Supporting Information Appendix: Universal Vote-by-Mail Has No Impact on Partisan Turnout or Vote Share

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S1 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 S1 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 S1 – 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	Other Effect
Magleby (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 Partisan Effect	
Gronke, Galanes-Rosenbaum, and Miller (2007)	OR	State Panel	Modest +			
Kousser and Mullin (2007)	CA	X-Section	Modest −			
Richey (2008)	OR	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 +			
Marble (2017)	WA	County DiD				− Roll-Off
Elul, Freeder, and Grumbach (2017)	CA	Precinct DiD	Modest −			
Keele and Titiunik (2018)	CA	Geo RDD	Modest −			
McGhee et al. (2019)	CA	County DiD	Modest +			
Atsusaka, Menger, and Stein (2019)	CO	Pre-Post	Modest +	↑ Infrequent Voters		
Bryant (2019)	CA	County DiD				↑ Mail Balloting
Szewczyk (2020*a*)	CA, UT, WA	County DiD				↓ Straight-Ticket Voting
Szewczyk (2020*b*)	WA	County DiD				↓ Public Spending

S2 Universal Vote-by-Mail Adoption by State

In this section, we provide a summary of states that have adopted programs to mail every registered voter a ballot by default. Table S2 shows this information, along with the level at which the vote-by-mail program was rolled out and some information about the timing of its implementation. As we can see, three states, Oregon, Colorado, and Hawaii have implemented statewide vote-by-mail programs in 2000, 2014, and 2020, respectively. The three states we focus on, California, Utah, and Washington, are those that have rolled out their vote-by-mail programs in a staggered fashion by county. The roll-out in California is still ongoing.

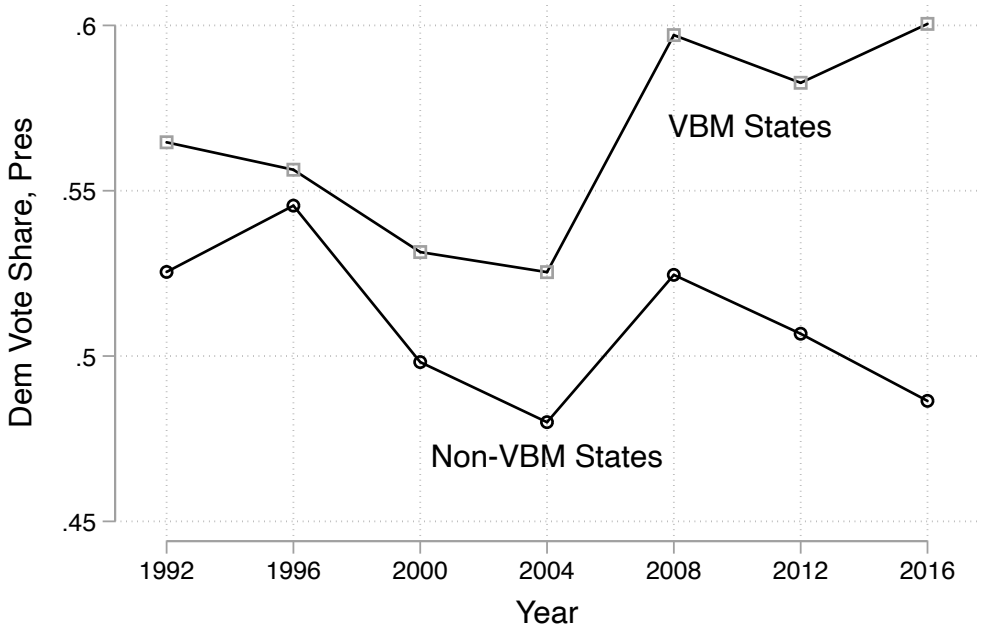
Table S2 – States With Programs to Mail Every Registered Voter a Ballot. Note: This table shows states where every county in the state is eligible to adopt a program to mail every registered voter a ballot for primary and general elections. Nebraska and North Dakota allow only some counties to conduct 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

S3 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 S1, 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 S2) 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 S1 – Democratic Presidential Two-Party Vote Share over time, by Vote-by-Mail. VBM states are those listed in Table S2.

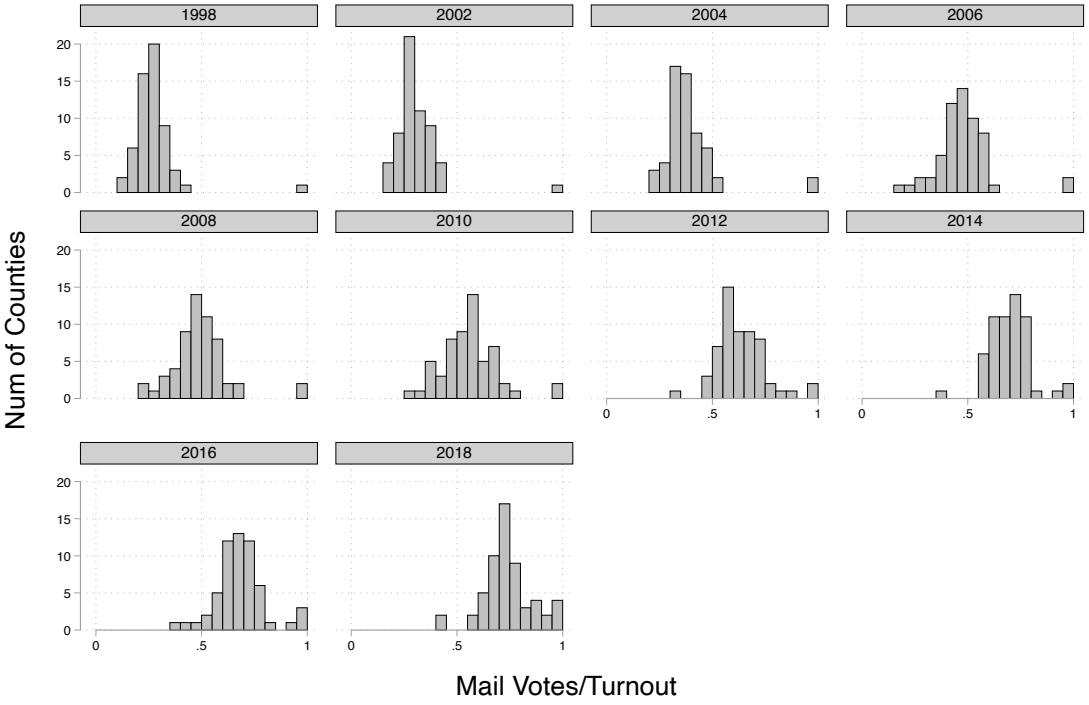


S4 Increasing Use of Vote-by-Mail

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.

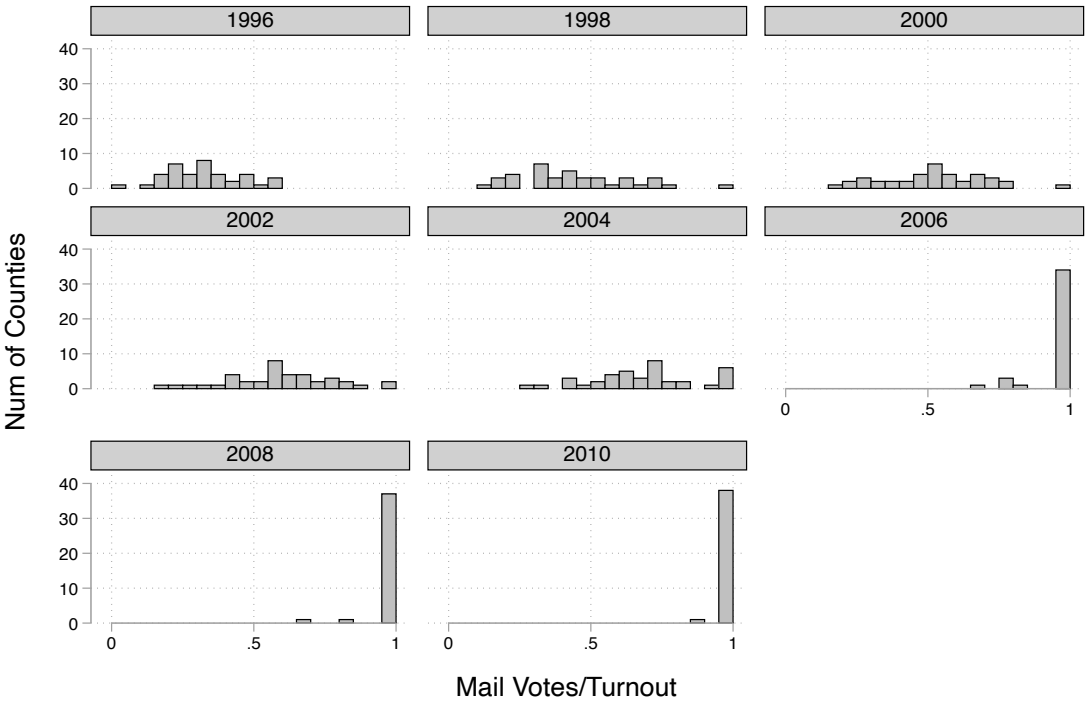
First, in Figure S2 we show vote-by-mail usage in California general elections over time. Each plot is a histogram of California counties, with the x-axis representing the share of total votes that were cast using vote-by-mail. As we can see, nearly all California counties received less than half of 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 S2 – 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.

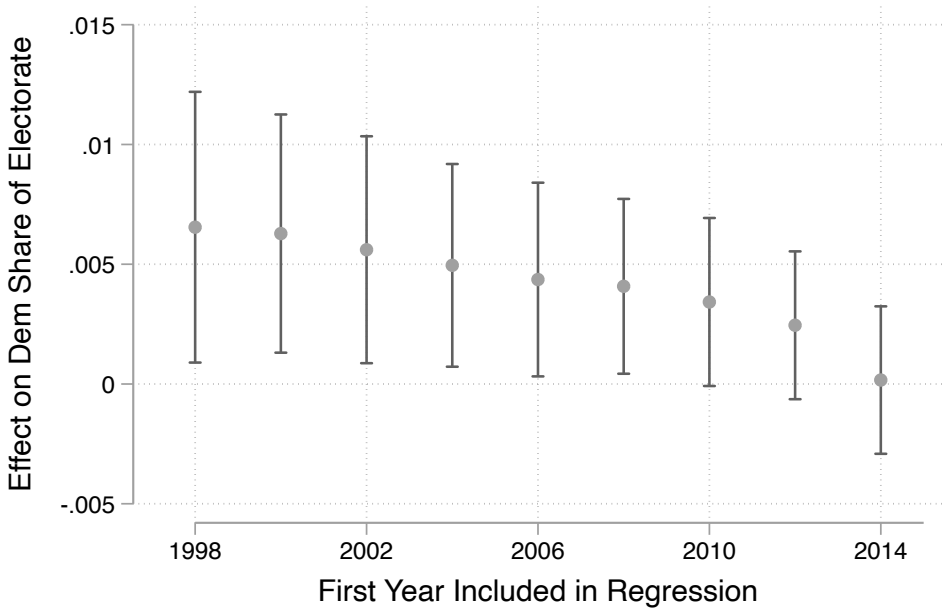
Figure S3 – Use of Vote-by-Mail in WA General Elections, 1996 to 2010.



S5 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 2). 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 S4, 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.

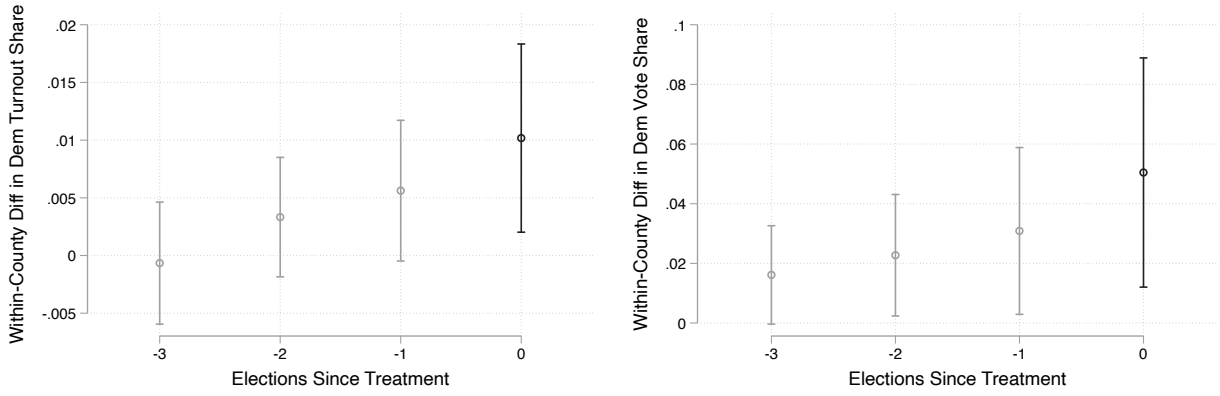
Figure S4 – Partisan Composition Effects Not Sensitive to Years Included in Sample.



S6 Graphical Evidence of Partisan Effects of Vote-by-Mail

In this section, we provide a graphical examination of vote-by-mail's effects on our outcomes in Table 2, which further suggests that there are no vote-by-mail effects on partisan turnout or vote share beyond the pre-trending issue. Figure S5 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 2: 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.

Figure S5 – Vote-by-Mail Reform and Pre-Trends.



S7 Partisan Effects Limiting to California and Utah

In this section, we show a version of Table 2 where we limit the analysis to California and Utah. For columns 1-3, where the outcome is Democratic turnout share, the results remain the same as in Table 2 because we have partisan composition for those two states, but not for Washington. For the Democratic vote share results in columns 4-6, 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 2.

Table S3 – 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)
VBM	0.007	0.001	0.001	0.041	0.009	0.004
	(0.003)	(0.001)	(0.001)	(0.021)	(0.007)	(0.006)
# Counties	87	87	87	87	87	87
# Elections	23	23	23	21	21	21
# Obs	986	986	986	1,218	1,218	1,218
County FE	Yes	Yes	Yes	Yes	Yes	Yes
State by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County Trends	No	Linear	Quad	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

S8 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 2. In each of these tables, we report confidence intervals for our estimates using the block bootstrap procedure described Cameron, Gelbach, and Miller (2008), clustered by county, due to the small number of clusters when estimating the effects independently for each state.

We show the results for California in Table S4. 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 S4 – 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)
VBM	0.003	-0.004	-0.001	0.030	0.001	-0.012
	[-0.004,0.013]	[-0.008,-0.001]	[-0.009,0.005]	[0.001,0.058]	[-0.017,0.014]	[-0.052,0.027]
# Counties	58	58	58	58	58	58
# Elections	11	11	11	11	11	11
# Obs	638	638	638	638	638	638
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County Trends	No	Linear	Quad	No	Linear	Quad

Block wild bootstrap confidence intervals clustered by county in brackets.

We show the results for Utah in Table S5. 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 5 and 6, 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 S6. 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 S6, the effect of vote-by-mail on the Democratic vote share is small.

Table S5 – 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)
VBM	0.009	0.003	0.001	0.044	0.012	0.008
	[0.000,0.017]	[-0.001,0.006]	[-0.001,0.004]	[-0.013,0.105]	[-0.008,0.032]	[-0.007,0.024]
# Counties	29	29	29	29	29	29
# Elections	12	12	12	10	10	10
# Obs	348	348	348	580	580	580
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County Trends	No	Linear	Quad	No	Linear	Quad

Block wild bootstrap confidence intervals clustered by county in brackets.

Table S6 – Vote-by-Mail Expansion Does Not Appear to Favor Either Party in Washington.

	Dem Vote Share [0-1]		
	(1)	(2)	(3)
VBM	0.015	0.012	0.008
	[0.006,0.022]	[0.004,0.020]	[0.001,0.016]
# Counties	39	39	39
# Elections	10	10	10
# Obs	780	780	780
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
County Trends	No	Linear	Quad

Block wild bootstrap confidence intervals clustered by county in brackets.

S9 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 3. In each of these tables, we report confidence intervals for our estimates using the block bootstrap procedure described Cameron, Gelbach, and Miller (2008), clustered by county, due to the small number of clusters when estimating the effects independently for each state.

We show the results for California in Table S7. 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 3. Our results in columns 4-6 for the vote-by-mail share are the same as Table 3 because we only use California in that analysis.

Table S7 – Vote-by-Mail Expansion Increases Participation in California.

	Turnout Share [0-1]			Vote-by-Mail Share [0-1]		
	(1)	(2)	(3)	(4)	(5)	(6)
VBM	0.018	0.014	0.014	0.186	0.157	0.136
	[-0.010,0.044]	[-0.006,0.040]	[-0.013,0.063]	[0.123,0.259]	[0.065,0.253]	[-0.198,0.266]
# Counties	58	58	58	58	58	58
# Elections	10	10	10	10	10	10
# Obs	580	580	580	580	580	580
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County Trends	No	Linear	Quad	No	Linear	Quad

Block wild bootstrap confidence intervals clustered by county in brackets.

Next, we show the results for Utah in Table S5. 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 3. 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 S9. 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 4-6, 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 S8 – Vote-by-Mail Expansion Increases Participation in Utah.

	Turnout Share [0-1]		
	(1)	(2)	(3)
VBM	0.032	0.032	0.034
	[-0.009,0.073]	[0.006,0.058]	[0.009,0.061]
# Counties	29	29	29
# Elections	12	12	12
# Obs	348	348	348
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
County Trends	No	Linear	Quad

Block wild bootstrap confidence intervals clustered by county in brackets.

Table S9 – Vote-by-Mail Expansion Increases Participation in Washington.

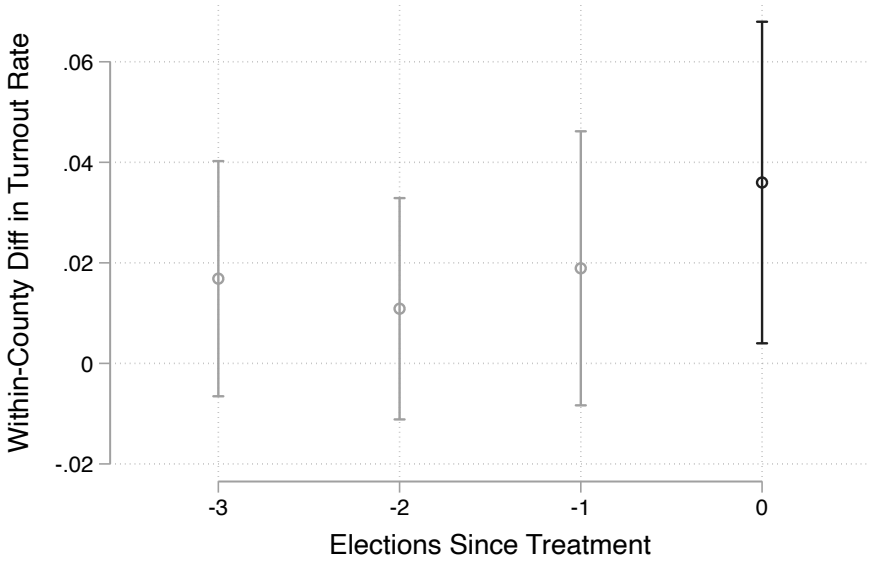
	Turnout Share [0-1]			Vote-by-Mail Share [0-1]		
	(1)	(2)	(3)	(4)	(5)	(6)
VBM	0.009	0.011	0.004	0.300	0.312	0.304
	[-0.001,0.019]	[-0.001,0.022]	[-0.009,0.018]	[0.226,0.367]	[0.225,0.404]	[0.175,0.436]
# Counties	39	39	39	39	39	39
# Elections	8	8	8	8	8	8
# Obs	312	312	312	312	312	312
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County Trends	No	Linear	Quad	No	Linear	Quad

Block wild bootstrap confidence intervals clustered by county in brackets.

S10 Graphical Evidence of Vote-by-Mail Effect on Participation

Figure S6 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 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 3, 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.

Figure S6 – Vote-by-Mail Reform Modestly Increases Turnout.



S11 Effect of Universal Vote-by-Mail on Republican Participation

In this section, we show that the non-effects of universal vote-by-mail on Democratic turnout in Table 2 hold when we instead look at Republican turnout share. The turnout share that we construct in columns 1-3 of Table 2 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 S10 we estimate the effects of vote-by-mail on the Republican turnout share. The specifications mirror columns 1-3 in our main results in Table 2. The first column shows the within-state difference-in-differences estimate, which is a decrease in Republican turnout share of approximately two and a half percentage points. 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 S10 – Vote-by-Mail Expansion Does Not Have Large Effects on Republican Share of the Electorate.

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

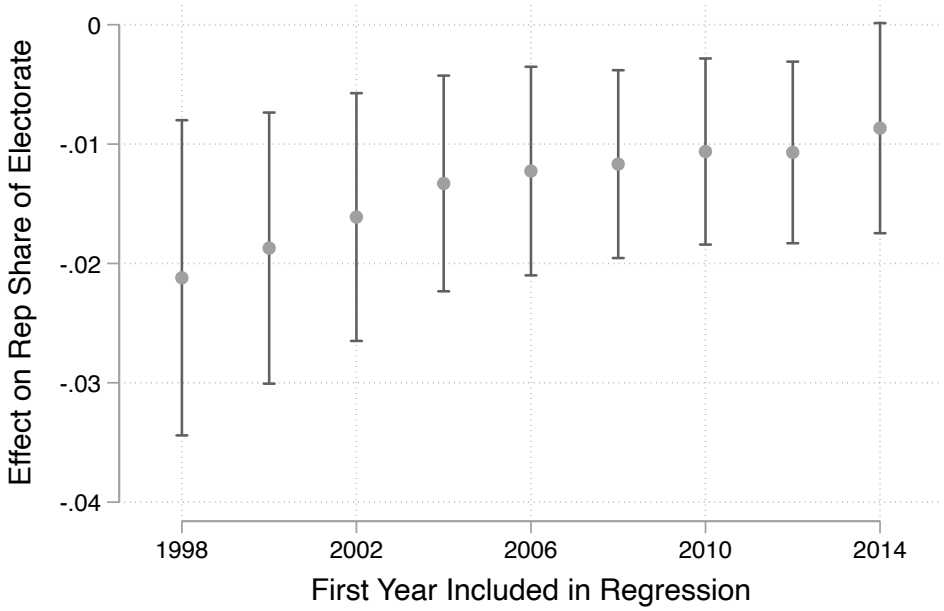
Robust standard errors clustered by county in parentheses.

To investigate the source of pre-trending more, we show the robustness of our difference-in-differences estimate (column 1 of Table S10) 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 S7, 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 difference-in-differences estimates in column 1 of Table S10 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 S7 – Republican Composition Effects Attenuate as We Include Just Recent Years in the Sample.



S12 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 S11. The specifications mirror those in columns 1-3 of Table 2. In our difference-in-differences design in column 1, we estimate that vote-by-mail decreased the share of the electorate age 55 or above by about one and a half percentage points. Once we include county-level time trends in columns 2 and 3, the estimates shrink to be 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.

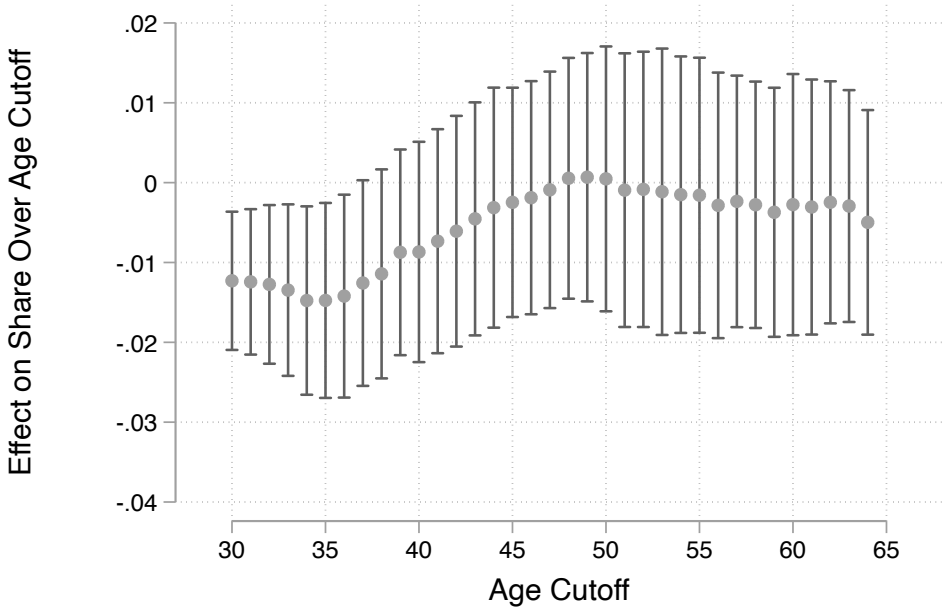
Table S11 – Vote-by-Mail Expansion Does Not Appear Have Large Effects on Age Composition of the Electorate.

	Turnout Share Age 55+ [0-1]		
	(1)	(2)	(3)
VBM	-0.016	-0.004	-0.005
	(0.012)	(0.009)	(0.010)
# Counties	87	87	87
# Elections	23	23	23
# Obs	986	986	986
County FE	Yes	Yes	Yes
State by Year FE	Yes	Yes	Yes
County Trends	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

The results in Table S11 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 S8 we show our estimates across a range of age cutoff values. For example, the leftmost estimate in Figure S8 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 S8 – Potentially Larger Effect on Electorate Age Using Higher Age Cutoff.



S13 Effects On Socio-Economic Status and Racial Composition of Electorate

In this section, we present evidence on the effect of vote-by-mail on the socio-economic status and racial composition of the electorate. We construct a variable that captures the share of the electorate that lives in census tracts with a 13% or higher poverty rate in the 2011-2016 American Community Survey five year sample. Using the same ACS data merged to the voter file, we measure the share of the electorate that lives in tracts that are more than 70% white.[22] We show the effects of vote-by-mail on these two outcomes in Tables S12 and S13. The specifications mirror those in columns 1-3 of Table 2.

Across all specifications in Table S12, the share of respondents coming from high-poverty tracts is not affected by vote-by-mail.

Table S13 estimates the effect of universal vote-by-mail on the turnout share from largely-white census tracts – columns 1 through 3 are substantively close to zero and cannot be distinguished from zero statistically.

Table S12 – Vote-by-Mail Expansion Does Not Appear Have Large Effects on Socio-Economic Status of the Electorate.

	Turnout Share High-Poverty Tracts [0-1]		
	(1)	(2)	(3)
VBM	-0.001	0.003	0.002
	(0.006)	(0.005)	(0.004)
# Counties	80	80	80
# Elections	23	23	23
# Obs	904	904	904
County FE	Yes	Yes	Yes
State by Year FE	Yes	Yes	Yes
County Trends	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

The results in Tables S12 and S13 rely on the arbitrary choice of the median tract to define the poverty rate and white-share cutoff. As in Figure S8, to show that our results are not simply an artifact of this choice of cutoff, in Figures S9 and S10 we show our estimates across a range of cutoff values. The figures show the effect of vote-by-mail on the race and poverty rate of the electorate is close to zero across a range of cutoffs.

[22] 13% is the median poverty tract poverty rate for California and Utah, and 70% is the median tract white share of the population.

Table S13 – Vote-by-Mail Expansion Does Not Appear Have Large Effects on Share of the Electorate from Overwhelmingly-White Tracts.

	Turnout Share High-White-Share Tracts [0-1]		
	(1)	(2)	(3)
VBM	-0.002	0.006	0.004
	(0.004)	(0.004)	(0.003)
# Counties	87	87	87
# Elections	23	23	23
# Obs	986	986	986
County FE	Yes	Yes	Yes
State by Year FE	Yes	Yes	Yes
County Trends	No	Linear	Quad

Robust standard errors clustered by county in parentheses.

Figure S9 – No Effect on Electorate Poverty Regardless of Cutoff.

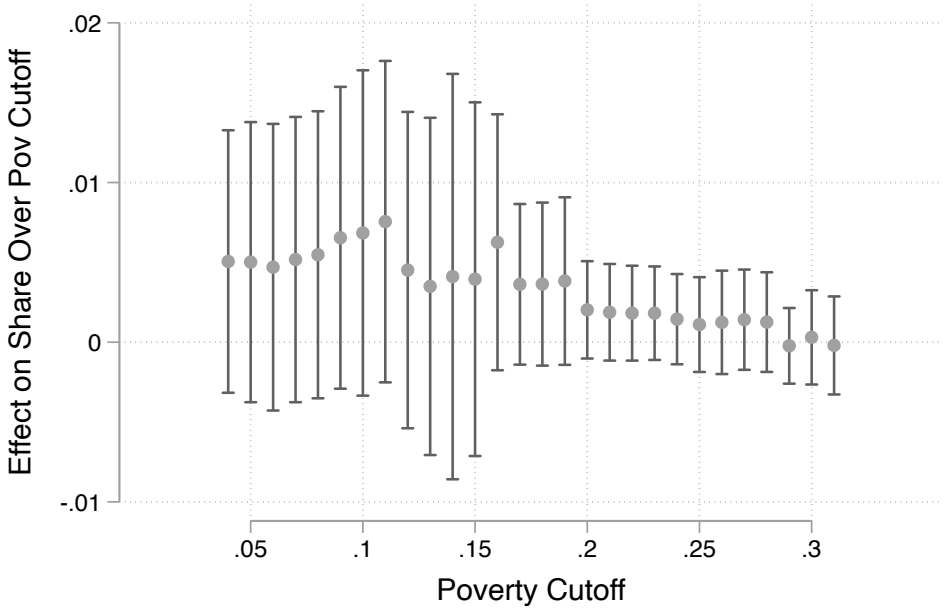
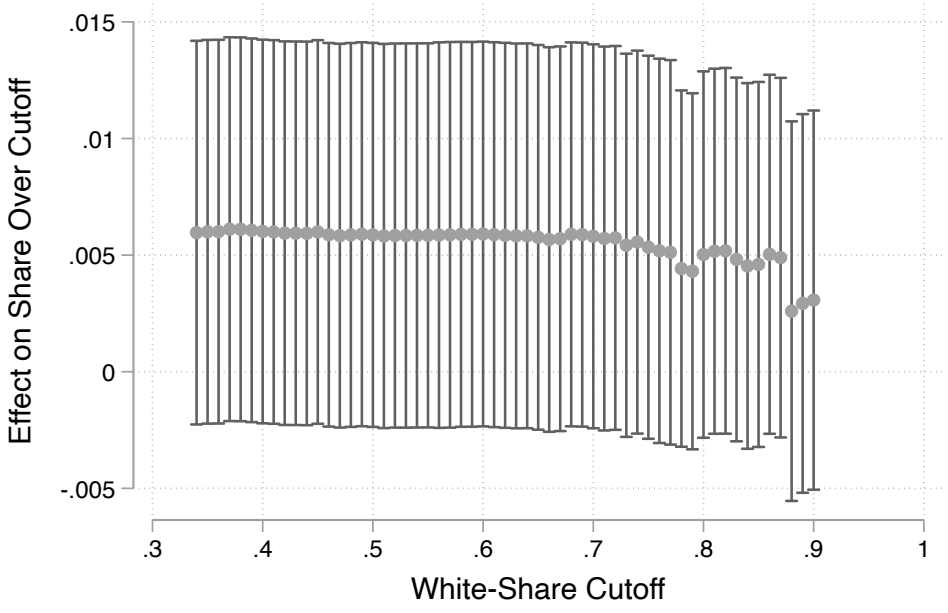


Figure S10 – No Effect on Electorate Race Regardless of Cutoff.



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