Forgiveness and crime dynamics: Empirical insights from the Catholic Great Jubilee of 2000 Event

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ABSTRACT

This paper focuses on investigating the behavioural implications of the Catholic foremost religious event, called a Jubilee Year, on crime levels. During the celebration, a massive remission of sins is offered to Catholics, raising an interesting question of whether more, fewer, or the same number of crimes are committed in temporal proximity to the event occurrence. The study is conducted by performing a conditional analysis on a longitudinal dataset of criminal activity counts across European countries, recorded around the Great Jubilee of 2000 celebration. The results of the empirical study on the event's impacts on crime levels show that Catholics committed fewer crimes during the event celebration. Excluding the most (or least) Catholic countries from the sample, or omitting countries geographically close to Italy, does not change the results qualitatively, further strengthening the main finding.

1 Introduction

Religious doctrines are multifaceted concepts that guide the conduct of adherents. Developed and polished over centuries, many present-day religions, including monotheistic ones, prescribe behavioural patterns to the faithful by defining the good and the bad for both the transient body and the eternal soul. Fulfilment of such spiritual recommendations by a substantial number of believers can be detected by observing shifts in various socio-economic indicators, especially in the temporal proximity of a major religious event. As religious practices vary widely, so too do the impacts of religious events identified by economists of

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religion. Among the notable empirical studies on spiritual occasions, a natural starting point is the research stream focused on the consequences of the Protestant Reformation, the earliest such event studied. Although the Second Christian Schism divided the Catholic Church more than five centuries ago, the powerful influence of Luther's teachings has been traced to socio-economic outcomes in modern societies. For instance, Becker and Woessmann (2009) investigated the long-term effects of the Protestant Reformation on human capital accumulation through the literacy channel, arguing that even nearly five hundred years after the Reformation, the positive spillovers from increased literacy can still be measured. Another study, by Rubin (2014), linked the spread of Protestantism to the simultaneous diffusion of the printing press, which helped amplify the popularity of Luther's sermons across Europe.

In the context of Islam, most studies have focused on the immediate effects of Ramadan fasting and the Hajj pilgrimage. Campante and Yanagizawa-Drott (2015) examined the impact of Ramadan fasting on productivity, economic growth, and happiness, finding that the faithful are less productive but happier during Ramadan. Almond and Mazumder (2011) conducted an extensive investigation into the effects of Ramadan fasting on babies *in utero* across different countries. Clingingsmith et al. (2009) estimated that a randomly assigned trip to Mecca (Hajj) increased tolerance toward other religious and ethnic groups and improved attitudes toward women among Pakistani Muslims.

Regarding polytheism, Rao (2011) explored how Hindu celebrations and festivals in India influence social trust, enhance the provision of public goods, and facilitate the accumulation of social capital. Turning to astrology, Beam and Shrestha (2020) found that zodiac-based beliefs about the favorability of the coming year distorted family expansion patterns in Malaysia.

Recently, a study on Catholic traditions by Montero and Yang (2022) examined the long-term economic development of Mexican municipalities where peak or harvest seasons overlapped with local saints festivals. Another paper on Catholicism, closest to the topic of

this manuscript, is by Bronzini et al. (2020) from the Bank of Italy, which estimated the economic impact of the Great Jubilee of 2000 as a tourism mega-event in the province of Rome.

This list is not exhaustive, and many other studies have made significant contributions to our understanding of the effects of religious events.[1] While in very few instances productivity declined as a result of the implementation of customs, the vast majority of religious celebrations were found to be beneficial for the faithful and their communities.

In this paper, a major Roman Catholic Church event called the Jubilee Year will be investigated. In particular, the impacts of the religiously prescribed practices of the event-related customs on crime will be evaluated. Such an investigation is of interest because during the Jubilee celebration, Catholics are given an opportunity for a fresh spiritual start by obtaining forgiveness for sins committed previously, a Jubilee indulgence. The Jubilee remission of sins is offered to every Catholic. However, in order to obtain it, a few conditions must be met. One of the requirements states that the forgiveness is granted to the faithful who genuinely promise to detach from all sins *and* not to sin again. The purpose of the current study is to examine whether Catholics' sinning patterns changed around the Great Jubilee of 2000 celebration. Recorded criminal offences will serve as a proxy for the number of bad deeds committed.

The study will be conducted using a conditional analysis of a longitudinal dataset of criminal activity across European countries, exploiting a two-way fixed effects model and controlling for a range of macroeconomic variables. The results show that the impact of the event on crime levels across European countries was negative and significant. This result was also found robust to controls and sample variations.

The rest of the paper is organized as follows. The next section outlines a historical

[1] A relatively recent survey on the state of Economics of Religion studies, including religious events, can be found in Iyer (2016).

and religious background on the Jubilee Year origins and its relation to remissions of sins (indulgences). Section 3 presents the data relevant to the investigation of the influence of the Great Jubilee of 2000 on criminal activities in European countries. Section 4 elaborates on the empirical strategy adopted and details the results obtained. Concluding remarks are provided in Section 5. Appendix A contains supplementary tables and figures.

2 Historical and religious background

2.1 Indulgences

Indulgences are an ancient Catholic custom of offering a cancellation of the temporal punishment due to sin in the next life in exchange for good works in this life. This custom is practised, with some modifications over time, since the eleventh century.[2] The Catechism of the Catholic Church defines: "An indulgence is a remission before God of the temporal punishment due to sin whose guilt has already been forgiven, which a faithful Christian who is duly disposed gains under certain prescribed conditions through the action of the Church, as the minister of redemption, dispenses and applies with authority the treasury of the satisfaction of Christ and the saints."[3] "An indulgence is partial or plenary according as it partially or wholly frees a person from the temporal punishment due to sin."[4]

A *modus operandi* of such remission can be described as the following: A person who is interested in obtaining an indulgence has to be baptised, not excommunicated, and in a state of grace. The state of grace, in turn, requires a sacramental confession and a full further detachment from all, even venial, sins.[5] After a wholehearted confession is made

[2]A full historical background on the evolution of indulgences can be found in dal Cavolo (1999).

[3]Catechism 1471, Code of Canon Law canon 992, Indulgentiarum Doctrina norm 1.

[4]Ibid. 1471, canon 993, norm 2, respectively. A "temporal punishment" here is the time to be spent in Purgatory, as opposed to the "eternal punishment" of hell. See Catechism 1472 on this matter.

[5]Cf. John Paul II (1999) general audience, citing Enchiridion Indulgentiarum. A complete list of the conditions required for the plenary indulgence, including an Eucharistic Communion and Prayers for the Pope intentions, can be found in Indulgentiarum Doctrina, norm 7.

by the believer and the forgiveness is granted by the confessor, the connection between the faithful and Christ is renewed, allowing him/her to override the sins temporal punishment in the Purgatory using the Church's infinite treasure of merits.[6] Being truly repentant and detest the sin is a crucial condition to obtain an indulgence, as it "cannot be acquired without a sincere conversion of mentality".[7] Every person is assumed to be a sinner, and in need for forgiveness at all times.[8] The Holy See is the only authority to grant indulgences, during special occasions/times declared by the Supreme Pontiff.[9,10] In Economics terms, all mentioned above makes the Catholic Church a monopolistic supplier of a particular religious service, a remission of sins, available exclusively to the followers of the Church, the Roman Catholics.

Indulgences played an important, if not to say crucial, historical role in shaping what we know today as modern Europe. Until the sixteenth century, indulgences were sold by the Catholic Church for profit and the concept was widely abused.[11] *Quaestores*,[12] who were officially entitled to collect the alms-givings for indulgences, went way beyond the bounds of reason collecting the funds. The abuse was so significant that it led Martin Luther to raise a question about the legitimacy of indulgences and the Pope's authority over the punishment in the afterlife. On October 31, 1517, Martin Luther nailed his "Ninety-Five Theses or

[6]Cf. Catechism 1476-1479 and/or Indulgentiarum Doctrina Chapter 1.3. This treasure is related to a concept of the economy of Salvation, also called the Divine economy or an economy of Revelation. See Catechism 1103 and Mirus (2009) interpretation, for instance.

[7]See Indulgentiarum Doctrina, Chapter 4.7, 4.8 and 4.11. Beer (1978), in his theological study, suggested that the intensity of the sorrow a sinner feels determines the "quality" of the indulgence obtained. This degree of devotion can be known only to God.

[8]Indulgentiarum Doctrina, Chapter 1.3, based on earlier sources.

[9]Code of Canon Law, canon 995.

[10]The Church "condemns with anathema those who maintain the uselessness of indulgences or deny the power of the Church to grant them", Indulgentiarum Doctrina, Chapter 4.8.

[11]For instance, the Saint Peter's Basilica in Rome was rebuilt from funds raised by selling a special indulgence, which obsoleted many serious sins, including theft and adultery. Another example is a "Butter Tower" of Rouen Cathedral built from monies collected for a special indulgence, which allowed eating butter during Lent. On the other hand, many churches, hospitals, leprosariums, bridges, roads and schools were built/renovated from funds collected by selling indulgences. See dal Cavolo (1999) for reference.

[12]"Pardoners" in Latin.

Disputation on the Power and Efficacy of Indulgences" on the door of the University of Wittenberg, inviting the Catholic Church to a theological dispute. This event started a second, Lutheran schism of the Roman Catholicism, known as Reformation.

Martin Luther and the Holy See did not reach a consensus on indulgences. On the contrary, with time more and more theological differences widened the division between the Roman Catholics and the Lutherans. Luther was excommunicated in 1521, but the revolution he started continued, causing religious wars in practically all European countries. The Church had reacted with Counter-Reformation, also called a Catholic Reformation or a Catholic Revival. During the Council of Trent (1545-1563), it restated all Catholic postulates and rejected any compromise with the Protestants. On the other hand, the practice of granting indulgences was modified; financial transactions related to indulgences were strictly forbidden in 1567, and all those who trafficked in indulgences were excommunicated by Pope Pius V in 1569.[13] An additional impact of the Catholic Reformation was the beginning of extensive patronage of artists who glorified the Catholic God through architecture, painting, sculpture, and music, leading to the establishment of Baroque art. Bernini, Rubens, Titian, El Greco, van Dyck, Rembrandt, among others, belong to a group of Counter-Reformation painters and sculptors. The Gregorian calendar was adopted during the Catholic Revival as well. Nonetheless, the division caused by Luther was irreversible. Inflamed by the abuse of the concept of indulgences, it created a religious shock to be studied by social scientists, including economists, centuries later. The influential book of Max Weber (1905), "The Protestant ethics and the spirit of capitalism", spurred an outburst of research focused on the socio-economic benefits of the Lutheran schism for the Protestants versus Catholics.[14] In Economics, *nemine contradicente*, i.e. an investigation on how the aspects of the Roman Catholic doctrine could benefit (or not) the Holy See followers after the Reformation, was

[13] See Beer (1978), inter alios, for reference.

[14] See, for instance, Blum and Dudley (2001) on lower cooperation costs and Ekelund, Hebert and Tollison (2002) on more religious competition.

never conducted.[15]

Upon closer examination of Luther's writings, it becomes clear that his theses can be divided into two categories. The first category addresses the issues related to the Roman Catholic Church as a provider of the indulgences religious product, while the second category offers guidance on the product's advantages/disadvantages to the targeted consumers of indulgences, the Christians. The latter category is particularly prominent in theses 42-51, which begin with: "Christians are to be taught..." From an economic perspective, this division identifies and separates the monopolistic supplier of a particular religious service (indulgences), or the Church, from the aggregated demand dimension, the Christians. The supply side of this market is criticized based on the Church's (possible) inability to deliver the forgiveness promised, the high prices charged for the product, and the underlying motivation of the Church as a religious authority to make monetary profits rather than care about its flock's souls. The consumers, or Christians, are instructed (and warned) about the potential flaws of the product and the possible negative spillovers from the consumption of indulgences, especially when frequently repeated. According to Luther, freeing the faithful from future penalty does not make man better.[16] On the contrary, the underlying hypothesis is that obtaining forgiveness for sins on Earth, whenever desired, would make a person more of a sinner. That is, the occasional forgiveness for sins, and the following nullification of the afterlife punishment, would inflate the very concept of God's judgement and alleviate the fear from it. Consequently, Lutherans might have expected a spike in criminal activities following a widespread distribution of indulgences.

[15]The authors are not aware of research where any aspect(s) of the Catholic faith, or its' consequences, found preferable versus the Protestant or any other religious doctrine/secularism. In inclusive studies for all religions, Catholics usually served as a control group, being the largest religious denomination in the sample.

[16]Thesis 44: "Because love grows by works of love, man thereby becomes better. Man does not, however, become better by means of indulgences but is merely freed from penalties."

2.2 A Jubilee Year custom

A Jubilee Year is a Catholic Church event celebrated in Italy every twenty-five years, or more frequently, since 1300 AC.[17] If the Jubilee falls on a round twenty-fifth year, it is considered planned, or ordinary. Additionally, the Pope can declare an extraordinary Jubilee, which can be held any time, commemorating a special occasion, and vary in length. For the faithful, the ordinary Jubilees are expected events, as opposed to extraordinary and unexpected, in terms of religious policy-making intervention. During this year, when declared by the Holy See, all the Catholics are invited to participate in the celebration, obtain forgiveness for sins committed previously and obsolete all the temporal punishment due to sin via a channel of the special plenary indulgences.

The Jubilee concept was first mentioned in the Book of Leviticus (25, 10-14) as a year during which all the slaves and prisoners should be freed, debts to be forgiven, lands returned to original owners and mercies of God ubiquitously manifested.[18] The main purpose of the event is to offer all Catholics a grant of cancellation of punishment due to sin.[19] The Catholic Church explicitly ties the Jubilee Year custom with indulgences to mark a "new beginning in the love story between God and men" and offers a smooth path "to burn away sin and leave the past behind".[20] Nevertheless, the Jubilee indulgences differ from other indulgences, as they have to obey the specifics of the Jubilee Year ritual. In addition to confession, detachment from all sins, communion and prayers for the Pope's intentions, the faithful must pass via a Holy Door in places designated by the Church. Such Holy Doors are opened on Christmas evening and sealed the day after the following Epiphany, causing the length of the

[17] The first Jubilee Year was declared by Pope Boniface VIII. Dante Alighieri, spotted between the pilgrims of the First Jubilee, mentioned it in his "Divine Comedy", Canto XXXI of Paradiso.

[18] Cf. Vatican official site, Jubilee 2000 documents.

[19] Pope John Paul II (1999) starts his general audience with: "...In close connection with the sacraments of Penance, our reflection today turns to a theme particularly related to the celebration of the Jubilee: I am referring to the gift of the indulgences, which are offered in particular abundance during the Jubilee Year..."

[20] See dal Cavolo (1999).

event to align almost perfectly with annually recorded data and making empirical research on Jubilee Year impacts more precise.[21] Historically, the Doors were located exclusively in Rome,[22] in order to create an influx of pilgrims who would purchase the indulgences, donate to the Church and contribute to the local tourism-related businesses during the event. However, the Great Jubilee of 2000 was planned, and executed, as a planetary event with a significant simplification of rites, including a recognition of the doors of the local basilicas and churches as the Holy Doors, for the purpose of the Jubilee indulgences bestowal.

2.3 The Great Jubilee of the year 2000

For the Holy See, a beginning of the new millennium had created a perfect opportunity to extend the scale of the Jubilee celebrations worldwide.[23] Such a special occasion required an appropriate preparation of the faithful and the Church. On November 10th, 1994, the Pope John Paul II published a special apostolic letter *"Tertio Millennio Adveniente"* ("As the third millennium approaches"), calling all the Catholics to spiritually prepare themselves, over three years, for the journey into a new millennium. Fitting the Trinitarian approach, the three years preceding the Great Jubilee of 2000 were devoted to the Son (1997), the Holy Ghost (1998) and the Father (1999).[24]

Italian civil authorities also took appropriate measures to ensure readiness. The provincial plan of investments was approved as early as four years prior the event, in 1996. It

[21] A full description of the modern procedure of opening/closing the Holy Doors can be found in the Vatican official site liturgy documents. Visualization of a medieval Holy Door opening can be obtained by watching the historical series "Borgias", season 3, episode 8, where the Pope Alexander VI opens the Jubilee of 1500. His intention was to collect alms-givings from selling indulgences to fund a crusade against the Turks. Interestingly, a full price-list for different sins to indulge is presented there.

[22] In four patriarchal basilicas: Saint Peter, Saint John Lateran (or Most Holy Saviour at the Lateran), Saint Mary Major and Saint Paul on the Ostian Way (or Outside the Walls). Additional locations include: the Basilica of the Holy Cross in Jerusalem, the Basilica of Saint Lawrence in Campo Verano, the Shrine of Our Lady of Divine Love and the Christian Catacombs. See the Apostolic Penitentiary's "The gift of the indulgence" by Cardinal Baum (2000) for reference.

[23] In 2000, the Roman Catholic Church had approximately 1.2 billion followers all over the world.

[24] The calendar of the three-year preparatory period can be found on the Vatican official website, Jubilee of 2000 calendar documents.

included more than eight hundred projects, priced jointly for almost 1.9 billion euros. Most of the funds were allocated to infrastructure enhancement, including the improvements of the rail-road and roads, adjustments at Rome-Fiumicino Airport, creation of parking lots, and more. A smaller fraction of the budget was assigned to the maintenance of public areas, preservation of cultural assets and security. Besides the public funds invested by the provincial authorities, non-negligible private investments were made, especially in the tourism-related businesses. In total, the private and public investments in the preparations to the Great Jubilee of 2000 amounted to approximately 6.5 billion euros, or 10 percent of the annual regional GDP.

When the year 2000 had finally arrived, the celebrations took place simultaneously in Rome, in the Holy Land and in dioceses and other ecclesiastic territories all over the world. In Rome only, more than eight million Catholics participated in the meetings with the Holy Father, at different audiences, ceremonies and Angelus. 1.6 million Catholic youth were hosted during only two days (19-20 of August) of the World Youth Day. The total number of the pilgrims-visitors to Rome in 2000 was estimated, by different sources, to lie between 24.5 million people to 32 million.[25] The Italian National Institute of Statistics and the Bank of Italy reported that the total amount of nights spent in Rome by the tourists rose from 17 million in 1999 to more than 24 million in 2000, and the international tourism expenditure increased by twenty percent, from 4.8 billion Euro in 1999 to 5.8 billion Euro in 2000.[26]

Remarkably, the pilgrims-visitors travelled to Rome despite the fact that this pilgrimage was not necessary any-more for obtaining the Great Jubilee plenary indulgence, because the requirement to pass via the Holy Doors of Rome basilicas was simplified and replaced with an offer of pilgrimage to a locally designated church. Moreover, the pilgrimage itself became an option, among few others, to obtain the remission of sins. After fulfilling the basic conditions

[25] See Brunelli and Trecart (2000) for details.
[26] Cf. Bronzini et al. (2020).

for a plenary indulgence,[27] the faithful could choose one of the three categories of good works to perform. The first category, works of piety or religion, included a pious pilgrimage or a visit to a Jubilee place. The second option required works of mercy or charity, in particular visiting brothers/sisters in need, or supporting by a significant contribution works of religious or social nature, or to devote a personal free time to benefit the community. The third alternative was to perform acts of penance for at least one whole day, such as an abstention from unnecessary consumption of smoking and drinking, or fasting, or an abstention from meat *and* a donation to the poor.[28] Given a wide range of choice between the charitable giving/volunteering, abstention/fasting and a visit to a Jubilee place, no Catholic was left behind without a suitable option to obtain a Great Jubilee indulgence. Economically speaking, the "price" of participation in the event was reduced from a mandatory pilgrimage to Rome in order to pass via the Holy Doors to an array of options to choose from, affordable to all the Catholics.

At the end of the year 2000, the Holy See celebrated the success of the Great Jubilee, emphasizing a massive involvement of the Catholics in the related ceremonies. To conclude the celebrations, the Pope John Paul II published another apostolic letter, *"Novo Millennio Ineunte"* ("At the beginning of the new millennium"), in which he outlined the priorities of the Church for the third millennium. As of the Great Jubilee, he found it "... impossible to take the measure of this event of grace which in the course of the year has touched people's hearts." An attempt to quantify the impact of the event — at least in the dimension of criminal activities — to be made in this paper.

[27]Being in a state of grace, confessed, received the Holy Communion and interiorly disposed to detach from all sins. See Apostolic Penitentiary's documents on Vatican official site on this matter, published by Cardinal Baum (2000).

[28]Ibid., 8-10.

3 Data sets

3.1 EuroStat data on crimes

The data set for the study on the impact of the Jubilee Year event on criminal activities was downloaded from the European Commission Statistical Bureau (EuroStat) publicly available database. The sample of interest covers all historical national administrative data on crimes collected annually from 1950 to 2007, fifty-eight years in total, with the Great Jubilee of 2000 event positioned toward the end of the sampled period.[29] All the data available on thirty-five European countries was extracted, with no selection applied. However, some countries had fewer observations than others, creating an unbalanced longitudinal sample. That is, the time-series dimension of the sample spans 58 years, while the cross-sectional dimension is 35 units of observation (countries), making 1,129 observations in the panel data. All countries had stable geographical borders during the time period studied.[30]

The annual offences data, as recorded from January 1^{st} to December 31^{th} each year by law enforcement authorities, reflect all criminal law violations in each country. The main categories of crimes reported include intentional homicides, robberies, burglaries of private residential premises, thefts of a motorized land vehicle, unlawful acts involving controlled drugs or precursors, acts causing harm or intending to cause harm to the person, injurious

[29] A conceptually related worldwide event held during the year 2000, known to the authors, was the "International Year for the Culture of Peace", declared by UNESCO and targeted at all nations. This event launched media campaigns and collected around 75 million signatures in support of a culture of peace under the Manifesto 2000 Project. In addition, a Culture of Peace News Network (CPNN) was established. For details, see UNESCO executive board session no. 161 report (2001) on the event's results and Page's (2001) interpretation of its efficacy. A separation of the UNESCO event's influences on recorded crimes, if any, from the Great Jubilee of 2000 impacts will be addressed in the empirical analysis section.

[30] For post-Soviet countries, the data on crimes was continuously extracted from the Communism era only when applicable in terms of territorial stability. For instance, Slovenia, Czechia, Lithuania, and Estonia had reported crimes autonomously even when these countries were part of the Yugoslavia, Czechoslovakia, and USSR conglomerates, respectively. To clarify by example, Czech data on recorded crimes included Bohemia and Moravia before and after Czechia's formal independence, obtained at the beginning of 1993 during the "Velvet Divorce".

acts of a sexual nature, and acts against property involving violence or threat against a person. All crimes were assigned an equal weight in the sample.

The historical data on crime provided by EuroStat offer only the total amount of crimes recorded annually for each country, while the nations vary significantly by population size. Thus, creating a variable of crimes per hundred thousand inhabitants would help to adjust the overall amounts of crimes committed to the population size of each country in order to make a valid comparison between the units of observation (countries) over time. For this purpose, the population data for each country were extracted from the United Nations Population Division database,[31] and a variable of crimes per hundred thousand citizens was created, intended to serve as a dependent variable in the longitudinal data analysis.[32] A summary statistics for crimes recorded, across all countries and years, is presented in Table 1. A full list of countries in the sample will be provided in Appendix A, Table A.1, together with the populations and percentages of Catholic affiliations in 2000, relevant to the next sub-section.

Table 1: Summary statistics of European crimes recorded, years 1950-2007

	Number of observations	Mean	S.d.	Minimum	Maximum
Crimes per 100,000 inhabitants	1,129	3,664.80	2,970.24	44.55	14,334.33

Notes. The unit of observation is crimes per 100,000 citizens in country i in year t. Number of observations refers to 35 countries observed over 58 years, unbalanced.
Source. European Commission Statistical Bureau (EuroStat).

[31] Demographic indicators by region, subregion and country, annually for 1950-2100 estimates, 1950-2023 (file GEN/01/REV1).

[32] For one of the countries in the sample, the United Kingdom, the crimes provided by EuroStat are divided into England *and* Wales, Scotland, and Northern Ireland, while the population data are supplied for the whole country only. For compatibility, the crimes were summed to total British crimes each year; then a variable of crimes per 100,000 British citizens was calculated.

3.2 Data on European Catholicism

As the religious event studied, the Great Jubilee of 2000, was celebrated exclusively by the followers of the Roman Catholic Church, potential populations under the influence of the event are the Catholics residing in each country sampled. Unfortunately, the exact number of indulgences granted to the faithful during the Great Jubilee of 2000 is unknown. The Holy See, or any other source, never published a statistical research on the count of the indulgences obtained, to the best of my knowledge. One of the reasons for lack of this data could be the private and sacramental nature of the confession required for obtaining an indulgence. If this conjecture is correct, individual-level data on such a delicate spiritual matter will never be available for research purposes. Nevertheless, the Catholic share of the populations can serve as a proxy for the amount of indulgences granted, especially in the case of countries where Catholics constitute a significant share of the population and could potentially cause a substantial divergence in criminal activities count, if impacted by the Jubilee Year customs. To give a clear picture on the presence of the Catholic faith in Europe, Figure 1 maps all European countries by their Catholic share. The dark red color indicates countries where majority of the population identifies as Catholics, while a yellow shade points out non-Catholic religious and/or secular dominances. As shown in the graph, the prominence of Catholicism in modern Europe is evident.

As of countries from the longitudinal unbalanced sample in focus, their populations and Roman Catholic shares in 2000 are presented in Appendix A, Table A.1, ranked by religious affiliation (descending). The percentage of Roman Catholics contains Catholics of Latin and Non-Latin Rites, both under the spiritual authority of the Holy See.[33]

As shown by the table, in sixteen countries out of thirty-five, Catholics dominate other

[33]The Non-Latin Rites denominations comprise combined Armenian, Coptic, Ethiopian, Mar Thoma and Syrian (including Alexandrian and Antiochian) Catholic Rites. However, the Non-Latin Rites Catholics constitute a historically minuscule fraction of Roman Catholics in Europe.

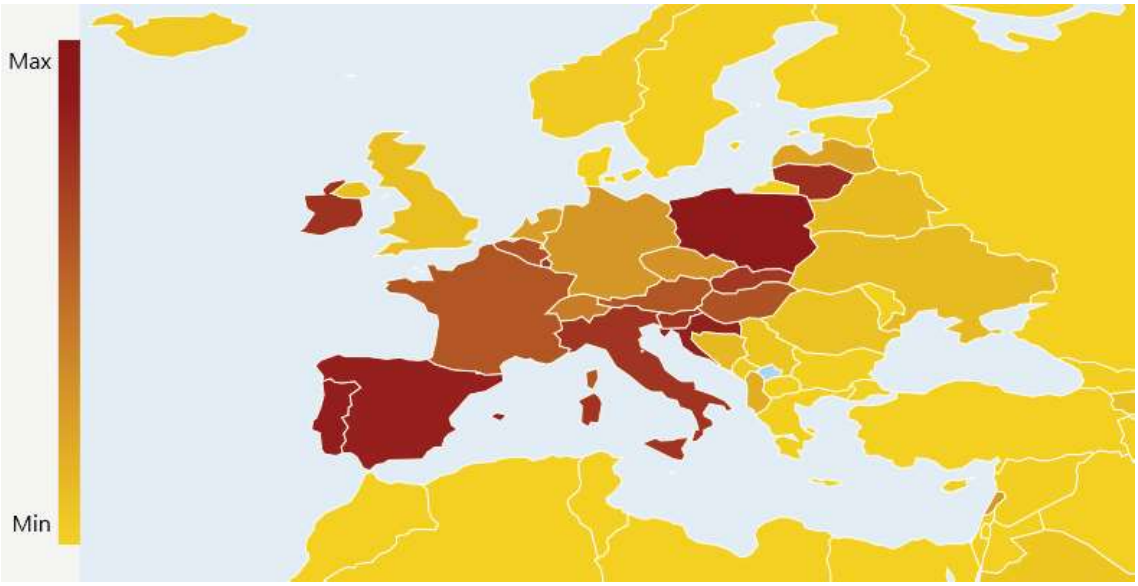


Figure 1: The percentage of Roman Catholics in the population of European countries as of 2020.
Note. A little blue dot in the middle is a "no data" region in Kosovo.
Source. The Association of Religion Data Archives (ARDA), "World Maps of Religious Affiliation," Adherents: Catholics.

religious confessions by the simple majority, while in fourteen countries out of thirty-five the Catholic faith followers exceed seventy percent of the population. Given the fact that the Great Jubilee of 2000 was the first planetary Jubilee and every Roman Catholic could take part in the event without travelling to Rome, such elevated Catholic shares should be sufficient to detect the influence of the celebration on crime levels, if there is any.

With regard to this matter, it is worth noting that in all countries in the sample, the Catholic shares developed gradually over time. In some countries, the Catholic percentage of the populations increased/decreased monotonically over the period sampled, while in other nations the development of this variable had a reversed U-shape or took other non-linear/unspecified forms. In no country did the percentage of Catholics remain stable over time, providing sufficient within variation for the conditional analysis to follow. At the same time, no abrupt inflow/outflow of faithful is observed around the year 2000, i.e., the very occurrence of the Great Jubilee event did not cause a massive enrolment into Catholicism in

order to obtain the remission of sins, nor a retraction of believers from Catholicism after the event was over. Polled Catholic shares summary statistics, for all countries in the sample, is provided by Table 2.

Table 2: European Catholic shares summary statistics, years 1950-2007

	Number of observations	Mean	S.d.	Minimum	Maximum
Catholic share	1,129	43.99	37.43	0.04	94.86

Notes. The unit of observation is a percentage of Catholics in country i in year t. Number of observations refers to 35 countries observed over 58 years, unbalanced. The maximal percentage of Catholics, 94.86%, belongs to Ireland in 1961, while a minuscule fraction of 0.04% indicates the percentage of Catholics residing in Finland in years 1950-1952.
Source. The Association of Religion Data Archives (ARDA), "Religious Characteristics of States Dataset," Religious Characteristics of States Dataset Project - Demographics v. 2.0 (RCS-Dem 2.0), COUNTRIES ONLY.

3.3 Data on additional macroeconomic variables

The empirical model proposed in the next section will include two-way fixed effects estimators to control for unobservable country and year characteristics. Such a design, combined with continuous religious shares, should suffice for identifying the event's impact on crime levels, if any. However, crime as a socio-economic indicator could be affected by various well-being–related and demographic factors, the volatility of which over time may not be fully captured by conventional fixed-effects techniques applied by country and/or year. Adding specific crime-relevant variables to the analysis would enrich the econometric model and ensure that the results regarding the event's influence are robust to alternative specifications.

I therefore consider an array of controls that could potentially impact crime levels. From an economic perspective, the natural candidates are GDP per capita, the inflation rate, and the unemployment rate. GDP per capita is widely recognized as a continuous measure of economic prosperity, improvements in which are expected to negatively impact crime. On the

other hand, a rising unemployment rate one could forecast to influence crime in the opposite direction. Inflation rate, especially when substantial, reduces the purchasing power of the local currency, effectively erasing real disposable income of households. Such reductions, when severe, could push more people into crime.

From a demographic point of view, the urban population share could absorb a portion of crime growth explained by urbanization expansion. The urban population share reflects the percentage of the population residing in towns and cities, as opposed to rural dwellings. In crowded residential areas, common in cities and towns, more opportunities to commit crimes arise. Last but not least, accounting for the impact of the number of police officers employed per hundred thousand citizens on crimes committed is straightforward.

The GDP per capita data were extracted from the Maddison Project Database (MPD) 2020 and provide all historical real GDP per capita at the country level, expressed in 2011 dollars. Inflation rates originated from International Monetary Fund statistics, published by World Development Indicators.[34] Unemployment rates were reported by the International Labour Organization using World Development Indicators of the World Bank as well. Urban population shares were sourced from the World Development Indicators database of the World Bank, originally collected by the United Nations Population Division, World Urbanization Prospects. The number of policemen employed per hundred thousand citizens was available in the EuroStat historical database, but only for the years 1993–2007. The summary statistics for all the control variables is provided in Table 3.

With regard to the suitability of the proposed variables as controls, it is worth noting that all the variables listed possess their own substantial between and within variations, while some of them are extremely volatile and/or change significantly over relatively short periods of time in a given country. In particular, the explosion of inflation rates after the fall of Communism in the post-Soviet countries points to a serious devaluation of the local

[34]The inflation was calculated using the Laspeyres formula.

Table 3: Macro-economic and demographic indicators summary statistics, years 1950-2007

	Number of observations	Mean	S.d.	Min	Max
GDP per capita	1,077	20,131.66	11,037.57	3,900	74,880
Urban population share	1,045	65.93	12.39	14.49	93.91
Inflation rate	913	18.34	91.15	-1.13	1500
Unemployment rate	744	7.92	5.38	0.4	37.32
Policemen per 100K citizens	400	333.96	116.69	152.82	688.83

Notes. The unit of observation is a country i in year t. Number of observations refers to 35 countries observed over 58 years, unbalanced. The number of observations varies due to availability of the data. Urban population share, inflation and unemployment rates are provided as percentages. The negative inflation rate observed belongs to Lithuania in 2003, while the gigantic 1,500% annual inflation was reported by Croatia in 1993. The highest unemployment rate was detected in North Macedonia in 2005. *Sources.* Maddison Project Database (MPD) 2020, World Bank/World Development Indicators, Euro-Stat, respectively.

currencies at that time.

4 Empirical strategy and analysis

4.1 The model

Let us now formally consider the unbalanced panel data on 35 European countries where the annual crime rates were recorded over 58 years. Let the unit of observation (country) be denoted by i, $i = 1 \dots N$, where $N = 35$, and the year by t, $t = 1 \dots T$, where $T = 58$. The total count of observations is the number of countries times the number of years, where not all countries have the same number of observations over time. In the model to follow, the binary explanatory variable is denoted by D and the rest of the control variables by x. Each variable is indexed by i and/or t. The impact of the event on crime is estimated by

the model of the form:

$$crimes_{i,t} = \beta_0 + \beta_1 x^1_{i,t} \cdot D^1_t + \beta_2 x^1_{i,t} + \beta_3 x^2_{i,t} + \beta_4 x^3_{i,t} + \beta_5 x^4_{i,t} + \beta_6 x^5_{i,t} + \beta_7 x^6_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where the dependent variable $crimes_{i,t}$ is the level of crimes recorded per 100,000 citizens in country i in year t. The crime rates are explained by the following independent variables.

A variable D^1_t is a binary variable that identifies the presence of the religious event shock. As such, it is assigned a value of one when the year is 2000 and zero otherwise. That is, $D^1_{year=2000} = 1$ and $D^1_{year\neq 2000} = 0$.

The interaction term, $x^1_{i,t} \cdot D^1_t$, is placed to isolate the impact of the event on sampled countries, as it takes a positive value only when the year is 2000. This impact is weighted by the percentage of Catholics residing in each country in 2000, denoted by the variable $x^1_{i,t}$. In addition, this variable will serve as a control alongside the interaction term, in order to create a separation of Catholicism-related continuous influences on crime levels, at all times, from the impacts of the one-time event, if there are any.

In terms of the "treatment effect" design suggested by the model in equation (1), it is worth noting that in all the countries in the sample the Catholic share of the population was positive at all times, including the year 2000, as at least one Catholic would always reside in a country. For instance, the least Catholic country in 2000 in the sample, Turkey, had a minuscule 0.04% fraction of Catholics in 2000, effectively weighting the potential impact of the event in Turkey by this small fraction. On the other hand, the most Catholic European country in 2000, Malta, had 93.95% of the population Catholic, adjusting the weight of the potential impact of the event on Maltese crimes to almost one. In this sense, all the countries in the sample are under the treatment of the event, but the magnitude of the treatment is proportional to the Catholic population share potentially influenced by the event in the year 2000. This suggested design is more precise than the common dichotomy of treated versus

non-treated units of observation, especially in the case when in a few countries in the sample the percentage of Catholics in 2000 concentrated around 15–45%, making it objectively harder to classify these countries as strictly "treated" or "non-treated".[35] Formally speaking, this approach is conceptually close to a generalized Difference-in-Differences (DiD) design with intensity-weighted dose response, as it addresses differences in exposure to the event according to the national Catholic share of the population in 2000.

All the following controls constitute a matrix of additional macroeconomic and demographic indicators discussed previously in sub-section 3.3. A variable $x^2_{i,t}$ relates to GDP per capita, $x^3_{i,t}$ is the urban population share in country i in year t, $x^4_{i,t}$ adds the inflation rate into the analysis, and $x^5_{i,t}$ is the percentage of the unemployed in country i in year t. The number of policemen is provided by $x^6_{i,t}$. The variables μ_i and λ_t indicate country and year fixed effects, respectively. $\varepsilon_{i,t}$ is the error term, with mean zero and assumed to display cluster heterogeneity at the country and year level.

4.2 Empirical results

To assess the impacts of the religious event in focus on crime levels, model (1) from the previous sub-section was empirically estimated. The estimation results are reported in Table 4, where in each column of the table an additional explanatory variable is added. The order of addition depends solely on the largest number of observations available for each variable from their original datasets.

Column (1) examines the most basic case where only the Jubilee-related coefficient is estimated, alongside two-way fixed effects. It appears as substantially negative and statistically significant at the 1% level, providing initial indication that the impact of the event on crime levels in 2000 was suppressing. This result is encouraging, but has to be challenged by adding more covariates in order to test its statistical stability and magnitude.

[35] See Appendix A, Table A.1 for a list of such countries.

In Column (2), continuous Catholic shares were added, largely leaving the main coefficient of interest on the Great Jubilee of 2000 impact unchanged. The purpose of examining Catholic shares together with the Jubilee impact is to separate the influences of criminal behaviour patterns of all Catholics at all times, approximated by the religious shares of the population, from the Jubilee celebration-related shift in criminal activity counts.

Column (3) further expands the analysis to include GDP per capita as an independent variable. In this column, the number of countries drops by one, as Liechtenstein did not have data on GDP per capita in the Maddison Project database. Again, the main coefficient of interest on the impact of the event on crime remains stable in absolute value and statistically significant in Column (3).

In Column (4), urban population share is incorporated, slightly weakening the main coefficient of interest from -8.68 to -7.18 while maintaining its significance. Surprisingly, the urban population share itself is estimated as negative and significant at the 5% level, hinting that urbanization expansion led to fewer crimes committed. This counter-intuitive result is reversed in the next column, where the inflation rate is introduced, effectively driving the urban population share estimated coefficient out of the statistical significance zone. At the same time, the main coefficient of interest on the Jubilee event's impact on crime weakens further to under -6, but still maintains significance at the 1% level.

This trend continues in Column (6), with the unemployment rate as a control further lessening the estimated coefficient of the event's impact to -3.51. Lastly, the number of policemen employed per hundred thousand citizens is regressed in Column (7), excluding from the sample two more countries that did not have data on law enforcement reported.[36] Moreover, the sample size is reduced substantially, as the data on policemen counts were available only for the years 1993–2007 for the remaining countries. In this final column, the impact of the Great Jubilee of 2000 event is diminished in magnitude, and its significance

[36]Bulgaria and Serbia.

Table 4: Impact of the Great Jubilee Year event on crime: fixed effects estimates

Dependent variable: crimes per 100K inhabitants	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Catholic\ Share \cdot Jubilee_{2000}$	-8.67***	-8.72***	-8.68***	-7.18***	-5.89***	-3.51***	-2.58**
	(1.09)	(0.87)	(1.58)	(1.94)	(1.82)	(1.00)	(1.01)
Catholic share		-5.27	11.06	6.58	9.06	27.83	38.77*
		(25.34)	(27.34)	(22.24)	(27.34)	(33.76)	(18.36)
GDP per capita			35.37	34.21	-2.46	-5.29	-59.10***
			(34.77)	(32.46)	(31.39)	(30.18)	(16.13)
Urban population share				-104.72**	-63.54	-73.26	-10.58
				(47.70)	(48.56)	(53.01)	(31.36)
Inflation rate					-0.20	0.63	-1.21
					(0.38)	(0.58)	(4.78)
Unemployment rate						-2.65	-15.35
						(26.63)	(18.70)
Policemen per 100*K*							-0.38
							(1.10)
Year FE	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y
Number of Observations	1129	1129	1077	1003	913	726	388
Number of Countries	35	35	34	34	34	34	32
R^2	0.91	0.91	0.91	0.93	0.94	0.96	0.98
$R^2 - adjusted$	0.90	0.90	0.90	0.92	0.93	0.95	0.98
$R^2 - within$	0.01	0.01	0.03	0.09	0.04	0.07	0.10

Notes. The unit of observation is crimes per 100,000 citizens in country i in year t. All columns include a constant. Asterisks ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors, reported in parentheses, are adjusted for cluster heteroscedasticity at the country and year levels. All the coefficients are generated using the `reghdfe` command in Stata. All shares and rates are expressed as percentages, while GDP per capita is provided in thousands of dollars in order to make the coefficients compatible. The number of observations changes from column to column due to missing observations.

RESULTS: The impact of the Great Jubilee of 2000 event on crime levels is negative and significant.

drops to 5%. In addition, GDP per capita is estimated to negatively impact crime, as expected. The intuition behind this result is straightforward, as higher levels of income partially obviate the need to commit crimes, especially property-related crimes. This result could be specific to the years when GDP per capita was already higher in the sampled countries, as the last column covers years 1993–2007 of relatively prosperous modern Europe. As such, this outcome should be accepted with caution due to the lower sample size in Column (7).

Preliminarily concluding the results, almost none of the explanatory variables was confirmed as significant in explaining crime variation, with the exception of the main coefficient of interest, the Great Jubilee Year event's impact on crime, which maintained significance through all columns of Table 4.[37]

To quantify the results obtained, it is helpful to translate the estimated coefficients into a number of crimes potentially reduced by the event occurrence. Recall that the combined population of the sampled countries sums to 576.227 million inhabitants.[38] Considering Column (5) of Table 4 as the preferred specification, where most of the right-hand-side variables were incorporated without suffering much sample size reduction from missing observations, the calculation of the aggregated estimated impact is straightforward. -5.89 crimes per hundred thousand citizens in a population of 576.227 million would imply an estimated decline in crimes of 3,393,977 crimes in total.[39] Such estimated decline is non-negligible.[40] Alternatively, the adoption of a more modest estimate from Column (7), Table 4, of -2.58 per hundred thousand inhabitants would yield an overall estimated reduction in crimes equal 1,486,673 crimes. In any configuration, the estimated coefficients on the impact of the Great

[37]The potential impact of the "International Year for the Culture of Peace," celebrated by UNESCO in 2000, is absorbed by year fixed effects, as this event targeted all nations.

[38]See Appendix A, Table A.1 note for details. For more precision, the population of Liechtenstein was removed from the total, as data on GDP per capita were unavailable.

[39]Recall that the Catholic shares were expressed as percentages and not shares, for convenience. See Table 4 notes for details.

[40]For a visualization of the estimated impact, see Appendix A, Figure 2

Jubilee of 2000 event on crime levels point to a negative, large in magnitude, and statistically significant influence of the event's occurrence on total number of crimes recorded in 2000, even for such a big population size as Europe.

4.3 Robustness checks

Despite the promising results obtained so far, this sub-section suggests a few robustness checks of the model estimated previously, in order to further establish the validity of the empirical findings. Of particular interest is to answer a number of questions on the possibility that the reduction in European crime in 2000 was initiated by a different, Catholicism-related or not, latent cause.

Firstly, consider the case where crime levels were negatively impacted by unknown but relevant factors in the data-generating processes occurring simultaneously in the most Catholic countries in 2000. This could distort the empirical results to attribute the estimated coefficients to the impact of the event in focus, especially given that the binary variable for the event's occurrence was weighted by the Catholic share of the population in 2000.

In order to check this hypothesis, Table 5 replicates the regression from Column (5) of Table 4, while dropping the most Catholic countries from the sample one by one when moving from one column to the next. That is, countries listed in Appendix A, Table A.1 were intentionally excluded from the analysis, starting with the most Catholic country in 2000, Malta.

The results of the analysis are presented in Table 5. In Column (1), Malta is missing. In Column (2) Malta and Poland are absent. In Column (3), Malta, Poland, and Ireland are removed from the sample. In Column (4), the countries from Column (3) are dropped, in addition to Croatia. In Column (5), Portugal and the countries from Column (4) are excluded. In Column (6) Slovenia is added to the countries previously omitted from the sample in Column (5). Column (7) reflects the removal of all the countries mentioned

earlier, in addition to Lithuania.

As evident from Table 5, the estimated impact of the Great Jubilee of 2000 event on crime remained negative and statistically significant in all columns, while fluctuating in absolute value from column to column.[41] Moreover, if we continue to drop more of the next most Catholic countries from the sample, the result would retain its statistical significance.[42] That is, if we exclude the following countries in the list — Italy, Spain, Luxembourg, and Slovakia — the results are still robust. Only when Belgium is subtracted would the estimated coefficient on the event's impact lose statistical significance. The countries that would be left in the sample in such a case are only two countries with a Catholic majority, France and Hungary, while the remainder of the sample possess only modest Catholic shares of the population. In addition, the sample size would be substantially reduced as well.

The second natural direction to explore, in order to confirm the robustness of the empirical results obtained, is to assume that in the least Catholic countries in the sample, crime could increase in 2000, artificially causing the most Catholic countries' crime counts to appear diminished. To check this conjecture, Table 6 excludes the least Catholic countries one by one — analogously to Table 5 — but this time removing countries from the bottom of the list in Appendix A, Table A.1. The countries that were excluded are: Turkey, Finland, North Macedonia, Greece, Estonia, Bulgaria and Denmark.[43]

The regression results show again that the impact of the Great Jubilee of 2000 event on crime levels persists as negative and significant in all columns of Table 6. Furthermore, it is increasing in absolute value as more least Catholic countries are excluded from the sample, consistent with the fact that the average Catholic share of the remaining countries rises with every additional exclusion.[44]

[41] A graphical representation of the coefficients estimated in Table 5, alongside their 1% confidence intervals, is provided in Appendix A, Figure 3

[42] These results are not shown here and are available upon request from the author.

[43] See Appendix A, Table A.1 for reference.

[44] A graphical representation of the coefficients estimated in Table 6, alongside their 5% confidence intervals,

Table 5: Impact of the Great Jubilee Year event on crime: fixed effects estimates excluding most Catholic countries

Dependent variable: crimes per 100K inhabitants	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Catholic Share · $Jubilee_{2000}$	-6.63***	-6.95***	-4.09***	-4.14***	-4.38***	-4.98***	-6.08***
	(1.99)	(1.61)	(1.42)	(1.36)	(1.50)	(1.49)	(1.55)
Catholic share	9.05	17.13	15.61	16.73	15.73	16.39	16.28
	(27.34)	(29.74)	(31.14)	(32.96)	(33.08)	(33.47)	(33.52)
GDP per capita	-2.61	-12.36	11.15	11.27	13.63	10.46	10.57
	(31.47)	(34.32)	(26.22)	(26.51)	(26.59)	(29.42)	(29.45)
Urban population share	-63.56	-57.20	-70.99	-70.53	-74.09	-72.52	-72.09
	(48.56)	(49.69)	(50.21)	(50.35)	(51.56)	(52.32)	(52.57)
Inflation rate	-0.20	-0.05	-0.12	-0.37	-0.39	-0.07	0.40
	(0.38)	(0.37)	(0.37)	(0.49)	(0.48)	(0.61)	(0.64)
Year FE	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y
Number of Observations	903	866	819	802	787	760	744
Number of Countries	33	32	31	30	29	28	27
R^2	0.94	0.94	0.94	0.94	0.94	0.95	0.94
$R^2 - adjusted$	0.93	0.93	0.94	0.94	0.94	0.94	0.94
$R^2 - within$	0.04	0.04	0.05	0.06	0.06	0.06	0.06

Notes. The unit of observation is crimes per 100,000 citizens in country i in year t. All columns include a constant. Asterisks ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors, reported in parentheses, are adjusted for cluster heteroscedasticity at the country and year levels. All the coefficients are generated using the `reghdfe` command in Stata. All shares and rates are expressed as percentages, while GDP per capita is provided in thousands of dollars in order to make the coefficients compatible. The number of observations changes from column to column due to most Catholic countries exclusions from the sample.

RESULTS: The impact of the Great Jubilee of 2000 event on crime levels is negative and significant, and is not driven by most Catholic countries' presence in the sample.

is provided in Appendix A, Figure 4.

Table 6: Impact of the Great Jubilee Year event on crime: fixed effects estimates excluding least Catholic countries

Dependent variable: crimes per 100K inhabitants	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Catholic Share $\cdot$ $Jubilee_{2000}$	-6.19***	-5.57**	-5.75**	-7.25***	-6.79***	-7.63***	-8.20***
	(2.12)	(2.05)	(2.13)	(1.93)	(2.03)	(2.11)	(2.56)
Catholic share	6.26	-6.89	-7.09	5.41	4.57	4.45	-5.22
	(27.40)	(25.88)	(25.88)	(25.70)	(25.77)	(25.83)	(28.43)
GDP per capita	1.40	1.22	1.45	-9.04	-9.00	-9.70	-6.51
	(32.22)	(32.93)	(32.96)	(32.81)	(32.90)	(33.21)	(33.35)
Urban population share	-71.95	-57.49	-57.43	-56.94	-54.83	-53.70	-50.98
	(51.64)	(49.05)	(49.10)	(50.51)	(50.97)	(51.20)	(50.22)
Inflation rate	-0.21	-0.22	-0.22	-0.16	-0.17	-0.41	-0.36
	(0.37)	(0.34)	(0.34)	(0.37)	(0.37)	(0.35)	(0.32)
Year FE	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y
Number of Observations	894	846	838	800	785	772	724
Number of Countries	33	32	31	30	29	28	27
R^2	0.94	0.94	0.94	0.94	0.94	0.94	0.94
$R^2 - adjusted$	0.93	0.93	0.93	0.93	0.93	0.93	0.94
$R^2 - within$	0.04	0.03	0.03	0.04	0.04	0.04	0.04

Notes. The unit of observation is crimes per 100,000 citizens in country i in year t. All columns include a constant. Asterisks ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors, reported in parentheses, are adjusted for cluster heteroscedasticity at the country and year levels. All the coefficients are generated using the `reghdfe` command in Stata. All shares and rates are expressed as percentages, while GDP per capita is provided in thousands of dollars in order to make the coefficients compatible. The number of observations changes from column to column due to least Catholic countries exclusions from the sample.

RESULTS: The impact of the Great Jubilee of 2000 event on crime levels is negative and significant, and is not driven by least Catholic countries' presence in the sample.

It is also worth noting that statistical significance of the coefficient on the event's impact drops from 1% to 5% in columns (2) and (3) of Table 6, but only marginally.[45] Continuing to drop the next two least Catholic countries in the list, Norway and Sweden, would not change the results qualitatively.[46]

Another relevant question to explore, with respect to the disproportionate impact of a few sampled countries on the estimation results, is the following: what if the results are driven only by the celebrations occurring in Italy and its closest geographic neighbours, given that the main ceremonies of the Great Jubilee Year of 2000 were held in Rome? In other words, examining a geographic dimension of the event's impact would reveal whether the event had Europe-wide implications or only a local influence. To answer this question, a similar exercise to that in Tables 5 and 6 is performed, this time excluding Italy and countries with the closest capitals to Rome one by one. A list of twenty-two European countries with capitals closest to Rome is provided in Appendix A, Table A.2. With regard to this list, it is worth noting that it does not coincide with the order of most/least Catholic countries documented in Appendix A, Table A.1, as some of the countries with capitals closest to Rome are deeply Catholic, while others are not.

Table 7 presents the estimation results obtained by sequentially excluding Italy, Slovenia, Croatia, Malta, Switzerland, Serbia, and North Macedonia, with one additional country omitted in each column. The results again show that the impact of the event on crime remains negative and statistically significant, and is not driven by the presence of Italy and its closest neighbours in the sample.[47] If the sample is further reduced by excluding more countries from the list in Appendix A, Table A.2, the coefficient on the impact of the Great

[45] In both cases $p > |t|$ is 0.011.

[46] Excluding more countries would reduce the sample size and make the estimated coefficient of interest fluctuate in and out of statistical significance. These results are not shown here but are available upon request from the author.

[47] A graphical representation of the coefficients estimated in Table 7, alongside their 5% confidence intervals, is provided in Appendix A, Figure 5. Notice that in column (1) the coefficient on the event's impact is significant at 5% level.

Table 7: Impact of the Great Jubilee Year event on crime: fixed effects estimates excluding neighbouring to Italy countries

Dependent variable:							
crimes per 100K inhabitants	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Catholic Share $\cdot$ $Jubilee_{2000}$	-5.34**	-5.62***	-5.82***	-6.76***	-6.60***	-6.72***	-6.88***
	(1.99)	(1.95)	(1.99)	(2.21)	(2.34)	(2.36)	(2.40)
Catholic share	-0.26	0.40	0.50	0.43	-0.32	-0.40	-0.60
	(25.60)	(25.86)	(27.10)	(27.10)	(27.23)	(27.24)	(27.28)
GDP per capita	-1.03	-3.41	-3.17	-3.27	-1.24	-1.14	-0.90
	(32.12)	(33.44)	(33.50)	(33.58)	(33.21)	(33.25)	(33.30)
Urban population share	-84.94*	-83.86*	-83.42	-83.43	-78.26	-78.38	-78.28
	(48.52)	(49.22)	(49.28)	(49.28)	(49.71)	(49.78)	(49.87)
Inflation rate	-0.18	-0.02	-0.26	-0.26	-0.23	-0.24	-0.24
	(0.36)	(0.36)	(0.65)	(0.66)	(0.66)	(0.66)	(0.66)
Year FE	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y
Number of Observations	865	838	821	811	785	777	769
Number of Countries	33	32	31	30	29	28	27
R^2	0.94	0.94	0.94	0.94	0.94	0.94	0.94
$R^2 - adjusted$	0.93	0.93	0.93	0.93	0.93	0.93	0.93
$R^2 - within$	0.06	0.06	0.06	0.06	0.05	0.05	0.05

Notes. The unit of observation is crimes per 100,000 citizens in country i in year t. All columns include a constant. Asterisks ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors, reported in parentheses, are adjusted for cluster heteroscedasticity at the country and year levels. All the coefficients are generated using the `reghdfe` command in Stata. All shares and rates are expressed as percentages, while GDP per capita is provided in thousands of dollars in order to make the coefficients compatible. The number of observations varies across columns due to the exclusion of countries geographically close to Italy from the sample.

RESULTS: The impact of the Great Jubilee of 2000 event on crime levels is negative and significant, and it is not driven by spatial proximity to Rome.

Jubilee of 2000 maintains a negative sign and statistical significance at the 1% or 5% level throughout all of the sequence. In this case, the results hold even when the majority of the sampled countries are excluded, as the full original sample contains thirty-five European countries.[48]

The estimated coefficients on the event's impact on crime increase in absolute value from column to column in Table 7, as more geographic neighbours of Italy are excluded from the sample, suggesting that the impact of the event gets stronger as we move farther away from Rome. In other words, decentralization of the event by replacing the requirement of pilgrimage to Rome with a visit to a local church or other "good works" allowed more Catholics from lands distant from Rome to take part in the event for the first time. Economically speaking, a substantial reduction in the participation cost led to an increased demand for indulgences. Indulgences, in turn, are granted conditionally on the wholehearted promise not to sin again. When such promises are kept, fewer crimes are committed at the country level as a spillover of massive indulgences consumption.

In this regard, this is of great importance in enhancing the understanding of the event's influence. Recall that the Great Jubilee of 2000 was the first planetary Jubilee that allowed the faithful to pass through locally designated church doors as Holy Doors, in order to obtain forgiveness, instead of travelling to Rome for the same purpose. Relaxing this condition significantly reduced the participation cost of the event. As a result, more Catholics from all over Europe had the opportunity to be granted the Jubilee indulgence in their home dioceses and abstain from committing crimes, at least for some period of time.

As of the main finding on the impact of the Great Jubilee of 2000 on recorded crime in European countries, all the alternative leave-one-out specifications considered in this subsection did not contradict the empirical validity of the result that the event had a negative and statistically significant effect on crime levels. On the contrary, re-sampling by exclud-

[48]These results are not shown here but are available upon request.

ing most/least Catholic countries and Italy's closest neighbours strengthens the previously reached conclusion that the impact of the event on crime in 2000 was negative, statistically significant, and Europe-wide.

5 Concluding remarks

In this paper, the impact of the Catholic Great Jubilee of 2000 and the related custom of the remission of sins on crime levels per hundred thousand citizens in European countries was examined. In order to do so, data on crime were sourced from the European Commission Statistical Bureau historical administrative database, covering years the 1950-2007. The empirical estimation involved a conditional analysis using a two-way fixed effects framework, alongside the incorporation of a wide range of independent variables that could potentially impact crime at the country level. As the impact of this one-time religious occasion was studied across nations where a unique event of the same spiritual nature was celebrated in many European countries, settled by religiously heterogeneous populations, the estimated impact of the event was weighted by the Catholic share of the population in each country.

The event in focus is found to have a negative and significant impact on crime levels recorded per hundred thousand inhabitants in Europe in 2000. Moreover, the estimated coefficient of the event's impact exhibits strong robustness despite the inclusion of additional covariates and the use of various resampling techniques, such as omitting the most and least Catholic countries from the sample and excluding countries geographically close to the event's center from the analysis.

The main finding of this paper contradicts the Lutheran hypothesis[49] that suggests that the faithful, when given the opportunity to cancel afterlife punishment for sin, would commit more bad deeds. As the event in focus was annual, every potential sinner had enough time

[49]For details on Luther's point of view on this matter, see the historical and religious background section.

to engage in crime and obtain forgiveness during the year. However, this is not what the data suggests. According to Catholic doctrine, this behaviour is explained as follows: when they are forgiven and the punishment is cancelled, Catholics fully erase their spiritual debt and move from a state of fearing God's judgement to a renewed and deeper connection with God — a phase of love. The threat of Purgatory is removed, at least temporarily, and the gates of heaven are open. To achieve this transition, the faithful are willing to make and keep promises not to sin again for as long as they can, indicating that fear may not be the only motivation for sinning or abstaining from sin.

It is worth noting that the longitudinal data setting examined in this paper, is compatible with a comparative look at other socio-economic outcomes under the impact of the same religious event, potentially allowing additional spillovers of the forgiveness obtained by Catholics to be estimated. In the realm of demographics, the dynamics of abortion and divorce could transform, as they both are considered sins and should be avoided. Subjective well-being indicators, if positively impacted by the release from the burden of sins, could bring a spark to productivity and innovation. Volunteering and charitable giving are expected to thrive in close temporal proximity to the event, as Catholics are directly instructed to be involved in "good works." Of particular interest would be an increase in funds donated not to the Church itself but to education, arts, and research *and* development, as such donations could catalyse the beginning of new cycles of expansion in these areas, leading to a permanent shift to a higher level of performance.

On a larger scale, the results of the current study indicate that a deeper understanding of the concept of forgiveness, obtained from the Almighty God or otherwise, and its behavioural consequences is required. While this study attempts to make a modest contribution to this important matter, many questions related to this topic are still open for future research.

Declaration on competing interest

The author(s) declare no competing interests.

Ethical approval

This article does not contain any studies with human participants, or their data, performed by any of the authors.

Informed consent

This article does not contain any studies with human participants, or their data, performed by any of the authors.

Data availability

The datasets analysed during the current study are available in the repositories:

Association of Religion Data Archives (ARDA), "Religious Characteristics of States Dataset," *Religious Characteristics of States Dataset Project - Demographics v.2.0 (RCS-Dem 2.0), COUNTRIES ONLY*.

European Commission Statistical Bureau (Eurostat), "Crime and Criminal Justice." *Crime - historical data (until 2007).*

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Appendix A. Supplementary tables and figures

Table A.1: Total population and Roman Catholics by percentage in European countries, in 2000

Country	Total population, millions	Roman Catholic share of the population
Malta	0.39	93.95%
Poland	38.35	90.01%
Ireland	3.78	89.00%
Croatia	4.48	86.84%
Portugal	10.31	84.53%
Slovenia	1.99	80.08%
Lithuania	3.50	79.12%
Italy	56.99	78.87%
Liechtenstein	0.03	78.43%
Spain	40.28	74.93%
Austria	8.02	74.25%
Luxembourg	0.44	72.62%
Slovakia	5.39	72.10%
Belgium	10.24	72.03%
France	59.21	60.97%
Hungary	10.22	55.98%
Switzerland	7.17	42.30%
Germany	83.51	32.57%
Netherlands	15.86	32.20%
Czechia	10.25	28.09%
Latvia	2.38	17.21%
United Kingdom	58.95	9.60%
Serbia	7.53	6.08%
Romania	22.39	5.70%
Cyprus	0.94	1.56%

Country	Total population, millions	Roman Catholic share of the population
Iceland	0.28	1.55%
Sweden	8.87	1.38%
Norway	4.49	0.90%
Denmark	5.34	0.64%
Bulgaria	8.19	0.56%
Estonia	1.37	0.51%
Greece	10.99	0.50%
North Macedonia	2.02	0.37%
Finland	5.18	0.14%
Turkey	66.90	0.05%

Note. The combined population of the listed countries is 576.23 million inhabitants.

Sources. The Association of Religion Data Archives (ARDA), "Religious Characteristics of States Dataset," Religious Characteristics of States Dataset Project - Demographics v. 2.0 (RCS-Dem 2.0), COUNTRIES ONLY and United Nation Population Division, World Population Prospects 2024, Demographic indicators by region, subregion and country, annually for 1950-2100 estimates, 1950-2023 (file GEN/01/REV1).

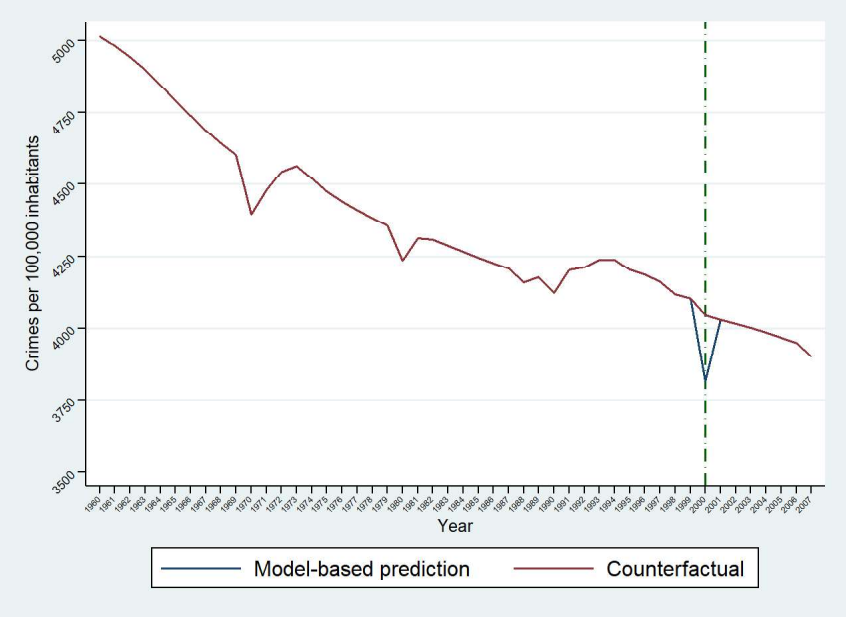


Figure 2: Predicted fitted average crime rates with and without the Great Jubilee of 2000 celebration estimated impact.
Note. The two lines coincide everywhere except in 2000. The one-time dip in the blue line reflects a estimated decline in crime per 100,000 inhabitants in Europe in that year.
Source. Table 4, Column (5) regression results.

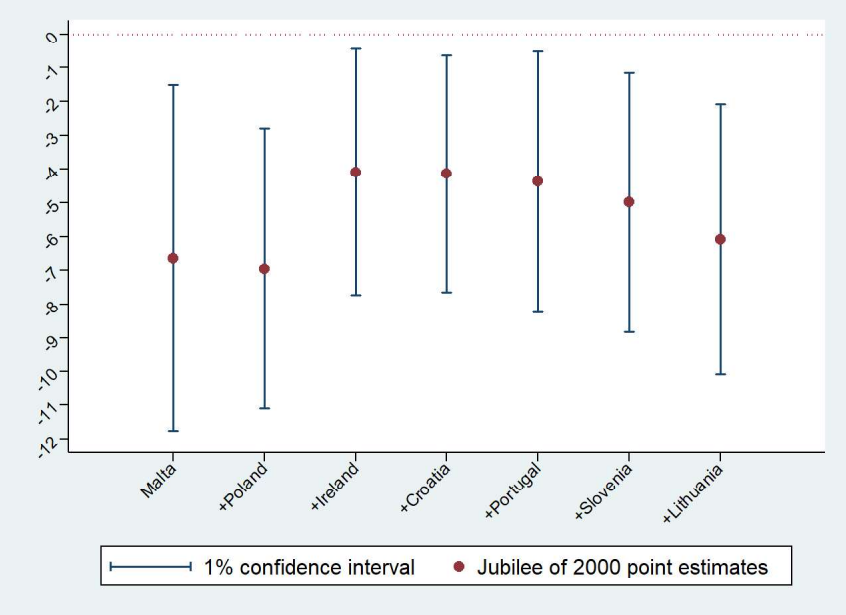


Figure 3: Leave-one-out estimates of the Jubilee impact excluding most Catholic countries.
Source. Table 5, columns (1)–(7) regression results.

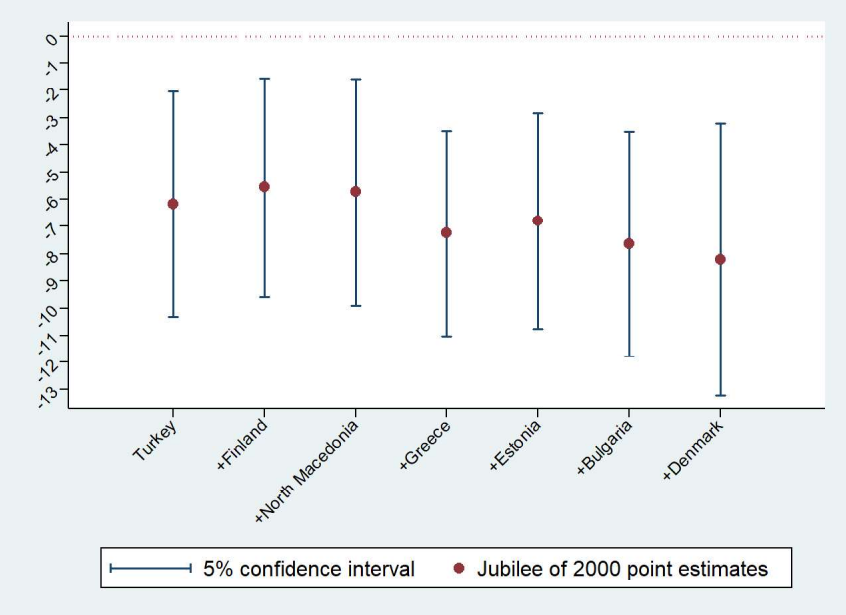


Figure 4: Leave-one-out estimates of the Jubilee impact excluding least Catholic countries.
Source. Table 6, columns (1)–(7) regression results.

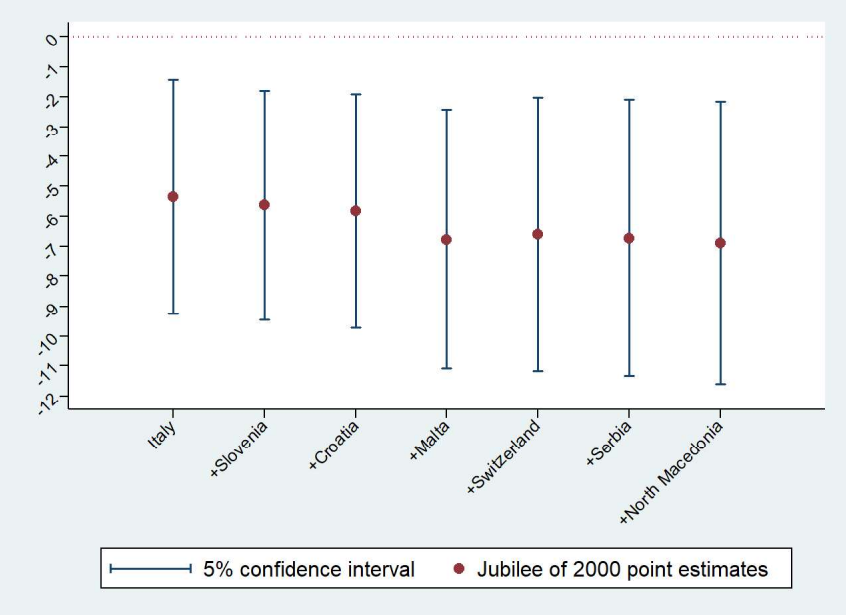


Figure 5: Leave-one-out estimates of the Jubilee impact excluding Italy and neighbouring to Italy countries.
Source. Table 7, columns (1)–(7) regression results.

Table A.2: Distance from European capitals to Rome (great-circle, km)

Country	Capital	Distance to Rome (km)
Italy	Rome	0
Slovenia	Ljubljana	490
Croatia	Zagreb	520
Malta	Valletta	690
Switzerland	Bern	690
Serbia	Belgrade	720
North Macedonia	Skopje	750
Austria	Vienna	765
Slovakia	Bratislava	785
Hungary	Budapest	810
Bulgaria	Sofia	900
Czechia	Prague	925
Luxembourg	Luxembourg	990
Greece	Athens	1050
France	Paris	1105
Romania	Bucharest	1140
Belgium	Brussels	1175
Germany	Berlin	1180
Netherlands	Amsterdam	1295
Poland	Warsaw	1315
Spain	Madrid	1365
United Kingdom	London	1435

Note. Distances are approximate great-circle (straight-line) distances from each capital city to Rome, calculated using geographic coordinates (Haversine formula). Values are rounded to the nearest 5–10 km.

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