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Abstract

In response to COVID-19, many scholars and policymakers are urging the U.S. to implement a nationwide system of voting-by-mail to safeguard the electoral process. What are the effects of vote-by-mail programs? In this paper, we provide a comprehensive design-based analysis of the effect of vote-by-mail on electoral outcomes. We collect data from 1996-2018 on all three U.S. states who implemented vote-by-mail in a staggered fashion across counties, allowing us to use a difference-in-differences design at the county level to estimate the causal effect of vote-by-mail programs. We find that: (1) vote-by-mail does not appear to affect either party's share of turnout; (2) vote-by-mail does not appear to increase either party's vote share; and (3) vote-by-mail modestly increases overall average turnout rates, in line with previous estimates. All three conclusions support the conventional wisdom of election administration experts and contradict many popular claims in the media.

1 Introduction

The COVID-19 pandemic threatens the 2020 U.S. election. Fears that the pandemic could deter many people from voting—or cause them to become infected if they do vote—have spurred calls for major electoral reforms. As election administration experts Nathaniel Persily and Charles Stewart put it: "The nation must act now to ensure that there will be no doubt, regardless of the spread of infection, that the elections will be conducted on schedule and that they will be free and fair."[1]

Persily and Stewart recommend a nationwide vote-by-mail program to allow Americans to vote from the safety of their own homes, but many question the potential political consequences of such a policy. President Trump declared that, if it was implemented, "you'd never have a Republican elected in this country again."[2] On the other hand, Brian Dunn, a former Obama campaigner and founder of a company that works on vote-by-mail programs, says that "There is justified concern that Democratic-leaning voters may be disadvantaged through vote-by-mail systems."[3] This debate continues in part because, in the academic literature, as Charles Stewart points out, "evidence so far on which party benefits [has] been inconclusive."[4]

We expand the existing evidence on the partisan effects of vote-by-mail by collecting new data on voting and election outcomes in California and Utah, which we combine with data on Washington state from Gerber, Huber, and Hill (2013). Together, this dataset allows us to study the full universe of county-level vote-by-mail programs with staggered roll-outs. While a large literature in political science studies various forms of convenience voting—see Table A.1 for a full review—there has not been any comprehensive analysis of vote-by-mail that

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[1] https://www.lawfareblog.com/ten-recommendations-ensure-healthy-and-trustworthy-2020-election
[2] https://www.theguardian.com/us-news/2020/apr/08/trump-mail-in-voting-2020-election
[3] https://www.nytimes.com/2020/04/10/us/politics/vote-by-mail.html
[4] https://www.nytimes.com/2020/04/10/us/politics/vote-by-mail.html

employs clear designs for causal inference to estimate effects on partisan outcomes.[5] The existing research supporting the neutral partisan effects of vote-by-mail compares turnout in Oregon before and after it implemented its statewide reform, or extrapolates from the behavior of irregular voters to make predictions about partisan effects (Karp and Banducci 2000; Berinsky, Burns, and Traugott 2001; Berinsky 2005).[6]

We find that vote-by-mail has no apparent effect on either the share of turned-out voters who are Democrats or the share of votes that go to Democratic candidates, on average, although these latter estimates are a bit less precise. We also find that it increases turnout by roughly 2 percentage points, on average—very similar to the estimate reported in Gerber, Huber, and Hill (2013) for Washington state.

These findings are consistent with the conventional wisdom in the convenience-voting literature (see Gronke et al. (2008) for a review). However, they should increase our confidence in these views, both because our data permits a stronger research design than was previously possible and because our dataset runs through the 2018 midterm elections, allowing for the most up-to-date analysis available.

Two main caveats are warranted in interpreting our findings. First, our evidence is about the effects of counties opting into vote-by-mail programs during normal times—that is, the

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[5]The existing papers with clear causal designs for the effect of vote-by-mail expansion study overall turnout (Gerber, Huber, and Hill 2013), roll-off (Marble 2017), political information and accountability (Szewczyk 2020a,b), the participation of low-propensity voters (Gerber, Huber, and Hill 2013), or precinct-level rather than county-level interventions (Elul, Freeder, and Grumbach 2017), and only study one state at a time. The closest analogue to the effect of vote-by-mail expansion on a party's vote share comes from Gerber, Huber, and Hill (2013) which finds that the turnout rates of high-propensity voters increase by less than those of low-propensity voters, who some may assume have different political leanings from regular voters. Fowler (N.d.) explicitly estimates the heterogeneous turnout effects of a convenience voting reform in West Virginia using a county-level difference-in-difference design and finds no evidence for different effects by party. Yet, the logic that expanding the pool of voters may favor one party is not flawed–for example, compulsory voting laws appear to improve the performance of the Labor party in Australia (Fowler 2013). Table A.1 in the Appendix summarizes the large existing literature on vote-by-mail reforms which generally studies the effect on turnout with findings ranging from a large increase Magleby (1987); Southwell and Burchett (2000); Richey (2008); Larocca and Klemanski (2011), to a modest increase or null effect (Berinsky, Burns, and Traugott 2001; Gronke, Galanes-Rosenbaum, and Miller 2007; Southwell 2009; Gerber, Huber, and Hill 2013; Menger, Stein, and Vonnahme 2015), to a decrease (Kousser and Mullin 2007; Elul, Freeder, and Grumbach 2017).

[6]Meredith and Malhotra (2011) presents evidence that vote-by-mail can change primary election outcomes since many voters mail their ballots before candidates withdraw. Szewczyk (2020b) finds that vote-by-mail the introduction of vote-by-mail in Washington lead to less taxation.

counterfactual we are comparing voting-by-mail to is a normally administered in-person election. The effect of vote-by-mail relative to the counterfactual of an in-person election during COVID-19 might be quite different, and the effect would depend on whether we believe COVID-19 disproportionately deters Democrats or Republicans from voting. Second, our results say nothing about whether vote-by-mail should be implemented nationwide. There may be reasons to worry about rolling out nationwide vote-by-mail that we cannot study; for example, it might have disparate impact on minority voters, who some claim utilize vote-by-mail at a lower rate,[7] or it may simply be too expensive to administer to be worth the cost. Finally, even if vote-by-mail did have partisan effects, there might still be good reasons to support it as a policy.

Despite these caveats, our paper has a clear takeaway: claims that vote-by-mail fundamentally advantages one party over the other appear overblown. In normal times, based on our data at least, vote-by-mail modestly increases participation while not advantaging either party.

2   Voting-by-Mail and County Roll Outs

Led by Oregon in 2000, six states in the US have now adopted, or are in the process of adopting all-mail elections.[8] In some of these cases, the state has implemented the vote-by-mail program across the entire state. As we summarize in Table 1, Oregon, Colorado, and Hawaii made statewide switches to vote-by-mail elections beginning in 2000, 2014, and 2020, respectively. Estimating the effects of these statewide adoptions of vote-by-mail policies on partisan election outcomes, turnout, and the partisan composition of the electorate is difficult, as these switches happen concurrently with other statewide changes and provide no within-state counterfactuals.

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[7]though also see McGhee et al. (2019)), `https://www.nytimes.com/2020/04/10/us/politics/vote-by-mail.html`

[8]Colorado, Hawaii, Oregon, Utah, and Washington now conduct all elections by mail (see `https://www.ncsl.org/research/elections-and-campaigns/all-mail-elections.aspx`).

Table 1 – States With Programs to Mail Every Registered Voter a Ballot. Note: This table shows states where every county in the state is eligible to adopt a program to mail every registered voter a ballot for primary and general elections. Nebraska and North Dakota allow only some counties to conduct all-mail elections, and several other states allow some counties to conduct special elections or local elections by mail.
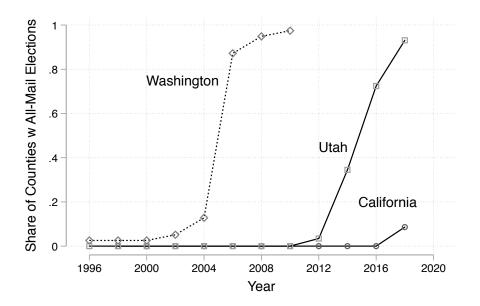
State	Level of Roll-Out	Year Started	Year Fully Implemented
California	County	2018	Ongoing
Colorado	State	2014	2014
Hawaii	State	2020	2020
Oregon	State	2000	2020
Utah	County	2012	2020
Washington	County	2006	2010

To study the effect of expanding vote-by-mail options, we narrow our focus to the three states that rolled out their vote-by-mail expansions at the county-level in a staggered fashion: California, Utah, and Washington.[9] By comparing counties that adopt a vote-by-mail program to counties within the same state that do not adopt the program, we are able to compare the election outcomes and turnout behavior of voters who have different vote-by-mail accessibility but who have the same set of candidates on the ballot for statewide races.

Each of these three states' reforms are slightly different, but all share a similar feature: counties adopting the vote-by-mail expansion mailed an absentee ballot to every eligible voter in the county, not just voters who had requested receiving a mailed absentee ballot. Voters can mail their completed ballot to their county elections office, or deposit their ballot in secure ballot drop-off locations throughout the county. Alternatively, each of these states' reforms also replaces traditional polling places with Election Day voting centers throughout the county. Voters can visit any of their county's voting centers to simply drop off their

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[9]In California, Utah, and Washington, vote-by-mail has become increasingly common. Figure 1 shows the share votes cast in the general election that are vote-by-mail, in California and Washington in each election year from 1998-2018. In the late 1990s, the majority of votes cast in both states came from non-VBM options. By the late 2010s, nearly every county in California had a majority of their votes cast using VBM and Washington had all-mail elections.

Figure 1 – Increase in the Adoption of Vote-by-Mail Expansions, California, Utah, and Washington General Elections, 1996 to 2018.

completed ballot on Election Day, request a replacement ballot, or vote in person on Election Day.

In Utah and Washington, each county has now adopted the vote-by-mail program described above. In California, the county-level roll-out is ongoing. Following the adoption of California's Voter's Choice Act (VCA), 5 of California's 58 counties adopted this vote-by-mail expansion for the 2018 elections, followed by an additional 10 counties for the 2020 elections.[10]

Figure 1 shows the timing of each state's county-level roll out of vote-by-mail reforms, and it illustrates the main source of variation we exploit in this study. The vertical axis represents the share of counties in each of the three states we study that expand their use of vote-by-mail. As we can see, each state rolled out its vote-by-mail program in a staggered fashion over several election cycles.

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[10]For the 2018 election 14 of California's 58 counties were allowed to opt into this new format for conducting elections, and all of California's counties were allowed to adopt these changes beginning in 2020. See https://www.sos.ca.gov/elections/voters-choice-act/about-vca/.

2.1 Outcomes of Interest

We collect data on a variety of outcomes to see how vote-by-mail expansion might affect elections. First, we are interested in how vote-by-mail affects the performance of Democratic versus Republican candidates. We collect county-level general election results for each state from its Secretary of State website to construct the Democratic two-party vote share in each Presidential, Gubernatorial, and Senatorial general election.[11]

Second, we are interested in how vote-by-mail might affect the partisan composition of the electorate. For this outcome, we use the California and Utah voter files, provided by L2, a private data vendor. The voter files contain information on each individual's name, registration address, date of birth, date of registration, party registration, and turnout history. Using the voter file, we can observe whether the vote-by-mail expansion led to a more Democratic or Republican electorate, based on the party registration of those who turn out to vote.

Finally, we are interested in the effect of vote-by-mail on turnout and vote-by-mail usage. For California and Utah, we collect the number of ballots cast in each general election from official state sources. For Washington, we use turnout provided by Gerber, Huber, and Hill (2013). To construct a turnout share, we divide the total number of ballots cast by the county's citizen voting age population in that year.[12] For California and Washington, we also observe each county's turnout by vote mode, so we can construct a measure of the share of total votes in a county that come via vote-by-mail.

Table 2 summarizes the information that we have collected from each of the three states that we study. Overall, the data we have collected covers a wide range of years (1996-2018). It includes each election cycle's turnout and election results from all three states. Vote-

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[11]In California, we use only Gubernatorial, not Presidential, election results. This is because the earliest county California to adopt a vote-by-mail expansion was in 2018, and a Presidential general election has not yet occurred since then.

[12]Each county's citizen voting age population is collected from https://www.census.gov/programs-surveys/decennial-census/about/voting-rights/cvap.html.

Table 2 – **Information Included in Various Data Sources.** Each column denotes a state, and checkmarks indicate features or observable information in that state. Turnout data is missing in California for the year 2000. While we have presidential election data for California, it did not implement its vote-by-mail program until after the 2016 presidential election.

	California	Utah	Washington
General Election Turnout	✔	✔	✔
Vote-by-Mail Ballot Usage	✔		✔
Gubernatorial Election Results	✔	✔	✔
Senatorial Election Results	N/A	✔	✔
Presidential Election Results	N/A	✔	✔
Voter File	✔	✔	
Years Included	1998-2018	1996-2018	1996-2010

by-mail usage comes from California and Washington, and our analyses on the partisan composition of the electorate that use the voter file come from California.

3 Empirical Approach: Difference-in-Differences

Estimating the effect of vote-by-mail programs is difficult because the states that have implemented vote-by-mail differ systematically from those that have not. Figure A.1 in the Appendix shows that states that go on to adopt expansive VBM policies (those listed in Table 1) are states that have had higher average Democratic vote shares for President, on average, than states that do not adopt these policies. Moreover, the gap in Democratic vote shares in VBM states an non-VBM states has grown over time. If we found, for example, that vote-by-mail programs are correlated with higher turnout for Democratic voters using a statewide design, we could not conclude that vote-by-mail causes Democratic voters to turn out more; it could be that Democratic voters simply turn out to vote more in liberal states. To get at the actual effect of the vote-by-mail program, we need to approximate an experiment in which some elections occur under vote-by-mail while other, similar elections do not.

To do something like this, we take advantage of the staggered rolling out of vote-by-mail across counties, within California, Utah, and Washington, as we explained above. In particular, we estimate the following equation:

$$Y_{ct} = \beta \text{VBM}_{ct} + \gamma_c + \delta_t + \epsilon_{ct}, \tag{1}$$

where Y is an outcome variable—usually partisan turnout rates or vote share—in county c during election t. The subscript p denotes whether the election type is a general election. Our treatment indicator, VBM, takes a value of 1 if the county opts into its state's vote-by-mail program, and 0 otherwise. The γ_c and δ_t terms represent county fixed effects and election fixed effects, respectively. In cases where we study only general elections, the γ term reduces to county fixed effects. As the above equation makes clear, this is a difference-in-differences design, where we compare within-county changes in turnout over time across changes in vote-by-mail policy. To identify β as the causal effect of vote-by-mail expansion, it must be the case that the trends in turnout in counties that do not adopt vote-by-mail provide valid counterfactuals for the trends we would have observed in the treatment counties, had they chosen not to adopt vote-by-mail.

We use a variety of tests to evaluate whether the parallel trends assumption might be reasonable in our case. First, to test for anticipatory effects, following Angrist and Pischke (2009) we plot coefficients on leads of our outcome variables and compare them to our estimated treatment effects. The simple idea of these tests is that a county's vote-by-mail program should not affect our outcomes in the elections prior to its adoption. Second, we relax the parallel trends assumption in a variety of ways by including more flexible sets of fixed effects, like linear or quadratic time trends. We discuss these tests in detail throughout the results sections.

4 Neutral Partisan Effects of Vote-by-Mail

Does vote-by-mail favor either political party in elections? Table 3 presents our main results.[13] The first column shows our basic difference-in-differences design where the outcome is the share of voters—that is, people who turn out to vote—who are Democrats. In this specification, we estimate that the Democratic turnout share increases by 1.4 percentage points as a result of vote-by-mail. This specification uses plain year fixed effects, pooling time shocks across states, and therefore does not make only the within-state comparisons that Gerber, Huber, and Hill (2013) recommends.

Accordingly, the next three columns use state-by-year fixed effects. In column 2, we see that the estimate falls to 0.7 percentage points with within-state time shocks accounted for. In columns 3 and 4, we also examine the possibility that counties may be on different trends by including linear (column 3) and quadratic (column 4) county-specific time trends. The inclusion of these trends attenuates the estimates dramatically, to only 0.1 percentage points, while also shrinking the standard errors. In the latter two specifications, which are our most precise specifications, even the upper bound of the 95% confidence interval is only about 0.3 percentage points, a very small effect. We conclude from these estimates that, while the naive difference-in-differences estimate suggests a small but detectable effect on Democratic share of turnout, more plausible estimates suggest a truly negligible effect.

The latter four columns use the same set of specifications to explore the difference-in-differences estimates for the effect of vote-by-mail on Democratic candidate two-party vote share, pooling together Democratic gubernatorial candidates, Democratic senate candidates, and Democratic presidential candidates. In column 5, the vanilla difference-in-differences specification, we estimate that vote-by-mail increases Democratic vote share by 0.1 percentage points. In column 6, when we switch to the more credible state-by-year fixed effects, we actually estimate a 2.7 percentage-point increase for Democrats—however, when we add trends in columns 7 and 8, this estimate attenuates markedly. While these estimates are

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[13]We show the results separately for each state in Section A.6 of the Appendix.

Table 3 – Vote-by-Mail Expansion Does Not Appear to Favor Either Party.

	Dem Turnout Share [0-1]				Dem Vote Share [0-1]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VBM	0.014	0.007	0.001	0.001	0.001	0.027	0.010	0.008
	(0.003)	(0.003)	(0.001)	(0.001)	(0.007)	(0.013)	(0.004)	(0.005)
# Counties	87	87	87	87	126	126	126	126
# Elections	23	23	23	23	28	28	28	28
# Obs	986	986	986	986	1,725	1,725	1,725	1,725
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses. The number of counties is small in columns 1-4 because we have partisan turnout share for CA and UT, but not WA. Columns 5-8 use data from all three states.

generally less precise than the turnout share estimates because fewer elections are included, they continue to suggest modest to null effects, and they are nowhere near the magnitude necessary to represent a major, permanent electoral shift towards the Democratic party.

A graphical examination further suggests that there are no vote-by-mail effects on turnout or vote share beyond the pre-trending issue. Figure 2 plots estimated "effects" of vote-by-mail for three pre-treatment periods as well as for the actual treatment period. These are estimated by including four dummy variables in the regression corresponding to column 2 in Table 3: three leads that take the value if the county became treated three elections in the future, two in the future, or one in the future, as well as the standard treatment dummy indicating the the county was a vote-by-mail county. As the plot shows, the pre-treatment effects are nearly as large as the estimated post-treatment effect, and they trend upwards steadily, with the estimated post-treatment effect essentially on trend. This further suggests to us that even the small partisan vote-share effect we estimate in our regressions is likely to be the result of residual pre-trending rather than a real effect.
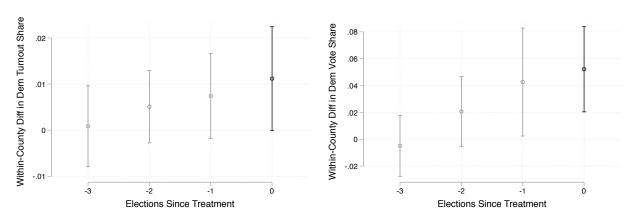
10

Figure 2 – Vote-by-Mail Reform and Pre-Trends.

In sum, looking across turnout and vote share outcomes, the substantively small size of the estimated effects leads us to conclude that vote-by-mail does not have meaningful partisan effects on election outcomes. We find the estimates on the Democratic share of turnout, which are particularly precise, to be most compelling. The expansion of vote-by-mail does not appear to tilt turnout towards the Democratic party, nor does it appear to affect election outcomes meaningfully.

5 Expanding Vote-by-Mail Modestly Increases Turnout

Having evaluated the partisan effects of vote-by-mail, we now evaluate its effect on political participation as measured by the share of the eligible population that turns out to vote in general elections.

5.1 Formal Estimates

Table 4 presents formal estimates of the effect of vote-by-mail expansion on participation.[14] The first four columns report estimates of the effect on the number of voters participating as a share of the citizen voting-age population. As in Table 3, Column 1 reports the standard

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[14]We show the results separately for each state in Section A.7 of the Appendix.

Table 4 – Vote-by-Mail Expansion Increases Participation.

	Turnout Share [0-1]				Vote-by-Mail Share [0-1]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VBM	0.029	0.021	0.022	0.021	0.186	0.186	0.157	0.136
	(0.005)	(0.009)	(0.007)	(0.008)	(0.027)	(0.027)	(0.035)	(0.085)
# Counties	126	126	126	126	58	58	58	58
# Elections	30	30	30	30	10	10	10	10
# Obs	1,240	1,240	1,240	1,240	580	580	580	580
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

difference-in-differences estimate with vanilla year fixed effects. Columns 2 uses the more credible state-by-year fixed effects, and columns 3 and 4 add linear and quadratic county-specific trends, respectively. Looking across the columns, we see a fairly stable estimate showing that vote-by-mail causes around a 2-percentage-point increase (estimates range from 2.1 to 2.9 percentage points) in the share of the citizen voting-age population that turns out to vote.
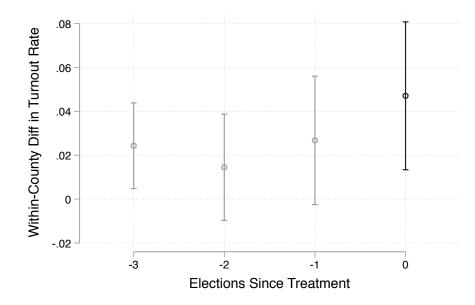
The final four columns, using the same regression specifications as columns 1 through 4, show that expanding vote-by-mail produces a large increase in the share of ballots that are mailed in—roughly a 17 to 20 percentage-point increase across specifications. This is not a surprising finding, but it does show that large numbers of voters appreciate the chance to mail in their ballot.[15]

5.2 Graphical Evidence

Figure 3 presents visual evidence of the effect on turnout. Each point represent represents a regression coefficient with the first three points being leads that anticipate a county's switch

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[15]Existing work on the expansion of vote-by-mail in California and Oregon reaches a similar conclusion that voters take advantage of the opportunity to vote by mail (Southwell 2004; Bryant 2019).

Figure 3 – Vote-by-Mail Reform Modestly Increases Turnout.

into vote-by-mail by three elections, two elections, and one election. The fourth point is the main estimated treatment effect, using four and more elections prior to vote-by-mail as a baseline. As in Table 4, the plot clearly captures that turnout increased in the year immediately following the introduction of vote-by-mail and turnout was not meaningfully higher before the counties adopted voting by mail.

6   Conclusion

This paper has offered new data to offer the most up-to-date, most credible causal evidence on the effects of vote-by-mail on partisan electoral outcomes and participation. In our data, we confirm important conventional wisdom among election experts: vote-by-mail offers voters considerable convenience, increases turnout rates modestly, but has no discernible effect on party vote shares or the partisan share of the electorate.

Our results should strengthen the field's confidence in these effects of vote-by-mail. While the design we implement is by no means perfect, our new data does permit empirical approaches stronger than those used in the existing literature. Only one existing paper in

the vote-by-mail literature employs a similar design, and it studies only participation and only in the state of Washington. As such, we believe our paper is the most comprehensive confirmation to date of vote-by-mail's neutral partisan effects.

As the country debates how to run the 2020 election in the shadow of COVID-19, politicians, journalists, pundits, and citizens will continue to hypothesize about the possible effects of vote-by-mail programs on partisan electoral fortunes and participation. We hope that our study will provide a useful data point for these conversations.

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Szewczyk, James. 2020b. "How Electoral Institutions Affect Political Accountability: Evidence from All-Mail Elections." Working Paper. http://jamesszewczyk.com/VBM_V7.pdf.

Online Appendix

Intended for online publication only.

Contents

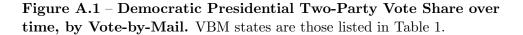## A.1 Summary of the Extant Literature on Vote-by-Mail Effects

This section summarizes the literature to date on the effects of vote-by-mail programs. Each row of Table A.1 represents a study on the effects of vote-by-mail, and the columns summarize the study's setting research design, effect on overall turnout, and a summary of its effect on the composition of the electorate, if any.
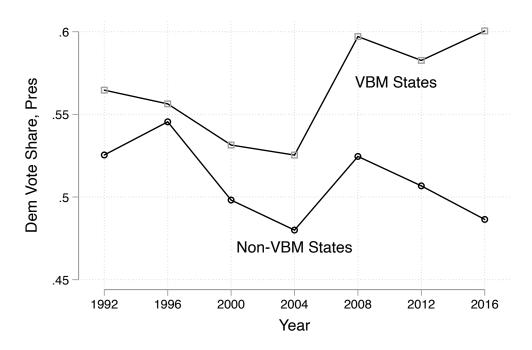
Table A.1 – **Review of Vote-by-Mail Effects Literature.** Note: Magelby (1987) studies a selection of cities in the United States and Canada. All other settings are state abbreviations. X-Section refers to a cross-sectional design, and DiD refers to a difference-in-differences design.

Paper	Setting	Design	Turnout Effect	Composition Effect	Partisan Effect
Magelby (1987)	USA, CAN	Pre-Post	Large +		
Karp and Banducci (2000)	OR	Pre-Post	Modest − to Modest +	↑ Frequent Voters	
Southwell and Burchett (2000)	OR	Pre-Post	Large +		
Berinsky, Burns, and Traugott (2001)	OR	Pre-Post	Modest +	↑ Frequent Voters	No Effect
Gronke et al. (2007)	OR	State Panel	Modest +		
Kousser and Mullin (2007)	CA	X-Section	Modest -		
Richey (2008)	CO	State Panel	Modest/Large +		
Southwell (2009)	OR	Pre-Post	Modest − to Null		
Bergman and Yates (2011)	CA	Pre-Post	Large +		
Larocca and Klemanski (2011)	OR, WA	X-Section	Modest/Large +		
Gerber, Huber, and Hill (2013)	WA	County DiD	Modest +	↑ Infrequent Voters	
Menger, Stein, and Vonnahme (2015)	CO	Pre-Post	Modest +		
Elul et al. (2017)	CA	Precinct DiD	Modest −		
Atsusaka (2019)	CO	Pre-Post	Modest +	↑ Infrequent Voters	

A.2 Differences Between VBM and non-VBM States

In this section, we show a key difference in the voting patterns of states that have adopted vote-by-mail programs and those that have not. We collect state-level presidential election results for each state from 1992-2016. In Figure A.1, we plot the Democratic Presidential two-party vote share separately for states that adopt a VBM program at some point and those that do not. The VBM states (those listed in Table 1) tend to vote for Democratic presidential candidates at higher rates than non-VBM states. Moreover, this gap has increased over time: in recent presidential elections, the average Democratic presidential vote share was about 10 percentage points higher in VBM states compared to non-VBM states. Overall, this illustrates the disadvantage of studying the effects of vote-by-mail programs at the state-level. The six states that have adopted vote-by-mail programs not only tend to vote for Democratic candidates at higher rates, but they also are trending more quickly in a Democratic direction than states that have not adopted VBM.

Figure A.1 – Democratic Presidential Two-Party Vote Share over time, by Vote-by-Mail. VBM states are those listed in Table 1.

A.3 Increasing Use of Vote-by-Mail

In this section, we show the fraction of votes cast using vote-by-mail over time for California and Washington. As we show, vote-by-mail usage has become increasingly common over time in both states.

First, in Figure A.2 we show vote-by-mail usage in California general elections over time. Each plot is a histogram of California counties, with the x-axis representing the share of total votes that were cast using vote-by-mail. As we can see, nearly all California counties received less than half of their ballots from vote-by-mail in 1998, but by 2018 nearly all counties in California received more than half of their ballots from vote-by-mail.

Figure A.2 – Use of Vote-by-Mail in CA General Elections, 1998 to 2018.

Next, we show the same set of histograms of vote-by-mail usage over time for Washington. Most of the counties adopted Washington's switch to exclusively vote-by-mail starting in 2006, which is where we see the largest shift toward vote-by-mail usage. By 2010, nearly all Washington counties had switched to the exclusive vote-by-mail program.

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Figure A.3 – Use of Vote-by-Mail in WA General Elections, 1996 to 2010.

A.4 Robustness of Composition Effects to Elections Included

In this section, we show the robustness of our main results on the effects of vote-by-mail on the partisan composition of the electorate (columns 1-4 of Table 3). For all of our results on the composition of the electorate, we use the California voter file. One concern with using this data is that voters removed from the voter file over time may be different from those remaining on the lists. In particular, we know that older voters in 1998 are much less likely to still be in the 2019 voter file we are using. This problem should be much smaller in elections that were held closer to the time when the voter file was compiled. In Figure A.4, we evaluate the sensitivity of our results to the number of elections prior to 2018 that we include in the difference-in-differences regression. We find that the results are substantively unchanged when we include fewer elections and, if anything, shrink toward zero.

Figure A.4 – Partisan Composition Effects Not Sensitive to Years Included in Sample.

A.5 Partisan Effects Limiting to California and Utah

In this section, we show a version of Table 3 where we limit the analysis to California and Utah. For columns 1-4, where the outcome is Democratic turnout share, the results remain the same as in Table 3 because we have partisan composition for those two states, but not for Washington. For the Democratic vote share results in columns 5-8, in the main results in our paper we pool all three states. Here, to make sure the sample we are studying is consistent across the two outcome variables, we limit the vote share analysis to just California and Utah. The results are slightly noisier because we have dropped Washington, but the takeaway remains substantively similar to our main results in Table 3.

Table A.2 – Vote-by-Mail Expansion Does Not Appear to Favor Either Party (California and Utah).

	Dem Turnout Share [0-1]				Dem Vote Share [0-1]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VBM	0.014	0.007	0.001	0.001	-0.034	0.041	0.009	0.004
	(0.003)	(0.003)	(0.001)	(0.001)	(0.014)	(0.021)	(0.007)	(0.006)
# Counties	87	87	87	87	87	87	87	87
# Elections	23	23	23	23	21	21	21	21
# Obs	986	986	986	986	1,218	1,218	1,218	1,218
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

A.6 Partisan Effects by State

In this section, we show our effects of vote-by-mail on partisan outcomes separately for each of the three states we study. The specifications in each of the table mirror those in our main results in Table 3.

We show the results for California in Table A.3. The effect on the Democratic turnout share is close to zero, and it is precisely estimated. The results for Democratic vote share are also similar to when we pool across all three states. At first it appears that vote-by-mail might lead to a small increase in Democratic vote share, but when we account for possible pre-trending by including county trends, it becomes clear that the effect is close to zero.

Table A.3 – Vote-by-Mail Expansion Does Not Appear to Favor Either Party in California.

	Dem Turnout Share [0-1]				Dem Vote Share [0-1]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VBM	0.003	0.003	-0.004	-0.001	0.030	0.030	0.001	-0.012
	(0.003)	(0.003)	(0.001)	(0.003)	(0.010)	(0.010)	(0.006)	(0.016)
# Counties	58	58	58	58	58	58	58	58
# Elections	11	11	11	11	11	11	11	11
# Obs	638	638	638	638	638	638	638	638
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

We show the results for Utah in Table A.4. Similar to the results for California, it appears at first that vote-by-mail might increase democratic vote shares by a small amount, but once we move to our more plausible specifications in columns 7 and 8, it appears that the increases we observe can be explained almost entirely by pre-trending.

Finally, we show the results on Democratic vote share for Washington in Table A.5. We do not show the results for partisan share of turnout in Washington because we only have that information for California and Utah. In each of the specifications in Table A.5, the effect of vote-by-mail on the Democratic vote share is small and reasonably precisely estimated.

Table A.4 – Vote-by-Mail Expansion Does Not Appear to Favor Either Party in Utah.

| | Dem Turnout Share [0-1] | | | | Dem Vote Share [0-1] | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VBM	0.009	0.009	0.003	0.001	0.044	0.044	0.012	0.008
	(0.004)	(0.004)	(0.002)	(0.001)	(0.026)	(0.026)	(0.009)	(0.007)
# Counties	29	29	29	29	29	29	29	29
# Elections	12	12	12	12	10	10	10	10
# Obs	348	348	348	348	580	580	580	580
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

Table A.5 – Vote-by-Mail Expansion Does Not Appear to Favor Either Party in Washington.

| | Dem Vote Share [0-1] | | | |
	(1)	(2)	(3)	(4)
VBM	0.008	0.008	0.011	0.013
	(0.005)	(0.005)	(0.004)	(0.007)
# Counties	39	39	39	39
# Elections	7	7	7	7
# Obs	507	507	507	507
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

A.7 Participation Effects by State

In this section, we show our effects of vote-by-mail on participation outcomes separately for each of the three states we study. The specifications in each of the table mirror those in our main results in Table 4.

We show the results for California in Table A.6. We can see that vote-by-mail increases turnout by about 1.4 to 1.8 percentage points in California, which is slightly smaller than the pooled effect we report in Table 4. Our results in columns 5-8 for the vote-by-mail share are the same as Table 4 because we only use California in that analysis.

Table A.6 – Vote-by-Mail Expansion Increases Participation in California.

	Turnout Share [0-1]				Vote-by-Mail Share [0-1]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VBM	0.018	0.018	0.014	0.014	0.186	0.186	0.157	0.136
	(0.010)	(0.010)	(0.008)	(0.014)	(0.027)	(0.027)	(0.035)	(0.085)
# Counties	58	58	58	58	58	58	58	58
# Elections	10	10	10	10	10	10	10	10
# Obs	580	580	580	580	580	580	580	580
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

Next, we show the results for Utah in Table A.4. In Utah, vote-by-mail appears to have increased turnout by a little over 3 percentage points, which is slightly higher than the pooled effect we report in Table 4. We do not have information on vote-by-mail usage in Utah, so we do not show results of vote-by-mail's effect on the VBM share in Utah.

Finally, we show the results for Washington in Table A.8. The effect of vote-by-mail on turnout in Washington hovers around 1 percentage point across specifications, which is lower than the pooled effect. Just looking at Washington alone, it looks like the effect of vote-by-mail on turnout is very modest. In columns 5-8, we show the effect of vote-by-mail on the share of voters using VBM. Because the reform in Washington sends the vote-by-mail share to 1 for all treated counties, the effect on the vote-by-mail share is massive. We do not include Washington in our main results because we wanted to measure voters' preferences for vote-by-mail, given the option. For that reason, in the main results we subset just to California, where voters have the option to mail in their ballot or vote in person at a voting center in their county.

Table A.7 – Vote-by-Mail Expansion Increases Participation in Utah.

| | Turnout Share [0-1] | | | |
	(1)	(2)	(3)	(4)
VBM	0.032	0.032	0.032	0.034
	(0.019)	(0.019)	(0.013)	(0.014)
# Counties	29	29	29	29
# Elections	12	12	12	12
# Obs	348	348	348	348
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

Table A.8 – Vote-by-Mail Expansion Increases Participation in Washington.

| | Turnout Share [0-1] | | | | Vote-by-Mail Share [0-1] | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VBM	0.009	0.009	0.011	0.004	0.300	0.300	0.312	0.304
	(0.004)	(0.004)	(0.006)	(0.007)	(0.031)	(0.031)	(0.044)	(0.064)
# Counties	39	39	39	39	39	39	39	39
# Elections	8	8	8	8	8	8	8	8
# Obs	312	312	312	312	312	312	312	312
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

A.8 Effect of Vote-by-Mail Expansion on Republican Participation

In this section, we show that the non-effects of vote-by-mail expansion on Democratic turnout in Table 3 hold when we instead look at Republican turnout share. The turnout share that we construct in columns 1-4 of Table 3 is the number of those who voted in the election that are registered as Democrats divided by the total number of those who voted in the election, regardless of their party affiliation. Because we include third-party and unaffiliated voters in the denominator, a non-effect on the Democratic turnout share does not guarantee a non-effect on the Republican turnout share.

In Table A.9 we estimate the effects of vote-by-mail on the Republican turnout share. The specifications mirror columns 1-4 in our main results in Table 3. The first column shows the basic difference-in-differences design, where we estimate that the Republican turnout share decreases by about half of a percentage points. The second column shows the within-state difference-in-differences estimate, which is a decrease in Republican turnout share of approximately two and a half percentage point. The last two columns show that this result does not hold once we include county-level trends to control for possible pre-trending if counties that enter vote-by-mail are trending less Republican over time compared to other counties. In those specifications, the estimate is closer to zero, and in each case we cannot reject the null hypothesis of no effect.

Table A.9 – Vote-by-Mail Expansion Does Not Have Large Effects on Republican Share of the Electorate.

| | Rep Turnout Share [0-1] | | | |
	(1)	(2)	(3)	(4)
VBM	-0.005	-0.024	-0.004	-0.007
	(0.005)	(0.007)	(0.004)	(0.004)
# Counties	87	87	87	87
# Elections	23	23	23	23
# Obs	986	986	986	986
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

To investigate the source of pre-trending more, we show the robustness of our vanilla difference-in-differences estimate (column 1 of Table A.9) based on years included in the sample. One concern with using the voter file data is that voters removed from the voter file over time may be different from those remaining on the lists. In particular, we know that older voters in 1998 are much less likely to still be in the 2019 voter file we are using. This problem should be much smaller in elections that were held closer to the time when

the voter file was compiled. In Figure A.5, we evaluate the sensitivity of our results to the number of elections prior to 2018 that we include in the difference-in-differences regression. We find that the estimate attenuates quite a bit when we include only recent elections, which suggests that registered Republicans were likely dropping out of the voter file at a higher rate in counties that adopted VBM early compared to counties that adopted VBM later.

Overall, even if we take the vanilla difference-in-differences estimates at face value, once we restrict the sample to years where we are more confident in our estimates of the composition of the electorate, it is clear that we can rule out large effects of vote-by-mail on the Republican share of the electorate.
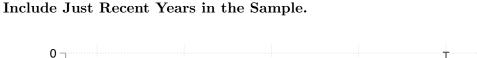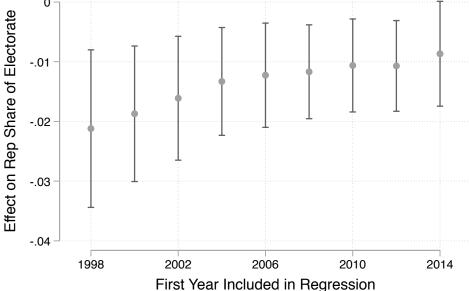
Figure A.5 – Republican Composition Effects Attenuate as We Include Just Recent Years in the Sample.

A.9 Effects On Age of Electorate

In this section, we present evidence on the effect of vote-by-mail on the age composition of the electorate. We construct a variable that is the share of the electorate – meaning the share of those who turn out to vote – that is age 55 or above. We show the effects of vote-by-mail on that outcome in Table A.10. The specifications mirror those in columns 1-4 of Table 3. In our vanilla difference-in-differences design in column 1, we estimate that vote-by-mail decreased the share of the electorate age 55 or above by a little more than one percentage point. Our within-state analysis in column 2 estimates a slightly larger decrease of one-and-one-half percentage points. Once we include county-level time trends in columns 3 and 4, the estimates shrink to be close to zero. In the specifications with quadratic and cubic trends, the sign on the point estimate flips to be positive, but is very close to zero. In all cases with adjustments for county trends, we cannot reject the null hypothesis that vote-by-mail does not affect the age composition of the electorate. Though the estimates are slightly noisier than our main results on the partisan composition of the electorate, we interpret these results as evidence that vote-by-mail programs to not dramatically change the age composition of those who turn out.

Table A.10 – **Vote-by-Mail Expansion Does Not Appear Have Large Effects on Age Composition of the Electorate.**

| | Turnout Share Age 55+ [0-1] | | | |
	(1)	(2)	(3)	(4)
VBM	-0.011	-0.016	-0.004	-0.005
	(0.008)	(0.012)	(0.008)	(0.010)
# Counties	87	87	87	87
# Elections	23	23	23	23
# Obs	986	986	986	986
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
State by Year FE	No	Yes	Yes	Yes
County Trends	No	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

The results in Table A.10 rely on the somewhat arbitrary choice of age 55 as the relevant age cutoff. To show that our results are not simply an artifact of this choice of cutoff, in Figure A.6 we show our estimates across a range of age cutoff values. For example, the leftmost estimate in Figure A.6 shows the estimated effect of vote-by-mail on the share of the electorate over the age of 30, and we do the same for each value of age from 30 to 65. The figure shows the effect of vote-by-mail on the age of the electorate is close to zero across a range of age cutoffs.

Figure A.6 – Potentially Larger Effect on Electorate Age Using Higher Age Cutoff.