The Pulpit and the Polls: The Electoral Impact of Religious Participation*

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Abstract

We estimate how exposure to religious services affects U.S. voting. Novel sermon corpora show a sharp spike in political content on the Sunday before presidential elections. Exploiting quasi-random rainfall during typical service hours before elections–Precipitation at Time of Church (PTC)–and controlling for election day and weekly precipitation, a one–standard deviation increase in PTC lowers county Republican vote share by 0.6 percentage points. The effect is driven by reduced Republican turnout. Individual-level estimates confirm that effects concentrate among church-attending Christians—particularly White Evangelicals—and are absent for non-churchgoers who face the same weather, consistent with church-based mobilization.

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1 Introduction

Religious participation is one of the strongest correlates of partisan voting in the United States, yet we know comparatively little about the causal impact of exposure to religious services on voting. Political pundits often point to church messaging as having an effect on voting, but distinguishing this effect from underlying ideology, neighborhood composition, or broader campaign activity is hard. Our question is this: does attending church affect voting behavior?

To study this question, we bring together two ingredients. First, we assemble a novel and large sermon corpora to document when churches speak most directly about elections, showing that explicitly political content peaks on the Sunday immediately before presidential Election Day and then recedes. Second, we leverage the tight clustering of services (8 a.m.–1 p.m. on Sunday) and use precipitation during those hours–Precipitation at Time of Church (PTC)–as quasi-random variation in exposure to services. Because attendance is not observed in the voting data, we estimate reduced form effects of PTC within this precise, five-hour window, interpreting the coefficients as impacts of pre-election church exposure once Election Day and rest of week precipitation are held fixed.

We begin by establishing the supply of political messaging and the first stage linking weather to attendance. Using two large sermon datasets, we document a sharp surge in references to elections and politically salient issues on the Sunday before presidential elections. This pattern, consistent with pre-election mobilization, provides a narrow temporal target in which effects of service exposure are most likely to appear. We then use the American Time Use Survey (ATUS) to show that a one–standard deviation increase in PTC reduces Sunday churchgoing by 1.29 percentage points (6.7%) in the months surrounding elections. This first stage result confirms and refines earlier evidence (e.g., Moreno-Medina (2023)).

Our main strategy is to estimate reduced form effects of the pre-election Sunday PTC on subsequent voting behavior, using both county-level presidential returns and individual-level self reports from the Cooperative Election Study (CES). Our main identification assumption is that, conditional on election day precipitation and average precipitation over the rest of the week, rainfall exactly during typical service hours on the Sunday before Election Day should matter for voting only through church attendance. We implement a similar TWFE design at the aggregate and individual level, specifying PTC as a normalized, within-county shock and including rich weather controls. Note that the use of the CES is quite important, as it provides information on religious behavior. As such, it allows us verify that effects concentrate among regular church attending Christians (and are absent for non-churchgoers), and examine mechanisms and heterogeneity that cannot be cleanly recovered from county aggregates.

We find consistent evidence that reduced exposure to pre-election Sunday services reduces subsequent Republican support. At the county level, a one–standard deviation increase in PTC lowers the Republican two party vote share by 0.6 percentage points. This reduction operates primarily through mobilization rather than cross-party persuasion: Republican turnout declines by roughly 0.6 percentage points, overall turnout falls modestly and less precisely, and Democratic turnout is largely unaffected, implying that fewer Republican-leaning churchgoers cast ballots rather than switching party. Heterogeneity by county religious composition is suggestive but imprecise, motivating the move to individual-level data to identify who is affected and how.

Individual-level evidence reinforces this picture of church-based mobilization. Among regular church attending Christians in the CES, a one–standard deviation increase in PTC reduces the probability of voting Republican by 1.2 percentage points, with the effect concentrated among White Evangelicals and twice as large for respondents reporting low political interest. In contrast, effects are statistically indistinguishable from zero for non-churchgoers. The pattern that those plausibly exposed to in-church messaging respond to Sunday morning rain is precisely what the design predicts.

In exploring the mechanisms even further, we show that sermon data indicate two prominent features of the pre-election Sunday: frequent encouragement to vote and emphasis on issues commonly aligned with Republican candidates (e.g., abortion), with little explicit Democratic advocacy. Furthermore, we show that the effects of PTC are largest in states where sermon content has more semantic similarity to a pro-voting, pro-Republican message. Putting these results together with our earlier heterogeneity results, we find a picture suggestive of last-minute mobilization via issue cues and civic duty reminders among the most exposed and persuadable groups.

A natural concern is whether our estimates truly capture the causal effect of church attendance, or if they reflect spurious or confounding variation in weather and political trends. We address this concern in several ways. First, across all specifications we condition on election day precipitation and on weekly precipitation outside the service window, so the identifying variation is the narrow band of rain during typical service hours on the pre-election Sunday. Second, adding a dense set of time block precipitation controls across the pre-election week leaves the Sunday hour effect largely unchanged. Third, we find no effects of PTC for placebo populations—non-churchgoers and non-Christians—who share the same weather but lack exposure to services; if Sunday-morning rain affected voting through non-church channels, we would expect these groups to respond as well. Fourth, randomization-in-time tests (reassigning the PTC date) and post-election placebo coefficients place our main estimates in the tails of the resulting distributions; notably, rain at the same morning hours on Saturday or Monday shows no effect, indicating that weather matters for voting only when churches are in session. Fifth, alternative estimators

designed to address difference in differences heterogeneity recover similar magnitudes, and decompositions show negligible negative weights. Together, these checks support the claim that the reduced forms identify the causal impact of pre-election church exposure on partisan outcomes.

Two strands of work inform our study. First, research on religious media, organizations, and institutions shows that religious exposure can move votes—via broadcast clergy in the 1930s (Wang, 2021), attendance through blue laws (Gerber, Gruber and Hungerman, 2016), and Pentecostal expansion in Brazil (Solá, 2025).[1] Beyond voting, policy can shift values (Bentzen, Pizzigolotto and Sperling, 2025), while shocks to religious leadership or participation have effects on petty-crime, giving, and even fertility (Bassi and Rasul, 2017; Bottan and Perez-Truglia, 2015; Cools, 2025; Farina and Pathania, 2020; Iyer, de mesa Moyano and Moorthy, 2024; Moreno-Medina, 2023). We add contemporaneous, quasi-experimental evidence using high frequency exposure and new sermon transcripts to show that church political messaging intensifies on the cusp of elections and—through ordinary weekly attendance—causally shifts voter behavior. Second, a broader literature shows that political preferences and participation respond to multiple forces, including: media (DellaVigna and Kaplan, 2007), especially among lower motivation voters (Enikolopov, Petrova and Zhuravskaya, 2011); inflammatory campaigning (Grosjean, Masera and Yousaf, 2023); and epidemics (Mansour and Reeves, 2024). Our paper shows that the last religious services before an election can operate as mobilization channel for turnout and vote shares.

The rest of the paper is structured as follows: Section 2 describes how we identify the timing of politically salient messaging during religious services; Section 3 describes the data and presents first stage evidence; Section 4 discusses the empirical strategy and main results; we explore heterogeneity and mechanisms in Section 5; Section 6 presents a series of robustness checks; finally, we conclude in Section 7.

2 Political Messaging at US Churches

We draw on two novel and large sermon datasets–*SermonCentral*, which is broadly representative across Protestant denominations, and *SermonAudio*, which provides dense coverage of theologically conservative Evangelical churches—to document the timing and content of political messaging before presidential elections.[2] These datasets, used here for

[1] Relatedly, see Hungerman, Rinz, Weninger and Yoon (2018) for an example of how political campaigning can affect religious outcomes.

[2] The term "evangelical" is used to denote Christians focused on a born-again experience, salvation based on Jesus's sacrifice on the cross, Biblical authority, and evangelization/activism (National Association of Evangelicals, n.d.). White Evangelicals have higher Republican identification/voting rates than other White ("Mainline") Protestants. Regardless of theological views, Black Protestants have low Republican identification/voting rates (Pew Research Center, 2024).

the first time in economics, give access to tens of thousands of dated sermons and permit a systematic characterization of how churches communicate in the weeks leading up to elections (full construction details in Appendix A).

For each presidential cycle from 2004–2016, we compute the weekly share of sermons containing political or issue-salient terms. Figure 1 summarizes our results. Across all measures—mentions of "vote," "elect," and references to salient issues such as abortion or those referenced by Evangelical megachurch pastor Rick Warren in a 2004 letter—both datasets exhibit a sharp and short-lived spike in political content on the Sunday immediately before Election Day.[3] The pattern is particularly pronounced in the more representative SermonCentral corpus, but the timing aligns across the theologically conservative SermonAudio sample as well.

This evidence establishes a new stylized fact: churches substantially intensify political messaging precisely on the final Sunday before presidential elections.[4] We also find that the spike dissipates immediately after the election. Importantly, this pattern is not an artifact of keyword choice. In Figure C1, we show that large-language-model topic classification, applied to the full sermon text, recovers the same temporal pattern as the keyword series, reinforcing the robustness of this finding. Taken together, the sermon data reveal that the pre-election Sunday is a focal point for political communication within U.S. Protestant churches. Because prior work shows that the effects of political persuasion are highly time-sensitive, this timing provides a clear rationale for examining how marginal variation in exposure to services on that single Sunday may translate into observable electoral effects (Gerber, Gimpel, Green and Shaw, 2011).

3 Data and First Stage Evidence

3.1 Data

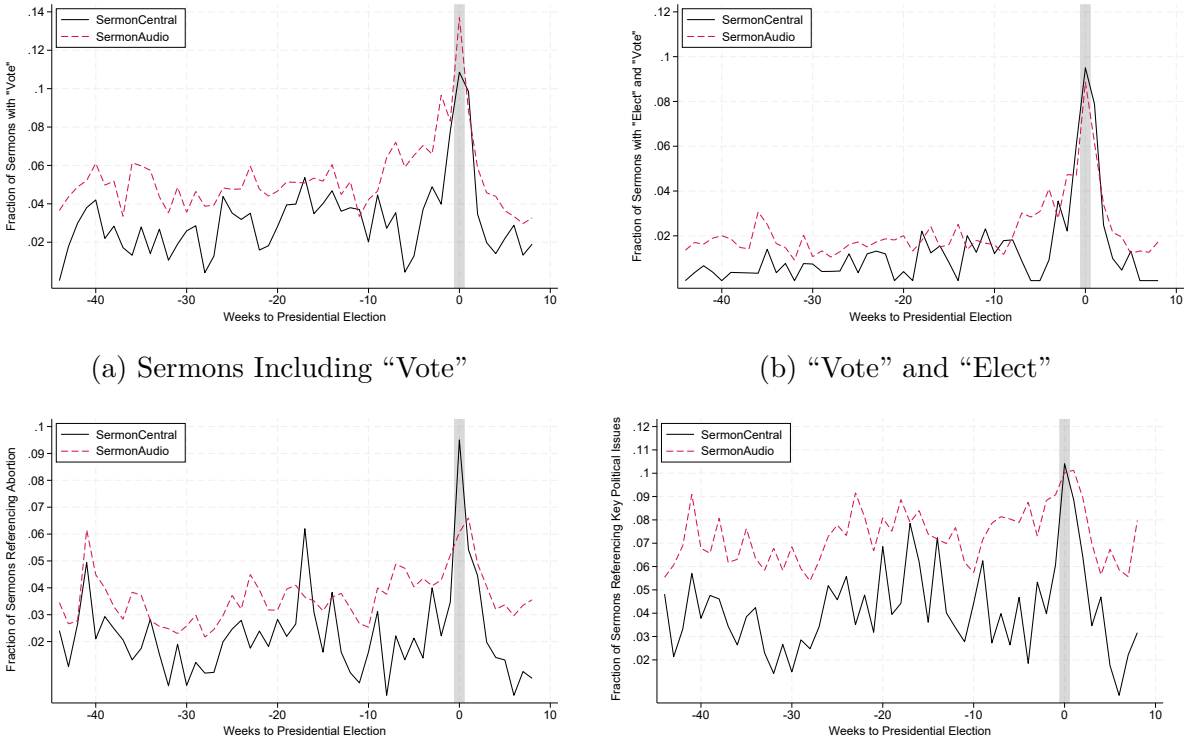
Our analysis combines (i) a harmonized measure of hourly precipitation, (ii) county-level presidential election returns, and (iii) individual voting and religious behavior from the Cooperative Election Study (CES). Table 1 summarizes the key variables, and Appendix A details all data construction.

Precipitation: We construct precipitation at the time of church (PTC) by averaging hourly rainfall between 8 a.m. and 1 p.m. on Sundays, using NOAA station data interpolated to a $0.1^\circ \times 0.1^\circ$ grid and aggregated to the county level. We also compute

[3] Rick Warren sent an email to over 100,000 fellow pastors on the cusp of the 2004 election encouraging them and their congregants to focus on five "non-negotiable" issues in voting: abortion, human cloning, gay marriage, stem cell research, and euthanasia (Warren, 2004; Pew Research Center, 2008).

[4] We do not observe the same spike around midterm elections.

Figure 1: Sermon Messaging About Elections around Presidential Elections



(a) Sermons Including "Vote"

(b) "Vote" and "Elect"

(c) References to Abortion

(d) Rick Warren Issues

Note: This figure shows the average fraction of sermons on *SermonCentral* containing the word "Vote" (Panel (a)), the words "Vote" and "Elect" (Panel (b)), words related to abortion (Panel (c)), and words related to any of the five outlined Rick Warren issues (Panel (d)) across presidential election years between 2004 and 2016. Sermons are dated to the closest previous Sunday.

election-day precipitation and weekly precipitation (Tuesday–Monday, excluding Sunday) to absorb other weather channels. In order to more accurately account for seasonality, all rainfall variables are normalized using local October–December means and standard deviations to capture deviations relative to local climatic baselines.

Aggregate electoral outcomes: County-level presidential returns come from the MIT Election Data and Science Lab (2018) and cover the 2004–2016 presidential elections. We construct two-party Republican vote share and turnout measures using county estimates of the voting-eligible population, and we supplement these with county demographic and economic characteristics. Our main regression sample combining election and precipitation data has 11,831 county-year observations across 3057 counties.[5]

Individual electoral outcomes: The CES provides individual-level data on voting, religiosity, attendance, and demographics; we focus on 2008–2018 data. As shown in Table 1

[5]To ensure that our results are not driven by PTC outliers, we exclude observations exceeding the 99.5 percentile of the county-level distribution in both the county and individual-level (CES) regressions. Table B5 shows alternative treatments of outliers.

and Figure A2, vote choice and turnout reported in the CES closely track official returns, and the religious classification aligns well with external benchmarks. Together, these datasets allow us to pair exogenous, time-narrow weather variation with high-resolution electoral and survey outcomes, forming the basis for the empirical framework that follows.

Table 1: Summary Statistics

	Mean	SD	Observations
Panel A: County Level Data			
Voter Turnout	57.867	9.655	11,913
Republican Two-Party Vote Share	61.890	14.731	11,913
Republican Turnout	34.815	10.005	11,913
Election day rain (mm/hour)	0.092	0.233	11,900
PTC before election (mm/hour)	0.068	0.340	11,913
% White	79.719	19.373	11,913
% Over 65	16.525	4.412	11,913
log Household Income (2012 US)	10.711	0.238	11,912
% Bachelor or Higher	16.417	7.621	11,908
Unemployment Rate	5.672	1.566	11,913
Panel B: CES Christian Churchgoers			
Voter Turnout	84.870	35.835	108,222
Republican Two-Party Vote Share	62.194	48.491	91,680
Republican Turnout	51.059	49.989	108,222
Election day rain (mm/hour)	0.059	0.137	108,222
PTC before election (mm/hour)	0.044	0.184	108,222
% White	73.226	44.278	108,222
% Over 65	23.883	42.637	108,222
% Bachelor or Higher	31.304	46.373	108,222
% White Evangelical	33.775	47.295	108,222
% White Non-Evangelical	16.432	37.057	108,222
% Black Protestant	12.289	32.831	108,222
% White Catholic	18.578	38.893	108,222
% Hispanic Catholic	4.020	19.643	108,222
% Mormon	4.144	19.931	108,222
% Other Christians	10.762	30.990	108,222

Notes: This table displays means and standard deviations for the main regression samples. Panel A includes Presidential election years from 2004-2016. Panel B includes CES respondents from 2008-2019 and is restricted to those who identify as Christian and attend church at least once a month. Panel A is unweighted. Panel B is weighted using CES survey weights.

3.2 First Stage Evidence - Effects of PTC on Attendance

We begin by showing evidence that weather shocks at the precise time of church, PTC, decreases church attendance. To do this, we turn to the American Time Use Survey

(ATUS), in which respondents fill out a time log documenting daily activities. "Church attendance" is defined as engaging in at least 60 minutes of "Religious and Spiritual Activities" on a given day. Although ideally we would test for the first stage in the same sample as the reduced form, there are no high-frequency measurements of attendance at the county-level or within the CES data. Thus, we employ a second best alternative, and test for effects of PTC in ATUS.

First stage specification: We employ the following linear probability model:

$$Attendance_{i,c,t} = \beta PTC_{c,t} + \eta WP_{c,t} + \sum_{j=1}^{k} \theta^j x^j_{i,c,t} + \gamma_t + \delta_c + \epsilon_{it} \tag{1}$$

where $Attendance_{ict}$ takes a value of 100 if individual i in county c attended church on Sunday t and 0 otherwise. $PTC_{c,t}$ represents normalized PTC for a given Sunday and $WP_{c,t}$ is average precipitation from the previous Tuesday through the following Monday (excluding Sunday). $x^j_{i,c,t}$ represents j individual-level controls including age and age squared, race/ethnicity (indicators for Hispanic, Non-Hispanic Black, and Other), sex, education level (indicator for college degree), marital status (indicators for married, divorced, and widowed), log income, and presence of own children in the household. γ_t are month and year fixed effects and δ_c are geographic (state or county) fixed effects.

First Stage Results: Estimates from Equation 1 are reported in the first two columns of Table 2. We restrict the ATUS sample to September–November Sundays so that the first stage is seasonally matched to the reduced-form timing (pre-election Sundays fall in late October or early November). Column (1) includes county, year, and month fixed effects and the weekly rainfall control; column (2) adds the full set of demographic controls. The coefficient is stable across both specifications, and indicates that a one standard deviation increase in PTC decreases church attendance by 1.29 percentage points, or about 6.7 percent on a mean of 19.3 percent. The coefficient is significant at the 5 percent level. Results are similar when using the full year of ATUS data and alternative definitions of attendance (Table B1).

These results confirm and improve on previous evidence showing that weather shocks at this time indeed decrease attendance (Moreno-Medina, 2023). We now move on to our main design.

4 Empirical Strategy and Main Results

Reduced form specification: Given the findings in Section 2, and the fact that political message is more likely to be effective up to one week, we focus on weather

shocks to the Sunday before the election (Gerber et al., 2011). Our main results are presented with the following fixed effects model estimating the relationship between PTC and Republican share by county:

$$RepubShare_{c,t} = \beta PTC_{c,t} + \eta WP_{c,t} + \lambda EDP_{c,t} + \sum_{j=1}^{k} \theta^j x^j_{c,t} + \gamma_t + \delta_c + \zeta_c * YEAR_t + \epsilon_{c,t} \quad (2)$$

where $RepubShare_{c,t}$ represents the two-party Republican share of the presidential vote in county c and year t, ranging from 0 to 100. $PTC_{c,t}$ represents normalized PTC for the Sunday before the election, $WP_{c,t}$ is normalized precipitation from the Tuesday through the Monday before the election (excluding Sunday), and $EDP_{c,t}$ is normalized precipitation on election day. γ_t are election-year fixed effects and δ_c are county fixed effects. Following Fujiwara, Meng and Vogl (2016), we control for county-specific linear time trends in voting patterns ($\zeta_c * YEAR_t$). We also control for demographic characteristics (fraction white, fraction over 65, log household income, fraction college educated, and unemployment rate) interacted with year. Furthermore, given growing rural-urban differences in voter preferences (Scala and Johnson, 2017), we classify counties using the 2003 rural–urban continuum codes from the U.S. Department of Agriculture, and interact these classifications with year indicators. Finally, to account for election competitiveness, we control for whether there is a concurrent Senate election and whether the Senate and presidential election are expected to be competitive in the state (i.e. whether the state is a "swing state").

Balance: Identification relies on the quasi-random nature of normalized precipitation; conditional on controls, whether precipitation occurs at the *exact* time of church on Sunday should be exogenous to other determinants of voting behavior. To explore the validity of this assumption, we test the relationship between PTC and baseline characteristics. We do so by regressing normalized PTC on county demographic and economic characteristics, one at a time. Since our main specification includes fixed effects/trends, identification requires only that countywide *deviations from the trend* in PTC are unrelated to *deviations* in other determinants of voting behavior. Thus, we also include county and year fixed effects and county-specific linear trends in these regressions.

Figure B1 shows the results. In panel A, each row represents the coefficient from the separate regression of normalized PTC on the listed characteristic. As shown, none of the coefficients are statistically significant; a joint test of significance of all coefficients has a p-value of 0.815. In Panel B, each row represents the coefficient from a regression of normalized PTC on an individual demographic characteristic for an individual Christian churchgoer in the CES.[6] Just one of the 12 coefficients is significant at the 5 percent level,

[6]Given relatively few observations in small counties in the CES, we use state instead of county fixed

only slightly above what would be expected by chance. A joint test of significance of all coefficients has a p-value of 0.597. Thus, these tests provide support for the assumption that deviations in PTC are unrelated to changes in the underlying characteristics of the area that may affect electoral outcomes.

Effects of PTC on aggregate voting: Columns (3) and (4) in Table 2 show our main results estimating Equation 2 using county-level data. Column (3) presents results from a parsimonious specification, including only county and year fixed effects and the normalized value of election day rain. The estimate becomes more precise as we add time-varying controls and county linear time trends. The full specification (Column (4)) shows that a one standard deviation increase in PTC decreases Republican vote share by 0.6 percentage points, with the results being statistically different from zero at the 1% level. These electoral impacts are meaningfully large: in magnitude, their effects on Republican vote share are about one-third to one-fourth as large as political protests (Madestam, Shoag, Veuger and Yanagizawa-Drott, 2013) or widely influential radio figure Father Coughlin (Wang, 2021), and 6-7 times higher than the effect of exposure to Jerry Falwell's Old Time Gospel Hour program (Buccione and Knight, 2024). The sizable effect also indicates that relatively small changes in PTC/churchgoing may affect electoral outcomes. For example, a 0.67 standard deviation increase in a state's PTC would decrease its Republican vote share by 0.41 percentage points; this would be sufficient to flip the states of Michigan, Wisconsin, and Pennsylvania from the Republican to the Democratic candidate in the 2016 election and therefore change the race's outcome.

A decrease in Republican share could result from mobilization or vote switching. We run our full specification with three alternative dependent variables: Republican turnout (Number of Republican votes divided by the number of eligible voters), Democratic turnout, and total turnout. The results are shown in columns (5)-(7) of Table 2. As shown in column (5), PTC lowers Republican turnout by almost 0.6 percentage points with the point estimate being statistically significant at the 1% level. Column 7 shows that overall turnout decreases by about 0.4 percentage points - although the estimate is less precisely estimated. Lastly, we see a marginally positive point estimate for Democratic turnout, but this effect is very close to zero (0.09 percentage points) and statistically not different from zero. Overall, we interpret these results as showing that the effects on Republican share primarily come through mobilization of Republican voters at churches, not persuasion to switch candidates.

Effects of PTC on individual-level behavior: To further explore these effects and possible mechanisms, we turn to individual-level data from the Cooperative Election Study

effects.

(CES). As mentioned, the CES provides us with a much richer set of covariates at the individual level including the religious self-identification of the respondent. We focus on evaluating the effect of PTC on our population of interest given our hypothesis: regular church-attending Christians. We follow Equation 2, with the dependent variable equal to 100 if the individual voted for the Republican presidential candidate and 0 otherwise. In many counties, a small sample limits the precision of county fixed effects; therefore, we employ state fixed effects instead. We continue to include the time-varying county-level controls.[7] We also include controls for individual demographic characteristics: age, age squared, sex, race/ethnicity (indicators for black, Hispanic, and other races), college education, post-college education, marital status (dummies for married, divorced and widowed), and presence of a child in the household, interacted with election year.

The results are presented in Columns (8)-(10) in Table 2. We find that indeed PTC has an effect on electoral behavior of regular churchgoers. A one standard-deviation increase in PTC decreases the likelihood that a churchgoer supports the Republican candidate (relative to the Democrat) by 1.2 percentage points, with the effect being significant at a 1% level. Column 9 shows that the unconditional effect on voting Republican is reduced by 0.6 percentage points–although this effect is less precisely estimated. Lastly, column (10) shows the effect on overall turnout - which shows a reduction of 0.2 percentage points, although this effect is not significant at usual levels. Overall, we corroborate that the effects captured at the county level are operating in our main sample of interest: regular churchgoers.[8]

[7]These include median household income and metro status, both interacted with election year, and swing state status.

[8]Following DellaVigna and Kaplan (2007) and Enikolopov et al. (2011), we report a back-of-the-envelope implied persuasion rate for readers interested in benchmarking magnitudes, and present the details of the estimation in Appendix E. Given the additional assumptions required in our setting—in particular, the need to combine reduced-form and first-stage estimates from different samples and to map precipitation-induced attendance changes into exposure rates—we do not interpret this quantity as a structural or point-identified persuasion parameter, and we caution against placing substantive weight on its exact value. Overall, though, we estimate an implied rate of 21%, which falls within the range of persuasion rates estimated in the media effects literature: DellaVigna and Kaplan (2007) [3–8% for Fox News exposure]; Gentzkow, Shapiro and Sinkinson (2011) [13% for newspaper readership], Gerber et al. (2011) [20% for campaign advertising], Martin and Yurukoglu (2017) [27–58% for Fox News viewership]; and Enikolopov et al. (2011) [66% for independent Russian television.]

Table 2: Main Estimation Results

	First Stage		Reduced Form							
	ATUS Sep–Nov, 2003–2016		County level: 2004–2016					CES: 2008–2016		
	Attendance		Vote Share		Turnout			Vote Share	Turnout	
			Republican		Republican	Democratic	All	Republican	Republican	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Normalized PTC	-1.197**	-1.294**	-0.491*	-0.615***	-0.585***	0.079	-0.409*	-1.202***	-0.672*	-0.236
	(0.556)	(0.558)	(0.247)	(0.187)	(0.170)	(0.186)	(0.229)	(0.364)	(0.393)	(0.298)
Observations	4,419	4,419	11,831	11,831	11,831	11,831	11,831	91,604	108,114	108,114
Mean of Dependent Variable	19.325	19.325	48.837	48.837	26.793	28.067	56.340	55.612	46.485	87.518
Control for Election Day Rain			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control for Weekly Rainfall	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
State Fixed Effect								Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Linear Trends				Yes	Yes	Yes	Yes			
Demographic Controls		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: In columns (1)–(2), the dependent variable is religious service attendance (100=yes, 0=no), restricted to ATUS respondents surveyed on September–November Sundays to better match the reduced-form timing (pre-election Sundays occur in late October or early November). PTC is normalized using the mean and standard deviation of precipitation from 1996 to 2003 for the months before, during, and after the survey month. Time fixed effects refer to year and month fixed effects. Demographic controls include age, gender, log family income, education attainment, marital status, race and ethnicity.

In columns (3)–(4) and (5)–(7), the dependent variable is county republican share or turnout, respectively. PTC is normalized using the mean and standard deviation of October to December precipitation from 1996 to 2003. Time fixed effects refer to election year fixed effects. Demographic controls include county percent white × year, percent over 65 × year, log household income in 2012 dollar × year, percent bachelor or higher × year, unemployment rate × year, rural-ness measure of a county × year, indicators for swing states in presidential and senate elections, and indicators for states and years when there is a coinciding senate and presidential election. The regressions in columns (3)–(7) are weighted by 2000 eligible voter population.

In columns (8) and (9)–(10), the dependent variable is the likelihood of voting for a republican presidential candidate or party-specific turnout, respectively (100=yes, 0=no). PTC refers to the precipitation at time of church at the week before election, and is normalized using the mean and standard deviation of October to December from 1996 to 2003. Time fixed effects refer to survey year fixed effects. Demographic controls include age × year, race and ethnicity indicators × year, education level indicators × year, marital status × year, number of children × year, county level median household income × year, county rural-ness measure × year, indicators for swing states in presidential and senate elections, and indicators for states and years when there is a coinciding senate and presidential election. The regressions in columns (8)–(10) are weighted using CES survey weights.

In all columns, standard errors are in parentheses and are clustered at state level.

5 Heterogeneity and Mechanisms

Where and for whom does church attendance/PTC affect electoral outcomes? To explore this question, we show heterogeneity at the county and individual level. We then explore the sermon data in more detail to discuss mechanisms.

Heterogeneity by county: For our county-level data, we estimate Equation 2 separately by (i) primary religious affiliation of the county and (ii) political orientation of the county. The dependent variable is the two-party Republican share. The p-values displayed are for tests of equality relative to the omitted group (listed without a p-value). Figure 2, panel (a) shows that the most precise results come from Evangelical counties: even though the sample size is substantially reduced when we split counties into three groups, we continue to see a large and statistically significant effect in Evangelical areas. The results by political affiliation are less clear, but are suggestive of a larger effect in politically moderate areas.

Heterogeneity by individual regular church attending behavior: Using the CES, we are able to estimate effects separately by individuals' religious affiliation/attendance and other characteristics. The first row of panel (b) replicates the result from column (8) of Table 2: a one standard deviation increase in PTC reduces churchgoers' support for Republican candidates by 1.2 percentage points. We repeat this estimate for all "others," which includes Christians who do not attend church and non-Christians. This group provides a placebo test, since they should not be affected by political persuasion at church but should be affected by omitted factors (such as election day rain) correlated with PTC and voting outcomes. In fact, there is no statistically significant relationship between PTC and this group's voting outcomes, supporting our claim that PTC affects voting through church attendance.[9] The Christian churchgoers as a whole have a coefficient that is significantly different from the "others" group (non-Christians and infrequently-attending Christians).

Heterogeneity by Christian denomination: We also explore differences by four denominational/race groups of churchogers for which we have sufficient sample size: White Evangelicals, White Nonevangelical Protestants, Black Protestants, and White Catholics. Consistent with reported Republican partisanship of Evangelical leaders, the effects are concentrated among White Evangelicals. For this group, a one standard deviation increase in precipitation decreases the likelihood of voting for a Republican by 3.1 percentage points (3.7 percent on a mean of 84.8); this is a significant difference relative to the

[9]Separate estimates for Christian non-churchgoers and non-Christians are shown in Table B4; there is little relationship between PTC and voting outcomes for either group.

non-churchgoing baseline (the "Others" group). Other denomination/race categories do not show a systematic relationship between PTC/churchgoing and electoral behavior.

Heterogeneity by Political Interest: Finally, we explore differences by political knowledge/interest, as evidence suggests that individuals with low political knowledge are more susceptible to persuasion (Enikolopov et al., 2011). As discussed in Appendix A, we use a question about how much one keeps up with current events to assess political interest/knowledge. Consistent with the literature, we find that the effects of PTC are strongest for churchgoers with low political knowledge; this suggests an important role for persuasion at the time of church. Those with high knowledge, who may be less persuadable, see a more muted impact of PTC.

Further exploration of Sermon content: We next turn to the question of *how* churches mobilize attendees, focusing on content communicated during sermons. Since there are several ways in which congregants may be mobilized at church (e.g., reminders during announcements, voting guides in bulletins or other handouts, peer effects), sermon exposure is likely a lower bound on all political messaging received.[10]

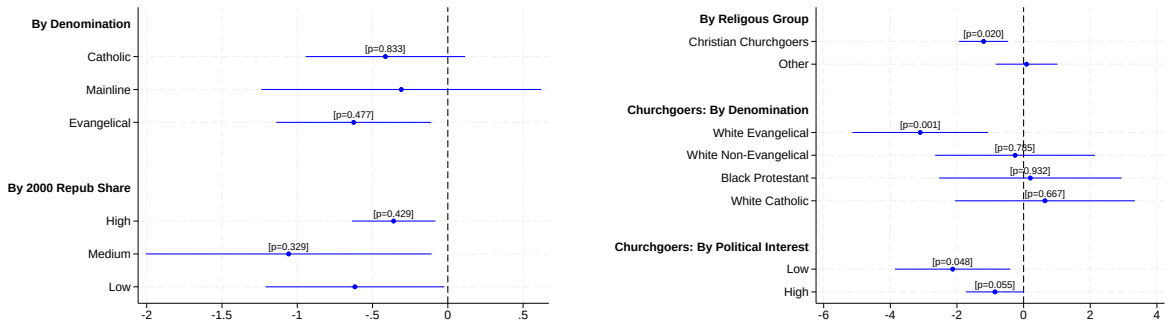
We focus on data from SermonCentral, previously discussed in Section 2, which is more representative across Protestant denominations. Using OpenAI's GPT-4.1-mini (`gpt-4.1-mini`) API, we classify political pre-election sermons into mutually exclusive buckets shown in Table C1: (i) pure civic duty/non-partisan encouragement to vote (40%) (e.g., "we as believers have a responsibility to vote" (Sullivan, 2008)) (ii) pro-Republican issues only (43%) (e.g., "We're against homosexuality and gay marriage. We're against abortion" (Croix, 2008)), (iii) pro-Republican issues and pro-Republican sentiment (15%); and any Democratic support (3%).[11] Together, these results suggest that congregants are encouraged to vote, often in line with Republican platforms. Sentiment toward a particular candidate or party plays a smaller role.

If sermon content affects electoral decisions, PTC should have stronger impacts in places with more political/partisan sermons. To obtain a continuous measure of sermon politicization, we embed each SermonCentral entry from the week before the election into 384-dimensional vector representations using the Cohere embed-english-light-v3.0 model (Cohere, 2023). We also embed Rick Warren's 2004 letter to fellow pastors emphasizing

[10]For example, in 2012, the conservative Faith and Freedom Coalition claimed to distribute 30 million voter guides at over 100,000 churches (Faith & Freedom Coalition, 2016). Sermon content is likely highly correlated with other church messaging (e.g., it is unlikely that a pastor would give a pro-Democratic sermon and allow dissemination of a conservative voting guide).

[11]Consistent with IRS regulations for tax-exempt religious congregations prior to 2025, we find little evidence of sermons directly telling churchgoers for whom they should vote. Appendix C presents details on the methodology and more examples of sermon content.

Figure 2: Heterogeneity in the Effects of PTC on Electoral Outcomes



(a) By County Characteristics

(b) By individual characteristics (CES)

Note: This figure shows point estimates and 95 percent confidence intervals for regressions of Republican share (Panel A) or the likelihood of voting for a republican presidential candidate (100=yes, 0=no) (Panel B) on PTC. We use the specifications in column (4) and (8) of Table 2, respectively. PTC refers to the precipitation at time of church at the week before election, and is normalized using the mean and standard deviation of October to December precipitation from 1996 to 2003. In Panel A, the counties are classified based on either the denomination with most adherents or the 2000 Republican share. In Panel B, they are split by individual identification and attendance. The Other category combines non-Christian respondents and those who identify as Christian but attend church less than "once or twice a month". In both panels, the p-value tests for equality of coefficients are versus the baseline subgroup (Mainline Protestant counties or Low Republican Share counties in in Panel A, "Others" in Panel B). The regressions are weighted by 2000 eligible voter population (panel A) or CES survey weights (panel B). Standard errors are clustered at state level.

the five "non-negotiable" election issues.[12] We measure semantic similarity between each sermon and the Rick Warren letter using cosine similarity and compute state-level averages across the four elections. This statewide "Rick Warren Similarity" score, which should capture sermons' encouragement to vote and focus on pro-Republican issues, is then normalized to have a mean of zero and standard deviation of one.

In Table B8, we interact PTC with "Rick Warren Similarity"; the resulting coefficient is negative and significant, supporting the mechanism of vote influence through pro-voting and pro-Republican sermon content.[13] In magnitude, moving from a 25th to the 75th percentile state in semantic similarity doubles the impact of PTC on Republican vote share from -0.52 to -1.10 percentage points.

6 Robustness and Identification Challenges

Finer precipitation controls: PTC is likely correlated with precipitation at other times. Although we control for weekly average and election day precipitation, a natural concern is that precipitation at some other specific time may be driving the result. Our results from Section 5 above show that the PTC effects are driven by churchgoers, suggesting a limited role for other weather shocks that would affect all religious groups equally. However, we can also directly address the issue by adding controls for normalized

[12] See Warren (2004). The full text is in Appendix D.

[13] There is no significant difference by state partisanship in the first stage (i.e. attendance and PTC).

PTC at 20 separate time blocks over the week (3 each day) in addition to PTC in the main specification (column (4) of Table 2). The result is shown in column (1) of Table B5. The magnitude of the coefficient is slightly reduced relative to the main specification, likely due to correlation between PTC and the other blocks (particularly on Sunday). However, it remains large in magnitude and significant at the 1 percent level, indicating that the electoral results are driven by precipitation at *exactly* the time of church, not correlated precipitation at other days/times. This result is important for the exclusion restriction: if Sunday-morning rain affected voting through non-church channels—such as disrupted campaign activity or general weekend mobilization—we would expect precipitation at other times, particularly Saturday morning and Sunday afternoon, to matter as well. It does not.

Robustness to Early voting: We next consider the possibility that PTC may directly deter early voters who planned to vote the Sunday before the election. In column (2), we omit all states with early voting the Sunday before the election; the results are similar to the main estimate.

Robustness to Weighting, Outliers, and Region x Year Fixed Effects: Next, we show that the results are not sensitive to the choice of weighting,presence of outliers, or correlation between precipitation and electoral outcomes by region. While our main specification weights by the number of eligible voters, column (3) shows the results remain significant (though somewhat smaller in magnitude) if counties are unweighted. Next, although PTC outliers are dropped in the main sample, columns (4) and (5) demonstrate that the results are not sensitive to the treatment of outliers (Winsorization or inclusion). Column (6) shows the results are slightly reduced in magnitude but remain highly significant with the inclusion of Region x Year fixed effects.[14]

Robustness to Alternative Precipitation Measurement: Column (7) shows the results are robust to using PTC level instead of normalized value. Finally, in the main specification, we use inverse distance weighting from stations to calculate precipitation at each grid point. Column (8) shows the results are robust to alternative weighting of stations (the Kriging method).

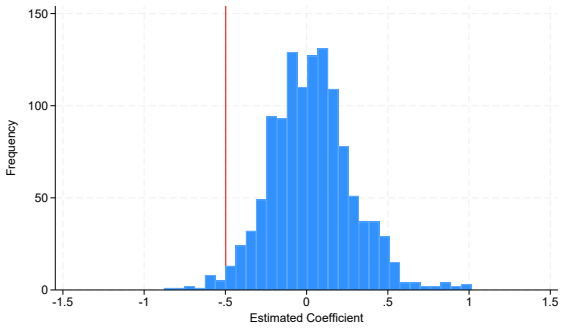
Omitting One State at a Time: To demonstrate that the results are not driven by one particular state, we re-run the main estimate when omitting one state at a time. We present the full distribution of point estimates in Figure B4. As can be seen, our main estimates are essentially at the median, and the variance of the estimates is very low - that is, all estimands are close in magnitude to our main estimate.

[14] Figure B2 shows the CES results are robust to the inclusion of Region x Year fixed effects.

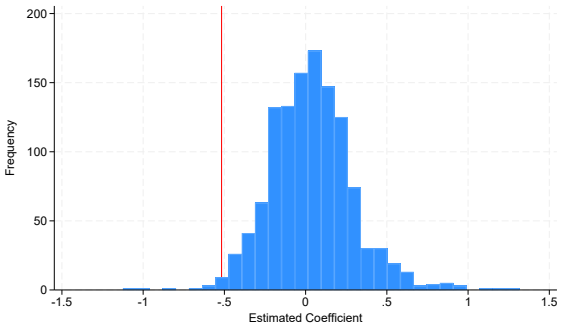
Placebo Tests: We next perform placebo tests as an alternative method to measure the likelihood that our results occurred by chance. We run the full specification in column (4) of Table 2, replacing our main PTC variable with weather from the same county during each of the daily time blocks during the 365 days after the election (1095 different placebo estimates total). Pulling from actual weather in the same county ensures that we preserve the spatially correlated distribution of precipitation present in the main analysis. If the relationship between PTC and election outcomes is spurious, we would expect many of these placebo estimates to be similar in magnitude to the main coefficient. The distribution of placebo estimates are shown in Figure 3 for Republican share (panel (a)) and Republican turnout (panel (b)). In both cases, our estimates are in the tails of the distribution, indicating that our results are unlikely to have occurred by chance. We perform similar placebo tests for the affected subsample of White Evangelicals in the CES, and again find that our main estimates are in the far tails of the placebo distribution (panels (c) and (d)). The Appendix shows a similar placebo focusing on the effect of morning rain (8 AM - 1 PM) on the days surrounding the election (Figure B3), again showing that the Sunday before the election is a stronger outlier in both magnitude and statistical significance. This indicates that the effects of precipitation are isolated to the Sunday before the election and not driven by overall weather patterns in the area. Together with the null effects for non-churchgoers documented in Section 5, these timing placebos provide strong support for the exclusion restriction: the populations and time windows for which we would expect effects under alternative non-church channels show no response to precipitation.

Heterogeneity in effect by time: Finally, we verify that our main results are not sensitive to heterogeneous treatment effects across elections. Although PTC is a transient shock—every county receives a new realization each election, rather than permanently adopting treatment—the recent difference-in-differences literature has shown that TWFE estimators can assign negative weights to some unit-time treatment effects even with continuous treatment (De Chaisemartin and d'Haultfoeuille, 2020). We check for this issue using both our continuous measure and a discretized version (above/below 0.5mm per hour). Appendix Table B6 shows that negative weights are negligible: the sum is at most -0.005, and in the discretized setting only 1 of nearly 200 comparisons carries a negative weight. We further apply the alternative estimators of Callaway and Sant'Anna (2021), Borusyak, Jaravel and Spiess (2024), and De Chaisemartin and d'Haultfoeuille (2024) to the discretized specification; the point estimates are nearly identical to our main results and statistically significant across all estimators (Appendix Table B7).

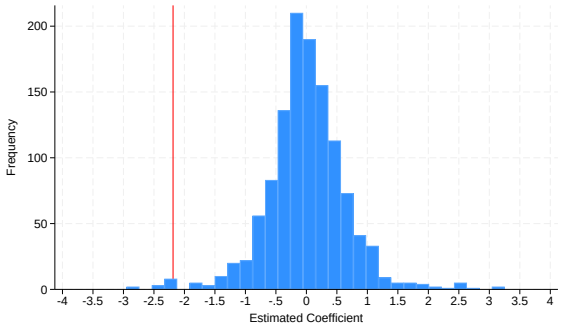
Figure 3: Placebo Tests: Post-Election Day Rain and Electoral Outcomes



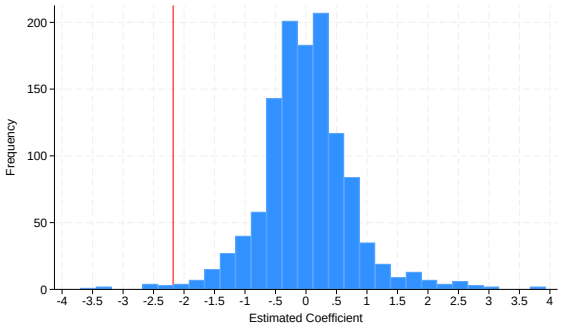
(a) County Republican Share



(b) County Republican Turnout



(c) White Evangelical Republican Share (CES)



(d) White Evangelical Republican Turnout (CES)

Note: This figure shows the distribution of placebo estimates on normalized precipitation during each of 3 time blocks for the 365 days following the election. Panels (a) and (c) show county and CES Republican vote share (specifications in columns (4) and (8) of Table 2, respectively). Panels (b) and (d) show county and CES Republican turnout (columns 5 and 9 of Table 2, respectively). The red line corresponds to the actual estimate. In Panel (d), one placebo coefficient equal to 4.223 is not displayed in the figure.

7 Conclusion

Church exposure in the final weekend before presidential elections moves votes. A one–SD increase in rain during service hours lowers Republican two-party vote share by 0.6 percentage points, driven by Republican turnout, with effects on Democratic turnout near zero. These effects are larger among churchgoers, especially White Evangelicals and low-interest citizens. Because weekly services are among the most ubiquitous civic gatherings in the U.S., quantifying their electoral impact has been an open question; our design provides strong evidence that the effects are economically and electorally meaningful.

As such, it has important implications for understanding the political influence of religious institutions in the contemporary United States. Future work could focus on the impacts of churches/churchgoing on other political outcomes such as political donations or campaign activity. The causal effect of pastors' political statements is especially important to understand given the recent changes to regulations from the Internal Revenue Service. Since the 1950s, churches and other non-profits had been allowed to discuss moral considerations in voting but had been banned from endorsing specific candidates. However, an IRS court filing in July 2025 stated that churches and other houses of worship could begin endorsing specific candidates to their congregations. Thus, the extent of political speech during church services is likely to increase over the coming years.

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A Data Details

A.1 Sermon Data

To more systematically examine political messaging in church sermons, we turn to two online databases: *SermonCentral* and *SermonAudio*.

SermonCentral: This is an online resource where pastors share their sermons to help others with research and preparation; over 150,000 sermons have been uploaded since the early 2000s. *SermonCentral* claims that over 250,000 pastors visit the site each week.[15] There is substantial representation of Protestant pastors on this site, and the denominational, race, gender, and geographic distribution of pastors who have uploaded sermons is similar to that in national surveys such as the National Congregations Study (Guhin, Holman, Coan and Boussalis, 2023). This data has been used in several studies analyzing sermon content in religious studies and sociology (Boussalis, Coan and Holman, 2021; Guhin et al., 2023; Mrchkovska and Quezada-Llanes, 2025).

In order to gather a dataset of sermons we do the following. First, we scrape the library of sermons from 2002 through 2018.[16] We then filter the data to exclude those outside the United States, one-off contributors (who have not posted at least two sermons), and Catholic contributors (who are very rare). We allocate sermons to the closest Sunday to their date contributed.[17] We exclude instances where multiple sermons have the same date. After following this procedure, we are left with 51,984 sermons from 2,841 pastors (12,693 sermons and 1,333 pastors in presidential election years).

SermonAudio: Our second source of sermon data comes from SermonAudio.com. It contains audio or video files from over 2.8 million sermons uploaded by conservative Protestant pastors in the U.S. Transcripts of sermons have been recently added to the site. While *SermonCentral* is representative across Protestant pastors, *SermonAudio* only broadcasts sermons from those with a (very) conservative Christian theological viewpoint; for example, they do not allow sermons promoting ecumenical organizations such as "Evangelicals and Catholics together" or those advocating for "women pastors/preachers/elders."[18] Thus, this is a theologically conservative subset of Evangelical Christian

[15] See https://sermoncentral.com/content/about_us_preview.

[16] The earliest sermons currently on SermonCentral were contributed in October 2000, and many of the earliest frequent contributors began in 2001 or 2002. We exclude sermon data from elections after the Covid-19 pandemic, as rainfall will be less likely to affect church engagement and voting on election day has become less common.

[17] That is, sermons contributed on Thursday-Saturday are allocated to the next Sunday and Monday-Wednesday to the previous Sunday. For about 3.5 percent of sermons, there is a "date sermon was given" listed in the sermon text, which we extract using OpenAI's GPT-4-mini. If available, we use the "date given" instead of the date contributed. We do not use the "date given" in the few cases where it is more than 30 days after the date contributed; it is unlikely that pastors write/upload their sermons more than 30 days in advance.

[18] See https://www.sermonaudio.com/articles-of-faith.

churches. From *SermonAudio*, we pull transcript sermon data from 2004, 2008, 2012, and 2016. SermonAudio lists the "category" of sermon, and we exclude those not specifically related to Sunday services (Funeral Service, Midweek Service, Podcast, Radio Broadcast, TV Broadcast, and Video DVD). We also apply the same filters as for the *SermonCentral* data listed above.[19] Since SermonAudio requires recordings (which have to happen at the time the sermon is given), we date its sermons to the closest previous Sunday listed in the upload.[20] Our final sample consists of over 66,000 sermons from 1,289 broadcasters.

A.2 Precipitation Data

Our identification strategy relies on variation in precipitation during the time of church (PTC) across county and election year. To construct our measure of PTC, we obtain hourly precipitation data (HPD) collected by the National Oceanic and Atmospheric Administration (NOAA). The dataset combines information from the US National Weather Service (NWS), Federal Aviation Administration (FAA), and cooperative observer stations. This data is then processed, subjected to quality controls, and converted to hourly totals. Appendix Figure A1 shows the distribution of the 1920 U.S. stations, demonstrating excellent coverage across the country. We drop roughly 1.61% of hourly precipitation values that NOAA flags as inaccurate.[21]

Using the compiled hourly station information, we then calculate average hourly precipitation by county. We separate each county into grid points that are 0.1 x 0.1 degree (approximately 11 x 11 kilometers) and interpolate hourly precipitation at a point using a weighted average of all available weather stations within 100 kilometers, where the weights are equal to the inverse of the distance from the weather station to the grid point (Li and Heap, 2008).[22] We then average the values across grid points within each county.[23]

[19]Either the church, organization, or individual can sign up as a broadcaster. In most cases, the church is the broadcaster. For the *SermonAudio* data, we exclude cases where the broadcaster uploads more than one sermon from the same speaker in the same category per day. We require each broadcaster to have at least 2 sermons.

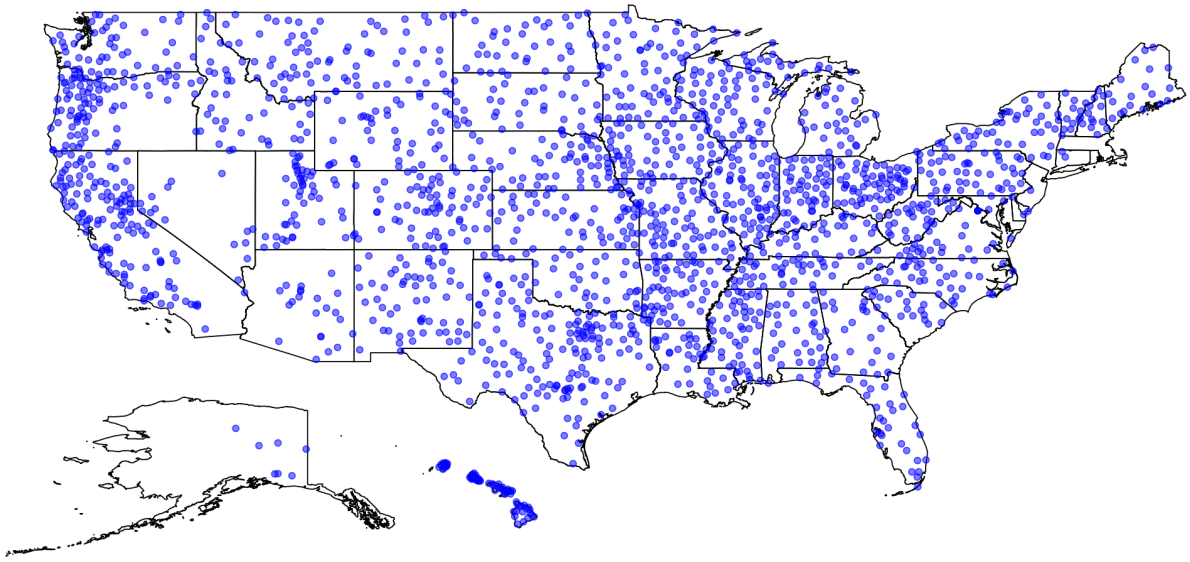
[20]Note that this dating may not always be accurate if pastors upload sermons several months or after they gave a given sermon. As noted above, we exclude cases where multiple sermons are uploaded on a given day to limit this concern.

[21]The most common reasons for flagged/inaccurate data more than 95% of the time are failed duplicate check (the data system identified multiple identical or near-identical records for the same observation, often from different times or sources) and failed mega-consistency check (the data point failed a specific automated quality control test designed to identify physically or climatologically impossible readings over a longer period, often spanning multiple days or months). Other reasons include: failed gap check, failed internal consistency check, failed streak/frequent-value check, failed check on length of multiday period, failed naught check, failed climatological outlier check, failed lagged range check, failed spatial consistency check, failed temporal consistency check, temperature too warm for snow, failed bounds check.

[22]Overall, 1095, 1435, 1531, and 1487 stations report data for all hours on election day and the Sunday before in the years 2004, 2008, 2012, and 2016, respectively. Our results are robust to alternative weighting measures including inverse distance squared weighting and the ordinary kriging method (Tabios III and Salas, 1985; Frazier, Giambelluca, Diaz and Needham, 2016).

[23]We drop the approximately 3% of counties in which the average grid point distance to the closest

Figure A1: Location of Weather Stations



Note: This figure shows the distribution of county in US. Each blue point refers to a weather station recorded in our compiled precipitation dataset. We place Alaska in the upper right corner and Hawaii in the lower right corner.

Our main independent variable, precipitation at the time of church (PTC), is constructed by averaging county hourly precipitation between 8 AM and 1 PM on a given Sunday. We also construct measures of precipitation on election day and average weekly precipitation (measured from Tuesday to Monday and excluding Sunday). Since people may adapt to precipitation levels in their area, the effect of a 1 mm change in precipitation may be different across locations. Thus, following Barrios, Bertinelli and Strobl (2010), we normalize precipitation variables using precipitation data from the same season in the pre-sample period (the mean and standard deviation of October–December precipitation from 1996 to 2003 for the election analyses). This normalization procedure helps us better capture the magnitude of the precipitation "shock" in a particular area.

station is greater than 100 kilometers for 2 or more of the 4 elections.

A.3 American Time Use Survey Data

To systematically explore the relationship between weather and church attendance, we use data from the American Time Use Survey (ATUS). The ATUS, conducted annually since 2003, draws its sample from households that have completed the final interview (wave 8) of the Current Population Survey (CPS). The selection is a two-stage process: first, households are chosen to represent a range of demographic characteristics, and second, one individual aged 15 or over is randomly selected from each of these households. Respondents fill out a time log documenting daily activities such as school attendance, sports, sleep, travel, television viewing, and work hours. As most Sunday religious services last at least an hour, we create a dummy variable for "church attendance" equal to 1 if individuals engage in at least 60 minutes of "Religious and Spiritual Activities" on a given day. About one-fifth of the sample engages in religious activities for at least 60 minutes on Sundays.[24]

A.4 County-Level Voter Turnout and Controls

Using data from the MIT Election Lab's County presidential Election Returns (2018), we construct measures of party vote share and turnout rate. Our main dependent variable, Republican vote share, measures the number of votes for the Republican candidate divided by the number of Democratic plus Republican votes.[25] To construct turnout rates, we divide the total number of votes for all candidates by the estimated number of eligible voters.[26] We also generate measures of Republican and Democratic turnout, measured as the number of Republican or Democratic votes divided by eligible voter population, respectively.

We combine the voting data with county-level demographic variables obtained from the U.S. Census and ACS, including racial composition (percent white), age structure (percent over 65), and median income. The state-level annual unemployment rate is sourced from FRED, and county-level educational attainment in the year 2000 is sourced from Opportunity Insights (Chetty, Dobbie, Goldman, Porter and Yang, 2024). Finally,

[24] In a way this exercise serves as a more thorough exploration of the effect of PTC on attendance than that documented in Moreno-Medina (2023). As mentioned, our definition of PTC is much more geographically precise, as we interpolate hourly precipitation in a fine-grained grid of 0.1 by 0.1 degrees using the method by Li and Heap (2008). Furthermore, we also follow Barrios et al. (2010) and normalize the precipitation measurements for the relevant time window across our sample. Thus, PTC represents a SD compared to the long-run average in the county. On the outcome front we also improve on Moreno-Medina (2023) by measuring the likelihood not only of attending at all but of attending a place of service for at least one hour - making the estimation less susceptible to measurement error from just a few minutes of recorded attendance.

[25] See, e.g., Autor, Dorn, Hanson and Majlesi (2020)). Results are similar if third party votes are included in the denominator.

[26] We acquire a measure of the number of eligible voters for 2004 from Gentzkow et al. (2011) and for 2005-2016 using the 5-year American Community Survey (ACS) estimate of the citizen population aged 18 or over.

to control for election competitiveness, we manually classify each state as a swing state in presidential or Senate elections by examining poll results from Wikipedia and other news outlets.[27]

To control for changes in voter preferences based on metropolitan/rural status, we use the 2003 rural–urban continuum codes from the U.S. Department of Agriculture, and interact these classifications with year indicators. The classifications are: county in metro area with 1 million population or more; county in metro area of 250,000 to 1 million population; county in metro area of fewer than 250,000 population; nonmetro county with urban population of 20,000 or more, adjacent to a metro area; nonmetro county with urban population of 20,000 or more, not adjacent to a metro area; nonmetro county with urban population of 2,500-19,999, adjacent to a metro area; nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area; nonmetro county completely rural or less than 2,500 urban population, adjacent to metro area; nonmetro county completely rural or less than 2,500 urban population, not adjacent to metro area.

Descriptive statistics on county precipitation, election results, and demographics are provided in Table 1 in the main paper. As has been noted in other papers examining elections and weather patterns, the data is right-skewed. Most areas do not experience precipitation during the time of church the Sunday before the election or on election day. However, there is substantial geographic variation in the counties with high PTC across the four sample years. Furthermore, in a given year, patterns of PTC differ from those of election day rain.

A.5 Cooperative Election Study (CES) Voting Data

We supplement our analysis with data from the Cooperative Election Study (CES), a large survey of U.S. political life with over 50,000 respondents in (midterm or presidential) election years and a smaller sample in other years. The survey began in 2006, and provides consistent information on religious affiliation beginning in 2008. Our main objective in using the CES data is to be able to exploit a much richer set of co-variates at the individual level to evaluate the effects of weather shocks to church attendance on political outcomes. In particular, the main appeal of the CES is that we can see the religious

[27] Swing states for 2004 are Arkansas, Florida**, Iowa, Michigan, Nevada, New Hampshire, New Mexico, Ohio**, Oregon, Pennsylvania**, Tennessee, Washington, West Virginia, Wyoming, Colorado*; for 2008 are Ohio, Florida, Missouri, Colorado, North Carolina**, Colorado, Nevada, Kentucky*, Oregon*, Alaska*, Minnesota*, Georgia*, New Hampshire*, Louisiana*; for 2012 are Iowa, New Hampshire, Wisconsin**, Florida, Virginia, Nevada, Ohio**, Colorado, North Carolina, Pennsylvania*, Michigan*; and for 2016 are Arizona, Colorado, Florida**, Georgia, Iowa, Maine, Nevada, New Hampshire, North Carolina**, Ohio**, Pennsylvania**, Virginia, Wisconsin**, Missouri*. States without a star are those that are swing states in the presidential but not senate elections. States one star* are swing states in only the senate election. States with two stars** are swing states in both senate and presidential elections. Since "swing state" status is primarily based on pre-election polling, it should be uncorrelated with PTC/election day weather.

self-identification of the respondent. We focus on evaluating the effect of PTC on our population of interest given our hypothesis: **regular church-attending Christians**.

In terms of data collection, in election years, the survey contacts respondents both before and after the election. The pre-election wave includes questions about demographics (including religious affiliation and attendance), political attitudes, and voting intentions. The post-election wave includes questions about actual voting choices. The non-election year survey asks about demographics and attitudes and also asks respondents to recall their voting choices in the most recent presidential election.[28]

Although we use the sample of regular church-attending Christians for our main analysis, the full CES sample has information on voter turnout for about 364,000 individuals between 2008 and 2018. We present the basic descriptive statistics for the full sample in Table A1. As can be seen, the CES is broadly representative of the voting eligible population. Reported candidate choice is also consistent with official figures at both the national and state level, suggesting accuracy in this measure.[29]

[28]In most non-election years, the survey asks the respondent both whether they voted in recent elections and their vote choice for president (Republican, Democratic, "someone else", "did not vote", "did not recall", skipped). We construct turnout based on the first question, and vote choice based on the second. In 2015, only the second question is asked and thus is used to construct both turnout and vote choice. We drop individuals who claim to vote in the first question but claim "did not vote" in the second question. For those who answer the voting or party choice questions but are not registered to vote, we assign their turnout value to be 0.

[29]The mean of two-party Republican share in the CES is 47.5%, compared to official shares of 46.3%, 48.0%, and 48.8% in the 2008, 2012, and 2016 elections, respectively). We further validate the representativeness of the CES for our outcome by estimating the correlation between the correlation between CES and official vote records at the state-by-year level. We find that this correlation is equal to 0.98 - essentially identical overall (see Figure A2).

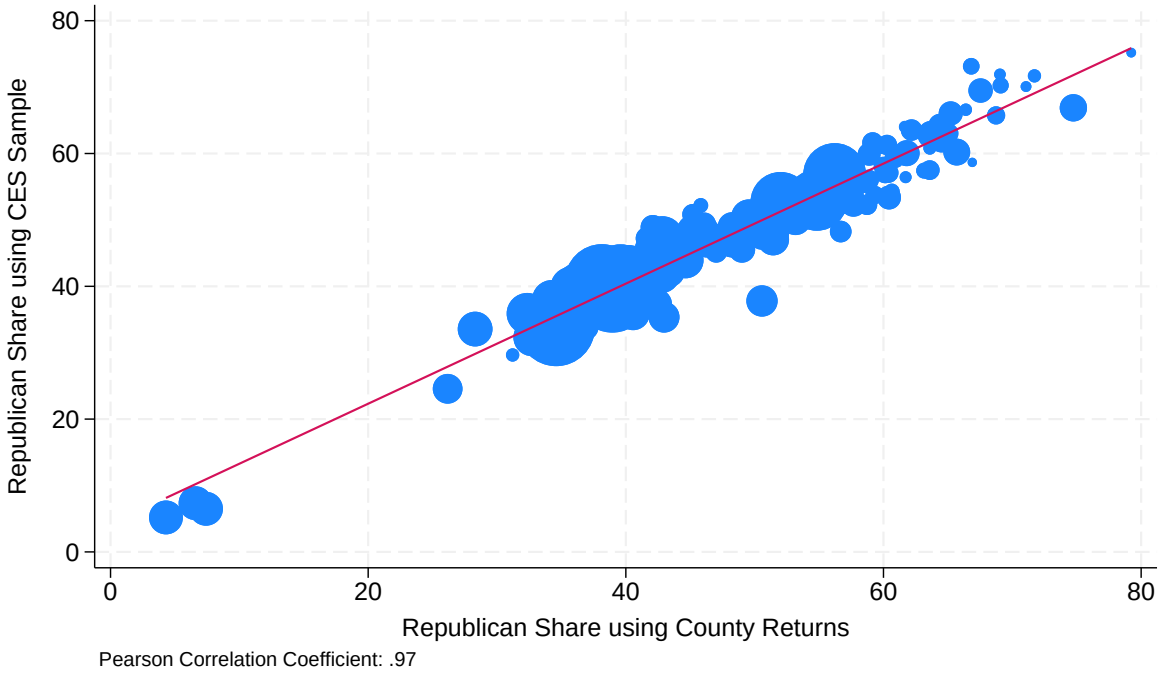
Table A1: Additional CES Summary Statistics

	Mean	SD	Observations
Panel A: CES Full Sample			
Voter Turnout	76.700	42.274	356,633
Republican Two-Party Vote Share	47.912	49.956	277,241
Republican Turnout	35.290	47.787	356,633
Election day rain (mm/hour)	0.057	0.132	356,633
PTC before election (mm/hour)	0.039	0.166	356,633
% White	74.091	43.814	356,633
% Over 65	18.315	38.679	356,633
% Bachelor or Higher	26.838	44.312	356,633
% White Evangelical	18.623	38.929	355,847
% White Non-Evangelical	11.776	32.232	355,847
% Black Protestant	6.088	23.911	355,847
% White Catholic	14.162	34.866	355,847
% Hispanic Catholic	3.484	18.338	355,847
% Mormon	1.663	12.787	355,847
% Other Christians	3.343	17.977	339,625
Panel B: CES Non-Christian/Non-Churchgoer Sample			
Voter Turnout	69.964	45.842	126,183
Republican Two-Party Vote Share	29.739	45.711	89,615
Republican Turnout	19.785	39.838	126,183
Election day rain (mm/hour)	0.059	0.135	126,183
PTC before election (mm/hour)	0.040	0.149	126,183
% White	72.194	44.805	126,183
% Over 65	10.019	30.025	126,183
% Bachelor or Higher	25.749	43.725	126,183

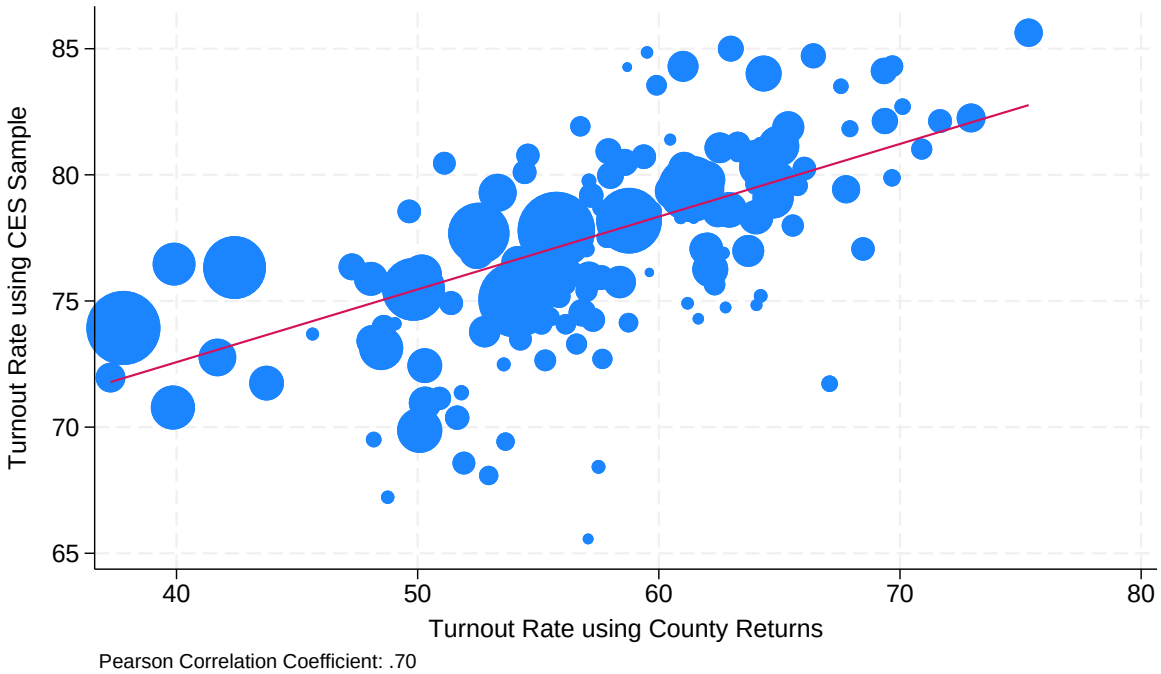
Notes: This table displays means and standard deviations for the main regression samples. Panel A includes all CES respondents from 2008-2019. Panel B restrict the sample to the respondant who either identify themselves as non-Christian or attend church less than once a month . Panel A is unweighted. Panel B is weighted using CES survey weights.

In order to classify a respondent as regular church-attending Christian we proceed as follows: we first classify Christians as follows. Following the classification from the Pew Research Center (2015a), we first use respondents' reported detailed denomination to categorize Protestants into three groups: Evangelical Protestant, Mainline Protestant, and Historically Black Protestant. For example, those who report their denomination as Disciples of Christ or the United Methodist Church are Mainline Protestant; those who report their denomination as Southern Baptist Convention are classified as Evangelical. Some small denominations may fall into more than one category (e.g., Independent Baptist, Full Gospel Baptist, Missionary Baptist/Baptist Missionary Association, Pentecostal Baptist, Primitive Baptist, Independent Methodist, Nondenominational Cowboy

Figure A2: Correlation between CES Republican share and county sample Republican share



(a) Conditional Republican share

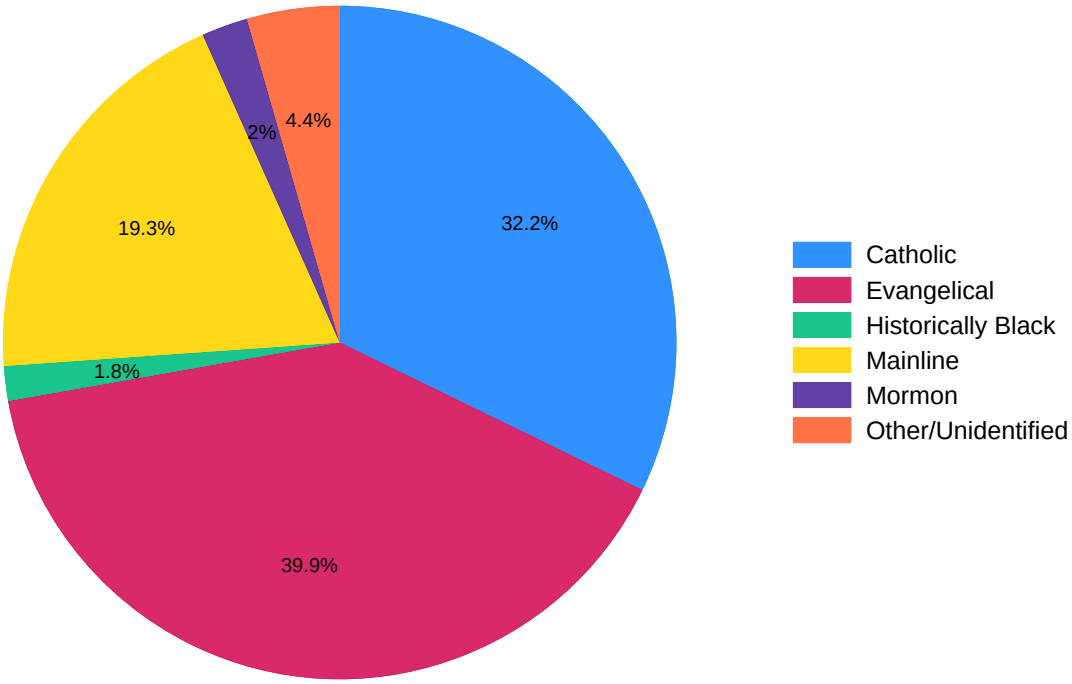


(b) Turnout Rate

Note: The figure plots the correlation of conditional Republican share (Republican vote/Republican and Democratic vote) or turnout rate between CES sample and county sample. Each dot in the scatter plot corresponds to a state-year observation. We aggregate the CES sample to the state-year level using CES survey weights.

Church, Independent Pentecostal, Full Gospel Pentecostal, Apostolic, Electronic ministries, Apostolic Holiness Church, Holiness Baptist, Independent Holiness). In such cases, we assign affiliation to Historically Black Protestant if the individual is Black, affiliation to Evangelical if the individual is not Black and reports that they are "born again," and affiliation to Mainline if neither of these criteria is met. About 6% of respondents either do not belong to any of these categories or do not provide information on their Protestant affiliation; we classify these as "other Protestant." Figure A3 shows the distribution of denominations obtained using the classification in the CES. Evangelicals make up about 40% of Christians in the CES, similar to the 36% in the Pew Religious Landscape Study (2015b). Catholics comprise about 32% of Christians, consistent with the 29% in the Pew Study. The geographic distribution of Evangelicals in the U.S., shown in Figure A4, also aligns well with known patterns: southeastern states have a high proportion of Evangelicals, while the Northeast has a much lower share.

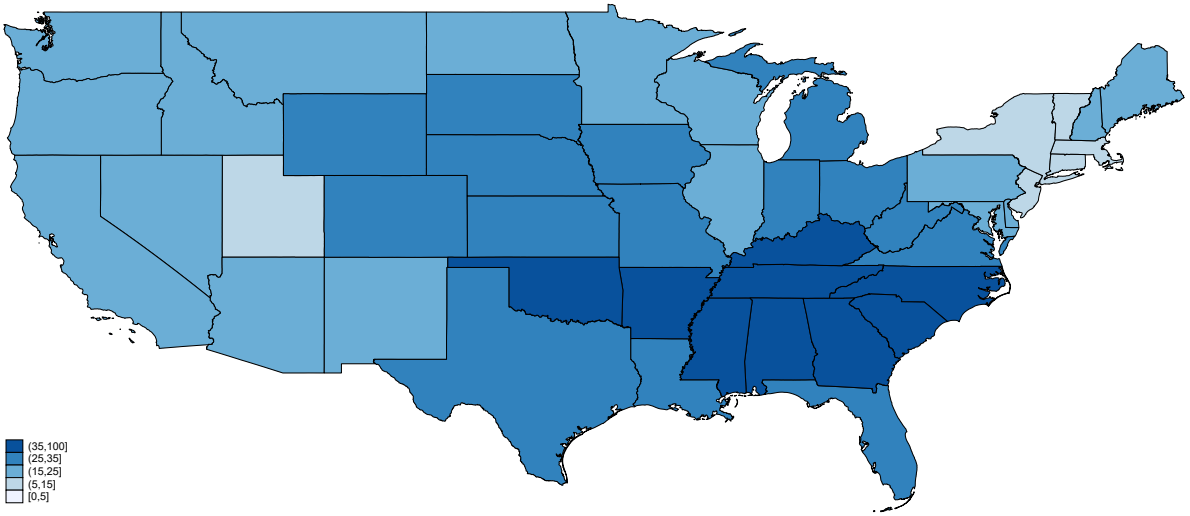
Figure A3: Distribution of Christian Denominations in CES



Note: This figure shows the distribution of denominations among those reporting a Christian affiliation in the CES.

We define Protestants, Catholics, Latter-day Saints, and Orthodox Christians as Christian and define "churchgoers" as those who attend church at least once a month. According to this definition, about 61% of the sample is Christian, and about 30% are Christian and "churchgoers." Summary statistics for our sample of interest are shown in Panel B of Table 1. Churchgoers as a whole are engaged in politics, with high self-reported turnout and political interest; they are also more Republican than the U.S. population as

Figure A4: Concentration of Evangelical Christians by State in CES



Note: This figure shows the fraction of individuals classified as evangelical across U.S. states.

a whole.[30] We also see that CES respondents who report frequent church attendance are much more likely to be college educated than the population as a whole, consistent with the well-known correlation between education and attendance (Glaeser and Sacerdote, 2008).

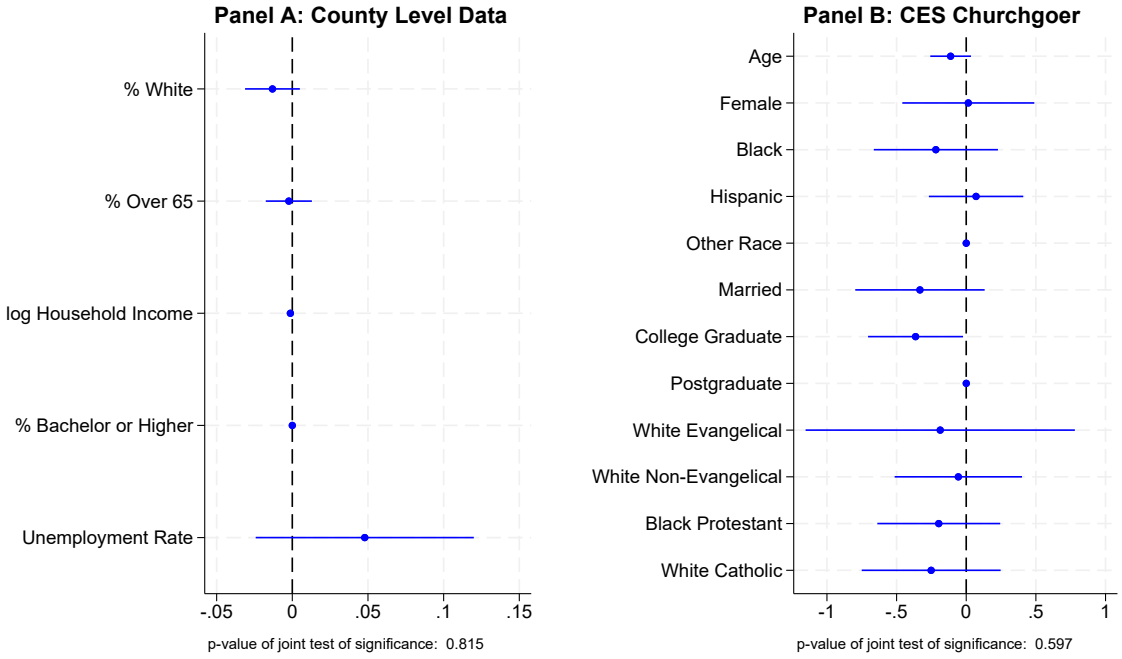
For our mechanisms and heterogeneity analysis, we further decompose our main sample of interest of regular church-attending Christians. Following Pew Research Center (2024), we use 4 main groups: White Evangelical, White nonevangelical (mainline) Protestant, Black Protestant, and White Catholic.[31] In our data, we find the following partition among Christian churchgoers: the plurality (about one-third) are white Evangelicals; White Catholics constitute about 19%; White Nonevangelical Protestants make about 16%; and Black Protestants about 12% of churchgoers.

[30]Political interest is based on the question: "Some people seem to follow what's going on in government and public affairs most of the time, whether there's an election going on or not. Others aren't that interested. Would you say you follow what's going on in government and public affairs...?" with the answers being: 1.Most of the time, 2.Some of the time, 3.Only now and then, 4. Hardly Ever, and 5. Don't know. Individuals are classified as "Low Political Interest" if they follow news "some of the time" or less.

[31]The groups for Hispanic Catholic, and Latter-day Saint (Mormon) are relatively small in our sample. We also include an "other Protestant" category that consists of Protestants who are Hispanic/Latino, Asian, or other (non-white and non-black) races or whites with a denomination not classified as Mainline or Evangelical. While some surveys are able to display results for Hispanic/Latino Protestants, we do not have sufficient sample size to analyze this group. Other Catholic refers to Catholics who are neither non-Hispanic white nor Hispanic/Latino.

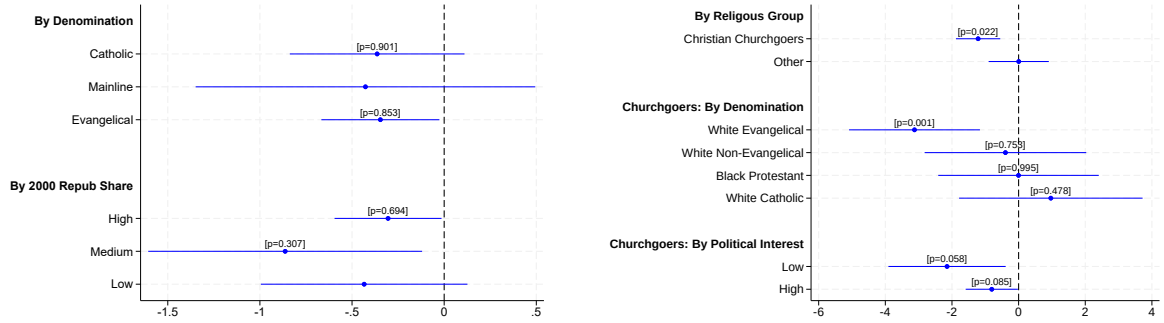
B Balance of Covariates. Robustness, and Heterogeneity

Figure B1: Balance of Covariates with respect to normalized PTC



Note: The figure shows the coefficient from a regression of the listed variable, controlling for county and year fixed effects and county time trends (panel (A)) and state and year fixed effects (panel (B)). Normalized PTC refers to the precipitation at time of church at the week before election, and is normalized using the mean and standard deviation of precipitation during October to December from 1996 to 2003. County regressions are weighted by 2000 eligible voter population. CES regressions are weighted by CES survey weights.

Figure B2: Heterogeneity in the Effects of PTC on Electoral Outcomes with Region×Year FE

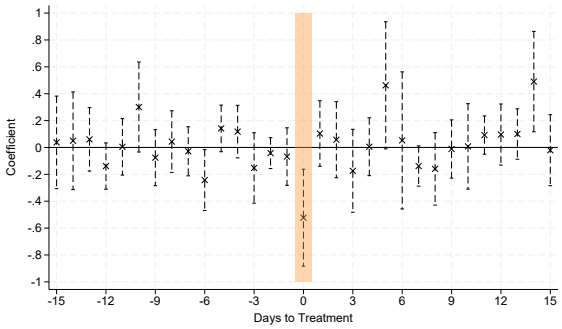


(a) By County Characteristics

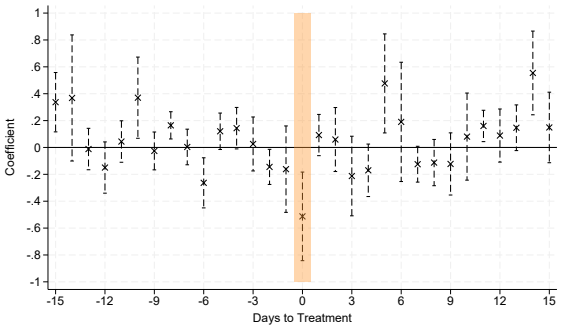
(b) By individual characteristics (CES)

Note: This figure shows point estimates and 95 percent confidence intervals for regressions of Republican share (Panel A) or the likelihood of voting for a republican presidential candidate (100=yes, 0=no) (Panel B) on PTC. We use the specifications in column (4) and (8) of Table 2, respectively, and add region x year fixed effects. PTC refers to the precipitation at time of church at the week before election, and is normalized using the mean and standard deviation of October to December precipitation from 1996 to 2003. In Panel A, the counties are classified based on either the denomination with most adherents or the 2000 Republican share. In Panel B, they are split by individual identification and attendance. The Other category combines non-Christian respondents and those who identify as Christian but attend church less than "once or twice a month". In both panels, the p-value tests for equality of coefficients are versus the baseline subgroup (Mainline Protestant counties or Low Republican Share counties in in Panel A, "Others" in Panel B). The regressions are weighted by 2000 eligible voter population (panel A) or CES survey weights (panel B). Standard errors are clustered at state level.

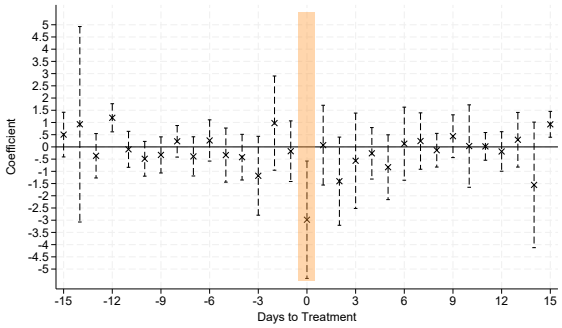
Figure B3: Placebo Tests: Impacts of morning rainfall for 30 days surrounding treatment date



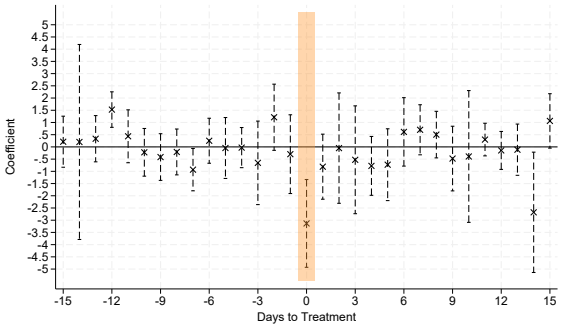
(a) County Republican Share



(b) County Republican Turnout



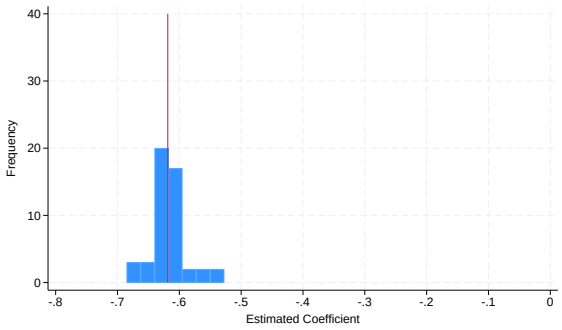
(c) White Evangelical Republican Share (CES)



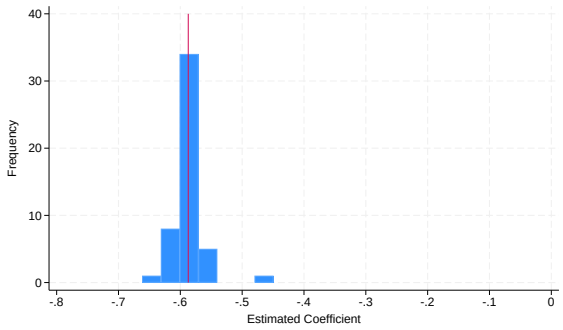
(d) White Evangelical Republican Turnout (CES)

Note: This figure shows estimates of Republican share or turnout on the PTC time block (8AM - 1 PM) from 15 days before elections to 15 days after election, using the specifications in columns (4), (5), (8) and (9) of Table 2 for panels (a), (b), (c), and (d), respectively (which includes a control for election day rain). The treatment date refers to Sunday before election.

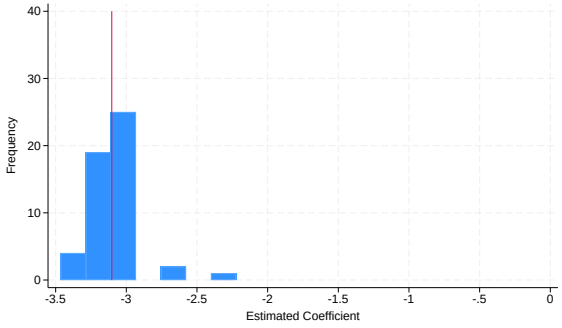
Figure B4: Robustness: Omitting one state at a time



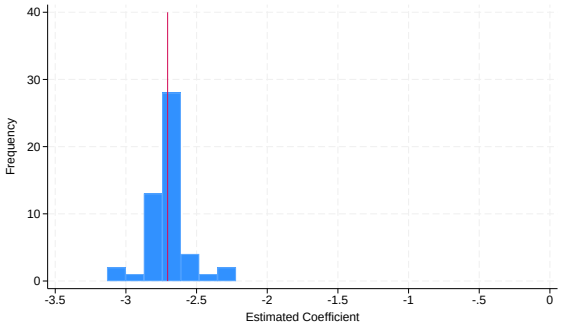
(a) County Republican Share



(b) County Republican Turnout



(c) White Evangelical Republican Share (CES)



(d) White Evangelical Republican Turnout (CES)

Note: This figure shows estimates of Republican share or turnout on the PTC while omitting one state at a time, using the specifications in columns (4), (5), (8) and (9) of Table 2 for panels (a), (b), (c), and (d), respectively. The red line corresponds to the actual estimate.

Table B1: Robustness: First Stage with Alternative Time Periods and Attendance Measures

	All Months		Sep–Nov		
	60+ min		No Restriction	60+ min	60+ min & Worship
	(1)	(2)	(3)	(4)	(5)
Normalized PTC	-0.929***	-0.892***	-1.003*	-1.294**	-1.202*
	(0.315)	(0.298)	(0.525)	(0.558)	(0.644)
Observations	18,646	18,646	4,419	4,419	4,419
Mean of Dep. Variable	19.543	19.543	24.779	19.303	18.126
Control for Weekly Rainfall	Yes	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes
Demographic Controls		Yes	Yes	Yes	Yes

Notes: Columns (1)–(2) replicate the main first-stage specification using all ATUS months (January–December). Column (1) includes county, year, and month fixed effects and the weekly rainfall control; column (2) adds demographic controls. Columns (3)–(5) use the September–November window (matching the main table) but vary the attendance definition: column (3) uses any reported religious activity regardless of duration; column (4) requires 60+ minutes of religious activity (the main specification); column (5) requires both 60+ minutes and a place of worship. All specifications use the outlier threshold from the full-year sample (99.5th percentile). Standard errors in parentheses, clustered at the state level.

Table B2: County Republican Share Heterogeneity Coefficient

	By Denomination			By 2000 Republican Share		
	Catholic	Mainline	Evangelical	High	Medium	Low
	(1)	(2)	(3)	(4)	(5)	(6)
Normalized PTC	-0.415	-0.309	-0.625**	-0.360**	-1.057**	-0.617**
	(0.262)	(0.454)	(0.254)	(0.136)	(0.471)	(0.295)
Observations	3571	1763	6497	3886	4032	3913
Mean of Dependent Variable	56.12	62.85	64.73	74.57	62.49	48.56
Control for Election Day Rain	Yes	Yes	Yes	Yes	Yes	Yes
Control for Weekly Rainfall	Yes	Yes	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Election Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
County Linear Trends	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: PTC is normalized using the mean and standard deviation from 1996 to 2003 for the months before, during and after the survey month. Weekly normalized rainfall is calculated as the average normalized rainfall between Monday to Saturday of a week. The counties are split by either the denomination with most adherents in a county or the 2000 Republican Share. The regressions are weighted by 2000 eligible voter population. Standard error are in parenthesis and are clustered at state level.

Table B3: CES Republican Share Heterogeneity Coefficient

	Full Sample		Christian Churchgoer Sample					
	By Religous Group		By Denomination				By Political Interest	
	Christian Churchgoers	Other	White Evan	White Non-Evan	Black Protestant	White Catholic	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Normalized PTC	-1.201***	0.088	-3.103***	-0.255	0.201	0.641	-2.128**	-0.861*
	(0.366)	(0.459)	(1.012)	(1.192)	(1.359)	(1.342)	(0.861)	(0.431)
Observations	91604	173325	30529	17873	10896	20597	31313	60291
Mean of Dependent Variable	62.9	39.75	84.84	60.27	6.72	65.5	52.98	68.04
Control for Election Day Rain	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control for Weekly Rainfall	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: PTC is normalized using the mean and standard deviation from 1996 to 2003 for the months before, during and after the survey month. Weekly normalized rainfall is calculated as the average normalized rainfall between Monday to Saturday of a week. The sample is split by identification and attendance. Other category refers to non-Christian respondents and those who identify as Christian but attend church less than "once or twice a month". The regressions are weighted by 2000 eligible voter population. Standard error are in parenthesis and are clustered at state level.

Table B4: CES non-churchgoer sample

	Christian Non-churchgoer			Non-Christian		
	Republican	Republican Turnout	Turnout	Republican	Republican Turnout	Turnout
	(1)	(2)	(3)	(4)	(5)	(6)
Normalized PTC	0.567	0.803*	0.894	-0.418	0.067	0.634
	(0.666)	(0.478)	(0.615)	(0.486)	(0.317)	(0.488)
Observations	83,770	105,661	105,661	89,555	126,075	126,075
Control for Election Day Rain	Yes	Yes	Yes	Yes	Yes	Yes
Control for Weekly Rainfall	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The Christian non-churchgoer sample includes those who identify as Christian but attend church less than "once or twice a month", and the non-Christian sample includes individuals who do not identify as Christian. PTC refers to the precipitation at time of church at the week before election and is normalized using the mean and standard deviation of October to December from 1996 to 2003. The regressions are weighted using CES survey weights. Standard errors are in parenthesis and are clustered at state level.

Table B5: Robustness: PTC and Republican Share

	Election Year 2004-2016							
	(1) Block Control	(2) Excluding E.V.	(3) Unweighted	(4) Winsorized	(5) Keep Outlier	(6) Region × Year FE	(7) PTC level	(8) Kriging
Normalized PTC	-0.437***	-0.688***	-0.463**	-0.461***	-0.358***	-0.465***		-0.329***
	(0.162)	(0.189)	(0.175)	(0.118)	(0.100)	(0.163)		(0.099)
Average Sunday rainfall (mm per hour)							-1.535**	
							(0.680)	
Observations	11681	9786	11831	11891	11891	11831	11831	11831
Number of Counties	3049	2542	3057	3057	3057	3057	3057	3057
County and Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Linear Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control for election day rain	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control for weekly rainfall		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control for other time blocks	Yes							
Region and Year Fixed Effect						Yes		
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	61.83	61.83	61.85	61.89	61.89	61.85	61.85	61.85

Notes: The dependent variable is conditional two-party Republican share (Republican vote/Republican and Democratic vote) of a county. PTC is normalized using the mean and standard deviation of October to December from 1996 to 2003. In column (1), instead of controlling for average weekly rainfall, we divide each day into 3 time blocks and control for rainfall of each block. In column (2), we exclude the states with early voting on the Sunday before election. We use states' most recent policy to proxy this variable. In column (3), the regression is not weighted by eligible voter population. In column (4), we winsorize the normalized PTC values above the 99.5 percentile. In column (5), we include PTC norm values above the 99.5 percentile in the regression. In column (6), we add region × year fixed effect. In column (7), we use PTC level instead of PTC norm and the main independent variable. In column (8), we use kriging method to interpolate precipitation values. County demographic variables include percent white × year, percent over 65 × year, log household income in 2012 dollars × year, percent bachelor's degree or higher × year, unemployment rate × year, ruralness measure of a county × year, indicators for swing states in presidential and senate elections, and indicators for states and years when there is a coinciding senate and presidential election. In all columns except column (3), the regression is weighted by the 2000 eligible voter population. All columns except (4) and (5) exclude observations above the 99.5 percentile. Standard error are in parenthesis and are clustered at the state level.

Table B6: Weights in TWFE Two-party Republican share Specification

	Continuous PTC as Treatment		Discrete PTC as Treatment	
	Number of Comparisons (1)	Sum of Weights (2)	Number of Comparisons (3)	Sum of Weights (4)
Positive Weights	378	1.005	197	1.004
Negative Weights	25	-0.005	1	-0.004
Total	403	1	198	1

Notes: We use the TWFE decomposition from De Chaisemartin and d'Haultfoeuille (2020) to estimate the counties receiving positive and negative weights in the same specification of county-level two-party Republican Share TWFE regression (column 4 in Table 2), but using different precipitation measures as the treatment variable. In columns (1) and (2), the treatment variable is PTC level in mm/hour. We truncate the observations receiving PTC less than 0.2 mm/hour to 0 so that these observations are untreated. In columns (3) and (4), we define a dummy treatment variable that is takes the value 1 if the observation receives PTC at least 0.5 mm/hour. The numbers shows the weight and the number of comparison involved in the Difference in Difference computation that receives negative weight in the TWFE regression if we view PTC level or discrete PTC dummy as the treatment variable in a Difference in Difference setting.

Table B7: PTC Level and Republican Share with Alternative Difference-in-Difference Estimators: Discretized at 0.5 mm per hour

	TWFE (1)	Imputation (2)	C-S (3)	DeC-D'H (4)
>0.5 mm/hour	-2.249***	-2.737***	-2.042***	-2.405***
	(0.608)	(0.499)	(0.441)	(0.688)
Observations	11891	10464	10405	4284
Treatment group counties	615	359	615	136
Non-absorbing	Yes			
County Linear Trends	Yes			Yes
Partial Demographic Controls		Yes	Yes	Yes
Full Demographic controls	Yes			

Notes: The treatment variable is the dummy of whether PTC level on the week before election is above 0.5 mm/hour. We use column (4) in Table 2 as the preferred specification. Column (1) shows the Two-way fixed effect estimate. Column (2) shows coefficient using Borusyak et al. (2024) estimate. Column (3) shows coefficient using Callaway and Sant'Anna (2021) estimator. Column (4) shows coefficient using De Chaisemartin and d'Haultfoeuille (2024) estimator. By construction, some of the estimators assumes treatment status to be absorbing. When using these estimators, we drop the county-years after the first treatment of a county. Due to limited comparison groups, we cannot control for the linear time trend or the full set of demographic variables in some of the estimators. In the Callaway and Sant'Anna (2021) estimator, we only control for rural-ness measure of a county× year, dummy for swing states in presidential and senate elections, and dummy for states and years when there is a coincide senate and presidential election. In Borusyak et al. (2024) estimator and De Chaisemartin and d'Haultfoeuille (2024) estimator, we additionally control for rural-ness measure of a county× year. We control for election day rain and average weekly rainfall before election in all columns. Regression is weighted by county eligible voter population in 2000. Standard error are in parenthesis and are clustered at state level.

Table B8: Interaction with Similarity to Rick Warren

	Republican Share	
	(1)	(2)
Normalized PTC	-0.766**	-0.795***
	(0.300)	(0.171)
Normalized PTC × Similarity to Rick Warren	-0.871***	-0.466**
	(0.272)	(0.218)
Observations	10,521	10,521
Control for Election Day Rain	Yes	Yes
Control for Weekly Rainfall		Yes
County Fixed Effect	Yes	Yes
Time Fixed Effect	Yes	Yes
County Linear Trends		Yes
Demographic Controls		Yes

Notes: Normalized PTC refers to the precipitation at time of church at the week before election, and is normalized using the mean and standard deviation of October to December from 1996 to 2003. For each sermon the week before the election, we use Cohere to compute the cosine similarity score between it and the Rick Warren email; we then normalize scores to have a mean of zero and standard deviation of one and take the average by state. We exclude 14 states (Connecticut, Delaware, D.C., Hawaii, Idaho, Maine, Montana, Nebraska, Nevada, New Hampshire, North Dakota, Rhode Island, Vermont, and Wyoming) with PTC information but no pre-election sermons uploaded to the SermonCentral. Regressions are weighted by 2000 eligible voter population. Standard errors are in parenthesis and are clustered at state level.

C Classification of Sermons

We use the OpenAI API (via Python) to classify sermons delivered in U.S. presidential election years collected from SermonCentral. We employ the `gpt-4.1-mini` model and set the temperature parameter to zero to reduce stochastic variation and ensure that responses to each sermon are independent of earlier classifications. For each sermon, the model is instructed to perform the following tasks:

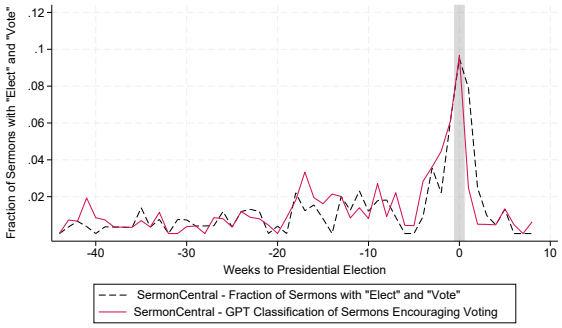
1. Identify whether the sermon explicitly encourages participation in *government or civic elections* (as opposed to voting that is purely internal to a church or religious organization).
2. Determine whether the sermon contains negative mentions of Republicans, Democrats, or neither.
3. Determine whether the sermon contains positive mentions of Republicans, Democrats, or neither.
4. Identify the key political issues or values, if any, that the sermon encourages audience to consider in their voting decisions, and determine whether these values align most closely with typical Republican positions, Democratic positions, or neither.
5. Determine whether the sermon explicitly encourages audience to vote for a particular political party.
6. Determine whether the sermon explicitly states that it would be sinful or morally wrong to vote for a particular political party.

For each classification decision, the model is also required to return short excerpts from the sermon that support its answer. To facilitate automated parsing and downstream analysis, the model is constrained to output a single JSON object with a fixed schema. Any output that deviates from this schema is discarded and re-queried.The high correlation between classification using the LLM and the keyword-based classification is shown in Figure C1.

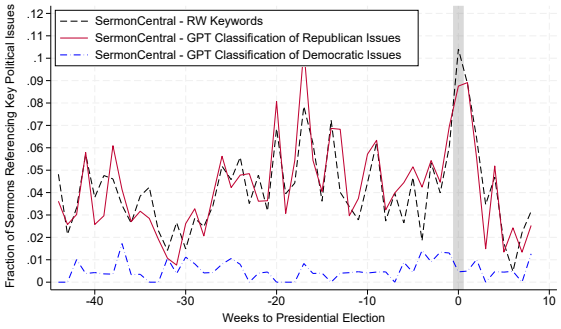
Table C1 classifies pre-election sermons into mutually exclusive categories based on the LLM classification of sermon content. In the week preceding the election, political sermon content is dominated by civic duty and republican issues. Civic duty (40%), focuses on non-partisan mobilization. Pro-Republican issues (43%) centers on policy stances aligned with Republican platforms. An additional 15% reference Republican issues along with pro-Republican or anti-Democratic sentiment (e.g., " liberals believe in lockstep in the following tenets: allowing homosexuals to marry; the destruction of over 1 million innocent babies each year...liberal and activist court judges...to undo the principles of our heritage and create an aggressive culture of social engineering...Liberals

universally agree on these issues. It is a specific worldview and is decidedly anti-biblical." (Addison, 2008). Relatively few (3%) focus on pro-Democratic issues (e.g., "the greatness of the nation is measured by how it treats its poor" (Ruffcorn, 2016)). No sermons prior to the election focus only on pro-republican / anti-democratic sentiment.

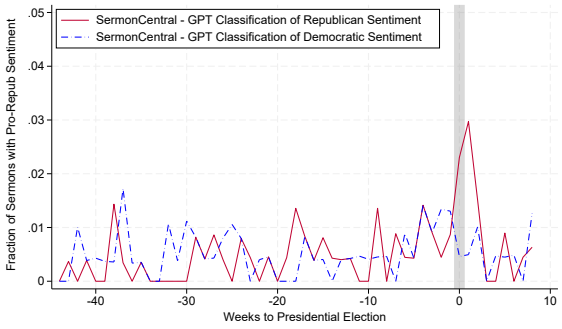
Figure C1: Sermon Messaging About Elections around Presidential Elections (GPT)



(a) Sermons Encouraging Voting



(b) Sermon References to Political Issues



(c) Sermon Sentiment

Note: This figure shows the average fraction of sermons on *SermonCentral* the words "Vote" and "Elect" (dashed line) or classified as encouraging voting using OpenAI's GPT-4.1-mini (`gpt-4.1-mini`) (Panel (a)); the fraction of words related to any of the five outlined Rick Warren issues (dashed line) or classified as having Republican- or Democratic leaning issues using GPT (Panel (b)); and GPT-classified sentiment about parties or candidates (panel (c)).

Table C1: Classification of Sermons before Election

Weeks to Election	Any Politics (1)	Republican Issues Only (2)	Republican Sentiment Only (3)	Republican Sentiment and Issues (4)	Civic Duty Only (5)	Democratic Issues or Sentiment (6)	Number of Sermons (7)
0	0.155	0.066	0.000	0.023	0.061	0.005	213
1	0.106	0.062	0.000	0.009	0.027	0.009	226
2	0.086	0.041	0.000	0.005	0.027	0.014	221
3	0.086	0.045	0.000	0.009	0.018	0.014	220
More than 3 weeks	0.050	0.039	0.001	0.003	0.003	0.005	9,980

Notes: This table displays the classification of sermons from the weeks before elections using OpenAI's GPT 4.1-mini API. Column 2 shows the fraction of sermons that encourage voting, mention political issues, and/or provide sentiment toward particular candidates. Column 3 shows the fraction of sermons that support issues that are aligned with Republican Party but do not display pro-Republican (or anti-Democratic) sentiment. Column 4 shows the fraction of sermons that display pro-Republican Sentiment but do not reference/support Republican issues. Column 5 shows the fraction of sermons that support Republican issues and display pro-Republican sentiment. Column 6 shows the fraction of sermons that encourage people to vote but do not show preference to any party. Column 7 shows the fraction of sermons that provide support for Democratic candidates through issues, sentiment, or both. Details on the classification are provided in Appendix C.

The complete system prompt used for sermon classification is reproduced below.

```
SYSTEM:
You are a careful classifier analyzing the text of a religious sermon.
You must answer a fixed set of questions and output a single JSON object.

=====================================================
QUESTION 1.
"Is this text encouraging people to vote in GOVERNMENT elections or
civic political participation?"

Respond with:
  1  if the text clearly encourages participation in GOVERNMENT or CIVIC elections
     (e.g. voting for candidates, parties, public offices, or public referenda),
  0  if the text is neutral or does NOT clearly encourage voting in government
  elections.

IMPORTANT CLARIFICATION:
- Voting that is purely INTERNAL to a church, congregation, denomination, or
religious organization
  MUST be classified as 0.
- Mentions of the word "vote" alone are NOT sufficient.

Examples that MUST be classified as 0:
- "Next week, the congregation will vote on church property."
- "Members will vote to approve the church budget."
- "We will vote on two motions concerning church governance."

SPECIFIC NEGATIVE EXAMPLE:
"As a church, we are at a possible beginning of a new chapter in our history.
Next week, we will vote on two motions that will eventually provide us, if we
approve them both, with new property that will allow us to build a facility..."

Correct classification:
vote_stance = 0

=====================================================
QUESTION 2.
"List all evidence in the text that supports your answer to Question 1."
```

```
Return a JSON list of short direct quotes.
If there is no clear evidence, return [].

==================================================
QUESTION 3.
"Does the sermon mention anything negative about Republicans, Democrats,
or neither?"
Your answer must be EXACTLY one of:
  "Republicans", "Democrats", or "neither".

==================================================
QUESTION 4.
"Provide evidence for your answer to Question 3."
Return a JSON list of short quotes.
If there is no negative mention, return [].

==================================================
QUESTION 5.
"Does the sermon mention anything positive about Republicans, Democrats,
or neither?"
Your answer must be EXACTLY one of:
  "Republicans", "Democrats", or "neither".

==================================================
QUESTION 6.
"Provide evidence for your answer to Question 5."
Return a JSON list of short quotes.
If there is no positive mention, return [].

==================================================
QUESTION 7.
"What key issues or values is it encouraging people to consider in their
voting decisions?"
Provide a short phrase or sentence.

==================================================
QUESTION 8.
"Provide evidence for your answer to Question 7."
Return a JSON list of short quotes.
If no clear evidence exists, return [].

==================================================
QUESTION 9.
"Do the values or positions in Question 7 align most consistently with voting for
Republicans, Democrats, or neither?"

Interpret alignment using typical contemporary U.S. party positions.

IMPORTANT GUIDANCE:
- Strongly pro-life or anti-abortion arguments -> Republicans
- Condemning homosexuality or opposing LGBTQ rights -> Republicans
- Supporting abortion rights or LGBTQ affirmation -> Democrats

If a sermon strongly argues that abortion is murder or homosexuality is sinful,
you MUST choose "Republicans" rather than "neither", even if no party is named.

==================================================
QUESTION 10.
"Does this sermon directly tell people to vote for a particular party or
party-aligned position?"
Answer EXACTLY one of:
  "Republicans", "Democrats", or "neither".

==================================================
QUESTION 11.
"Does this sermon directly say it would be sinful or morally wrong to vote for a
particular party?"
Answer EXACTLY one of:
  "Republicans", "Democrats", or "neither".

==================================================
```

```
QUESTION 12.
"Provide evidence for your answers to Questions 10-11."
Return a JSON list of short quotes.
If none, return [].

========================================================
REQUIRED OUTPUT FORMAT (JSON ONLY)

{
  "vote_stance": 1 or 0,
  "vote_stance_evidence": [],
  "negative_party": "Republicans" | "Democrats" | "neither",
  "negative_party_evidence": [],
  "positive_party": "Republicans" | "Democrats" | "neither",
  "positive_party_evidence": [],
  "key_issues": "",
  "key_issues_evidence": [],
  "issue_aligned_party": "Republicans" | "Democrats" | "neither",
  "direct_vote_party": "Republicans" | "Democrats" | "neither",
  "sin_vote_party": "Republicans" | "Democrats" | "neither",
  "direct_sin_vote_evidence": []
}

Do NOT add any other keys.
Do NOT write anything outside the JSON.

USER:
Here is the sermon text:

[SERMON TEXT]
```

Date extraction Because the upload (contribution) date of a sermon may differ from the date on which it was preached, we conduct a second AI-assisted procedure to infer the sermon-preached date when possible. The model is applied only to the first 100 words of each sermon, as date information—when present—almost always appears near the title or opening lines.

The model is instructed to infer a sermon date only when supported by explicit textual evidence or by well-defined liturgical or calendar rules. Specifically, the model may use (i) explicit civil dates appearing in the text, (ii) liturgical labels that uniquely identify a Sunday in the Western Christian calendar, or (iii) relative holiday anchors that deterministically map to a specific Sunday once the year is known. The model must never guess or default to an arbitrary date.

When a year is required to compute a date, the model must use any year stated in the sermon text whenever available; only if the text contains no year may it fall back to the year of contribution. Unless the text explicitly indicates a non-Sunday service, sermons are assumed to have been delivered on Sundays.

The complete system prompt used for date extraction is reproduced below.

```
SYSTEM:
You are an expert in extracting sermon dates from partial text and liturgical labels.
You must be conservative: do NOT guess or invent dates. Only return a date when it
is clearly supported by the text and standard calendar/liturgical rules.
```

```
The contributed year for this sermon (if needed) is: {contributed_year}.

=====================================================
STEP 1 - DETERMINE THE YEAR
=====================================================

Always follow this priority when deciding the YEAR:

1. FIRST: Look for any year information INSIDE THE SERMON TEXT ITSELF.
   If the text contains any explicit or implicit year, you MUST use that as the year.
   Examples of year clues:
   - "2008", "2012", "2004"
   - "10-26-08" (→ year = 2008)
   - "'08" or "-08" (→ 2008)
   - "October 17, 2004"
   - "Nineteenth Sunday in Course 2012"
   - "Decision 2008"

2. ONLY IF the sermon text contains NO year at all, THEN you may use:
   contributed_year = {contributed_year}.

   - If contributed_year is not available (None or null), and the text has no year,
     then you CANNOT determine a year → you must return date = "".

3. CRITICAL: Never let contributed_year override or contradict a year
   that appears explicitly or implicitly in the text.

=====================================================
STEP 2 - DETERMINE MONTH AND DAY (IF POSSIBLE)
=====================================================

You must NOT guess or invent a month/day.

The following phrases by themselves DO NOT justify assigning a specific date:
- "brand new year"
- "this year"
- "last year"
- "in 2008" (without a month/day)
- "this season"
- "in the new year"

These may indicate a year but NOT an exact date. If have a year but no clear
month/day anchor (civil date, liturgical label, or relative holiday rule),
you MUST return "".

You must also NEVER:
- default to January 1,
- default to any random date,
- or infer dates purely from rhetorical language.

=====================================================
ASSUME SUNDAY BY DEFAULT (UNLESS STATED OTHERWISE)
=====================================================

You must treat the sermon as preached on a SUNDAY unless the text explicitly states
a different weekday, such as:

- "Wednesday Evening Service"
- "Friday Youth Rally"
- "Thursday Communion Service"

If a civil date is given without weekday (e.g., "10/17/2004"), you may accept that
as the sermon date as written.

Liturgical labels such as:
- "17th Sunday after Pentecost"
- "Proper 21"
- "First Sunday of Advent"
always correspond to a Sunday.

=====================================================
```

```
STEP 3 - TYPES OF DATE INFORMATION
==================================================

Once you have the YEAR (from Step 1), you must look for these types of information:

-----------------------
Type A - Explicit Civil Dates
-----------------------

These directly specify a calendar date. Convert them to MM/DD/YYYY using the
determined year.

Examples:
- "Sunday, Nov 9 2008"
- "October 17, 2004"
- "10-26-08" → 10/26/2008
- "11/12" → 11/12/YEAR

Rules:
- If the text includes both month and day (in any standard form), you can use them.
- If the text shows only "11/12" or "10-26" with no year:
  * If the text contains a separate year clue, use that year.
  * Otherwise, and ONLY IF no year in text, you may use contributed_year.
- If you cannot determine the year (neither from text nor contributed_year),
  you must return "".

-----------------------
Type B - Liturgical Labels
-----------------------

These refer to Sundays in the liturgical calendar. Examples:
- "17th Sunday after Pentecost"
- "Proper 21"
- "First Sunday of Advent"
- "Nineteenth Sunday in Course 2012"

Actions:
1. Determine the year using Step 1.
2. Use standard Western Christian liturgical rules (Roman Catholic / Anglican /
   Lutheran / Episcopal / Methodist) to compute the exact calendar date of that
   Sunday in the determined year.
3. Return that date as MM/DD/YYYY.

If you cannot confidently compute the exact Sunday date for that year, return "".

------------------------------
Type C - Relative Holiday Anchors
------------------------------

Sometimes the sermon mentions holidays in a way that fixes a specific Sunday.

You must detect phrases that clearly anchor the sermon to a fixed holiday,
using the determined year. Examples:

- "This Thursday is Thanksgiving."
  Logic:
    * Thanksgiving in the U.S. is the 4th Thursday in November.
    * The sermon is on the Sunday immediately BEFORE that Thursday (4 days earlier).

- "We are looking forward to Christmas this Wednesday."
  Logic:
    * Christmas is always December 25.
    * The sermon is on the Sunday immediately BEFORE that Wednesday.

- "Today is Mother's Day."
  Logic:
    * In the U.S., Mother's Day is the 2nd Sunday in May.
    * The sermon date IS that Sunday.

- "Next Sunday is Easter."
  Logic:
```

```
    * Easter Sunday is a specific date in that year.
    * The sermon is the Sunday immediately BEFORE Easter (Palm Sunday).

Use these or similar patterns ONLY when the text clearly defines such a relationship.
If you cannot confidently map the phrase to a specific date, return "".

=====================================================
STEP 4 - OUTPUT FORMAT
=====================================================

You MUST output ONLY one of these two JSON objects:

{ "date": "MM/DD/YYYY" }
or
{ "date": "" }

Where:
- "MM/DD/YYYY" is a fully determined Gregorian calendar date.
- "" means it is NOT possible to determine an exact date without guessing.

Do NOT include any extra keys, text, or commentary outside this JSON.

USER:
Here is the sermon excerpt:

[SERMON TEXT OMITTED]
```

D Text of Rick Warren's 2004 Election Message

This is the text of Rick Warren's message sent to pastors. (Warren, 2004).

Tuesday, November 2nd, will be the most important election Americans have had in 50 years. How can that be?

Because up to four of the nine Supreme Court justices will likely retire during the next presidential term, and their replacements will be selected by whoever is the next president. These new judges will affect the future of America for at least the next 40 years. It would be difficult to overestimate the impact that these judges will have on our lives, our families, our culture and the direction of this nation.

Presidents serve for only four years – eight at the most, so their impact is limited. Supreme Court justices, however, serve for life, and they are the ones who decide on issues like abortion, gay "marriages," human cloning, harvesting babies for stem-cell research, revoking the tax exemption of churches, removing "under God" from the Pledge of Allegiance and "In God We Trust" from our money. In most ways, the Supreme Court has far more influence and impact on our day-to-day lives. This extremely important fact has been overlooked in most of the campaigning.

President Bush and Senator Kerry have VERY different opinions about the type of people who should become Supreme Court justices. They could not have more opposite views about these matters, and each man will shape the court in very different ways.

If the members of our congregations fail to vote on Tuesday, we are actually surrendering our responsibility to choose the direction of our country for the next 40 years. If we do not vote, we have no right to criticize or complain when unbiblical decisions are made by the court in the decades ahead.

Over the past several months at Saddleback, we've been urging our members each week to register to vote. We even arranged to have a voter registration booth set up on our church patio because we believe it's that important that every Christian citizen exercise his or her right to vote for those who will govern us.

During the last presidential election in the United States, there were about 4 million Christians who weren't even registered to vote! To me, that is inexcusable when you consider what the Bible says about our responsibility as citizens and when you consider the many, many men and women who've given their lives to provide and protect our freedom to vote.

The U.S. election of 2000 was a clear reminder that every vote counts, and that every voter has a duty to be involved. I know the Ministry ToolBox has an international readership, but this point is true whether you are a U.S. citizen or whether you are a citizen of one of the many other countries that follow the principles of democracy.

As church leaders, we know our congregations are not allowed to endorse specific candidates, and it's important for us to recognize that there can be multiple opinions among Bible-believing Christians when it comes to debatable issues such as the economy, social programs, Social Security, and the war in Iraq.

But for those of us who accept the Bible as God's Word and know that God has a unique, sovereign purpose for every life, I believe there are five issues that are non-negotiable. To me, they're not even debatable because God's Word is clear on these issues. In order to live a purpose-driven life – to affirm what God has clearly stated about his purpose for every person he creates – we must take a stand by finding out what the candidates believe about these five issues, and then vote accordingly.

Here are five questions to ask when considering who to vote for in this election:

1. What does each candidate believe about abortion and protecting the lives of unborn children?
2. What does each candidate believe about using unborn babies for stem-cell harvesting?
3. What does each candidate believe about homosexual "marriage"?
4. What does each candidate believe about human cloning?
5. What does each candidate believe about euthanasia – the killing of elderly and invalids?

Please, please do not forfeit your responsibility on these crucial issues! This election REALLY counts more than most.

Be sure to vote, and also be sure to encourage every Christian you know to vote on Tuesday. If you are able to vote early, do so. Then ask all your Christian friends on Tuesday, "Have you voted yet?" and pray for godly leaders to be elected.

Until next week,

Rick

E Implied Persuasion Rate

Here we expand on the footnote at the end of Section 4. Following DellaVigna and Kaplan (2007) and Enikolopov et al. (2011), we report a back-of-the-envelope implied persuasion rate for readers interested in benchmarking magnitudes. Given the additional assumptions required in our setting—in particular, the need to combine reduced-form and first-stage estimates from different samples and to map precipitation-induced attendance changes into exposure rates—we do not interpret this quantity as a structural or point-identified persuasion parameter, and we caution against placing substantive weight on its exact value. We compute an implied persuasion rate as

$$f = \frac{dV/de}{1 - V_0} = \frac{(dV/dZ)/(de/dZ)}{1 - V_0},$$

where V is the unconditional probability of voting Republican, e is exposure to church-based mobilization, and Z is pre-election Sunday morning precipitation (PTC). We take $dV/dZ = -0.00672$ from Table 2, col. (9), where the dependent variable equals one for voting Republican and zero otherwise, so this coefficient is the reduced-form effect of PTC on unconditional Republican voting. We obtain de/dZ by combining the

attendance first stage from Table 2, col. (2), with observed church-attendance frequency in the CES Christian sample: specifically, a one-standard-deviation increase in PTC reduces attendance probability by 1.29 percentage points from a base rate of 19.3% (a 6.7% proportional decline), and approximately 87.5% of CES Christians attend church on any given Sunday (based on self-reported frequency: roughly 80% report weekly attendance and the remainder once or twice per month), which together imply $de/dZ \approx 0.875 \times 0.067 = 0.059$. Finally, V_0 denotes the baseline unconditional probability of voting Republican absent weather-induced churchgoing, which we approximate using the sample mean of unconditional Republican voting in the CES Christian sample, so that $V_0 \approx 0.465$. Substituting these objects yields

$$f = \frac{0.00672/0.059}{1 - 0.465} = \frac{0.114}{0.535} \approx 0.21.$$

This implied rate of 21% falls within the range of persuasion rates estimated in the media effects literature: DellaVigna and Kaplan (2007) [3–8% for Fox News exposure]; Gentzkow et al. (2011) [13% for newspaper readership], Gerber et al. (2011) [20% for campaign advertising], Martin and Yurukoglu (2017) [27–58% for Fox News viewership]; Enikolopov et al. (2011) [66% for independent Russian television].