15 relevant stakeholders and experts working to understand their perspectives and ideas.



ACKNOWLEDGEMENTS



Dr. Daniel Diermeier
Chancellor of Vanderbilt University



Dr. Condoleezza Rice
Director, Hoover Institution
Fmr. Secretary of State



Jack Johnson
TN State Senate Majority Leader



Dr. Alan Wiseman
Vanderbilt Chair of Political Science



Sam Oakley
EVP, Pinnacle Asset Management



Dr. Dana Nelson
Nancy Perot Chair of English and
Professor of American Studies

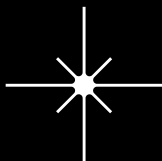


Chase Mandell
Vanderbilt Democrats Club President
Student



Doug Gross
CEO of Gross Farms
Leader of Idaho Potato Commission

*For a full list of interview participants, see appendix.



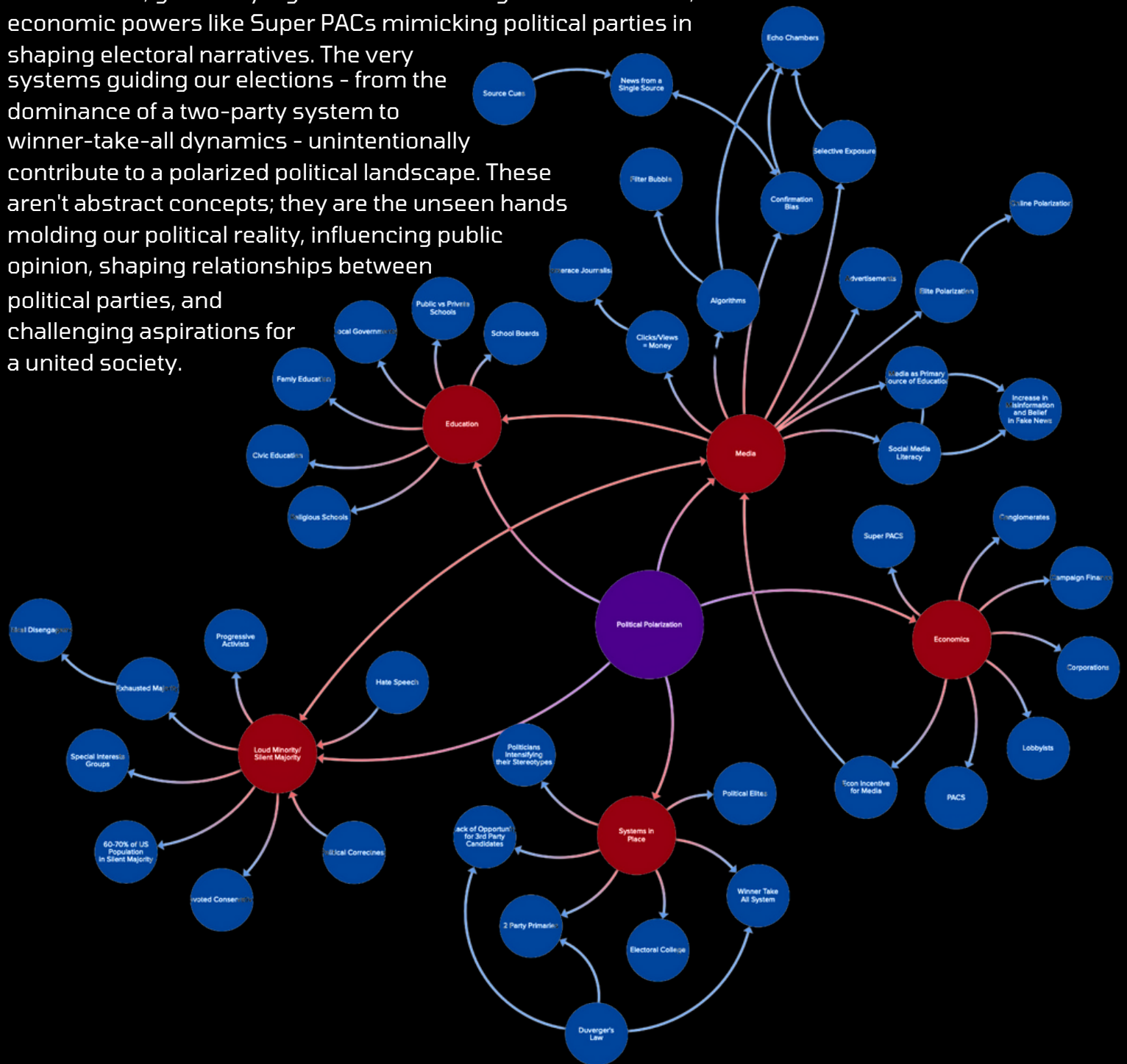
Acknowledgements

We extend our sincerest gratitude to all the stakeholders and experts who took the time to talk with us. Their insights and perspective were invaluable to our research.

CHALLENGE LANDSCAPE

Systems Map

It's not just about policies and parties; it's the daily structures shaping our thoughts and convictions. Think of scrolling through social media, guided by algorithms reinforcing echo-chambers, or economic powers like Super PACs mimicking political parties in shaping electoral narratives. The very systems guiding our elections - from the dominance of a two-party system to winner-take-all dynamics - unintentionally contribute to a polarized political landscape. These aren't abstract concepts; they are the unseen hands molding our political reality, influencing public opinion, shaping relationships between political parties, and challenging aspirations for a united society.



Systems Map Explained

MEDIA

The impact of polarized media views is significantly influenced by filter bubbles, where algorithms on platforms like Facebook not only shape ads but also recommend and prioritize content on users' feeds (Lazer et al., 2015). These algorithms, fostering echo chambers and described as "homophily in the interaction networks" and "bias in information diffusion toward like-minded peers" (Cinelli et al., 2021), contribute to the rapid dissemination of polarized content, deepening the divide in public opinion.

ECONOMIC MOTIVATIONS

Economic factors, including the influence of Super PACs, corporations, lobbyists, and investors, play a crucial role in political polarization. Super PACs, resembling political parties, use tools like mailers and democratic endorsements to wield significant influence in elections, as seen in impactful 2017 endorsements and prior successes (Benjamin, 2022). Lobbying faces ethical challenges, navigating a conflict between prioritizing public welfare and businesses pursuing self-interests, reflecting a modern disagreement on the role of businesses in maintaining trust in democratic systems (Ron & Singer, 2022).

INSTITUTIONAL SYSTEMS

Institutional systems in the United States, such as the two-party system, contribute to a lack of sincere voting equilibrium, following Duverger's Law, where majority voters back the stronger candidate and third-party candidates receive minimal support (Bouton et al., 2017). Winner-take-all elections and the electoral college inadvertently limit diverse political representation, deepening political polarization.

LOUD VS. SILENT MAJORITY

The Exhausted Majority seeks compromise amid polarization, challenging the notion of a 50:50 split. Core beliefs, rather than demographics, shape views, recognizing issues like hate speech. Divergent views on immigration, race, and gender coexist, yet there's a shared concern about American politics. Understanding diverse groups is crucial to addressing polarization, emphasizing interventions based on core beliefs and fostering national unity (Hawkins et al, 2018). Critiques highlight the detrimental impact of extreme political wings, urging moderation, understanding differing views, and resisting extremism for the sake of liberal democracy (Epstein, 2022).

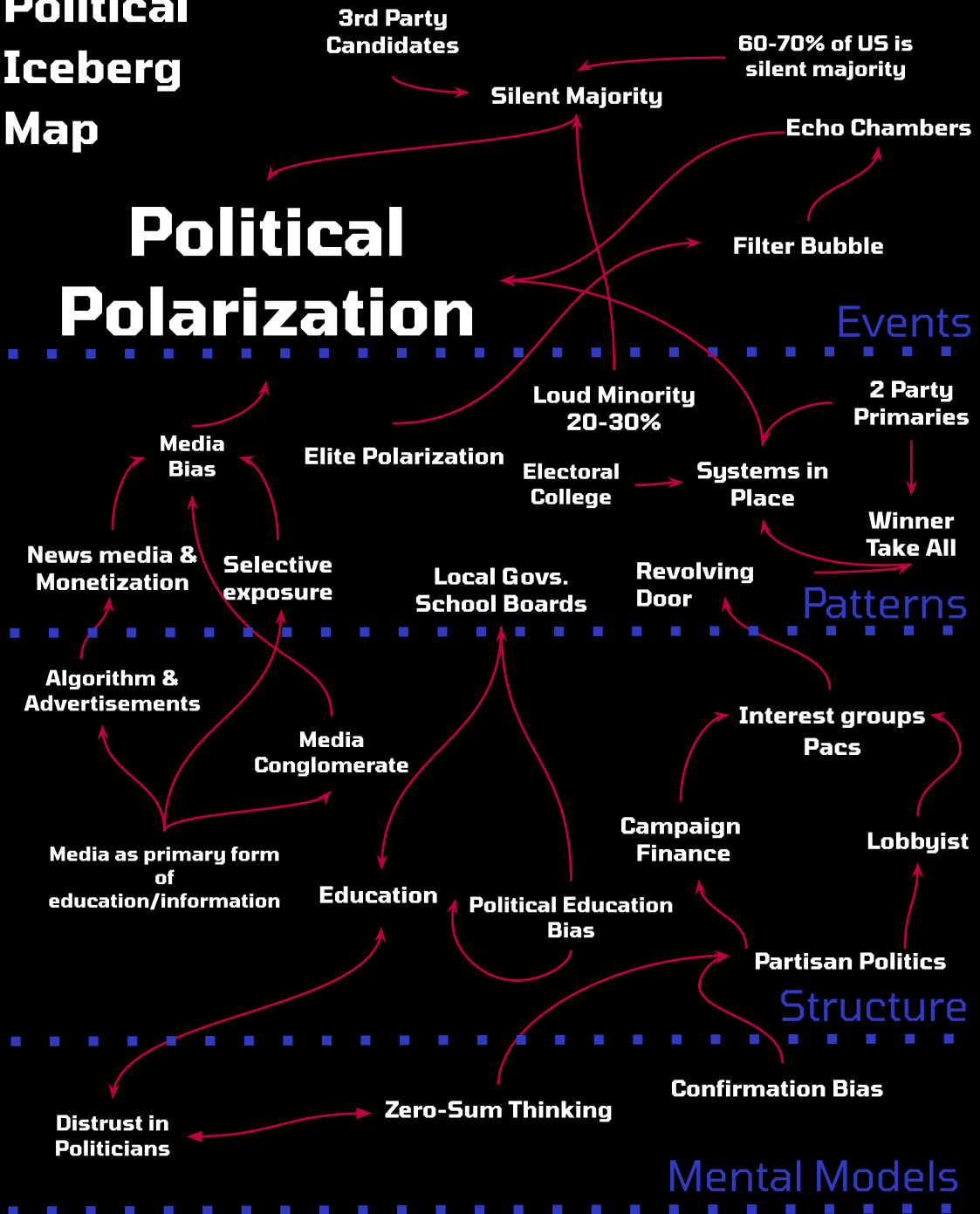
EDUCATION

In education, family influence at an early age plays a vital role in shaping party preferences. Parental agreement politically is identified as highly effective in promoting political continuity between generations (Iyengar et al., 2018). The lack of comprehensive civic education since the 1930s contributes to a divided citizenry. Research indicates that citizens with higher information levels are more accepting of democratic norms and exhibit greater political efficacy (Carpini, 2000). The disparities in educational systems can further contribute to varying levels of political awareness and understanding.

INTERDEPENDENCIES

Political Iceberg Map

Political Polarization



The Political Iceberg map - by revealing interdependencies among critical factors - aids in comprehensively identifying our solutions landscape, along with the specific gaps and levers for change needed to address polarization effectively.

SOLUTIONS LANDSCAPE



01. SOCIAL MEDIA

Attempting to solve the problem of political polarization is as complex as the problem itself, and attempted solutions can be categorized similarly to the causes. For instance, addressing polarization on social media involves considering various platforms and their differences. If Facebook is more polarized and Gab is less so, learning from Gab and applying those lessons to Facebook/Twitter could be a potential solution. However, the challenges in social media and news polarization highlight the problem's complexity. One significant concern is confirmation bias, which the public often perceives as an issue with news and social media. While people can now discern biased sources, modern algorithms detect preferences and recommend content that reinforces existing beliefs, hindering a comprehensive understanding of issues. Senator Jack Johnson, from the Tennessee State Senate, discussed social media issues, attributing them to uninformed individuals spreading misinformation. Despite receiving angry messages from misled constituents, once he clarified the content of the bills, the people who were just angry at him often changed their minds. In this approach, Johnson demonstrates a local level, in which his addressing misinformation over social media creates a new sense of understanding of the issues. On a global level, proponents of increased moderation of social media websites have attempted to address the spread of misinformation through community notes, in which readers add context to misleading posts.



Dr. Dana Nelson

Nancy Perot Chair of English and
Professor of American Studies

"Algorithms [drive polarization through] what Tristan Harris describes as the race to the bottom of our brain stem... that what gets our attention and clickbait is the stuff that makes us angry, the stuff that makes us hateful, the stuff that makes us feel self-righteous."

"All of those institutions are succumbing to algorithms... algorithms that are ultimately extractive and we don't think about that. We think about them in terms of our social media feed, but they Hoover our most intimate data to the benefit of the companies that are in control of them."

02. LOUD MINORITY, SILENT MAJORITY

In the social aspect of political polarization or the loud minority silent majority, several solutions have appeared in recent years. Due to the contentious nature of American politics, the level of polarization in the U.S. may have already reached its peak as people begin to shy away from the extremes due to fatigue (Heltzel, 2020). On a state and local level, more moderate individuals who have felt marginalized by the more extreme individuals in politics have started to focus on their state's primaries, as they offer opportunities to make one's opinions heard. In voting in these elections, the moderates have attempted to place more moderate candidates up for election, preventing extreme candidates from ever gaining major traction.

SOLUTIONS LANDSCAPE PT. 2

03. EDUCATION

Educational reform in the U.S. has been a focus, particularly in civics education, where only 36 states require it. Efforts to improve this aspect are part of broader educational enhancements. However, the COVID-19 pandemic significantly impacted these initiatives, with a notable decline in grades 4-8 reading scores, reaching levels not seen since 1992, as reported by the National Assessment of Educational Progress (NAEP, 2022). This underscores the challenges in educational advancement during global crises. Institutions like Vanderbilt University, under Chancellor Daniel Diermeier, are notable for adopting a principled neutrality approach in these complex scenarios.



Dr. Daniel Diermeier
Chancellor of Vanderbilt University

"[The problem with] Universities that do not explicitly have a commitment to institutional neutrality [... is that it is much easier for them to] undermine the students' freedom to explore ideas."

04. SYSTEMS IN PLACE

The United States has several systems in place that encourage political polarization. For example, the Electoral College creates an environment in which strong political parties have an extreme advantage and, therefore, win one hundred percent of the effective votes from a state with only a simple majority of votes. In an effort to curb political polarization, more progressive thinkers have proposed abolishing the Electoral College entirely, making the presidential election a popular vote. However, this proposal has gained limited support, partly due to concerns from smaller states. They worry that eliminating the Electoral College could render rural states - with their smaller populations - politically insignificant.

05. ECONOMICS

Two main economic strategies to address political polarization include curbing the incentivization of social media companies and reducing the influence of political donations in campaigns. The first strategy involves challenging the profit-driven, sensationalist media coverage that tends to prioritize controversy over substantive issues. However, this shift is challenging due to the higher public interest in personalized, sensationalist coverage. The second strategy focuses on efforts to reverse the Citizens United vs. FEC decision to diminish the impact of political donations. Despite attempts by some progressive politicians, such as Jeanne Shaheen in 2023, these efforts have largely been unsuccessful primarily because many politicians benefit from the current system.

GAPS & LEVERS OF CHANGE



Through rigorous research, insightful interviews, and strategic mapping, our analysis of political polarization unveiled crucial gaps and levers for change. Each lever is accompanied by a proposed intervention.

GAP → LEVER → INTERVENTION

Electoral Systems Favoring Extremes

Electoral Reform for More Representative Systems

Advocacy and policy changes for electoral systems like ranked-choice voting or proportional representation to encourage more moderate and representative political outcomes (Tausanovitych, 2023).

Media Polarization and Echo Chambers

Promoting Media Literacy and Diverse Media Consumption

Educational programs in schools and communities focusing on media literacy, encouraging critical thinking and consumption of a wide range of media sources; research has shown that continued exposure to counter-attitudinal content led to depolarization over time (Beam et al., 2018).

Lack of Constructive Dialogue Across Political Divides

Encouraging Bipartisan Initiatives and Dialogue in Educational Institutions

Creation of bipartisan committees and forums at various levels of government and within communities to facilitate constructive discussions on contentious issues. These conversations have been shown to decrease affective polarization, if only in the short term and topic specific (Santoro & Broockman, 2022).

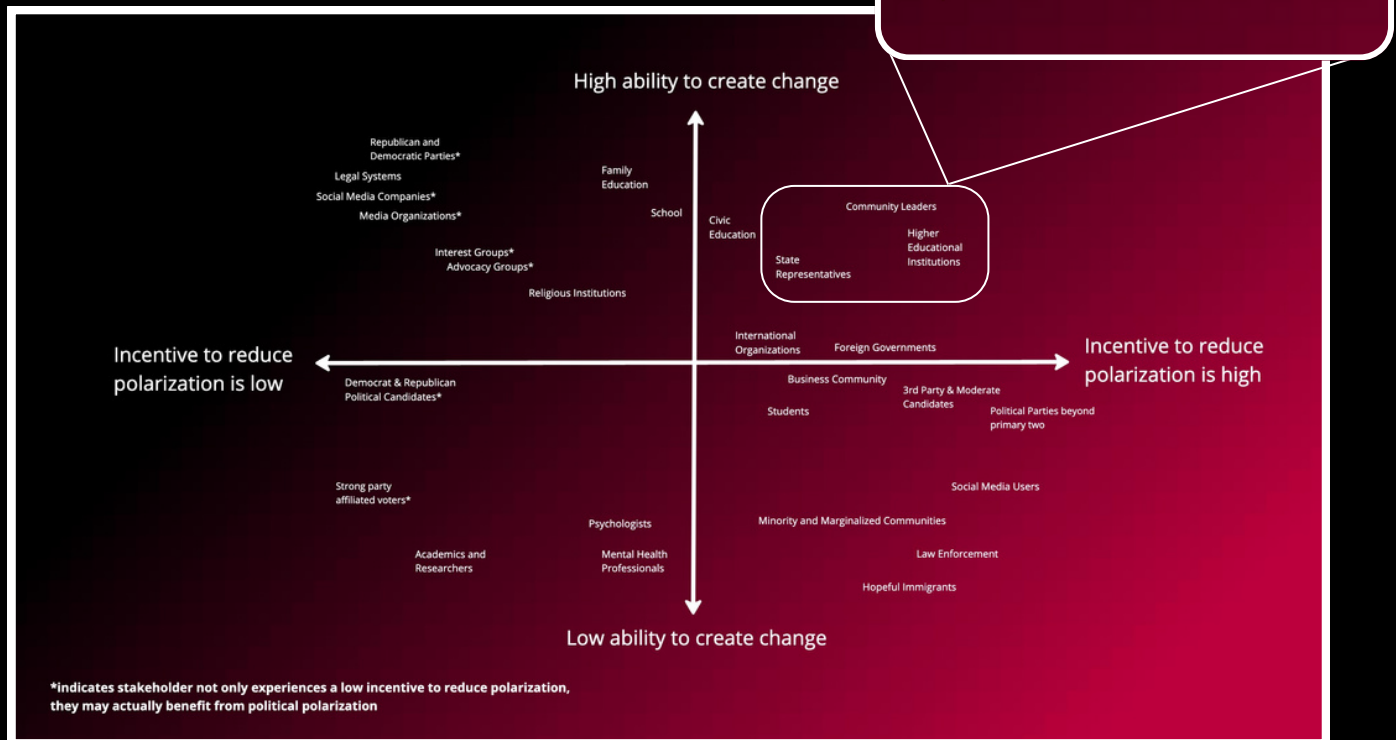
American Public Lacks Understanding of the Government

Enhanced Civic Education

Implementing robust civic education programs to educate the public about the government's structure, functions, and civic responsibilities; "Research indicates that citizens with higher levels of information tend to be more accepting of democratic norms, such as political tolerance" (Delli Caprini, 2000).

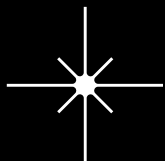
Power Map

Below is a power map ranking stakeholders based on their capacity and motivation to mitigate political polarization. The quadrant highlighting those with both high motivation and high capability identifies a set of stakeholders distinctly equipped to execute our recommended measures.



Synthesizing the Power Map and Gaps & Levers

In the above framework, community leaders, higher education institutions, and state representatives emerge as the key stakeholders with the highest mix of incentive and ability to tackle political polarization. These groups are uniquely positioned to make real strides in reducing polarization. Our research outlines specific interventions for each group, providing a practical starting point for change.



Gap: American Public Lacks Understanding of the Government

Lever: Community Leaders Advocating for Local Civic Education

In line with Tip O’Neill’s famous quote, “All politics is local,” community leaders can emphasize the significance of engaging with local government and policies. By advocating for local civic education, they can help bridge the gap in public understanding of government operations, thus fostering a more informed and involved citizenry at the grassroots level.

Gap: Lack of Constructive Dialogue Across Political Divides

Lever: Higher Educational Institutions Implementing Principled Neutrality

Secretary Rice’s insight on the risk of institutions aligning with singular policies and Vanderbilt Chancellor Diermeier’s emphasis on universities abstaining from policy positions highlight the necessity for higher educational institutions to adopt principled neutrality. This approach can create a fertile ground for constructive dialogue across political divides, ensuring academic freedom and the exploration of diverse viewpoints without institutional bias.

Gap: Media Polarization and Echo Chambers

Lever: State Representatives Promoting Media Literacy and Critical Thinking

Senator Johnson’s observation about the credibility issues stemming from social media and Dr. Nelson’s critique of legacy media succumbing to divisive algorithms underline the need for interventions in media literacy. State representatives can play a crucial role in addressing media polarization and echo chambers by promoting policies that foster media literacy and critical thinking, thereby enabling the public to critically evaluate and navigate the vast array of information available in today’s media landscape.



Dr. Condoleezza Rice

Director, Hoover Institution
Fmr. Secretary of State

“Institutional alignment with a singular policy or perspective risks hobbling rigorous debate on campus and alienating dissenting community members. When extreme partisanship is promoted by academic leadership, we deviate from the principles of free inquiry which make our academic institutions great.”



Dr. Daniel Diermeier

Chancellor of Vanderbilt University

“Principled neutrality is about [the] university abstaining from commenting or taking positions on policy, unless [it] directly affects the working of the university [...]” “We want to be sure that [faculty or students] don’t feel that there’s a party line that [they] have to fall in line within in order to be members of the community that they have. It’s about freedom to explore things.”



Dr. Dana Nelson

Nancy Perot Chair of English and
Professor of American Studies

“Even legacy media is subsiding to the algorithms... They test headlines up until they find the most divisive one.”



Jack Johnson

TN State Senate Majority Leader

“Social media has created platforms for people who otherwise would have zero credibility.”

Power Map Extended Analysis

In the power map, stakeholders such as social media platforms and major news outlets are identified as beneficiaries of political polarization (marked with an asterisk on the map). Although they possess significant capacity for effecting change, their derived benefits from polarization reduce their incentive to do so, complicating the implementation of change. To address this, two main strategies are proposed:

01. Increase their incentive to reduce polarization

02. Legislate ★

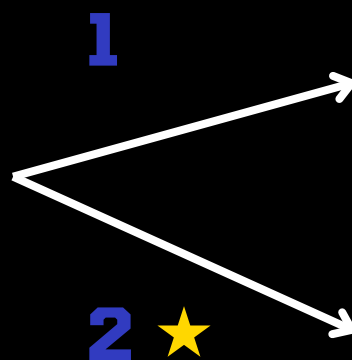
The first approach entails a substantial cultural shift, such as a growing public preference for unbiased information over partisan viewpoints, which could motivate these outlets to alter their practices. However, affecting such a cultural transformation directly is challenging.

Legislation, on the other hand, offers a more feasible solution to alter the current situation. For instance, laws could mandate that social media companies adjust their algorithms or disclose data about echo chambers, thereby influencing the information dissemination landscape.

Organizations Potentially Benefiting from Polarization

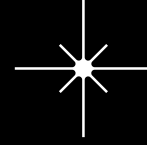


Potential Solutions





KEY INSIGHTS & LESSONS LEARNED



Political polarization has become a widespread phenomenon affecting nearly every person living in America. Although solutions exist to mitigate the problems associated with political polarization, these solutions are rather limited when applied. Furthermore, the implications of political polarization are far reaching. From increasing distrust and hatred among constituents and politicians alike, to lack of policy being passed, the future of the United States is at a critical phase in its continuing development. Voters are deeply set in their respective beliefs, politicians crave the media's attention, and the majority of voters are left powerless to enact the change they wish to see in the world around them.

However, disagreement and discourse are fundamental to the fiber of the United States. Political parties provide the vessel for meaningful, and powerful, debate to transpire, enabling the United States to become the world superpower it is today. The government was designed to be cumbersome when decisions need to be made, that way no one person could seize power and become a dictator; gridlock is the greatest asset of the government. Change wasn't meant to be easy, change was meant to be done with intent. The structure of the United State's government induces the benefits and drawbacks experienced by all under their power.

Throughout this semester, our exploration into political polarization has revealed its deep and widespread influence in everyday life. Our research and stakeholder interviews have shown us the intricate layers of this issue. We've gained significant insights into its effects, but with each new finding, the complexity of the challenge becomes more apparent. Though we've pinpointed possible avenues for change, we're aware that the path forward is long and the issue lacks a simple solution. Our determination to tackle this nuanced problem, however, remains undeterred and focused.



Jack Johnson

TN State Senate Majority Leader

"People need to become critical thinkers rather than resorting to hate."

APPENDIX



Dr. Daniel Diermeier
Chancellor of Vanderbilt University



Dr. Condoleezza Rice
Director, Hoover Institution
Fmr. Secretary of State



Jack Johnson
TN State Senate Majority Leader



Dr. Alan Wiseman
Vanderbilt Dept. Chair, Political Science



Sam Oakley
EVP, Pinnacle Asset Management



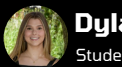
Dr. Dana Nelson
Nancy Perot Chair of English and
Professor of American Studies



Chase Mandell
Vanderbilt Democrats Club President
Student



Doug Gross
CEO of Gross Farms
Leader of Idaho Potato Commission



Dylan Mentzer
Student, NY



Chloe Altman
Student, CA



Ryan Rose
Student, FL



Avery Jansen
Student, TN



Megan Woodworth
Student, ID



Aidan Moon
Student, TN



Ari Shamberg
Student, IL

This research on polarization has greatly benefited from the contributions of a **wide array of experts, stakeholders, and practitioners**. Their diverse perspectives, deep knowledge, and real-world experiences have been indispensable in shaping the understanding of this complex issue. The willingness of these contributors to share insights and engage in **meaningful discussions** has significantly enhanced the depth and breadth of the analysis, enabling a more nuanced and comprehensive exploration of the factors driving polarization in society.

The research team is **deeply appreciative** of the time and effort dedicated by these individuals in assisting with this important project. It is hoped that the findings presented herein do justice to the knowledge and experiences shared by these generous contributors.



References

- Beam, M. A., Hutchens, M. J., & Hmielowski, J. D. (2018). Facebook news and (de)polarization: Reinforcing spirals in the 2016 US election. *Information, Communication & Society*, 21(7), 940–958. [https://doi.org/10.1080/1369118X.2018.1444783]
- Benjamin, A. (2022). PACs rule everything around me: How political action committees shape elections and policy in the local context. *Interest Groups & Advocacy*, 11(2), 278–302. [https://doi.org/10.1057/s41309-022-00163-2]
- Bouton, L., Castanheira, M., & Llorente-Saguer, A. (2017). Multicandidate elections: Aggregate uncertainty in the laboratory. *Games and Economic Behavior*, 101, 132–150. [https://doi.org/10.1016/j.geb.2015.10.003]
- Campbell, D. (2007, May 14). The 21 studies that generated the findings in “Civics Exam: Schools of Choice Boost Civic Values.” *Education Next*. [https://www.educationnext.org/the-21-studies-that-generated-the-findings-in-civics-exam-schools-of-choice-boost-civic-values/]
- Cinelli, M., De Francisci Morales, G., Galeazzi, A., Quattrociocchi, W., & Starnini, M. (2021a). The echo chamber effect on social media. *Proceedings of the National Academy of Sciences*, 118(9), e2023301118 [https://doi.org/10.1073/pnas.2023301118]
- Cintolesi, A. (2022). Political polarization and primary elections. *Journal of Economic Behavior & Organization*, 200, 596–617. [https://doi.org/10.1016/j.jebo.2022.06.018]
- Delli Carpini, M. X. (2000). In search of the informed citizen: What Americans know about politics and why it matters. *The Communication Review*, 4(1), 129–164. [https://doi.org/10.1080/10714420009359466]
- Epstein, K. (2022, November 7). A Dispatch from the Exhausted Majority. [https://www.americanpurpose.com/articles/a-dispatch-from-the-exhausted-majority/]
- Ertan, G., Çarkoğlu, A., & Erdem Aytaç, S. (2022). Cognitive political networks: A structural approach to measure political polarization in multiparty systems. *Social Networks*, 68, 118–126. [https://doi.org/10.1016/j.socnet.2021.05.004]
- Fazio, L. K., Rand, D. G., & Pennycook, G. (2019). Repetition increases perceived truth equally for plausible and implausible statements. *Psychonomic Bulletin & Review*, 26(5), 1705–1710. [https://doi.org/10.3758/s13423-019-01651-4]
- Guess, A. M., Lerner, M., Lyons, B., Montgomery, J. M., Nyhan, B., Reifler, J., & Sircar, N. (2020). A digital media literacy intervention increases discernment between mainstream and false news in the United States and India. *Proceedings of the National Academy of Sciences*, 117(27), 15536–15545. [https://doi.org/10.1073/pnas.1920498117]
- Haim, M., Arendt, F., & Scherr, S. (2017). Abyss or Shelter? On the Relevance of Web Search Engines’ Search Results When People Google for Suicide. *Health Communication*, 32(2), 253–258. [https://doi.org/10.1080/10410236.2015.1113484]
- Hawkins, S., Yudkin, D., Míriam, J.-T., & Dixon, T. (2018). *Hidden Tribes: A Study of America’s Polarized Landscape*. More in Common. [https://hiddentribes.us/media/qfpekz4g/hidden_tribes_report.pdf]
- Heltzel, G., & Laurin, K. (2020a). Polarization in America: Two possible futures. *Current Opinion in Behavioral Sciences*, 34, 179–184. [https://doi.org/10.1016/j.cobeha.2020.03.008]
- Heltzel, G., & Laurin, K. (2020b, August). Polarization in America: Two possible futures. *Science Direct*. [https://www.sciencedirect.com/science/article/pii/S2352154620300450?ref=pdf_download&fr=RR-2&rr=8462cad109aa61f2]
- Iyengar, S., Konitzer, T., & Tedin, K. (2018). The Home as a Political Fortress: Family Agreement in an Era of Polarization. *The Journal of Politics*, 80(4), 1326–1338. [https://doi.org/10.1086/698929]
- Iyengar, S., & Westwood, S. J. (2015). Fear and Loathing across Party Lines: New Evidence on Group Polarization. *American Journal of Political Science*, 59(3), 690–707. [https://doi.org/10.1111/ajps.12152]
- Lazer, D. (2015). The rise of the social algorithm. *Science*, 348(6239), 1090–1091. [https://doi.org/10.1126/science.aab1422]
- Ron, A., & Singer, A. A. (2020). Democracy, corruption, and the ethics of business lobbying. *Interest Groups & Advocacy*, 9(1), 38–56. [https://doi.org/10.1057/s41309-019-00073-w]
- Santoro, E., & Broockman, D. E. (2022). The promise and pitfalls of cross-partisan conversations for reducing affective polarization: Evidence from randomized experiments. *Science Advances*, 8(25), eabn5515. [https://doi.org/10.1126/sciadv.abn5515]
- Scores decline in NAEP reading at grades 4 and 8 compared to 2019. (n.d.). Retrieved January 16, 2024, from [https://www.nationsreportcard.gov/highlights/reading/2022/]
- Tausanovitch, A. (2023, January 31). It’s Time To Talk About Electoral Reform. *Cap 20*. [https://www.americanprogress.org/article/its-time-to-talk-about-electoral-reform/]
- Westerwick, A., Johnson, B. K., & Knobloch-Westerwick, S. (2017a). Confirmation biases in selective exposure to political online information: Source bias vs. content bias. *Communication Monographs*, 84(3), 343–364. [https://doi.org/10.1080/03637751.2016.1272761]
- Westerwick, A., Johnson, B. K., & Knobloch-Westerwick, S. (2017b). Confirmation biases in selective exposure to political online information: Source
- Wilke, C. J. (2022). A double-edged sword? How appeals to group identity may shape affective polarization & political mobilization. *ProQuest Information & Learning (US)*, 83(4-B). [http://gateway.proquest.com/openurl?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&res_dat=xri:pqm&rft_dat=xri:pqdiss:28768307]