Resilience of Faith: The Effect of Religious Regulations during and after the Covid-19 Pandemic

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Abstract

How do religious rules and regulations affect behavior? We examine this question using changes in Catholic regulations during the Covid-19 pandemic combined with mobility data from 15 million smartphone users from 2019-2022. We first document overall trends: total religious attendance declined sharply in March 2020 and thereafter recovered slowly and more gradually than other activities like restaurant visits. There were also variations across religious groups, with Catholics returning at a slower pace than Protestants, Orthodox Christians, Jews, Muslims, Hindus, and Buddhists. We then introduce a novel approach to examine the impact of religious policies on behavior, leveraging variations in the timing of dispensation rescissions (requirements for Sunday attendance) by US Catholic bishops. Using a difference-in-differences event study model, we find a short-term 2-4 percentage point increase in Catholic weekend church attendance following the lifting of dispensations, compared to the 2019 baseline. However, this effect fades over time and is smaller than the attendance surge seen after reopening churches post-lockdowns. These results suggest that religious policies impact behavior, though their effects may be transient.

Keywords: Religious Attendance, Catholicism, Covid-19, Geolocation data

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1 Introduction

Religious practice is widespread in the United States: 40 percent of Americans report being active in a church or religious group and Americans give over $120 billion annually to fund religious organizations.[1] Recent research has explored how factors such as natural disasters or income causally affect religious participation, and other work has examined the correlates of attendance. However, one understudied factor is the causal impact of religious precepts themselves. Specifically, do changing requirements from religious leaders directly affect the value of participation, or is the demand for religious services driven primarily by other factors such as individual psychological benefits or community involvement? A lack of exogenous variation in religious precepts has thus far limited causal exploration of the impact of religious regulations. This paper addresses this gap by examining the impact of quasi-random variation in Catholic organizational policies during the Covid-19 pandemic.

We employ foot traffic data from SafeGraph Inc., which utilizes smartphone signals as a proxy for church visits, to examine weekly religious attendance from 2019 through the end of 2022. SafeGraph provides daily location data from approximately 15 million cell phones, enabling us to examine visit patterns within small geographic areas and across different types of religious institutions. We categorize these institutions into denominations including Roman Catholic, Eastern Catholic, Eastern Orthodox, Protestant (Mainline and other), Latter-day Saints (LDS), Jehovah's Witness (JW), Jewish, Muslim, Buddhist, and Hindu based on their names. We focus on in-person attendance as it usually provides greater opportunities for connection and has substantially stronger links to mental and physical health than online religious engagement (e.g., watching livestreams of services) (Upenieks et al. 2023; VanderWeele 2020).[2]

To examine the impact of religious policies, we use two unique institutional features of the hierarchical Catholic Church: (i) its division into 175 U.S. territorial dioceses, each

[1] See Purcell and Smith (2012) and Giving USA.

[2] The value of in-person interactions has been shown in educational settings, with students experiencing better performance and reporting higher levels of connection in in-person versus online classes (Kofoed et al. 2021; Lichand et al. 2022). For many religious groups, in-person attendance is seen as a fundamental component of religious practice (Bankier-Karp and Shain 2022; Levin 2020; VanderWeele 2020).

under the direction of a bishop and (ii) the requirement of Sunday Mass attendance for members. When Catholic churches closed starting on March 11, 2020 and Catholics were unable to attend in-person Masses, individual bishops issued dispensations to Catholics in their respective dioceses, i.e. the geographic area under the pastoral care of that bishop, relieving them of the requirement to attend Sunday Mass. Even after churches reopened as early as April 2020, dispensations remained in effect for several months; they were lifted at varying times across the country by the local bishops and were not necessarily correlated with the secular reopening of businesses. This unique variation in timing enables us to examine the causal impact of religious policy on church attendance, disentangled from secular reopening events. We collect data on dispensation lifting dates and combine it with SafeGraph foot traffic data on attendance. We then apply a difference-in-differences event study model to assess the impact of religious policies on church attendance. Recognizing the potential challenges of two-way fixed effects with differential timing and treatment effect heterogeneity, as discussed in recent literature (Callaway and Sant'Anna 2021; de Chaisemartin and D'Haultfoeuille 2020; Goodman-Bacon 2021; Sun and Abraham 2021), we adopt an alternate estimator proposed by de Chaisemartin and D'Haultfoeuille (2022) that is robust to treatment effect heterogeneity.

We document the sharp decline and slow recovery in religious service attendance following the Covid-19 pandemic. Relative to their 2019 levels, visits to Catholic churches lagged behind those to restaurants and other religious organizations throughout 2020 and 2021 but caught up in 2022. By 2022, both Catholic and non-Catholic religious attendance were back to about 85-90 percent of their 2019 levels.

We then examine the impact of the religious requirement of Sunday Mass attendance. Our robust estimator shows that the lifting of dispensations leads to a 4 percentage point increase in weekend church attendance relative to the baseline level of 2019, observed one week later; attendance remains elevated at about 2 percentage points for 6 weeks. Our estimator is robust to inclusion of Covid-19 related controls and secular reopening trends represented by reopening of restaurants. However, this attendance impact is transitory, lasting for only six weeks following the lifting of dispensations. Additionally, our findings

demonstrate that the lifting of dispensations is not associated with changes in visits to non-Catholic religious institutions or restaurants, suggesting a lack of correlation with other reopening events.

This paper contributes to the literature on how religious policies or persuasive messages affect individual behaviors. Theoretically, if the primary benefit of religious actions is "afterlife consumption" (Azzi and Ehrenberg 1975), a change in religious regulations from a trusted leader that raises the benefits of attendance should meaningfully impact attendance over the long run.[3] However, if religious actions are based on shorter term psychological benefits, community engagement, or habits, changes in requirements may have less impact.[4] Answering the question about the impact of religious requirements is difficult, however, since a lack of exogenous policy variation often makes it difficult to identify causal effects.[5] Some correlations point to little influence of religious precepts. For example, contrary to official Catholic teaching, a majority of regular Mass attendees do not view the use of artificial contraceptives as morally wrong (The Pew Research Center 2016), and the contraceptive usage rate among Catholics is comparable to other religious groups in the U.S. (Burge 2023). However, other studies exploiting variation in exposure to leaders' messages find that they impact behavior. For example, a persuasive message related to fertility from the Pope increased unprotected sex and fertility in the short run in Brazil. However, only the timing of births shifted; there were no long-term impacts on fertility (Bassi and Rasul 2017). Papal visits in Italy also decrease abortions and increase church attendance (Farina and Pathania 2020). Similarly, a Kenyan's archbishop's statement on the acceptability of married couples' condom use for HIV prevention (counter to official teaching) increased condom use in his archdiocese (Stroebel and van Benthem

[3]A similar logic would apply if individuals simply get utility from "following the rules."

[4]Changes in religious precepts may also matter in religious "clubs" that use high levels of sacrifice/prohibitions to screen out free riders (Iannaccone 1992); the most committed may comply and the less committed may leave the organization. However, given the difficulty of monitoring others' Mass attendance as well as the limited "club" benefits (networks/mutual aid) in mainstream Catholic churches, it is unlikely that changes in the Sunday Mass requirement would be used to screen out free riders.

[5]While more strict religious regulations may be correlated with individual behavior, the direction of causality is often unclear. For example, it may be that more strict religions attract people who attend church frequently or do not drink alcohol. Noting limited cases of exogenous variation in religious proscriptions, Hungerman (2014) uses variation in access to secular activities to examine the impact of religious policies on individual behavior.

2012). The influence of religious leaders extends beyond reproductive issues to perspectives and behavior on immigrants and refugees (Deiana et al. 2023), climate change (Maibach et al. 2015; Myers et al. 2017), and public health (Vyborny 2021).

We contribute to this literature by examining how religious policies impact an underexplored but key component of religious expression: service attendance. Aside from its fundamental role in religious practice, service attendance is also important to study as it has been linked to positive social outcomes including lower crime rates, reduced alcohol/drug use, and greater charitable giving (Bottan and Perez-Truglia 2015; Gruber and Hungerman 2008; Moreno-Medina 2023). While other studies have examined the impact of secular laws on religious service attendance (Gruber and Hungerman 2008), we are the first to examine the impact of religious policies mandating attendance and introduce a novel form of exogenous variation in policies: dispensation lifting in U.S. Catholic dioceses. Consistent with findings in earlier persuasion literature, we find that the impact of religious policies on behavior relative to the control group is short-lived. Thus, while people may get additional utility from following religious requirements, the effects fade as the rule becomes less salient and/or is overridden by other factors affecting both the treatment and control groups such as community engagement, psychological comfort, or a return to pre-Covid habits.

This paper also contributes to the literature examining the impact of adversity on religious practice. Theoretically, individuals may turn to religious beliefs and practices to psychologically cope during difficult times and/or may rely on insurance provided by religious communities (Bankier-Karp and Shain 2022; Corcoran, Scheitle, and DiGregorio 2022; Makridis, Johnson, and Koenig 2021; Pargament and Park 2019). Consistent with theory, natural disasters (Bentzen 2019) and economic crises (Ager and Ciccone 2018; Chen 2010; Costa, Marcantonio, and Rocha 2023; Dehejia, Deleire, and Luttmer 2005; Orman 2019) have been shown to increase religious practice. Bentzen (2021) shows an increase in private religious practices as indicated by increases in Google searches on the topic of "prayer" or "spiritual communion" in the first few months of the Covid-19 pandemic; Ruan, Vaughan, and Han (2023) find a positive relationship between pandemic

severity and searches for religious terms across Chinese provinces. However, the long-term impact of Covid-19 on in-person religious attendance remains unclear. While the pandemic itself might have heightened the desire for religious engagement (Peteet 2020), lockdown measures could have conversely weakened in-person attendance, particularly among those who were already less engaged with religious practices before the pandemic (Boguszewski, Makowska, and Podkowińska 2022; Meza 2020). This potential decline in in-person attendance is further supported by recent surveys indicating a decrease compared to pre-pandemic levels (Witt-Swanson, Benz, and Cox, 2023; Nortey and Rotolo, 2023).

This study offers three key advantages over prior research on religious responses to adversity and specifically Covid-19. First, we leverage cell phone location data (2019-2022) to capture actual attendance behavior, avoiding potential biases in self-reported data (Rossi and Scappini 2014). This aligns with a similar approach used by Pope (2024) to examine pre-pandemic patterns. Second, our high-frequency weekly data enables a nuanced analysis of religious practice dynamics and the short- and long-term effects of religious policies. Finally, the large sample size allows us to detect subtle effects and examine trends even within smaller religious groups. These advantages provide a deeper understanding of religious responses to adversity and the evolving landscape of religious practice during Covid-19.

Furthermore, this paper aligns with a growing literature that examines the effects of social distancing measures on mobility patterns using cellular data. Social distancing restrictions, government closures, and reopenings have been shown to have substantial impacts on mobility and activities (Abouk and Heydari 2021; Andersen 2020; Caselli, Fracasso, and Scicchitano 2022; Cronin and Evans 2020; Nguyen et al. 2021). Our study contributes to this body of evidence by providing evidence on mobility patterns within religious institutions in comparison to restaurants, bars, and other activities and examining how extragovernmental policies affect foot traffic.

Finally, this paper demonstrates the potential for using Large Language Models (LLMs) for classification of religious groups. We use OpenAI's text-davinci-003 (GPT 3.0) to classify over 200,000 religious organizations in the Safegraph data that we are unable to

place into groups with keywords. We show validity of this strategy by demonstrating its over 85 percent accuracy against manual classification of groups. We also show high spatial correlation between the counts of distinct religious groups achieved with our classification SafeGraph versus the U.S. religion census. This demonstrates the feasibility of using LLMs in cases where substantial numbers of groups with distinct names need to be classified and manual classification would be prohibitively time intensive and/or expensive.

2 Background: The US Catholic Church and Dispensations

The Catholic Church is separated into geographic, juridical areas known as archdioceses or dioceses. There are 175 territorial dioceses in the United States, with 172 in the continental states.[6] Each state has at least one diocese while Texas has the most with fifteen. Only four dioceses cross state borders.[7] Each diocese is headed by a bishop, who has pastoral and spiritual care over all of the Catholics who live in his diocese.

Catholics are obliged to participate in Mass on Sundays (or Saturday evenings) and holy day of obligations; according to the *Catechism of the Catholic Church*, those who fail in this obligation commit a grave sin.[8] The proper authority can issue a dispensation which relaxes an ecclesiastical law in a particular case. For a diocese, the bishop holds this authority and can release individuals under his care from the obligation to attend Mass.

At the beginning of the pandemic, some bishops quickly granted Catholics in their diocese a dispensation from attending Mass on Sundays and during holy days of obligation. Seattle and Oakland were the first to offer dispensations on March 11, 2020. Within two weeks, 97.1 percent of dioceses issued some sort of dispensation, coinciding with public

[6]The Archdiocese of Anchorage and the Diocese of Juneau merged in May 2020 to form the Archdiocese of Anchorage-Juneau. Before this, the most recent creation of a US diocese was Laredo in July 2000.

[7]The Diocese of Gallup lies in the states of Arizona and New Mexico, the Diocese of Wilmington traverses the Delaware-Maryland border, the Diocese of Norwich in Connecticut has a small portion in New York, and the Archdiocese of Washington covers the District of Columbia along with a portion of southern Maryland

[8]In the United States, the US Conference of Catholic Bishops (USCCB) designates holy days of obligation besides Sunday: (1) January 1, the solemnity of Mary, Mother of God, (2) the solemnity of the Ascension, (3) August 15, the solemnity of the Assumption of the Blessed Virgin Mary, (4) November 1, the solemnity of All Saints, (5) December 8, the solemnity of the Immaculate Conception, and (6) December 25, Christmas. Since 1999, many dioceses have moved the Ascension celebration to the Seventh Sunday of Easter.

closing of church buildings and the suspension of the public celebration of Mass.[9] [10] While some bishops re-opened churches within a month with a limited schedule of public Masses, they did not reinstate the requirement for the faithful to attend weekend services. While more than half of the dioceses were reopened within ten weeks of closing, none of these lifted dispensations at the same time.[11]

Bishops began rescinding dispensations in August 2020. They lifted them at varying times across the country, with the median diocese lifting its dispensation in June 2021 (after churches were reopened for 54 weeks). Panel (a) of Figure 1 shows both the timing and geographical variation of the lifting of dispensations. Dioceses that had the earliest removal dates are shown in darker reds while those with the latest removal dates appear in lighter reds. As shown, there is substantial geographic variation in dispensation rescission dates.[12] Table A.1 in the Appendix provides some additional details about the timing including (i) the percent of total Catholics in each quintile and (ii) the cumulative percent of US Catholics who still fall under an active dispensation after the last diocese in the row's quintile had reinstated the obligation. We see that just over 50 percent of the Catholic population had the moral obligation to return to Mass after June 18, 2021.[13] We discuss the quasi-randomness of the dispensation rescission in Section 5.2. Table A.2 in the Appendix provides dispensation lifting dates for the largest dioceses.

When bishops lifted dispensations, Catholics learned about the reinstated Mass attendance requirement through various channels. Dioceses and parishes posted updates on websites, bishops shared videos on social media, and some local news outlets even reported the changes. Individual parishes also announced the news in bulletins, during livestream services, and through emails. To encourage Catholics to attend Mass after the dispensation

[9]Washington, Louisville, Detroit, Covington, and Jefferson City are the five dioceses that did not issue a dispensation within the first two weeks after March 11, 2020. However, each of these did so soon after.

[10]For dioceses which we had no data on the start date of a dispensation, we assumed that beginning date for the suspension of public Masses as the start date for dispensation. Since the faithful physically were not able to attend church services, they would not be obligated to do so.

[11]Only the Diocese of Rockville Centre lifted the dispensation at the same time as opening. The churches had been publicly closed for more than a year when they reopened on August 14, 2021.

[12]The first diocese to lift the dispensation was Sioux Falls in South Dakota on August 8, 2020. The median group of dioceses rescinded this indult from attending Mass on June 6, 2021. Baton Rouge, Las Cruces, Providence, Rochester, and Worchester are a sample from this group.

[13]We use the 2019 average weekly attendance by diocese as the metric for number of Catholics.

rescission, some dioceses also put restrictions on livestream masses. Additionally, many individual churches over time decided to stop offering this online option.[14]

3 Data

To proxy for church attendance, the primary outcome of this study, we analyze foot traffic from SafeGraph Inc.'s patterns data set. We utilize anonymized smartphone data for time period January 2019 until November 2022, when SafeGraph ceased providing this data. The company aggregates individual pings at points of interest (POIs) to provide daily metrics of foot traffic, including number of visits, number of visitors, and dwell times. While the number of devices that SafeGraph tracks changes over time as shown in Appendix Figure A.2, 13 million smart phone devices are seen in the data set during last observable month.

Since SafeGraph collects mobility data through thousands of third-party applications on both Apple and Android platforms with the consent of users to share anonymized data, individuals who do not consent or utilize specific applications remain unaccounted for, raising questions about the potential underestimation of total mobility and the representativeness of the sample. Given our focus on examining changes in relative mobility over time, the underestimation of total mobility poses minimal concern as long as the composition of the sample remains relatively stable during our study period. Previous studies utilizing SafeGraph (or its spin-off, Veraset) have demonstrated that the sample exhibits a high degree of representativeness in terms of demographic and socioeconomic factors (e.g., (Chen and Rohla 2018; Hsu et al. 2022).[15]

We identify business categories using the North American Industry Classification

[14]The scope of this paper relies on religious participation based on in-person attendance. Although some Catholic churches still livestream Mass, Church law requires an individual under normal circumstances to physically attend Mass. In Appendix Figure A.1, Google search trends for keywords such as "online mass," "spiritual communion," and "mass times" are presented. The trends reveal a significant spike in searches for "online mass" and "spiritual communion" in March 2020, corresponding to the period when churches closed down due to the pandemic. However, these searches experienced a sharp decline shortly after, dropping to about 20 percent of the maximum point and indicating a limited role for online services. Notably, as in-person attendance began to recover in 2021, searches for "online mass" and "spiritual communion" further decreased. In contrast, searches for "mass times" declined during the pandemic lockdown and showed a slight increase alongside the recovery of in-person attendance.

[15]The cited papers assess the representativeness of the data by conducting comparisons between the regional characteristics at the Census block or tract level, where the devices are located, and the official Census data.

System (NAICS) code to identify religious institutions (NAICS code 813110), full-service restaurants (NAICS code 722511), bars (NAICS code 722410), movie theaters (NAICS code 512131), and fitness centers (NAICS code 713940). We restrict our analysis to those POIs that had observations for at least 6 weeks before and at least 16 weeks after the shutdown, which dropped 10,250 of 440,128 religious POIs from our analysis. For each business, SafeGraph contains a place name, address, and geolocation information (latitude and longitude). SafeGraph does not provide information on the religious affiliation of POIs. Therefore, using the provided place name, we categorize organizations into the appropriate religious groups using common keywords (e.g., "Our Lady of the Assumption" and "Catholic Church" for Catholics; "Mosque" for Muslims, "Synagogue" for Jews). For those not easily classified with keywords, we use OpenAI's text-davinci-003 (GPT 3.0) to separate out religious groups. Appendix B discusses the classification procedure in more detail. We check the validity of our classifications by comparing the counts of religious congregations from SafeGraph to those in the U.S. Religion Census, which collects counts of congregations across the country (Grammich et al. 2023). Figure A.3 plots of the number of religious congregations in the U.S. Religion Census against our classification of SafeGraph institutions. The Pearson correlation is extremely high (over 0.99) and the points are close to the 45 degree line, indicating that our classification places the correct number of institutions into each religious group. Appendix B also shows a high correlation between the Religion Census and SafeGraph when examining the spatial distribution of religious groups and tests the GPT/keyword classification against manual classification of groups.

Given our focus on Catholic institutions, we also compare counts of Catholic churches in Safegraph to administrative data from the *Official Catholic Directory* (OCD). As shown in panel (a) of Appendix Figure A.4, diocese counts are highly correlated with a Pearson correlation coefficient of 0.89, indicating that we have correctly identified Catholic churches in the Safegraph dataset. We then examine Catholic attendance in SafeGraph against the reported Catholic population. To scale up the raw foot traffic data to the actual visits, we normalize the diocesan raw visits at the level (total counts of pings) by dividing

by the weekly state-level number of devices seen by SafeGraph and multiplying by the yearly state population.[16] Assuming the sampling rate in state level is no different from diocesan level (i.e., $\frac{\text{devices in diocese}}{\text{diocesan population}} = \frac{\text{devices in state}}{\text{state population}}$), this normalization method gives us the approximate number of actual visits at the diocesan level. We plot the 2019 average normalized weekend foot traffic against the size of the respective diocese.[17] Panel (b) of Figure A.4 shows a clear linear relationship between these two variables. As the size of the diocese increases, the foot traffic to Catholic Churches increases. As such, we deem foot traffic as a good proxy for attendance at church services.

To compare foot traffic over time, we use the average weekly foot traffic from 2019 as the baseline. Because the attendance may drop to near zero in some places, we do not use the raw numbers or logs, following previous studies (Abouk and Heydari 2021; Barrios et al. 2021; Cantor et al. 2020; Caselli, Fracasso, and Scicchitano 2022; Glaeser et al. 2021).

We collected the dates of diocese closings, re-openings, granting dispensations, and reinstating the obligation to attend church in several ways. We first contacted each diocese for this information and received responses from 50 of the 172 dioceses in our sample. For the other dioceses we used publicly available information online from diocesan home pages, individual church bulletins, and news articles. Dispensation lifting dates were collected for all dioceses. Closing, re-opening, and dispensation granting dates are missing for 10, 13, and 18 dioceses, respectively. For dioceses without information on the exact dispensation granting date, we assume dispensations were granted the day that churches were closed. Administrative data on Catholic population, total population, and the number of parishes comes from the *Official Catholic Directory* (OCD).[18]

Data on bar and restaurant closing and re-openings comes from the Centers for Disease Control and Prevention (CDC)'s Policy Surveillance program, which includes information on state-level executive orders, administrative orders, resolutions, and proclamations through August 15, 2021. We create dummy variables indicating whether restaurants and

[16]Weekly state-level devices seen is available from SafeGraph. Yearly state population is from Census.

[17]The OCD provides data on the number of Catholics residing in each diocese's boundary. We use the pre-pandemic Catholic population from 2019 as the size of a diocese.

[18]We use the 2019 statistics contained in the 2020 volume.

bars are (i) fully closed or (ii) open without restrictions (open with restrictions is the omitted category). The data from the CDC is available until August 2021; we assume that restaurants and bars in all counties are fully open after this point.[19]

County level weekly Covid-19 cases and deaths data comes from The New York Times archive, which collects data from state and local health agencies. Data on vaccination in 2020-2022 from the CDC, including population with first, second, and a booster dose. We obtain the county-level daily weather data from PRISM Climate Group compiled by Aaron Smith.

Measures of socioeconomic status including median household income, poverty rate, and education attainment at the county level are obtained from the US Department of Agriculture County-level Data Sets. We use 2019 value of these variables except for educational attainment, for which we use 2015-2019 average. County-level 2016 presidential election results are obtained from MIT Election Data and Science Lab. As socioeconomic controls are not available at high frequency, in our regressions we interact their baseline levels with a linear time trend. State-level monthly unemployment rate comes from Local Area Unemployment Statistics (LAUS) from the US Bureau of Labor Statistics. When dioceses cross state boarders, we use the weighted average of the unemployment rates for the respective states. We aggregate all controls to the diocese level.

Table 1 presents summary statistics of the main variables. In panel (a), foot traffic relative to 2019 baseline levels varied across facilities, with most showing significant recovery by 2022 (80-109%). Notably, large Protestant megachurches[20] and JW congregations experienced lesser recoveries. The Catholic church saw a steep 43% decline in 2020 but rebounded to 90.4% of baseline by 2022, surpassing other religious groups. JW faced the most substantial decline and slowest recovery due to stringent social distancing policies.[21] Columns 5-7 show little variation in foot traffic on designated service days.[22]

[19]Although some states enacted mask or vaccination mandates during the 2021-2022 winter surge, most social distancing or capacity requirements were lifted by summer 2021 and not reinstated.

[20]The Hartford Institute for Religious Research provides a list of megachurches. We focus on the largest subset, those with weekly attendance over 3000. We match by the church name and location to identify 693 megachurches in the SafeGraph data. See `http://hirr.hartsem.edu/megachurch/database.html`.

[21]JW implemented a church closure from March 2020 to April 2022 (Molina 2022).

[22]Designated service days are Saturdays and Sundays for Catholics; Sundays for Protestants, Eastern Orthodox Christians, LDS, and JW; Fridays and Saturdays for Jews; and Fridays for Muslims.

Panel (b) summarizes the time-varying controls across different years. The unemployment rate peaked in 2020 and stabilized in 2021 and 2022. The percentages representing regions where restaurants faced closures or were permitted to operate without restriction provide a proxy for secular reopening events governed by local and state authorities. Although the state and local mandates for restaurant closures were lifted early in 2020, the process of resuming full unrestricted operations was considerably slower.[23] By 2021, less than 1 percent of regions enforced restaurant closure orders on average, yet only 68 percent operated without any lingering social distancing constraints. Covid-19 cases and deaths surged dramatically from 2020 to 2021, but deaths decreased in 2022.

In Appendix Table A.3, we provide the estimated counts of foot traffic for each facility. Appendix Table A.4 presents the summary statistics of covariates determined prior to 2020.

4 Foot Traffic Trends

Panel (a) of Figure 2 depicts the national trends in weekend foot traffic of Catholic churches in the contiguous US, relative to the 2019 average, from January 2019 to October 2022, along with the proportions of closed churches, churches without dispensation orders, and restaurants fully open (with no government restrictions).[24] Prior to the pandemic, foot traffic followed an expected pattern: a notable increase in April during Easter, a decline in the summer, and a recovery towards the end of the year. However, in March 2020, as most churches closed due to Covid-19, church attendance dropped significantly to 16 percent of the 2019 average. The closure of churches was not long; by May to June 2020, the majority of dioceses made the decision to reopen churches, resulting in only 13 percent of churches remaining closed by July 2020. With the reopening, the weekend attendance recovered to 40 percent of the 2019 average in July 2020. However, the dispensation orders issued by the bishops were not rescinded in most dioceses right after the reopening of churches. In fact, less than 3 percent of churches operated without a dispensation order throughout 2020. In March 2021, many dioceses began lifting the

[23] Social distancing measures encompassed mandatory spacing, capacity limitations, dine-in prohibitions, and restricted operating hours, among others.

[24] The shares in the graph are weighted by average total population in each diocese.

dispensation orders, which was followed by a significant increase in attendance from May to August 2021. Following the lifting of dispensations, attendance almost returned to the 2019 level by the end of 2021. In 2022, the overall foot traffic pattern mirrored that of 2019, with a surge around Easter and a dip during the summer, although the overall magnitude was reduced by 8.6 percent.

In panel (b), we compare the foot traffic patterns of Catholic churches on weekends with visits to other religious facilities. Other religious groups are broken out individually in Figure 3. Other religious facilities displayed a pattern similar to Catholic churches, with a surge around Easter and a dip during the summer, as the majority of them represent Protestant Christianity. Although visits to other religious facilities also declined with the inception of the pandemic, the decline was relatively smaller, only by 50 percent of the 2019 average in March 2020. This pattern is consistent with anecdotes of Protestant congregations remaining open during the early part of the Covid-19 pandemic, as well as limited encouragement to close from many large Protestant denominations (Smith and Snider 2023). Even when denominations did encourage closure, the decentralized nature of many Protestant congregations may have also precluded a nationwide shutdown like that experienced by Catholic, LDS, or JW congregations. Over the subsequent year, people returned to other religious facilities more quickly than to Catholic churches, but Catholic churches eventually caught up after the lifting of dispensations. In late 2022, the attendance of other religious facilities even became relatively lower than that of Catholic churches; the Catholic churches reached 91.4 percent while all other religious facilities remained at the 84.7 percent of the pre-pandemic level. As indicated in Figure 3, other groups with strong returns to services by 2022 include those placing a high priority on physical service attendance including Orthodox Christians and LDS, while Protestant megachurches experienced a sluggish return to in-person services.

We next compare trends in Catholic attendance to other, non-religious activities including restaurant and bar visits, movie theaters, and gyms. We choose these comparison activities because they represent similar levels of Covid risk (e.g., similar concentrations of people, time spent at a location, etc.) and are non-essential activities. Gyms in particular

are an interesting point of comparison because, like religious service attendance, they may be sensitive to disruptions in habits. Panels (c)-(e) show the trends for other activities. Similar to churches, these activities generally experienced a slight increase in the spring, a small dip in the late summer or fall, and a subsequent rise in the late fall/winter before the pandemic. In March 2020, all experienced a significant decline, with the greatest decline at movie theaters. Of the six types of facilities analyzed (Catholic churches, all other religious facilities, restaurants, bars, gyms, and movie theaters), restaurants rebounded the fastest, regaining their 2019 average in mid-2021. By 2022, restaurant visits reached 92.6 percent of the 2019 average. Gyms and movie theaters also experienced strong rebounds to 99.1 and 96.4 percent of their 2019 levels, respectively. In contrast, visits to bars only recovered to 82.9 percent of their 2019 average.

5 Religious Policies and Church Attendance

In this section, we discuss the empirical strategy and provide support that the timing of dispensation rescissions is quasi-random. We then present our main results.

5.1 Empirical Strategy

As shown in the previous section, church attendance fell substantially in March 2020 and slowly increased beginning in May/June as churches reopened. However, visits to religious organizations, and especially Catholic churches, lagged visits to restaurants. Possible reasons include fears around contracting Covid-19 and changes in norms or habits. For Catholic churches, one additional contributor was the presence of dispensations, which removed Catholics' obligation to attend Mass.

While all U.S. dioceses gave dispensations in March 2020, Bishops individually rescinded them at times ranging from August 2020 to October 2022. As discussed in Section 5.2 below, the lifting of dispensations was based on individual Bishops' decisions and not strongly correlated with the political or religious characteristics of an area. As a result, we can use the quasi-random variation in the lifting of dispensations to examine the impact of this policy on attendance. This provides a unique opportunity to examine the impact of religious policies, which is often difficult given that policies are not usually imposed in

a way that is exogenous to population characteristics.

We first use a traditional OLS event study to examine the impact of lifting dispensations on weekend Catholic church attendance:

$$attend_{d,t} = \sum_{s \in S} \beta_s p^s_{d,t} + \theta X_{d,t} + t\gamma_r + \eta_t + \delta_d + \epsilon_{z,t} \tag{1}$$

where $attend_{d,t}$ is attendance relative to 2019 average in diocese d on week t and s represents weeks before/after a diocese rescinded the dispensation, with week -1 (i.e. the week prior to the lifting) as the omitted category. We bin periods more than 8 units before treatment or more than 12 periods after.[25] $p^s_{d,t}$ is a dummy variable taking a value of 1 if the dispensation was lifted s weeks ago and 0 otherwise. η_t and δ_d are week and diocese fixed effects, respectively. We also control for region linear time trends ($t\gamma_r$) to account for different patterns in return to activities across regions which may be related to Covid spread, weather, or other factors. $X_{d,t}$ includes diocesan-level controls that may affect religious attendance including monthly state unemployment rate, dummies for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), and the fraction of the population that has received dose 1 of a Covid-19 vaccine.[26] To control for differential evolution of attendance in areas with different initial demographic or socioeconomic characteristics, we include linear time trends interacted with 2019 median household income, and the fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share.

As discussed in recent literature, two-way fixed effects may produce biased estimates of average treatment effects (as well as leads and lags in event studies) in the presence of differential timing and treatment effect heterogeneity [see, e.g., Callaway and Sant'Anna (2021); de Chaisemartin and D'Haultfoeuille (2020); Goodman-Bacon (2021); Sun and

[25]For OLS regressions, we do not trim the dataset to only include periods -8 to +12, as certain time period fixed effects would then be based on very few observations. See Miller (2023). We only include observations up to 52 weeks after the dispensation was lifted.

[26]Diocesan-level weather variables such as average temperature and precipitation are included because weather has been shown to affect people's mobility and religious attendance (Abouk and Heydari 2021; Andersen 2020; Moreno-Medina 2023; Nguyen et al. 2021).

Abraham (2021)]. Therefore, we also use the estimator proposed by de Chaisemartin and D'Haultfoeuille (2022), which is robust to treatment effect heterogeneity. This estimator compares the evolution of attendance between $t-k-1$ and period t between dioceses with the dispensation lifted in period $t-k$ for the first time and dioceses with the dispensation still in effect (not-yet-treated dioceses) at period t. For each relative time period, it computes a weighted average which provides an unbiased effect of being treated k periods ago.

5.2 Timing of Dispensation Rescission

One possible concern is that bishops' decisions to lift dispensations may be influenced by factors correlated with post-Covid mobility such as government policies or population political affiliation/religiosity. In this case, estimates of β_s in Equation 1 might reflect overall trends in behavior rather than the causal impact of religious policies. We examine this concern in three ways. In this section, we explore whether the timing of dispensation rescissions is correlated with other potential determinants of mobility including population characteristics and government Covid-19 restrictions. Two other tests to explore this concern (event study pre-trends and placebo tests on non-Catholic attendance and secular activities) are discussed in Section 5.3 and Section 6 below.

Referenced above, panel (a) of Figure 1 details the geographic variation in dispensation lifting dates. While the substantial geographic variation lends support to the exogeneity of the bishops' policies, we examine the correlation between policy dates and population characteristics in panels (b)-(d) of Figure 1. As one might expect that the political leanings of an area may be correlated with individuals returning to religious services and the bishop's decisions to rescind dispensations, panel (b) shows the share of those who voted for Donald Trump in the 2016 presidential election. In a side-by-side comparison to panel (a), we see that there is differentiation between the two. The Pearson correlation coefficient between the date of removal and the Republican share is -0.19. It is interesting to note that certain dioceses located in Republican strongholds reinstated the attendance requirement much later than one might predict. For instance, the dioceses of Dallas and Alexandria (in central Louisiana) were among the last quintile group to lift dispensations.

Other dioceses with low Republican shares, such as New York and Boston, were among the first to require Catholics to come back to Mass. This gives us confidence that the timings of rescissions were not necessarily tied to the political leanings in the surrounding area. Finally, panel (c) and (d) show little correlation between the rescission date and the fraction Catholic or diocese total attendance, respectively.

As shown in Figure 2 above, many dispensation rescissions appear to coincide with or closely follow full reopening of restaurants, raising concern estimates of β_s in Equation 1 might reflect the impact of secular reopening rather than religious regulations. Panel (a) of Figure A.5 displays the simple correlation between the restaurant reopening and dispensation rescission dates. The correlation coefficient of the two dates, calculated in days since March 1, 2020, is relatively low (0.17). Notably, while restaurant reopening dates are concentrated primarily in the first half of 2021, the rescission of dispensation orders is more dispersed temporally. Recognizing that both reopening and dispensation rescission dates may be influenced by regional Covid-19-related characteristics and other demographic and socioeconomic factors, we conduct a test to determine whether these dates correlate after controlling for these characteristics. We regress both the date of restaurant reopening and dispensation rescission (measured in days since March 1, 2020) on the relevant variables and plot the relationship between the residuals in panel (b). The correlation coefficient remains largely unchanged, indicating a limited relationship even after accounting for diocesan characteristics. Appendix Table A.5 presents the full regression results. As the correlation between restaurant reopening and dispensation rescission dates persists, despite the inclusion of control variables, we address this issue by introducing an indicator variable for restaurant reopening as part of our main specification. Additionally, to reinforce the argument for the exogeneity of dispensation lifting, we conduct several robustness checks in Section 6.

5.3 Results

Figure 4 shows the results of the event studies on dispensation rescinding, showing both the OLS and de Chaisemartin and D'Haultfoeuille (2022) (DCM-DH) estimates.[27]

[27]Note that the de Chaisemartin and D'Haultfoeuille (2022) estimates do not bin observations before -8 or after +12 as is done in the OLS.

Panel (a) includes only region linear time trends. Panel (b) adds the controls outlined above controlling for factors that may affect mobility and/or economic activities.[28] Given that Saturday evening Mass attendance fulfills the Catholic weekly obligation, we consider total weekend visits (Saturday plus Sunday) in the main specification. In Appendix Figure A.6, we show the results are similar when considering Saturday or Sunday attendance separately.

We focus the analysis on the DCM-DH coefficients given their robustness to treatment effect heterogeneity. In the 8 weeks leading up to a bishop rescinding the dispensation, Catholic church attendance remains relatively stable. This provides support for the identifying assumption that the imposition of the policy is unrelated to underlying trends in religious behavior. Upon rescission of the dispensation, there is a sharp uptick in attendance. One week after, attendance increases by about 4 percentage points of the baseline 2019 level. Attendance remains elevated by 2 percentage points on average for 6 weeks and then returns to baseline indicating that, while there is a response to the bishops' religious policies, the responses are relatively short lived. This result could be driven by (i) dispensations leading Catholics to return to Mass about 6 weeks earlier than they otherwise would have, (ii) dispensations leading Catholics to return to Mass for about 6 weeks only, or a combination of both. While we are unable to fully separate these two effects given the variability in weekly/seasonal attendance, the overall increase in Catholic attendance over this period (particularly the summer and fall of 2021) highlighted in Section 4 indicates that at least a portion of the result is driven by relative increase in control group attendance. Thus, while religious rules do affect behavior, they may be overridden over time by decrease rule salience and/or relative growth in other factors such as desire for community or return to pre-Covid norms.

To compare the magnitude of the attendance effect to other studies, we estimate that, before the pandemic, roughly 30 percent of Catholics visited a church on a given week.[29] Then, the 2-4 percentage point increase relative to the 2019 average would equate

[28]We do not include Covid-19 case rates given the possibility that church attendance may in itself increase Covid spread in a local area. Figure A.9 shows that the results are robust to controlling for Covid case and death rates.

[29]According to the Center for Applied Research in the Apostolate's frequently requested church statistics,

to a 0.6-1.2 percentage point increase in Catholic attendance overall (400,000-800,000 people on a population of about 67 million Catholics).[30] The magnitude is similar to the short-term weekly attendance effect of papal visits in Italy (1.1 percentage points for women, no significant change in attendance for men) (Farina and Pathania 2020). It is smaller in magnitude than the *decrease* in weekly attendance (3.5 percentage points) brought about by changes in "blue laws" increasing retail activities available on Sundays (Gruber and Hungerman 2008), indicating that the opportunity cost of religious activity may have a larger role than some religious regulations themselves. The short-lived nature of the effect is consistent with other evidence on statements of religious leaders (Bassi and Rasul 2017; Farina and Pathania 2020), providing further evidence on the limited role of religious leaders on behavior in many contexts.

Figure A.7 shows event studies for church reopenings in the Spring/Summer of 2020. While the reopening estimates cannot be considered causal given they are often driven by government policies on business openings and large gatherings, it is useful to compare the magnitude of the attendance increases around church reopenings. After reopenings, attendance increases by about 6 to 10 percentage points on the 2019 level. In this context, dispensation rescission has a meaningful effect of about one-third to one-half the size of return to churches upon reopening.

5.4 Heterogeneity

Does the response to dispensation rescission differ by location? The effect of Covid-19 risk and government policies on mobility differs by political affiliation (e.g., Barbalat and Franck (2022)), and thus, it may be expected that responses to Catholic church policy do as well. Panel (a) of Figure 5 displays the DCM-DH event study on dispensation rescission separating dioceses into Republican vs. Democrat based on whether their 2016 two-party presidential vote share was greater or less than/equal to 50 percent. Interestingly, there

in 2015, 23.4 percent of Catholics attended Mass weekly and 26.1 percent attended at least once a month but not weekly. If we assume that those in the latter group attended exactly once per month, an average week would see 30 percent of Catholics in the pews. See `https://cara.georgetown.edu/faqs`.

[30] Using geolocation data, Pope (2024) estimates that a smaller figure for weekly attendance (6 million Catholics per week at Sunday services). This figure is about 50% higher when other days of the week (most notably Saturday evenings) are included. On a baseline of 9 million, a 2 to 4 percentage point increase from dispensation lifting would equate to a smaller 180,000-360,000 person increase in weekly Catholic attendance.

is suggestive evidence that Democratic dioceses respond more strongly to dispensation lifting than Republican ones, consistent with the greater mobility responsiveness to local government mandates in Democratic areas (e.g., (Grossman et al. 2020)). The greater responsiveness may in part be a function of the slower pre-lifting return to church in Democratic areas, as shown in Figure A.8, In Republican areas, those most likely to come back may have already returned to church by the time dispensations were lifted.

We also examine heterogeneity by Catholic fraction of the population. In heavily Catholic areas, peer interactions may make people more aware/responsive to the lifting of dispensations. However, in areas dominated by other religions that saw a quicker return to in-person attendance in 2021, norms may have interacted with dispensations to push Catholics back to church. We perform a DCM-DH estimation splitting the sample at the median into low vs high fraction Catholic. Panel (b) of Figure 5 of provides suggestive evidence that dispensations increase attendance more in heavily Catholic areas, potentially indicating spillovers from peers. Note that it is difficult to separate out the effects of religion versus political affiliation, as the correlation between Republican share and fraction Catholic is -0.46.

6 Robustness and Placebo Tests

In Appendix Figure A.9, we examine robustness of our results to the exclusion of potential outliers and to alternative specifications. In panel (a), we drop dioceses that lifted dispensations before May 21, 2021 (the first quintile), as responses to religious policies may differ early in the pandemic. Our estimates are not sensitive to the exclusion of early adopters. We next consider whether our results are being driven by dioceses that lifted dispensations around the same time as other activities were reopening. In this case, our results could be driven by a general return to activities, not a specific effect of Catholic policy. Therefore, in panel (b), we omit dioceses that removed dispensations the week before, week of, or week after restaurants were fully reopened. The results are unchanged, suggesting our results are not driven by these other policies. We next remove weeks around Christmas (December 19-January 1) and Easter weekend each year given the spikes in attendance occurring around these dates; panel (c) shows that the effect

of dispensations remain, although the spike in period +1 is reduced. This suggests that effects that the effects of dispensations are particularly pronounced around major holidays. In panel (d), we show that the results are robust to adding controls for the three-week average of Covid cases and Covid deaths per 100,000. We next consider that individuals may attend church outside the boundaries of their home diocese and drop all churches within 5 kilometers of a diocese boundary (panel (e)); the results remain similar. Given our main results are weighted by population, we next perform a number of robustness checks to test the sensitivity to large areas and weighting. The results remain largely unchanged when dropping Los Angeles, the largest diocese (panel (f)), the five largest dioceses by total population (panel (g)), or weighting by Catholic population instead of total population (panel (h)). Finally, panel (i) shows that the results are similar when treatment is defined at the county rather than the diocese level.

We next use placebo tests to explore the exogeneity of dispensation rescission. One potential concern is that bishops may decide to lift dispensations in response to local government policies, Covid-19 rates, or increases in overall mobility; in these cases, observed increases in Catholic church attendance could simply be the result of underlying trends. To examine this possibility, we perform placebo tests on non-Catholic religious attendance and weekday secular activities. We focus on weekday activities since weekend activities may be affected by religious participation itself. If rescission is unrelated to underlying mobility trends, we should see no significant impact of the policy on these outcomes. Figures A.10 test for religious attendance on the primary day of worship for other religious group; there is no evidence of changes in any other group's attendance across the threshold. Figure A.11 shows no relationship between rescission weekday secular activities. Overall, these results indicate that lifting of dispensations is unrelated to general trends in other activities, and that the increase in attendance at Catholic churches after the lifting is caused by the policy itself.

7 Conclusion

In response to government policies aimed at containing the spread of the virus and the public's fear of COVID-19, religious activities were significantly disrupted in March

2020. Religious institutions implemented social distancing measures and, in some cases, temporarily closed down churches. To address concerns regarding regular attendance, the US Catholic Church went a step further by dispensing Catholics from the obligation to attend Sunday Mass.

This paper utilizes foot traffic data from smartphone signals to examine the trends in US religious participation from 2019-2022 and explore the impact of religious policies on behavior. After lockdowns, the return to Catholic churches lagged behind the return to other religious organizations and secular activities such as restaurants; however, by 2022, Catholics and other religious groups had reached about 85-90 percent of their 2019 levels. We leverage the differential timing of dispensation lifting across the country, which had little correlation with secular reopening events, to examine the impact of religious policies on behavior. We employ a robust difference-in-differences event study model addressing treatment effect heterogeneity. Our analysis reveals that the lifting of dispensations leads to a temporary 2-4 percentage point increase in weekend Catholic church attendance relative to the 2019 average. This is smaller in magnitude than the increase seen with the initial reopening of churches. The response to the lifting of dispensation orders indicates that religious regulations impact behavior in the short run, even in challenging circumstances like the COVID-19 pandemic. However, these regulations have less impact in the long run, when they may be overridden by habits or the desire for community engagement or individual spiritual benefits. Future studies could examine the impact of the lifting of dispensations on other outcomes or the impact of other changes in religious policies on behavior.

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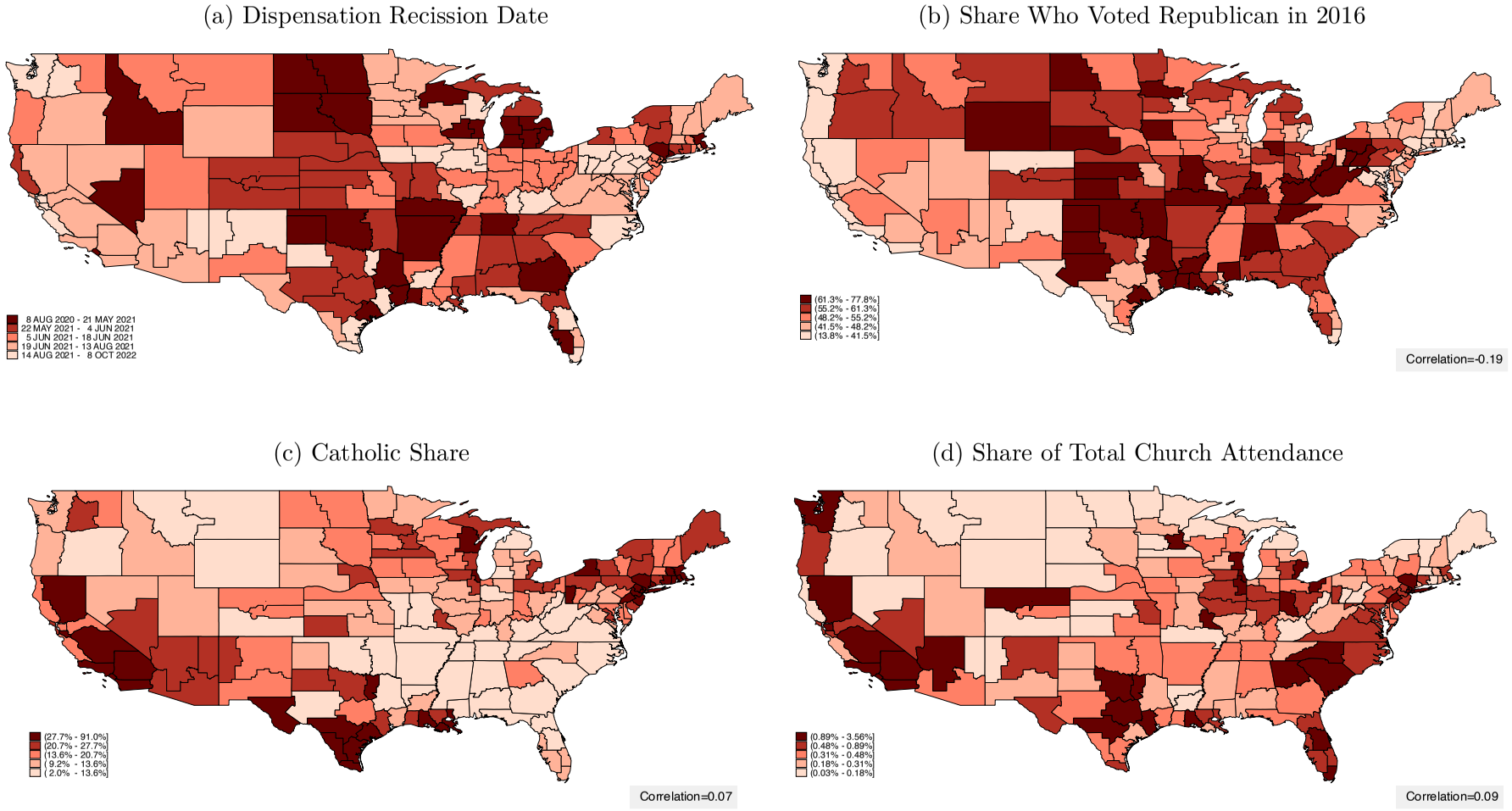
Tables and Figures

Table 1. Summary Statistics

					Day(s) of service		
	All	2020	2021	2022	2020	2021	2022
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Foot trrafic relative to 2019 average							
Catholic	0.755	0.595	0.782	0.902	0.515	0.733	0.914
	[0.282]	[0.294]	[0.212]	[0.243]	[0.311]	[0.208]	[0.234]
All Other Religious Facilities	0.795	0.711	0.833	0.847			
	[0.194]	[0.214]	[0.159]	[0.174]			
Eastern Catholic	0.815	0.735	0.856	0.859	0.680	0.834	0.922
	[1.456]	[2.334]	[0.526]	[0.684]	[2.456]	[0.673]	[0.893]
Eastern Orthodox	0.883	0.715	0.867	1.088	0.618	0.823	0.962
	[3.875]	[0.409]	[0.597]	[6.899]	[0.482]	[0.597]	[0.752]
Protestant	0.803	0.720	0.843	0.850	0.622	0.787	0.862
	[0.194]	[0.211]	[0.161]	[0.177]	[0.248]	[0.160]	[0.176]
Mainline Protestant	0.783	0.698	0.816	0.841	0.572	0.720	0.803
	[0.217]	[0.225]	[0.188]	[0.211]	[0.262]	[0.191]	[0.199]
Other Protestant	0.807	0.724	0.849	0.854	0.629	0.798	0.873
	[0.199]	[0.215]	[0.166]	[0.184]	[0.250]	[0.162]	[0.184]
Protestant Megachurch	0.601	0.470	0.654	0.689	0.381	0.587	0.687
	[0.360]	[0.385]	[0.308]	[0.342]	[0.406]	[0.339]	[0.393]
LDS	0.814	0.608	0.844	1.009	0.451	0.780	1.022
	[0.404]	[0.316]	[0.328]	[0.458]	[0.365]	[0.331]	[0.470]
JW	0.424	0.428	0.320	0.536	0.311	0.172	0.506
	[0.314]	[0.328]	[0.216]	[0.350]	[0.373]	[0.161]	[0.409]
Jewish	0.858	0.767	0.875	0.941	0.753	0.863	0.897
	[1.548]	[0.626]	[0.852]	[2.539]	[0.712]	[0.793]	[2.159]
Muslim	0.787	0.747	0.757	0.866	0.733	0.745	0.902
	[0.527]	[0.489]	[0.471]	[0.611]	[0.635]	[0.550]	[0.661]
Hindu	0.850	0.697	0.817	1.057			
	[2.757]	[0.765]	[0.768]	[4.810]			
Buddhist	0.895	0.800	0.917	0.975			
	[0.995]	[0.672]	[0.916]	[1.318]			
Restaurant	0.847	0.696	0.926	0.926			
	[0.237]	[0.220]	[0.207]	[0.203]			
Bar/Drinking Place	0.741	0.599	0.805	0.829			
	[0.262]	[0.242]	[0.218]	[0.263]			
Gym	0.863	0.692	0.917	0.991			
	[0.262]	[0.265]	[0.183]	[0.233]			
Movie Theater	0.696	0.416	0.733	0.964			
	[0.381]	[0.311]	[0.300]	[0.315]			
Panel B. Time varying controls							
State level unemployment rate(%)	5.762	8.075	5.365	3.643			
	[3.028]	[3.812]	[1.443]	[0.699]			
Restaurant closed(%)	6.450	17.85	0.882	0			
	[24.44]	[38.07]	[9.278]	[0]			
Restaurant fully open(%)	64.18	27.58	68.42	100			
	[47.94]	[44.68]	[46.46]	[0]			
Weekly Covid cases per 100K	198.2	121.1	197.8	280.6			
	[283.0]	[160.4]	[194.5]	[414.2]			
Weekly Covid deaths per 100K	2.232	2.122	2.799	1.720			
	[3.221]	[3.675]	[3.483]	[2.115]			
% Pop. with 1+ vaccine dose(s)	36.38	0.00189	39.87	72.77			
	[33.67]	[0.0310]	[25.06]	[12.05]			
Observations	25,972	8,944	8,944	8,084	8,944	8,944	8,084

Note: The table presents the means and standard deviations (in brackets) of the variables in the diocesan level. All values are weighted with the total population of the dioceses. Columns 1-4 show the total weekly traffic. The days of services are as follows: Saturday and Sunday for Catholic Church; Sunday for other religion, Protestant, Eastern Catholic, Eastern Orthodox, LDS, and JW; Friday and Saturday for Jewish; Friday for Muslim. Eastern Catholic refers to the twenty-three Churches that are in union with Rome and whose rituals are similar to the Orthodox Church. They have their own respective bishops, called patriarchs.

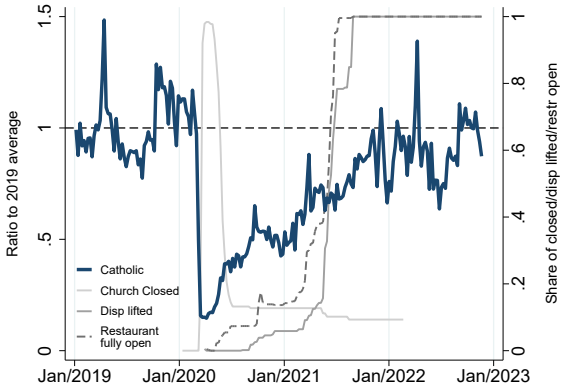
Figure 1. Dioceses by Key Demographic Variables



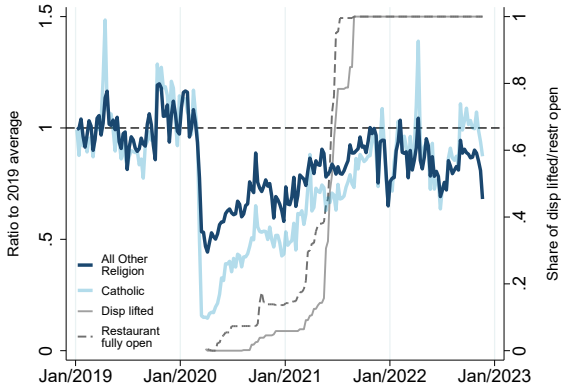
Note: Each map shows a specific demographic variable among the 172 Catholic dioceses in the continental US. Panel (a) provides a comparison for the other maps. Panel (b) provides the distribution of those who voted Republican in the 2016 presidential election. Panel (c) provide shows the percent Catholic of each diocese in 2019. This is calculated from the administrative data from the *Official Catholic Directory*. Panel (d) is a measure of the size of the diocese by the average weekend attendance in 2019 using foot traffic data from SafeGraph. For instance, a 2.0 percent share means that a diocese comprised 2.0 percent of the total weekend attendance among all US dioceses. Finally, panels (b), (c), and (d) show the Pearson correlation coefficient between the dispensation rescission date and the respective variable.

Figure 2. Foot Traffic Trends by Category

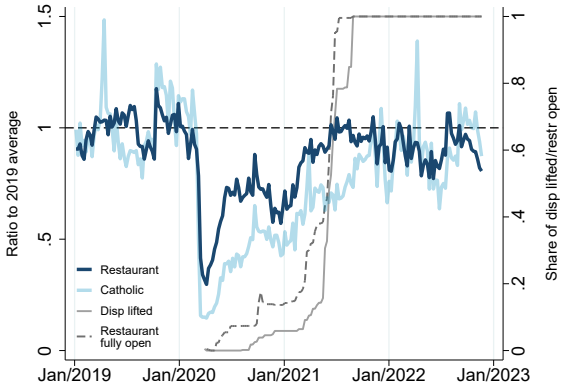
(a) Weekend Traffic to Catholic Churches



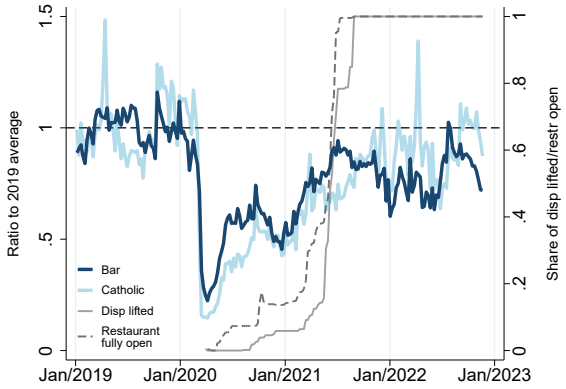
(b) All-day Traffic to Other Religious Facilities



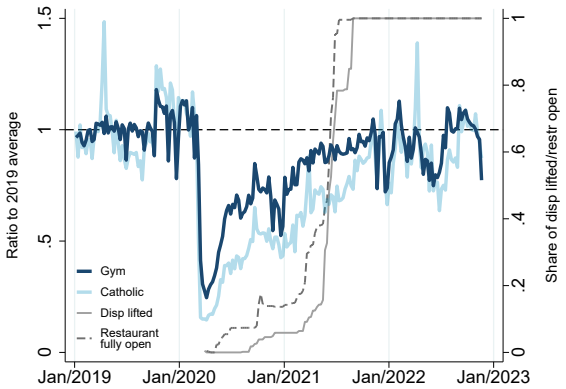
(c) All-day Traffic to Restaurants



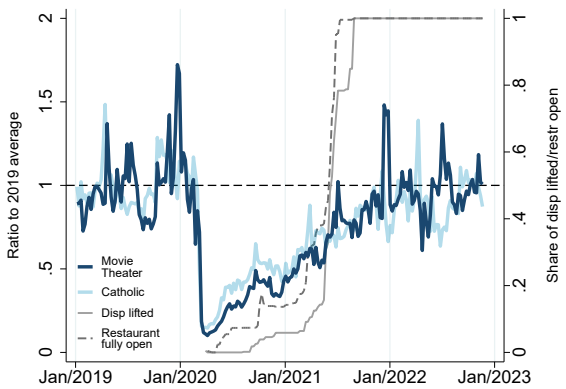
(d) All-day Traffic to Bars



(e) All-day Traffic to Gyms



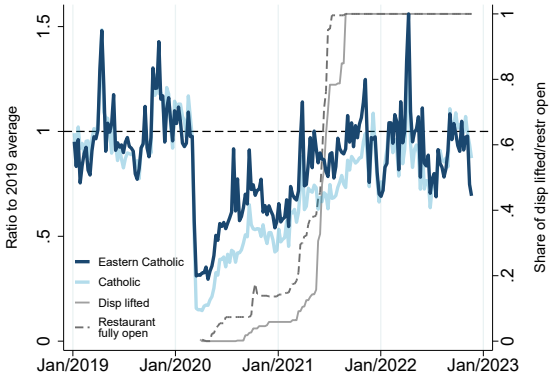
(f) All-day Traffic to Movie Theaters



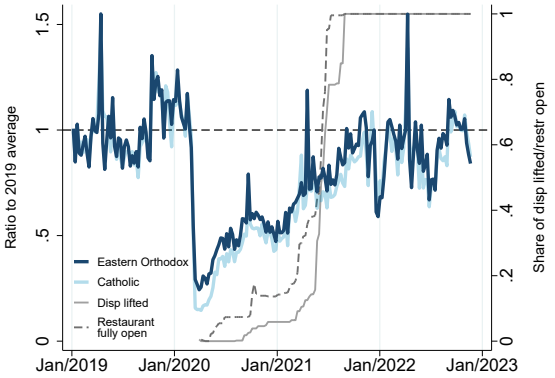
Note: The figures illustrate the national trends in foot traffic relative to the 2019 average. Panel (a) shows the foot traffic trend in Catholic churches on weekends from 2019 to 2022. Panels (b), (c), (d), (e), and (f) show the all-day traffic to other religious institutions, restaurants, bars, gyms, and movie theaters, respectively. Trend in weekend Catholic churches visits is depicted for comparison in panels (b)-(f).

Figure 3. Foot Traffic Trends by Religious Group (Day(s) of Service)

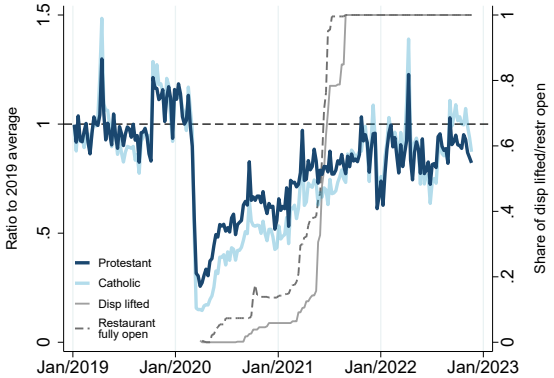
(a) Eastern Catholic



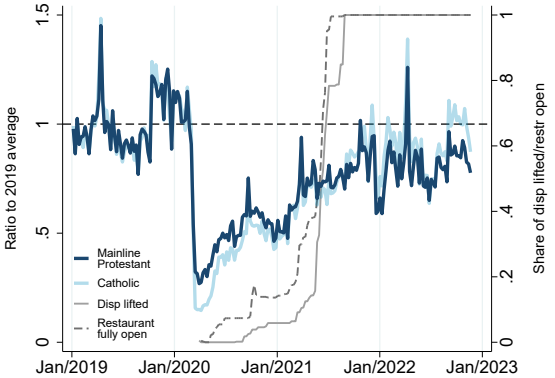
(b) Eastern Orthodox



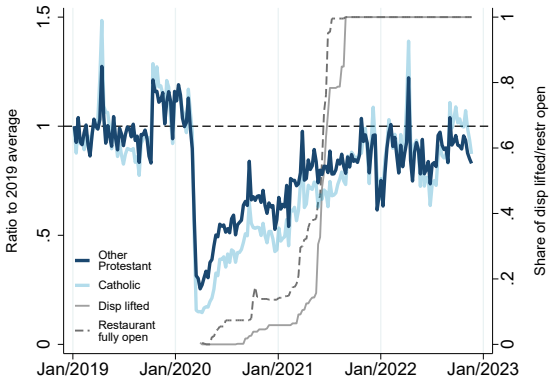
(c) Protestant



(d) Mainline Protestant



(e) Other Protestant



(f) Protestant Megachurch

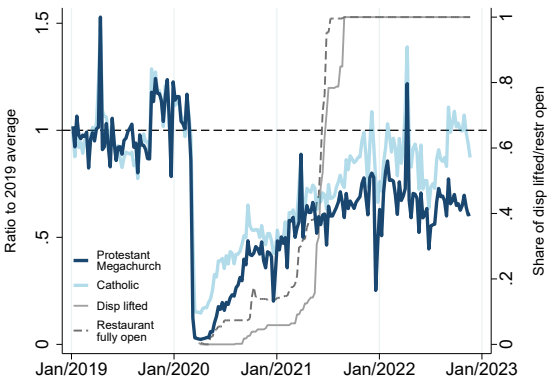
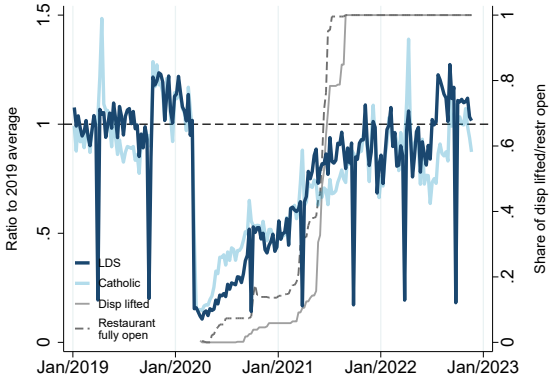
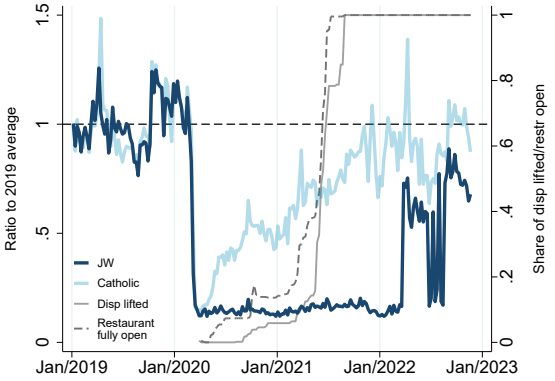


Figure 3. (Continued) Foot Traffic Trends by Religious Group (Day(s) of Service)

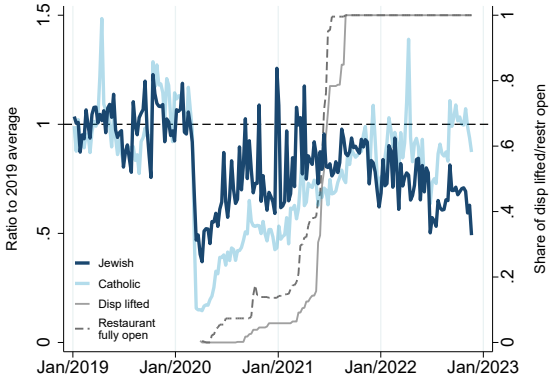
(g) LDS



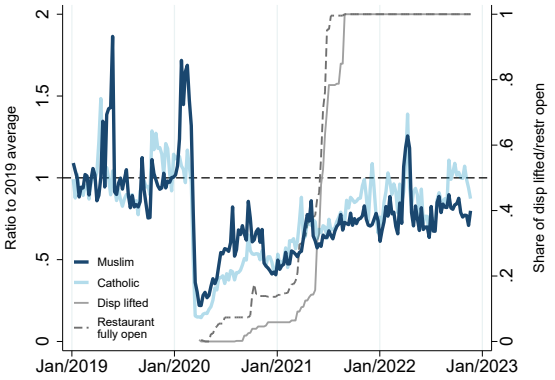
(h) JW



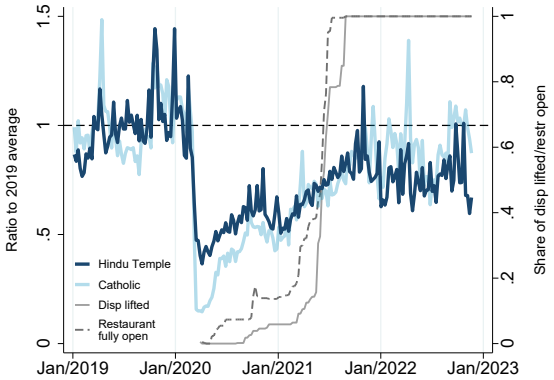
(i) Jewish



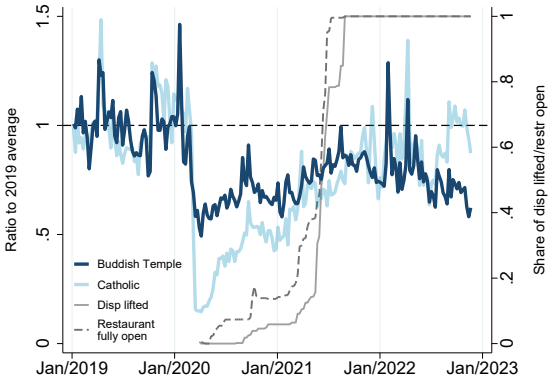
(j) Muslim



(k) Hindu



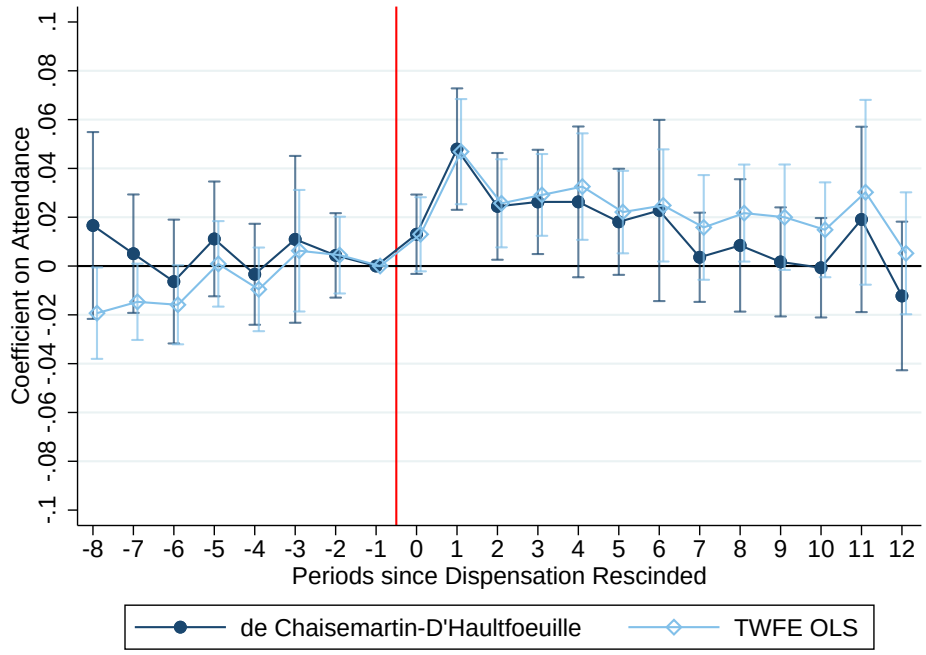
(l) Buddhist



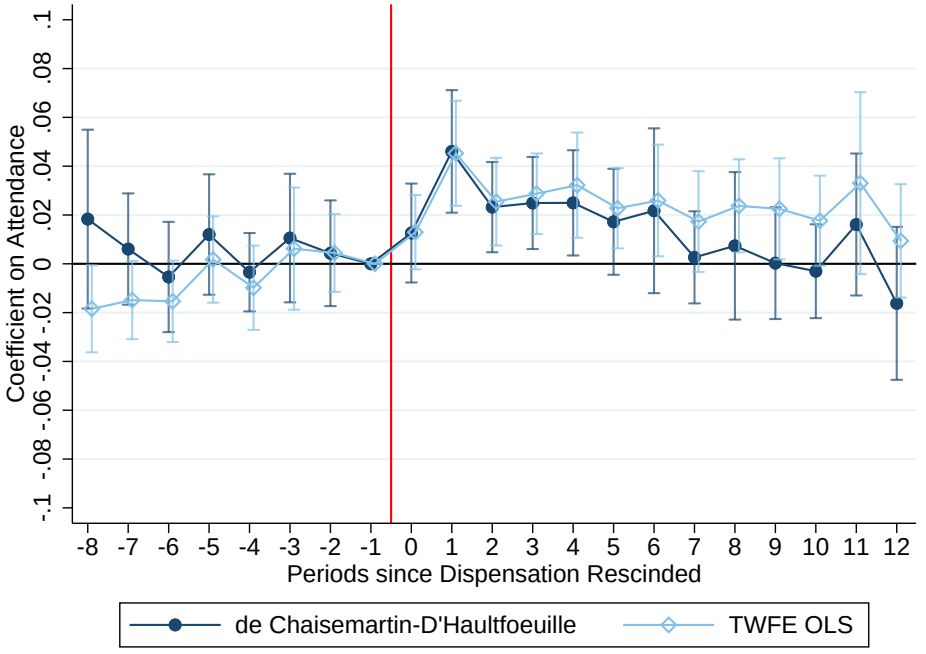
Note: These figures display the trend in attendance to religious institutions on their day(s) of service. Day(s) of service are described in the note of Table 1. All-day attendances are used for Hindu and Buddhist Temples. Weekend trend in Catholic church is depicted in the figures for comparison. All values of trend are relative term to 2019 average. The dips in LDS coincide with their biannual General Conference dates. JW start to recover its attendance in April 2022 when they finally reopen their Kingdom Halls. The Protestant total includes counts from Mainline and Other (Evangelical and Black Protestant). Megachurches are broken out separately and also included in the Mainline and Other Protestant totals.

Figure 4. Dispensation Rescission and Catholic Church Attendance

(a) Without Controls



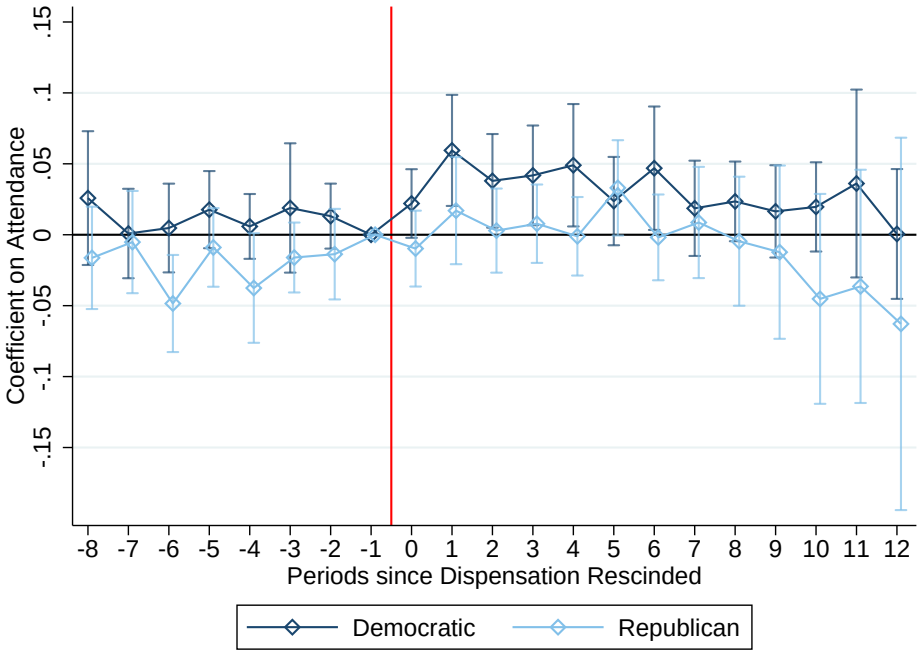
(b) With Controls



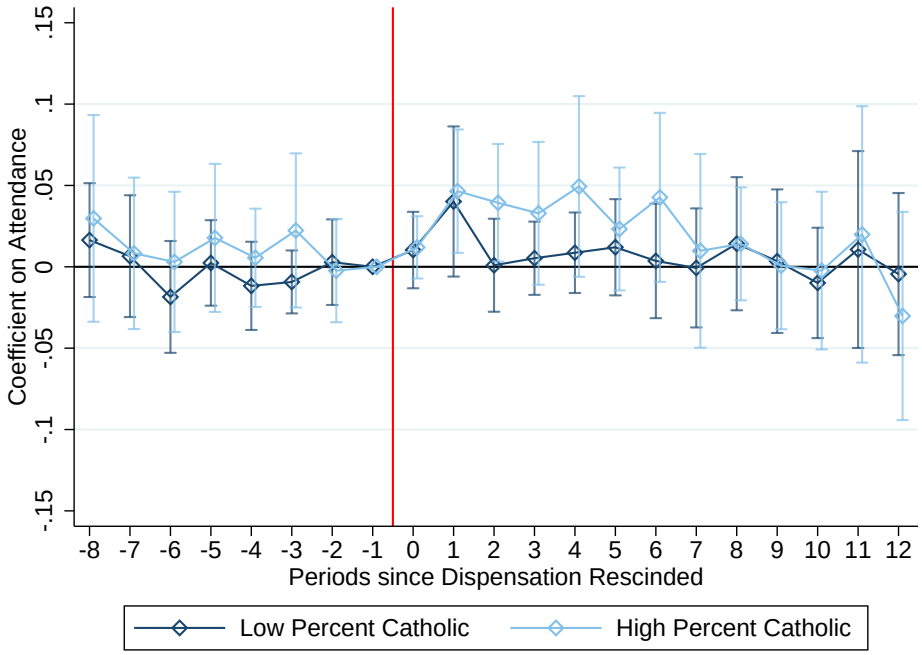
Note: These figures display point estimates and 95 percent confidence intervals for event studies of Catholic Church attendance on diocese dispensation rescission. Panel (a) includes region linear time trends. Panel (b) includes controls for unemployment rate, dummies for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), fraction of the population that has received dose 1 of a Covid-19 vaccine, and linear time trends in 2019 median household income, fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share. Standard errors are clustered at the diocese level.

Figure 5. Dispensation Rescission and Catholic Church Attendance: Heterogeneity

(a) By Political Affiliation



(b) By Fraction Catholic



Note: These figures display point estimates and 95 percent confidence intervals for event studies of Catholic Church attendance on diocese dispensation rescission using the DCM method. Panel (a) separates the sample by political affiliation, where Republican is defined as having over 50 percent of the 2016 Presidential two-party vote share. Panel (b) splits the sample by fraction Catholic (above vs at/below the sample median). Both panels include region linear time trends and controls for unemployment rate, dummies for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), fraction of the population that has received dose 1 of a Covid-19 vaccine, and linear time trends in 2019 median household income, fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share. Standard errors are clustered at the diocese level.

Appendix Tables and Figures

Table A.1. Lifting of Dispensation by Quintile

Quintile	Date Range	Number of Dioceses	Quintile Percent of Catholics	Cumulative Percent with Dispensation
First	8/08/2020 - 5/21/2021	29	14.4	85.6
Second	5/22/2021 - 6/04/2021	33	16.7	68.9
Third	6/05/2021 - 6/18/2021	40	22.2	46.7
Fourth	6/19/2021 - 8/13/2021	38	23.7	23.0
Fifth	8/14/2021 - 10/08/2022	35	23.0	0.0

Note: Each grouping of dioceses presents the ranges in which dispensations were lifted. The measurement for number of Catholics comes from measuring the average weekly attendance during pre-pandemic year of 2019 using mobility data from SafeGraph.

Table A.2. Lifting of Dispensation by the Twenty Largest US Dioceses

Diocese	State	Rescinding Date	Quintile	Percent of US Catholics
Los Angeles	CA	6/19/2021	Fourth	3.56
Galveston-Houston	TX	1/02/2022	Fifth	3.09
Chicago	IL	6/10/2021	Third	2.59
Detroit	MI	3/13/2021	First	2.08
San Bernardino	CA	7/01/2021	Fourth	2.01
Atlanta	GA	5/22/2021	Second	2.00
Phoenix	AZ	7/01/2021	Fourth	1.70
Dallas	TX	11/28/2021	Fifth	1.67
Orange	CA	3/13/2021	First	1.66
San Diego	CA	7/01/2021	Fourth	1.61
Miami	FL	4/10/2022	Fifth	1.60
San Antonio	TX	5/23/2021	Second	1.51
Fort Worth	TX	5/23/2021	Second	1.44
Orlando	FL	4/10/2022	Fifth	1.44
Newark	NJ	6/05/2021	Third	1.42
New York	NY	4/07/2021	First	1.31
Brooklyn	NY	6/05/2021	Third	1.27
Rockville Centre	NY	8/14/2021	Fifth	1.27
Austin	TX	5/23/2021	Second	1.23
Sacramento	CA	6/20/2021	Fourth	1.21

Note:The 20 largest dioceses are listed in order according to size of Catholic population. The quintile represents the same grouping as in Table A.1. The first quintile is the earliest group of dioceses that reinstated the obligation to attend Mass. The measurement for number of Catholics comes from measuring the average weekly attendance during pre-pandemic year of 2019 using mobility data from SafeGraph.

Table A.3. Summary Statistics of Raw Counts

					Day(s) of service		
	All	2020	2021	2022	2020	2021	2022
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Religious Facilities							
Catholic	53,003	41,207	54,604	64,282	17,001	24,455	31,538
	[43,546]	[38,495]	[40,045]	[48,939]	[18,414]	[18,941]	[25,555]
All Other Religious Facilities	690,712	623,291	722,257	730,404			
	[523,645]	[499,228]	[528,374]	[537,304]			
Eastern Catholic	1,399	1,222	1,495	1,488	463	620	695
	[1,667]	[1,505]	[1,760]	[1,716]	[581]	[758]	[825]
Eastern Orthodox	7,010	5,932	7,241	7,948	1,213	1,666	2,021
	[7,688]	[6,381]	[7,297]	[9,148]	[1,473]	[1,811]	[2,355]
Protestant	622,370	563,122	652,169	654,954	112,512	142,026	155,494
	[475,806]	[451,512]	[481,262]	[489,557]	[104,280]	[113,406]	[126,193]
Mainline Protestant	80,492	73,122	83,438	85,386	12,779	15,868	17,729
	[60,564]	[59,595]	[59,688]	[61,811]	[12,586]	[12,695]	[14,275]
Other Protestant	541,876	490,003	568,727	569,560	99,734	126,157	137,763
	[429,382]	[404,889]	[436,513]	[442,323]	[93,982]	[103,454]	[114,862]
Protestant Megachurch	9,576	7,515	10,499	10,830	2,657	4,133	4,690
	[10,968]	[10,819]	[10,787]	[11,003]	[4,736]	[4,352]	[4,920]
LDS	23,826	17,780	24,592	29,668	4,227	7,394	9,402
	[79,936]	[68,634]	[79,653]	[90,685]	[19,266]	[26,519]	[32,859]
JW	4,084	4,083	2,997	5,292	770	412	1,265
	[5,321]	[5,737]	[3,434]	[6,228]	[1,522]	[532]	[1,685]
Jewish	16,155	15,933	17,974	14,389	4,315	4,865	3,825
	[41,405]	[42,459]	[46,771]	[32,965]	[12,158]	[12,618]	[8,064]
Muslim	6,771	6,652	6,361	7,357	1,487	1,477	1,811
	[8,576]	[9,880]	[7,270]	[8,323]	[2,130]	[1,637]	[1,965]
Hindu	4,582	4,217	4,757	4,792			
	[6,531]	[6,560]	[6,652]	[6,344]			
Buddhist	5,913	5,637	6,101	6,010			
	[11,748]	[11,488]	[11,762]	[12,010]			
Panel B. Other Facilities							
Restaurant	4,103,891	3,445,155	4,467,075	4,430,884			
	[3,280,461]	[2,951,446]	[3,418,317]	[3,358,254]			
Bar/Drinking Place	338,012	278,732	371,357	366,707			
	[289,551]	[262,953]	[308,587]	[285,622]			
Gym	1,322,439	1,081,354	1,403,063	1,499,970			
	[1,152,256]	[1,043,580]	[1,144,010]	[1,228,807]			
Movie Theater	97,268	57,968	103,169	134,217			
	[81,040]	[61,747]	[76,056]	[85,852]			
Observations	25,972	8,944	8,944	8,084	8,944	8,944	8,084

Note: The table presents the means and standard deviations (in brackets) of the variables. All values are weighted with the total population of the dioceses. Columns 1-4 show the total weekly traffic. The days of services are as follows: Saturday and Sunday for Catholic; Sunday for other religion, Protestant, Eastern Catholic, Orthodox, LDS, and JW; Friday and Saturday for Jewish; Friday for Muslim. Other religion includes all religious groups above and Hindu and Buddhist temples.

Table A.4. Summary Statistics of Time Invariant Covariates

	(1)
Panel A. Number of Churches	
Catholic	152.96
	[108.55]
Other Non-Catholic Religious Facilities	3,383.05
	[2,440.99]
Eastern Catholic	4.82
	[4.51]
Eastern Orthodox	31.28
	[28.11]
Protestant	3,075.67
	[2,261.97]
LDS	61.56
	[150.49]
JW	20.36
	[15.00]
Jewish	109.48
	[305.38]
Muslim	27.88
	[29.69]
Hindu	21.13
	[23.89]
Buddhist	37.69
	[56.99]
Panel B. Demographic and SES Characteristics	
Household income	55370.2
	[13187.1]
% of pop. with BA degree	32.88
	[7.521]
Poverty rate (%)	13.45
	[3.253]
Share of white (%)	61.29
	[18.58]
Share of Hispanic (%)	18.57
	[16.01]
Share of black (%)	14.28
	[9.677]
Share of Catholic (%)	20.69
	[14.64]
Median age	38.24
	[2.926]
% of pop. over 65	22.71
	[3.302]
2016 Republican Vote Share (%)	45.88
	[13.10]
Observations	34,916

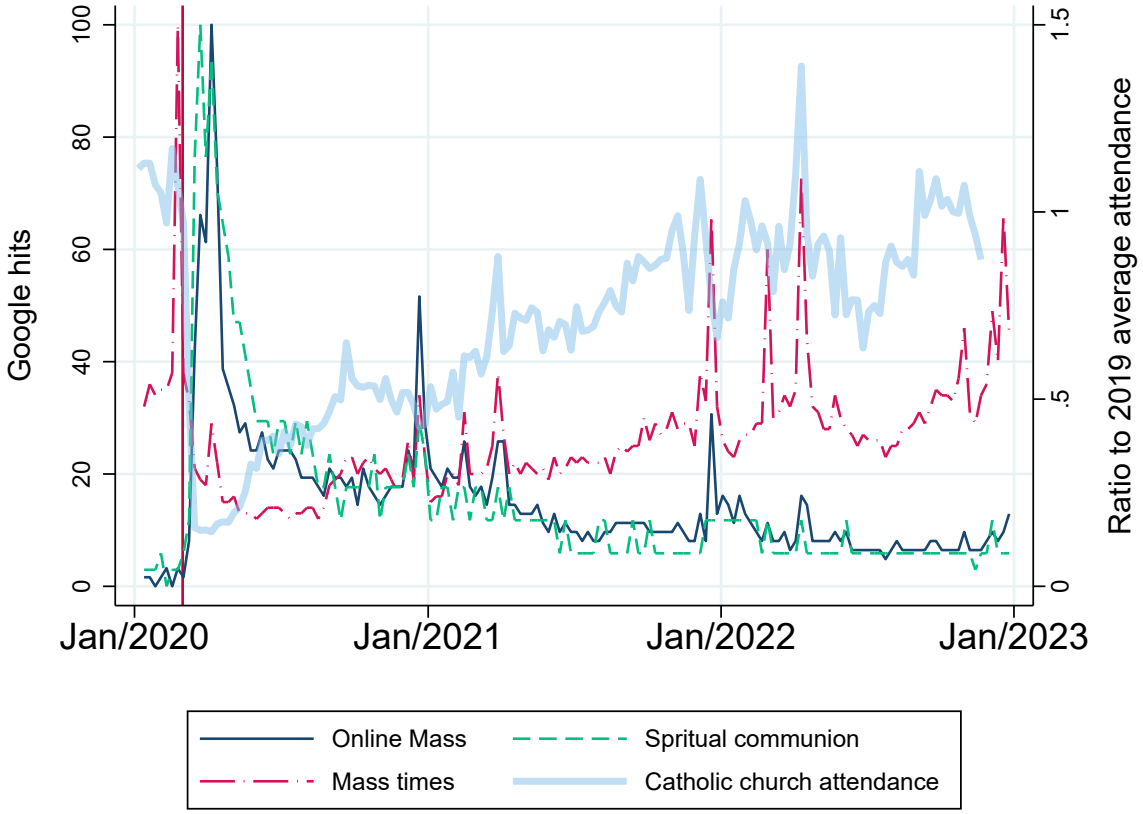
Note: The table presents the means and standard deviations (in brackets) of the variables in the diocesan level. All values are weighted with the total population of the dioceses.

Table A.5. Relationship between Diocesan Characteristics and Restaurant Reopening/Dispensation Rescission Dates

	Restaurant Reopen (1)	Dispensation Rescission (2)	Rescission before Apr 2021 (3)	Rescission before Jul 2021 (4)
Ln(HH income 2019)	36.1739	-198.5007*	0.3738	0.1120
	(69.7740)	(110.9086)	(0.2646)	(0.3599)
Share of population with BA 2015-2019	-6.3916**	2.8920	-0.0080	0.0045
	(2.6758)	(3.4942)	(0.0097)	(0.0107)
Poverty rate 2019	-7.7906*	-0.9801	0.0055	-0.0066
	(4.2782)	(4.4829)	(0.0147)	(0.0187)
non-Hispanic white share 2019	3.6086**	-3.2220	-0.0052	0.0113
	(1.5539)	(2.3537)	(0.0075)	(0.0070)
Hispanic share 2019	2.1541	0.3160	-0.0098	0.0049
	(1.5163)	(2.1908)	(0.0065)	(0.0065)
Black share 2019	1.5447	-4.4614**	-0.0028	0.0152**
	(1.5419)	(2.0773)	(0.0062)	(0.0062)
Median age 2019	-5.2574	9.3062	0.0027	-0.0430
	(7.2697)	(10.1057)	(0.0230)	(0.0334)
60+ share 2019	-11.7205*	-9.4877	-0.0085	0.0529*
	(6.5559)	(9.4840)	(0.0231)	(0.0302)
Share of Republican Vote 2016	-1.6024	-0.4709	0.0016	0.0026
	(1.4101)	(1.6875)	(0.0049)	(0.0049)
Catholic share 2019	-0.0457	-1.8054***	0.0028	0.0007
	(0.8286)	(0.5380)	(0.0023)	(0.0018)
Covid-19 Cases per 100K, (initial-Jun 2020)	-0.0255	-0.0008	-0.0001	0.0000
	(0.0277)	(0.0319)	(0.0001)	(0.0001)
Covid-19 Cases per 100K, (Jul-Dec 2020)	-0.0460***	-0.0033	0.0000	0.0000
	(0.0094)	(0.0103)	(0.0000)	(0.0000)
Covid-19 Cases per 100K, (Jan-Mar 2021)	-0.0248*	-0.0174	0.0000	0.0001
	(0.0149)	(0.0219)	(0.0000)	(0.0001)
Covid-19 Deaths per 100K, (initial-Jun 2020)	0.9462**	-0.0832	0.0015	0.0014
	(0.3711)	(0.3769)	(0.0015)	(0.0016)
Covid-19 Deaths per 100K, (Jul-Dec 2020)	0.8653**	0.0311	0.0018	-0.0015
	(0.4275)	(0.5332)	(0.0015)	(0.0015)
Covid-19 Deaths per 100K, (Jan-Mar 2021)	1.2558***	0.1469	-0.0021	0.0000
	(0.4069)	(0.5088)	(0.0016)	(0.0017)
Covid-19 Vaccination Rate, 1st Dose, Mar 2021	2.0365*	2.6310**	-0.0036	-0.0071
	(1.1141)	(1.3148)	(0.0047)	(0.0047)
Northeast	4.0582	31.9886	-0.1407	-0.3628**
	(32.7488)	(39.3778)	(0.1166)	(0.1505)
South	23.8015	32.2819	-0.0814	-0.1675
	(43.1581)	(35.9119)	(0.1282)	(0.1246)
West	95.5658***	-28.6208	-0.0493	0.0933
	(29.1114)	(29.6652)	(0.0934)	(0.0882)

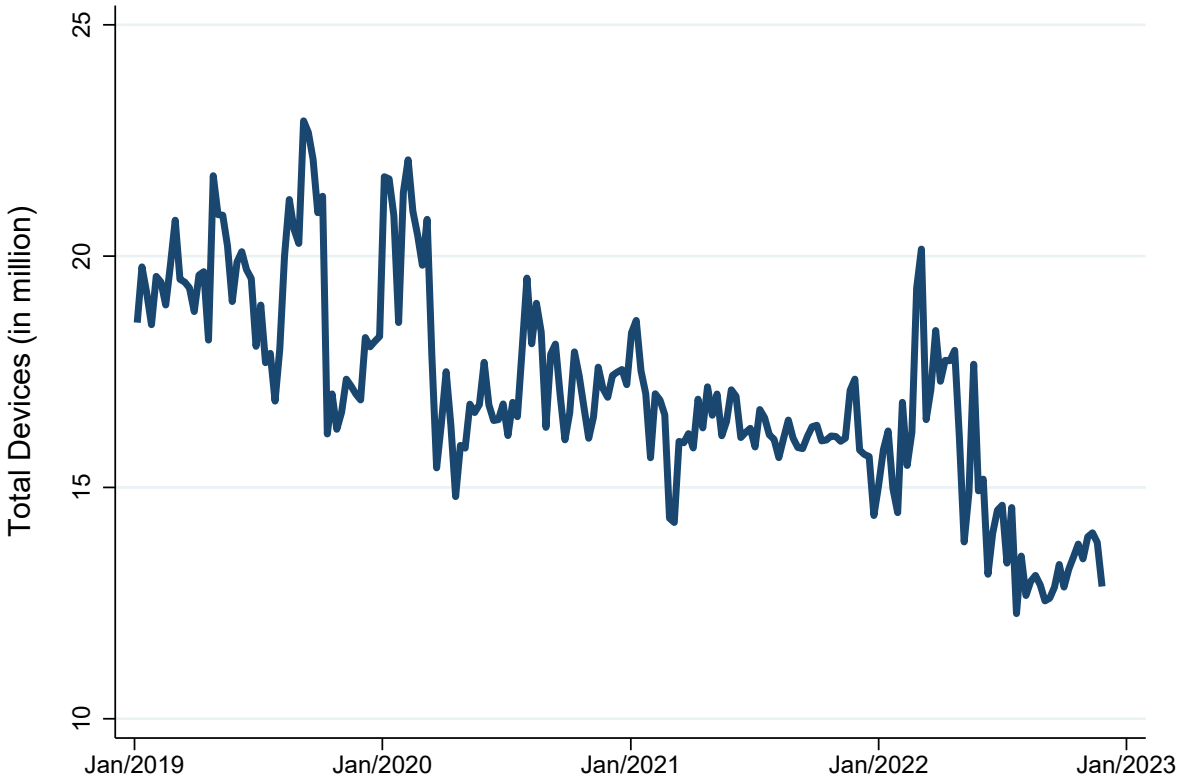
Note: N=172. The table presents the regression coefficients of diocesan characteristics on restaurant reopening date (column 1) and dispensation rescission date (column 2). Dependent variables of columns 3 and 4 are indicators for lifting dispensation earlier than April and July 2021, respectively. All shares and ratios are in percent. Region fixed effect is included with Midwest as the base category.

Figure A.1. Trends in Google Search



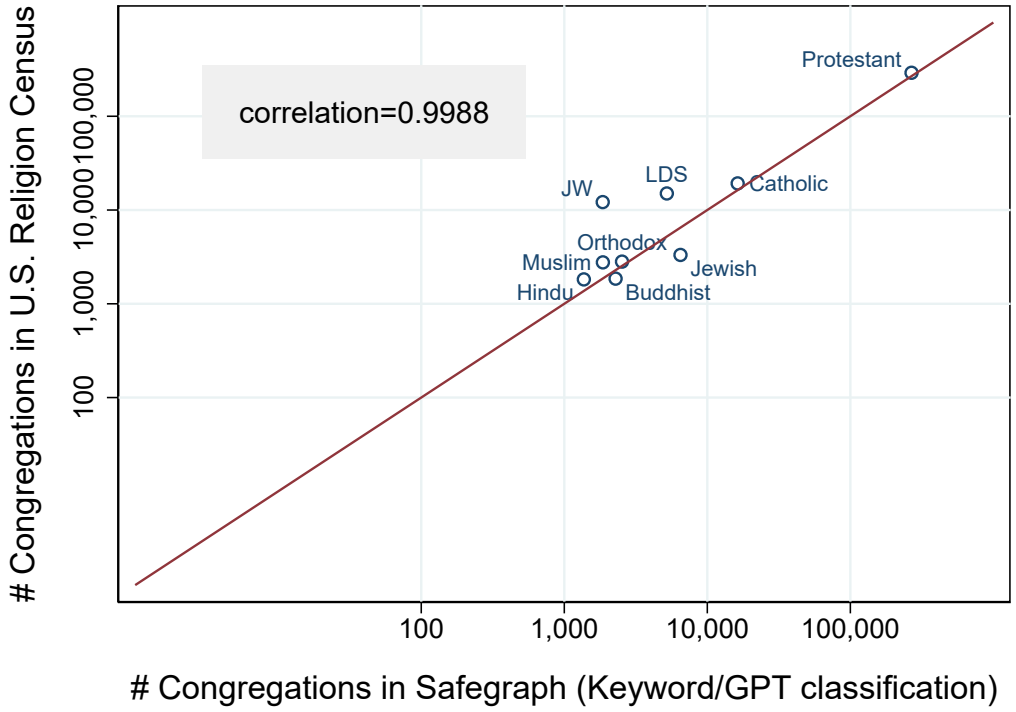
Note: The figure displays the Google search trends for the keywords "online mass," "mass times," and "spiritual communion." The Google Trend hits signify the relative popularity of each keyword throughout the specified search period, from January 2020 to December 2022.

Figure A.2. Total Devices Seen in SafeGraph



Note: The figure displays the aggregate of the weekly total devices in each state in the contiguous US.

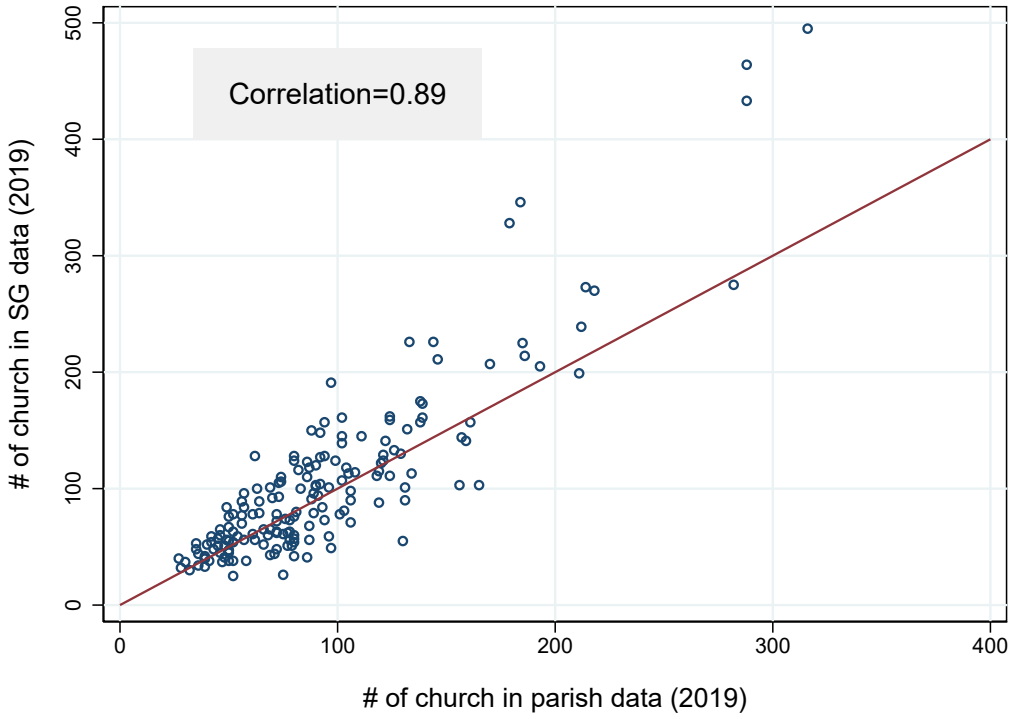
Figure A.3. Number of Religious Congregations in SafeGraph and U.S. Religion Census



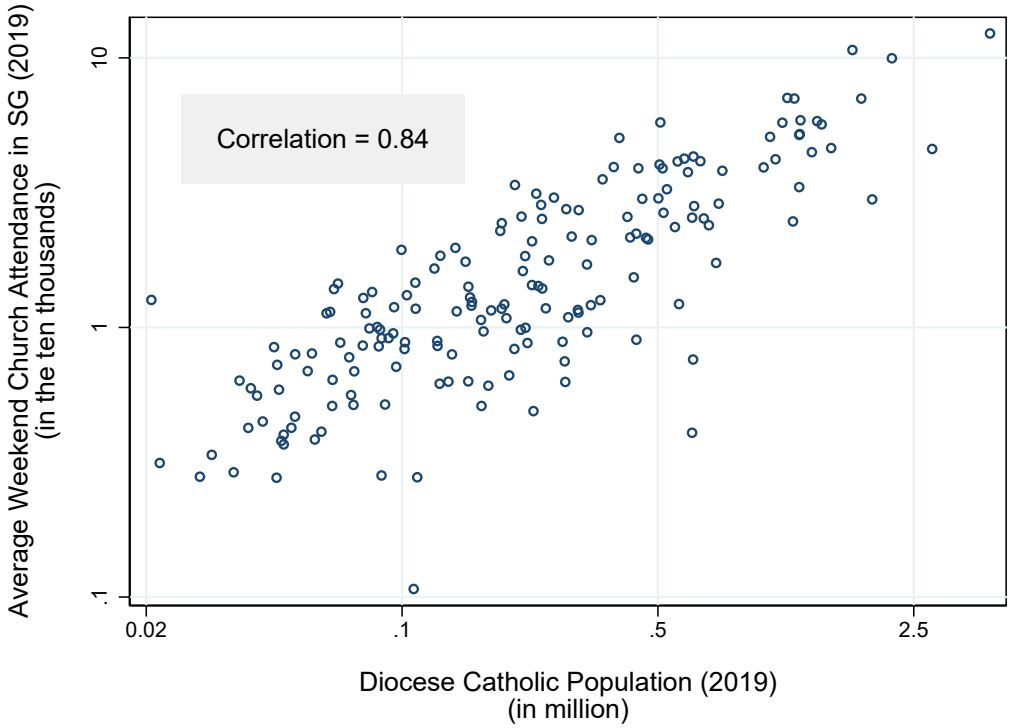
Note: These figures plot the number of religious congregations nationally in the 2020 U.S. religion Census against the number in SafeGraph. Each point represents a separate religious group. The solid line is the 45 degree line. Religious group classifications in SafeGraph are based on the organization's listed name; to classify, the authors use keywords and GPT along with some manual adjustments.The Pearson correlation coefficient is also given in the figure.

Figure A.4. Validity of Catholic Data in SafeGraph

(a) Catholic Churches by Diocese: SafeGraph vs. Administrative Data



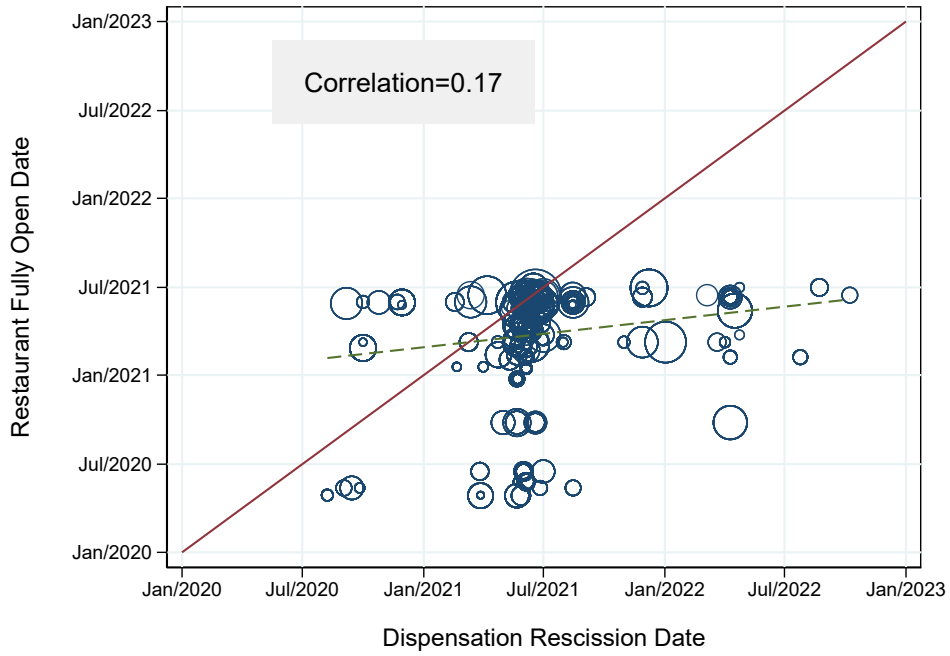
(b) Foot Traffic vs. Number of Catholics by Diocese



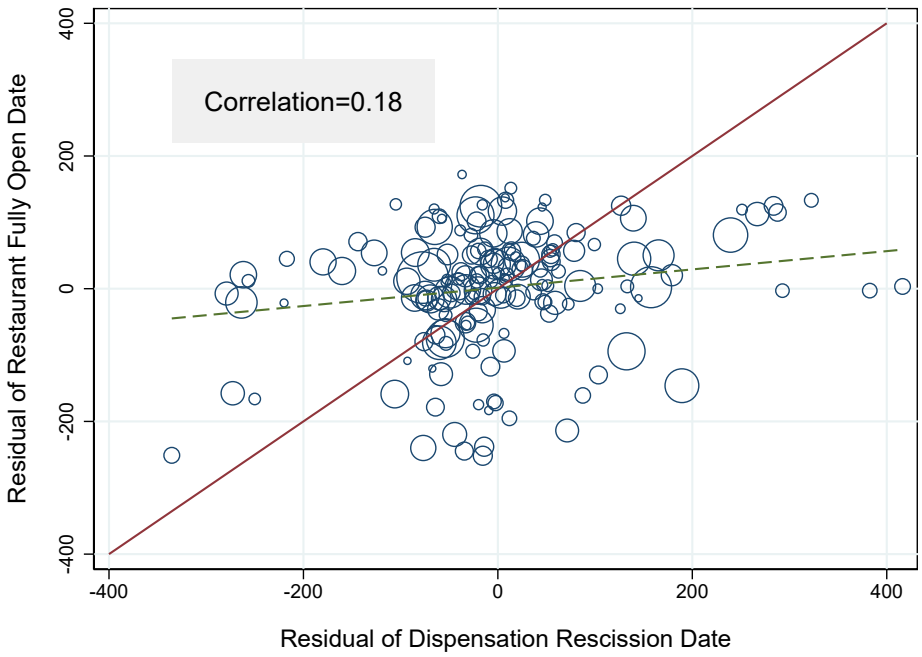
Note: Panel (a) shows that between the number of Catholic churches identified in the SafeGraph data correlate closely with those in the administrative data. Panel (b) presents a clear linear relationship between the number of average weekend attendance in 2019, i.e. foot traffic, in the SafeGraph data and the total Catholic population by diocese. Catholic parish and population data comes from administrative data in the *Official Catholic Directory*. The Pearson correlation coefficient is also given in each panel.

Figure A.5. Correlation Between Dispensation Rescission Dates and Restaurant Reopening Dates

(a) Raw Correlation



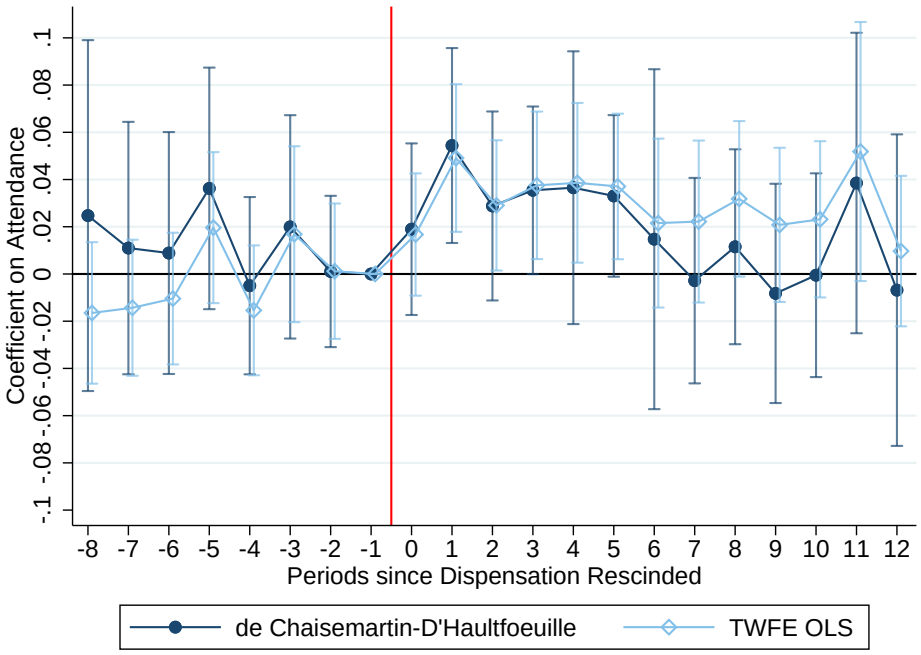
(b) Correlation Conditional on Diocesan Characteristics



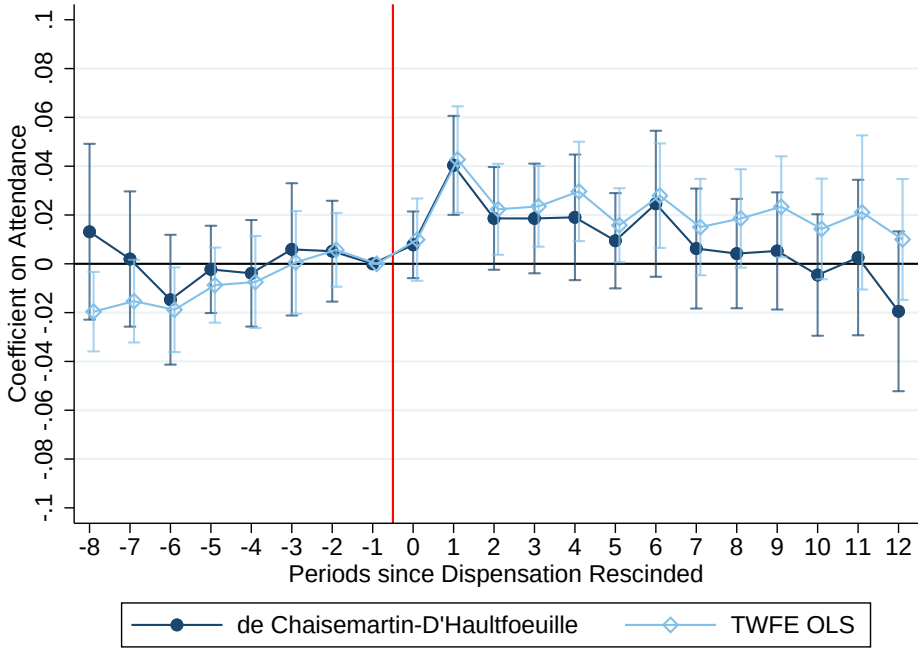
Note: Panel (a) shows the correlation of restaurant reopening and dispensation rescission dates. The dates are calculated as days since March 1, 2020. The restaurant reopening date is the date when the last county in the diocese lifted restrictions on the restaurants. Green dashed line denotes the fitted line of the dates weighted with the diocesan population. Panel (b) displays the correlation of the residuals of regressions of restaurant reopening and dispensation rescission dates on diocesan-level demographic, socioeconomic, and Covid-19 related variables. The full list of variables and the regression results are available in Appendix Table A.5.

Figure A.6. Dispensation Rescission and Catholic Church Attendance by Day

(a) Saturday



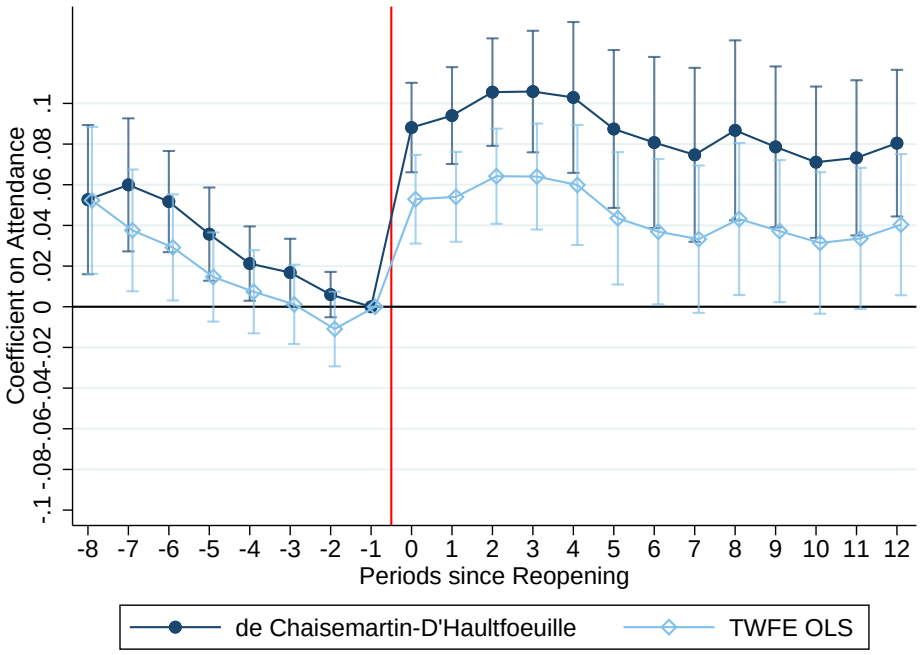
(b) Sunday



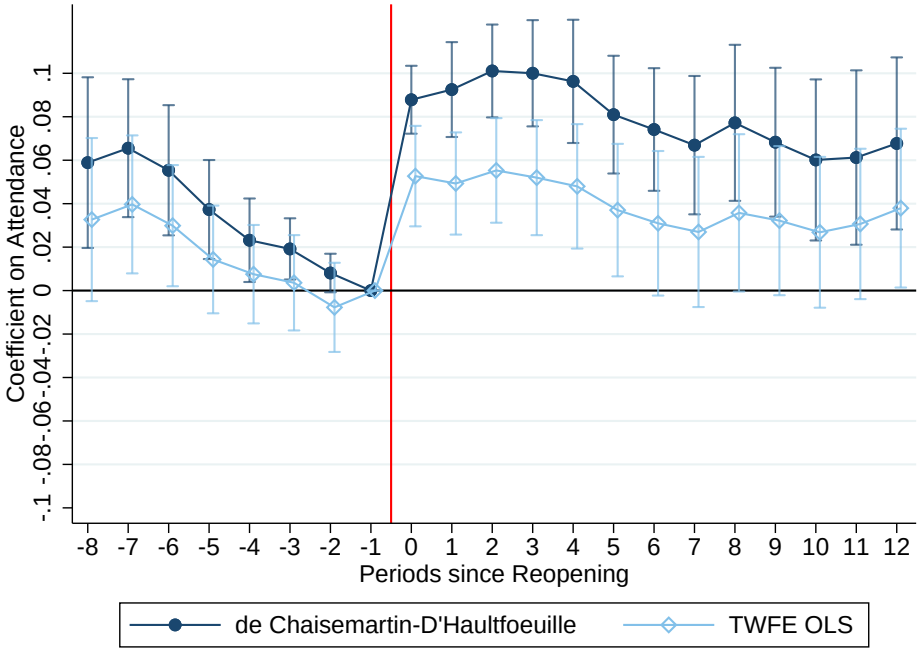
Note: These figures display point estimates and 95 percent confidence intervals for event studies of Catholic Church attendance on diocese dispensation rescission. Panel (a) includes only Saturday attendance and Panel (b) includes only Sunday attendance. Both panels include region linear time trends, controls for unemployment rate, dummies for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), fraction of the population that has received dose 1 of a Covid-19 vaccine, and linear time trends in 2019 median household income, fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share. Standard errors are clustered at the diocese level.

Figure A.7. Church Reopening and Catholic Church Attendance

(a) Without Controls



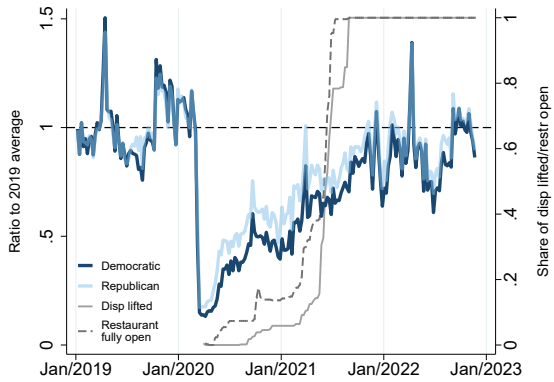
(b) With Controls



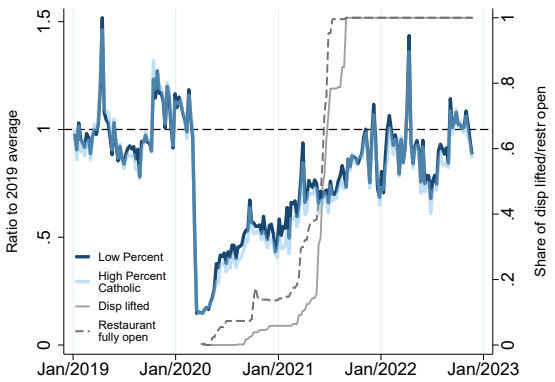
Note: These figures display point estimates and 95 percent confidence intervals for event studies of Catholic Church attendance on church reopening at the diocese level. Panel (a) includes region linear time trends. Panel (b) includes controls for unemployment rate, dummies for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), fraction of the population that has received dose 1 of a Covid-19 vaccine, and linear time trends in 2019 median household income, fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share. Standard errors are clustered at the diocese level.

Figure A.8. Heterogeneity in Foot Traffic to Catholic Church

(a) By Political Affiliation



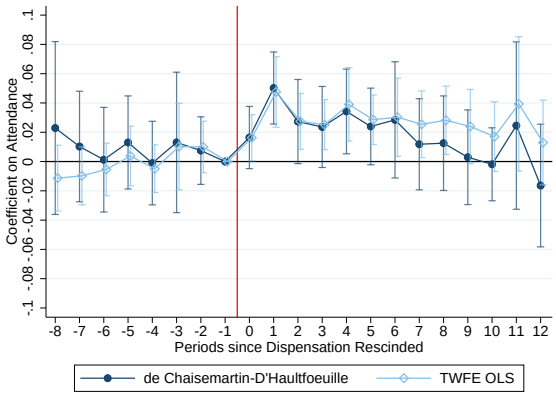
(b) By Fraction Catholic



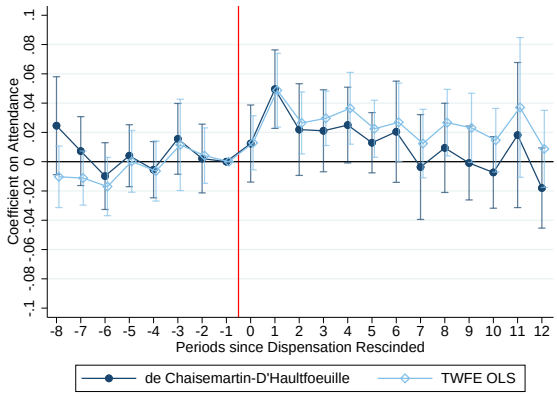
Note: These figures display the trends in weekend foot traffic to Catholic churches by political affiliation and fraction of Catholic in panels (a) and (b), respectively. See the note of Table 5 for further information.

Figure A.9. Dispensation Rescission and Catholic Church Attendance: Robustness

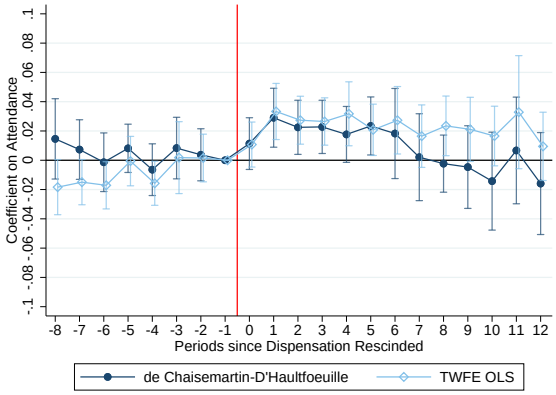
(a) Remove Early Dispensation Lifters



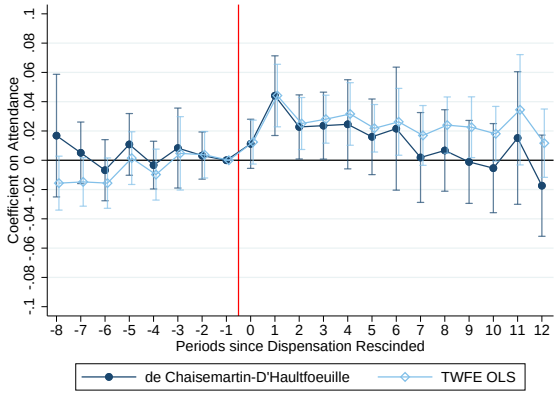
(b) Remove Dispensations Lifted with Restaurant Reopening



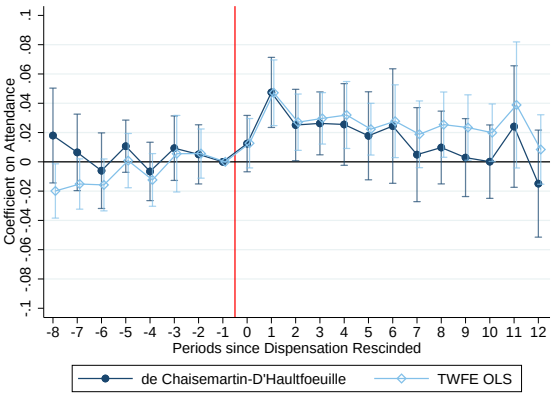
(c) Remove Christmas and Easter



(d) Add Covid-19 Cases Controls



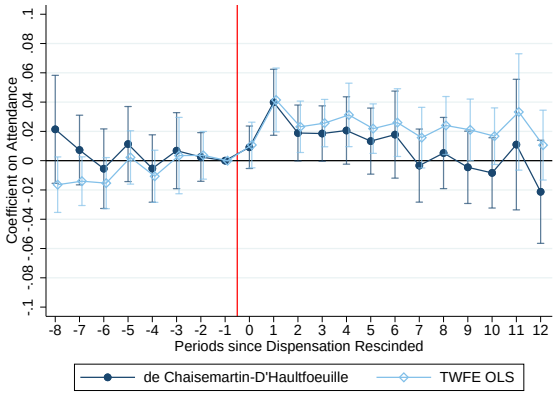
(e) Remove Churches $<$ 5 Km from Border



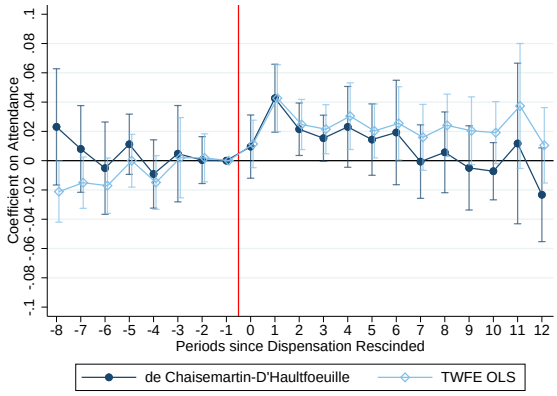
Note: These figures display point estimates and 95 percent confidence intervals for event studies of Catholic Church attendance on diocese dispensation rescission using the DCM method. Panel (a) excludes dioceses that lifted dispensations before May 21, 2021 (the first quintile). Panel (b) removes dioceses where restaurants were fully reopened the week before, week of, or week after the dispensation lifting. Panel (c) removes the time around Christmas and New Years (Dec 19-Jan 1) and Easter. Panel (d) adds controls for the 3-week average of Covid cases per 100,000 and Covid deaths per 100,000. Panel (e) removes churches within 5 Km of a diocese border. All panels include region linear time trends and controls for unemployment rate, controls for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), fraction of the population that has received dose 1 of a Covid-19 vaccine, and linear time trends in 2019 median household income, fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share. Regressions are weighted by the total diocese population and standard errors are clustered at the diocese level.

Figure A.9. (Continued) Dispensation Rescission and Catholic Church Attendance: Robustness

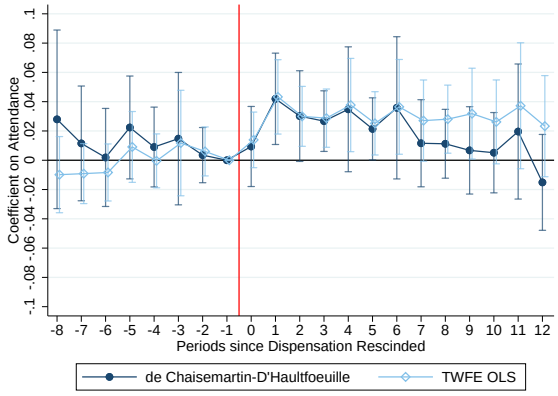
(f) Remove Diocese of Los Angeles



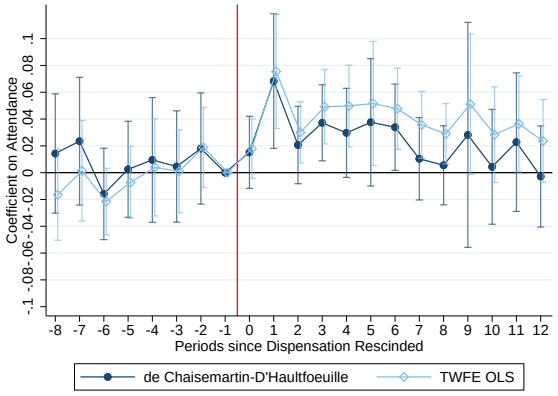
(g) Remove Five Largest Dioceses



(h) Weighted by Catholic Population



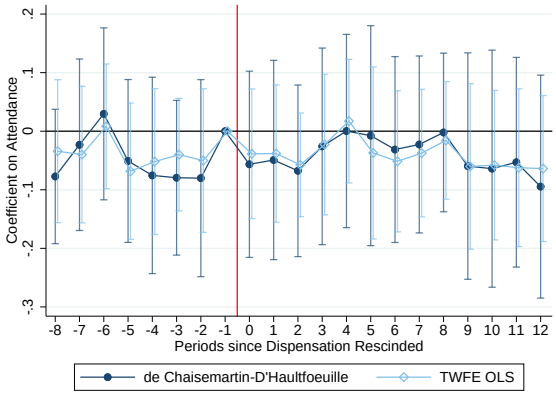
(i) County Level



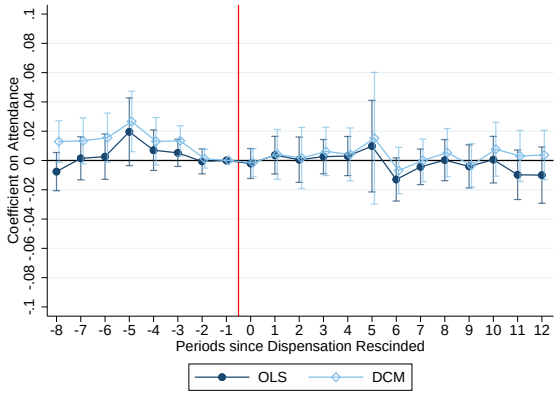
Note: These figures display point estimates and 95 percent confidence intervals for event studies of Catholic Church attendance on diocese dispensation rescission using the DCM method. Panel (f) removes the largest diocese (Los Angeles). Panel (g) removes the 5 largest dioceses by total population. Panel (h) weights by county Catholic population. Panel (i) performs regressions at the county level. All panels include region linear time trends and controls for unemployment rate, controls for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), fraction of the population that has received dose 1 of a Covid-19 vaccine, and linear time trends in 2019 median household income, fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share. Regressions are weighted by the total diocese population in panels (f) and (g) and by county population in panel (i). Standard errors clustered at the diocese level.

Figure A.10. Dispensation Rescission and Non-Catholic Religious Attendance

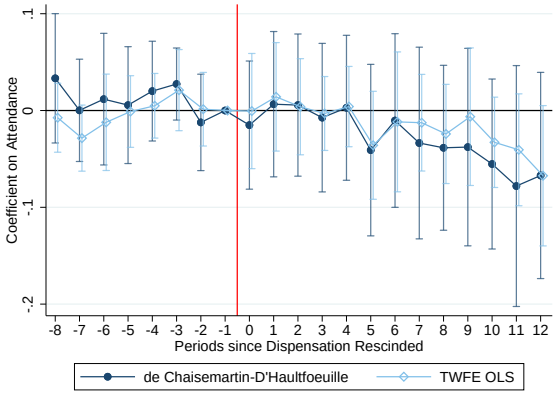
(a) Eastern Orthodox



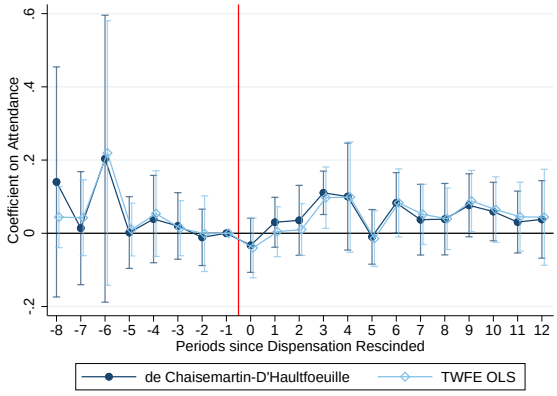
(b) Protestant



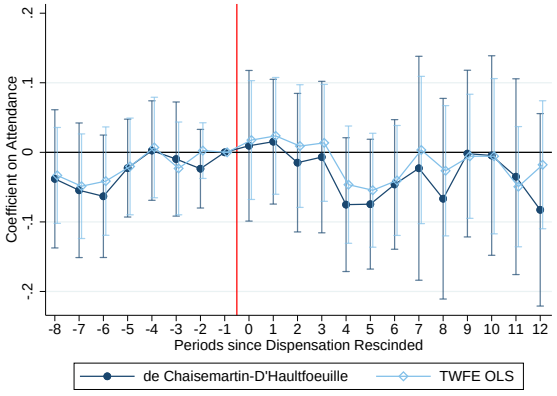
(c) LDS



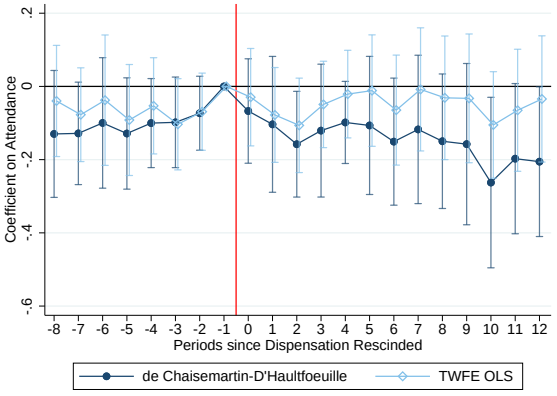
(d) Jewish



(e) Muslim

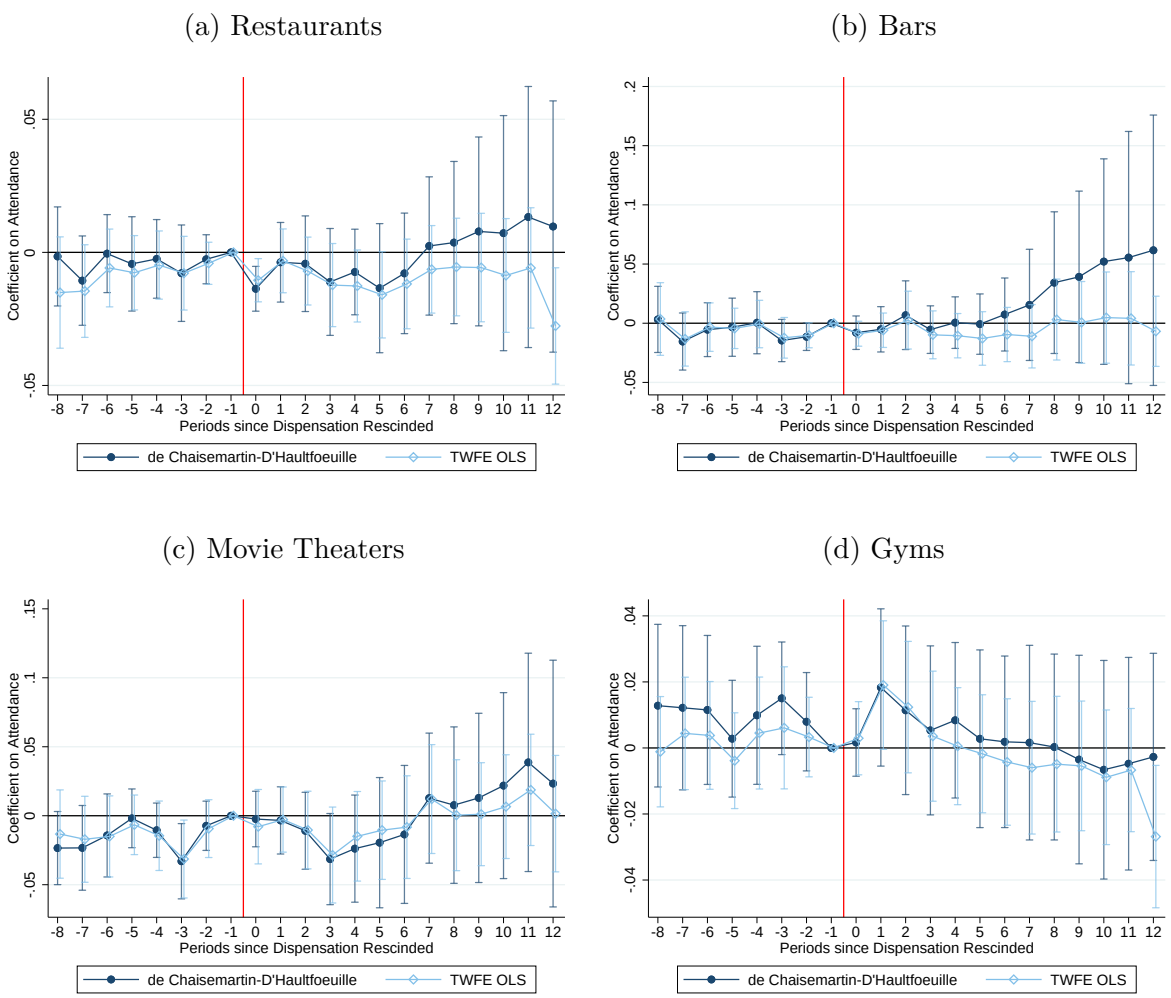


(f) Buddhist



Note: These figures display point estimates and 95 percent confidence intervals for event studies of other religious attendance on primary worship day(s) on diocese dispensation rescission. Orthodox includes Eastern Orthodox and Eastern Catholic churches. All regressions include controls for unemployment rate, dummies for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), fraction of the population that has received dose 1 of a Covid-19 vaccine, and linear time trends in 2019 median household income, fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share. Standard errors are clustered at the diocese level.

Figure A.11. Dispensation Rescission and Weekday Activities



Note: These figures display point estimates and 95 percent confidence intervals for event studies of weekday foot traffic at various types of businesses on diocese dispensation rescission. All regressions include controls for unemployment rate, dummies for whether restaurants and bars are closed or fully reopened, weather controls (average weekend precipitation and average weekend temperature), fraction of the population that has received dose 1 of a Covid-19 vaccine, and linear time trends in 2019 median household income, fraction with a bachelor's degree, poverty rate, fraction white, black, Hispanic, fraction Catholic, median age, fraction over 60 years old, and 2016 Republican presidential share. Standard errors are clustered at the diocese level.

Appendix B: Classifying Religious Organizations

Among the 440,128 named religious organizations in the SafeGraph dataset, we use keywords to classify 236,177 into the following religious groups: Buddhist, Hindu, Jehovah's Witness (JW), Jewish, Latter Day Saints (LDS), Muslim, Orthodox, Protestant, Roman Catholic, and Other (which includes other religions, educational institutions classified under NAICS 813110, and other types of organizations such as religious charities or national organizations that do not hold services). We manually inspected the dataset to ensure that we correctly identified Catholic churches as they are the focus of Section 5. In particular, we spot check whether the POIs are actually churches that hold Masses and not just Catholic-related entities.[31] To classify the remaining 203,951 organizations, we use OpenAI's text-davinci-003 (GPT 3.0). Text-davinci-003 as well as other Generative Pre-trained Transformer (GPT) large language models have been shown to perform well in text classification tasks (see, e.g., Chiu, Collins, and Alexander (2021); Møller et al. (2023); Sawicki et al. (2023)). They are especially useful in cases like ours where we do not have suitable training data for the non-keyword classified religious groups.[32]

OpenAI provides an application programming interface (API) to allow developers to send prompts to AI models and receive generated responses. By implementing OpenAI package in Python with the API, we ask GPT3.0 to *"Classify the text into exactly one of the following categories: lds, jewish, muslim, hindu, buddhist, jehov, bahai, Protestant, catholic, orthodox_jewish, orthodox, education_institute, social_services, other."* GPT provided classification in these categories but also created a few new categories (e.g., Sikh).[33] Because we are focused on religious service attendance, not religious schools or services such as food banks, we specify educational institutions and social services

[31]Examples of clearly Catholic organizations that do not qualify as churches were schools attached to the parish, diocesan administrative offices, religious orders province offices, and charitable groups with a Saint's name. We cross reference with the OCD and/or public web pages of these organizations to verify that they do not have public services.

[32]Møller et al. (2023) discusses that pre-trained models like GPT may be preferable to training a new neural network in cases without suitable learning data is not available.

[33]We originally used the following prompt: *"Classify the text into exactly one of the following categories: lds,jewish, muslim, hindu, buddhist, jehov, bahai, Protestant, catholic, orthodox, education_institute, social_services, other,"* but find that many Jewish organizations were being placed in the Orthodox category (likely due to their association with Orthodox Judaism). GPT much more accurately separates out Jewish organizations when asked separately for "orthodox jewish, jewish, and orthodox."

separately. This decreases the likelihood that religious schools/social service groups are placed in the category of their respective religious group. With these instructions, GPT categorizes the 203,951 organizations as follows: 998 Buddhist, 716 Hindu, 396 JW, 6,611 Jewish, 221 LDS, 149 Muslim, 727 Orthodox, 4,180 Catholic, 157,871 Protestant, and 32,082 other.[34] To further ensure that our sample is limited to locations that hold religious services, we provide a second prompt: "Are weekly, public religious services held at the following locations? Answer yes or no." GPT classifies 165,166 into "yes" and 38, 780 into "no." We then aggregate the GPT responses to the first prompt into the groups listed above. Next, we move an entry into the "other" category if it has both i) a classification as Protestant, Muslim, Jewish, Orthodox, JW, or LDS based on the first prompt and ii) a "no" response to the second prompt. We do not require weekly services for Buddhist and Hindu sites as these are less common. This procedure moves 13,338 Protestant, 123 LDS, 51 JW, 1,874 Jewish, 51 Muslim, and 217 Orthodox groups into "other."

For validation, we compare the total counts of religious congregations from SafeGraph to those in the U.S. Religion Census, as discussed in the main text and shown in Figure A.3. We also examine whether our classifications reveal the correct spatial distribution of religious groups. Figure B.1 plots state-level counts of each religious group between the two datasets. The two datasets are highly correlated for each religious groups, with all correlation coefficients above 0.9 and most points close to the 45 degree line. As in Figure A.3 SafeGraph classification appears to slightly undercount LDS and JW organizations and overcount Jewish organizations relative to the U.S. Religion Census. Overall, these figures provide evidence for the validity of our classifications, as they result in the numbers and spatial distribution of each religious group similar to the Religion Census.

As an additional check on our classifications, we randomly choose 800 observations from the whole sample for manual classification. Table B1 shows the results. Overall, GPT and keyword classification achieved an overall accuracy of 87 percent.[35] Most individual

[34]Since we have already manually classified Catholics, we move 4,327 organizations GPT classified as Catholic into the "other" category. Most of these are official Diocese offices or monasteries/convents, etc. These include Catholics not in full communion with the Roman Catholic Church into other (e.g., GPT classified as "liberal Catholic" or "Old Catholic").

[35]Accuracy is measured as the number of "correct predictions" over the total number of predictions, where a prediction is assumed to be correct if it matches the manual classification.

groups show a high level of accuracy and high rates of precision (true positives) and recall (true negatives). A substantial fraction of the errors are due to confusion between religious groups and the other category: when we exclude those manually classified as "other," the accuracy increases to 93 percent and, when we also exclude those classified as "other" by GPT/keyword, the accuracy increases to 99 percent.

In addition to checking the classification of POIs, we also compare attendance patterns calculated from our calculations in Safegraph to survey measures of religious attendance. We focus on Catholics relative to other groups, given the paper's focus on Catholic attendance patterns. We use the Congressional Cooperative Election Study (CCES), an annual survey asking respondents for both their religious affiliation and the frequency of religious service attendance.[36] Figure B.2 plots the fraction of religious service attendance that is Catholic at the state-level in both the CCES and the SafeGraph datasets. Panel (a) presents the Catholic fraction of Christian (Catholic plus Protestant) attendance, while panel (b) presents the Catholic fraction of total religious (Catholic, Protestant, Orthodox Christian, Jewish, Muslim, Hindu, and Buddhist) attendance. We find the correlation between the survey and foot traffic data is relatively high as both with coefficients of about 0.75. Interestingly, relative to the survey data, SafeGraph reveals lower Catholic attendance relative other groups. This could point to differences in attendance conditional on survey responses (e.g., Catholics who report attending "a few times a year" attend less than Protestants who say the same.) Nevertheless, the high correlation in spatial distribution of Catholics points to validity of our classifications and the SafeGraph data.

Protestant Subgroups

Of the 440,128 religious organizations in SafeGraph, 319,808 are Protestant. Scholars often divide Protestantism into three main branches: evangelical Protestantism, mainline Protestantism, and historically black Protestantism (see The Pew Research Center

[36]With regards to the question on service attendance, individuals can answer (1) more than once a week, (2) once a week (3) once or twice a month, (4) a few times a year, (5) seldom, (6) never, or (7) don't know. We construct an annual attendance variable that weights the responses. Someone who answers (1) more than once a week is assumed to attend 104 services during the year. We assume the following: those that answer (2) 52 times a year, (3) 15 times a year, and (4) 3 times a year. The other responses are not used in the construction of variable.

(2015)). These categories represent different streams of theology, religious practice, and tradition. Using our dataset, we are able to separate Protestants into two groups: mainline Protestants and other Protestants (consisting of Evangelical Protestants and members of Historically Black Protestant traditions).[37] Since many denominations fall within a few religious traditions, we first use keywords to classify the following denominational "families": Baptist, Lutheran, Presbyterian, Methodist, Anglican/Episcopal, UCC, AME, Seventh Day Adventist, Quaker, other identifiable evangelical groups (e.g., Nazarene churches), other identifiable mainline groups (e.g., Disciples of Christ), and other identifiable historically black groups (e.g., House of Prayer). If an organization's name indicates it is Methodist, Quaker, Anglican/Episcopal, UCC or part of another identifiable Mainline groups, we categorize it as Mainline Protestant. Similarly, we assign African Methodist Episcopal and other identifiable historically black groups to "historically black" category and assign Seventh Day Adventist and other identifiable evangelical group to "evangelical" category (historically black and evangelical groups are then combined).

Because Baptist, Lutheran, and Presbyterian churches may belong to multiple traditions, we use data from the Religion Census to estimate the likelihood of their adherents belonging to each group. The Religion Census provides a breakdown of adherents for each denomination in each county. For example, in Mecklenburg County, North Carolina, it provides the number of Baptists associated with the Southern Baptist Convention, the National Baptist Convention, the American Baptist Churches, and other Baptist groups. Using the classification provided by the Pew Center (see "Appendix B: Classification of Protestant Denominations from The Pew Research Center (2015)) and numbers of adherents in each denomination from the U.S. Religion Census Grammich et al. (2023), we aggregate the number of each tradition within each denominational family. For example, we might estimate that 75 percent of Baptist adherents in Mecklenburg County are evangelical or part of historically black traditions, and 25 percent are mainline. Then, we take all SafeGraph organizations in Mecklenburg County with "Baptist" in their name, and assign 75 percent of their adherents to Evangelical or Black Protestant and 25

[37]We are not able to separate out Evangelical and Black Protestants at this time due to similarly-named churches without a denomination listed in their church name.

percent to Mainline Protestant.[38] We then perform a similar calculation for Baptists in all other counties and then for Lutheran and Presbyterian denomination families.[39] This methodology provides a "weight" for each church in each category that can be used to aggregate attendance patterns to the national level. The remaining groups not associated with any denominational category are given a weight of 1 for "other Protestant" (Black Protestant or Evangelical) given that, as found in The Pew Research Center (2015), about 80 percent of nondenominational Christians are Evangelical or Black Protestant.

One concern with this methodology is that some churches may be associated with a denomination that is not reflected in their church name. (For example, Elevation Church in Mecklenburg County was until 2023 associated with the Southern Baptist Convention.) This may be especially likely in the case of Evangelical churches. Thus, when we include data on these churches when aggregating from the religion census (e.g., we say they are part of "Baptists"), but they are not classified with that tradition in the SafeGraph data, we might wrongly estimate the fraction of adherents with a denomination such as "Baptist" in their church name that are evangelical/black vs mainline Protestant. To adjust for this, we examine the websites of the largest Protestant denominations. We use a scraper (beautiful-soup and selenium in python) to pull all church names and addresses. Then, for each state, we calculate the fraction of churches that include keywords in their name. For the associations that have a directory but are non-scrapable, we manually go through directories and calculate the percentage of churches that reference their denomination families in their names by state. For the associations that do not include church directory their official website, we use "USAChurches.org" to get a sample of their churches and calculate the corresponding percentage.[40] We then adjust the adherents count in the

[38]We rely on the number of adherents rather than the number of congregations because SafeGraph attendance data is at the person level. If there is one very large Baptist evangelical church and two small Baptist Mainline churches in a county, we want to assign the majority of people going to Baptist churches in the county to the Evangelical tradition.

[39]There are 218 observations that are classified twice using keyword but does not have a clear denomination, such as "United Methodist Presbyterian Church." For these organizations, then we find the average probability based on its two classified denominations, assuming the church is equally likely to be a "Methodist" and "Presbyterian."

[40]The denominations with scrapeable websites are: Presbyterian Church, U.S.A. (PCUSA), Wisconsin Evangelical Lutheran Synod (WELS); Lutheran Church Missouri Synod (LCMS), Evangelical Lutheran Church in America (ELCA), Southern Baptist Convention (SBC). The non-scrapable denominations include: Presbyterian Church of America (PCA), and the American Baptist church (ABC). The denom-

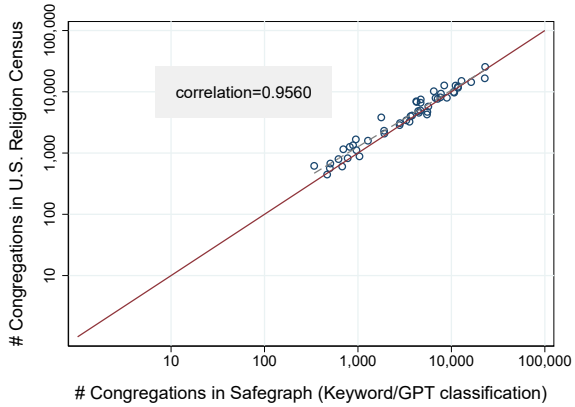
religion census by state and denomination by multiplying the number of adherents by the fraction of churches with the denomination family in their name. For example, if 25 percent of Southern Baptist churches in Mecklenburg county have the word "Baptist" in their name, we multiply the number of Southern Baptist adherents in the county in the Religion Census by 0.25. We then use the procedure described above to allocate churches to denominational families based on these adjusted adherents counts.

Since we use the U.S. religion census to construct our grouping of Protestant traditions, we cannot use it for verification. However, we can check the spatial distribution of groups by comparing the estimated attendance in each tradition to reported affiliation in surveys. We calculate total Sunday state-level attendance from SafeGraph in mainline Protestant vs other Protestant traditions and construct a variable that represents each tradition's fraction of total Protestant attendance in each state in 2019. We compare this to the fraction of Protestant affiliation corresponding to each tradition in the Pew 2014 Religious Landscape Study (The Pew Research Center 2015). Unlike the comparisons in Figure B.1, we do not expect these to lie along the 45 degree line because affiliation and attendance may differ. For example, mainline Protestants report less frequent church attendance than evangelical Protestants (The Pew Research Center 2015), suggesting that mainline Protestants would lie below the 45 degree line. Figure B.3 shows mainline Protestants as a fraction of total religious attendance. Across states, the correlation between reported affiliation and SafeGraph attendance is high, providing evidence for the validity of our classifications.

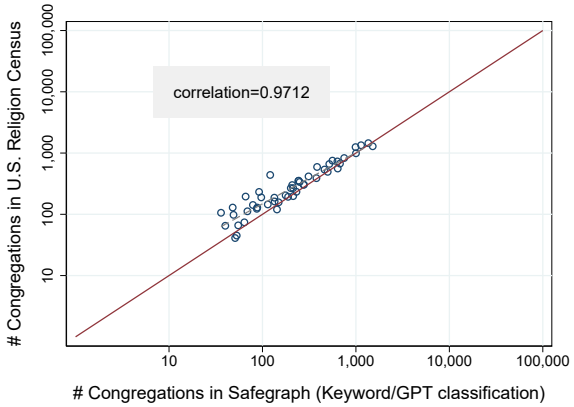
inations without directories are the National Baptist Convention, USA (NBC); Progressive National Baptist Convention; and National Missionary Baptist Convention.

Figure B.1. Number of Religious Congregations by State

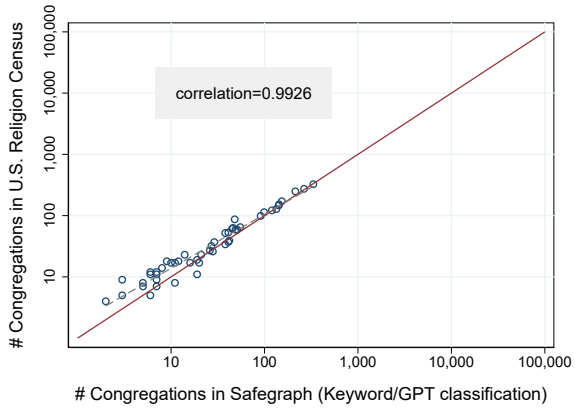
(a) Protestant



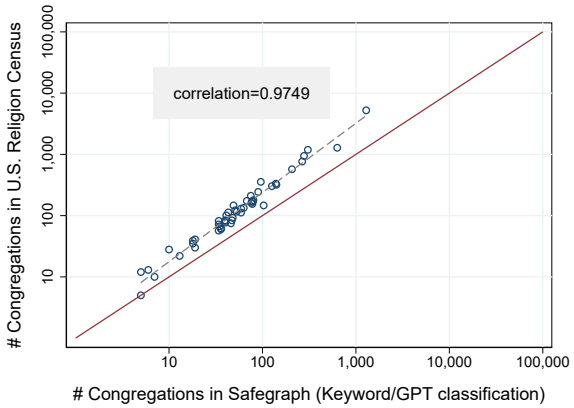
(b) Catholic



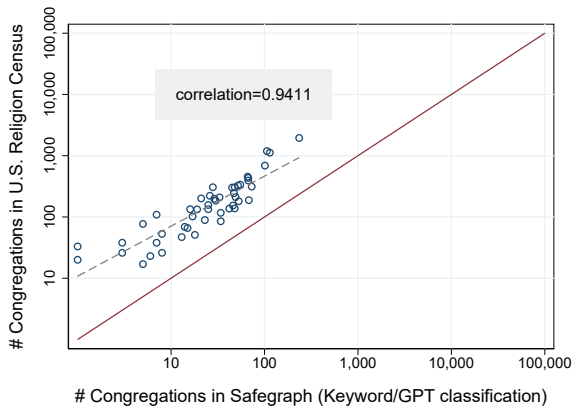
(c) Eastern Orthodox



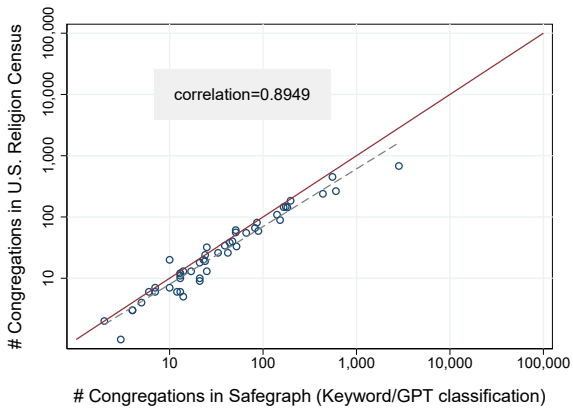
(d) LDS



(e) JW



(f) Jewish



Note: These figures plot the number of religious congregations in the 2020 U.S. religion Census against the number in SafeGraph. Each point represents a separate religious group and state. The solid line is the 45 degree line and the dashed line is the best fit line between the points. Religious group classifications in SafeGraph are based on the organization's listed name; to classify, the authors use keywords and GPT along with some manual adjustments. The Pearson correlation coefficient is also given in each panel.

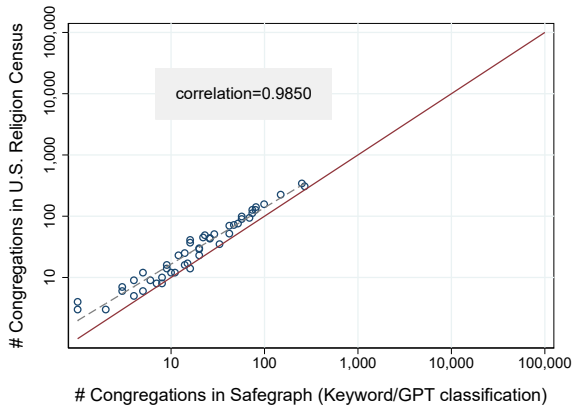
Table B.1. GPT/Keyword versus Manual Classification of Religious Groups

		Manual Classification									
		Buddhist	Catholic	Hindu	JW	Jewish	LDS	Muslim	Orthodox	Protestant	Other
Keyword/	Buddhist	2	0	0	0	0	0	0	0	0	1
GPT Classification	Catholic	0	28	0	0	0	0	0	0	4	1
	Hindu	0	0	2	0	0	0	0	0	0	0
	JW	0	0	0	6	0	0	0	0	0	0
	Jewish	0	0	0	0	12	0	0	0	0	4
	LDS	0	0	0	0	0	14	0	0	0	0
	Muslim	0	0	0	0	0	0	5	0	0	1
	Orthodox	0	0	0	0	0	0	0	5	1	1
	Protestant	0	0	0	0	0	2	0	0	549	53
	Other	1	3	0	0	0	0	1	0	33	71

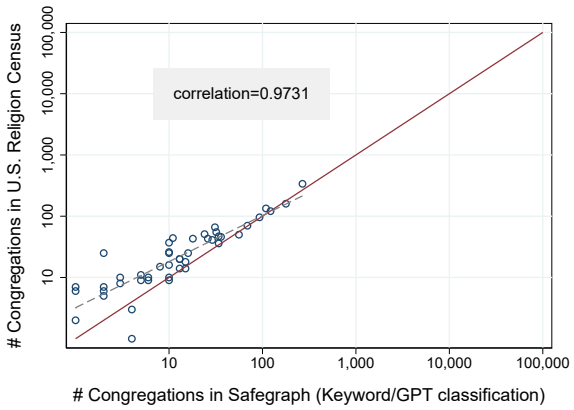
Note: The table presents the manual and GPT/Keyword classifications for 800 randomly chosen religious groups.

Figure B.1. (Continued) Number of Religious Congregations by State

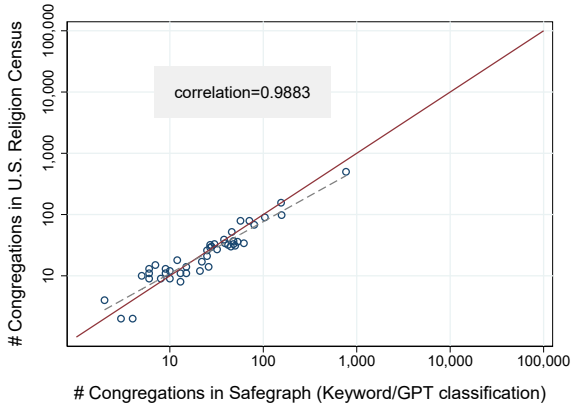
(g) Muslim



(h) Hindu



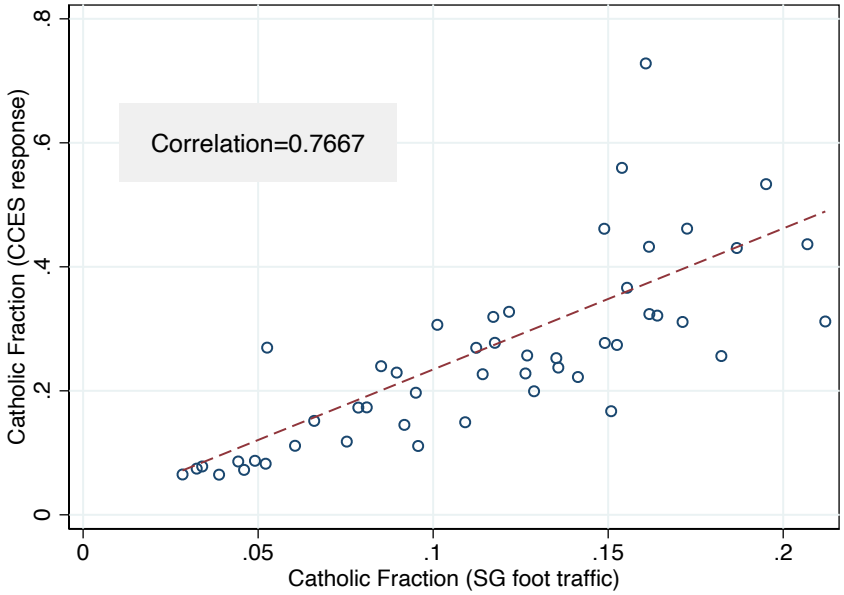
(i) Buddhist



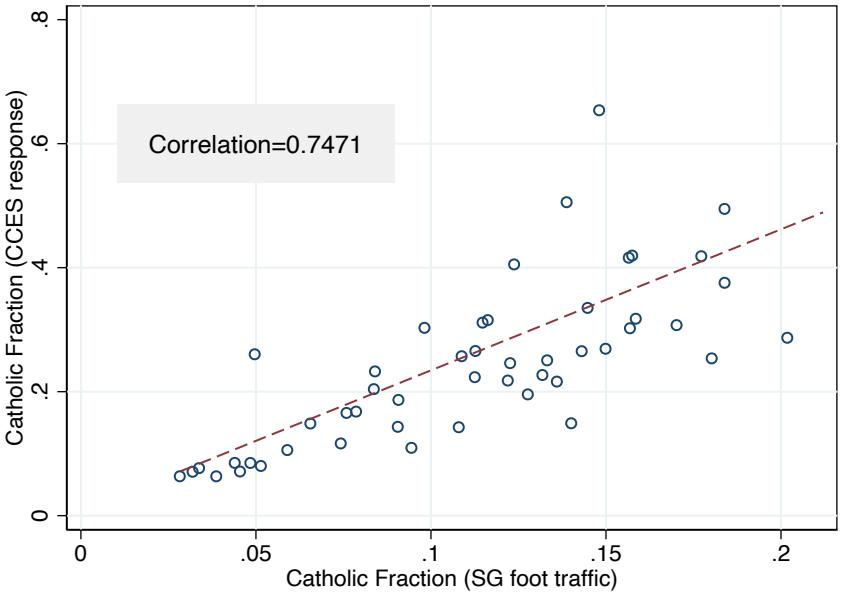
Note: These figures plot the number of religious congregations in the 2020 U.S. religion Census against the number in SafeGraph. Each point represents a separate religious group and state. The solid line is the 45 degree line and the dashed line is the best fit line between the points. Religious group classifications in SafeGraph are based on the organization's listed name; to classify, the authors use keywords and GPT along with some manual adjustments. The Pearson correlation coefficient is also given in each panel.

Figure B.2. Comparison of Religious Attendance by State

(a) Catholic to Protestant

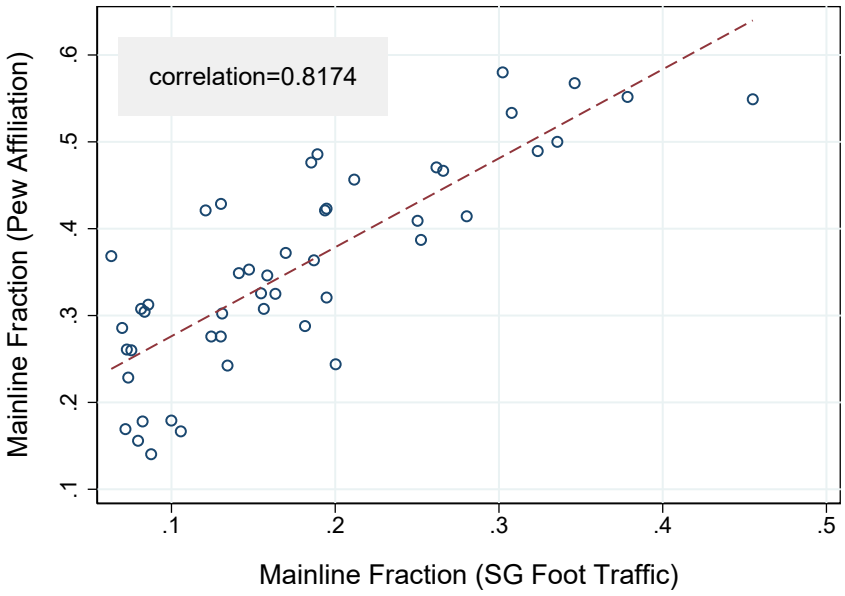


(b) Catholic to All Other Religious Groups



Note: These figures plot the fraction of Catholic attendance as reported the Congressional Cooperative Election Study (CCES) survey against the fraction of Catholic in foot traffic in SafeGraph. Each point represents a separate state. The dashed line is the best fit line between the points. The attendance in panel (a) includes Catholic and Protestant groups. The attendance in panel (b) includes Catholic, Protestant, Orthodox, Jewish, Muslim, Hindu, and Buddhist groups. Religious group classification in SafeGraph is based on the organization's listed name along with the methodology explained in Appendix B. The Pearson correlation coefficient is also given in each panel.

Figure B.3. Protestant Traditions: Affiliation and Attendance by State



Note: These figures plot the fraction of Protestant Sunday church attendance that is mainline Protestant in Safegraph versus the fraction of Protestants identifying as Mainline in the Pew Religoius landscape study. Each point represents a separate state. The dashed line is the best fit line between the points. Religious group classifications in SafeGraph are based on the organization's listed name along with the methodology explained in Appendix B. The Pearson correlation coefficient is also given in the panel.