



Taking One for the (Other) Team: Does Political Diversity Lower Vaccination Uptake?

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Abstract

What implications might rising animosity towards political out-partisans have for public health? Vaccination has a significant social aspect, protecting not only the vaccinated, but also those around them. While political ideology in the United States was an important driver of individuals' willingness to get vaccinated against COVID-19, with those on the political right displaying greater hesitancy, we examine the role that *political diversity* has on vaccine uptake across US states and commuting zones. Using data from the Cooperative Election Study fielded on over 20,000 respondents in November 2021, and controlling for individual partisanship, we find that those who are political outliers in their community are significantly less likely to get vaccinated. By contrast, we find no equivalent negative effect for ethnic diversity. In sum, the impact of affective polarization is not limited to encounters between non-partisans; it can lead to decreased pro-social behavior that harms political friends and foes alike. Yet these behavioral effects depend on how individuals relate to their community's predominant political ideology.

Keywords Affective polarization · Political diversity · COVID-19 · Vaccination · Social capital

Introduction

Do individuals become less willing to engage in pro-social behavior when it would also benefit political foes? The high level of political polarization in the United States has led to considerable hand-wringing. Beyond contributing to outcomes like

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legislative gridlock and the increasingly divisive positions taken by congressional candidates (Jones, 2001; Stone & Simas, 2010; Jensen et al., 2012), a number of studies have voiced concerns that the rise in affective polarization, which designates animosity towards out-party members, may have far-reaching effects beyond the political realm (Huber & Malhotra, 2017; Endres & Panagopoulos, 2017; Liu et al., 2019). In this article, we investigate whether vaccination against COVID-19 was among these, by focusing on the impact of political diversity. Our main contention is that because vaccination has a pro-social aspect, individuals who perceive themselves as political outliers in their area should be less likely to get vaccinated.

While the development of COVID-19 vaccines was an unprecedented success, their roll-out faced considerable obstacles, from the logistics of distribution to challenges of public communication. One result is that even in a country like the United States, with a plentiful supply of vaccines, uptake was shown to be highly uneven across regions (Aw et al., 2021). These challenges are not new: vaccine hesitancy was on the rise years before the COVID-19 pandemic, with significant demographic and geographical disparities in uptake during previous vaccination campaigns, from influenza and measles to the swine flu (H1N1) vaccine (Baum, 2011; Malik et al., 2020; Krupenkin, 2021).

In the case of the COVID-19 vaccine, in particular, political partisanship ranks among the strongest predictors of attitudes towards vaccines (Korn et al., 2020; Gadarian et al., 2021, 2022; Yang et al., 2021). According to data collected in April 2022, 55% of the vaccinated population in the US identified as Democrats, against 15% who identified as Republicans (Kaiser, 2022). By contrast to this emphasis on individual partisanship effects, we are interested in how the diversity of political views in an area affects pro-social behavior within it, controlling for individuals' own political ideology. We argue that while affective polarization may be high across the country, its behavioral effects should vary according to an area's partisan make-up. Specifically, individuals who perceive themselves to be at odds with the dominant political position in their community should feel a lesser sense of identity with and belonging to that community. A greater ideological distance to the average stranger in their area should be associated with lower empathy towards their neighbors. This should translate into lesser willingness to engage in pro-social behavior that would benefit political foes. We test our expectations in the context of the COVID-19 pandemic, by asking whether greater political diversity was associated with lower rates of vaccination.

These expectations draw in large part on the study of social capital, which examines variation in individuals' trust in strangers, and their willingness to contribute to public goods (Putnam, 2000; Alesina & La Ferrara, 2002; Hero, 2003). Higher levels of social capital have been consistently associated with wealthier, safer, and more democratic societies—as well as healthier ones. US counties with higher social capital saw significantly lower COVID-19 infection rates (Makridis & Cary, 2021; Pitas & Ehmer, 2020), a relation that may be partly due to higher vaccination uptake in the same areas (Qiao et al., 2022). Yet in a more unsettling finding, more diverse societies have been consistently observed to exhibit lower levels of social capital and its associated benefits (Putnam, 2007; Alesina & La Ferrara, 2002; Hero, 2003). The diametrically opposite expectation, usually linked back to the original “contact

hypothesis," which holds that intergroup interactions should breed more tolerance (Tajfel et al., 1979), has received more measured support from large observational data, usually limited to sub-segments of the population, like younger individuals (Stolle & Harell, 2013). Studies of contact with out-groups have mostly looked to ethnic diversity (Nathan & Sands, 2023); we apply the same logic to a region's political diversity. We then compare the two, using data on COVID-19 vaccination.

The 2021 Cooperative Election Study survey provides us with a unique sample of over 20,000 respondents that brings together individuals' political partisanship and their COVID-19 vaccination behavior from November 3 to December 7, 2021, during an important moment in the US vaccination drive, as the Biden administration announced a series of moves to increase vaccination rates before the holiday season and the end of the year.¹ We leverage these data to get a picture of the variation in political diversity across US states and commuting zones, and how it affects vaccination hesitancy among individuals living in these areas.

Our study offers three main insights. First, while the literature on affective polarization has tended to ignore geography, we argue that the behavioral effects of affective polarization should vary according to an area's political diversity: simply put, animosity towards out-partisans should matter most in the presence of out-partisans. To this purpose, we offer a simple means of measuring political diversity from the individual's perspective, using widely available survey data. Secondly, we show that this measure of political diversity provides considerable traction on pro-social behavior: the willingness to get vaccinated against COVID-19 appears significantly lower for individuals who are more politically distant from their area's average ideological position. The effect is sizeable, lowering the rate of vaccination against COVID-19 in an area by as much as 10% points (a 13% difference from the average vaccination rate) across the range of ideological distance. By contrast, ethnic diversity shows no equivalent negative effect. Third, and most broadly, the results imply that the impact of affective polarization are not limited to encounters between non-partisans: they can alter individuals' public health choices in ways that affect political friends and foes alike.

Stated most generally, our theoretical claim is that political diversity decreases pro-social behavior. We define the latter as voluntary actions intended to benefit others, such as co-operating, sharing, donating, and volunteering. We test our argument on vaccination because of its significant social component. Indeed, vaccination not only protects those individuals who get the shot, but also those around them, by reducing virus transmission and contributing to herd immunity (Anderson & May, 1985; Bauch et al., 2003). To reach the desired rates of immunization at the population level, a successful public health campaign thus requires low-risk individuals to get vaccinated for reasons that go beyond their strict self-interest. The positive spillovers from vaccination have led some to depict vaccination as a social contract,

¹ White House Press Release. November 22, 2021. <https://www.whitehouse.gov/briefing-room/statements-releases/2022/11/22/fact-sheet-biden-administration-announces-six-week-campaign-to-get-more-americans-their-updated-covid-19-vaccine-before-end-of-the-year/>.

whereby the ability to protect others living in proximity by limiting the spread of disease gives rise to a moral obligation to do so (Korn et al., 2020).

In the case of COVID-19, this pro-social component may be especially relevant given the sharp differences in mortality risk across age cohorts. One consistent public health message was that vaccination would protect vulnerable people around vaccinated individuals. A representative 2021 tweet from the Center for Disease Control read: “#COVID19 spreads from person to person. The joy we get from ending the pandemic will spread from person to person, too. Getting a COVID-19 vaccine will bring us one step closer to returning to our way of life.”² Consistent with this messaging, greater levels of prosociality were associated with higher vaccination intent, both in the case of COVID and earlier vaccination campaigns (Betsch et al., 2018; Enea et al., 2022). Similarly, interventions to prime awareness of the pro-social aspect of vaccination through social nudging have significant effects on vaccine take-up in lab experiments (Korn et al., 2018). Even controlling for political ideology, individuals who scored higher on various altruism measures were associated with lower rates of vaccine hesitancy (Murphy et al., 2021). In sum, getting vaccinated is at least in part an other-seeking behavior. And awareness of its pro-social aspect transcends political partisanship. As a result, as Neumann-Böhme et al. (2020) offered in one of the earliest surveys of attitudes towards the COVID vaccine: “A campaign emphasising the social benefits of vaccination could increase the willingness to be vaccinated among those amenable to such pro-social motives.” The question we ask is, what might drive individuals’ amenability to these motives?

In the remainder of the paper, we begin by situating the notion of political diversity in the literatures on affective polarization and social capital. We then outline the research design using survey evidence, and present the relation between political diversity and vaccination choices. We end with a brief discussion of the results’ implications.

Political Diversity in the Context of Affective Polarization

Political disagreement is not a novel phenomenon, and neither are encounters between members of opposing parties. What does seem to have changed over the last two decades is the animosity that individuals feel for members of the opposing party. This has been the focus of a recent literature which looks at the general public’s attitudes and behavior towards in-party versus out-party members, as opposed to political scientists’ traditional treatment of polarization as the difference between the policy positions taken by political elites (Iyengar & Krupenkin, 2018; Mason, 2018; Iyengar et al., 2019).

This body of work has documented a pronounced rise in affective polarization over the past decade, whereby partisans of one party feel animus and mistrust towards partisans of the opposite party. As partisanship has come to stand for deep-seated social identities (Green et al., 2008), it has become a heuristic that individuals

² <https://twitter.com/cdcgov/status/1399803015683575809?lang=en>.

rely on when making a wide range of non-political choices: what business partners to engage with, what employers to hire, what consumer goods to purchase, and even what romantic partners to pair with (McConnell et al., 2018).

Affective and policy polarization are mutually constitutive (Bougher, 2017), each feeding the other: affective polarization is a product of ideological disagreement, but it also leads individuals to take more extreme policy stances than they otherwise would (Jensen et al., 2012), and leads to biased perceptions of others' views: individuals assess co-partisans as more in agreement and non-partisans as more politically radical than they actually are (Levendusky & Malhotra, 2016). Affective polarization is thus related to ideological polarization, but it remains "theoretically and empirically distinct" (Iyengar et al., 2019, 2012). The respective policy positions of Democrats and Republicans in the US could thus remain the same, but a rise of distrust between members of the two parties might nonetheless have important behavioral effects. In our argument, affective polarization is a background condition. We expect its effects on behavior to vary in systematic ways. In an area constituted solely of co-partisans, out-partisan animosity should have no observable effect. Conversely, in an area of high political diversity, the same level of animosity should be expected to deeply affect the way individuals relate to their community. As a result, those individuals whose ideological position is more distant from their community's average ideology should be less likely to engage in pro-social behavior at the margin.

The COVID-19 pandemic added to the list of previously neutral acts, like putting on a face mask, self-isolating to prevent disease spread, or even hand-washing, that have taken on a political valence (Baxter-King et al., 2022; Clinton et al., 2021; Gadarian et al., 2021). In particular, Baxter-King et al. identified an interactive effect between individual partisanship and the proportion of co-partisans in an area: Republicans (but not Democrats) appeared less likely to wear face masks in public as the share of co-partisans in their area increased. That is, the presence of co-partisans magnified already present partisan differences. When the same study looked at vaccination rates, it found a much weaker local partisanship effect, which the authors interpreted as evidence that partisan norms enacted through social pressure are at their most potent when behavior can be easily observed, as with masks.

Most studies examining affective polarization illustrate its effects through direct encounters between individuals of opposite political affiliations. These studies take the high level of political animus as a given, treating it as idiosyncratic of this moment in political history, and a feature of the country as a whole. They then examine how such affective polarization manifests, on average, in encounters between non-partisans generated by the analysts, most often in online settings (Iyengar et al., 2019). Geography plays little role in these studies; the location of test subjects does not enter the analysis. Yet it is likely to matter for outcomes. To take one prominent finding, the fact that individuals express less willingness to date out-party members would have no observable effect on romantic pairings in a community that is either all Democrat, or all Republican. When it comes to public health, it is these net outcomes which we care most about. The lack of attention to the political make-up of different communities in the affective polarization literature thus makes it harder to get a sense of its actual effect on individual and aggregate behavior.

By contrast, we are interested in how the behavioral effects of affective polarization might vary in systematic ways. Instead of generating hypothetical encounters between members of opposing parties, our central claim pertains to individuals' relation to the average partisanship of their community. Using widely available survey data, we thus proxy for political diversity by measuring the distance between individual ideological position and the community's average ideology.

We expect that individuals who are political outliers in a given area will, all else equal, feel less affinity with and lower empathy towards their community, and thus be less willing to contribute to the public good. For instance, a lone Democrat living in a low political diversity, Republican-dominated area would be less likely to get vaccinated than if s/he were living in a Democrat-dominated region: their impetus for prosocial behavior would be weakened by the sense that their relevant community is made up of out-partisans. We expect this to manifest not so much as a desire to harm others, but rather as a lesser inclination to aid them. The result should be less propensity to engage in pro-social behavior among individuals who sense that the beneficiaries of their contribution are more likely to be political foes. Such individual choices would affect all the community's members alike. One implication is that communities that are more politically diverse, in the sense that they feature a higher proportion of individuals who consider themselves political outliers, would see less pro-social behavior overall.

Since vaccination has a significant social component (Betsch et al., 2018; Korn et al., 2018, 2020; Enea et al., 2022), we expect it to be affected by the same logic: individuals who perceive themselves to live in regions of clashing political ideology would be less willing to get vaccinated as a means of protecting those around them. Just as field experiments show participants to be less likely to work for, or buy goods from ideological foes (McConnell et al., 2018), individuals may be less willing to invest in the public good when they imagine that public to be made up of out-partisans.

Our reasoning make necessary assumptions about the effects of intergroup contact. We remain largely agnostic about the relationship between political diversity and affective polarization, yet for our theoretical expectations to hold, affective polarization cannot be significantly reduced by proximity to members of the out-party. If this were the case, and contact with non-partisans, by itself, significantly lowered animosity towards them, then this could swamp our main expectation. Political diversity would still offer more "opportunities" for affective polarization to express itself, but this animosity would be made lower by exposure to political diversity in the first place. How much of a concern is this?

A number of distinct scholarly bodies of work, from political science to social psychology, consider how interactions between different groups—separated by ethnic, religious, or ideological lines—affect individuals' sense of belonging to their in-group, and tolerance towards the out-group. Broadly speaking, this scholarship offers two diametrically opposed expectations. On the one hand, what is most often referred to as the "contact hypothesis" posits that diversity leads to increased

intergroup tolerance, through an increase in trust, empathy, and solidarity.³ On the other hand, what is usually referred to as “conflict theory” argues that diversity breeds greater distrust of the out-group, and more in-group self-identification.

Looking at the literature on social capital, where a number of studies have assessed these competing expectations on outcomes trust and rates of volunteerism, conflict theory appears to dominate on average.⁴ Insofar as scholars have found exceptions to this relationship in observational evidence, they have done so by looking at subsamples of the population, like young people (Stolle & Harell, 2013).

In the specific case of partisan divisions, most work that has found support for an equivalent of the contact hypothesis has done so by generating positive interactions across political lines in laboratory settings. The premise is that individuals may generalize from positive experiences with an out-group member to the broader out-group, and thus reduce animosity towards that out-group. Attempts at fostering cross-party conversations have found that such dialogue can indeed reduce affective polarization (Levendusky & Stecula, 2021). Yet these positive effects of externally arranged contact may be small and short-lived (Santoro & Broockman, 2022). More importantly, these effects appear to depend largely on the nature of the interaction: positive interactions reduce out-group hostility, but negative out-party contact exacerbates it (Wojcieszak & Warner, 2020), by making political identities more salient (Paolini et al., 2010). Looking back to contact between ethnic and religious groups, the impact of negative interactions has been shown to outweigh that of positive interactions, leading to a net negative effect of contact (Barlow et al., 2012). For these reasons, and given what we know about the difficulty of fostering constructive inter-party dialogue outside of engineered encounters in a laboratory setting, we posit that at the population level, living in proximity to out-partisans should not decrease out-partisan animosity sufficiently to negate the deterrent effect of political diversity on pro-social behavior.

Our assumption that proximity to out-partisans does not reduce affective polarization on average seems supported by descriptive data. Using American National Election Studies (ANES) survey data from 1978 to 2020, we find that political diversity and affective polarization are, if anything, positively correlated.⁵ While the relationship between these variables is complex, and this correlation does not amount to dispositive evidence, it should nonetheless make us more confident that proximity to out-party members does not reduce cross-partisan animosity in a way would swamp our expectations.

³ For a recent review of the contact hypothesis literature that looks principally at racial and ethnic encounters, but calls on expanding this study to other forms of identity, see Nathan and Sands (2023).

⁴ As Putnam (2007) puts it in a survey of these findings, “For progressives, the contact theory is alluring, but I think it is fair to say that most (though not all) empirical studies have tended instead to support the so-called ‘conflict theory’.”

⁵ State-level affective polarization is calculated as the yearly average value of the difference between in-party and out-party feeling thermometer rating. State-level political diversity is calculated as the state-level variance of 7-point political ideology for each state in each survey year. The correlation between the two measures is 0.22. See Fig. A2 for the scatter plot of affective polarization by political diversity.

Another necessary assumption underlying our theory is that individuals are sufficiently aware of the distribution of political ideology among the people around them to adjust their behavior accordingly. While this premise may appear demanding at first glance, the recent decades' rise in polarization itself renders it more plausible. As politics has increasingly permeated the daily lives of Americans, the number of potential cues of partisanship has risen. Survey respondents have no trouble assigning partisan leaning to ostensibly non-political objects and activities, from cars and coffee to sports and music (Hiaeshutter-Rice et al., 2021). Individuals thus form their impression of the distribution of political views in their area not only through exposure to local news and local candidates' yard signs during election periods, but also by such cues as the rate of "pick-up trucks vs Priuses" they encounter in their day-to-day lives (Hetherington & Weiler, 2018). Closest to our setting of interest, existing findings support the idea that individuals are able to pick up on and respond to even small differences in the partisan make-up of their area, and that these can affect choices over matters of public health, like mask-wearing (Baxter-King et al., 2022).

We also attempt to get traction on this assumption analytically. In our empirics, we test whether greater political awareness magnifies the effect of ideological distance. Indeed, given that our mechanism assumes that individuals must have a sufficiently keen sense of the partisanship of their area, it follows that those who are more politically informed may have a more accurate sense of this. As a result, we might expect that our measure of individual ideological distance would have a greater effect for those individuals who report higher political interest. In our empirics, we test this expectation using the "Political Interest" question in the CES dataset.

Political Diversity Versus Ethnic Diversity

The work on social capital is of special interest to us, since the decision to get vaccinated reflects the type of contribution to the public good that is often used to proxy for social capital, alongside gestures like volunteering, voting, or donating blood (Guiso et al., 2004; Putnam, 2000). As mentioned above, this body of research likely offers the richest set of studies on the conflicting expectations over the effect of diversity on social attitudes and behavior. The median finding on this score is that more diverse societies show lower levels of trust and volunteerism than more homogeneous societies (Alesina & La Ferrara, 2002; Hero, 2003). As a rule, these studies consider the effects of ethnolinguistic diversity; we apply the same reasoning to political diversity.

Yet we also compare how these two types of social diversity affect our outcome of interest. Since ethnic minorities are known to have been disproportionately affected by COVID-19, this question is of inherent interest. Even prior to the COVID-19 pandemic, vaccination rates for a range of preventable diseases were known to be consistently lower among minority groups, owing both to greater hesitancy and poorer access (Wang et al., 2014). Such hesitancy reflects a history of discrimination and injustice that has sown distrust of the healthcare system among minorities (Hamel et al., 2020). On the other hand, heightened awareness among

ethnic minorities—due to greater COVID-19 prevalence early on in the pandemic due to a host of factors (Hooper et al., 2020)—may lead to greater willingness to take preventive measures, such as wearing masks, self-isolating, and getting vaccinated. Existing studies often group together minority groups like Black and Latino Americans with recent immigrants, yet the historical relationship of Black Americans with the health system, especially, leads us to separate the two.

Insofar as they have been compared, the effects of partisan difference have been found to be as high as those of religious difference in some survey experiments (McConnell et al., 2018), and greater than the effects of racial bias in tests of unconscious bias (Iyengar & Westwood, 2015). One explanation is that discrimination along political lines remains socially acceptable, and is indeed encouraged by elites, in ways that racial discrimination rarely is. Yet the two effects operate on the same premise: all else equal, individuals may be less willing to engage in pro-social behavior when they perceive their neighbors to be unlike themselves.

Data and Empirical Strategy

To test and compare the effects of political diversity and ethnic diversity on vaccine uptake, we principally rely on data from the Cooperative Election Study (CES), run out of Harvard and administered by YouGov. While the CES is primarily interested in how Americans view their local elected officials, it also asks a series of questions about non-political activity, including the following about the COVID-19 vaccine, from the 2021 survey: “Did you receive a vaccine for the novel coronavirus (COVID-19)?” This is the first and as of now only wave of the survey to ask the question. Binary responses to this question become our main dependent variable of interest.

While unrepresentative surveys have shown a tendency to overestimate vaccine uptake given social desirability bias (Bradley et al., 2021), the CES, which is designed to be “representative” of the adult US population, appears to closely track actual uptake numbers. According to the 2021 CES survey conducted between November 3 and December 7 2021, 75.0% of respondents responded that they had received the COVID-19 vaccine, a figure that is close to the actual vaccination rate according to the CDC (71.6% and 76.7% of the US adult population, respectively, received at least one dose or completed the series by December 7, 2021). Figure A1 in the supplementary appendix compares the actual vaccination rate and the self-reported rate across states. It shows no systematic bias in the self-reporting data.

We are interested in the effects of political diversity in a given area on individuals’ vaccination decisions. We define that area at two levels of analysis: state and commuting zone. The CES survey is designed to be “representative” of all US adults, and distribution across states is considered in the sample construction. Commuting zones (CZs) are clusters of counties that feature strong within-cluster commuting ties, and weak between-cluster commuting ties. And while our theoretical expectations would apply to smaller geographical units, we are constrained by the availability of the sample across smaller units. Despite covering more than 20,000 respondents, the distribution over counties is such that it does not allow for a reliable

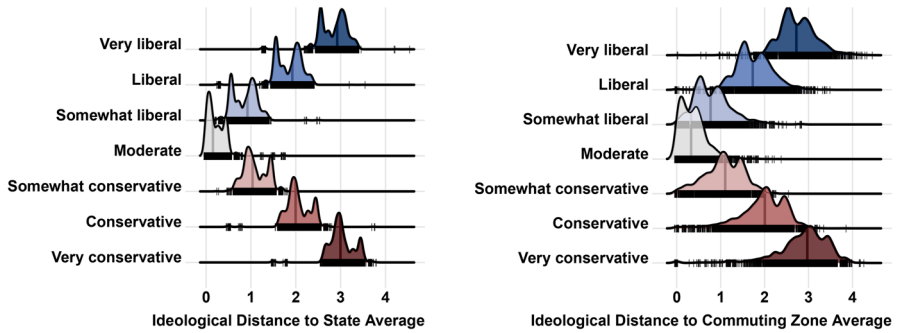


Fig. 1 The distribution of ideological distance measure. The figures show the distribution of the measures of *Ideological Distance* across individual ideology using the Cooperative Election Study. For each respondent, we calculate the distance from their own ideological position to the average ideology score of their state and their commuting zone. On the left (right), we illustrate the distribution of the measures of *Ideological Distance* based on the distance to the average ideological score in each state (commuting zone). Even within each ideological group, there is a wide variation in individuals' distance to their community's mean ideology. We evaluate the role of this variation for vaccination decisions, below.

measure of ideological distance. Yet CZs offer some potential benefits over counties in their exposure to spatial autocorrelation (Carpenter et al., 2022). CZs also suit our purpose since they encompass individuals who are especially likely to interact by virtue of common labor markets and related factors like transportation networks, providing a good proxy for the odds of disease spread.

We assess the impact of political diversity by calculating the absolute individual-level distance between each respondent's ideology and the average ideology score in their area, both at the state and the CZ level. At the state level, we calculate the measure of *Ideological Distance (State)* by relying on the most fine-grained political ideology question from the 2021 CES survey, measured on a 7-point scale.⁶ To calculate ideological distances at the CZ level, which we denote as *Ideological Distance (CZ)*, we draw on a larger sample from the CES surveys, from 2017 to 2021, and take the average across those years for each CZ. Since the 7-point scale measure is not available in the 2017–2020 survey waves, there we rely instead on an analogous 5-point scale ideology question. These measures capture the extent to which an individual's ideology deviates from the average ideology in the specified areas. An individual with an ideology similar to the average in the area will score low on this measure, while one with a differing ideology will score high.

Figure 1 illustrates the distribution of the *Ideological Distance* measures, calculated as the distance between an individual's own ideology and the average ideology of their state (left panel) and CZ (right panel). As expected, individuals who strongly identify with either conservative or liberal ideologies—specifically those

⁶ The question reads: “In general, how would you describe your own political viewpoint?” Responses are coded on a 7-point scale, from “Very liberal” to “Very conservative.” Given the large size of the sample, and to maximize the precision of the results, we set aside the 7.2% of respondents who answered “not sure” when asked about their political viewpoint.

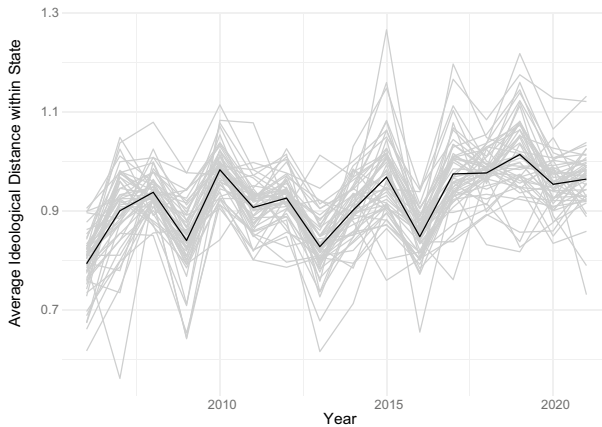


Fig. 2 Average ideological distance by state over time. Grey lines describe the average ideological distance within each state over time, 2006–2021. The black line denotes the average trend across all states.

who self-identify as “very liberal” or “very conservative”—are more distant from the average ideology of their area. Figure 1 also reveals the substantial variation in ideological distance among individuals with the same ideological stance, depending on where they live. For example, within the “very liberal” group, individuals residing in predominantly liberal areas tend to have lower distance scores. Yet some in this same group, living in areas where their views are less common, are outliers in their area, scoring 3 or higher on this ideological distance measure.

To test prevalent expectations around ethnic diversity, we combine the CES data with a large recent dataset on immigration from Mayda et al. (2022), who measure the share of immigration by county drawing on demographic data from the U.S. Census and American Community Survey. We take the share of immigrants in each commuting zone as a proxy for ethnic diversity. Separately, we also estimate the effect of the White immigrant share and the non-White immigrant share in each commuting zone (Tables A6 and A7 in the SI). In addition, we test the impact of ethnic diversity using the county-level share of non-White individuals as an alternative measure, using the data from the Census (Table A8 in the SI). The findings remain similar to our main specifications.

Before turning to our estimation strategy, it is worth examining the trend across time in political diversity at the aggregate level. To do so, we simply calculate the state-level mean of individual ideological distance measures, for each state, for each year. Figure 2 illustrates this measure at the state level, over time.⁷ The figure shows a first peak in 2008, and a second increase following 2016, the year of Donald Trump’s election, which persists to the most recent wave of the survey. In other words, looking at the last 15 years, the current ideological distance separating

⁷ The figure relies on the 5-point ideological measure in the CES survey, which is the most fine-grained ideological variable consistently measured across survey waves from 2006 to 2021.

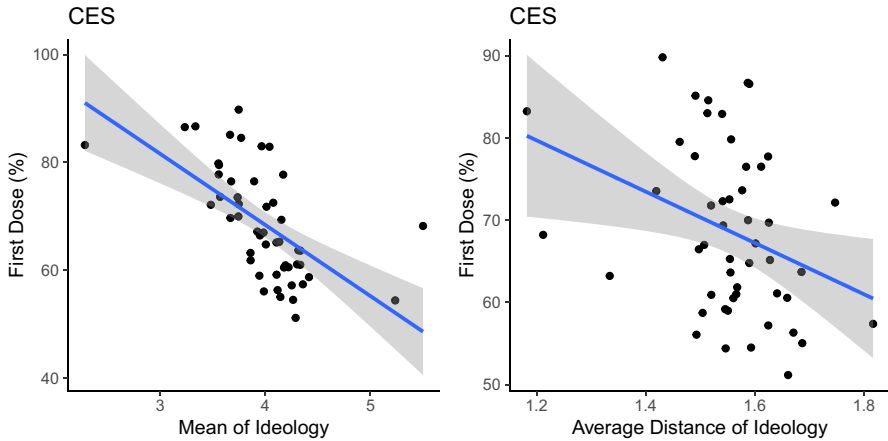


Fig. 3 Vaccination rates by ideology and ideological polarization. The panels compare the percentage of the population who had received at least one dose of COVID-19 vaccines by 2021 with the average within-state ideology score (left) and the average distance of ideology (right). The blue line shows a linear regression coefficient with 95% confidence interval in dark grey. Vaccination rates are calculated using CDC data. Variables related to mean ideology and the ideological distance are calculated using the 2021 CES survey (Color figure online).

two random individuals living in the same area is high. This proves important for our theoretical expectations. There could be reasons to expect that the rise in affective polarization would have led to lower average political diversity, if people are more likely to move to areas populated by politically like-minded individuals, as suggested by Liu et al. (2019). Yet, the trend in Fig. 2 suggests that while such self-sorting may be taking place, it is not sufficiently strong to decrease the average ideological variance within states. Regional political diversity appears to have increased over time along with the rise in affective polarization.

We further examine the correlation between ideological variance and official state-level vaccination rate from the CDC data. Figure 3 compares the proportion of the population who were vaccinated as of 2021 with the average state-level ideology (left) and ideological variance (right).⁸ Figure 3 demonstrates that the aggregate vaccination rate is not only lower in more conservative states, but also in states that feature greater variance in individual ideological beliefs. While this provides suggestive evidence consistent with our theoretical expectations, it should be interpreted with caution, since these group-level data are subject to a concern over ecological fallacy.

We now turn to our main estimation strategy. In our main analysis, we rely on individual-level data to estimate the effects of *Ideological Distance (State)* or

⁸ The vaccination rate is calculated as the percentage of individuals who had received at least one vaccine dose by December 31, 2021 for each state. The ideological orientation is calculated as the average ideology score across the 7-point scale of all individuals within each state, measured on a one-dimensional left-to-right spectrum, while the ideological variance is the within-state statistical variance of the same.

Ideological Distance (CZ) on individuals' vaccination decisions, controlling for each respondent's political ideology and the area's average ideology, as follows:

$$Y_{ij} = \alpha + \beta_1 \text{Ideological Variance}_j + \beta_2 \text{Ideology}_i + \beta_3 \text{Average Ideology}_j + \beta_4 \text{Immigrant Share}_j + X_i \gamma + \epsilon_{ij}, \quad (1)$$

where Y_{ij} is a binary indicator coded 1 for a vaccinated individual i living in an area j . We are primarily interested in the coefficient β_1 on *Ideological Variance_j*, measured either at the level of commuting zone or state. We then replace this measure with *Ideological Distance*. Apart from controlling for respondents' own ideology (*Ideology*) and the average ideology in a region j (*Average Ideology*), we also include a set of demographic controls, X_i , that may confound the relationship between political polarization and vaccine uptake. These include gender (women have been observed to exhibit greater vaccine hesitancy); age (older people are more vulnerable to COVID-19 and should be more willing to get vaccinated); urban areas (which feature better access to healthcare than rural areas); and education and income, which we control for with binary indicators for high school degree, college degree, annual incomes above 100 K, and annual incomes between 50–100 K. Lastly, we control for respondents' race and ethnicity, coded as White, Black, Asian, and Hispanic.

In addition, we estimate multilevel logistic models as an alternative estimation strategy. Multilevel modeling allows for the inclusion of group-level indicators, such as *Average Ideology*, which does not vary within each group, while also taking into account differences between groups. While our fixed effects models offer a significant advantage by allowing us to capture unobservable characteristics at the group level, we show the estimates from multilevel logistic models to ensure that our main findings are not driven by model specification.

Results

Table 1 presents the results. Columns (1)–(4) present the results of least-squares models with the probability of vaccination as the dependent variable; Columns (5)–(6) present the results of multilevel mixed logistic models with the binary variable of vaccination decision as the dependent variable.⁹ In columns (1), (2) and (5), we use the measure of ideological distance calculated as the absolute difference between one's ideology to the average ideology in one's state of residence. In columns (3), (4) and (6), we use the measure calculated based on the average ideology in one's commuting zone.¹⁰

⁹ We present the full results with coefficients on all covariates in Table A1 in the SI.

¹⁰ In the SI, we estimate the same models excluding income level variables. While income is an important factor to control, the CES allowed respondents to choose "Prefer not to answer" in the income question. Due to this, about 10% of respondents are necessarily omitted from the analysis in our main analysis. We nonetheless estimate the same models excluding income level variables and ensure that our main results remain unchanged as presented in Table A2.

Table 1 The effects of ideological distance on COVID-19 vaccination decision

	(1)	(2)	(3)	(4)	(5)	(6)
Ideological distance (state)	-0.023** (0.002)	-0.022** (0.002)			-0.038* (0.017)	
Average ideology (state)	-0.047** (0.013)				-0.233* (0.096)	
Ideological distance (CZ)			-0.021** (0.003)	-0.021** (0.003)		-0.044* (0.018)
Average ideology (CZ)			-0.040** (0.007)			-0.181** (0.045)
Ideology (7-point)	-0.069** (0.002)	-0.069** (0.002)	-0.068** (0.002)	-0.068** (0.002)	-0.472** (0.011)	-0.467** (0.012)
Immigrant share	0.082* (0.035)	0.148** (0.041)	0.072* (0.034)		0.991** (0.227)	0.792** (0.241)
Model	Linear	Linear	Linear	Linear	Multilevel	Multilevel
State fixed effects	✓	✓	✓	✓	✓	✓
Commuting zone fixed effects	✓	✓	✓	✓	✓	✓
State random intercepts	✓	✓	✓	✓	✓	✓
Commuting zone random intercepts	✓	✓	✓	✓	✓	✓
Observations	21697	21697	21697	21697	21697	21697

Note: Standard errors in parentheses. All models control for gender, age, education levels (high school degree, college degree), income levels (income of 100 K or higher, income of 50–100 K), area types (city, suburb and town; rural as a baseline category), racial and ethnic groups (White, Black, Asian and Hispanic). We also control for whether a respondent or someone the respondent knows have been diagnosed with the COVID-19. Standard errors are clustered on states in columns (1)–(2) and on commuting zones in columns (3)–(4).

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

The results suggest that individuals are less likely to get vaccinated as their ideological distance to average ideology of their area increases. Our primary variables of interest, *Ideological Distance (State)* and *Ideological Distance (CZ)*, appear negatively correlated with the probability of vaccination, across all the estimated models. Based on model (1), a one standard deviation increase in the distance to the state's average ideology is associated with a decrease of 2.4% point in vaccination odds. More dramatically, moving *Ideological Distance* across the full range in the sample, from its minimum to its maximum level, is associated with a decrease of vaccination odds of 10.0% points. These results are not driven by the area's overall ideological orientation, which we control for separately, and which behaves as expected: more conservative areas see lower vaccination rates on average. To be sure, these are probabilistic effects at the margin. While large, the effect of ideological distance is not deterministic. Rather, the findings indicate that on average, greater distance from the prevalent ideology in an individual's community significantly decreases the odds of getting vaccinating, controlling for individual partisanship, and a battery of other

potentially confounding variables. Yet given the size of the stakes, these effects appear large enough to have a real impact on public health outcomes.

Next, we examine whether the effects of ideological distance hold when separately examining a liberal or a conservative group of individuals. As presented in Tables A3 and A4 in the SI, we find that the measure of ideological distance consistently appears negative across the models even with a subset of liberals or conservatives, respectively. Notably, we find that the effects remain substantial when we estimate the models separately with individuals who self-identify as liberals. Among liberals, individuals whose ideology is farther from the area's average ideology are less likely to be vaccinated. The results ensure that the effects of ideological distance are distinct from the effects of individual ideology, which we already control in all the estimated models. The results also ensure that our main findings are not driven by a group of very conservative individuals who would score high on ideological distance measure and who are also less likely to get vaccinated.

As for the effects of ethnic diversity, despite fears that minority groups may be more hesitant to get vaccinated (Wang et al., 2014), the immigrant share in a commuting zone appears consistently associated with increased odds of vaccination, as shown in columns (1)–(7). One standard deviation increase in the share of immigrants is associated with a 1.0–1.3% point increase of vaccination odds. These positive results also hold for US-born respondents, who appear more likely to get vaccinated in areas with high immigration (as presented in Table A5 in the SI)—although US-born respondents are themselves, all else equal, less likely on average to get vaccinated than non-US-born immigrants.¹¹ The findings also hold when we separately estimate the share of White immigrants and that of non-White immigrants. Both measures are positively associated with the probability of vaccination; the effect is more significantly associated with the share of non-White immigrants (see Tables A6 and A7 in the SI).

On the other hand, coefficients on the control variables (full results are shown in Table A1 in the SI) suggest Black respondents are significantly less likely to get vaccinated. This appears consistent with the data on prior vaccination campaigns, like influenza, and offers credence to accounts stressing the historically fraught relationship of Black Americans with the US healthcare system (Malik et al., 2020). Other demographic controls behave as expected: older, more educated, and higher income respondents living in larger metropolitan areas are more likely to get vaccinated than younger, less educated, and lower income respondents living in rural areas, and men are on average more likely to get vaccinated than women.

Next, we explore how affective polarization conditions the effects of ideological distance on vaccination decision. In our theoretical argument, affective polarization is a background condition that is treated as fixed, and the main effect of interest is that of ideological distance. Yet it follows that ideological distance is likely to have a greater impact on individuals' decision to engage in pro-social behavior if they feel stronger animosity towards out-groups to begin with. The CES data do not include

¹¹ In the CES data, 74.5% of US-born respondents received a COVID-19 vaccine, compared to 79.9% among non-US born immigrants.

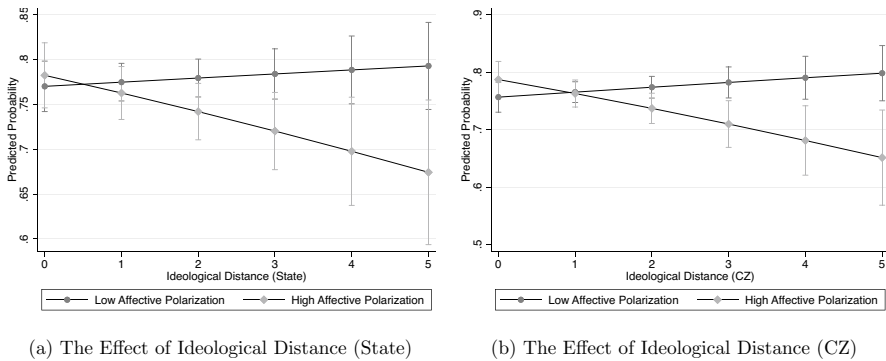


Fig. 4 The effects of ideological distance on COVID-19 vaccination decision by levels of affective polarization

a measure of affective polarization, which makes it difficult to test this interaction effect with precision. We try the next best thing, by combining the CES data with state-level affective polarization calculated using the ANES data.¹² Using the combined data, we then estimate the interaction effect of state-level affective polarization and individual-level ideological distance. As affective polarization is measured at the state level, we estimate a multilevel logistic model.

Figure 4 illustrates the effects of ideological distance conditional on state-level affective polarization levels on vaccination probability (See Table A9 in the SI for the full results). On the left (right) panel, we present the effects of ideological distance, measured as the distance between individuals' ideology and the average ideology within their state (commuting zone), conditional on the degree of state-level affective polarization. The grey (black) line describes the predicted probability of vaccination as a function of ideological distance when state-level affective polarization is high (low).¹³ Both figures clearly demonstrate that the ideological distance plays a limited role in affecting vaccination decisions in states with low affective polarization, while showing a clear negative effect in states with high affective polarization. The results conform to our expectation about the relationship between affective polarization, political diversity and pro-social behavior: With high affective polarization as a background condition, we expect that ideological distance negatively affects individuals' willingness to engage in pro-social behavior.

¹² We calculate the state-level affective polarization by relying on survey responses about feelings toward preferred and non-preferred party in the ANES data. Following Stewart et al. (2020), we calculate the difference in feelings toward preferred and non-preferred party. We calculate the average of state-level affective polarization of three ANES survey years: 2012, 2016 and 2020. For 2012 and 2016, we use the calculated measure from Stewart et al. (2020). We do our own calculations using the same approach for 2020.

¹³ We set the value of low and high state-level affective polarization as 0.37 (bottom 1%) and 0.55 (top 1%), respectively.

Finally, we explore possible sources of heterogeneity for the effect of ideological distance. First, we examine whether the effect of ideological distance varies based on area types, distinguishing between urban, suburban, and rural areas. In suburban areas, for example, individuals may have a more accurate sense of the average partisanship and ideology within their locality due to visible lawn signs and increased interactions with their neighbors. To explore this possibility, we estimate an interaction effect of ideological distance and city residence. The results presented in Table A10 in the SI show no significant interaction effect, although urban residents are themselves more likely to vaccinated than others.

Secondly, we examine the extent to which political interest interacts with the effects of political diversity. We estimate an interactive effect of political interest and ideological distance. As our claim rests on the assumption that individuals should be well aware of the partisanship of their area, we expect that the effects of ideological distance on vaccine uptake should be more pronounced among the politically informed. In the CES survey, in what the survey refers to as the “Political Interest” question, respondents are asked about how closely they follow issues related to government and public affairs. Based on their responses, we generate a binary variable coded 1 for those who answered that they follow politics “most of the time”, and 0 otherwise. We then interact this variable with our measure of ideological distance. The results, presented in Table A11 in the SI, reveal a significant interactive effect between political interest and ideological distance. While ideological distance alone negatively affects vaccine uptake, the interaction term is substantively and statistically significant. This suggests that the effect of ideological distance is stronger for those with high political interest, which further validates our key assumption.

Conclusion

The social effects of affective polarization are typically studied by bringing about real or imagined encounters between non-partisans: in laboratory settings and online field experiments, individuals appear less willing to work for, go into business with, purchase goods from, or date members of the opposing political party. These studies select subjects (and those they interact with) without regard for where they are located, with the implicit assumption that affective polarization is a trait of this moment in political history that affects everyone equally.

By contrast, our argument highlights how the social effects of polarization should vary according to the political make-up of a region. Those individuals who are themselves farther away from the average political viewpoint of their region should be less likely to contribute to the public good. We find evidence for this expectation looking at public health behavior, at both the state and commuting zone level. Individuals who are more at odds with their region’s ideological mean are less likely to get vaccinated. Most importantly, these effects hold when controlling for the individual’s ideology—which has well established effects of its own, and which our analysis replicates.

One piece of good news is that at least in the case we examine here, ethnic homogeneity does not appear to deter pro-social behavior in the same way as political

diversity. Areas with greater social diversity, as proxied for by regional immigrant share, and share of non-Whites, are not associated with lower vaccination rates; in some cases, the association is even positive. The bad news is that political animosity, perhaps by virtue of being more socially acceptable (Iyengar & Westwood, 2015), and actively encouraged by elites, may now have more prevalent effects, in ways that go far beyond the political realm.

Given how the argument draws heavily on the social capital literature, future work could take up analogous testable implications for other pro-social behaviors. If political diversity appears to reduce vaccination rates, does a similar mechanism lead to a negative relationship between political diversity and other pro-social behaviors? In a companion article, we find that political diversity is associated with reduced willingness to donate blood (Kim & Pelc, 2024). Future work could further examine how political diversity is associated with other forms of pro-social behavior, including volunteering, charitable giving, and organ donation, as well as voting. In sum, the large set of findings evaluating the impact of ethnic and social diversity on cooperative behavior could be fruitfully replicated to evaluate the full social effects of political diversity.

One implication for policymakers looking to increase vaccination uptake, or encourage other pro-social public health behavior such as social distancing, mask wearing, or blood donations, is that an emphasis on the social aspect of such actions in public messaging might vary in effectiveness across regions. Although socially-targeted messaging is a common prescription of “vaccination as social contract” proponents (Korn et al., 2020; Neumann-Böhme et al., 2020), our findings suggest that its efficacy is likely to depend on the political make-up of a given area. In areas featuring high political diversity, an emphasis on individual self-interest, or alternative considerations like ensuring the health of family members, may prove more effective.

Our focus on political diversity makes plain that the social effects of affective polarization go beyond encounters between political foes. In many settings, individuals have no way of knowing who will be affected by their behavioral choices. They rely on a range of heuristics to determine how similar to them their neighbors are, and they adjust their behavior accordingly. In sum, affective polarization manifests not only in discrete encounters between non-partisans, but also in a generalized mistrust towards the community as a whole. The result is that affective polarization ends up harming political friends and foes alike.

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Data Availability All data and replication code can be found on the Harvard Dataverse repository: Kim, Sung Eun; Pelc, Krzysztof. 2024, “Replication Data for: Taking One for the (Other) Team: Does Political Diversity Lower Vaccination Uptake?”, <https://doi.org/10.7910/DVN/LPSLQW>, Harvard Dataverse.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

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References

- Alesina, A., & La Ferrara, E. (2002). Who trusts others? *Journal of Public Economics*, 85(2), 207–234.
- Anderson, R. M., & May, R. M. (1985). Vaccination and herd immunity to infectious diseases. *Nature*, 318(6044), 323–329.
- Aw, J., Seng, J. J. B., Seah, S. S. Y., & Low, L. L. (2021). COVID-19 vaccine hesitancy: A scoping review of literature in high-income countries. *Vaccines*, 9(8), 900.
- Barlow, F. K., Paolini, S., Pedersen, A., Hornsey, M. J., Radke, H. R. M., Harwood, J., Rubin, M., & Sibley, C. G. (2012). The contact caveat: Negative contact predicts increased prejudice more than positive contact predicts reduced prejudice. *Personality and Social Psychology Bulletin*, 38(12), 1629–1643.
- Bauch, C. T., Galvani, A. P., & Earn, D. J. D. (2003). Group interest versus self-interest in smallpox vaccination policy. *Proceedings of the National Academy of Sciences*, 100(18), 10564–10567.
- Baum, M. A. (2011). Red state, blue state, flu state: Media self-selection and partisan gaps in swine flu vaccinations. *Journal of Health Politics, Policy and Law*, 36(6), 1021–1059.
- Baxter-King, R., Brown, J. R., Enos, R. D., Naeim, A., & Vavreck, L. (2022). How local partisan context conditions prosocial behaviors: Mask wearing during COVID-19. *Proceedings of the National Academy of Sciences*, 119(21), e2116311119.
- Betsch, C., Schmid, P., Heinemeier, D., Korn, L., Holtmann, C., & Böhm, Robert. (2018). Beyond confidence: Development of a measure assessing the 5C psychological antecedents of vaccination. *PLoS ONE*, 13(12), e0208601.
- Bougher, L. D. (2017). The correlates of discord: Identity, issue alignment, and political hostility in polarized America. *Political Behavior*, 39(3), 731–762.
- Bradley, V. C., Kuriwaki, S., Isakov, M., Sejdinovic, D., Meng, X.-L., & Flaxman, S. (2021). Unrepresentative big surveys significantly overestimated US vaccine uptake. *Nature*, 600(7890), 695–700.
- Carpenter, C. W., Lotspeich-Yadao, M. C., & Tolbert, C. M. (2022). When to use commuting zones? An empirical description of spatial autocorrelation in US counties versus commuting zones. *PLoS ONE*, 17(7), e0270303.
- Clinton, J., Cohen, J., Lapinski, J., & Trussler, M. (2021). Partisan pandemic: How partisanship and public health concerns affect individuals' social mobility during COVID-19. *Science Advances*, 7(2), eabd7204.
- Endres, K., & Panagopoulos, C. (2017). Boycotts, Buycotts, and political consumerism in America. *Research & Politics*, 4(4), 2053168017738632.
- Enea, V., Eisenbeck, N., Carreno, D. F., Douglas, K. M., Sutton, R. M., Agostini, M., Bélanger, J. J., Gützkow, B., Krienkamp, J., Abakoumkin, G., et al. (2022). Intentions to be vaccinated against COVID-19: The role of prosociality and conspiracy beliefs across 20 countries. *Health Communication*, 1, 1–10.
- Gadarian, S. K., Goodman, S. W., & Pepinsky, T. B. (2021). Partisanship, health behavior, and policy attitudes in the early stages of the COVID-19 pandemic. *PLoS ONE*, 16(4), e0249596.
- Gadarian, S. K., Goodman, S. W., & Pepinsky, T. B. (2022). *Pandemic politics: The deadly toll of partisanship in the age of COVID*. Princeton University Press.

- Green, D., Palmquist, B., & Schickler, E. (2008). *Partisan hearts and minds*. In Partisan Hearts and Minds: Yale University Press.
- Guiso, L., Sapienza, P., & Zingales, L. (2004). The role of social capital in financial development. *American Economic Review*, 94(3), 526–556.
- Hamel, L., Lopes, L., Muñana, C., Artiga, S., & Brodie, M. (2020). *KFF/the undefeated survey on race and health*. Kaiser Family Foundatio.
- Hero, R. E. (2003). Social capital and racial inequality in America. *Perspectives on Politics*, 1(1), 113–122.
- Hetherington, M., & Weiler, J. (2018). *Prius or pickup?: How the answers to four simple questions explain America's great divide*. Houghton Mifflin.
- Hiaeshutter-Rice, D., Neuner, F. C., & Soroka, S. (2021). Cued by culture: Political imagery and partisan evaluations. *Political Behavior*, 4, 1–19.
- Hooper, M. W., Nápoles, A. M., & Pérez-Stable, E. J. (2020). COVID-19 and racial/ethnic disparities. *JAMA*, 323(24), 2466–2467.
- Huber, G. A., & Malhotra, N. (2017). Political homophily in social relationships: Evidence from online dating behavior. *The Journal of Politics*, 79(1), 269–283.
- Iyengar, S., Sood, G., & Lelkes, Y. (2012). Affect, not ideology: A social identity perspective on polarization. *Public Opinion Quarterly*, 76(3), 405–431.
- Iyengar, S., & Krupenkin, M. (2018). The strengthening of partisan affect. *Political Psychology*, 39, 201–218.
- 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.
- Iyengar, S., Lelkes, Y., Levendusky, M., Malhotra, N., & Westwood, S. J. (2019). The origins and consequences of affective polarization in the United States. *Annual Review of Political Science*, 22, 129–146.
- Jensen, J., Naidu, S., Kaplan, E., Wilse-Samson, L., Gergen, D., Zuckerman, M., & Spirling, A. (2012). Political polarization and the dynamics of political language: Evidence from 130 years of partisan speech [with comments and discussion]. *Brookings Papers on Economic Activity*, 4, 1–81.
- Jones, D. R. (2001). Party polarization and legislative gridlock. *Political Research Quarterly*, 54(1), 125–141.
- Kaiser. (2022). KFF COVID-19 Vaccine Monitor, (April 13–26, 2022). <https://www.kff.org/coronavirus-covid-19/dashboard/kff-covid-19-vaccine-monitor-dashboard/>
- Kim, S. E., & Pelc, K. (2024). Does political diversity inhibit blood donations? *Perspectives on Politics*. Online First. doi:10.1017/S1537592724000021
- Korn, L., Betsch, C., Böhm, R., & Meier, N. W. (2018). Social nudging: The effect of social feedback interventions on vaccine uptake. *Health Psychology*, 37(11), 1045.
- Korn, L., Böhm, R., Meier, N. W., & Betsch, C. (2020). Vaccination as a social contract. *Proceedings of the National Academy of Sciences*, 117(26), 14890–14899.
- Krupenkin, M. (2021). Does partisanship affect compliance with government recommendations? *Political Behavior*, 43(1), 451–472.
- Levendusky, M. S., & Stecula, D. A. (2021). *We need to talk: How cross-party dialogue reduces affective polarization*. Cambridge University Press.
- Levendusky, M. S., & Malhotra, N. (2016). (Mis) perceptions of partisan polarization in the American public. *Public Opinion Quarterly*, 80(S1), 378–391.
- Liu, X., Andris, C., & Desmarais, B. A. (2019). Migration and political polarization in the US: An analysis of the county-level migration network. *PLoS ONE*, 14(11), e0225405.
- Makridis, C. A., & Cary, W. (2021). How social capital helps communities weather the COVID-19 pandemic. *PLoS ONE*, 16(1), e0245135.
- Malik, A. A., McFadden, S. A. M., Elharake, J., & Omer, S. B. (2020). Determinants of COVID-19 vaccine acceptance in the US. *EclinicalMedicine*, 26, 100495.
- Mason, L. (2018). Ideologues without issues: The polarizing consequences of ideological identities. *Public Opinion Quarterly*, 82(S1), 866–887.
- Mayda, A. M., Peri, G., & Steingress, W. (2022). The political impact of immigration: Evidence from the United States. *American Economic Journal: Applied Economics*, 14(1), 358–89.
- McConnell, C., Margalit, Y., Malhotra, N., & Levendusky, M. (2018). The economic consequences of partisanship in a polarized era. *American Journal of Political Science*, 62(1), 5–18.
- Murphy, J., Vallières, F., Bentall, R. P., Shevlin, M., McBride, O., Hartman, T. K., McKay, R., Bennett, K., Mason, L., Gibson-Miller, J., et al. (2021). Psychological characteristics associated with

- COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nature Communications*, 12(1), 1–15.
- Nathan, N. L., & Sands, M. L. (2023). Context and contact: Unifying the study of environmental effects on politics. *Annual Review of Political Science*, 7, 26.
- Neumann-Böhme, S., Varghese, N. E., Sabat, I., Barros, P. P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. (2020). Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *The European Journal of Health Economics*, 21, 977–982.
- Paolini, S., Harwood, J., & Rubin, M. (2010). Negative intergroup contact makes group memberships salient: Explaining why intergroup conflict endures. *Personality and Social Psychology Bulletin*, 36(12), 1723–1738.
- Pitas, N., & Ehmer, Colin. (2020). Social Capital in the Response to COVID-19. *American Journal of Health Promotion*, 34(8), 942–944.
- Putnam, R. D. (2000). “Bowling alone: America’s declining social capital.” In *Culture and politics*. Springer pp. 223–234.
- Putnam, Robert D. (2007). E pluribus unum: Diversity and community in the twenty-first century the 2006 Johan Skytte Prize Lecture. *Scandinavian Political Studies*, 30(2), 137–174.
- Qiao, S., Li, Z., Zhang, J., Sun, X., Garrett, C., & Li, X. (2022). Social capital, urbanization level, and COVID-19 vaccination uptake in the United States: A national level analysis. *Vaccines*, 10(4), 625.
- 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.
- Stewart, A. J., McCarty, N., & Bryson, J. J. (2020). Polarization under rising inequality and economic decline. *Science Advances*, 50, 6.
- Stolle, D., & Harell, A. (2013). Social capital and ethno-racial diversity: Learning to trust in an immigrant society. *Political Studies*, 61(1), 42–66.
- Stone, W. J., & Simas, E. N. (2010). Candidate valence and ideological positions in US House elections. *American Journal of Political Science*, 54(2), 371–388.
- Tajfel, H., Turner, J. C., Austin, W. G., & Worchel, S. (1979). An integrative theory of intergroup conflict. *Organizational Identity: A reader*, 56(65), 2–16.
- Wang, J., Munshi, K. D., & Hong, S. H. (2014). Racial and ethnic disparities in influenza vaccinations among community pharmacy patients and non-community pharmacy respondents. *Research in Social and Administrative Pharmacy*, 10(1), 126–140.
- Wojcieszak, M., & Warner, B. R. (2020). Can interparty contact reduce affective polarization? A systematic test of different forms of intergroup contact. *Political Communication*, 37(6), 789–811.
- Yang, Z., Imouza, A., Pelrine, K., Lévy, S., Liu, J., Desrosiers-Brisebois, G., Godbout, J-Fr., Blais, A., & Rabbany, R. (2021). Online Partisan Polarization of COVID-19. In *2021 International Conference on Data Mining Workshops (ICDMW)*. IEEE pp. 893–901.

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