Trump vs. the GOP: Political Determinants of COVID-19 Vaccine Hesitancy *

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Abstract

This study examines the relationship between Trumpism and COVID-19 vaccination in the US. We find that counties with greater Trump support show lower COVID-19 vaccination rates. However, this relationship is beyond the effects of Republican partisanship. The distinctive effects of Trumpism are further validated through falsification and placebo exercises. To address potential endogeneity, we suggest an instrumental variable (IV) strategy based on online search behavior before the rise of Trump. The IV estimates confirm the negative link between Trump support and COVID-19 vaccination, which is conditional on the partisan divide or conservative orientation. As a mechanism, we provide evidence that distrust in science increased to a greater degree in counties that voted for Trump in 2016 more than they did for Romney in 2012. Moreover, we do not find comparable results in places with an increase in Republican partisanship or conservatism. These results substantiate that the Trump effect on COVID-19 responses is not attributable to the general political climate.

Keywords: COVID-19, Trump, Vaccination, Partisanship
JEL classification: H12, H75, I12, J18

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1 Introduction

"There is a huge political divide..... The top 22 states (including D.C.) with the highest adult vaccination rates all went to Joe Biden in the 2020 presidential election..... Some of the least vaccinated states are the most pro-Trump."

NPR news on June 9 in 2021

Individuals' political beliefs affect their perceptions and thus behaviors.[1] In particular, during the COVID pandemic, political beliefs can affect health risk perception among individuals and, consequently, their decisions and behaviors, which can then impact others'. Obviously, this can lead to different public health outcomes in a community even given the same risks. For this reason, understanding how political beliefs affect risk perception is critical in designing and implementing public health policies. During the recent COVID-19 pandemic, risk perceptions and responses have been of significant interest not only to policy makers, but also to academics for this reason.

Social interests have focused more on the effects of partisan differences between Republicans and Democrats on their attitudes toward public health policies against COVID-19, such as mask use, social distancing, or vaccination. In line with empirical studies on this topic such as Barrios and Hochberg (2020) and Engle et al. (2020), some critics argue that the leadership of President Trump has weakened compliance with public health measures against COVID-19. For instance, Paul Krugman stated in his column in the New York Times that "He wasn't oblivious to the danger. He just didn't care" (Krugman, 2020b).[2]

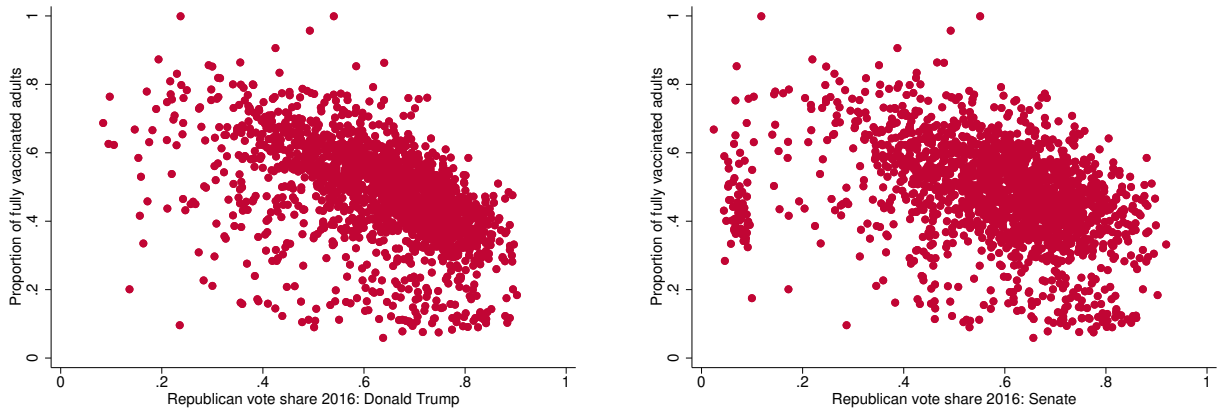
However, it has not been clearly analyzed whether the relationship between Trump support and passive responses to the COVID-19 pandemic can be distinguished from the effects of Republican partisanship. For instance, Figure 1 shows county-level correlations between the proportion of fully vaccinated adults aged 18 or over and the vote shares of Trump and the Republican party in the 2016 presidential and Senate elections. Despite a few outliers with low vote shares in Panel (b), the vote shares display almost identical negative correlations with COVID-19 vaccination, suggesting a difficulty in differentiating the effects of support for Trump and for the Republican party on COVID-19 responses.

This study distinguishes Trump support and Republican partisanship, and we investigate how support for Trump or *Trumpism* affects responses to the pandemic, particularly

[1] There is a large literature about the effect of political beliefs. Among others, the effects on economic perceptions and behaviors include Gerber and Huber (2010), Prior et al. (2015), McConnell et al. (2018), Bartels (2002), Baker et al. (2020), and Hassan et al. (2020).

[2] There obviously exist opposing views. Republican Steve Scalise, for example, introduced in Fox News a report by the select Republican subcommittee arguing that "Trump actions on coronavirus saved hundreds of thousands of lives."

Figure 1: COVID-19 Vaccination and Republican vote shares



(a) Trump vote share

(b) Senate vote share

focusing on vaccine hesitancy.[3] This approach differs from previous studies in the sense that we investigate the effects of Trump's leadership beyond partisanship or partisan differences between Republicans and Democrats.

Using county-level COVID-19 vaccination data from the Centers for Disease Control and Prevention (CDC), we find that Trump vote share in 2016 is negatively associated with COVID-19 vaccination rate. In particular, this relationship is attributable to not only Republican partisanship. Even conditional on the Republican vote share in the Senate election, additional support for Trump predicts significantly lower vaccination rate. Falsification and placebo exercises using different elections strengthen the interpretation that the negative link between Trumpism and COVID-19 vaccination is distinct from the partisan divide.

To address potential endogeneity, we propose an IV based on online search behavior from Google Trends data. Our identification strategy hinges on the claim that an emphasis on American identity is a key characteristic that distinguishes Trumpism from traditional conservatism (Korostelina, 2016; Cha, 2016; Schertzer and Woods, 2021). In this context, we use search interest in the term "American" relative to "United States" in 2014, the period before the rise of Trump, to instrument the Trump vote share in 2016 across metropolitan areas. Consistent with the intuitions of the IV strategy, the relative search interest in the term "American" turns out as a good predictor of Trump support, while it does not show a significant association with Senate Republican vote share. Also, the IV estimates confirm the negative link between Trump support and COVID-19 vaccination

[3]Trumpism refers to political beliefs that support a set of social mechanisms for President Trump and his political base. For the purpose of this paper, we use the term Trumpism broadly to refer to both the leadership of Trump and the rise of Trump support.

rate.

Despite extensive evidence across counties and metropolitan areas, cross-sectional analyses are limited to illustrate whether COVID-19 vaccine hesitancy emerged as a result of Trumpism or is merely rooted in inherent regional characteristics. Since it is not possible to compare attitudes toward COVID-19 before and after Trump, we instead consider changes in public opinion on climate science as of the rise of Trumpism for two reasons. First, the Trump administration took analogous approaches to climate change and the COVID pandemic. Second, beliefs about science can shape pandemic-related attitudes (Safford et al., 2021). In these views, we can infer that if there were any changes in trust in climate science tied to Trump support, they would have implications on COVID-related attitudes in a consistent direction. Our results indicate that distrust in climate science increased by a greater degree in counties with greater Trump support, but this relationship is not explained by changes in Republican partisanship or conservative orientation.

Our findings propose a novel perspective on the recent works about political factors in COVID-19 responses. A series of studies claims that Republican partisanship induced passive behaviors and decisions against COVID-19 risk, such as less social distancing or lower mask use (Allcott et al., 2020; Barrios and Hochberg, 2020; Gollwitzer et al., 2020; Painter and Qiu, 2021; Fridman et al., 2021). However, an important limitation of these studies is that they do not separate Trump support and Republican partisanship conceptually, in spite of their heterogeneous contexts and implications.[4] In contrast, by differentiating support for Trump and that for the Republican party, this paper shows that Trumpism had distinct effects on COVID-19 vaccination, conditional on Republican partisanship.

Moreover, our findings move closer to a causal interpretation. Since previous works rely on cross-sectional or survey-based ordinary least squares (OLS) regressions, addressing endogeneity is limited, even with a host of controls. In this regard, we suggest an IV strategy that alleviates concerns about potential confounders. Also, by examining temporal changes in distrust in science, we corroborate that COVID-19 vaccine hesitancy does not reflect inherent local nature, but is a phenomenon that arose from Trumpism,

More generally, our study adds to the literature on the effects of partisan differences on agents' attitudes and behaviors in nonpolitical environments. Among others, Bartels (2002), Gerber and Huber (2010), and Prior et al. (2015) find that partisanship can affect formation of economic perceptions and, thus, evaluation of the economy. Similarly, McConnell et al. (2018) claim that partisan differences can lead to different economic

[4]Kaushal et al. (2021) is an exception as they incorporate Trumpism and partisanship for their analyses, but their approaches and results are not analogous to ours. Section 2 discusses the differences in more detail.

choices in labor and goods markets. Given that this study differentiates the effects of Trumpism and those of partisanship, future studies might be extended to the effects of individual leadership on agent's attitudes and behaviors beyond partisan differences.

The remainder of this paper is organized as follows. Section 2 reviews related studies on COVID-19 and responses to it. In Section 3, we investigate the cross-sectional relationship between Trump support and COVID-19 vaccination, and Section 4 discusses its mechanism. Section 5 concludes.

2 Related Literature on COVID-19

Since the pandemic began, numerous studies on COVID-19 and responses to it have been reported in a short period of time. Though we summarized related works above briefly, a more detailed discussion of the studies on COVID is necessary to outline current understanding and to clarify the contribution of this paper.

Our study builds on the literature on the effects of political ideologies on COVID-19 responses. Using Google Health Trends data, Barrios and Hochberg (2020) show that counties with a higher proportion of Trump voters performed less searches about COVID-19, and suggest a consistent pattern from social distancing data provided by Unacast. Based on GPS data from smartphones, Allcott et al. (2020) and Gollwitzer et al. (2020) argue that Trump vote share in 2016 predicts lower compliance with social distancing. Painter and Qiu (2021) complement the findings above from an alternative data source. Exploiting debit card transaction data, they show that the higher is the Trump vote share, the lower is the compliance with state orders.

Despite different data sources for measuring COVID-19 responses, a common feature of the studies mentioned above is that the 2016 US presidential election outcome is used to measure county-level political preference: the Trump vote share is interpreted as support for the Republican party. However, considering unique characteristics of Trumpism, it can be problematic to simply adopt Trump vote share as a proxy for partisanship or conservatism. In this study, we employ various estimation strategies to analyze the effects of Trumpism beyond partisan differences, and the results suggest their heterogeneous effects on COVID-19 vaccination.

Survey-based analyses can be an alternative approach. For example, Pennycook et al. (2021) conducted surveys in the US, Canada, and the UK, and show that conservatism with strong political polarization is closely related to lower perceptions on COVID-19 risk, and lower vaccination intentions because of weak analytical thinking. From a longitudinal survey of US residents, Fridman et al. (2021) analyze the difference between

self-identified Democrats and Republicans in vaccine attitudes and intentions, indicating one's willingness of getting a vaccine when one becomes available.

Among others, Kaushal et al. (2021) is most closely related to our study in that they try to compare individual attitudes toward COVID-related issues depending both on partisanship and Trump support. Based on survey-based analyses, it is argued that both Republican and Non-Republican Trump supporters display similar negative responses to COVID-related issues. However, as there is no significant difference identified between Trump supporters and opponents, their results are limited to elucidate distinct effects of Trumpism. In contrast, our study differentiates Republicans and Trump supporters with heterogeneous implications on attitudes toward the COVID-19 pandemic. Moreover, we substantiate the heterogeneity in diverse aspects such as an IV strategy or changes in distrust in science.

Some other recent studies have addressed questions related to cultural factors in responses to the COVID-19 pandemic. Bazzi et al. (2021) argue that total frontier experience of each county, which indicates the time spent on the frontier between 1790 and 1890, explains less active social distancing and lower mask use mainly due to the prevalence of individualism. Similarly, Chen (2021) documents that strong individualism is associated with lower compliance with social distancing regulation, but in the US, this relationship can be reversed by the degree of public perception of COVID-19 as a severe threat. In terms of political culture, Ananyev et al. (2021) examine negative effects of one mass media outlet in the US, Fox News, on public containment efforts during the COVID-19 pandemic. The authors argue that greater exposure to Fox News led to less reduction in traveling and smaller increase in the possibility of complying with stay-at-home requirements. Interpreting Trumpism in part as a cultural phenomenon (e.g. Inglehart and Norris, 2016; Gelfand et al., 2016; Noland, 2020), our study contributes to this body of literature.

3 Trump Support and COVID-19 Vaccine Hesitancy

This section explores the cross-sectional relationship between Trump support and COVID-19 vaccination. The OLS estimates indicate that COVID-19 vaccination rate is negatively associated with Trump vote share in 2016, and that this relationship exists above and beyond the partisan divide. Using an IV strategy based on online search behavior, we confirm that the negative link between Trump support and vaccination is not confounded by alternative factors. The OLS and IV estimates are robust to additional controls and show similar patterns with different outcome variables.

3.1 County-Level Evidence: OLS Estimates

3.1.1 Data and Estimating Equation

Our cross-sectional estimations follow Equation 1. The outcome variable is Vaccination$_c$, which indicates the proportion of fully vaccinated individuals aged 18 and over.[5] As shown in Figure 2, COVID-19 vaccination rates vary significantly across counties. In particular, the spatial distribution is not restricted to the divide between red and blue states. In our estimations, we focus on within-state variations conditional on state-level political orientation.

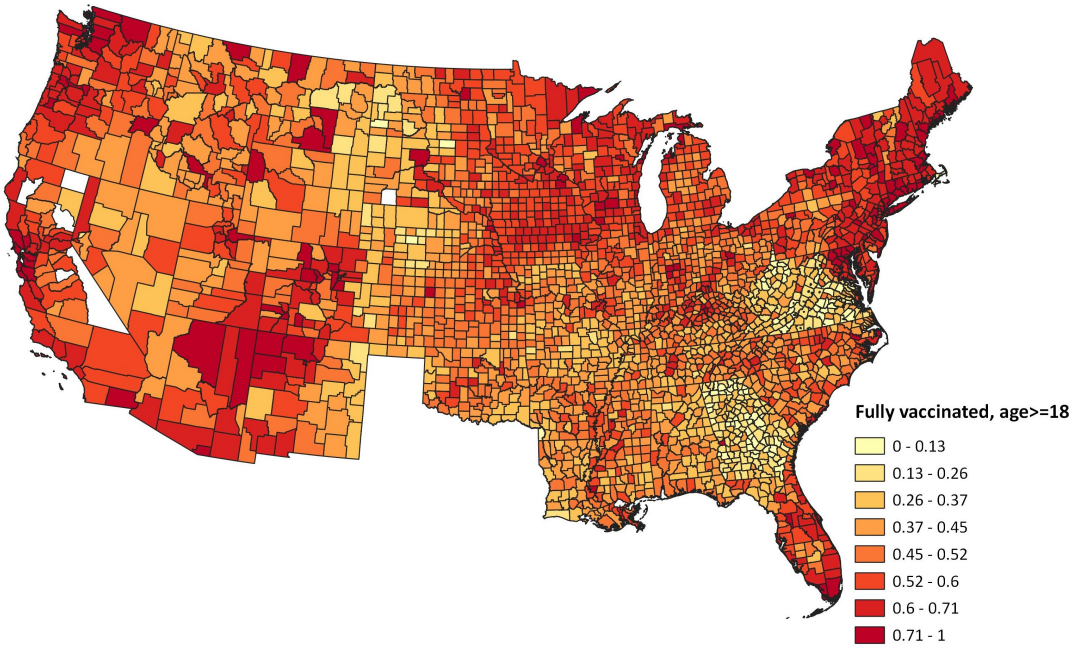
$$\text{Vaccination}_c = \alpha + \beta \text{ Vote Share}_c + \gamma_1' \boldsymbol{X}_{geo,c} + \gamma_2' \boldsymbol{X}_{socio,c} + \delta_s + \epsilon_c \tag{1}$$

Vote Share$_c$ is the variable of interest based on Republican vote shares in different elections. $\boldsymbol{X}_{geo,c}$ is a vector of geographic controls including county area, latitude, longitude, average temperature, and rainfall. The equation also controls for socioeconomic conditions $\boldsymbol{X}_{socio,c}$, which might affect political orientation and COVID-19 vaccination rates simultaneously. The controls consist of population density; per capita income; Gini index of household income inequality; proportions of whites, males, elderly, college graduates, and natives; and changes in manufacturing employment share. To avoid endogeneity, we use the socioeconomic conditions measured before onset of the Trump phenomenon.[6] δ_s indicates state fixed effects, and the standard error ϵ_c is clustered at the state-level.

[5] Fully vaccinated people denote those who have received the second dose in a two-dose COVID-19 vaccines or one dose of single-shot vaccine. The results are strongly robust to different age cutoffs.

[6] The static variables are obtained from the 2010-2014 American Community Survey (ACS) estimates. The changes in share of manufacturing employment are calculated between 2000 and 2014.

Figure 2: The proportion of people fully vaccinated against COVID-19



Note: The map shows the proportion of people aged 18 or over who are fully vaccinated against COVID-19. Data is from Centers for Disease Control and Prevention.

3.1.2 OLS Results

Table 1 reproduces the correlations illustrated in Figure 1. The first explanatory variable is the Trump vote share in the 2016 election, and Columns (1) and (2) show its strong negative association with COVID-19 vaccination rate. Identical patterns are observed with the Republican vote share in the 2016 Senate election, as shown in Columns (3) and (4). The sample counties for the presidential and Senate elections are not matched due to different electoral districts, but this does not affect the correlations. Columns (5) and (6) indicate that the OLS estimates of the Trump vote share change little when the sample counties are matched with those for the Senate election.

Table 1: Support for Trump and the GOP, and COVID-19 vaccination rates: OLS estimates

Dep. var: Proportion of fully vaccinated population aged ≥18 years						
	(1)	(2)	(3)	(4)	(5)	(6)
Trump vote share, 2016	-0.411***	-0.349***			-0.424***	-0.405***
	(0.053)	(0.055)			(0.045)	(0.035)
Republican vote share, Senate 2016			-0.449***	-0.282***		
			(0.054)	(0.042)		
R-squared	0.61	0.66	0.62	0.72	0.66	0.74
N	2829	2828	1854	1853	1854	1853
Geographic controls	Y	Y	Y	Y	Y	Y
Socioeconomic controls	N	Y	N	Y	N	Y
State fixed effects	Y	Y	Y	Y	Y	Y

Notes: The table shows standardized OLS estimates. Robust standard errors clustered at the state-level are shown in parentheses. The outcome variable is the proportion of the population aged 18 years and older who received full COVID-19 vaccination.

Beyond simple correlations, Table 2 tries to distinguish variations in COVID-19 vaccination due to Trump support from those based on the partisan divide. In Columns (1) and (2), we control for the Republican vote share in the Senate election and the Trump-GOP gap (Trump vote share−Republican vote share in the Senate election) simultaneously. If the correlation between Trump support and COVID-19 vaccination rate is in essence attributable to partisanship, then the coefficient of the Trump-GOP gap would not be significant. However, despite the negative estimates of the Republican vote share in the Senate election, the Trump-GOP gap variable is still strongly associated with a lower vaccination rate. According to Column (2), a one standard deviation higher Trump-GOP gap is associated with 0.44 standard deviations lower vaccination rate. Alternatively, conditional on the Senate Republican vote share, 1% additional votes for Trump to the Senate election predicts a 0.5% lower vaccination rate. This suggests that the negative link between Trump support and COVID-19 vaccination is not only a consequence of partisanship, but involves unique features of Trumpism.

This interpretation is strengthened by falsification tests in Columns (3) and (4) where we control for the Trump vote share and include the GOP-Trump gap (Republican vote share in the Senate election−Trump vote share). The falsification results are not comparable with the baseline estimates. Conditional on the Trump vote share, the GOP-Trump gap is not tied to COVID-19 vaccination rate, and even shows a positive correlation when socioeconomic controls are excluded. This suggests that, while the simple correlations are

almost identical, the Trump effects dominate the partisanship effects.

Table 2: Trump support and COVID-19 vaccine hesitancy: OLS estimates conditional on the GOP vote share

Dep. var: Proportion of fully vaccinated population aged ≥18 years						
	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline		Falsification		Placebo	
Trump-GOP gap, 2016	-0.551***	-0.436***				
	(0.076)	(0.072)				
Republican vote share, Senate 2016	-0.396***	-0.429***				
	(0.056)	(0.036)				
GOP-Trump gap, 2016			0.239**	0.098		
			(0.091)	(0.069)		
Trump vote share, 2016			-0.357***	-0.387***		
			(0.050)	(0.033)		
Romney-GOP gap, 2012					-0.229**	-0.037
					(0.103)	(0.072)
Republican vote share, Senate 2012					-0.409***	-0.275***
					(0.094)	(0.077)
R-squared	0.67	0.74	0.67	0.74	0.56	0.63
N	1854	1853	1854	1853	1599	1599
Geographic controls	Y	Y	Y	Y	Y	Y
Socioeconomic controls	N	Y	N	Y	N	Y
State fixed effects	Y	Y	Y	Y	Y	Y

Notes: The table shows standardized OLS estimates. Robust standard errors clustered at the state-level are shown in parentheses. The outcome variable is the proportion of the population aged 18 years and older who received full COVID-19 vaccination.

A potential concern for the interpretation above is whether presidential and Senate elections differ in their characteristics. For example, if presidential elections are more ideologically motivated than Senate elections, the negative estimate of the Trump-GOP gap might not identify the uniqueness of the Trump phenomenon, but merely capture ideological differences in vaccination rates. To address this issue, we conduct placebo exercises in Columns (5) and (6) which reproduce the baseline estimates using the 2012 presidential and Senate elections. Contrary to the baseline specifications, the Romney-GOP gap is not strongly tied to COVID-19 vaccination. While its coefficient is negative in Column (5), controlling for socioeconomic conditions negates the correlation. In contrast, the Republican vote share in the Senate shows a strong negative correlation with the

vaccination rate.[7]

3.2 Metro-Level Evidence: IV Estimates

3.2.1 IV Strategy Based on Google Trends

Despite the various specifications to address endogeneity, omitted variables cannot be completely eliminated. To alleviate concerns about potential omitted variables, this section proposes an IV strategy based on online search behavior.

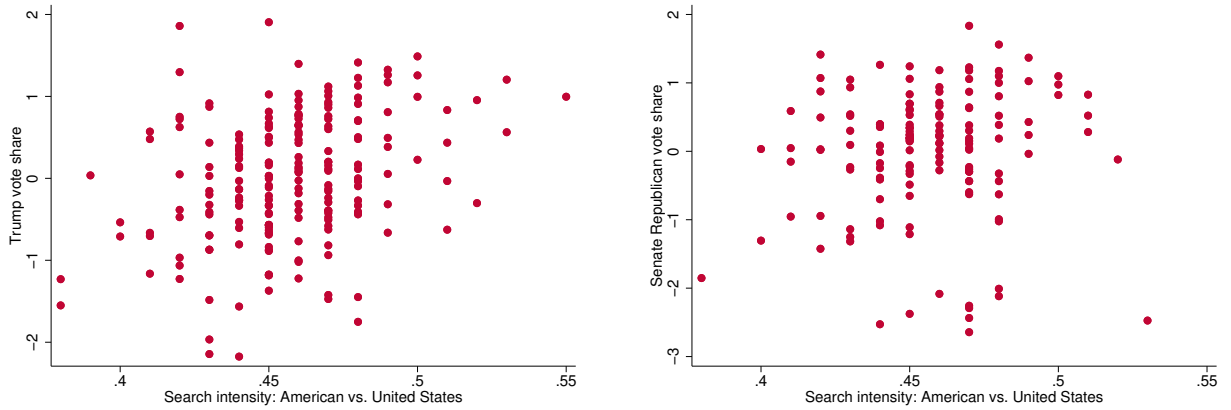
Our identification rests on the arguments that the emphasis on American identity is the distinguishing factor that separates the Trump phenomenon from existing conservatism (Korostelina, 2016; Cha, 2016; Schertzer and Woods, 2021). Trump declared that "Americanism, not globalism, will be our credo" at the 2016 Republican National Convention on July 21, and American national identity was always at the center of Trumpism, as expressed by slogans like "America first" or "Make America Great Again".[8] This suggests that American nationalism was a crucial factor that translated into Trump support. According to a poll conducted by Quinnipac University in 2016, 85 % of Trump supporters agreed with the statement that "America has lost its identity" (Fukuyama, 2016).

In this context, we exploit online search patterns to measure salience of American identity across metropolitan areas. To elaborate, we consider search volume of the terms "American" relative to "United States" based on the assumption that the latter is a more value-neutral terminology, while the former directly or indirectly involves the aspects of national identity. Since we use the search volumes in 2014 before onset of Trump phenomenon, relative search interest in the term "American" can be interpreted as an existing regional tendency that could promote future support for Trump.

[7] The negative estimate should be interpreted with caution. It might reflect adverse effects of Republican partisanship on COVID-19 vaccination, but the strong correlation between support for Trump and that for the Republican party also can generate downward bias. While we provide an identification strategy for the effects of Trumpism in Section 3.2.2, causal interpretation of the effects of Republican partisanship is beyond the scope of this study.

[8] This tendency is also labeled as various forms of nationalism, such as economic nationalism, national conservatism, or American nationalism (e.g. Lieven, 2016; Post, 2017; Dueck, 2019; Renshon, 2021).

Figure 3: Relative search interest in "American" vs. "United States" and Republican vote shares



(a) Trump vote share

(b) Senate vote share

Note: The Y-axis shows the residual vote share of the Republican party. The X-axis denotes the relative search volume of "American" relative to "United States" measured in 2014.

Figure 3a shows a positive correlation between the relative search volume of "American" in 2014 and Trump's vote share in 2016. This suggests that the extent of American identity captured by online search behavior is an appropriate predictor of support from Trump. In contrast, the correlation is less significant for the Senate election as shown in Figure 3b. This difference is consistent with the arguments that the emphasis on American national identity is a unique feature of Trumpism, which is distinct from existing conservative organizations. In this sense, the IV strategy would allow us to estimate the relationship between Trump support and COVID-19 vaccination, conditional on Republican partisanship.

3.2.2 IV Results

Table 3 shows the IV estimation results. The sample consists of 205 metropolitan areas based on Nielsen's Designated Market Area (DMA).[9] Columns (1) and (2) show the first stage results that the the relative search interest in "American" significantly predicts the Trump vote share. As shown in Columns (3) and (4), using the Senate vote share as an outcome variable does not provide comparable results. This difference reinforces the validity of the IV in that the IV estimates are not biased due to direct effects of Republican

[9]All the county-level variables are harmonized with the DMA boundaries. Since each DMA is a set of counties, quantity variables or ratio variables with information on their numerators and denominators can be aggregated at the DMA-level. Otherwise, we calculate weighted averages using the share of population of each county as weight.

partisanship. While the sample sizes differ for the presidential and Senate elections, Columns (5) and (6) confirm that the difference does not alter the first stage results.

Columns (7) and (8) establish the negative relationship between Trump support and COVID-19 vaccination rate. According to Column (8) with socioeconomic controls, counties with a one standard deviation higher Trump vote share display a 0.63 standard deviations lower vaccination rate. Given that the IV is not significantly associated with Republican vote share in the Senate election, this result is interpreted as a causal link between Trumpism and COVID-19 vaccine hesitancy, conditional on partisan differences in COVID-19 responses. Moreover, Section 3.3 reports that the OLS and IV estimates are robust to a battery of additional controls including alternative measures of conservatism and partisanship.

Table 3: Support for Trump and the GOP, and COVID-19 vaccination rates: IV estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	First stage: baseline and falsification						Second stage	
Dep. var:	Trump vote share		Senate Republican vote share		Trump vote share		% Fully vaccinated	
Search intensity: American vs. United States	0.308***	0.276***	0.109	0.120	0.173**	0.221***		
	(0.072)	(0.054)	(0.101)	(0.115)	(0.080)	(0.068)		
Trump vote share, 2016							-0.599***	-0.625***
							(0.208)	(0.222)
R-squared	0.11	0.46	0.03	0.16	0.09	0.44		
F-stat							18.27	26.42
N	205	205	145	145	145	145	205	205
Geographic controls	Y	Y	Y	Y	Y	Y	Y	Y
Socioeconomic controls	N	Y	N	Y	N	Y	N	Y

Notes: The table shows the standardized IV estimates. with robust standard in parentheses. Columns (1)-(6) show the baseline and falsification first stage regressions, and the IV estimates are presented in Columns (7) and (8).

3.3 Robustness Checks

This section demonstrates the robustness of our findings in two aspects. In Section 3.3.1, we show that the negative relationship between Trump support and COVID-19 vaccination rate is robust to various additional controls. Section 3.3.2 documents that the negative effects of Trumpism are also observed with alternative dimensions of COVID-19 responses.

3.3.1 Additional Controls

Despite various strategies to address potential endogeneity, one might still be concerned about omitted variables. In Table 4, we include 7 additional controls that could be correlated with both Trump support and COVID-19 vaccination rate, and the results are shown to be robust.

Table 4: Trump support and COVID-19 vaccine hesitancy: additional controls

Dep. var: Proportion of fully vaccinated population aged ≥18 years								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel 1: OLS Estimates with Trump vote share							
Trump vote share, 2016	-0.338***	-0.331***	-0.325***	-0.325***	-0.345***	-0.335***	-0.317***	-0.329***
	(0.069)	(0.072)	(0.058)	(0.058)	(0.062)	(0.052)	(0.058)	(0.060)
R-squared	0.71	0.71	0.66	0.66	0.71	0.66	0.66	0.71
N	2117	2044	2811	2809	2105	2809	2790	2015
	Panel 2: OLS Estimates with Trump-GOP gap							
Trump-GOP gap, 2016	-0.494***	-0.495***	-0.436***	-0.436***	-0.497***	-0.443***	-0.428***	-0.455***
	(0.066)	(0.067)	(0.069)	(0.071)	(0.065)	(0.072)	(0.066)	(0.061)
R-squared	0.78	0.78	0.75	0.75	0.78	0.75	0.75	0.79
N	1417	1364	1839	1838	1410	1838	1839	1360
Geographic controls	Y	Y	Y	Y	Y	Y	Y	Y
Socioeconomic controls	Y	Y	Y	Y	Y	Y	Y	Y
State fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
	Panel 3: IV Estimates							
Trump vote share, 2016	-0.618**	-0.642***	-0.508*	-0.758***	-0.618***	-0.635***	-0.626***	-0.653**
	(0.253)	(0.246)	(0.290)	(0.231)	(0.240)	(0.221)	(0.228)	(0.318)
F-stat	22.21	23.01	14.85	21.34	23.73	25.68	25.49	11.79
N	205	205	205	205	205	205	205	205
Geographic controls	Y	Y	Y	Y	Y	Y	Y	Y
Socioeconomic controls	Y	Y	Y	Y	Y	Y	Y	Y
Additional controls								
Conservatism	√							√
Partisanship		√						√
Social vulnerability			√					√
Health disparity				√				√
News interest					√			√
Social capital						√		√
Flu vaccination							√	√

Notes: Panel 1 and 2 show the OLS estimates with standard errors clustered at the state-level, and Panel 3 shows the IV estimates with robust standard errors. The outcome variable is the proportion of the population aged 18 years and older who received full COVID-19 vaccination.

To further clarify that ideological or partisan differences do not underlie the Trump effects, we control for alternative measures of conservatism and partisanship. These measures are constructed from Cooperation Election Study (CES) which is a nationally representative survey. Based on questions about ideological position and partisan identity, we create two dummy variables equal to 1 if a respondent answers that he/she is conservative or Republican, and their county (metro)-level averages are used as explanatory variables.[10] As shown in Columns (1) and (2), the estimates are strongly robust to conservatism and partisanship measures in all specifications.

Another concern is that vulnerability to socioeconomic shocks might be correlated both with the rise of Trump support and with a passive response to the COVID-19 pandemic. In this regard, Columns (3) and (4) control for indices of social vulnerability and health disparity, the effects of which are not significant on the results.[11] Alternatively, weaker social ties could be an omitted variable. For example, Mobius et al. (2007) and Konstantinou et al. (2021) find that stronger social ties promote vaccination, and Giuliano and Wacziarg (2020) suggest a negative relationship between social capital and support for Trump around the 2016 presidential elections. To address this concern, Columns (5) and (6) include measures of news interest and social capital as proxies for the extent of social ties, but the results are not sensitive to the additional controls.[12] In Column (7), we show that adding flu vaccination rates from the CDC does not change the results. Lastly, Column (8) includes all additional controls.

3.3.2 Alternative Outcome Variables

While this study focuses on vaccination rate, the negative link between Trump support and COVID-19 responses is observed with alternative variables. In Table 5, we reproduce the OLS and IV estimates using three different outcome variables related to COVID-19 responses.

[10] The county (metro)-level averages are computed by pooling 5 waves of CES surveys from 2010 to 2014.

[11] Social vulnerability and health disparity indices are obtained from Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (CDC/ATSDR) and National Institute for Environmental Health Sciences (NIEHS), respectively.

[12] The measure of news interest is based on a CES question about interest in public affairs, and its county (metro)-level variable is constructed following the same procedures for those of conservatism and partisanship. The social capital index is from Rupasingha et al. (2006).

Table 5: Alternative outcome variables about COVID-19 responses

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. var.	COVID-19 vaccine hesitancy		Mask use		Social distancing	
	Panel 1: OLS Estimates with Trump vote share					
Trump vote share, 2016	0.116***	0.088***	-0.351***	-0.401***	-0.213***	0.091**
	(0.016)	(0.018)	(0.038)	(0.044)	(0.071)	(0.034)
R-squared	0.95	0.97	0.70	0.72	0.39	0.77
N	2829	2828	2829	2828	2829	2828
	Panel 2: OLS Estimates with Trump-GOP gap					
Trump-GOP gap, 2016	0.211***	0.101***	-0.366***	-0.328***	-0.474***	0.094
	(0.037)	(0.027)	(0.087)	(0.087)	(0.126)	(0.058)
R-squared	0.92	0.95	0.65	0.68	0.37	0.76
N	1854	1853	1854	1853	1854	1853
Geographic controls	Y	Y	Y	Y	Y	Y
Socioeconomic controls	N	Y	N	Y	N	Y
State fixed effects	Y	Y	Y	Y	Y	Y
	Panel 3: IV Estimates					
Trump vote share, 2016	1.014***	1.069***	-0.648***	-0.762***	0.252	0.160
	(0.284)	(0.288)	(0.203)	(0.167)	(0.160)	(0.158)
F-stat	15.00	14.73	27.93	25.58	27.93	25.58
N	190	190	205	205	205	205
Geographic controls	Y	Y	Y	Y	Y	Y
Socioeconomic controls	N	Y	N	Y	N	Y

Notes: Panel 1 and 2 show the OLS estimates with standard errors clustered at the state-level, and Panel 3 shows the IV estimates with robust standard errors. The outcome variable is the proportion of the population aged 18 years and older who received full COVID-19 vaccination.

The first variable is a survey-based measure of COVID-19 vaccine hesitancy. Using data from the Household Pulse Survey (HPS), the CDC provides county-level estimates of vaccine hesitancy as the proportions of respondents indicating that they would "probably not" or "definitely not" receive a COVID-19 vaccine when available.[13] Columns (1) and (2) confirm that the Trump effects hold for potential vaccine hesitancy. This suggests that

[13]The survey was conducted during May 26, 2021 – June 7, 2021.

our findings based on actual vaccination rates are not biased due to other socioeconomic factors that could affect vaccination irrespective of personal hesitancy.[14] Columns (3) and (4) consider mask usage. Based on a survey conducted by the New York Times and Dynata, the estimated share of individuals who answered to always wear a mask in public is employed as an outcome variable.[15] The results are consistent with our baseline findings. In all specifications, the willingness to wear a mask is inversely proportional to the Trump vote share in 2016.

Lastly, Columns (5) and (6) assess the relationship between Trump support and social distancing. Using the Unacast social distancing scoreboard grade, which is available daily, we compute county and metro-level averages from January to September in 2021 as outcome variables.[16] Contrary to vaccine hesitancy and mask use, social distancing does not show a consistent relationship with Trump support. The sign of the estimates changes depending on specifications, and their magnitude is volatile. However, these mixed results do not contradict our baseline findings in that social distancing can be both a cause and consequence of COVID-19 responses. For example, hesitancy in vaccination or mask use can exacerbate the spread of COVID-19, and this can lead to stronger social distancing by individuals or local communities. In line with this, Kaushal et al. (2021) document that while Republicans or Trump supporters are less likely to wear masks than Democrats, partisan differences in compliance with social distancing are less significant.

4 Distrust in Science Before and After Trump

Having established the cross-sectional relationship between Trump support and COVID-19 vaccine hesitancy, this section now turns to its mechanism. Our hypothesis is that Trump's words and actions negating scientific facts about COVID-19 were more impactful in regions with greater Trump support, and that this created regional variations in the perception of the efficacy of COVID-19 vaccination.[17]

For an appropriate test of this hypothesis, we need information about COVID-19 vaccine hesitancy at the local-level before and after Trump, which is not available by construction. Instead, this section considers trust in science as a proxy for attitude toward COVID-19 vaccination.[18]

[14] For example, Khubchandani et al. (2021) shows that socioeconomic factors such as annual incomes and education levels promotes COVID vaccination.

[15] Dynata conducted roughly 250,000 interviews in July 2020.

[16] The social distancing score is based on nonessential visits relative to those of the previous year estimated from cell phone mobility data.

[17] Paz (2020) summarizes the words of Trump about the COVID-19 pandemic in chronological order.

[18] Safford et al. (2021) suggest empirical evidence that attitudes toward scientific practice have shaped

Among various dimensions of science, we focus on climate science for two reasons. First, public opinion on climate change has been widely adopted as an indicator of trust in science (e.g. Kellstedt et al., 2008; Fiske and Dupree, 2014; Krause et al., 2019), and such an approach is being applied in the context of COVID-19 responses (e.g. Hamilton and Safford, 2021; Brzezinski et al., 2021; Bazzi et al., 2021). Second, more crucially, Trump's attitude toward climate change is analogous to that toward the COVID-19 pandemic. He has expressed continuous distrust in climate science and implemented policies inhibiting climate action (Davenport and Lipton, 2016; Merica, 2017; Davenport and Landler, 2019; Borunda, 2020), where this tendency is strongly comparable to COVID-19 denialism by the Trump administration (Edelman, 2020; Krugman, 2020a). If this had differential effects on regional attitudes toward climate change depending on Trump support, it would be informative about regional divergence in perspectives on COVID-19 vaccination.

In this view, we estimate how public opinion on climate change evolved in relation to Trump support. Our estimating equation is

$$y_{ct} = \alpha + \beta \text{ Vote Share}_{ct} + \gamma X_{ct} + \delta_c + \delta_{st} + \epsilon_{ct} \tag{2}$$

The equation is estimated over two periods, before and after Trump. The outcome variables are measures of public opinions about global warming, which are constructed from Yale Program on Climate Change Communication data (Howe et al., 2015). To capture changes in distrust in science before and after Trump, the outcome variables are computed for $t = 2014$ (before), 2020 (after). Vote Share$_{ct}$ indicates Republican vote shares in $t = 2012$ (before), 2016 (after). While the baseline specifications use presidential vote shares to measure trends in Trump support, senate vote shares are employed as a falsification exercise. δ_c denotes county fixed effects that absorb unobserved local characteristics such as underlying cultural, political, or socioeconomic conditions. δ_{st} is state-year fixed effects, and X_{ct} includes additional time-varying controls that could be potential confounders of Trump support.

views about COVID-19.

Table 6: Changes in public opinion about global warming after Trump

Dep. var: Public opinion about global warming									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Global warming is happening			Global warming is supported by scientists			Worried about global warming		
Republican presidential vote share	-0.447***		-0.457***	-0.466***		-0.427***	-0.489***		-0.440***
	(0.067)		(0.041)	(0.061)		(0.045)	(0.075)		(0.054)
Republican senate vote share		0.026			-0.043			0.026	
		(0.172)			(0.143)			(0.202)	
R-squared	0.92	0.93	0.94	0.94	0.95	0.96	0.92	0.94	0.94
N	6226	1514	1514	6226	1514	1514	6226	1514	1514
State-year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: The table shows standardized OLS estimates with county fixed effects and state-year fixed effects. Robust standard errors clustered at the state-level are shown in parentheses. The outcome variable is the proportion of the population aged 18 years and older who received full COVID-19 vaccination.

Table 6 shows that, in counties that voted more for Trump in 2016 than for Romney in 2012, distrust in climate science increased further after Trump took office. People in such regions became less likely to agree with the existence or scientific background of global warming (Columns (1) and (4)) and thus became less worried about its consequences (Columns (7)). However, this relationship is not attributable to changes in partisanship. In Columns (2), (5), and (8), Republican vote share in the Senate election is used as an explanatory variable, and the estimates are close to zero with lower statistical significance. This further validates that the increase of distrust in science is not just a consequence of regional divergence in partisanship, but a direct result of the Trump phenomenon. Columns (3), (6), and (9) confirm that the different estimates from presidential and Senate elections are not due to underlying differences in sample counties.

Despite the sharp difference in the results from presidential and Senate elections, there might be concern about whether the Trump effects are distinct from ideological effects. For example, there is literature arguing that conservatives tend to oppose science more frequently than liberals (e.g. Mooney, 2007, 2012; Gauchat, 2012), and a few recent studies suggest a negative link between conservatism and social distancing (e.g. Pennycook et al., 2021).

To address this concern, Table 7 shows the robustness to two additional controls of survey-based measures of conservatism and Republican partisanship. The variables are constructed from CES following the same procedure as described in Section 3.3.1 but for

the periods before and after Trump.[19] For all the outcome variables, the negative link between increase of Trump support and trust in climate science remains robust.

Table 7: Changes in opinion about global warming after Trump: Robustness

Dep. var: Public opinion about global warming									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Global warming is happening			Global warming is supported by scientists			Worried about global warming		
Republican presidential vote share	-0.492***	-0.481***	-0.482***	-0.532***	-0.531***	-0.531***	-0.571***	-0.568***	-0.569***
	(0.070)	(0.074)	(0.074)	(0.064)	(0.068)	(0.068)	(0.075)	(0.079)	(0.079)
Conservative population	-0.008		0.011	-0.010		0.002	-0.012		0.012
	(0.012)		(0.015)	(0.012)		(0.015)	(0.013)		(0.016)
Republican partisanship		-0.019	-0.025		-0.014	-0.015		-0.028*	-0.035**
		(0.014)	(0.016)		(0.013)	(0.014)		(0.014)	(0.016)
R-squared	0.95	0.95	0.95	0.96	0.97	0.97	0.95	0.95	0.95
N	3354	3156	3156	3354	3156	3156	3354	3156	3156
State-year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: The table shows standardized OLS estimates with county fixed effects and state-year fixed effects. Robust standard errors clustered at the state-level are shown in parentheses. The outcome variable is the proportion of the population aged 18 years and older who received full COVID-19 vaccination.

5 Conclusion

A large literature documents that individuals' political beliefs affect their perceptions and behaviors. In this context, recent studies have investigated the effects of political beliefs on perception of health risk and responses to public policies against the COVID-19 pandemic. For instance, a series of studies uses the Trump vote share to argue that Republican partisanship is related to weak compliance with government social distancing orders (Barrios and Hochberg, 2020; Allcott et al., 2020; Engle et al., 2020; Gollwitzer et al., 2020). Despite much discussion, however, it has not been clarified whether the relationship between Trump support and passive responses to the COVID-19 pandemic can be distinguished from the effects of Republican partisanship or conservatism.

This study distinguishes Trumpism and Republican partisanship and investigates how support for Trump affects individual responses to the pandemic, focusing on vaccination hesitancy. Evidence suggests that the Trump vote share in 2016 is negatively associated with COVID-19 vaccination rate. More crucially, this relationship cannot be attributed simply to Republican partisanship. Even conditional on the Republican vote share in the

[19] To elaborate, county-level averages are computed separately for 2011-2015 and for 2016-2020.

Senate election, additional support for Trump predicts lower vaccination rate significantly. Falsification and placebo exercises using different elections strengthen the interpretation that the negative link between Trumpism and COVID-19 vaccination is distinct from the partisan divide. Obviously, this approach is distinguished from previous studies using the concepts of Trump's leadership and partisanship without clear distinction. Furthermore, to address potential endogeneity, we suggest an IV strategy based on online search behavior before the rise of Trump. The IV estimates corroborate the negative relationship between Trump support and COVID-19 vaccination, conditional on the effects of the partisan divide.

Beyond the cross-sectional relationship, we suggest distrust in science as a mechanism to account for the Trump effects on COVID-19 vaccine hesitancy. Considering that the Trump administration had similar approaches to climate change and the COVID-19 pandemic, we use trust in climate science as a proxy for attitudes toward scientific aspects of COVID-19 vaccination. Our results show that skepticism in climate change increased further in counties with greater Trump support, but this relationship cannot be explained by changes in Republican partisanship or conservative orientation.

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