Université de Neuchâtel
Institut de recherches économiques

IRENE Working Paper 22-09

COVID-19 Vaccination, Political Partisanship, and Moral Values

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This version: October 2022

Abstract

This paper examines the association between political partisanship and willingness to vaccinate against COVID-19 in the US. It shows that those counties with a stronger lead of the Republican candidate during the latest presidential electoral rounds displayed consistently lower vaccination rates (1st and 2nd dose) than swing counties and Democratic strongholds. The paper also examines how partisanship interacts with socio-demographic variables such as education, income per capita, and ethnic composition in affecting vaccination attitudes. The results remain qualitatively unaffected when taking into consideration differences in the timing and intensity of vaccination campaigns across states and the potential endogeneity of political preferences. Our results also highlight how the specific combination of moral values that characterize the Republican electorate might explain the observed association between partisanship and vaccination rates.

Keywords: COVID-19, Vaccination, Partisanship, Moral Values

JEL Classification: I12, I18, Z13

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1. Introduction

After its outbreak in the Chinese province of Hubei in December 2019, COVID-19 rapidly spread across all the world regions and reached the pandemic status in March 2020. In an attempt to flatten to contagion curve and reduce the load on the healthcare systems, the World Health Organization called on countries to take urgent and aggressive actions to protect global health (Cucinotta and Vanelli, 2020). Several governments enacted shelter-in-place and social distancing measures to reduce interpersonal contact and mobility in the months that followed and launched "stay at home" media campaigns aimed at altering citizens' habits. It soon became clear, however, that developing a vaccine would have been the only real way to get us out of the pandemic and restore a certain degree of normality.

The urgent need to slow viral transmission, lessen disease severity, and reduce mortality, jumpstarted a race toward the development and distribution of COVID-19 vaccinations. While typical vaccine development can take upwards of 10-15 years, an unprecedented international response by researchers, funders and regulators made it possible to develop COVID-19 vaccines in less than a year after the identification of the virus (Burgos et al., 2021). But while some countries managed to reach high vaccination rates among those offered vaccines, others were slower in their progress. Despite strong recommendations and advertising campaigns deployed almost everywhere in the world, COVID-19 vaccine acceptance to date has varied widely between countries, and even within countries between groups with different sociodemographic characteristics. In May 2021, a Gallup poll has estimated the worldwide unwillingness to take the COVID-19 vaccine to around 32 percent, or 1.3 billion people (Ray, 2021).

Unwillingness to be vaccinated against COVID-19 can stem from a number of different reasons (Geiger et al., 2021). At the individual level, these include a low perceived risk of contracting the disease, concerns regarding vaccine safety and effectiveness, heightened in the specific case of COVID-19 by fear of negative side effects related to an expedited approval process (Lin et al., 2021), belief in alternative prevention measures for and/or negative past experiences with health services. For people living with chronic medical conditions, additional barriers to vaccine acceptance include real and perceived contraindications, risks of individual vaccines with respect to specific medical conditions, and a lack of awareness of vaccine recommendations among specialists caring for these patients (Dubé and McDonald, 2022).

Acceptance and refusal of vaccines are also highly context-dependent and should not be reduced to individual factors. Socioeconomic, cultural, and political factors that go a long way in explaining the differential spread of the disease and the success of non-pharmaceutical interventions (Deopa and Fortunato, 2021 and 2022) also influence how people perceive and make decisions about vaccination. According to Douglas and Wildavsky (1982), individuals are embedded in a sociocultural milieu wherein and by which risk is constructed and interpreted. Perception of risk, in turn, affects responses to public health concerns and vaccine attitudes. Relatedly, political ideology, defined as the set of beliefs about the proper order of society, has a strong influence on social behaviors, general value orientations, and risk (Erikson and Tedin, 2003).

Baumgaertner et al. (2018) show that, in the case of the US, political affiliation is an important indicator of how communities respond to public health concerns and vaccination campaigns; more conservative individuals display a generally higher aversion to risk and, therefore, are less likely to vaccinate against preventable diseases than less conservative individuals. This political divide has been exacerbated by the pandemic. COVID-19 has in fact heightened political polarization across the US, where safety guidelines and compliance have varied substantially depending on political orientation, with Republican individuals less likely to follow the Center for Disease Control and Prevention safety guidelines (Patterson, 2022; and Gollwitzer et al., 2020).

Analogously, using national representative surveys, partisanship has been shown to be an important risk factor for getting the COVID-19 vaccine in the US, with conservatives less likely to accept inoculation against COVID-19 (Jones and McDermott, 2021; Dolman et al., 2022). At the county level, the vaccination-rate gap between counties that voted for Biden in 2020 and the ones won by Trump increased nearly six-fold from 2.2 percent to 12.9 percent during the first six months of the vaccination campaign (KFF, 2021). Along the same lines, Ye (2021) shows that the Republican counties had consistently lower average vaccination rates between January 2021 and August 2021 than the Democratic counties and that the gap between the two has grown by month. However, one important limitation of this branch of study is the potential endogeneity of political partisanship since pro-vaccination individuals might be prone to vote for Democratic candidates as they are likely to devote more attention to vaccination programs and other COVID-19 containment measures.

This paper examines the association between political partisanship and vaccination rates at the county level and finds results overall consistent with previous contributions, but it strengthens and complements the existing literature along several lines. Firstly, it extends the time span of analysis up until Summer 2022, to control for potential time non-linearities in vaccine hesitancy related to the successive waves of the pandemic. Secondly, it accounts for different intensities of political partisanship by distinguishing between counties with historically rooted political partisanship and swing counties. Thirdly, it investigates how partisanship interacts with other sociodemographic variables in affecting vaccination attitudes. Finally, and more importantly, it addresses one of the main limitations of previous empirical studies and explores the underlying causes of the association between partisanship and attitudes toward vaccination. We argue that political disparities in the US are built around two important cleavages: universal vs communal values and high vs low social capital, with communal values and low social capital typically associated with the formation of skeptical views on COVID-19 vaccination. The study of these two channels, moral values, and social capital, also allows us to deal with the potential endogeneity issue which generally affects partisanship/vaccination regressions.

The remaining of this paper is organized as follows. We first introduce the methodology utilized in our study; we discuss the data, present some initial descriptive analysis, and outline the empirical strategy employed to uncover the relationship between political partisanship and vaccination, and the role played by underlying values. The second section of the paper presents the main results of our study. The last section offers some concluding remarks and the relevance of our contribution.

2. Methodology

2.1 Data

For this study, we employ data at the county level obtained from different sources. First, the Center for Disease Control and Prevention (CDC) provides daily county-level data on cumulative COVID-19 vaccination rates starting from late December 2020. As the main dependent variable, we consider alternatively the percent of fully vaccinated people (i.e., individuals that have had the second dose of a two-dose vaccine or one dose of a single-dose vaccine) based on the jurisdiction and county where the recipient lives and, as a robustness check, the percent of the total population with at least one dose of vaccine inoculated. We use data from January 2021 to July 2022.

Second, the MIT Election Data and Science Lab provides data at the county level on the total votes collected by each political party in US presidential election held between 2008 and 2020. We use these data to construct several independent variables that we use alternatively in our regressions. A measure of "*rooted partisanship*" which is a categorical variable taking three possible values: safe democratic county if the democrats always won the county in presidential elections over the period 2008-2020; safe republican county if republican always won; and swing county if each of the two parties won the county at least once. A measure of "*partisanship in 2020*": strongly democratic (strongly republican) county if the democrats (republicans) won the county by more than 10 percentage points; and slightly democratic (slightly republican) if the margin of victory was below 10 percent. We also consider the share of votes collected by each party and their ratio.

Third, we draw on Haidt and Joseph (2004) and Graham et al. (2013) to measure the importance of a broad spectrum of values and study what can explain the association between partisanship and vaccination rates in the US. These two seminal papers propose a typology that opposes universalist moral values, based on the notion of care for others and ideas relating to equality, justice, and rights, and that therefore favors bridging between different groups, to communal and more bonding values based on in-group loyalty and respect for the authority more apt to tie up specific groups or relationships. Building on Enke (2020), which provides data on the value scores at the county level for the period 2015-2018, we construct a variable that measures the relative importance of communal versus universalist moral values as the simple difference between the scores of each category and another one which looks at the ratio[‡]. We also gather data on measures of social capital in 2017, which is provided by the U.S. Congress Joint Economic Committee (United States Congress Joint Economic Committee, 2018). The specific variable that we use is an index with several standard components (electoral turnout; response rate to the 2010 census; violent crimes; non-profits per capita; religious congregations per capita; and a family unity subindex). We create a dummy variable taking value 1 if the Social Capital index associated with a specific county has a value in the upper quartile of the distribution and 0 otherwise.

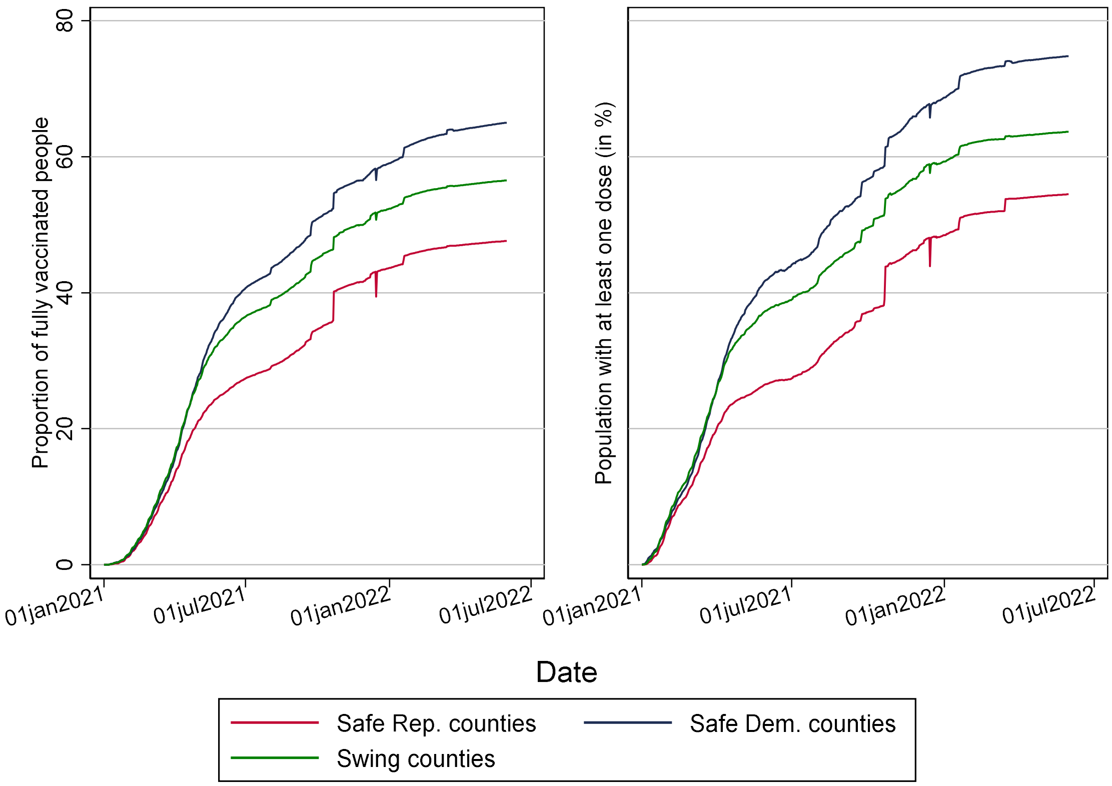
Finally, we add several standard controls which come from various additional sources. Daily cumulative rate of COVID-19 cases and deaths per 1,000 people are provided by the New York Times. Socio-economic data on educational attainments, unemployment, and per capita income come from the USDA's American Community Survey. We also control for county-level demographics and population characteristics such as age structure, race, household size, exposure to the internet, population density, and health insurance coverage extracting data from the US Census and American Community Survey. Data on hospital beds per 1000 people and ICU beds intensive care are sourced from the Healthcare Cost Report Information System (HCRIS) and from an open hospital facilities dataset produced by Definitive Healthcare. All datasets were merged using the five-digit County Federal Information Processing Standard code identifiers.

2.2 Descriptive analysis

Our final sample consists of 3099 counties. With regards to partisanship, 448 of these counties are identified as democratic strongholds, 458 counties as swing counties, and 2193 counties as republican strongholds. Table A1 in the Appendix shows the summary statistics for the variables employed in this study. Figure 1 displays the daily evolution of the proportion of fully vaccinated people and of people who received at least one dose dividing US counties according to our rooted partisanship variable. Safe democratic counties are depicted in blue and safe republican counties are depicted in red while the green line indicates swing counties over the last four presidential elections. Safe democratic counties consistently recorded higher shares of the vaccinated population all along the period and the gap widened over time, especially during 2021. Notice, interestingly, that swing counties lie right in the middle between the two extreme cases.

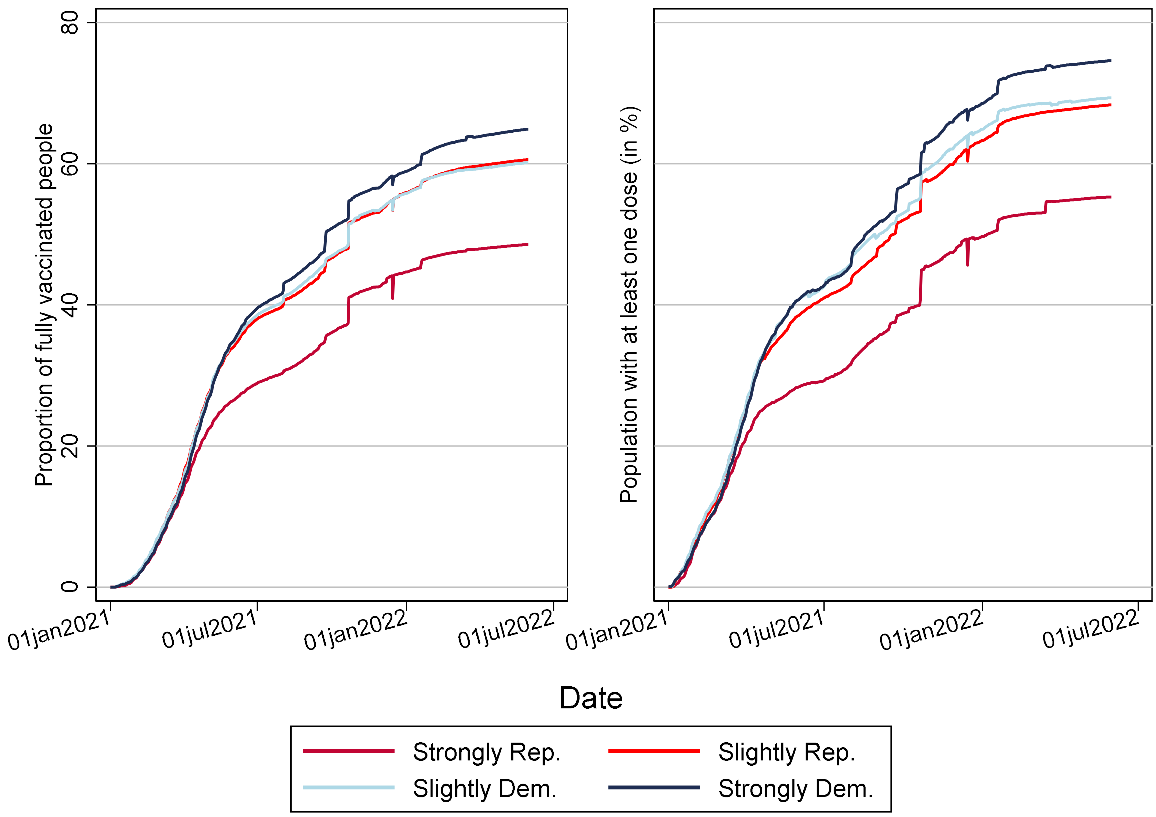
[‡] See Appendix B for a more in-depth description of the indicator.

Figure 1. Daily proportion of fully vaccinated people and people who received at least one dose by 2000-2020 US party partisanship (by *rooted partisanship* values)



Notes: counties are identified as either Safe Democrat or Safe Republican if the party won all 2008-2020 presidential elections. Alternatively, counties are identified as Swing if Democrats and Republicans alternated as the most voted party at least one time over the 2008-2020 presidential elections.

Figure 2. Proportion of fully vaccinated and people who received at least one dose by 2020 US party partisanship (by *partisanship in 2020* values)



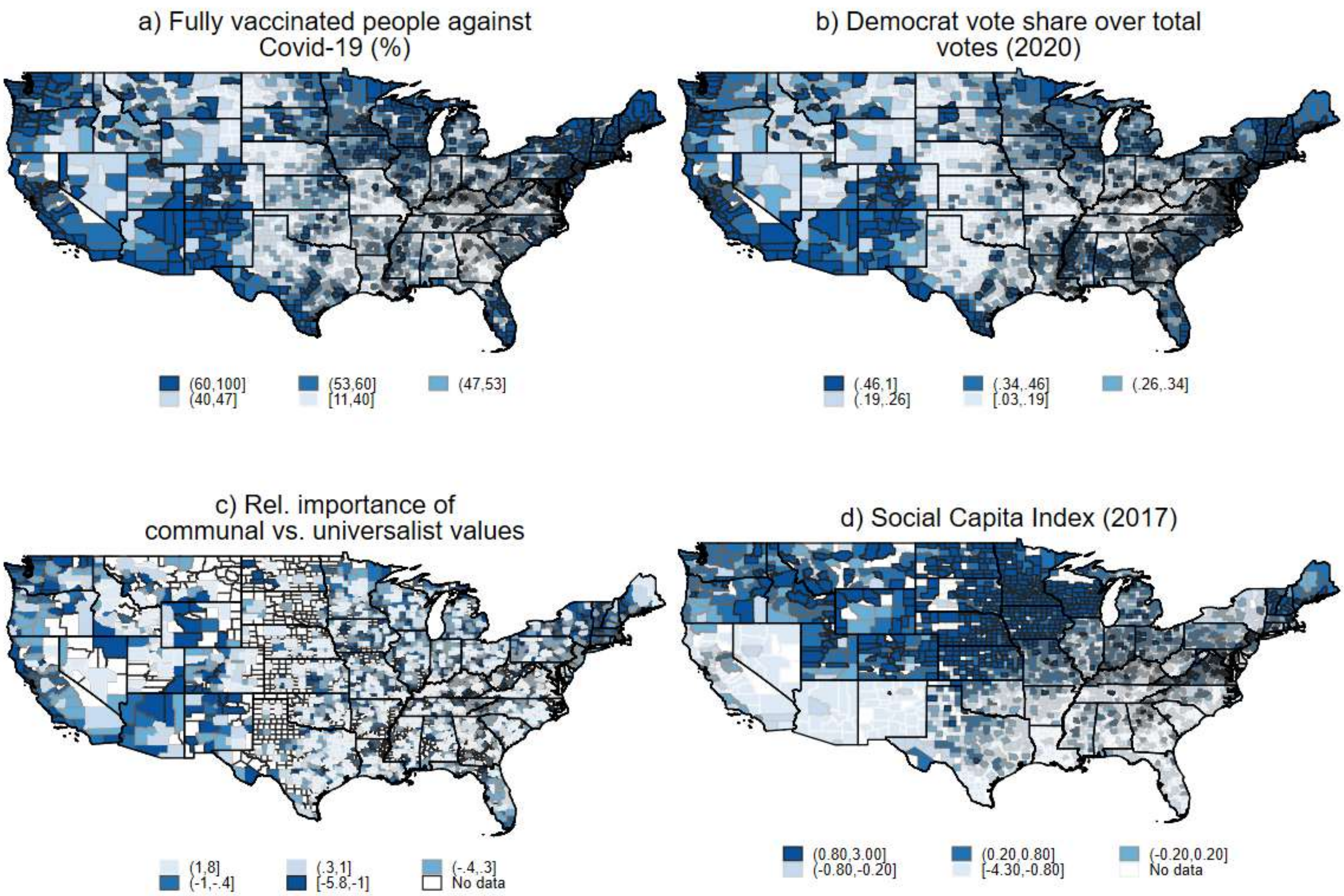
Notes: counties are identified as Strongly Rep. (Dem.) if the party obtained more than 10% votes compared to the second most voted party in the 2020 presidential election. Alternatively, counties are identified as Slightly Rep. (Dem.) if the party won with less than a 10% difference in the county.

We obtain analogous results considering data on partisanship in 2020. As displayed in Figure 2 below, counties that won by the Democratic party in the 2020 presidential election with an ample majority displayed higher vaccination rates all along the observation period with respect to Republican strongholds. Counties won with a lower margin by either of the parties lie in the middle.

Figure 3 below shows the overlap between the vaccination map as it looks in July 2022 (the end of our sample period) and the electoral map for the last presidential election. In Panel (a), darker areas represent counties with higher shares of the population fully vaccinated against COVID-19. Darker areas in Panel (b), in turn, are associated with a higher proportion of votes for the Democratic party in the 2020 presidential election. Those counties achieving higher vaccination rates are the ones where the Democrats collected higher shares of votes.

Figure 3 also reports in Panel (c) the intensity of communal (bonding) values relative to universal (bridging) ones along US counties. Comparing the geographical distribution of values with the voting and the vaccination maps above highlights how the overall high intensity of universal values tends to be associated with higher shares of votes accruing to the democrats. Analogously, the geographical distribution of votes also overlaps with the distribution across counties of the social capital index (Panel (d)), with counties voting for the democratic party displaying on average higher levels of social capital.

Figure 3. Vaccination rate, political ideology, social capital, and moral values in US counties



Notes: All the panels consider county-level data for contiguous United States territories only. White denotes counties with an insufficient number of observations. Break points are chosen at any ventiles.

2.3 Empirical strategy

To identify the effect of partisanship on vaccination outcomes, we estimate the following baseline equation:

$$y_{it} = \alpha + \beta_1 \left(rooted\ partisanship_i \times quarters_q \right) + \beta_2\, cases_{it-7} + \beta_3\, deaths_{it-7} + \theta_i + p_m + state_s \times p_m + \varepsilon_{it}$$

Where y_{it} is the cumulative percent of fully vaccinated people (individuals inoculated with the second dose of a two-dose vaccine or with one dose of a single-dose vaccine) for a given county *i* on day *t*. $rooted\ partisanship_i$ is the categorical measure of partisanship built using data over the period 2008-2020 described above. $quarters_q$ is a vector of dummy variables indicating quarters from 2021Q1 to

2022Q2 (2022Q2 includes only April and May). $cases_{it-7}$ and $deaths_{it-7}$ are respectively the daily cumulative rate of COVID-19 cases and deaths per 1,000 people at the county level (lagged by one week).

Our main coefficient of interest is β_1 on the interaction between $rooted\ partisanship_i$ and $quarters_q$. It captures the differential evolution of vaccination rates in counties with different vote preferences, as a proxy for political partisanship, over the different quarters of the pandemic. The specification includes a rich set of fixed effects; p_m is a set of month fixed effects that account for common time trends such as the information available to all citizens affecting the common evolution of vaccination. The county fixed effects θ_i absorb all differences in the vaccination measure across counties due to time-invariant characteristics. To further strengthen the identification, we include also state-per-month fixed effects. This allows us to control for possible non-linear time trends specific to each state, capturing monthly state variation in compliance measures through the sample period. Finally, α is the constant term and ε_{it} is the stochastic error term. All estimations are conducted with Driscoll and Kraay standard errors (Driscoll and Kraay, 1998; and Hoechle, 2007) or two-way clustering (Thompson, 2011; and Gow et al., 2010) to account for general forms of cross-sectional and temporal dependence.

In the second set of regressions, we add to our baseline specification a series of interaction terms between our measure of partisanship and several socioeconomic indicators at the county level to account for potential heterogeneous effects of political partisanship across different social, economic and racial groups. We interact rooted partisanship with the share of the population with less than a high school diploma, the poverty rate in 2020, the median household income, and the share of minorities in the whole population.

Finally, we introduce in the analysis our measures of communal and universal values and social capital. We investigate the correlation between political preferences, values, and social capital and then the direct association between these latter latent variables and vaccination rates. We show that indeed a substantial part of the variance in vaccination rates across counties is explained by differences in values and patterns of social interactions. We also show that in those counties with particularly high levels of universalism and social capital, the coefficient measuring the impact of political partisanship on vaccination rates loses significance.

Robustness checks include the use of weekly and monthly data (rather than quarterly) to control for potential noise in the time-variant variables and check whether the impact changes with the time unit selected; the introduction of "percent of total pop with at least one dose" as a key dependent variable to control for the fact that some people might feel safe enough with just one dose; the use of several different proxies for political preferences to test whether the results are driven by the specific independent variable of interest's specification employed; the introduction of month fixed effects; and the use as the dependent variable of the total number of people 65+ who are fully vaccinated to test whether there are some differences when we restrict the analysis to the older share of the population. Furthermore, since the beginning of the vaccination campaign was not homogenous in the US, we replicate the baseline estimation after having time-centered and normalized the data around the date of vaccine introduction which typically changes across states.

3. Results

3.1 Political partisanship and COVID-19 vaccination rate

The regression analysis results in Table 1 show the associations between political partisanship and vaccination rates, after controlling for the health and socio-economic confounding variables described above. Models 1 and 2 use respectively state and week two-way cluster robust standard errors while Model

3 employs Driscoll-Kray standard errors to account for strong cross-sectional dependence. Overall, the regression coefficients of the interaction terms between our rooted partisanship dummy and the quarter dummies are negative and strongly significant suggesting that vaccination rates have been consistently lower in swing counties than in Democratic strongholds, and even lower in Republican strongholds.

3.2 Socioeconomic interactions

Table 2 collects the results of a series of regressions that build on our baseline model and add several additional interaction terms to examine how the impact of political partisanship on vaccination varies with socioeconomic conditions.

Model (4) introduces as an additional control the proportion of the population without a high school diploma. Not surprisingly, the estimated effects of the interaction term between our (low) education measure and quarter dummies on vaccination rates are always negative and significant implying that vaccination rates have been consistently lower in relatively low-educated counties. The estimated coefficients of the triple interactions between education, political partisanship, and quarter dummies are instead always positive suggesting that the two negative effects on vaccination rates (i.e., not being democratic and not being educated) tend to reinforce each other.

Panel a in Figure 4 uses the results of the first column in Table 2 to plot the predictive margins of political partisanship on vaccination rates at different levels of education. The horizontal axis measures variations in the percentage of the population that did not attain a high school diploma. Not surprisingly, the average marginal effect of partisanship to the Democratic Party on vaccination is always higher than the effect of republican partisanship independently on the level of education. Interestingly, however, the relative difference between the two effects progressively reduces as education decreases and eventually disappears, suggesting that political preferences matter less on vaccination attitudes when the population is low educated.

We obtain analogous results when controlling for the portion of the population below the poverty line in 2020 (Model 5). The estimated effects of the interaction term between our (high) poverty measure and quarter dummies on vaccination rates are always negative and significant implying that vaccination rates have been consistently lower in relatively poor counties, while the estimated coefficients of the triple interactions between poverty, political partisanship, and quarter dummies are always positive suggesting that the two negative effects on vaccination rates (i.e., not being democratic and being poor) reinforce each other. Furthermore, when looking at the marginal effects, we observe that the differential impact of democratic partisanship on vaccination rates wanes as the share of the population under the poverty rate increases (Figure 4, panel b).

Regression 1. Regressing the proportion of the fully vaccinated population over time (quarters) on the 2008-2020 US party partisanship

	(1) Fully vaccinated people (%)	(2) Fully vaccinated people (%)	(3) Fully vaccinated people (%)
Swing * 2021q2	-1.920***	-2.109***	-2.109***
	(0.705)	(0.672)	(0.204)
Swing * 2021q3	-4.298***	-4.672***	-4.672***
	(1.058)	(0.925)	(0.062)
Swing * 2021q4	-5.537***	-5.862***	-5.862***
	(0.953)	(0.897)	(0.056)
Swing * 2022q1	-6.247***	-6.434***	-6.434***
	(1.055)	(1.063)	(0.041)
Swing * 2022q2	-6.576***	-6.806***	-6.806***
	(1.050)	(1.024)	(0.028)
Safe rep * 2021q2	-4.403***	-4.806***	-4.806***
	(0.900)	(0.842)	(0.330)
Safe rep * 2021q3	-8.110***	-8.804***	-8.804***
	(1.266)	(1.028)	(0.098)
Safe rep * 2021q4	-10.206***	-10.902***	-10.902***
	(1.160)	(1.068)	(0.109)
Safe rep * 2022q1	-11.574***	-12.193***	-12.193***
	(1.452)	(1.347)	(0.064)
Safe rep * 2022q2	-12.118***	-12.739***	-12.739***
	(1.499)	(1.388)	(0.044)
L7.Total case rate per	0.021**	0.039***	0.039***
	(0.009)	(0.012)	(0.001)
L7.Total death rate per	-1.488***	-0.822***	-0.822***
	(0.316)	(0.292)	(0.029)
Constant	40.910***	-49.855	
	(1.497)	(1046.083)	
Observations	1574758	1259727	1259727
R-squared	0.957	0.890	0.301
County FE	Yes	No	No
State FE	No	Yes	Yes
Month FE	Yes	Yes	Yes
State x Month FE	Yes	Yes	Yes
Health + economic controls	No	Yes	Yes

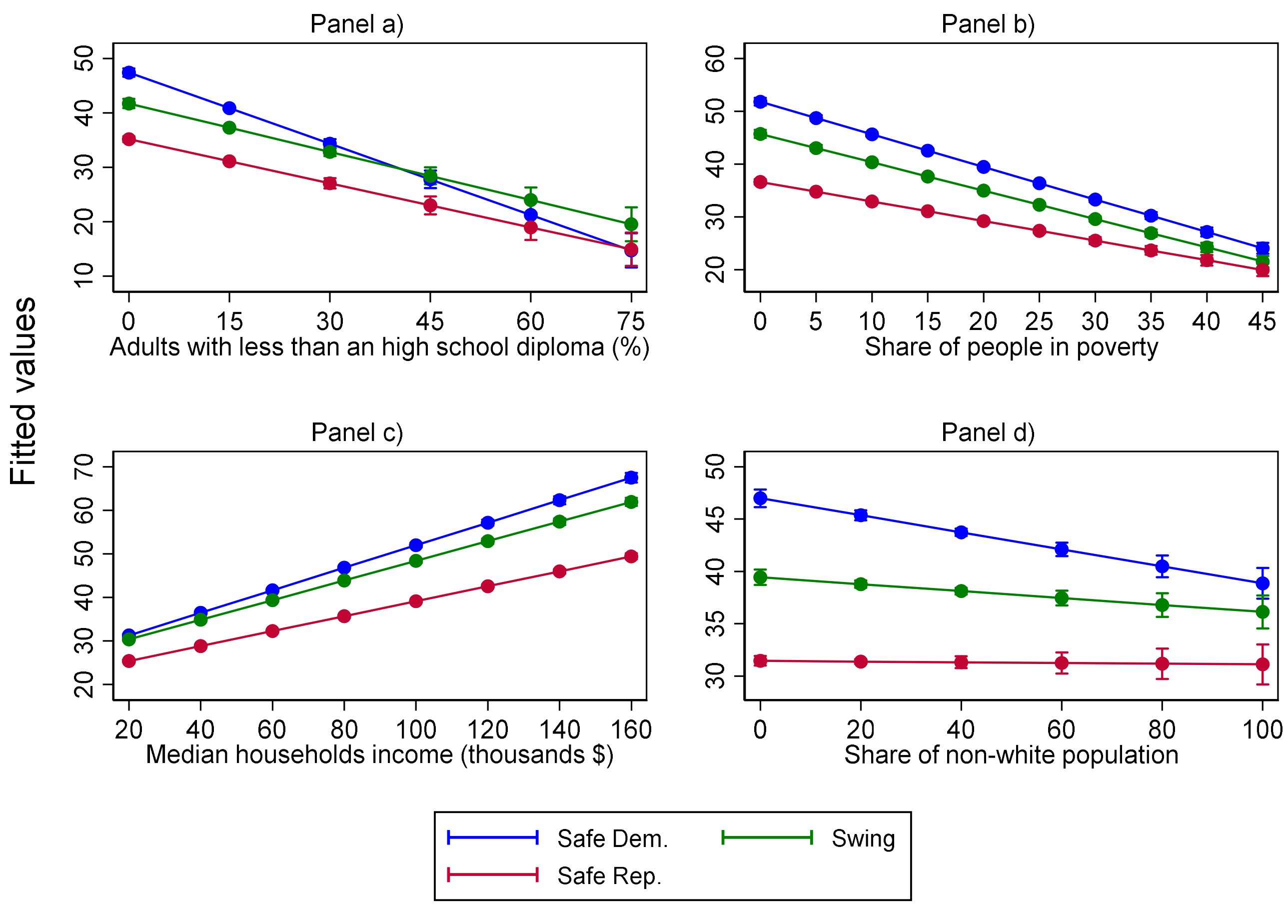
Models 1 and 2 use two-way cluster robust standard errors (state and week). Model 3 uses Driscoll-Kraay standard errors to account for strong cross-sectional dependence. Health and economic controls include the unemployment rate, poverty rate, median income, the proportion of people with less than a high school diploma, population density, the proportion of people with internet subscriptions, the proportion of people older than 65 years old, the proportion of minorities, proportion of people with health insurance, health insurance rate number of hospital beds of all types per 1000 people. Robust standard errors are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 2. The diversified impact of 2008-2020 political partisanship by socio-economic factors on the proportion of the fully vaccinated population over time (quarters).

	Model (4)	Model (5)	Model (6)	Model (7)
Socio-economic variable:	% less than high school diploma	Poverty rate	Median income	% of non-white population
Quarter * Socio-economic variable				
2021q2	-0.813***	-0.626***	0.210***	-0.205***
	(0.058)	(0.055)	(0.019)	(0.015)
2021q3	-1.279***	-1.067***	0.369***	-0.315***
	(0.021)	(0.012)	(0.004)	(0.004)
2021q4	-0.656***	-0.900***	0.331***	-0.158***
	(0.062)	(0.016)	(0.006)	(0.014)
2022q1	-0.345***	-0.772***	0.307***	-0.078***
	(0.023)	(0.014)	(0.004)	(0.006)
2022q2	-0.231***	-0.711***	0.291***	-0.043***
	(0.019)	(0.011)	(0.005)	(0.004)
Rooted partisanship * Quarter * Socio-economic variable				
Swing * 2021q2	0.100***	-0.071***	-0.065***	-0.043***
	(0.020)	(0.015)	(0.004)	(0.007)
Swing * 2021q3	0.320***	0.099***	-0.097***	0.033***
	(0.012)	(0.015)	(0.004)	(0.007)
Swing * 2021q4	0.200***	0.131***	-0.036***	0.096***
	(0.015)	(0.012)	(0.007)	(0.007)
Swing * 2022q1	0.119***	0.167***	0.004	0.112***
	(0.011)	(0.010)	(0.004)	(0.006)
Swing * 2022q2	0.059***	0.176***	0.014***	0.105***
	(0.008)	(0.010)	(0.004)	(0.006)
Safe rep * 2021q2	0.217***	0.173***	-0.117***	-0.014
	(0.029)	(0.028)	(0.009)	(0.009)
Safe rep * 2021q3	0.462***	0.421***	-0.193***	0.050***
	(0.008)	(0.011)	(0.003)	(0.007)
Safe rep * 2021q4	0.193***	0.303***	-0.093***	0.140***
	(0.026)	(0.014)	(0.010)	(0.013)
Safe rep * 2022q1	0.059***	0.301***	-0.060***	0.162***
	(0.010)	(0.008)	(0.005)	(0.007)
Safe rep * 2022q2	-0.017***	0.260***	-0.033***	0.145***
	(0.005)	(0.007)	(0.003)	(0.007)
L7.Total case rate per 1000 people	0.004*	0.004	0.003	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)
L7.Total death rate per 1000 people	-1.324***	-0.646***	-0.071	-1.197***
	(0.129)	(0.152)	(0.197)	(0.194)
Constant	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
Observations	1574758	1574758	1574758	1574758
Within R-squared	0.8649	0.8598	0.8602	0.8706

All the models use Driscoll-Kraay standard errors to account for strong cross-sectional dependence. The models also include month-fixed effects and county-fixed effects. The socio-economic variables employed are % less than high school education for model (4), poverty rate for model (5), median income for model (6), and share of non-white population for model (7). Regressions have been run with the Stata command *xtscc*. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 4. Predictive margins of rooted partisanship with 95% of Confidence Intervals



Note: Calculation from Table 2, Models 4-7. The predictive margins are plotted with 95 percent confidence intervals.

The results of Model 6, which includes among the regressors also the median household income, mirror those of Model 5 as household income is negatively correlated with poverty rates. The interaction term between median income and quarter dummies on vaccination rates turn out to be always positive and significant implying that vaccination rates have been consistently higher in richer counties. Furthermore, as shown in Figure 4 panel c, the difference between democratic and republican counties seems to be more evident in relatively richer counties (i.e., the income effect complements the partisanship effect). Finally, Model 7 examines the role of racial minorities in explaining vaccination rates. The results highlight how the presence of a large share of racial minorities in the population is invariably associated with declining rates of vaccination. Even controlling for racial minorities does not affect our key result on partisanship. The higher the share of racial minorities, however, the lower the difference between democratic and republican counties. In fact, vaccination rates in republican strongholds are almost unaffected by the share of minorities while in democratic strongholds the presence of large minorities seems to discourage vaccination (Figure 4 panel d).

3.3 The role of moral values and social capital

The results of the previous section prove the existence of a strong association between political partisanship and vaccination rates, an association that turns out to be extremely robust to the introduction of several socioeconomic controls. One important limitation of our regression strategy is that the underlying causes of this association remain unexplored. We try to address this issue here by explicitly introducing in our regression analysis a proxy of the type of value diffused and a variable measuring social capital at the county level. We study how these relate to political preferences and vaccination attitudes. As discussed above, we construct a variable that measures the relative importance of communal (bonding) moral values versus universalist (bridging) values and we employ the social capital index produced by U.S. Congress Joint Economic Committee. Table 3 below shows that both the diffusion of universal values and social capital are highly correlated with a higher share of votes collected by the Democratic party in the 2020 presidential elections while the opposite hold for universalist values and low social capital. As a consequence, also our variable measuring the relative importance of communal vs universalist values is positively correlated with the republican vote shares.

Table 3. Pairwise correlations for variables of major interest

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) Fully vaccinated people (%)	1.000					
(2) Long-run county partisanship (2008-20)	-0.521	1.000				
(3) Rep votes/Dem votes (2020)	-0.583	0.515	1.000			
(4) Rep. votes share (2020)	-0.669	0.821	0.792	1.000		
(5) Rel. importance of communal vs universalist values (2015-18)	-0.188	0.212	0.195	0.242	1.000	
(6) Social Capita Index	0.023	0.183	0.229	0.248	-0.022	1.000

Table 4 below reports the results of a series of regressions gauging the impact of moral values and social capital on the share of fully vaccinated individuals over time. It shows that, all along the sample period, they have both been strongly associated with vaccination rates. Counties characterized by the diffusion of universal values (column 1) and by high social capital (column 2) have displayed on average higher vaccination rates in all the quarters examined in the study. The results hold also when considering both the independent variables in the same framework (column 3). In fact, the estimated coefficients in the third column of the table are of a higher magnitude than in the previous two. Moral values and social capital might particularly matter in vaccination compliance when they are observed at their extreme values, that is when we look at communities displaying extremely low levels of care and fairness, as well as low levels of social capital. In Table 5 we test this hypothesis. More particularly, we replicate the baseline regression after subsetting the sample based on the upper quartile of moral values (columns 1 and 2) and the lower quartile of the Social Capital Index (columns 2 and 3). Interestingly, in counties displaying very high levels of universalism and social capital the effect of partisanship on the vaccination rate loses significance. Indeed, the coefficient for the dummy variable on republican strongholds remains negative and significant only when considering high social capital counties in a specification without county-fixed effects. These results suggest that moral values and social capital can at least partly explain the results on the association between political preferences and vaccination attitude object of the first part of this paper and previous contributions.

Table 4. The impact of moral values and social capital on the proportion of the fully vaccinated population over time

	(1) Fully vaccinated people (%)	(2) Fully vaccinated people (%)	(3) Fully vaccinated people (%)
Rel. importance of communal vs universalist values * Quarter			
2021Q2	-0.488***		-0.503***
	(0.129)		(0.127)
2021Q3	-0.775***		-0.796***
	(0.149)		(0.145)
2021Q4	-0.798***		-0.817***
	(0.149)		(0.148)
2022Q1	-0.893***		-0.915***
	(0.138)		(0.136)
2022Q2	-0.860***		-0.881***
	(0.129)		(0.125)
L7.Total case rate per 1000 people	0.039***	0.017**	0.040***
	(0.011)	(0.007)	(0.011)
L7.Total death rate per 1000 people	-3.566***	-2.177***	-3.500***
	(0.513)	(0.357)	(0.494)
Social Capital Index (upper quartile=1) * Quarters			
2021Q2		1.099***	2.023***
		(0.396)	(0.460)
2021Q3		0.735	2.607***
		(0.635)	(0.660)
2021Q4		-0.015	2.168***
		(0.815)	(0.693)
2022Q1		-0.178	2.491***
		(0.894)	(0.782)
2022Q2		-0.207	2.355***
		(0.871)	(0.792)
Constant	38.465***	37.072***	37.758***
	(1.637)	(1.340)	(1.577)
Observations	1025102.000	1574758.000	1025102.000
R-squared	0.959	0.952	0.959
County FE	Yes	Yes	Yes
State FE	No	No	No
Month FE	Yes	Yes	Yes
State x Month FE	Yes	Yes	Yes
Health and economic controls	No	No	No

All three models use two-way cluster robust standard errors (state and week). Health and economic controls include the unemployment rate, poverty rate, median income, proportion of people with less than a high school diploma, population density, proportion of people with internet subscription, the proportion of people older than 65 years old, proportion of minority, the proportion of people with health insurance, health insurance rate number of hospital beds of all types per 1000 people. Robust standard errors are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5. The impact of political partisanship on vaccination rate for communities with low levels of moral values and social capita

	(1) Fully vaccinated people (%)	(2) Fully vaccinated people (%)	(3) Fully vaccinated people (%)	(4) Fully vaccinated people (%)
Swing	0.000	2.020**	0.000	2.498***
	(.)	(0.944)	(.)	(0.434)
Safe rep	0.000	1.602	0.000	3.364***
	(.)	(1.016)	(.)	(0.672)
Swing * 2021q2	0.097	0.598	-2.185**	-2.370**
	(0.923)	(1.090)	(0.982)	(0.979)
Swing * 2021q3	-0.857	-0.184	-4.051***	-4.083***
	(1.301)	(1.456)	(1.302)	(1.232)
Swing * 2021q4	-2.799*	-1.904	-5.292***	-5.178***
	(1.451)	(1.623)	(0.986)	(1.067)
Swing * 2022q1	-3.974**	-2.400	-5.667***	-5.855***
	(1.918)	(2.090)	(1.068)	(1.310)
Swing * 2022q2	-4.479**	-3.202	-5.876***	-6.123***
	(1.995)	(1.944)	(1.125)	(1.396)
Safe rep * 2021q2	-2.404**	-2.132*	-3.851***	-4.245***
	(1.002)	(1.147)	(0.972)	(1.030)
Safe rep * 2021q3	-4.162***	-3.779**	-6.886***	-7.364***
	(1.504)	(1.600)	(1.503)	(1.540)
Safe rep * 2021q4	-7.146***	-6.733***	-9.622***	-9.964***
	(1.792)	(1.748)	(1.522)	(1.728)
Safe rep * 2022q1	-9.105***	-8.034***	-11.381***	-11.864***
	(2.562)	(2.341)	(1.899)	(2.182)
Safe rep * 2022q2	-10.099***	-9.139***	-12.022***	-12.552***
	(2.665)	(2.272)	(2.018)	(2.312)
L7.Total case rate per 1000	0.010	0.049***	0.039***	0.022*
people	(0.010)	(0.016)	(0.009)	(0.012)
L7.Total death rate per 1000	-0.588**	-0.516	-1.463**	-0.287
people	(0.246)	(0.307)	(0.595)	(0.434)
Constant	35.822***	-840.805	35.233***	2337.078**
	(2.206)	(1183.376)	(2.562)	(1008.755)
Observations	807194.000	590400.000	374107.000	317099.000
R-squared	0.950	0.867	0.956	0.894
County FE	Yes	No	Yes	No
State FE	No	Yes	No	Yes
Month FE	Yes	Yes	Yes	Yes
State x Month FE	Yes	Yes	Yes	Yes
Health and economic controls	No	Yes	No	Yes

Analysis in models 1 and 2 are run over the upper quartile of moral values, while analyses in models 3 and 4 are run over the lower quartile of the Social Capital Index. Models 1 and 2 use two-way cluster robust standard errors (state and week). Health and economic controls include unemployment rate, poverty rate, median income, the proportion of people with less than a high school diploma, population density, proportion of people with internet subscription, the proportion of people older than 65 years old, proportion of minority, proportion of people with health insurance, health insurance rate number of hospital beds of all types per 1000 people. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

That the specific combination of moral values that characterize the Republican electorate might explain their relative hesitancy to participate in the vaccination program is very much in line with recent literature that highlights the importance of behavioral norms, values, and social capital during the COVID-19 pandemic (Brodeur et al., 2021, Borgonovi and Andrieu, 2020, and Durante et al. 2021). Studying the impact of moral values and social capital, rather than of political partisanship, on vaccination rates also allows us to solve the endogeneity problem which potentially affects the validity of any estimate gauging the impact of political preferences on vaccination attitudes. One can argue that the causal relationship is not univocal; individuals with skeptical attitudes towards vaccine inoculation might have well expressed republican preferences during the latest presidential election *because* this party was less keen to force people into vaccination programs rather than the other way around.

3.4 Robustness

To confirm the role played by political partisanship, values, and social capital and emphasize the differences observed amongst US counties, as first robustness check, we first re-estimate our baseline specification using a dataset aggregated weekly and monthly (rather than quarterly) to control for potential noise in the time-variant variables and to see whether the impact is dependent on the time unit selected. All the results are confirmed (see Table A2 in the Appendix).

We further check whether our results are robust to changes in the proxies chosen for vaccination attitudes and political preferences. In our second robustness check, we replace our dependent variable with the percentage of the total population with at least one dose inoculated, to control for the fact that some people might feel safe enough with just one dose. Then we restrict our attention to the elderly and consider fully vaccinated individuals over 65 years old (Table A3 in the Appendix). We also introduce different proxies for political preferences, considering our measure for partisanship in the 2020 election (see data description above) and the ratio between the share of votes collected by republicans and democrats. This has the additional advantage of focusing the scope of our analysis on the latest electoral round employing the most recent observations on political preferences. Once again, the results remain unaffected in all the different specifications (see Table A4 in the Appendix).

To test whether our results are driven by the specific time unit selected and whether using more fragmented time units we remain able to detect the impact of vote preferences on vaccination rate over time, we interact different time units with the independent variable (see Table A5 in the Appendix). The beginning of the vaccination campaign was not homogenous across US states for several reasons (e.g., some states faced delays in the vaccine supply). To control for this time heterogeneity, we replicate our baseline estimation after having time-centered and normalized the data around the date of vaccine introduction. The unit of observation remains the county. We also consider the logarithm of the number of people vaccinated to alleviate problems coming from the skewness of the data and potential outliers (see Table A6 in the Appendix). Finally, as an additional check on the potential endogeneity of political preferences, we exclude the latest elections and re-estimate the baseline regression with the rooted partisanship variable ranging only between 2008-2016. Results are overall comparable to those of the baseline estimation (see Table A7 in the Appendix).

4. Discussion

This paper examines how vaccine hesitancy in the US has been associated with political preferences since the introduction of the SARS-COV2 vaccination in the early 2021 program till the end of July 2022. We show that all along the vaccination program republican strongholds consistently show lower vaccination rates (for each one of the subperiods in the sample) than democratic strongholds while swing counties lie in the middle between the two. We also show that the effect of political partisanship on vaccination has a heterogeneous effect across different social, economic and racial groups.

While our results confirm by and large the findings of the growing literature on the topic, the time span of observation is much longer than in previous contributions. This dispels any concern that the association emerging from the data is (at least partly) driven by the exceptional conditions that characterized the early stages of the vaccination program. Furthermore, by accounting explicitly for differences in the timing and intensity of vaccination campaign across states and the potential endogeneity of political preferences to the vaccination stances of the political parties, our paper innovates and complement the existing literature.

Finally, we do not limit our attention to the association between political preferences and attitudes toward vaccination, but we make a step further. We investigate the reasons behind this association. Our results suggest that it is the specific configuration of values that characterize republican constituencies (i.e., the relative prevalence of communal and bonding values), and the (associated) relative lack of social capital, that explain why entrenched republican counties consistently display an aversion to vaccination.

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Appendix A

Table A1. Descriptive statistics of the study variables, Democratic and Republican counties

	(1) All counties Mean (SD)	(2) Democrat counties Mean (SD)	(3) Republican counties Mean (SD)
Fully vaccinated people (%)	51.512	64.287	47.557
	(12.181)	(13.483)	(9.854)
65+ vaccinated (%)	79.205	86.328	76.453
	(11.884)	(9.864)	(11.731)
Rel. importance of communal vs universalist values (2015-2018)	-0.064	-0.551	0.091
	(1.138)	(0.824)	(1.187)
Social Capital Index	0.004	-0.573	0.076
	(1.004)	(1.179)	(0.926)
Total case rate per 1000 people	251.789	243.306	253.542
	(59.276)	(58.199)	(61.536)
Total death rate per 1000 people	3.813	3.095	4.063
	(1.601)	(1.784)	(1.539)
Population in thousands, 2016-20	104.667	369.619	49.047
	(333.903)	(742.735)	(86.540)
Population density (people per square km)	106.276	490.415	33.683
	(699.661)	(1775.506)	(61.383)
= 1 if county is metro	0.374	0.636	0.321
	(0.484)	(0.482)	(0.467)
Adults with less than an high school diploma in % (2016-20)	12.448	12.634	12.821
	(6.038)	(7.159)	(5.711)
Adults with a bachelor degree or higher in % (2016-20)	22.573	31.386	20.526
	(9.702)	(14.143)	(7.394)
Unemployment rate (2021)	4.613	5.853	4.304
	(1.698)	(2.098)	(1.499)
Percent of people in poverty (2020)	13.751	15.588	13.622
	(5.405)	(7.644)	(4.791)
Median household income (thousands $)	57.304	62.416	55.873
	(14.499)	(22.019)	(12.437)
Prop HH with an internet subscription	0.790	0.804	0.784
	(0.082)	(0.113)	(0.075)
Median age	41.586	38.752	42.020
	(5.440)	(5.389)	(5.209)
White population (%)	82.131	62.514	85.686
	(16.419)	(22.531)	(11.819)
Black population (%)	9.125	22.873	6.769
	(14.522)	(24.424)	(10.130)
Hispanic population (%)	9.617	15.220	8.757
	(13.989)	(20.382)	(12.124)

HH with health insurance (%)	99.904	99.905	99.900
	(0.050)	(0.057)	(0.049)
Observations	3099	448	2193

Notes: mean coefficients; sd in parentheses; statistics for daily variables (Fully vaccinated people (%), 65+ vaccinated (%), total cases rate, and total deaths rate) are computed for the day 31 May 2022. Columns (2) and (3) refer to strongly Democrat and strongly Republican counties respectively.

Table A2. - Weekly and monthly aggregation for time-variant data (robustness check 1)

	(1) Weekly	(2) Weekly dkraay	(3) Monthly	(4) Monthly dkraay
Swing * 2021q2	-1.790**	-1.971***	-2.541***	-2.785***
	(0.693)	(0.517)	(0.852)	(0.666)
Swing * 2021q3	-4.285***	-4.668***	-4.435***	-4.858***
	(1.063)	(0.161)	(0.933)	(0.237)
Swing * 2021q4	-5.493***	-5.851***	-5.544***	-6.000***
	(0.957)	(0.127)	(0.868)	(0.097)
Swing * 2022q1	-6.188***	-6.391***	-6.184***	-6.486***
	(1.058)	(0.105)	(0.946)	(0.152)
Swing * 2022q2	-6.524***	-6.762***	-6.459***	-6.778***
	(1.052)	(0.067)	(0.959)	(0.083)
Safe rep * 2021q2	-4.232***	-4.622***	-5.247***	-5.738***
	(0.901)	(0.863)	(1.119)	(1.114)
Safe rep * 2021q3	-8.156***	-8.877***	-8.177***	-8.929***
	(1.272)	(0.253)	(1.071)	(0.419)
Safe rep * 2021q4	-10.191***	-10.957***	-10.106***	-11.021***
	(1.169)	(0.263)	(1.255)	(0.306)
Safe rep * 2022q1	-11.548***	-12.203***	-11.347***	-12.125***
	(1.446)	(0.166)	(1.376)	(0.297)
Safe rep * 2022q2	-12.101***	-12.751***	-11.774***	-12.531***
	(1.494)	(0.103)	(1.450)	(0.247)
Total case rate per 1000 people	0.019**	0.039***	0.011*	0.038***
	(0.009)	(0.001)	(0.006)	(0.003)
Total death rate per 1000 people	-1.557***	-0.836***	-1.769***	-0.878***
	(0.313)	(0.075)	(0.390)	(0.142)
Constant	41.156***		44.064***	
	(1.633)		(1.291)	
Observations	228945.000	183144.000	52581.000	42058.000
R-squared	0.958	0.207	0.967	0.223
County FE	Yes	No	Yes	No
State FE	No	Yes	No	Yes
Month FE	Yes	Yes	Yes	Yes
State x Month FE	Yes	Yes	Yes	Yes
Health and economic controls	No	Yes	No	Yes

Dataset is aggregated weekly (columns 1 and 2) and monthly (columns 3 and 4) to control for potential noise in the time-variant variables and to see whether the impact is dependent on the time unit selected. The rest of the model is identical at the baseline. Models 1 and 3 have been conducted with multi-clustering (by state and week). Models 2 and 4 have been conducted with Driscoll-Kraay standard errors to account for strong cross-sectional dependence. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A3 – Political partisanship, share of the population with at least one dose inoculated and fully vaccinated individuals over 65 years old (robustness checks 2-3**)**

	(1) Pop with at least one Dose (%) (daily)	(2) Pop with at least one Dose (%) (weekly)	(3) 65+ fully vaccinated (%)
Swing * 2021q2	-3.323***	-3.209***	-1.392
	(0.890)	(0.879)	(0.851)
Swing * 2021q3	-5.408***	-5.438***	-2.146**
	(1.147)	(1.144)	(0.938)
Swing * 2021q4	-6.770***	-6.772***	-3.278***
	(0.993)	(0.991)	(0.614)
Swing * 2022q1	-7.559***	-7.554***	-3.212***
	(1.064)	(1.061)	(0.676)
Swing * 2022q2	-7.832***	-7.823***	-3.433***
	(1.015)	(1.009)	(0.630)
Safe rep * 2021q2	-6.358***	-6.221***	-4.070***
	(1.059)	(1.050)	(1.039)
Safe rep * 2021q3	-9.389***	-9.454***	-5.172***
	(1.390)	(1.381)	(1.131)
Safe rep * 2021q4	-11.963***	-11.995***	-6.684***
	(1.302)	(1.307)	(0.734)
Safe rep * 2022q1	-13.419***	-13.460***	-6.441***
	(1.615)	(1.600)	(0.889)
Safe rep * 2022q2	-13.706***	-13.731***	-6.642***
	(1.611)	(1.596)	(0.824)
L7.Total case rate per 1000	0.025***	0.024***	0.018*
people	(0.009)	(0.009)	(0.010)
L7.Total death rate per 1000	-1.734***	-1.781***	-0.505
people	(0.359)	(0.351)	(0.357)
Constant	46.840***	47.683***	60.960***
	(1.573)	(1.596)	(1.443)
Obs	1569767.000	225072.000	1574758.000
R2	0.941	0.943	0.954
County FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
State x Month FE	Yes	Yes	Yes
Health and economic controls	No	No	No

2022q2 includes April and May only. All models have been conducted with multi-clustering (by state and week) to account for strong cross-sectional dependence. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A4 – Alternative proxies for political preferences and COVID-19 vaccination rate (robustness check 4)

	Model (1)	Model (2)	Model (3)	Model (4)
Slightly rep *2021q2	-1.839**	-2.349***		
	(0.763)	(0.166)		
Slightly rep *2021q3	-3.507***	-4.474***		
	(1.093)	(0.059)		
Slightly rep *2021q4	-4.179***	-5.052***		
	(1.002)	(0.034)		
Slightly rep *2022q1	-4.318***	-5.197***		
	(1.119)	(0.018)		
Slightly rep *2022q2	-4.493***	-5.321***		
	(1.064)	(0.012)		
Strongly rep * 2021q2	-4.410***	-4.887***		
	(0.896)	(0.350)		
Strongly rep * 2021q3	-8.236***	-9.056***		
	(1.222)	(0.092)		
Strongly rep * 2021q4	-10.203***	-11.084***		
	(1.115)	(0.110)		
Strongly rep * 2022q1	-11.626***	-12.422***		
	(1.375)	(0.058)		
Strongly rep * 2022q2	-12.125***	-12.909***		
	(1.440)	(0.040)		
L7.Total case rate per 1000	0.020**	0.039***	0.018***	0.030***
people	(0.009)	(0.001)	(0.005)	(0.001)
L7.Total death rate per 1000	-1.379***	-0.803***	-1.440***	-0.676***
people	(0.304)	(0.028)	(0.334)	(0.029)
2021q2 * prop repdem2020			-0.954***	-1.273***
			(0.319)	(0.075)
2021q3 * prop repdem2020			-1.599***	-2.187***
			(0.516)	(0.026)
2021q4 * prop repdem2020			-2.198***	-2.827***
			(0.332)	(0.034)
2022q1 * prop repdem2020			-2.532***	-3.176***
			(0.271)	(0.016)
2022q2 * prop repdem2020			-2.577***	-3.292***
			(0.299)	(0.014)
Constant	41.079***		39.701***	
	(1.450)		(0.958)	
Obs	1574758	1259727	1574758	1259727
R2	0.957	0.195	0.959	0.337
COUNTY FE	YES	NO	YES	NO
STATE FE	NO	YES	NO	YES
STATE x Month FE	YES	YES	YES	YES
Month FE	YES	YES	YES	YES
Health + economic controls	NO	YES	NO	YES

Dep. variable: Fully vaccinated people (%). 2022q2 includes April and May only. Models 1 and 3 have been conducted with multi-clustering (by state and week). Models 2 and 4 have been conducted with Driscoll-Kraay standard errors to account for strong cross-sectional dependence. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A5 – Regressing the proportion of the fully vaccinated population over time (months) on the 2008-2020 US party partisanship (robustness check 5**)**

	(1) Fully vaccinated people (%)	(2) Fully vaccinated people (%)	(3) Fully vaccinated people (%)
Swing # 2021m2	0.162	0.169	0.169***
	(0.133)	(0.144)	(0.021)
Swing # 2021m3	0.337***	0.340	0.340***
	(0.104)	(0.238)	(0.014)
Swing # 2021m4	-0.208	-0.239	-0.239**
	(0.308)	(0.435)	(0.100)
Swing # 2021m5	-1.875**	-2.089***	-2.089***
	(0.707)	(0.716)	(0.140)
Swing # 2021m6	-3.131***	-3.440***	-3.440***
	(0.922)	(0.890)	(0.072)
Swing # 2021m7	-3.673***	-3.988***	-3.988***
	(1.006)	(0.949)	(0.022)
Swing # 2021m8	-4.209***	-4.595***	-4.595***
	(1.129)	(1.030)	(0.038)
Swing # 2021m9	-4.486***	-4.895***	-4.895***
	(1.125)	(1.028)	(0.026)
Swing # 2021m10	-4.975***	-5.289***	-5.289***
	(0.988)	(0.956)	(0.069)
Swing # 2021m11	-5.386***	-5.703***	-5.703***
	(0.944)	(0.935)	(0.013)
Swing # 2021m12	-5.720***	-6.044***	-6.044***
	(1.056)	(1.043)	(0.029)
Swing # 2022m1	-5.828***	-6.053***	-6.053***
	(1.114)	(1.125)	(0.016)
Swing # 2022m2	-6.115***	-6.211***	-6.211***
	(1.079)	(1.158)	(0.023)
Swing # 2022m3	-6.274***	-6.487***	-6.487***
	(1.080)	(1.120)	(0.037)
Swing # 2022m4	-6.365***	-6.613***	-6.613***
	(1.079)	(1.093)	(0.016)
Swing # 2022m5	-6.436***	-6.632***	-6.632***
	(1.088)	(1.098)	(0.015)
Safe rep # 2021m3	-0.124	-0.124	-0.124***
	(0.172)	(0.138)	(0.019)
Safe rep # 2021m4	-0.494**	-0.554*	-0.554***
	(0.197)	(0.294)	(0.055)
Safe rep # 2021m5	-2.137***	-2.297***	-2.297***
	(0.473)	(0.564)	(0.217)
Safe rep # 2021m6	-4.979***	-5.455***	-5.455***
	(0.839)	(0.792)	(0.204)
Safe rep # 2021m7	-6.759***	-7.401***	-7.401***
	(1.079)	(0.978)	(0.111)
Safe rep # 2021m8	-7.635***	-8.296***	-8.296***
	(1.188)	(1.051)	(0.041)
Safe rep # 2021m9	-8.466***	-9.189***	-9.189***
	(1.375)	(1.168)	(0.053)
Safe rep # 2021m10	-8.928***	-9.694***	-9.694***
	(1.369)	(1.171)	(0.046)
Safe rep # 2021m11	-9.711***	-10.364***	-10.364***

	(1.084)	(1.045)	(0.125)
Safe rep # 2021m12	-10.534***	-11.197***	-11.197***
	(1.238)	(1.197)	(0.027)
Safe rep # 2022m1	-11.069***	-11.896***	-11.896***
	(1.416)	(1.339)	(0.061)
Safe rep # 2022m2	-11.383***	-12.081***	-12.081***
	(1.512)	(1.406)	(0.024)
Safe rep # 2022m3	-11.906***	-12.441***	-12.441***
	(1.461)	(1.428)	(0.040)
Safe rep # 2022m4	-12.143***	-12.810***	-12.810***
	(1.489)	(1.443)	(0.039)
Safe rep # 2022m5	-12.289***	-12.960***	-12.960***
	(1.517)	(1.457)	(0.026)
Safe rep # 2022m6	-12.415***	-13.017***	-13.017***
	(1.554)	(1.474)	(0.025)
L7.Total case rate per 1000 people	0.021**	0.039***	0.039***
	(0.009)	(0.012)	(0.001)
L7.Total death rate per 1000 people	-1.475***	-0.820***	-0.820***
	(0.318)	(0.292)	(0.029)
Constant	41.002***	-49.041	
	(1.441)	(1045.827)	
Observations	1574758.000	1259727.000	1259727.000
R-squared	0.957	0.890	0.303
County FE	Yes	No	No
State FE	No	Yes	Yes
Month FE	Yes	Yes	Yes
State x Month FE	Yes	Yes	Yes
Health and economic controls	No	Yes	Yes

Models 1 and 2 use two-way cluster robust standard errors (state and week). Model 3 uses Driscoll-Kraay standard errors to account for strong cross-sectional dependence. Health and economic controls include the unemployment rate, poverty rate, median income, proportion of people with less than a high school diploma, population density, the proportion of people with internet subscriptions, the proportion of people older than 65 years old, the proportion of minorities, proportion of people with health insurance, health insurance rate number of hospital beds of all types per 1000 people. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A6 – Time-centered vaccination campaign and log of vaccinated people (robustness checks 6 and 7)

	(1) Fully vaccinated people (%)	(2) Fully vaccinated people (%)	(3) ln(Total number of fully vaccinated people)	(4) ln(Total number of fully vaccinated people)
Swing * 2021q2	-2.285***	-2.412***	-0.038	-0.001
	(0.624)	(0.254)	(0.024)	(0.028)
Swing * 2021q3	-4.856***	-5.094***	-0.086***	-0.050**
	(0.886)	(0.135)	(0.023)	(0.024)
Swing * 2021q4	-5.786***	-6.154***	-0.131***	-0.108***
	(0.790)	(0.134)	(0.032)	(0.023)
Swing * 2022q1	-6.344***	-6.721***	-0.134***	-0.118***
	(0.803)	(0.119)	(0.029)	(0.021)
Swing * 2022q2	-6.674***	-7.085***	-0.143***	-0.103***
	(0.787)	(0.142)	(0.033)	(0.025)
Safe rep * 2021q2	-4.626***	-5.093***	-0.078**	-0.035
	(0.780)	(0.345)	(0.026)	(0.035)
Safe rep * 2021q3	-8.652***	-9.311***	-0.144***	-0.103***
	(0.955)	(0.145)	(0.026)	(0.029)
Safe rep * 2021q4	-9.907***	-11.002***	-0.185***	-0.188***
	(0.879)	(0.168)	(0.048)	(0.031)
Safe rep * 2022q1	-10.912***	-12.200***	-0.189***	-0.195***
	(0.906)	(0.168)	(0.046)	(0.028)
Safe rep * 2022q2	-11.453***	-12.731***	-0.200***	-0.176***
	(0.895)	(0.238)	(0.051)	(0.034)
Constant	42.230***		9.009***	
	(1.053)		(0.054)	
Observations	1438542.000	1162144.000	1437354.000	1161429.000
R-squared	0.961	0.325	0.983	0.535
County FE	Yes	No	Yes	No
State FE	No	Yes	No	Yes
Month FE	Yes	Yes	Yes	Yes
State x Month FE	Yes	Yes	Yes	Yes
Health and economic controls	No	Yes	No	Yes

All models replicate the baseline estimation after having time-centered and normalized the data around the date of vaccine introduction. Models 1 and 3 use two-way cluster robust standard errors (state and week). Models 2 and 4 use Driscoll-Kraay standard errors to account for strong cross-sectional dependence. Health and economic controls include unemployment rate, poverty rate, median income, the proportion of people with less than a high school diploma, population density, proportion of people with internet subscription, proportion of people older than 65 years old, the proportion of minorities, the proportion of people with health insurance, health insurance rate number of hospital beds of all types per 1000 people. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A7 – Regressing the proportion of the fully vaccinated population over time (quarters) on the 2008-2016 US party partisanship (robustness check 8)

	(1) Fully vaccinated people (%)	(2) Fully vaccinated people (%)	(3) Fully vaccinated people (%)
Swing * 2021q2	-1.852**	-2.012***	-2.012***
	(0.708)	(0.683)	(0.204)
Swing * 2021q3	-4.199***	-4.510***	-4.510***
	(1.072)	(0.968)	(0.061)
Swing * 2021q4	-5.770***	-5.946***	-5.946***
	(0.929)	(0.874)	(0.077)
Swing * 2022q1	-6.593***	-6.633***	-6.633***
	(1.098)	(1.052)	(0.044)
Swing * 2022q2	-6.935***	-7.035***	-7.035***
	(1.150)	(1.066)	(0.034)
Safe rep * 2021q2	-4.262***	-4.635***	-4.635***
	(0.886)	(0.836)	(0.317)
Safe rep * 2021q3	-7.832***	-8.469***	-8.469***
	(1.267)	(1.056)	(0.095)
Safe rep * 2021q4	-9.988***	-10.564***	-10.564***
	(1.116)	(1.021)	(0.109)
Safe rep * 2022q1	-11.339***	-11.829***	-11.829***
	(1.428)	(1.307)	(0.064)
Safe rep * 2022q2	-11.901***	-12.404***	-12.404***
	(1.486)	(1.357)	(0.044)
L7.Total case rate per 1000 people	0.020**	0.039***	0.039***
	(0.009)	(0.012)	(0.001)
L7.Total death rate per 1000 people	-1.529***	-0.844***	-0.844***
	(0.320)	(0.291)	(0.029)
Constant	40.916***	-5.408	
	(1.495)	(1055.951)	
Observations	1574758	1259727	1259727
R-squared	0.956	0.856	0.300
County FE	Yes	No	No
State FE	No	Yes	Yes
Month FE	Yes	Yes	Yes
State x Month FE	Yes	Yes	Yes
Health and economic controls	No	Yes	Yes

Models 1 and 2 use two-way cluster robust standard errors (state and week). Model 3 uses Driscoll-Kraay standard errors to account for strong cross-sectional dependence. Health and economic controls include unemployment rate, poverty rate, median income, proportion of people with less than high school diploma, population density, proportion of people with internet subscription, proportion of people older than 65 years old, proportion of minority, proportion of people with health insurance, health insurance rate number of hospital beds of all types per 1000 people. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix B

To measure the importance of a broad spectrum of values, Haidt and Joseph (2004) and Graham et al. (2013) developed a new positive framework of morality, that is, the Moral Foundations Theory (MFT). MFT is drew on the idea that people's moral values can be partitioned into five "foundations":

1. Care/harm: measures the extent to which people care for the weak and attempt to keep others from harm.
2. Fairness/reciprocity: measures the importance of ideas relating to equality, justice, rights, and autonomy.
3. In-group/loyalty: measures people's emphasis on being loyal to the "in-group" (family, country) and the moral relevance of betrayal.
4. Authority/respect: measures the importance of respect for authority, tradition, and societal order.
5. Purity/sanctity: measures the importance of ideas related to purity, disgust, and traditional religious attitudes.

Based on Moral Foundations Theory and Enke (2020), we construct our indicator of moral values as the simple difference between communal and universalist values:

The relative importance of communal values = Communal values – Universalist values
= (In-group + Authority) – (Care + Fairness)

Importantly, the harm/care and fairness/reciprocity dimensions correspond to universalist moral values. For example, the fairness principle requires that people be fair, not that they be fair only to their neighbors. On the other hand, in-group/loyalty and authority/respect are tied to certain groups or relationships. In what follows, the fifth foundation is ignored because "divine" values are not directly related to the distinction between universalist and communal ones.