

Voter Turnout as a Silver Lining to Political Polarization

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1 Abstract

Political polarization is rising in the United States and other OCED nations [1]. Most politically engaged citizens have some grasp on the negative implications of such political shifts: damaging rhetoric, undemocratic sentiment, public distrust, and others. However, we seek to find a potential silver lining: an increase in polarization could mean an increase in political engagement and, thereby, voter turnout. We construct an approximate simulation of the US electorate, modeling changes in mood over time. Every four years, we tabulate an election and count the results. The results are grim: while partisans are much more likely to turn out to the polls, their fervor does not translate to a larger population-level turnout.

2 Introduction

Democracy, as a political system, is the cornerstone of the United States of America. It has encouraged citizen engagement by giving the people a voice in shaping the nation's policies and directions. The most prominent example of citizens' power is their collective ability to elect the President of the United States. However, several citizens refrain from using the power that democracy grants them by not voting in presidential elections. Voter turnout is a fundamental pillar of any thriving democracy, serving as a vital gauge of civic engagement and an instrument through which citizens assert their collective will. When a significant portion of the eligible population participates in elections, the results are legitimized, reducing the risk of a minority political party gaining disproportionate power.

Encouraging higher voter turnout fosters a culture of civic engagement and political participation, which may result in a more politically active electorate. Effective democracy demands robust civic engagement, a significant aspect of which is aggregate voter turnout. Nevertheless, despite the importance of voting to sustain a democratic system, many fail to turn out. The 2020 presidential election had the highest voter turnout since 1960, with 66%

of eligible voters turning out [11]. That is, in its best year, approximately a third of the population of the United States failed to turn out. This apparent political indifference drove us to research potential causal factors in voter turnout, specifically the influence of observed increases in political polarization [1].

The United States has continued to observe increasing political polarization [1]. This extreme polarization has several adverse effects, often leading to extreme rhetoric and partisanship and fostering an environment of hostility and demonization of the opposition. However, despite political polarization’s predominantly negative implications, we posit a potential silver lining in an increase in voter turnout. Current research on the potential positive effect on voter turnout by political polarization in the last decade is limited. However, researchers have observed increased turnout after polarization in Germany, Spain, and the Netherlands [6]. Although turnout was higher in 2020 than at any time since 1960 (Figure 1) [13], it may not have been extreme enough to account for the disproportionate increase in political polarization when compared to other OCED nations [1].

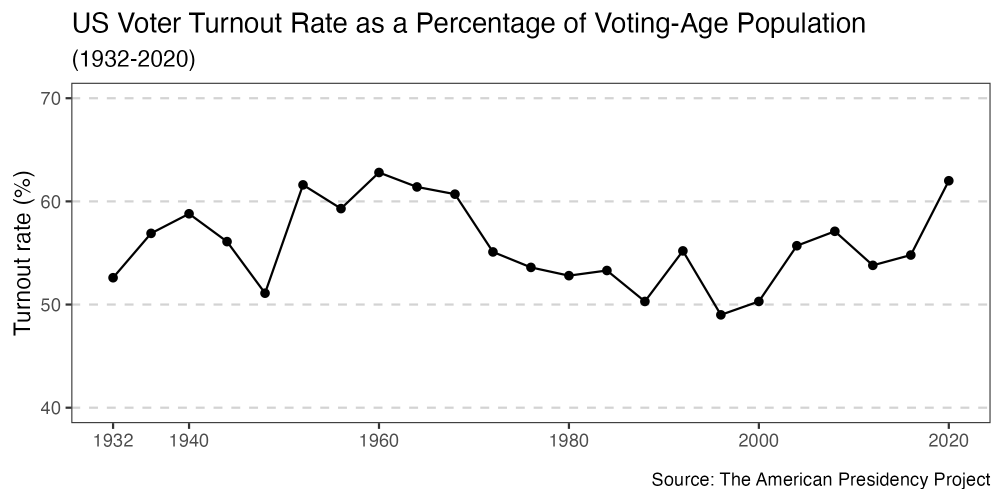


Figure 1: Total US voter turnout

3 Literature Review

This study aims to explore the correlations and relationships between voter turnout and various independent variables. Using demographic data alongside information from past elections, we quantify the importance of one’s vote, age, political polarization, partisanship, and gender to their turnout likelihood. These data are crucial to assembling our model and understanding how each variable changes voter turnout. To accomplish this, we relied on external sources, including data from the Pew Research Center, to facilitate our investigation of these relationships.

In the initial phase of our research, we sought to better understand voter turnout in past elections by utilizing the resources offered by the Pew Research Center. Notably, the 2018, 2020, and 2022 elections recorded the highest voter turnouts in recent United States history [10]. Historical evidence shows that past elections can help understand why people turn out to vote. We observed that voter participation is more likely when political outcomes are uncertain due to closely divided politics, as individuals believe their votes can impact the results. The data provided by the Pew Research Center demonstrated that the proportion of major American political parties is relatively even. That is, a comparatively small number of votes can swing an election to either party [8]. Conversely, lower voter participation occurred when people perceived their preferred political choice had minimal chance of winning. Individuals who believed their votes could effect change were more likely to turn out to vote. Those who thought their vote held little significance were less likely to participate. Hence, it is essential to recognize that higher voter turnout is associated with competitive political landscapes and the belief that votes can make a difference. Additionally, other factors, such as age, played a role in determining voter turnout.

The Pew Research Center’s data enabled us to explore how age influences political affiliations and typologies. Our study benefited from this information, which revealed that younger

demographics tend to lean more liberal while older demographics lean more conservative [2]. This data, derived from a survey of over 10,000 Americans, identified four age groups (18-29, 30-49, 50-64, and 65+) and assessed the strength of individuals' political preferences. It was evident that the younger demographic (18-29) was inclined to be strongly liberal, with approximately 70% expressing this preference, while the 65+ age group had 41% identifying as conservative [2]. This analysis showed a substantial shift towards conservatism as age increased. However, it is essential to note that while there were some strong liberals or conservatives, a significant portion remained less firmly affiliated with any political party.

The literature also shows that political views often form at a young age, influenced by family generations. An individual's birth era can significantly impact political preferences [9]. Consequently, political choices change once individuals can make independent decisions without the influence of their family. As individuals reach the age categories of 30-49 and 50-64, they tend to make more informed decisions based on their life experiences, leading to significant shifts in voting patterns [2]. Once these changes occur, individuals often maintain consistent voting preferences. Although this does not explain all aspects of voting behavior, it provides valuable insights into why certain age groups exhibit higher turnout rates.

Politics and voter turnout are highly affected by an individual's race and ethnicity [9]. Race and ethnicity are frequently central to an individual's political affiliation [9]. The Pew Research Center provided statistics that white Americans are the most likely to turn out. However, racial minorities are not monolithic, with support for Democrats and Republicans varying widely among different racial minority groups. Our model uses these varying beliefs to adjust starting political scores for agents of each racial group.

Older adults experience less physical mobility, meaning they are less likely to move frequently and thus do not need to re-register to vote. Moreover, they have more free time after retirement, providing a strong incentive to vote, particularly regarding issues related

to social security and income. In contrast, younger voters are often actively employed or enrolled in school, which may hinder their ability to participate in elections. These phenomena combine to result in much higher turnout among older adults (as shown by Our World in Data [4]) than younger ones, which we quantify as agent parameters in our model, updating turnout likelihood as a voter ages.

Political polarization is crucial to understanding why individuals hold strong political beliefs and vote accordingly. Pew finds that voters on the far end of both sides of the political spectrum are more likely to show up on election day [8]. We adjust agent turnout likelihoods similarly, increasing turnout rate when an agent holds strong partisan beliefs. Those with mixed or less passionate affiliations are less likely to participate [8]. This polarization, combined with age-related factors, contributes to the complex landscape of political preferences, resulting in a sizable portion of voters with mixed or changing political ideologies. Those who felt that they were not represented well by either party and were in the "mixed" category (i.e., those who do not have a strong association with any party) had lower turnout rates. This engagement disparity can be attributed to various factors, including education, age, and especially the strength of partisan leanings.

Education can also affect who turns out. Education levels significantly influence voter turnout, as higher-educated individuals tend to lean more liberal and more likely to show up on polling day [7]. At each iteration, our model adjusts for these partisan and engagement changes based on the education status of an individual agent.

The Center For American Women and Politics provided critical data related to gender and voter turnout [5]. Contrary to our initial assumptions, women have consistently turned out to vote more than men since the 1980 presidential election [5]. This trend is influenced by the political preferences of women, who tend to lean more liberal than men [9]. Consequently, our simulation slightly shifts female agents to the political left while increasing their turnout

at each iteration.

3.1 Limitations of existing research

Despite the insights gained from our research, some crucial limitations are worth noting before exploring our model outcomes. First, we had to make generalizations regarding the impact of various parameters on individuals, such as education. Educational backgrounds vary widely, and not all degrees or levels of education are equal. While we would have loved a linear regression model to help select the numeric strength on partisan lean/turnout likelihood while other parameters are held constant, no such model is publically available at the time of writing this piece. Additionally, each education system and institution differs, making generalizations necessary for our analysis that have much higher variance in the real-world citizenry. We also faced challenges in understanding the strength of political ideology in individuals, as each person may have a different level of attachment to their beliefs. While efforts have been made to quantify political lean numerically, an agreed-upon standard has yet to form.

Moreover, our study did not consider the family history of our agents, which can shift partisan leanings, especially among younger voters who are still culturally tied to their parents. Our model, therefore, considers each agent independently of all others.

Finally, survey-based research inherently relies on voluntary participation, which may introduce bias, and therefore, the data cannot fully represent the entire US population of registered voters. While demographers and statisticians work hard to account for these biases, we must acknowledge that variance is added each time survey results are used to quantify model shifts numerically.

4 Methodology

To investigate the effect of political polarization on voter turnout, we built a highly simplified model of the United States. We drew age, race, and education levels from probability distributions observed by demographers [1, 7, 8, 9]. We evolved this population over time, replacing citizens from a draw of the same joint demographic distribution as elders died with a probability observed by the NIH [3]. At each iteration, our agents’ politics shifted according to approximate expectations observed in recent elections [7]. Every four iterations (i.e., every four years), an election is held and results are tabulated.

We quantify agents’ politics on a continuous scale in which increasing negative values are increasingly liberal, and positive values are increasingly conservative. Agent political ”scores” are shifted based on the strength of correlations between parameters and US voter politics. For example, because black Americans are highly likely to lean Democrat [10], race pushes agent politics score more negative than for other races.

After agent traits are shifted at each iteration, each affects voter turnout probability. Specifically, we model agent turnout likelihood as a Gaussian distribution with a variable mean. An agent votes when the value drawn from that Gaussian distribution exceeds 0.5. The mean of this Gaussian distribution varies as a function of each agent parameter after shifting them.

Elections are held every four years (i.e., every four model iterations). Ties are broken arbitrarily with a probability of 0.5 for each party. Centrists are identified as agents using the following formula,

$$A_c = \begin{cases} 1 & |A_p| < 0.1 \\ 0 & \text{otherwise} \end{cases}$$

where $A_c \in \{0, 1\}$ is the agent’s centrism status and A_p is that agent’s political score.

Centrists have some specific qualities: as a party is in power longer, their political scores drift in the opposite direction of the sitting leader (representing the general trend of declining presidential approval rating with time [12]), and centrists drift further conservative with age than non-centrists do, which helps correct with an observed general shift away from centrism with age [7].

Similarly to centrists, we quantify a separate agent status for "extremism." An agent is classified as "extreme" using the following,

$$A_e = \begin{cases} 1 & |A_p| > 0.3 \\ 0 & \text{otherwise} \end{cases}$$

where $A_e \in \{0, 1\}$ is the agent's extremism status and A_p is that agent's political score. For both centrism and extremism, a value of 1 indicates an affirmative status for those conditions.

Like centrists, extremists have some unique behavior. Specifically, extreme agents have a slight bump to the expected value of their turnout distribution draw in the form of a shift in the mean of the Gaussian distribution from which turnout is drawn. This effect is similar to the impact on turnout likelihood that being between the ages of 50 and 65 has. That is, the effect is by no means a guarantee that turnout will occur. Additionally, extremists' political scores move further away from the party in power if that party is not their own and not at all if they are of the same party as the sitting leader.

What results from this model is a highly simplified approximation of the American electorate with quantifiable polarization. This model allows us to investigate whether or not political polarization can overcome the natural drifts in American public opinion.

5 Data Presentation

We aim to find two outcomes of our model: first, an increase in political polarization over time, and second, the effect of that polarization on total voter turnout over time. First, we have to quantify our population’s polarization. Figure 2 shows that when compared to the starting distribution of political scores initialized in our model, the mass of the political distribution shifted from being centered near 0 (i.e., politically centrist) towards the wings of the distribution. This increase in variance demonstrates increased political polarization over time, even as generations die and new agents are introduced to the model. While left-leaning voters show more mass at their end of the distribution, this is likely a product of a slightly left -leaning starting distribution, the parameters of which we discuss in the Methodology.

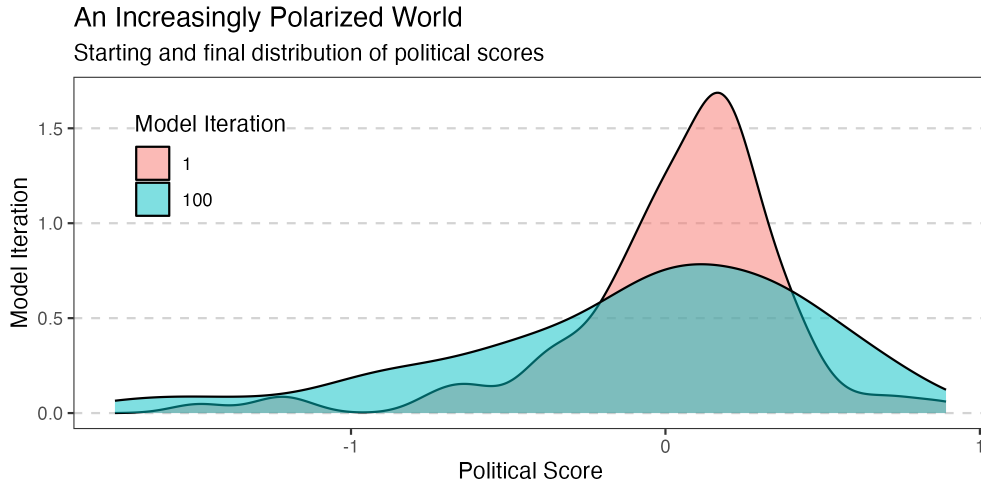


Figure 2: Starting and final political score distribution

However, the story of our agents’ polarization is more complex. While the starting and ending distributions show a stark difference in politics, Figure 3 shows that comparative levels of polarization held once the initial polarization process took hold around iteration 40. This trend indicates that in our model, while politics are a polarizing force, there is a threshold beyond which a population, on average, is unwilling to cross en masse.

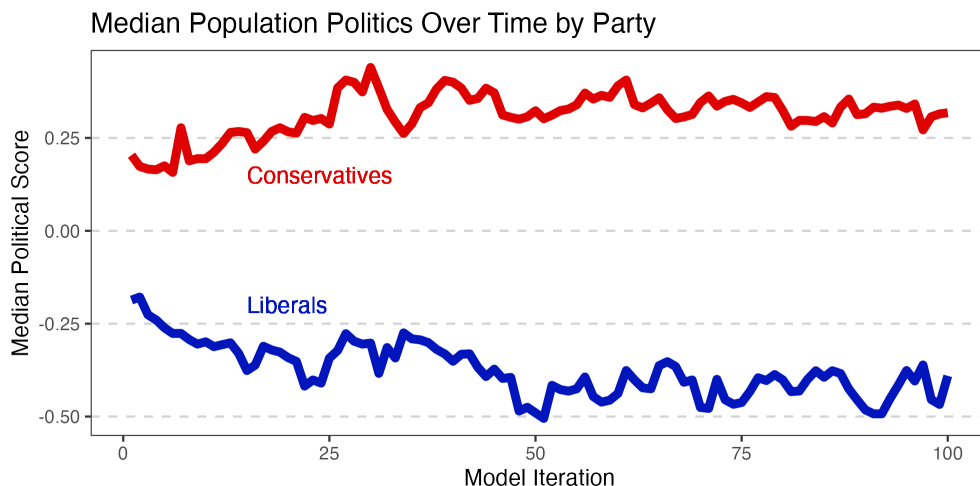


Figure 3: Population political shifts by party

Comparing the distribution of political scores among the population at iteration 40 and the final iteration shows a much closer trend. That is, once we allow a population to become polarized at approximately this rate, politics stabilize and remain approximately identical until the model closes at iteration 100. We will call iteration 40 our "polarization equilibrium point." Figure 4 shows population political distribution between our polarization equilibrium and the final iteration of our model.

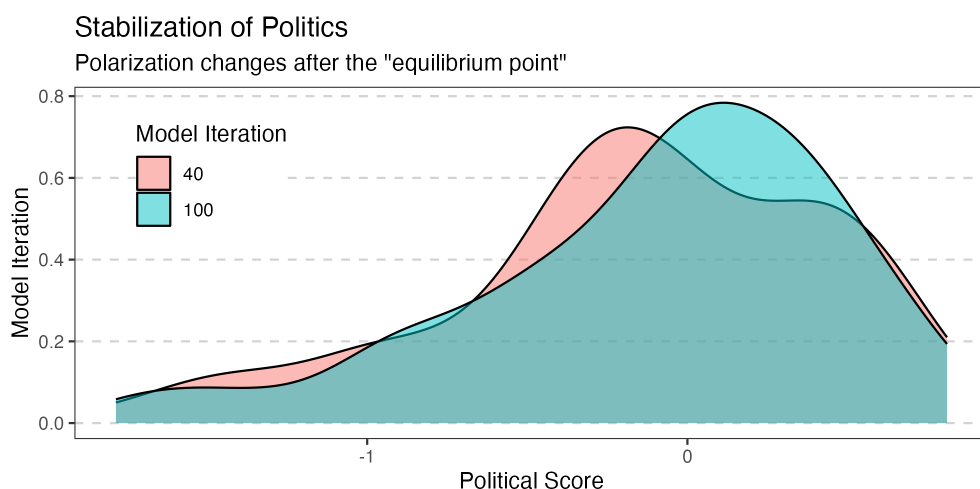


Figure 4: Agent political shifts after iteration 40

Once polarization is quantified, we hope to find a relationship between that polarization and an increase in voter turnout, on average, after polarization occurs. Figure 5 shows the

total votes cast (out of the 100-agent population) in each election. After our polarization equilibrium at iteration 40, voting rates remain approximately equivalent to the rates predating that equilibrium. Additionally, while polarization was slightly stronger by liberal voters, exactly half of the post-equilibrium elections went to either party. In the limited time since political polarization became a household phrase (i.e., since the 2016 election cycle), one election has gone to each party, so these results are unsurprising.

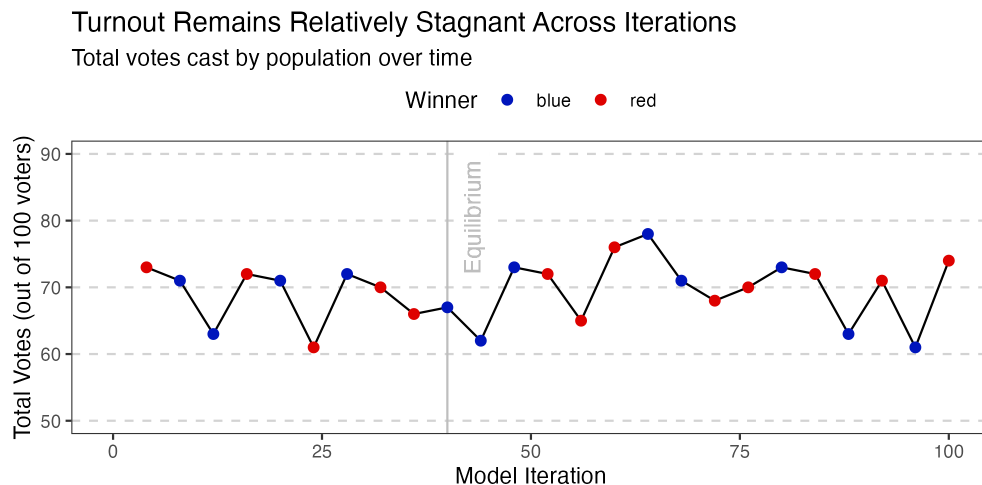


Figure 5: Total vote count over all electoral iterations

We find that, even as polarization takes hold, the absolute distribution of party loyalty remains remarkably similar. Our population’s politics tend to regress towards a mean of 0. That is, the natural push and pull of partisan politics may make people more confident in their votes but does not necessarily change the overall political party distribution of the population writ large. Even as liberal voters became slightly more partisan conservatives, neither party took a firm majority over a long-run average. Figure 6 shows the comparative number of agents in each party over every iteration of our model.

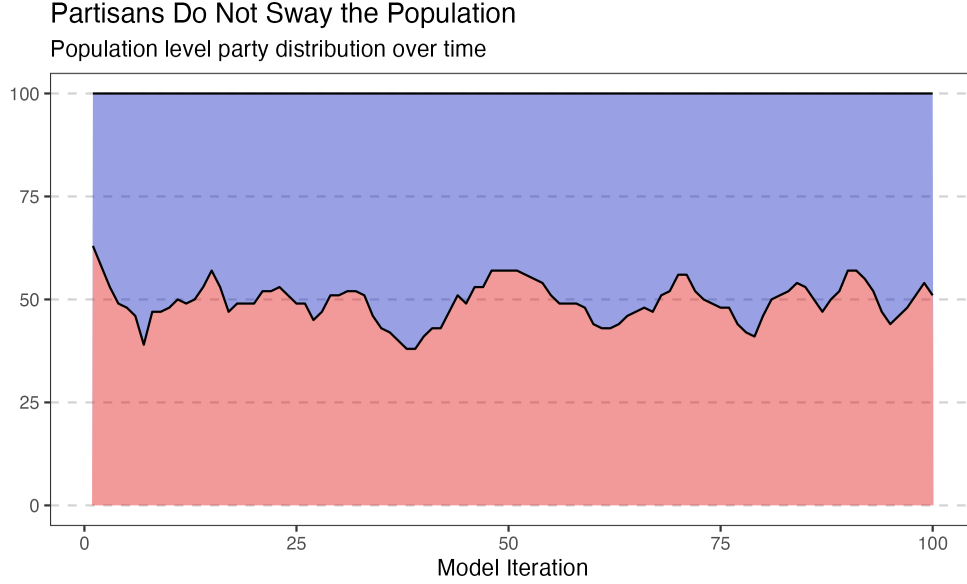


Figure 6: Population party distribution over all iterations

6 Statistical Modelling

We constructed a linear model using data from each simulated election year to find which of our agent parameters had the most impact on whether or not a voter turned out. It is important to note that this model is limited in its use outside of this simulation since relationships between variables are sometimes linear in our simulation, where they may not be in real-world practice. The results of that model are shown in Table 1 below.

Unsurprisingly, an agent being an extremist is highly correlated with turnout. This is expected behavior since increasing turnout likelihood with extremism was built into our model. Similarly, an increase in age predicts an increase in turnout likelihood. This is also built into our simulation, as it is an observed phenomenon in real-world elections [2]. However, the findings of our linear model deviate from programmed simulation rules in two places. First, an agent is more likely to vote if they are conservative. This was not explicitly added to our model but is an observed phenomenon [7] that emerged naturally due to our simulation parameters. Second, although education was explicitly coded to increase turnout

likelihood in our simulation, voting turnout rates did not vary across education levels while holding all else constant. This is likely attributable to an offsetting of the changes made to turnout likelihood by education from a combination of other factors.

Voter Turnout Model			
Predictive strength of agent parameters			
term	estimate	p.value	significance
Intercept	0.006	9.53×10^{-1}	
Age	0.011	1.37×10^{-20}	***
Is Extremist	0.183	2.07×10^{-17}	***
Race: Black	-0.148	3.06×10^{-2}	**
Race: Hispanic	-0.006	9.06×10^{-1}	
Race: Other	-0.104	1.36×10^{-1}	
Race: White	-0.062	2.90×10^{-1}	
Sex: Male	0.036	2.14×10^{-1}	
Political Score	-0.155	8.49×10^{-3}	**
Party: Red	0.087	6.11×10^{-3}	**
Education: High School or Less	-0.017	3.93×10^{-1}	
Education: Some College	-0.020	4.72×10^{-1}	
*: $p < 0.1$			
**: $p < 0.05$			
***: $p < 0.005$			

Figure 7: Linear model output

Our linear model using simulated data shows that polarization is highly likely to increase the chances of any one agent turning out. However, on a population level, our previous analysis shows no real change as political polarization increases. Thus, while we did observe polarization, it did not have an appreciable effect on long-term, population-level turnout levels.

7 Conclusion

Despite the insights gained from our research, some crucial limitations are worth noting before exploring our model outcomes. First, we had to make generalizations regarding the impact of various parameters on individuals, such as education. Educational backgrounds vary widely, and not all degrees or levels of education are equal. While we would have loved a linear regression model to help select the numeric strength on partisan lean/turnout likelihood while other parameters are held constant, no such model is publically available at the time of writing this piece. Additionally, each education system and institution differs, making generalizations necessary for our analysis that have much higher variance in the real-world citizenry. We also faced challenges in understanding the strength of political ideology in individuals, as each person may have a different level of attachment to their beliefs. While efforts have been made to quantify political lean numerically, an agreed-upon standard has yet to form.

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7.1 Future Research

There is much left to be done in the field of election outcome modeling. Most importantly, demographers and survey writers must continue to improve their numeric quantification

of otherwise non-numeric phenomena. Additionally, forming a widely accepted system of numeric quantification of partisan leanings would allow researchers from all over the social sciences to use partisan lean in their work. In modeling specifically, social science would benefit significantly from the creation of dedicated software (R library, Python package, or other) for agent-based election modeling. While building our own was an excellent exercise in learning, saving time by using a robust and abstracted modeling framework would have allowed us to focus more rigorously on our results.

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