

The Medieval origins of Catholic political preferences*

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Abstract

To what extent do conservative culture and institutions affect political preferences and support of gender equality policies in the long term? In every Italian election with a running Catholic party, regions in north-eastern Italy showed marked differences in their Catholic votes (above 20 p.p.), which are also reflected by anti-divorce and anti-abortion votes in dedicated referenda (1974, 1981). I exploit a natural experiment to disentangle the effects of two possible long-term determinants of these different preferences: conservative formal institutions (the theocratic Papal States), and conservative culture (Medieval patriarchal norms). The Po river separates two regions: for several centuries, one displayed conservative culture but progressive institutions, and the other had a progressive culture and was only partially subject to conservative institutions. I formalize and estimate an extension to geographic regression discontinuity designs, the Difference-in-Geographic Discontinuities (DIG) estimator. I find that conservative institutions have no effect on conservative votes. I argue that the entire difference in votes is attributable to culture, through its effect on social capital.

JEL Codes: Z10, D72, N9, C21

Keywords: culture, institutions, political preferences, persistence, gender norms

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1 Introduction

Politically conservative regions are found in every corner of the world. Regardless of economic conditions, they display long-lasting preferences for conservative parties that often have explicit ties to religion. This is the case with theocratic states like Iran, where the religious oppression of female liberties is now causing upheaval ([BBC News](#)), but also in industrialized democracies. For instance, the U.S. Republicans and the Polish conservative party restricted access to abortion building their arguments on the Bible, and openly admitted ties to the Catholic Church ([The New York Times](#), 2022; [BBC News](#), 2021).¹ In the Muslim world, the Tunisian conservative party recently stopped a reform that would have repealed Quran-based unequal inheritance laws and granted equal inheritance rights to women ([DAI](#), 2020).²

How do regions become persistently conservative? Are conservative votes driven by the historical experience of conservative institutions, or are they the result of conservative culture?

North-eastern Italy offers a unique setting to disentangle these two effects. The Po river separates two regions that displayed different political preferences for over a century. The region north of the Po, Veneto, is commonly referred to as “white”, from the colour that identified Catholic workers’ leagues dating back to the XIXth century, and more recently the Catholic party *Democrazia Cristiana (DC)* (1943-1994). It is widely considered a politically conservative region. Conversely, the region south of the river – Emilia-Romagna – is known as “red”, by the socialist and communist leagues and parties dominating the local political scene. In every election held in the XXth century and in two referenda on divorce and abortion, municipalities north of the river displayed more conservative (Catholic) votes – at least 20 percentage points more than the southern riverside.

These two regions have different cultural norms and historical institutions, summarized in [Figure 1](#). I define culture (C) using [Todd \(1990\)](#)’s family systems. Todd classified all NUTS-3 regions in Europe based on inheritance norms and cohabitation rules that developed in the Middle Ages and theorized that they explain contemporary spatial patterns of political preferences and religiosity. These norms are more conservative ($C = 1$) north of the Po, whereas they are more progressive on the southern riverside ($C = 0$). However, the disposition of historical formal institutions (I) does not fully overlap with that of culture. Approximately half of the municipalities south of river Po were part of the Papal States, a theocratic state ruled by the Pope, with conservative formal institutions based on Catholic doctrine which became particularly oppressive with the Roman Inquisition ($I = 1$).³ The other municipalities south and north of the Po were subject to more

¹Despite the unprecedented decrease in the number of believers in both countries ([Pew Research Center](#), 2022; [Notes from Poland](#), 2022).

²In Asia, Gopalganj in Bangladesh and Gujrat in India are well-known examples of regions where votes are cast based on religious affiliation.

³Vatican City, the contemporary evolution of Papal States, is still subject to doctrine-based legislation. For instance, it maintains the illegality of divorce and abortion to this date.

Figure 1: Geographic disposition of treatments and DIG estimator

East comparison:

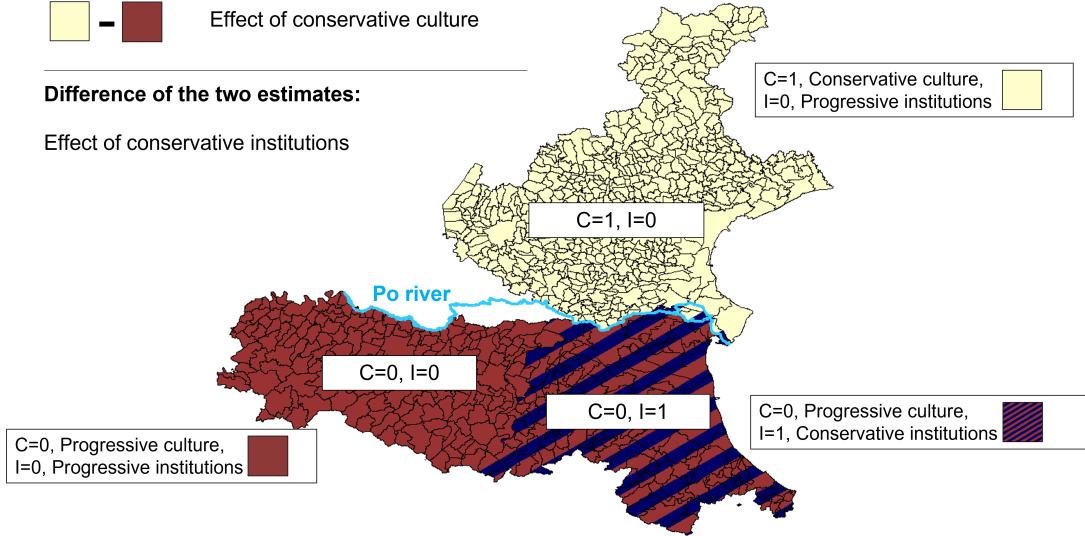
Effect of conservative culture
+ Effect of conservative institutions

West comparison:

Effect of conservative culture

Difference of the two estimates:

Effect of conservative institutions



Notes: The figure shows how the geographic disposition of more conservative culture ($C = 1$) and formal institutions ($I = 1$) allows disentangling the effect of more conservative institutions on votes for the Catholic party (1948-1992), and votes against divorce and abortion (1974, 1981). This is done by estimating a “West” and an “East” regression discontinuity and taking their difference (DIG).

progressive institutions. In particular, they were ruled by states that opposed the Catholic Church’s claims for jurisdiction and limited the action of the Roman Inquisition in their territories. For a common citizen, the river has been nearly impossible to cross until the 20th century: the only temporary bridges were guarded military pontoons, and any commercial exchange on the river was closely monitored. The two river banks, which are morphologically, climatically, and agriculturally comparable, were colonized by populations from the respective inland only after the river course stabilized in its definitive form in the Low Middle Ages. By then, these populations had already begun to develop different family systems (cultures, C).

Causal identification exploits the hard border constituted by the river and the mismatch in the spatial disposition of culture (C) and institutions (I). As shown in Figure 1, I divide the area into a West and an East section, for each one I estimate a geographic regression discontinuity, and I take their difference. This is the intuition behind the Differences-in-Geographic discontinuities (DIG) estimator formalized in this paper, that identifies the effect of conservative institutions (the Papal States).

I find that conservative institutions (Papal States) are irrelevant to 20th-century Catholic political preferences and support of divorce and abortion. I then argue that the entire effect (on average

25 percentage points in votes) is attributable to conservative culture ($C = 1$). To do so, I consider one extra outcome, the attendance of voluntary Catholic religion classes in public schools. This choice is observable and implies reputational costs, and it is more likely to be driven by cultural reasons. I also provide evidence against the effect of possible confounders.

Finally, I argue that culture affects conservative votes through social capital. In the culturally progressive region ($C = 0$) south of the Po, equal inheritance norms imply smaller families with less wealth and thus higher levels of cooperation and mutual support. The superimposition of oppressive conservative institutions like the Papal States ($I = 1$) clashed with the local culture and did not leave a mark on political preferences. In the culturally conservative region ($C = 1$) instead, unequal inheritance norms reduced the need for cooperation between families and their social capital. As a result, the Catholic Church became a source of sustenance and service provision and acquired a fundamental role in local communities. This was further enhanced by the fact that progressive formal institutions north of the Po ($I = 0$) did not allow Catholic institutions to be oppressive as they were in the Papal States.⁴

The paper proceeds as follows: [Section 2](#) reviews the literature and the contribution, [Section 3](#) presents the two treatments (C, I) within the historical setting, [Section 4](#) describes the data, [Section 5](#) presents the empirical strategy and formalizes the DIG estimator, [Section 6](#) discusses the results, [Section 7](#) lists robustness checks and [Section 8](#) discusses mechanisms. [Section 9](#) concludes the paper.

2 Literature review

This paper contributes to the literature on culture and institutions, reviewed by [Alesina and Giuliano \(2015\)](#). It is particularly related to studies on the effect of family ties (e.g. [Alesina and Giuliano \(2010, 2014\)](#)), and the long-term persistence of historical institutions on economic development. Among these, [Acemoglu et al. \(2011\)](#) show evidence that the sudden and brief imposition of progressive Napoleonic institutions in Germany had a long-term impact on economic development; [Malik and Mirza \(2019\)](#) look at Muslim shrines in Punjab Pakistan and find a negative impact. There are several contributions on the historical origins of political preferences. [Fontana et al. \(2018\)](#) use a geographic RD design in central-northern Italy and attribute the root of widespread communist preferences in Emilia Romagna (my progressive culture region) to Nazi occupation during WWII. They also provide a review of studies on the origins of extreme political preferences. My findings indicate culture as an alternative explanation.

Political preferences are also studied by [Acemoglu et al. \(2020\)](#), who explain the rise of fascism in Italy as a response to socialism in the aftermath of WWI. [Basten and Betz \(2013\)](#) also

⁴[Todd \(1990\)](#) also theorizes that a highly cooperative culture seeks representation in parties that promote cooperation, such as the socialist and communist parties. On the other hand, the patriarchal culture north of the Po closely resembles the image of God and Christ and their relationship in the Catholic doctrine.

use a geographic RD design: they show that the pseudo-random conversion to Protestantism in XVIth-century Switzerland increases current dislike over redistributive policies and the reduction of working hours, in line with Protestant doctrine.

I contribute by disentangling the effect of institutions and finding that it is a null effect, because of the pre-existing cultural norms and their effect through social capital. [Nunn and Wantchekon \(2011\)](#) find that an institution that undermined mutual trust and cooperation – the slave trade – persist in local culture. In this case, the high level of cooperation in the culturally progressive region limited the consequences of an externally imposed oppressive institution.

This paper is also related to the causal literature on the persistence and long-term determinants of gender norms. Among cultural explanations, [Alesina et al. \(2013\)](#) and [La Ferrara and Milazzo \(2017\)](#) use Murdock's classification of ethnicities as treatments. The former show that the use of the plough in the distant past translates into lower contemporary female labour participation and less equal gender norms; the latter analyze the effect of an inheritance law reform in Africa on populations with different inheritance norms, and find that the policy had different effects on the education investments made on boys and girls. On the institutional side, [Lippmann et al. \(2020\)](#) find that institutions in Eastern Germany have prevailed over traditional gender roles in shaping female labour market outcomes. [Teso \(2019\)](#), instead, shows that the gender imbalance caused by slave trades in Africa had persistent effects on contemporary gender norms and female labour participation. I show that cultures implying strong differences in gender norms persist in the long run regardless of the superimposition of gender unequal institutions.

I also contribute to the literature on [Todd](#)'s family systems in both economic history and applied microeconomics, since they define the cultural variable in this study (see [Section 3.1](#)). Family systems correlate with various modern and contemporary socio-economic indicators, such as education, regional growth, and labor market outcomes ([Duranton et al., 2009](#); [Baudin and De Rock, 2021](#)). In light of the increasing availability of historical microdata, family systems informed new indexes such as the Female Friendliness Index by [De Pleijt et al. \(2019\)](#), or the Patriarchy Index by [Szoltysek and Poniat \(2018\)](#). Along with other correlational studies (e.g. [Carmichael et al. \(2016\)](#); [Bertocchi and Bozzano \(2015, 2016\)](#)), these contributions show that family systems can predict gender differences in educational attainments, employment, and various indicators of female agency. To my knowledge, this is the first paper that causally tests [Todd](#)'s theories on the nexus between family systems, religiosity, political affiliation, and female emancipation.

Finally, to attain causal identification, I propose and formalize an extension to geographic regression discontinuities designs, the Difference-in-Geographic RD (DIG). The proposed extension allows tackling the issue of compound treatments discussed by ([Keele and Titiunik, 2015](#)) by exploiting spatial heterogeneity in the assignment of multiple treatments. Methodologically, it relates to [Grembi et al. \(2016\)](#), who proposed a similar strategy to disentangle compound effects in traditional RD studies, when the adoption of multiple treatments is staggered over time rather than across space. The DIG can be used with any underlying geographic RD estimator: in my applica-

tion, I rely on the Distance Adjusted Propensity Score Matching (DAPS_m) ([Papadogeorgou et al., 2019](#)) and on ([Dell, 2010](#))’s estimators.

3 Historical background

In this section, I present the historical setting with the objective of clarifying the definition of the two treatments. In [Section 3.1](#), I describe family systems, the cultural treatment (C); in [Section 3.2](#) I sketch the evolution and characteristics of historical states in the area, and their relationship with Catholic religion (I). Having defined both treatments, [Section 3.3](#) discusses the history and geography of the Po river in relation to the identifying assumptions of the geographic discontinuity design. Finally, [Section 3.4](#) provides a concise description of the history of Italian politics across the XXth century to clarify the nature of the outcome variables.

3.1 Culture (C): Family systems

[Mason \(2001\)](#) concisely defines family systems as “a set of beliefs and norms, common practices, and associated sanctions through which kinship and obligations of particular kinship relationships are defined. Family systems typically define what it means to be related by blood, or descent, and by marriage; who should live with whom and at what stages of the life course; the social, sexual, and economic rights and obligations of individuals occupying different kin positions in relation to each other; and the division of labour among kin-related individuals”. They were classified in Europe at the NUTS-3 level by [Todd \(1990\)](#),⁵ who pinpoints the origin of these norms around A.D. 1000, in the heart of the Middle Ages.⁶

In my setting around the Po river there are two family systems ([Figure 1](#)) characterized by different inheritance norms and a different intensity of patriarchal authority:

- The *Communitarian family system*, which I will refer to as “**Progressive culture**” ($C = 0$) for simplicity, was located south of the Po river, in the Italian region of Emilia-Romagna. In this system, all male children could get married and their wives entered the groom’s extended household under the authority of the groom’s father, the patriarch. Upon his death, each male child inherited an equal share of the family’s wealth, and became patriarch of his own household;
- The *STEM family system*, which I will refer to as “**Conservative culture**” ($C = 1$), was located north of the Po river, in the Italian region of Veneto.

⁵Todd built on pre-existing work by the French sociologist Le Play, (1806 - 1882) ([Todd, 1985](#)).

⁶In line with other popular cultural classifications, like the ethnic classification by [Murdock \(1967\)](#) adopted by [Alesina et al. \(2013\)](#), family systems are strongly associated to traditional agrarian practices, which shaped norms within families in periods when households also constituted agricultural enterprises.

In this system, only one male child was allowed to get married: only his wife entered the household, and they lived under the patriarch's authority. Upon the patriarch's death, the chosen son inherited the role of patriarch and the entire household wealth. When other male sons were allowed to marry, they were not entitled to any bequests or authority and had to remain under their brother's authority. More often, they left the household. Typically, they remained unmarried to avoid future inheritance claims, or joined the clergy.

Todd's classification is based on the cohabitation of married siblings observed in historical census data and parish registries.⁷ The rules that characterized family systems were strict and enforced. [Garino \(1985\)](#) reports that between the XIIIth and the XVIIIth century, both noble and peasant families north of the Po (conservative, $C = 1$) made frequent use of the *fedeicommissum* institution. This allowed the patriarch to command that the entire wealth remained in the hands of a single heir: all bequests in the hands of non-designated children were bound to return to the designated heir upon their death.

For agricultural families, which constituted the vast majority of the population until the XXth century, the enforcement of norms had consequences for the family's sustenance. Most families entered a sharecropping contract with the landowner. Due to the direct link between the family's workforce and agricultural output, until the XIXth century these contracts stated that marriages and fertility choices had to be approved by the landlord ([Molini, 1858](#)). Within the family, the patriarch was directly responsible for abiding by these clauses. A hypothetical young couple that violated these norms and left the household would turn to salaried work, with much lower living standards, as they would not have the necessary workforce to enter a separate sharecropping contract ([Barbagli, 2000](#)).⁸

Moreover, since the Middle Ages, Canon Law (for many centuries the only family law) sanctioned that the patriarch had authority upon children's marriages, based on social and economic convenience, and that challenging it was a prosecutable crime ([Catholic Church, 1959; Esposito, 2018](#)). In Italy, sharecropping was abolished in 1964, and the legal figure of the household head in 1975.⁹

Historical census data provides descriptive evidence that family systems remained in place at

⁷Parish registries were mandated by the Catholic Church in 1614, but the Republic of Venice on the north bank of the Po had begun collecting census data already in the XVth century ([Sonnino, 1996](#)).

⁸Sharecropping remained the prevalent form of agricultural production on both riversides until the XIXth century, when the southern riverbank ($C = 0$) saw a sudden shift towards salaried agricultural work. Sharecropping became again prevalent following targeted fascist policies.

⁹In both cases, the formal and actual abolition coincide. Italian agricultural workers already demanded the abolition of sharecropping in 1919 ([Cova, 2011](#)). However, its importance was even increased by the fascist regime, which used it to colonize formerly uninhabited lands with people from distant regions (especially Veneto and Emilia-Romagna, on the Po riversides). These colonization experiences were sometimes prolonged long after the end of fascism, until the 1970s (for instance, in the case of the Pontine Marshes ([Folchi, 2000; Alfieri, 2018](#))). The 1970s were also years of protests and female emancipation movements, which firmly campaigned to keep divorce and abortion legal before the respective referenda, and for women's parity in Family Law – including the abolition of the household head figure ([Vellati, 2017](#)).

least until quite recently.

In the XIXth century the share of children born outside wedlock had its national minimum on the north bank of the Po (conservative, $C = 1$) and its maximum in the provinces on the south bank (progressive, $C = 0$) ([MAIC, 1874, 1883, 1900](#)). In most cases, these children were then recognized in their first years of life after the parents got married, suggesting that this metric is indicative of sexual freedom, and of different levels of patriarchal authority over fertility and marriages choices ([Bertocchi and Bozzano, 2015, 2016](#)). Moreover, the different norms predict a larger family size in the conservative region ($C = 1$): [Section F](#) in the Appendix shows with maps that this prediction is verified until the 1970s, and that average family size is spatially correlated with Catholic votes.

[Todd](#)'s theoretical hypothesis on the causal link from family systems to religiosity, ideology, and gender norms posits that Catholic doctrine is closely mirrored by a strong patriarchal authority and by non-egalitarian inheritance norms. Hence, STEM families (conservative, $C = 1$) would adhere more strongly to Catholicism and exhibit more conservative political preferences compared to Communitarian (progressive, $C = 0$) families.¹⁰ A more direct mechanism is the higher reliance on the clergy as a means of sustenance for unmarried children north of the Po ($C = 1$), as discussed in [Section 8](#). Inheritance norms also affect women's role within the household, which mirrors closely their husband's authority ([Barbagli, 2000; Carmichael et al., 2016](#)). In STEM (conservative, $C = 1$) families, unequal bequest rules imply that only the chosen heir can marry: by construction, there will be on average fewer women or, if the numbers are comparable, a much larger portion will be represented by the patriarch's daughters, who are deprived of indirect inheritance and are thus in a more submissive position. Those that married a patriarch had to give birth to more children to maintain a sufficient working force in the sharecropping family. In a Communitarian (progressive, $C = 0$) family, more women will be wives of male children, each of whom is entitled to the same share of inheritance and authority. To this end, [Barbagli \(2000\)](#) reports that in STEM (conservative, $C = 1$) families these hierarchies also translated in codified domestic rites: for instance, it was typical for women to eat meals separately from males and while standing, except for the patriarch's wife, if she was old enough. [Table 1](#) summarizes the characteristics of family systems on the two banks of the Po river. Todd's theory predicts that the northern bank (conservative, $C = 1$) should exhibit stronger support for the Catholic party, and stronger resistance to the legalization of abortion and divorce.

¹⁰See [Todd \(1990\)](#), part 2.

Table 1: Summary of Family Systems (C)

Location	Family System	Inheritance norms (over wealth and patriarchal authority)	Patriarchal authority	Female agency
North of Po river (Veneto)	More conservative ($C = 1$) (STEM)	Undivided	Stronger	Weaker
South of Po river (Emilia)	More progressive ($C = 0$) (Communitarian)	Egalitarian	Weaker	Stronger

3.2 Formal institutions (I): pre-unitary states and religion

Figure 2 shows the different states in the area around the Po in 1797. It is representative of the historical setting from the end of the XVIth century to 1861, with the exception of the Napoleonic period (1797-1815). Section A in the Appendix provides additional details on the evolution of pre-unitary borders over time. The Papal States (conservative, $I = 1$) and the other states in the area (progressive, $I = 0$) exhibit clear and sharp differences in their formal relationship with Catholic religion already from the Middle Ages. Following the historical literature, I describe these differences in three key historical phases: (i) from the Low Middle Ages to the Inquisition period (A.D. 1000-1500 ca.); (ii) from the Inquisition period to the codification of laws (A.D. 1500-1800 ca.); (iii) the Modern era (A.D. 1800-1861).

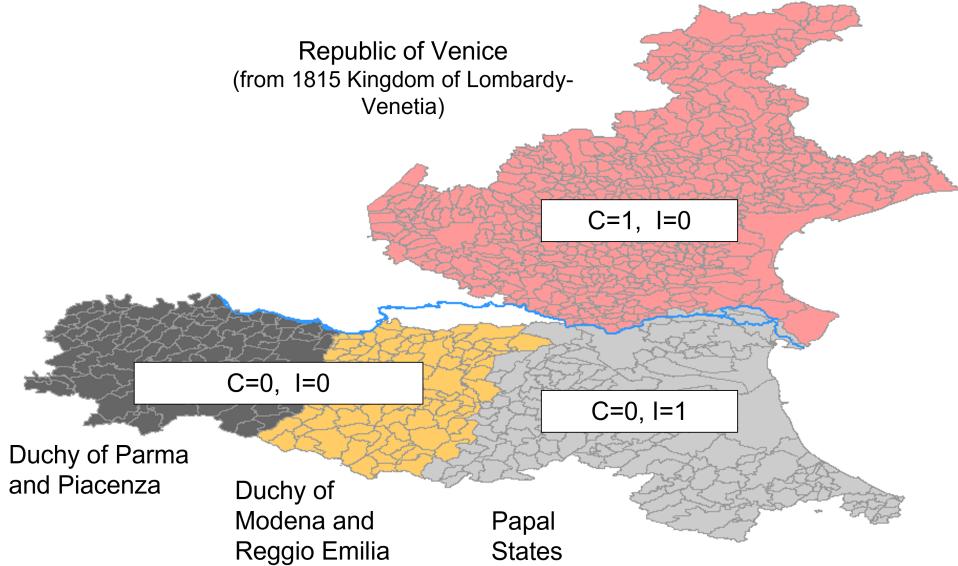
First period: from the Low Middle Ages to the Inquisition period (A.D. 1000-1500 ca.).

In this period, while family systems began developing in the area, the Papal States (conservative, $I = 1$) already applied Canon Law also for criminal and civil proceedings. The first codified piece of law, dated 1140, remained the cornerstone of Catholic Canon Law until its abolition in 1917 (Pertile, 1892; Prodi, 1982). It directly refers to the Sacred Books, and it equates crimes with sins, prescribing corporal punishments as a form of mortification of the body and expiation of sins. One of its fundamental principles sanctioned that secular tribunals are subject to the Church's authority, as a result of the equation between crimes and sins (Catholic Church, 1959; Prodi, 1982).

As a result, from the Late Middle Ages (1250 ca.) Church tribunals began working with the explicit intention to monitor and control morality, advocating extra-territorial jurisdiction on moral and family law (which concerned abortions and bequests)¹¹, heresy and blasphemy (Bellabarba, 2008). The Republic of Venice ($I = 0$) reacted by re-affirming its secular jurisdiction, while also engaging in several diplomatic and military conflicts with the Papal States over the domination of the Po waters and the surrounding area. This earned Venice several interdicts (collective excommunications from the Pope), from the XIIIth to the XVth century (Bouwsma, 1968; Piasentini, 1999). These contrasts, however, were institutional and not religious: during the entire duration of the

¹¹More in general, all that concerned family law, hence marriages, adultery, separations, sexual violence.

Figure 2: Territorial divisions in 1797



Notes: Papal States will be defined as “conservative institutions” ($I = 1$). All other territories in this map are coded as $I = 0$ (“progressive institutions”). This disposition of pre-unitary is representative since the XVIth century, and then again from 1815 to 1861.

1480s excommunication, Venetians kept celebrating masses against the Pope’s orders, with soldiers defending churches’ gates (Piasentini, 1999). In terms of legislation against blasphemy, Cantini (1800) reports that in the Papal States ($I = 1$) blasphemous commoners were often subjected to severe corporal punishments.¹² Until 1442 in the Republic of Venice ($I = 0$), blasphemies – only those against Venice’s protector, Mark the Evangelist – were simply subject to a fine, and there are no records of any trial for blasphemy until 1450 (Piasentini, 1999; Derosas, 1980).

Second period: from the Inquisition period to the codification of laws (A.D. 1500-1800 ca.)

In the last years of the XVth century, all European states underwent a phase of moralization and increased attention towards orthodoxy: the increased frequency of recent epidemics and, in the case of Venice, the recent defeats against the Muslim Ottoman Empire were interpreted as direct consequences of the widespread disrespect of Catholic morals. Within the Papal States’ borders, the central control of Rome over the population and administrators in the peripheral provinces was strengthened, with virtually no distinction between secular and religious matters and with

¹²They had to pay a high fine within 10 days or undergo corporal punishment: depending on the number of admonitions, these could go from public exposition to lashing and tongue mutilation.

heavy use of repressive methods (Prodi, 1982).¹³ This shift in attitudes became even stronger with the advent of the Protestant Reform, in 1517 (Piasentini, 1999; Cantini, 1800; Derosas, 1980), followed by the establishment of several Inquisition tribunals. The Roman Inquisition in particular, which operated in Italy and reported directly to cardinals in Rome, strengthened its control on the population by setting up its tribunals also outside the Papal States. These claimed jurisdiction on all crimes connected to heresy and blasphemy and arrived at commanding compulsory confessions, which became the source of approximately 70% of all new investigations (Bellabarba, 2008; Black, 2009). The Inquisition transformed local parishes in places of control, severing the centuries-old relationship between villagers and their parson: once a trusted fellow villager with higher education, now an instrument of oppression and an Inquisition prosecutor (Cherubini, 1984).

Such a controlling structure was received with uprest and resistance outside the borders of the Papal States. The neighboring Duchy of Modena and Reggio Emilia south of the Po river ($I = 0$) saw several conflicts between the local clergy and feudal lords (Rambaldi, 1991). The latter increased their popularity in rural villages and engaged in violence against numerous priests with the support of the Duchies, causing the Inquisitors to start prosecution against them. The central government in Rome, afraid of worsening their relations with the Duchies and for the many episodes of violence, responded by advising local Inquisition tribunals to be more lenient. Interestingly for causal identification, the Duchies appointed feudal lords who were in conflict with nobles families from the Papal States to administer regions at the border, for they would invest the necessary resources to protect the integrity of the borders in a context of frequent violence and incursions. The Papal States had recently enlarged their territories and pushed to expand towards the West. The military conflicts at the border, jointly with a feudal organization that tied villagers to their feudal lord, made it nearly impossible to migrate across states.¹⁴

Similarly, the Republic of Venice ($I = 0$) harshly negotiated and obtained jurisdiction over heterodoxy (Black, 2009). While the Papal States ($I = 1$) replaced the harshest corporal punishments with the death penalty (Cantini, 1800), the Republic of Venice kept corporal punishments out of the picture (Piasentini, 1999). The Republic established its own tribunal against blasphemy shortly after, also aimed at preventing the cession of power to the Inquisition (Derosas, 1980). This *de facto* independent tribunal punished blasphemy, a very widespread habit in the Republic of Venice, only when committed along with other crimes (Derosas, 1980),¹⁵ and even trials for heresy and witchcraft in the Republic made particularly limited use of torture and led to no executions (Seitz, 2011).¹⁶ In 1606, the tension with the Papal States over jurisdiction brought a new papal

¹³This period coincided with the conquer of the cities of Bologna and Ferrara south of the Po. The repression of independent decision-making also affected local clergy, which was put under the strict monitoring of new administrators sent from Rome and used as appendices of the Roman Inquisition (Rambaldi, 1991)

¹⁴Rambaldi (1991) also reports that the few immigrants in villages close to the border arrived alone, and that they were excluded from participating in public life, lived in conditions of extreme poverty, and often spurred violent clashes with the local population.

¹⁵This institution, called *Esecutori contro la bestemmia* conducted a total of 702 trials for blasphemy between 1642 and 1657: among the condemned, none had committed only blasphemy, and sentences posed great emphasis on the other crimes.

¹⁶For a total of approximately 600 trials between 1550 and 1650. Magic was also a widespread habit of commoners

Table 2: Comparison of XIXth century penalties for religious and moral crimes

	$I = 1$	$I = 0$	$I = 0$	$I = 0$
Crime	Papal States	Duchy of Modena and Reggio Emilia	Duchy of Parma and Piacenza	Kingdom of Lombardy-Venetia
Abortion	10 years imprisonment	15 years imprisonment	3-5 years imprisonment	1-5 years imprisonment
Blasphemy	1-3 years forced labour	6 months imprisonment if due to anger outburst, 5 years forced labour if heretical and deliberate	Unmentioned	Unmentioned
Theft of sacred objects	Death	Death for sacramental bread, for other sacred objects ≥ 5 years forced labour	Forced labour for life for sacramental bread, not mentioned for other sacred objects	Unmentioned
Scandalous interruption of religious function	15-20 years imprisonment	Max 7 years imprisonment if the priest is outraged	1-3 years imprisonment	6-12 months imprisonment, 1-5 years imprisonment if public safety is put at risk

Notes: Based on the direct comparison of post-Napoleonic criminal codes (1815-1866) – ([Ducato di Modena e Reggio, 1852](#); [Ducato di Parma, Piacenza e Guastalla, 1850](#); [Catholic Church, 1862](#); [Regno Lombardo-Veneto, 1852](#)). The Kingdom of Lombardy-Venetia includes all territories north of the Po in the area of study.

interdiction, which led Venice to exile a large part of the clergy. This fact, known as the Interdict War, almost developed into a wide-European conflict and was only resolved by the mediation of France ([Loughlin, 1913](#)).¹⁷ At the end of the Interdict War, Venice kept the ban on the Jesuits, key actors of the Inquisition tribunals.

Third period: Modern era (A.D. 1815-1861) Napoleonic occupations introduced the codification of laws. Starting in 1815, the criminal codes of the Papal States ($I = 1$) and all more progressive institutions ($I = 0$: the Duchy of Modena and Reggio Emilia, the Duchy of Parma and Piacenza and the Kingdom of Lombardy-Venetia) can be directly compared.¹⁸ [Table 2](#) shows that religious crimes are punished much more harshly in the Papal States ($I = 1$). The same is true for abortion, except for the Duchy of Modena and Reggio Emilia, which prescribes 5 additional years of imprisonment compared to the Papal States. The Lombardy-Venetia's code and the Duchy of Parma and Piacenza's codes are far less detailed concerning crimes against religion.¹⁹

3.3 The Po as a hard border and the colonization of the Po Valley

The Po is the longest and one of the largest Italian rivers and it generates the Po Valley, the widest plain in the country. In its trait within my setting, its mean daily discharge between 1921 and 2011

since the Low Middle Ages, as documented by archival sources analyzed by [Piasentini \(1999\)](#).

¹⁷The conflict started when two monks were arrested and trialed by a Venetian tribunal and jailed over common crimes. The Catholic Church claimed full jurisdiction over any crimes committed by members of the clergy, and the Venetians refused to hand over the two prisoners. Also in this case, for the entire duration of the interdiction, Venetians kept celebrating masses and Catholic festivities.

¹⁸The different length of Napoleonic occupation does not drive the results, as introduced in [Section 7](#) and discussed in [Section D.2](#).

¹⁹[Section E.3](#) will show that the inclusion or exclusion of the Duchy of Parma and Piacenza south of the Po, which is the most lenient among the states labeled as progressive ($I = 0$), does not affect the estimates.

is estimated between 180 and $280m^3/s$: due to the lower exploitation of its waters for agriculture and to more intense precipitations, climatologists and historians estimate a higher discharge the further back in time. The areas just around the Po were characterized by frequent floods until the construction of embankments by Napoleon in 1806 (Zanchettin, 2008). Before that, floods made the area uninhabitable for most of the year, due to the high prevalence of malaria and the absence of permanent roads over humid terrains (Bocchi, 1861).

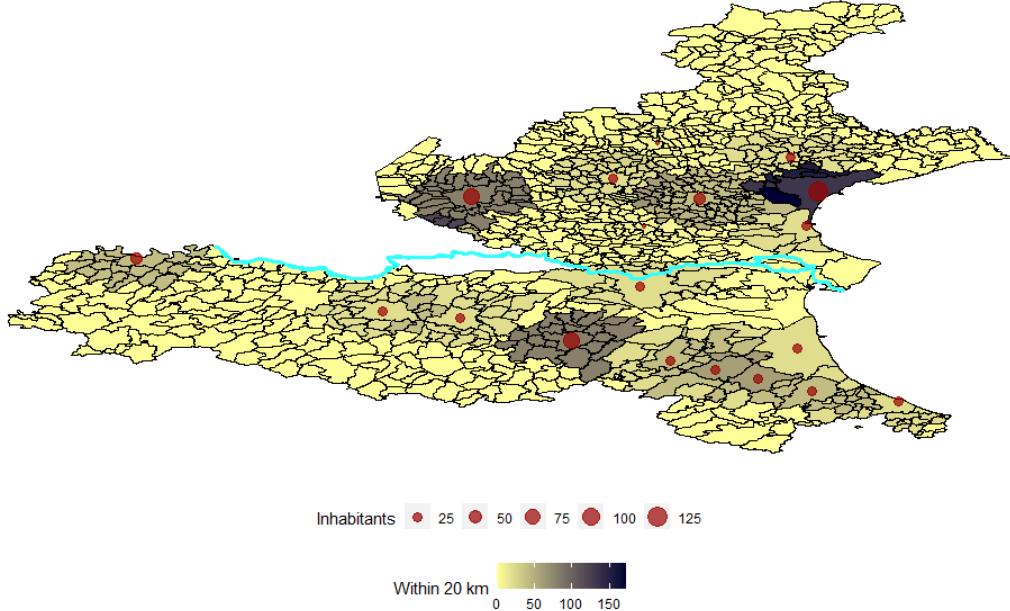
These floods are particularly important for the colonization of the two riverbanks and hence for the classification of family systems, for two reasons. First, right after the fall of the Roman Empire (A.D. 569-774),²⁰ they caused a drastic demographic fall around the river, coupled by frequent Germanic incursions that the river contained to the northern riverside. The conservative culture ($C = 1$) is typical of Germanic populations and the incursions were probably a channel of transmission (Todd, 1990). Second, the current course of the river is the result of a series of intense floods that occurred around A.D. 1152 (Uggeri, 2004), that is before the areas immediately close to the river were permanently re-colonized by the farther inland. Figure 3 shows cities in the area with more than ten inhabitants in 1300, the moment of maximal development in the Middle Ages. Excluding Ferrara (8km away from the 1152 course of the Po), the area near the river was still sparsely populated. Indeed, the second wave of colonization (which did not concern the lowest points of the plain) began only in the XVth century, with some areas close to the river's mouth colonized as late as the XVIIIth century (Sonnino, 1996). This complements Todd (1990)'s evidence on the Po river representing a discontinuity in the culture of family systems.

The remaining challenge for identification using a regression discontinuity design at the Po is potential interferences between the two riversides (note that, however, though these would imply a negative bias). Crossing the Po became feasible for a common citizen only at the end of the XIXth century, for several reasons. First, quite trivially, because that is when the first permanent bridges were built (Romanoni, 2008). Second, because although the Po had a higher discharge in the past, the width of the Po in this trait has remained constant over time, implying stronger currents and more dangerous navigation (Orlando, 2011).²¹ Direct historical recounts of the dangers of navigation due to rip currents can be found from the XIIIth to the XIXth century (Uggeri, 2004; Bocchi, 1861). Finally and most importantly, the Po has always been the border between different states in conflict with each other for many centuries over the control of navigation. As such, the river itself has been the theatre of several conflicts from the IXth to the XVIth side, to the extent that all existing (temporary) bridges before the XIXth centuries were guarded pontoons or fortified wooden bridges, controlled by soldiers from either river bank, whose aim was monitoring, taxing and often blocking each other's commercial traffic on the river (Romanoni, 2008; Uggeri, 2004; Bocchi, 1861). Wooden bridges were also the target of attacks from enemy ships (Romanoni, 2008). For all these reasons, already in the XIIIth century the Republic of Venice established an armed fluvial

²⁰During the Langobard Kingdom.

²¹The direct recount by "Marin Sanudo the Young", in 1483, reports that the pontoon bridge in Pontelagoscuro was 410 Roman steps long (23 boats), corresponding to approximately 607m (Uggeri, 2004). The current bridge in the same locality is 610m long.

Figure 3: Thousands urban inhabitants within one day of travel (20 km) in 1300



Notes: Red dots show urban population estimates in thousands inhabitants for year 1300, before the Black Death demographic crisis ([Sommario, 1996](#)). For each municipality, the colour indicates city inhabitants (thousands) within a 20km radius, which approximates the maximum distance that a man could walk in a day.

police force on the Po, aimed at preventing any form of unauthorized mobility, escorting ships to protect them from attacks, and supporting them in case of shipwrecks due to currents ([Orlando, 2011](#)).²²

3.4 A primer on Italian Catholic politics after WWII

The first openly Catholic party, *Partito Popolare Italiano* (PPI) was founded in 1919 and first ran for elections between 1919 and 1924. Those elections, however, were characterized by widespread fascist violence aimed at preventing Catholics and socialists from voting, especially in the Po valley. Therefore, I exclude them from the main analysis. In [Section B.1](#) in the Appendix, I provide further historical details and I present results for those 3 elections.

Democrazia Cristiana (DC) was founded as the successor of PPI in 1943 and became a key element of the Italian Resistance. The first post-war political elections were held in 1948, for the first time with male and female universal suffrage. The 1948-1994 period, known as the *first republic*, was characterized by large mass parties: DC (the largest one) and, most notably, the red *Partito Comunista Italiano* (PCI) and *Partito Comunista Italiano* (PSI). The end of the *first republic*

²²In the Peace of Costanza (1186), the Republic of Venice had also sanctioned that building pontoons was an exclusive right of state institutions.

coincided with the dissolution of all three parties. PCI was the first to dissolve, in 1991, following the fall of the U.S.S.R.. On the other hand, PSI and DC dissolved after a series of scandals on party financing and corruption known as *Tangentopoli*, which began in 1992 and led to the redefinition of the entire Italian political scene and to the end of the mass-party era in Italy.

4 Data

I combine data from several sources. I employ data from the Italian Ministry for Internal Affairs ([Ministero dell'Interno, 2020a,b,c](#)) on the results on the two referenda, which were held in 1974 (on divorce) and 1981 (on abortion), and of every political election from 1948 to 1992 for the Chamber of Deputies, a total of 11 elections.²³ For all voting occasions, no municipality reported missing data ($N = 923$). Since several municipalities underwent mergers and separations between 1948 and 1994, I harmonize all years to the municipalities in place in 1979, that is the mid-election and also the one between the two referenda.

Other covariates at the municipality level, measured every 10 years from 1951 to 1991, are taken from the decennial census ([ISTAT, 2020](#)). Since they are contemporaneous to the outcome variables, they are not used as baseline covariates in my model. However, average family size, a proxy of the persistence of family systems, is used to corroborate the results descriptively. For each municipality, I also compute the number of urban inhabitants within 20 km of the modern city hall in year 1300, based on population data from [Sonnino \(1996\)](#) – shown in [Figure 3](#). Coordinates and altitude of municipalities are taken from [ISTAT \(2015\)](#): in computing distances from rivers, I take the coordinates of the city hall.²⁴ Raster data on rivers are from [ISPRA \(2020\)](#). Data on the attendance of Catholic religion classes in schools and the total number of students are from the Italian Ministry of Education ([UAAR, 2022](#)). Finally, social capital indicators used to analyze mechanisms in [Section 8](#) are taken from [Guiso et al. \(2016\)](#).

Summary statistics of outcomes and municipality characteristics by treatment groups are presented in [Section C](#) in the Appendix.

²³Perfect bicameralism implies that at political elections, voters above 25 years old could vote for both the Chamber of Deputies and the Senate, whereas the voting age (18 since the 1976 elections) only allows voting for the Chamber of Deputies. Moreover, in [Section B.1](#) I repeat the analysis for the 1919, 1921, and 1924 elections: for those, I only have access to results for the Chamber of Deputies.

While the results of the 1972 political elections and the referendum on divorce from 1974 are available online, the results of the 1981 referendum on abortion at the municipal level are kept at physical archives of the Ministry of Internal Affairs and were digitized manually.

²⁴As an alternative, I also computed the distance between the river and the average latitude and longitude within a municipality's polygon, and taking the minimum distance of each polygon from the river: the results are not affected. However, the procedure is much more computationally intensive. Note that the oldest available geographic data are from 2011: in cases when municipalities underwent mergers from the period of analysis to 2011, I assign the coordinates of the new city hall to all the original municipalities.

5 Empirical Strategy

5.1 Geographic Regression Discontinuity Estimator

In intuitive terms, a DIG point estimate is the difference of two geographic regression discontinuity (GRD) estimates. These, in turn, must be estimated with an underlying GRD estimator. In what follows, I will briefly define GRD estimators in generic terms, as it will be useful to formalize the Difference-in-GRD (DIG) estimator in the next section. For a more detailed presentation of GRDs, I refer the reader to [Keele and Titiunik \(2015\)](#).

Consider a municipality i , with $i \in \{1, 2, \dots, N\}$, uniquely identified by its coordinates (latitude and longitude), $\mathbf{L}_i = (L_i^1, L_i^2)$. For the sake of illustrating a generic GRD estimator, let there be a single binary treatment indicator $T = \{0, 1\}$, which changes discontinuously at a geographic threshold denoted \mathcal{B} , the border. In this setting, the border \mathcal{B} corresponds to a line (the river), and it is composed of a set of points denoted \mathbf{b} , where $\mathbf{b} = (L^1, L^2) \in \mathbb{R}^2$. Let \mathcal{B} separate space in two non-overlapping regions, defined as the sets of treated and control units, $\mathbf{L}_t \equiv \{(L_i^1, L_i^2) : T_i = 1\}$ and $\mathbf{L}_c \equiv \{(L_i^1, L_i^2) : T_i = 0\}$. Define average potential outcomes as $Y(T) \equiv \mathbb{E}(Y_i(T_i) | T_i)$. Finally, let t index treated units, $t \in \{1, 2, \dots, N_t\}$ and c index control units, such that $c \in \{N_t + 1, N_t + 2, \dots, N\}$, so that $N_t + N_c = N$. Under continuity of potential outcomes, the GRD at border point \mathbf{b} , for an observed outcome Y , is identified by:

$$E_{\mathcal{B}}[\tau(\mathbf{b})] \equiv E_{\mathcal{B}} \left[\lim_{\mathbf{L}_t \rightarrow \mathbf{b}} E \{Y_i | \mathbf{L}_i \in \mathbf{L}_t\} - \lim_{\mathbf{L}_c \rightarrow \mathbf{b}} E \{Y_i | \mathbf{L}_i \in \mathbf{L}_c\} \right]$$

Note that one could potentially identify $\tau(\mathbf{b})$ for each $\mathbf{b} \in \mathcal{B}$ and obtain their distribution. This formulation indicates that the GRD estimator of interest is the mean of that distribution, i.e. $E_{\mathcal{B}}[\tau(\mathbf{b})]$. For simplicity, in the remainder of this paper I will restrict to the neighbourhood of \mathcal{B} implicitly: I will omit from the notation the limits and the expectation over the distribution of \mathcal{B} , and I will refer to $E_{\mathcal{B}}[\tau(\mathbf{b})]$ as:

$$\tau(\mathbf{b}) \equiv E[Y(1)] - E[Y(0)]$$

There are many possible estimators for GRDs. The one I will adopt in my analysis is the Distance Adjusted Propensity Score Matching estimator (DAPSm) by [Papadogeorgou et al. \(2019\)](#). The DAPSm estimates the Average Treatment Effect on the Treated (ATT, the estimand) by performing 1:1 nearest-neighbour matching without replacement on the DAPS score:

$$DAPS_{tc} = w \times |PS_t - PS_c| + (1 - w) \times \text{Dist}_{tc} \tag{1}$$

where $w \in [0, 1]$ determines the relative importance of the geographic distance between two elements of each pair, and of their propensity scores PS , which models assignment to treatment conditional on a vector of observables \mathbf{X} . Let me anticipate that I also include in \mathbf{X} the closest tract of the

river. Namely, I separate the river into 10 equally long tracts and for each municipality, I define a factor variable indicating the closest one, to ensure that matching is also based on longitude. In my analysis, I compute Dist_{tc} as the Euclidean distance between paired t and c 's city halls, and I set $w = 0.5$. In [Section E.2](#) in the Appendix, I show that results remain comparable with different values of w (estimates become slightly larger as w approaches 1). I also specify a caliper equal to 0.4 for the propensity score PS , such that two municipalities whose propensity scores differ by more than 0.4 cannot be matched. Moreover, even though DAPS m relies on propensity score matching, I include a limit on the standardised difference in means across treated and control group on single covariates in \mathbf{X} , equal to 0.5. In other words, if for any observed covariate the standardised difference in means between the treated and control group exceeds 0.5, the matched dataset is not considered valid and the matching algorithm starts over.

The choice of DAPS m is motivated by two observations. First, as noted by [Keele et al. \(2015\)](#), in traditional RD designs that restrict to a small neighbourhood of \mathcal{B} , unconfoundedness holds regardless of conditioning on covariates: this, however, requires a sufficient density mass of observations located around the border \mathcal{B} . Conditioning on pre-treatment covariates can guarantee unconfoundedness in contexts where it is necessary to enlarge the bandwidth beyond the immediate proximity of \mathcal{B} . In this setting, out of 923 municipalities, only 78 are located within 10 km of the river Po, 176 within 20 km: it is a natural consequence of using municipal rather than individual data. Incidentally, by showing robust estimates across specifications that include increasing numbers of covariates, I can test and show evidence of unconfoundedness even in the largest sample, where the maximum distance is 175 km (the 75th percentile is 81 km). Second, precisely because municipal data imply a limited sample size compared to standard matching studies, and because of computational feasibility, I prefer propensity score matching to exact and distribution-based matching methods: because of these two specific advantages, I chose the DAPS m over [Keele et al. \(2015\)](#)'s GRD estimator. [Section E.3](#) in the Appendix presents a robustness check with a different underlying GRD estimator ([Dell \(2010\)](#)) that does not rely on matching.

5.2 Difference-in-Geographic discontinuities: the DIG estimator

[Keele and Titiunik \(2015\)](#) formalized and discussed, in the context of GRDs, the assumption of Compound Treatments Irrelevance. If multiple treatments change at \mathcal{B} , one must assume that all treatments except the one of interest are either continuous at \mathcal{B} , or that they have no effect on the outcome. [Keele and Titiunik](#) then hint towards a design à la [Grembi et al. \(2016\)](#): the intuition is that, if the confounding treatments vary at the same border but they are introduced at different points in time, one could estimate one GRD for each of the two periods and take their difference, and in this way isolate the effect of the policy of interest.

However, in this setting and in most long-term persistence studies, treatments are assigned in a distant past in which the only quantitative information available are geographic variables, and the

outcomes are only measured in the present. The DIG estimator exploits geographic mismatches in the assignment of multiple treatments to identify the effect of (at least) one of them.

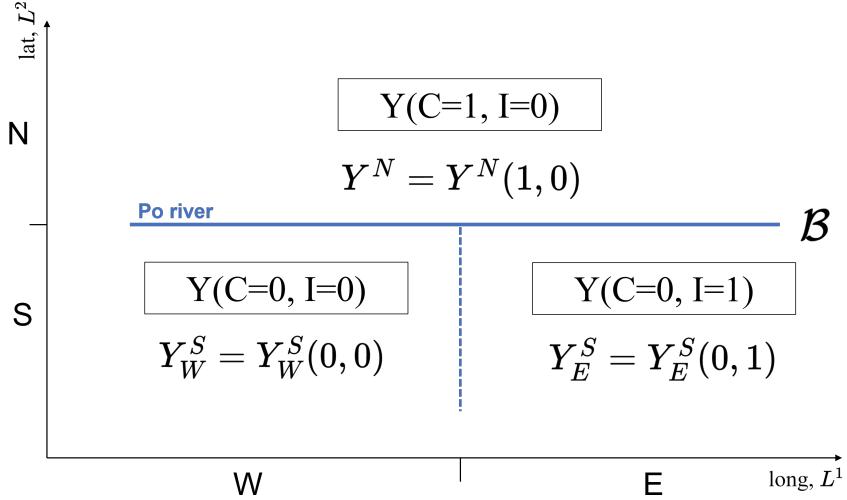
In the Po valley, two treatments are changing discontinuously at the river, which corresponds to the border \mathcal{B} . As in the previous sections, these treatments are denoted as C_i (culture) and I_i (Institutions):²⁵

$$C_i = \begin{cases} 1, & \text{for } L_i \text{ north of } \mathcal{B} \implies \text{conservative culture} \\ 0, & \text{otherwise} \implies \text{progressive culture} \end{cases}$$

$$I_i = \begin{cases} 1, & \text{if } i \text{ had conservative institutions (i.e. Papal States)} \implies C_i = 0 \\ 0, & \text{otherwise} \end{cases}$$

The aim is to identify the ATT of Papal States' domination (i.e. the effect on the treated of passing from progressive institutions, $I = 0$, to conservative ones, $I = 1$), unconditional from C . I denote average potential outcomes as $Y(C, I)$ and identify three geographic areas based on the observed values of C and I . In [Figure 4](#), I summarize the correspondence of observed and potential outcomes in this setting. For observed outcomes, I use superscripts N, S to denote the areas north and south of the river, respectively, and subscripts E, W to denote east and west in the southern area.

Figure 4: Correspondence of observed and potential outcomes



I make the following identifying assumptions:

Assumption 1. (*Continuity*)

²⁵Modern administrative regions are also separated by the Po river: I will show that this is not a concern when discussing results, in [Section 6](#).

All potential outcomes are, in expectation, continuous in latitude and longitude at the border. That is, for $C, I = (0, 1)$ and $\forall \mathbf{b} \in \mathcal{B}$:

$$\lim_{\mathbf{L}_i \rightarrow \mathbf{b}} E[Y_i(C, I) | \mathbf{L}_i \in \mathbf{L}_t] = \lim_{\mathbf{L}_i \rightarrow \mathbf{b}} E[Y_i(C, I) | \mathbf{L}_i \in \mathbf{L}_c] = E[Y_i(C, I) | \mathbf{L}_i = \mathbf{b}] \quad (\text{A1})$$

After separating the setting in a West and East areas ([Figure 1](#), [Figure 4](#)), I specify an homogeneity assumption.

Assumption 2. (Spatial homogeneity)

The ATT of culture (C) is the same in the West and East areas. Namely, for $I = 0, 1$, in a neighbourhood of \mathcal{B} :

$$E_{i=t}[Y^N(1, I)] - E_{i=t}[Y^S_W(0, I)] = E_{i=t}[Y^N(1, I)] - E_{i=t}[Y^S_E(0, I)] \quad (\text{A2})$$

Note that this formulation of A2 is specific to this application for three reasons. First, I define my estimand as the ATT. To identify the ATNT, the expectation could be taken only over untreated units ($E_{i=c}$), or unconditionally if the estimand of interest is the ATE. Second, in other settings the spatial homogeneity might be required over latitude, or both latitude and longitude, depending on the “location” of the treatment whose effect needs to be subtracted when taking the difference. Third, in other settings where the potential outcome $Y(1, 1)$ is observed and be used to identify the treatment effect of both treatments, the assumption should be generalized to both treatments. With A1-A2, I can drop superscripts N, S and subscripts E, W from potential outcomes.

Assumption 3. (Additivity)

The ATT of conservative institutions is independent of culture C in the neighbourhood of border \mathcal{B} , when $C = 0$ (south of the Po):

$$\begin{aligned} & E_{i=t}[Y(1, 1) | C = 0] - E_{i=t}[Y(1, 0) | C = 0] \\ &= E_{i=t}[Y(0, 1) | C = 0] - E_{i=t}[Y(0, 0) | C = 0] \end{aligned} \quad (\text{A3})$$

Note that, to identify the unconditional ATT of conservative culture, I would need to write out the corresponding condition. While the latter entails different potential outcomes, the intuition is not different: they both require that C and I do not have interactive effects on Catholic votes. Let me underline two observations concerning A3. First, because of the disposition of treatments, I only need to assume this for territories south of the Po (i.e. conditionally on $C = 0$). Second, this assumption is only needed to identify unconditional effects. Identifying the effect of conservative institutions conditional on progressive culture, or the effect of conservative culture conditional on

progressive institutions does not require A3 (both cases correspond to what actually realized in the history of the region in my setting).

Finally, I assume SUTVA, which in this setting must be formalized for two treatments. Define matrix $\mathbf{Z} \equiv [\mathbf{C}, \mathbf{I}]$, with row elements $\mathbf{Z}_i = [C_i, I_i]$, defining each unit's treatment status.

Assumption 4. (SUTVA)

4.1 Consistency. $\forall i$:

$$Y_i = Y_i(\mathbf{Z}_i) \text{ if } \mathbf{Z}_i = C_i, I_i \quad (\text{A4.1})$$

4.2 No spillover effects. For both treatments C and I and for any two distinct municipalities $i \neq j$, the outcome for unit i does not depend on the treatment of unit j :

$$Y_i(\mathbf{Z}) = Y_j(\mathbf{Z}') \text{ if } \mathbf{Z}_i = \mathbf{Z}'_i \quad (\text{A4.2})$$

Define now the two following GRDs, one for the West and one for the East areas:

$$\begin{aligned} \tau_W(\mathbf{b}) &\stackrel{(A4)}{=} E_{i=t}[Y^N(1, 0)] - E_{i=t}[Y^S_W(0, 0)] \\ \tau_E(\mathbf{b}) &\stackrel{(A4)}{=} E_{i=t}[Y^N(1, 0)] - E_{i=t}[Y^S_E(0, 1)] \end{aligned} \quad (2)$$

The DIG estimator is the difference of these GRDs:

Proposition 1 (DIG estimator). *Under assumptions A1-A4, the DIG estimator identifies the ATT of having been dominated by the Papal States (conservative institutions) in the neighbourhood of \mathcal{B} :*

$$\tau_{DIG} \equiv \tau_W(\mathbf{b}) - \tau_E(\mathbf{b}) \quad (\text{DIG})$$

Proof.

$$\begin{aligned} \tau_{DIG} &\equiv \tau_W(\mathbf{b}) - \tau_E(\mathbf{b}) \\ &\stackrel{(A1-A2)}{=} E_{i=t}[Y(1, 0)] - E_{i=t}[Y(0, 0)] \\ &\quad - E_{i=t}[Y(1, 0)] + E_{i=t}[Y(0, 1)] \\ &\stackrel{(A4)}{=} E_{i=t}[Y(0, 1)] - E_{i=t}[Y(0, 0)] \\ &\stackrel{(A3)}{=} E_{i=t}[Y(C, 1)] - E_{i=t}[Y(C, 0)] \end{aligned}$$

□

In this discussion, I have implicitly made two assumptions. The first is an ignorability assumption. Namely, for the West GRD $\tau_W(\mathbf{b})$ to identify the effect of conservative culture conditional on progressive institutions ([Equation 2](#)), there must be no confounder of variable C in the West area. The second is a homogeneity assumption equivalent to A2, for residuals in the East and West comparisons. Namely, for the DIG to identify the effect of conservative institutions it is necessary that any residual determinant of the outcomes has the same effect in the West and East comparisons. Formalizing them would require triple-indexed potential outcomes, which would complicate the notation and its readability. Therefore, I exclude them from the DIG estimator formalization, while acknowledging and testing them informally in robustness checks dedicated to confounders ([Section 7](#)).

6 Estimation and results

I first estimate three GRDs by DAPS, for each election between 1948 and 1992 and the two referenda. These are: (1) the overall GRD, estimated on the entire sample (2) $\hat{\tau}_W(\mathbf{b})$, restricting to the West area, and (3) $\hat{\tau}_E(\mathbf{b})$, restricting to the East area.²⁶

I set $w = 0.5$, such that geographic distance and the propensity score are given the same importance by the DAPS matching algorithm. The covariates included in the propensity scores are:

- The municipality's minimum altitude, which proxies agricultural characteristics;
- The disposition along the river Po in terms of longitude. Namely, I divide the river into 10 equally long segments and for each municipality, I indicate the closest segment with a factor variable. This proxies the easiness of crossing the river in the tract closest to the municipalities in the last century;
- The urban inhabitants located in cities within one day of travel (20 km) in year 1300. The year 1300 is considered the apex of Medieval urban expansion, after several centuries of growth and right before the XIVth century demographic crisis. Therefore, urban population in 1300 proxies maximum the availability of infrastructures and connections between rural and urban areas in the Low Middle Ages, the period of family systems' development.²⁷

The continuity of altitude and 1300 urban inhabitants around the Po river can be inspected visually on maps, in [Figure F.11](#) in the Appendix and in [Figure 3](#), respectively.

²⁶Estimation is carried out in R. DAPS estimation of the individual GRDs is carried out with the DAPS R package by [Papadogeorgou et al. \(2019\)](#), available at [this github repository](#). Standard errors for the DIG are obtained by non-parametric bootstrapping.

²⁷Note that this variable is highly correlated with the presence of *Communes* in the XIII-XIVth centuries, which were shown to affect contemporary cultural traits by [Guiso et al. \(2016\)](#). However, population size is more informative, since it allows to capture the intensity of commerce and thus the presence of roads and infrastructures useful for local movement of people also in the centuries to come.

Table 3: GRD and DIG estimates

Dependent variable	Overall GRD			$\hat{\tau}_W(\mathbf{b})$			$\hat{\tau}_E(\mathbf{b})$			$\hat{\tau}_{DIG} = \hat{\tau}_W(\mathbf{b}) - \hat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) votes for the Catholic party in year:											
1948	26.712***	(2.028)	212	29.094***	(4.416)	40	23.599***	(2.002)	160	5.494	(2.579)
1953	23.422***	(1.317)	386	23.501***	(3.811)	40	24.998***	(1.474)	294	-1.497	(2.214)
1958	24.85***	(1.344)	390	26.082***	(3.714)	40	26.722***	(1.501)	296	-0.641	(2.261)
1963	26.663***	(1.276)	402	26.536***	(3.374)	40	28.955***	(1.423)	306	-2.419	(2.230)
1968	26.504***	(1.226)	406	27.537***	(3.215)	40	28.503***	(1.368)	308	-0.967	(2.056)
1972	25.927***	(1.219)	406	27.888***	(3.126)	40	27.928***	(1.359)	308	-0.04	(2.170)
1976	23.913***	(1.147)	406	25.954***	(2.98)	40	26.121***	(1.257)	308	-0.166	(1.936)
1979	24.004***	(1.119)	406	26.256***	(2.96)	40	26.239***	(1.256)	308	0.017	(1.946)
1983	21.012***	(1.048)	416	24.236***	(2.776)	40	23.581***	(1.182)	316	0.655	(1.818)
1987	21.006***	(1.043)	406	22.754***	(2.999)	40	23.936***	(1.146)	308	-1.183	(1.843)
1992	13.042***	(0.861)	406	16.12***	(1.996)	40	15.852***	(0.904)	308	0.268	(1.424)
(%) votes against legalization of:											
Divorce (1972 referendum)	25.099***	(1.148)	416	28.32***	(3.363)	40	27.353***	(1.287)	316	0.967	(2.180)
Abortion (1981 referendum)	22.862***	(0.975)	416	27.385***	(2.878)	40	24.506***	(1.105)	316	2.879	(1.905)

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$, Bonferroni-adjusted p-values for 5 hypotheses. The overall GRD, $\hat{\tau}_W(\mathbf{b})$ and $\hat{\tau}_E(\mathbf{b})$ are obtained by DAPSm. The overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I on Catholic votes. $\hat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture (absent confounders), $\hat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\hat{\tau}_{DIG}$ identifies the ATT of conservative institutions. The Catholic party is *Democrazia Cristiana*. All estimates control for altitude, urban population in 1300, and longitude along the river in the propensity score component of the DAPSm estimator. DIG standard errors are obtained by non-parametric bootstrapping.

Since the list of existing municipalities varies slightly across years, the DAPSm matching algorithm is implemented in each year for both the West and East subsamples. [Section E.4](#) presents balance tables. Then, for each voting occasion, I manually compute the DIG as $\hat{\tau}_{DIG} = \hat{\tau}_W(\mathbf{b}) - \hat{\tau}_E(\mathbf{b})$, and I estimate its standard error by non-parametric bootstrapping. In total, I obtain $16 \times 4 = 64$ point estimates.²⁸ I apply a Bonferroni correction for the presence of 5 hypotheses, one for each class of outcomes.²⁹ [Table 3](#) summarizes results for 1948-1992 political elections.

Consider the 1981 referendum on abortion, in the last line of [Table 3](#), as an example to clarify the interpretation. The $\hat{\tau}_W(\mathbf{b})$ estimate indicates that absent confounders, conservative culture ($C = 1$) implies approximately 27 additional percentage points against the legalization of abortion. $\hat{\tau}_W(\mathbf{b})$ is estimated in the West, which south of the Po only includes municipalities that were not part of Papal States ($I = 0$). $\hat{\tau}_E(\mathbf{b})$, instead, restricts the sample south of the Po river to municipalities

²⁸This number takes into account the 1919-1924 elections. Due to their peculiarities, the results for those are shown in [Section B.1](#) in the Appendix.

²⁹1948-1992 elections, the referenda on divorce and abortion, attendance of Catholic classes in school, pre-war political elections (discussed in [Section B.1](#) of the Appendix), and social capital (discussed in [Section 8](#)).

that were part of Papal States ($I = 1$): this estimate is the compound effect of conservative culture and institutions on the percentage of votes against abortion. The DIG estimate is their difference, and it identifies the causal effect of conservative institutions ($I = 1$, Papal States), which is not distinguishable from zero. The overall GRD estimate (22.862) uses the entire sample. It is also a compound effect with a different weighting compared to $\hat{\tau}_E(\mathbf{b})$, and since it is quantitatively close to $\hat{\tau}_W(\mathbf{b})$ and $\hat{\tau}_E(\mathbf{b})$ but it is estimated on a larger sample, it is included to provide a benchmark. Moreover, it shows that although the DIG is not distinguishable from zero, there is a slight difference in magnitude between the overall GRD and the GRDs estimated on the two subsamples. This is important because, when researchers make ignorability assumptions on one treatment to comply with the Compound Treatment Irrelevance assumption, the overall GRD is used as an estimate for the causal effect of the single treatment of interest.

All DIG estimates are equal to zero. Moreover, for most years and regardless of the specific geographic area considered for the estimation, the Po river corresponds to a discontinuity in voting patterns of at least 20 percentage points. The only exceptions are concentrated in year 1992: they mirror the growing mistrust towards the party system, recently invested by the fall of U.S.S.R. and the first *Tangentopoli* scandals, which eventually led to the collapse of the entire Italian party system. Indeed, 1992 political elections hit the minimum turnout since 1948 and, as expected, the discontinuity at the Po is lower in magnitude but consistent across the West and East subsamples.

From 1948 to 1987 instead, the estimates are stable at around 25 percentage points. This is particularly telling in light of the alternation of economic expansions (in the 1950s-1960s) and recessions (in the 1980s), the age of extremist terror attacks known as *Anni di piombo* in the 1970s, and the introduction of regional governments. The latter, which happened in 1970, is particularly important: since the two riversides belong to different administrative regions, local governments' performance and regional policies could act as confounders for the cultural variable (C). However, if that was the case, one should see some instability in the estimates before and after 1970, which is not observed.

To conclude the interpretation of results, let me briefly discuss compliance with Assumption 3, the absence of interactive effects of culture and institutions south of the Po.

First, note that the separate estimation of the overall GRD, $\hat{\tau}_W(\mathbf{b})$ and $\hat{\tau}_E(\mathbf{b})$ already provides suggestive evidence of its validity. In fact, note that even in absence of A3 and absent confounders, $\hat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture ($C = 1$), conditional on $I = 0$, i.e. conditional on not having been dominated by Papal States. On the other hand, $\hat{\tau}_E(\mathbf{b})$ identifies a compound effect of the two treatments. The two point estimates are statistically equivalent since their difference, the DIG, is not distinguishable from zero. If the two treatments interacted in some way that affected Catholic votes in the long term, the DIG could not have been zero, because $\hat{\tau}_W(\mathbf{b})$ and $\hat{\tau}_E(\mathbf{b})$ would have to be different, and the difference would have remained consistent over a number of consecutive elections.

However, the reader might still worry about spillovers south of the Po, such that even the

municipalities that were not under the conservative institutions of Papal States ($I = 0$) would show the effects of their geographic proximity. Under this scenario, $\hat{\tau}_W(\mathbf{b})$ would also identify a compound effect, and DIG estimates equal to zero might simply be the result of spillovers, rather than a zero effect of conservative institutions. A piece of evidence against this possibility, on top of the historical evidence on the defense of the border between Papal States and the Duchy of Modena, is the replicability of results with the [Dell \(2010\)](#) GRD estimator instead of DAPS m : this robustness check is described in detail in [Section E.3](#). Dell includes all municipalities in the map, whereas the DAPS matching algorithm excludes those in the far-west corner, farther away from the Papal States, which would presumably be less impacted by spillovers. The Dell and DAPS m estimators produce the same DIG estimates, suggesting that spillovers are not a concern. Since it uses all the municipalities in the sample, this robustness check also allows excluding that the small sample size selected by DAPS m to estimate $\hat{\tau}_W(\mathbf{b})$ might be driving the results.

To what degrees do these considerations help in identifying also the effect of conservative culture? Provided that the spatial distribution of treatment C measures the cultural variable of family systems and not other correlated confounders, under A3 the unconditional ATT of conservative culture is identified by $\hat{\tau}_W(\mathbf{b})$.³⁰

Does variable C capture the culture of family systems rather than highly correlated confounders? The main potential confounder, perfectly correlated with family systems, are modern administrative regions. As discussed above, these were established in 1970, and any confounding effect would have shown as an instability in the estimates around that year. A possible historical confounder is the different intensity of Napoleonic occupation in the early XIXth century. A large fraction of municipalities north of the Po ($C = 1, I = 0$) passed almost immediately under the control of the Habsburg Empire. As a result, they were exposed later to Napoleonic reforms on family law, which covered divorce and inheritance. A robustness check in [Section D.2](#) in the Appendix shows that the length of Napoleonic occupation is not a concern, whereas [Section D.1](#) excludes the confounding effect of other cultural dimensions.

On the other hand, the spatial distribution of other variables that are theoretically related to Todd's family systems supports the claim that variable C is indeed capturing family systems. As mentioned in [Section 3.1](#), the higher average family size north of the Po (conservative culture, $C = 1$) passes from a maximum of 8 in 1953 to a maximum of 5 in 1971, but it remains highly spatially correlated with Catholic votes for the entire period (see, in Appendix, [Figure B.2](#) for 1921 elections, and [Section F](#)).

The stronger adherence of the conservative family systems' culture ($C = 1$) to Catholicism is also related to the aforementioned statistics on illegitimate births in the XIXth century ([MAIC, 1874, 1883, 1900](#)), for which the two sides of the Po registered the national minima and maxima. Regardless of whether this results from misreporting by women and their families, they are indicative

³⁰ And even without A3, the estimated effect of conservative culture conditional on progressive institutions equals all estimates of compound effects, suggesting the actual absence of interactions (i.e. the validity of A3): also in this case, spillover effects remain the only potential threat.

Table 4: GRD and DIG estimates: religion class in schools

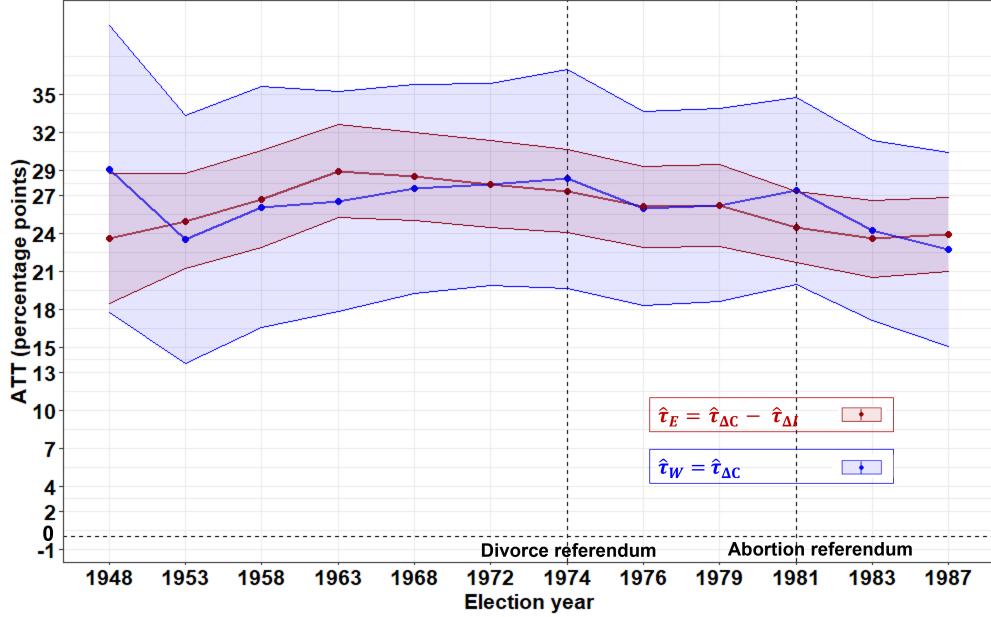
Dependent variable	Overall GRD			$\hat{\tau}_W(\mathbf{b})$			$\hat{\tau}_E(\mathbf{b})$			$\hat{\tau}_{DIG} = \hat{\tau}_W(\mathbf{b}) - \hat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) students attending Catholic religion class:											
Elementary schools	3.230***	(0.727)	1182	9.361***	(1.478)	296	4.036***	(0.811)	1070	5.325	(3.346)
Middle schools	5.413***	(1.012)	520	10.970***	(1.700)	116	5.018***	(1.256)	462	5.952	(9.317)
High schools	11.317***	(2.114)	394	14.484***	(4.323)	88	11.014***	(2.190)	334	3.470	(9.411)

Notes: *p<0.1; **p<0.05; ***p<0.01, Bonferroni-adjusted p-values for 5 hypotheses. The overall GRD, $\hat{\tau}_W(\mathbf{b})$ and $\hat{\tau}_E(\mathbf{b})$ are obtained by DAPSm. The overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I on Catholic votes. $\hat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture (absent confounders), $\hat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\hat{\tau}_{DIG}$ identifies the ATT of conservative institutions. DIG standard errors are obtained by non-parametric bootstrapping.

of different degrees of compliance with Catholic morals and patriarchal authority, as described by Todd's theories. Both these metrics are only available at the province level, and therefore they can only serve as descriptive evidence.

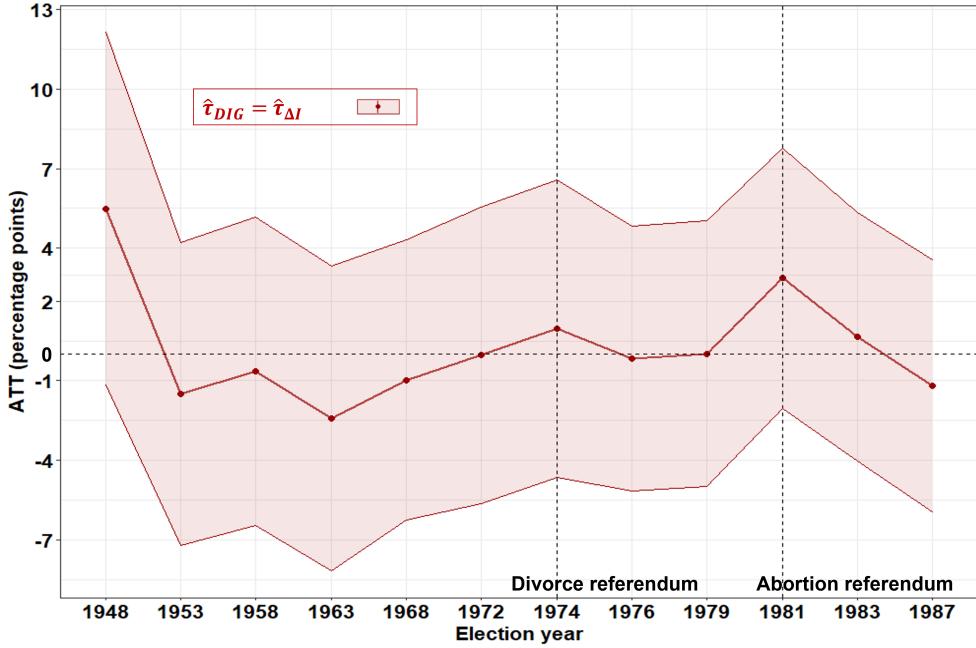
To provide further causal evidence, I then consider an extra outcome variable. In both public and private Italian schools of every level, curricula include one weekly hour of Catholic religion classes. The teachers must have graduated in theology from an institute approved by the Vatican, and they are appointed by bishops. The syllabus is set at the national level by the Vatican. These classes are taught by default to all students, but parents can voluntarily opt out. Doing so, however, is a visible signal in the community and entails a reputational cost in communities that hold religiosity as a shared value. If culture drives the higher share of Catholic votes in the culturally conservative region ($C = 1$), one would expect the result to be replicated with this extra outcome, as indeed shown in [Table 4](#). In [Section 8](#), I also test the effects on two indicators of social capital, to investigate the mechanisms of action of culture.

Figure 5: Results: East and West GRDs



Notes: The figure shows, for each voting occasion, the point estimates and Bonferroni-corrected 95% C.I (5 hypotheses) for $\hat{\tau}_E(\mathbf{b})$ (in red, compound effect of conservative culture and institutions) and for $\hat{\tau}_W(\mathbf{b})$ (in blue, the effect of conservative culture). Their difference (the DIG) identifies the effect of conservative institutions and is shown in [Figure 6](#).

Figure 6: Results: DIG, the effect of conservative institutions



Notes: The figure shows, for each voting occasion, the point estimates and Bonferroni-corrected 95% C.I (5 hypotheses) for $\hat{\tau}_{DIG}$, which identifies the effect of conservative institutions. Standard errors are obtained by non-parametric bootstrapping.

7 Robustness checks

In this section, I list five robustness checks. They are described in detail in dedicated sections of the Appendix.

7.1 Robustness of the identification strategy

The robustness checks for the identification strategy move along two dimensions. The first is the exclusion of possible confounders, to corroborate the claim that the entire difference in voting preferences between riverbanks can be attributed to conservative family culture. I consider two sets of confounders:

1. To exclude that other cultural dimensions may drive the results, I estimate a GRD at river Piave. The river runs entirely in the culturally conservative region ($C = 1$), it is similar to the Po in terms of difficulty of crossing, and it is known to separate other cultural dimensions (dialects, festivities). As shown in [Section D.1](#), I find no significant effects on Catholic votes.
2. An institutional confounder is the length of Napoleonic occupation, which is partially spatially correlated to the cultural variable and implies a different exposition to the Napoleonic code,

which introduced progressive reforms on inheritance and family law. Exploiting the river Adige as the border of the area that stayed longer under Napoleonic domination within the culturally conservative region ($C = 1$), in [Section D.2](#) I show that the length of Napoleonic occupation does not affect Catholic votes.

Finally, to provide quantitative evidence that the Po river was a hard border, in [Section D.3](#) I consider the case of a province outside my setting where the Po could be crossed more easily due to historical reasons as suggestive evidence of what the counterfactual of a crossable river would look like. Despite being classified as culturally conservative ($C = 1$), the easier contacts with culturally progressive areas ($C = 0$) led to more moderate differences in Catholic votes: the municipalities that are closer to progressive areas are those that display more progressive voting preferences.

7.2 Robustness of the estimation

I show the robustness of results to the following variations in the estimation of GRDs:

1. In [Section E.1](#), I use alternative sets of covariates in the specification of the Distance-Adjusted-Propensity-Score (DAPS).
2. In [Section E.2](#), I consider four alternative values of w ($w = 0, 0.25, 0.75, 1$) in the DAPS matching algorithm. w indicates the relative importance given to geographic distance and to the propensity score component;
3. In [Section E.3](#), I replicate results using [Dell \(2010\)](#)'s GRD estimator instead of DAPSm. While it is not ideal in this setting from an econometric point of view, presenting it as an alternative estimation strategy has two advantages. Unlike matching estimators, Dell's GRD exploits all observations within a pre-specified bandwidth. First, this allows to replicate estimates of τ_W , the effect of conservative culture, with a much larger sample: this shows that DAPSm estimates were not driven by outliers. Second, it includes municipalities in the west-most provinces south of the Po, which were not selected by the DAPS matching algorithm. These are the municipalities that are farther away from the Papal States: the fact that their inclusion does not alter point estimates is suggestive of no spillover effects from the Papal States to other municipalities (since geographic proximity is likely to increase potential spillovers).

8 Mechanisms

There are two non-exclusive mechanisms suggested by the existing literature.

Reliance on the Catholic Church for subsistence and welfare services.

In the conservative culture region ($C=1$), men who were not chosen to inherit after their father's

death could either ask their brother (the new patriarch) to remain in the household under his authority, or leave the household. In the first case, they would not marry unless allowed by their brother, and their children would be faced with the same choice once old enough. For those who left, a common choice was to join the clergy: as priests, not only would they secure sustenance, but they would enjoy high social status. Anecdotal evidence suggests this has been the case over time and that. The culturally conservative region maintains higher numbers of vocations, despite these have been decreasing all over the country. Indeed, regional statistics not only confirm a wide gap between the culturally conservative and progressive regions, it also shows that the culturally conservative region, which is the only area with this family system (and these unequal inheritance norms) in the entire country, displays the national maximum. [Cipriani \(2020\)](#) reports regional statistics from the Vatican offices on vocations: in the culturally conservative region ($C = 1$), 15.2 every 10000 inhabitants is a Catholic priest (the national maximum), whereas the figure in the culturally progressive region is 6.9.

Cooperation, social capital and mutual support.

The egalitarian inheritance norms in the progressive culture region ($C = 0$) imply that each individual household has less resources in terms of both wealth and labour force. In order to work as sharecroppers, households collaborated and join forces, creating strong networks that are not found in the conservative culture region ($C = 1$) where a single family typically sufficed as a sharecropping unit. [Todd \(1990\)](#) claimed that these differences should be visible in the contemporary organization of work. Indeed, the progressive culture region ($C = 0$) displayed the national maximum percentage of workers employed by cooperatives consistently from 1951 to 2001 ([Menzani, 2015](#)). On the contrary, the culturally conservative region ($C = 1$) has very few workers employed in cooperatives, but it has among the highest number of small dynastic family enterprises ([Caboni and Tomeo, 2021](#)). Recent research indicates that family firms are mostly found in presence of low social capital ([Amore, 2017](#)), so that one would expect lower social capital in the culturally conservative region ($C = 1$) north of the river.

Social capital is also related to cooperatives in the culturally progressive region ($C = 0$). In fact, large cooperatives developed in the XIXth century also with the aim of providing basic welfare services to its members, such as education and basic healthcare, as well as a network for mutual support ([Menzani, 2015](#)). These same services have been offered for centuries by institutions affiliated to the Catholic Church: indeed, all large cooperatives in the culturally conservative region ($C = 1$) were openly Catholic and collaborated with these institutions, unlike relying on members as in the culturally progressive region. One possible line of reasoning is that when political institutions are conservative to the point that they become oppressive and contrast pre-existing high levels of trust and collectivism in the local culture, as it was the case with the Papal States ($I = 1$) in the progressive culture region ($C = 0$), these institutions are not absorbed by the culture and as a result do not translate into more conservative political preferences. On the other hand, when religious institutions are not oppressive and they respond to a demand for services that derives from a less cooperative culture, religion becomes an integral part of that culture and possibly affects political

Table 5: GRD and DIG estimates: social capital

	Overall GRD			$\hat{\tau}_W(\mathbf{b})$			$\hat{\tau}_E(\mathbf{b})$			$\hat{\tau}_{DIG} = \hat{\tau}_W(\mathbf{b}) - \hat{\tau}_E(\mathbf{b})$	
Dependent variable	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
Non-religious NGOs per capita:											
	-0.126	(0.338)	775	1.201	(0.602)	652	-0.216	(0.407)	588	1.417	(0.667)
Probability of a local organ donation chapter:											
	-0.234***	(0.071)	775	-0.279*	(0.110)	652	-0.185	(0.091)	588	-0.093	(0.152)

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$, Bonferroni-adjusted p-values for 5 hypotheses. The overall GRD, $\hat{\tau}_W(\mathbf{b})$ and $\hat{\tau}_E(\mathbf{b})$ are obtained by Dell. The overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I on Catholic votes. $\hat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture (absent confounders), $\hat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\hat{\tau}_{DIG}$ identifies the ATT of conservative institutions. DIG standard errors are obtained by non-parametric bootstrapping.

preferences in the long term. Following the argument by [Platteau \(2000\)](#), the greater importance of family members relative to people from outside the family in the culturally conservative region could also translate into a higher level of individualism, which is associated with a lower social capital. Unlike the other proposed channels, the regression discontinuities and the DIG can be estimated on social capital. I use the measures of social capital from [Guiso et al. \(2016\)](#), namely (i) the number of non-religious NGOs per capita and (ii) the probability of having a local chapter of the only Italian NGO for organ donations in the municipality. Following the reasoning above, one would expect to find that conservative institutions have no effect ($DIG=0$) whereas all the GRDs should have a negative estimate (less social capital in the conservative culture region north of the river). As shown in [Table 5](#), none of the results for the overall number of non-religious NGOs are significant, but once restricting to blood and organ donations, the GRDs indicate a discontinuity in social capital with the expected sign³¹, and the effect of conservative institutions is null. The maps for these indicators of social capital are shown in [Figure F.12](#) and [Figure F.13](#) in the Appendix.

9 Conclusion

To the present day, conservative parties often advocate limiting individual rights – especially women’s rights – using religious arguments. At the same time, all over the world and for a number of religions, the majority of conservative parties self-identify with religious faiths. In autocratic and theocratic countries, the limitation of individual rights is often implemented by oppressive means.

This paper investigates the role of conservative culture and institutions as determinants of religious, conservative political preferences in the long term. Thanks to the natural experiment it

³¹ $\hat{\tau}_E$ is negative and only marginally not significant, due to the Bonferroni correction. The T statistics equals -2.033.

exploits, the results also sheds light on the long-term consequences of oppressive theocratic institutions and on the way these depend on the substantive culture.

To isolate the effects of conservative culture and institutions, I focus on the area around the Po river in northern Italy, which constituted a hard border for both family systems and pre-unitary states for several centuries. In this area, the spatial distributions of conservative culture and institutions do not fully overlap. This mismatch allows me to overcome the issue of compound treatments and to identify the causal effect of conservative institutions, the theocratic Papal States, which ruled part of the region for at least three centuries (XVIth-XIXth).

I formalize and estimate the Difference-in-Discontinuity estimator (DIG), an extension of Geographic Regression Discontinuity designs (GRDs), and I describe how the identifying assumptions can be easily generalized to other GRD designs and different causal estimands. I find that the conservative institutions of the Papal States did not affect votes to Catholic parties (1948-1992), nor preferences over divorce and abortion (1974-1981). I then argue that the entire estimated discontinuity ($25p.p.$) can be attributed to culture. The argument is based on a series of robustness checks, available historical and correlational evidence from economic history, and an additional contemporary outcome that entails reputational bias, namely the attendance of voluntary Catholic religion classes in public schools. In particular, I find that a stronger patriarchal authority led to an increase in Catholic, anti-divorce and anti-abortion preferences of at least 20 percentage points from 1948 to 1987.

In the territories that became part of the Papal States, the local culture was already highly cooperative. The controlling and oppressive religious institutions that were later imposed by an external political power did not alter the level of cooperation in the community, which maintained high levels of social capital. On the contrary, in the culturally conservative regions, the culture was more individualistic and as such it relied on Catholic institutions – which were never equally controlling and oppressive – for the provision of basic services, rather than on cooperation. At the same time, inheritance norms in the culturally conservative region increased the social role of the Catholic Church as a means of sustenance for those not entitled to their family's wealth.

My analysis suffers from two sources of limitations. First, the formal analysis of mechanisms is currently limited to social capital, due to data unavailability on other channels, such as religiosity. Second, I exploit a natural experiment from Italian history: while informative, the specific circumstances of different settings can limit the external validity of the results. Future research could focus on the collection of novel data to investigate the causal link between religiosity and political preferences, and consider settings in context with different variations in culture and religious institutions.

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APPENDIX

A Historical appendix

The territorial division depicted in [Figure A.1](#) (and in [Section 3.2](#)) has been in place since 1598 and remained unaltered until the Italian Unification, in 1861, with the sole exception of the Napoleonic experience (1797-1815). During the Communal period that preceded this territorial division, all Italy was characterized by a large number of independent city-states that controlled small territories in their proximity, leading to a much more fragmented division. The communal experience is taken into account in the main analysis by controlling for the urban population in 1300, the apex of that period.

The two bigger states in the map started playing predominant roles already in the XIIIth century. South of the Po, the Papal States controlled large part of its 1797 territories already in 1248. North of the Po, the Republic of Venice experienced its maximal expansion and the creation of an Empire: it only missed the annexation of the territories closer to the Po, which at the time remained largely uninhabited. These were formally annexed in 1438.³² By the beginning of the XVIth century, south of the Po, the Papal States ($I = 1$) occupied all territories coloured in gray, except the province of Ferrara, which was however a satellite state and passed under direct control of the Papal States in 1598. The two Napoleonic Italian campaigns (1797 and 1800) concerned the entire area, although to different degrees: all territories south of the Po and a small portion of the northern riverside (79 municipalities in the province of Verona) were annexed to the Cisalpine Republic from 1797 to 1815, whereas the rest of the north riverside was ceded to the Habsburg Empire and passed under direct French ruling between 1805-1815.³³ The Congress of Vienna in 1815 sanctioned that all former territories of the Republic of Venice (the entire north riverside) would be part of the Kingdom of Lombardy-Venetia, under the control of the Habsburg Empire, and that Papal States would retain the same borders they had in 1797. The portion of land that is not depicted, between the Republic of Venice and the Duchy of Modena and Reggio Emilia (in yellow), belonged to the Duchy of Mantua. While it is excluded from the main analysis, it will be discussed and included as a robustness check in [Section 7](#). Italian unification, in 1861, only concerned territories south of the Po, whereas the Kingdom of Lombardy-Venetia north of the Po remained under Austrian rule until the third War of Independence in 1866.

B Additional results

B.1 The 1919-1924 elections

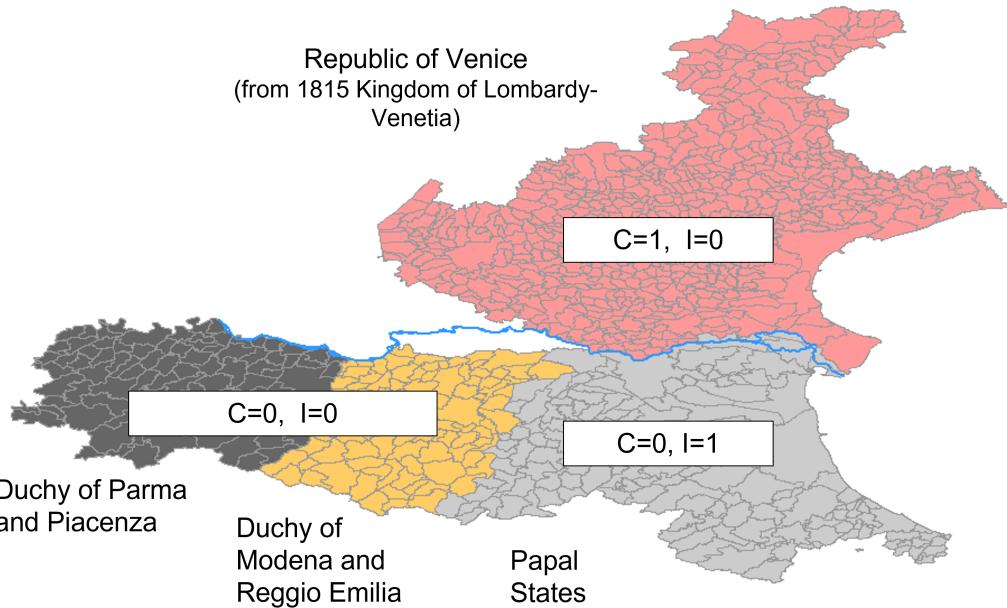
Despite the existence of a Catholic party running for elections between 1919-1924, I have not included those years in the main analysis because of the influence of fascist violence on election results. In this section, I detail the history of pre-WWII Catholic politics in Italy and present results for the 1919, 1921 and 1924 elections.

The first general elections in Italy were held in 1861. From 1874 to 1913, Catholics were prohibited to participate

³²With the exception of 22 municipalities, known as *Transpadania Ferrarese*, which remained under Papal domination until 1797 and in some cases until 1815 (the latter are shown as grey in the map). These municipalities were very sparsely populated and contact with the southern river bank was arduous, resulting in long periods of isolation ([Di Brenna and Cantù, 1861](#)). Nevertheless, any effect attributable to Papal States in this municipalities would produce a downward bias. I remove them from the analysis, as they would formally render the geographic RD estimator inconsistent for the causal estimand of interest. Note, however, that due to their negligible number and scarce population, the results are quantitatively comparable if they are included. These results are available upon request.

³³[Section D.2](#) provides a robustness check to rule out any confounding effect from the intensity of Napoleonic occupation.

Figure A.1: Pre-unitary states as of 1797



in elections or be elected by the *Non expedit* Papal bull. In 1913, the Holy See signed the so-called *Patto Gentiloni*, which led to the election of approximately 200 Catholic candidates in the coalition sustaining the prime minister Giovanni Giolitti (Corbetta and Piretti, 2009). Nevertheless, the Holy See began participating to Italy's political life in 1901, when Pope Leone XIII formally recognized the "almost servile" conditions of proletarians,³⁴ and opened to the creation of Catholic associations of both workers and owners, the so-called *white leagues* (Cova, 2011). Until then, Catholic workers were not represented by the already existing *red leagues* (socialist), because these had strong anticlerical positions. the leagues, which until then were industry-specific, eventually merged and formed modern Italian labour unions in the aftermath of WWI. Regardless of their political affiliation, unions responded to the deep, war-initiated economic crisis with violent protests, strikes, land and factory occupations known as the *red biennium* (1919-1921). The agitations of agricultural workers in the Po valley were particularly intense, leading to a huge growth of the white union that, contrary to Leone XIII positions, preached revolution against the owners. Nevertheless, red and white unions also had violent clashes on the accounts of their different ideologies (Cova, 2011; Encyclopaedia Britannica, 2021b). 1919 was a year of crucial transformations:

- Following the end of WWI, the widespread discontent of war survivors over the unfavourable conditions of peace, and the surging economic crisis, 1919 elections were the first held under universal male suffrage (Corbetta and Piretti, 2009);
- The newly-founded Catholic Party, *Partito Popolare Italiano* (PPI) ran for the 1919 elections with the endorsement of the Catholic Church. It immediately became the main opponent of PSI, the biggest party, and ran until 1924 elections. It was then banned during the fascist regime (Corbetta and Piretti, 2009; Encyclopaedia Britannica, 2021b);

³⁴In his *Rerum novarum* encyclical.

- Mussolini founded the *Fasci di combattimento*. These were armed militias that used violence as a means of repressing protests of both white and red unions, leagues and associations, with the aim of attracting middle-class votes for the newly-created fascist party, and dissuading votes towards the Catholic and Socialist parties, PPI and PSI. They were particularly active in the Po valley, especially in the two provinces neighboring the river, Ferrara and Rovigo. Intimidatory and punitive expeditions began in 1919, increased in frequency in the so-called *black biennium* (1921-1922), and continued until the establishment of fascist dictatorship ([Encyclopaedia Britannica, 2021a](#)). By the 1924 elections, socialist and Catholic opposition to fascism from lower classes had already been defeated, and Mussolini had already passed a new majoritarian electoral law which then granted him control of the Parliament.³⁵

I use data collected by [Corbetta and Piretti \(2009\)](#), which report the votes obtained by PPI in a large number of municipalities ($N = 913$), for election in the Chamber of Deputies. Despite the missingness of some municipalities, which can be inspected visually in [Figure B.2](#), I treat the data as complete.

Estimation by DAPSm yields the following results:

Table B.1: DAPSm results: 1919-1924 elections

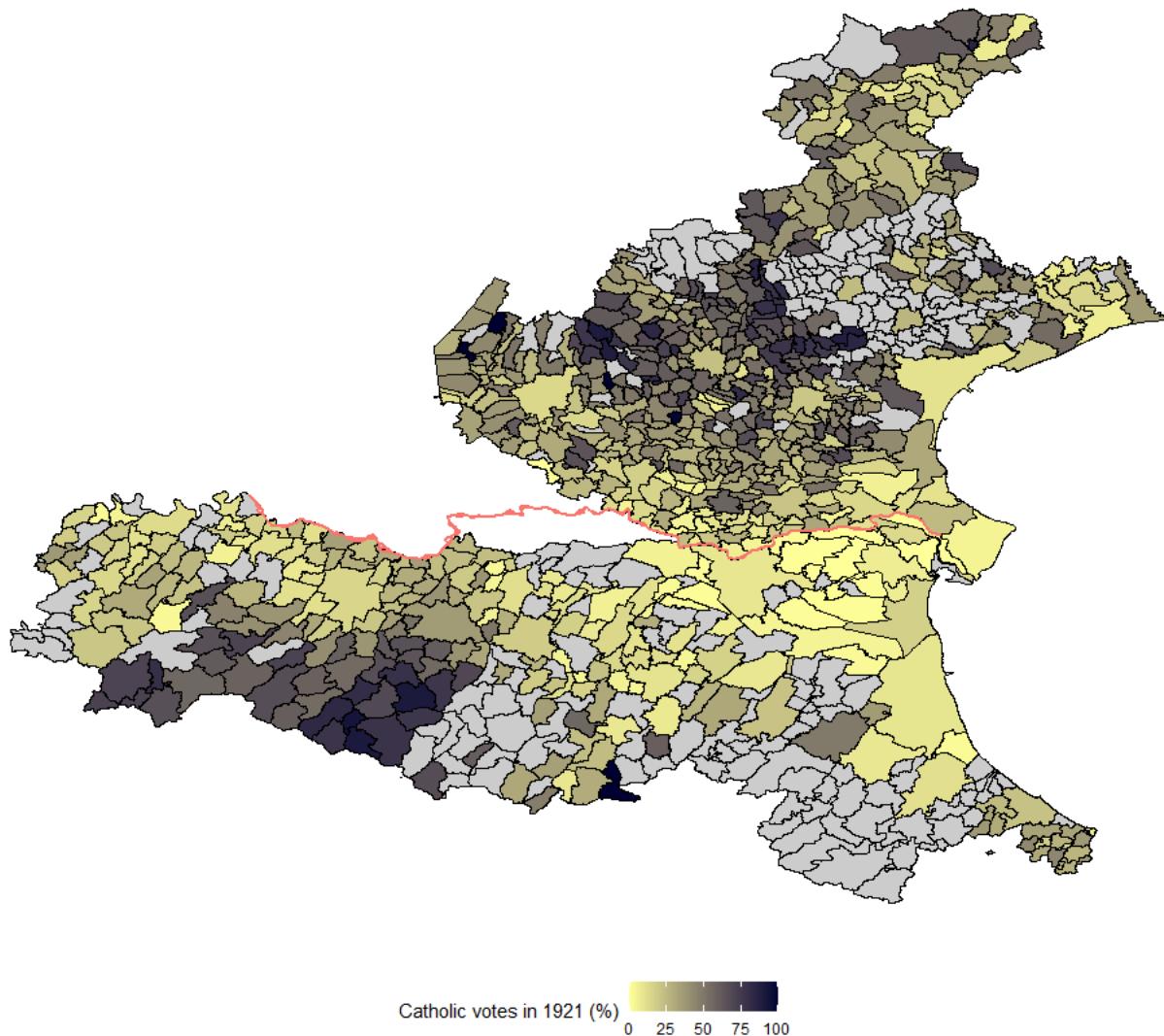
Dependent variable	Overall GRD			$\widehat{\tau}_W(\mathbf{b})$			$\widehat{\tau}_E(\mathbf{b})$			$\widehat{\tau}_{DIG} = \widehat{\tau}_W(\mathbf{b}) - \widehat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) votes for the Catholic party in year:											
1919	11.05***	(1.902)	386	19.726**	(6.364)	40	11.361***	(2.033)	294	8.365*	(3.277)
1921	9.037***	(2.572)	386	8.889	(7.399)	40	15.347***	(2.56)	294	-6.458	(3.975)
1924	9.276***	(1.216)	386	10.06**	(3.076)	40	11.319***	(1.527)	294	-1.259	(1.866)

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, Bonferroni-adjusted p-values. The overall GRD, $\widehat{\tau}_W(\mathbf{b})$ and $\widehat{\tau}_E(\mathbf{b})$ are obtained by DAPSm. The overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I on Catholic votes. $\widehat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture (absent confounders), $\widehat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\widehat{\tau}_{DIG}$ identifies the ATT of conservative institutions. The Catholic party is *Partito Popolare Italiano*. All estimates control for altitude, urban population in 1300, and longitude along the river in the propensity score component of the DAPSm estimator. DIG standard errors are obtained by non-parametric bootstrapping.

The year-specific spatial distribution of fascist punitive expeditions is likely to influence the difference in magnitude between $\widehat{\tau}_W(\mathbf{b})$ and $\widehat{\tau}_E(\mathbf{b})$ and consequently, the DIG point estimate. DIG estimates, after accounting for the presence of multiple hypotheses, remain equal to zero. Even ignoring the Bonferroni correction, the estimates are largely unstable over time and change sign. Due to the influence of fascist violence, I maintain that while the effect of conservative institutions (measured by the DIG) is zero, it is not possible to make a quantitative statement on the effect of conservative culture only by looking at these three elections. All robustness checks on the main analysis have been performed for these elections: they were omitted for the sake of brevity and clarity, but they are available upon request.

³⁵The rise of fascism in response to the events of the *red biennium* are studied quantitatively by [Acemoglu et al. \(2020\)](#).

Figure B.2: Catholic votes (%) in 1921



C Summary statistics

The following tables summarize baseline covariates used for matching, contemporary characteristics and outcome variables in the treatment groups used to estimate GRDs. The overall GRD contrasts groups **North of Po - South of Po, overall**. $\tau_W(\mathbf{b})$ contrasts **North of Po - South-West of Po**, and $\tau_E(\mathbf{b})$ contrasts **North of Po - South-East of Po**.

Table C.2: Summary statistics by treatment groups: baseline covariates

		Baseline covariates				
		Distance to Po (km)	Extension (km ²)	Minimum altitude(m)	Maximum altitude(m)	Inhabitants in year 1300
North of Po $(C = 1, I = 0)$	Mean	64.058	31.591	121.768	578.068	17692.97
	St.dev.	39.79	32.969	216.26	866.265	28433.291
	Min	0.104	2.971	-3	2	0
	Max	175.829	415.899	1075	3300	173000
South of Po, overall $(C = 0, I = 0)$	Mean	47.165	65.56	110.858	509.568	17035.266
	St.dev.	32.243	61.147	136.497	570.447	22749.085
	Min	0.484	3.171	-3	3	0
	Max	125.304	653.822	792	2165	80000
South-West of Po $(C = 0, I = 0)$	Mean	31.869	58.884	145.064	610.736	9452.202
	St.dev.	21.281	39.945	154.006	637.19	14399.097
	Min	0.484	3.171	1	19	0
	Max	81.209	260.602	792	2165	40000
South-East of Po $(C = 0, I = 1)$	Mean	66.358	73.937	67.938	382.632	26549.865
	St.dev.	33.386	79.421	94.645	442.375	27287.831
	Min	0.686	5.44	-3	3	0
	Max	125.304	653.822	393	1945	80000

Table C.3: Summary statistics by treatment groups: contemporary characteristics

		Contemporary characteristics		
		Turnout (1979)	Adult pop. (1979)	Mean family size in 1953
North of Po $(C = 1, I = 0)$	Mean	0.916	5540.179	4.834
	St.dev.	0.073	16948.838	0.981
	Min	0.368	212	2.352
	Max	1.049	273621	8.628
South of Po, overall $(C = 0, I = 0)$	Mean	0.944	9221.811	4.312
	St.dev.	0.058	27072.041	0.41
	Min	0.572	225	3.277
	Max	1.006	383956	5.674
South-West of Po $(C = 0, I = 0)$	Mean	0.929	7143.649	4.269
	St.dev.	0.073	17500.333	0.409
	Min	0.572	225	3.435
	Max	1.001	142071	5.674
South-East of Po $(C = 0, I = 1)$	Mean	0.963	11829.315	4.366
	St.dev.	0.016	35455.625	0.406
	Min	0.915	680	3.277
	Max	1.006	383956	5.206

Table C.4: Summary statistics by treatment groups: electoral outcomes

		Outcomes		
		Votes to DC in 1979 (%)	Votes against divorce (%)	Votes against abortion (%)
North of Po $(C = 1, I = 0)$	Mean	56.508	59.215	49.075
	St.dev.	13.803	14.017	11.902
	Min	21.839	25.743	21.9
	Max	92.974	91.751	85.6
South of Po, overall $(C = 0, I = 0)$	Mean	32.827	35.593	27.532
	St.dev.	11.028	10.963	9.238
	Min	11.834	12.357	10.3
	Max	72.452	71.202	64.5
South-West of Po $(C = 0, I = 0)$	Mean	36.725	38.534	29.732
	St.dev.	11.558	11.107	9.065
	Min	14.461	16.465	12.9
	Max	72.452	71.202	64.5
South-East of Po $(C = 0, I = 1)$	Mean	27.936	31.903	24.771
	St.dev.	7.983	9.584	8.7
	Min	11.834	12.357	10.3
	Max	49.332	55.393	55.8

Table C.5: Summary statistics by treatment groups: religion class in schools

		Outcome: attendees Catholic religion class		
		Elementary school (%)	Middle school (%)	High school (%)
North of Po $(C = 1, I = 0)$	Mean	88.241	86.659	79.287
	St.dev.	12.162	11.943	19.011
	Min	1.500	0.775	0.693
	Max	100	100	100
South of Po, overall $(C = 0, I = 0)$	Mean	83.733	82.085	69.916
	St.dev.	13.824	12.538	21.964
	Min	1.554	3.571	1.630
	Max	100	100	100
South-West of Po $(C = 0, I = 0)$	Mean	83.246	82.905	69.916
	St.dev.	13.368	10.125	20.432
	Min	2.970	50.365	4.545
	Max	100	100	100
South-East of Po $(C = 0, I = 1)$	Mean	84.141	81.312	68.470
	St.dev.	14.193	14.429	23.258
	Min	1.554	3.571	1.630
	Max	100	100	100

D Robustness checks on the identification

D.1 Other cultural dimensions as potential confounders: the Piave river

In order to attribute the entire difference in Catholic votes between the two riversides to conservative culture, it is necessary to exclude the effect of possible confounders. I estimate a GRD at river Piave, that runs entirely within the culturally conservative region ($C = 1$) but separates other cultural dimensions – a map is provided in [Figure F.7](#). For instance, the two riversides have different dialects, festivities and culinary traditions. If these dimensions had any role in explaining modern voting patterns, a GRD estimated along the Piave would return significant estimates. Historically, the Piave was equally large and difficult to cross. For instance, this is what made the Piave decisive during WWI. The river hard border was the first point where the Italian army was able to stop the advance of the Austro-Hungarians after the 1917 defeat of Caporetto (150 km away, to the north). Subsequently, in 1918, its strong currents prevented the construction of Italian pontoon bridges and destroyed others that had been already built, delaying the Second Battle of Piave by two days ([Enciclopedia Treccani, 2011](#)). As shown in [Table D.6](#), estimates are not discernible from zero at any voting occasion.

Table D.6: Robustness check: DAPS_m GRD at river Piave

Dependent variable	(1)			(2) - Preferred specification			(3)		
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N height
(%) votes for the catholic party in year:									
1948	3.836	(3.778)	477	3.948	(3.769)	477	4.124	(3.745)	476
1953	2.19	(3.652)	481	2.331	(3.636)	481	2.553	(3.599)	481
1958	4.258	(3.612)	482	4.256	(3.586)	482	4.328	(3.531)	482
1963	5.291	(3.614)	483	5.29	(3.582)	483	5.333	(3.505)	483
1968	6.419	(3.628)	483	6.418	(3.606)	483	6.38	(3.543)	483
1972	5.033	(3.683)	483	5.032	(3.662)	483	4.944	(3.598)	483
1976	6.638	(3.57)	483	6.637	(3.527)	483	6.606	(3.474)	483
1979	6.043	(3.513)	483	6.041	(3.47)	483	6.069	(3.404)	483
1983	6.579	(3.433)	483	6.578	(3.398)	483	6.594	(3.325)	483
1987	6.945	(3.271)	483	6.944	(3.235)	483	6.892	(3.171)	483
1992	3.94	(2.688)	483	3.94	(2.67)	483	3.875	(2.613)	483
(%) votes against legalization of:									
Divorce (1972 referendum)	5.343	(3.256)	483	5.342	(3.226)	483	5.617	(3.14)	483
Abortion (1981 referendum)	4.705	(3.671)	483	4.704	(3.628)	483	4.877	(3.517)	483
Covariates:									
Longitude along river Po, Altitude	Yes	Yes	Yes	No	No	No	No	No	No
Urban Density in year 1300	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Turnout and electorate size	No	No	No	No	No	No	Yes	Yes	Yes

Notes: *p<0.1; **p<0.05; ***p<0.01, Bonferroni-adjusted p-values. The GRD at the Piave identifies the ATT of potentially confounding cultural dimensions, other than conservative family systems. The Catholic party is *Democrazia Cristiana*.

D.2 Napoleonic occupation as a potential confounder: the Adige river

A second confounder for the effect of conservative culture is the intensity of Napoleonic occupation. Whereas all the southern Po riverside and a small number of municipalities north of the Po remained under direct Napoleonic control from 1797 to 1815 (as part of the Cisalpine Republic), the vast majority of municipalities north of the Po were only marginally affected by Napoleonic legislation, since Napoleonic occupation in 1797 lasted just few months, and was resumed again from 1805 to 1815 (Zaghi, 1991).³⁶ The Napoleonic Code, which was extended to all conquered territories, mandated the equal partition of inheritance among all living sons and daughters: it temporarily outlawed the primogeniture norms in place north of the Po (the conservative culture), and abolished the institution of *fideicommissum*. Moreover, while formalizing the supremacy of the husband over the wife that was customary of all Europe, and while imposing some limitations that made divorcing easier for the husband, the Code kept divorce legal based on the French Revolutionary Laws (1792), both on the grounds of adultery and of “incompatible moods” (Tulard et al., 1998). The institution of divorce came as a complete novelty for the inhabitants of former Italian states (Barbagli and Kertzer, 1990).

Within the northern Po riverside, a large part of the border between the Cisalpine Republic and other municipalities was set at river Adige, another large river characterized by rip currents and guarded by soldiers during the Cisalpine Republic years.

I exploit the tract of river Adige that served as a border as a geographic discontinuity, and estimate a GRD by Dell (2010). I do not carry out the estimation by DAPS_m due to the low number of municipalities that were part of the Cisalpine Republic (79). Namely, for all outcomes I estimate: bbold

$$Y_m = \alpha + \gamma_{GRD} \mathbb{I}\{\text{North}\}_m + f(lat_m, long_m) + \phi_m + \mathbf{X}'_m \boldsymbol{\beta} + \varepsilon_m$$

Where $f(lat_m, long_m)$ is a squared polynomial of longitude and latitude, ϕ_m are border fixed effects, and \mathbf{X} includes a number of municipalities’ characteristics, summarized along the results in Table D.7. Since the entire area was characterized by a conservative culture ($C = 1$) and was previously under the progressive institutions of the Republic of Venice ($I = 0$), the GRD identifies the effect of the shorter length of Napoleonic occupation from those of culture and pre-existing formal institutions. Formally, the effect is estimated conditional on $C = 1$ and $I = 0$. All estimates are statistically equal to zero.³⁷

Figure D.3 summarizes the characteristics of municipalities considered in this estimation:

³⁶In his first military campaign in Italy in 1797, Napoleon forced the Republic of Venice to surrender and dissolve. However, already in January 1798, he ceded large part of the ex Republic of Venice to the Austrian Habsburg Empire. These territories passed again under Napoleonic control from 1805 to 1815, as part of the Kingdom of Italy, after the second Italian campaign.

³⁷Albeit not very precisely, due to low number of municipalities under the Cisalpine Republic.

Figure D.3: Napoleonic occupation north of the Po river ($C = 1, I = 0$)

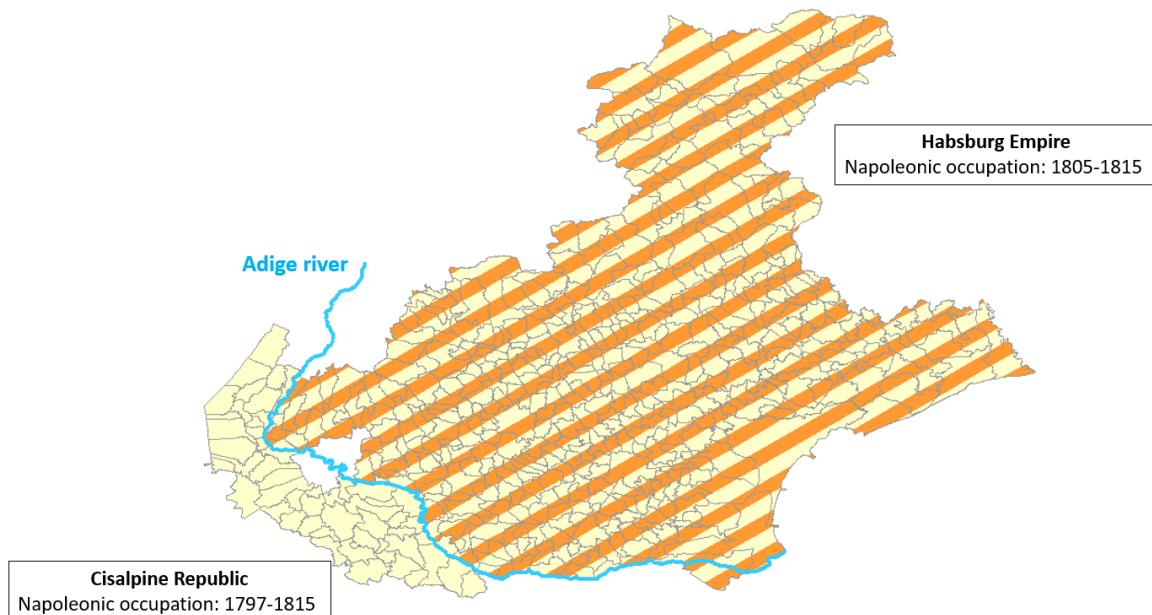


Figure D.4: Notes: the map shows the municipalities used in the robustness check on the intensity of Napoleonic occupation. Below the border of the Adige river, Napoleonic occupation through the Cisalpine Republic lasted from 1797 to 1815, whereas north of the Adige from 1805 to 1815.

Table D.7: The effect of Napoleonic occupation intensity: GRD at river Adige

Dependent variable	(1)			(2)			(3)		
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N height
(%) votes for the catholic party in year:									
1948	3.836	(3.778)	477	3.948	(3.769)	477	4.124	(3.745)	476
1953	2.19	(3.652)	481	2.331	(3.636)	481	2.553	(3.599)	481
1958	4.258	(3.612)	482	4.256	(3.586)	482	4.328	(3.531)	482
1963	5.291	(3.614)	483	5.29	(3.582)	483	5.333	(3.505)	483
1968	6.419	(3.628)	483	6.418	(3.606)	483	6.38	(3.543)	483
1972	5.033	(3.683)	483	5.032	(3.662)	483	4.944	(3.598)	483
1976	6.638	(3.57)	483	6.637	(3.527)	483	6.606	(3.474)	483
1979	6.043	(3.513)	483	6.041	(3.47)	483	6.069	(3.404)	483
1983	6.579	(3.433)	483	6.578	(3.398)	483	6.594	(3.325)	483
1987	6.945	(3.271)	483	6.944	(3.235)	483	6.892	(3.171)	483
1992	3.94	(2.688)	483	3.94	(2.67)	483	3.875	(2.613)	483
(%) votes against legalization of:									
Divorce (1972 referendum)	4.705	(3.671)	483	4.704	(3.628)	483	4.877	(3.517)	483
Abortion (1981 referendum)	5.343	(3.256)	483	5.342	(3.226)	483	5.617	(3.14)	483
Covariates:									
Longitude along river Po, Altitude	Yes	Yes	Yes	No	No	No	No	No	No
Urban Density in year 1300	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Turnout and electorate size	No	No	No	No	No	No	Yes	Yes	Yes
Lat-long polynomial and border FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *p<0.1; **p<0.05; ***p<0.01, Bonferroni-adjusted p-values. The GRD at Adige river identifies the ATT of a shorter Napoleonic occupation on Catholic votes, and on votes against divorce and abortion. The Catholic party is *Democrazia Cristiana*. Due to the low number of municipalities that experienced a longer Napoleonic occupation (79), the GRD is estimated by [Dell \(2010\)](#). The city of Verona, which is crossed by river Adige, is excluded from the analysis.

D.3 The Po as a hard border: evidence from Mantua

This robustness check compares summary statistics in the area of study to the province of Mantua, which is not in the setting of the main analysis. Despite being small, Mantua provides suggestive evidence of what would have happened if the Po river had not been a hard border between the two riversides in the main analysis setting.

The province includes 70 municipalities, and it is located between the west-most provinces of the north riverside ($C = 1$) and the south riverside ($C = 0$). It was part of a separate state with respect to both since 1115, except during the Napoleonic domination (1797–1815), when it became part of the Cisalpine Republic along the entire region of Emilia. Mantua has been classified by [Todd \(1990\)](#) as a STEM province (more conservative culture, $C = 1$).³⁸ It has the particular feature of being crossed by the Po river, as shown in [Figure D.5](#). [Uggeri \(2004\)](#) reports the presence of a bridge within the province since the Middle Ages, and that Mantua had several military conflicts with states located on both riversides over the passage of merchant ships in its tract of the Po river. Due to military conflicts, the movement of people across its borders is not a concern during the Medieval centuries that saw the formation of family systems (C). Within the province of Mantua then, one would expect to find little or no difference in voting patterns between the two sides of the Po river. For what concerns the main analysis, the closeness of Mantuan municipalities (where $C = 1$) to the south-west riverside in the main setting (where $C = 0$) would imply, if anything, that the estimates overall GRD and the $\hat{\tau}_W$ estimates are negatively biased. The fact that those estimates are quantitatively equivalent to those from the east sample is evidence that the bias is unlikely to be in place. Indeed, the map in [Figure D.5](#) shows that the municipalities that display more Catholic preferences are those closer to the northern riverside in the setting (where $C = 1$), and those with less Catholic preferences are bordering the south riverside ($C = 0$).

The closeness of municipalities in the setting south of the Po ($C = 0$) also implies that once border controls were lifted, as during the Napoleonic period unification, and then again starting in 1861, the mixture of cultural norms would happen more quickly.

[Table D.11](#) shows summary statistics of contemporary characteristics, baseline covariates and outcome variables for the two sides of the river, within the Mantua province. [Table D.8](#) instead summarizes outcome variables (conservative votes) within the province of Mantua, in comparison with the setting's north riverside ($C = 1$) and south riverside ($C = 0$). Indeed, the differences in conservative votes between the two riversides in Mantua are far smaller than those between the two riversides, though still present. Taken as a whole, the province of Mantua displays modern political preferences that lie in between. However, by looking at them by riverside, it becomes clear that Mantuan municipalities south of the Po display very similar numbers to those from the setting's south riverside. Despite the presence of a bridge, these municipalities were closer to them than to the rest of Mantua, and the STEM family system ($C = 1$) did not have the same persistence it had in the setting's north riverside, as expected, except for the municipalities further away from the river, as shown in [Figure D.5](#).

³⁸[Todd \(1990\)](#) does not specify, in this case, whether the parish registries used for the classifications are located south or north of the Po river, and whether he used a single archive or multiple ones.

Figure D.5: DC votes (%) in 1979 in Mantua province

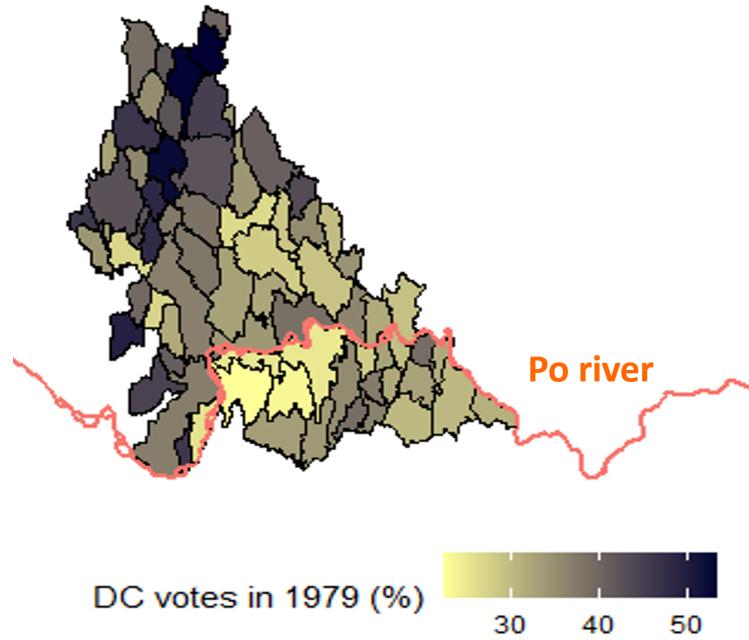


Table D.8: Outcome variables' summary statistics in Mantua relative to the riversides in the setting

		Mean	St.dev	Min	Max	N
Votes to Democrazia Cristiana (%) in 1979	N riverside	56.51	(13.798)	21.839	92.974	582
	S riverside	32.765	(11.078)	11.834	72.452	341
	Mantua	36.033	(7.408)	22.166	53.322	70
Votes against abortion (%) (1981)	N riverside	40.089	(11.906)	21.9	85.6	582
	S riverside	27.54	(9.263)	10.3	64.5	341
	Mantua	32.256	(7.210)	18.9	51.3	70
Votes against divorce (%) (1974)	N riverside	59.216	(14.014)	25.743	91.751	582
	S riverside	35.515	(10.994)	12.357	71.202	341
	Mantua	39.952	(8.353)	23.418	61.097	70

Notes: All outcome variables are measured in percentage points (0-100). Mantua displays mixed voting patterns with respect to the setting's north riverside ($C = 1$) and south riverside ($C = 0$). Despite being classified as a culturally conservative province ($C = 1$), within the province the Po was easier to cross. This suggests that instead, in the main area of study, the Po river was indeed a hard border.

Table D.9: Summary statistics by riverside within Mantua: baseline covariates

		Baseline covariates				
		Distance to Po (km)	Extension (km ²)	Minimum altitude(m)	Maximum altitude(m)	Inhabitants in year 1300
Mantua North of Po	Mean	16.192	33.858	27.231	53	14615.385
	St.dev.	11.506	21.417	15.595	49.739	19298.662
	Min	0.31	8.913	11	17	0
	Max	30.020	103.843	88	214	40000
Mantua South of Po	Mean	4.918	32.269	12.778	19.444	8888.889
	St.dev.	3.649	18.446	2.521	3.927	16722.752
	Min	0.356	12.733	9	12	0
	Max	12.986	69.942	17	27	40000

Table D.10: Summary statistics by riverside within Mantua: contemporary characteristics

		Contemporary characteristics		
		Turnout (1979)	Adult pop. (1979)	Mean family size (1953)
Mantua North of Po	Mean	0.961	4315.615	4.02
	St.dev.	0.012	6832.674	0.419
	Min	0.929	488	2.971
	Max	0.996	49836	4.773
Mantua South of Po	Mean	0.961	3729.5	3.921
	St.dev.	0.011	3301.909	0.361
	Min	0.939	746	3.368
	Max	0.977	14660	4.816

Table D.11: Summary statistics by riverside within Mantua: outcomes

		Outcomes		
		Votes to DC in 1979 (%)	Votes against divorce (%)	Votes against abortion (%)
Mantua North of Po	Mean	37.789	41.654	33.81
	St.dev.	7.318	8.236	7.132
	Min	25.357	25.268	21
	Max	53.322	61.097	51.3
Mantua South of Po	Mean	30.962	35.032	27.767
	St.dev.	4.674	6.336	5.101
	Min	22.166	23.418	18.9
	Max	38.84	47.961	38.7

E Robustness checks on the estimation

E.1 Additional specifications of propensity scores

[Table E.12](#) adds two alternative specifications for the propensity score component of the DAPS. For the sake of brevity, I restrict this check to the specification of the overall GRD, although results are equivalent also for $\hat{\tau}_W(\mathbf{b})$ and $\hat{\tau}_E(\mathbf{b})$. First, I remove urban population in 1300, as it could be considered a post-treatment control with respect to family systems (C). I then add turnout and electorate size at the election: even comparing municipalities with similar contemporary population and political participation, estimates remain quantitatively stable.³⁹

Table E.12: Overall GRD with different PS specifications

Dependent variable	(1)			(2) - Preferred specification			(3)		
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N
(%) votes for the catholic party in year:									
1948	25.061***	(1.926)	208	26.712***	(2.028)	212	29.27***	(2.122)	216
1953	23.719***	(1.33)	388	23.422***	(1.317)	386	23.247***	(1.38)	384
1958	24.999***	(1.347)	392	24.85***	(1.344)	390	25.378***	(1.395)	390
1963	26.584***	(1.274)	404	26.663***	(1.276)	402	27.08***	(1.312)	408
1968	26.541***	(1.216)	408	26.504***	(1.226)	406	27.303***	(1.287)	400
1972	25.999***	(1.205)	408	25.927***	(1.219)	406	26.523***	(1.276)	404
1976	24.171***	(1.135)	408	23.913***	(1.147)	406	24.896***	(1.177)	404
1979	24.303***	(1.106)	408	24.004***	(1.119)	406	25.444***	(1.172)	404
1983	21.524***	(1.04)	420	21.012***	(1.048)	416	22.618***	(1.157)	394
1987	21.389***	(1.031)	408	21.006***	(1.043)	406	21.821***	(1.095)	400
1992	13.59***	(0.857)	408	13.042***	(0.861)	406	13.414***	(0.885)	406
(%) votes against legalization of:									
Divorce (1972 referendum)	25.761***	(1.142)	420	25.099***	(1.148)	416	25.959***	(1.213)	396
Abortion (1981 referendum)	23.475***	(0.966)	420	22.862***	(0.975)	416	23.25***	(1.003)	398
Covariates:									
Longitude along river Po, Altitude	Yes	Yes	Yes	No	No	No	No	No	No
Urban Density in year 1300	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Turnout and electorate size	No	No	No	No	No	No	Yes	Yes	Yes

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$, Bonferroni-adjusted p-values. For each election, the overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I . The Catholic party is *Democrazia Cristiana*.

³⁹These are definitely post-treatment controls and could act as mediators, thus biasing the estimates. For this reason they are excluded from the main analysis.

E.2 Robustness: changing w in DAPSm

E.2.1 Alternative values of w

This section replicates all results by varying w , the weight given to the propensity score by the DAPS matching algorithm. In the main analysis, I attributed the same weight to propensity scores and geographic distance ($w = 0.5$): I now replicate results with $w = (0, 0.25, 0.75, 1)$. As shown in the balance tables in [Section E.4](#), the matching algorithm reduces the average distance from the river of treated units⁴⁰ at the expense of a slightly worse balance on some other baseline covariates. The algorithm also attributes high importance to longitude in the propensity score matching component of DAPS, as shown by balance tables. Comparing estimates for different values of w allows to assess how this impacts results: intuitively, lower values of w (higher importance given to distance) should yield estimates that are more affected by this trade-off. To illustrate this fact, in [Table E.23](#) I report balance of baseline and outcome variables when w takes the extreme values of 0 and 1. [Table E.13](#) summarizes DIG estimates obtained with these weights:

Table E.13: DIG estimates with different values of w

DIG estimates					
	$w = 0$	$w = 0.25$	$w = 0.5$	$w = 0.75$	$w = 1$
Dependent variable					
(%) votes for the catholic party in year:					
1948	0.684	2.069	2.493	5.053	-0.233
1953	-6.129	-4.658	-1.497	-1.973	-2.135
1958	-5.247	-3.781	-0.641	-0.798	1.71
1963	-6.385	-4.959	-2.419	-1.742	-1.606
1968	-4.937	-3.383	-0.967	-0.908	-2.367
1972	-3.818	-2.067	-0.04	-0.055	-1.323
1976	-3.762	-1.985	-0.166	-0.44	-1.107
1979	-3.483	-1.83	0.017	-0.613	-0.53
1983	-2.968	-1.315	0.655	0.296	1.116
1987	-4.612	-3.215	-1.183	-1.282	0.027
1992	-1.257	-0.843	0.268	0.908	3.074
(%) votes against legalization of:					
Divorce (1972 referendum)	-2.942	-0.737	0.967	1.012	2.09
Abortion (1981 referendum)	-1.136	1.422	2.879	2.344	5.083

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, Bonferroni-adjusted p-values. The table shows how DIG estimates, which identify the ATT of conservative institutions on Catholic votes, vary with w . w is the weight given to the propensity score by the DAPS matching estimator, as opposed to geographic distance. The value $w = 0.5$ is the one used in the main analysis. The Catholic party is *Democrazia Cristiana*. All estimates include altitude, urban population in 1300 and longitude along the river as covariates in the propensity scores. Standard errors are obtained by non-parametric bootstrapping.

DIG estimates remain stable at zero, while GRD estimates have higher magnitude for higher values of w . In other words, as the matching process attributes more importance to baseline covariates and less to distance between pairs of municipalities, the discontinuities in voting patterns at the Po river increase in magnitude. Nevertheless, even when geographic proximity is the only matching criterion ($w = 0$), estimates remain in the neighbourhood of 20 percentage points.

⁴⁰The 1-to-1 greedy matching algorithm departs from treated units and finds a suitable match for each one. In the end, it keeps treated units that are closer to the river, and selects matches that are further away. As a result, the overall Average Standardized Difference in distance means increases overall.

Table E.14: GRD and DIG estimates with $w = 0$

Dependent variable	Overall GRD			$\hat{\tau}_W(\mathbf{b})$			$\hat{\tau}_E(\mathbf{b})$			$\hat{\tau}_{DIG} = \hat{\tau}_W(\mathbf{b}) - \hat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) votes for the catholic party in year:											
1948	26.712***	(2.028)	212	24.012***	(3.69)	40	23.328***	(1.985)	160	0.684	(2.960)
1953	23.422***	(1.317)	386	18.328***	(2.802)	40	24.458***	(1.447)	294	-6.129	(2.560)
1958	24.85***	(1.344)	390	21.025***	(2.786)	40	26.271***	(1.484)	296	-5.247	(2.612)
1963	26.663***	(1.276)	402	21.8***	(2.496)	40	28.185***	(1.392)	306	-6.385	(2.734)
1968	26.504***	(1.226)	406	23.047***	(2.534)	40	27.984***	(1.351)	308	-4.937	(2.472)
1972	25.927***	(1.219)	406	23.538***	(2.486)	40	27.356***	(1.341)	308	-3.818	(2.534)
1976	23.913***	(1.147)	406	21.878***	(2.374)	40	25.64***	(1.233)	308	-3.762	(2.259)
1979	24.004***	(1.119)	406	22.323***	(2.236)	40	25.806***	(1.23)	308	-3.483	(2.243)
1983	21.012***	(1.048)	416	20.443***	(2.031)	40	23.411***	(1.149)	316	-2.968	(1.992)
1987	21.006***	(1.043)	406	18.985***	(2.224)	40	23.597***	(1.129)	308	-4.612	(2.064)
1992	13.042***	(0.861)	406	14.341***	(1.571)	40	15.598***	(0.887)	308	-1.257	(1.574)
(%) votes against legalization of:											
Divorce (1972 referendum)	25.099***	(1.148)	416	24.458***	(2.856)	40	27.399***	(1.259)	316	-2.942	(2.227)
Abortion (1981 referendum)	22.862***	(0.975)	416	23.585***	(2.353)	40	24.721***	(1.081)	316	-1.136	(1.975)

Notes: *p<0.1; **p<0.05; ***p<0.01, Bonferroni-adjusted p-values. The overall GRD, $\hat{\tau}_W(\mathbf{b})$ and $\hat{\tau}_E(\mathbf{b})$ are obtained by DAPSm. The overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I on Catholic votes. $\hat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture (absent confounders), $\hat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\hat{\tau}_{DIG}$ identifies the ATT of conservative institutions. The Catholic party is *Democrazia Cristiana*. All estimates control for altitude, urban population in 1300, and longitude along the river in the propensity score component of the DAPSm estimator. DIG standard errors are obtained by non-parametric bootstrapping.

Table E.15: GRD and DIG estimates with $w = 0.25$

Dependent variable	Overall GRD			$\widehat{\tau}_W(\mathbf{b})$			$\widehat{\tau}_E(\mathbf{b})$			$\widehat{\tau}_{DIG} = \widehat{\tau}_W(\mathbf{b}) - \widehat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) votes for the catholic party in year:											
1948	26.712***	(2.028)	212	25.446***	(3.661)	40	23.377***	(1.986)	160	2.069	(2.817)
1953	23.422***	(1.317)	386	19.984***	(3.001)	40	24.642***	(1.457)	294	-4.658	(2.502)
1958	24.85***	(1.344)	390	22.839***	(2.997)	40	26.619***	(1.502)	296	-3.781	(2.454)
1963	26.663***	(1.276)	402	23.558***	(2.705)	40	28.516***	(1.417)	306	-4.959	(2.524)
1968	26.504***	(1.226)	406	24.674***	(2.727)	40	28.057***	(1.352)	308	-3.383	(2.321)
1972	25.927***	(1.219)	406	25.344***	(2.655)	40	27.412***	(1.341)	308	-2.067	(2.404)
1976	23.913***	(1.147)	406	23.674***	(2.536)	40	25.66***	(1.236)	308	-1.985	(2.105)
1979	24.004***	(1.119)	406	24.025***	(2.457)	40	25.855***	(1.239)	308	-1.83	(2.108)
1983	21.012***	(1.048)	416	22.084***	(2.227)	40	23.399***	(1.171)	316	-1.315	(1.971)
1987	21.006***	(1.043)	406	20.441***	(2.326)	40	23.656***	(1.135)	308	-3.215	(1.981)
1992	13.042***	(0.861)	406	14.886***	(1.605)	40	15.729***	(0.896)	308	-0.843	(1.520)
(%) votes against legalization of:											
Divorce (1972 referendum)	25.099***	(1.148)	416	26.544***	(3.059)	40	27.282***	(1.273)	316	-0.737	(2.215)
Abortion (1981 referendum)	22.862***	(0.975)	416	25.98***	(2.627)	40	24.558***	(1.094)	316	1.422	(1.959)

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, Bonferroni-adjusted p-values. The overall GRD, $\widehat{\tau}_W(\mathbf{b})$ and $\widehat{\tau}_E(\mathbf{b})$ are obtained by DAPSm. The overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I on Catholic votes. $\widehat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture (absent confounders), $\widehat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\widehat{\tau}_{DIG}$ identifies the ATT of conservative institutions. The Catholic party is *Democrazia Cristiana*. All estimates control for altitude, urban population in 1300, and longitude along the river in the propensity score component of the DAPSm estimator. DIG standard errors are obtained by non-parametric bootstrapping.

Table E.16: GRD and DIG estimates with $w = 0.75$

Dependent variable	Overall GRD			$\widehat{\tau}_W(\mathbf{b})$			$\widehat{\tau}_E(\mathbf{b})$			$\widehat{\tau}_{DIG} = \widehat{\tau}_W(\mathbf{b}) - \widehat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) votes for the catholic party in year:											
1948	26.712***	(2.028)	212	29.762***	(4.571)	40	24.71***	(2.1)	160	5.053	(3.102)
1953	23.422***	(1.317)	386	24.025***	(3.871)	40	25.997***	(1.497)	294	-1.973	(2.795)
1958	24.85***	(1.344)	390	26.781***	(3.769)	40	27.58***	(1.526)	296	-0.798	(2.652)
1963	26.663***	(1.276)	402	27.509***	(3.515)	40	29.251***	(1.443)	306	-1.742	(2.507)
1968	26.504***	(1.226)	406	27.97***	(3.27)	40	28.878***	(1.373)	308	-0.908	(2.582)
1972	25.927***	(1.219)	406	28.27***	(3.16)	40	28.325***	(1.369)	308	-0.055	(2.485)
1976	23.913***	(1.147)	406	26.083***	(2.997)	40	26.523***	(1.264)	308	-0.44	(2.222)
1979	24.004***	(1.119)	406	26.024***	(2.963)	40	26.637***	(1.258)	308	-0.613	(2.181)
1983	21.012***	(1.048)	416	24.242***	(2.786)	40	23.946***	(1.177)	316	0.296	(2.052)
1987	21.006***	(1.043)	406	22.721***	(3.002)	40	24.003***	(1.141)	308	-1.282	(2.124)
1992	13.042***	(0.861)	406	16.601***	(1.974)	40	15.693***	(0.91)	308	0.908	(1.725)
(%) votes against legalization of:											
Divorce (1972 referendum)	25.099***	(1.148)	416	28.654***	(3.392)	40	27.641***	(1.293)	316	1.012	(2.528)
Abortion (1981 referendum)	22.862***	(0.975)	416	26.935***	(2.866)	40	24.591***	(1.108)	316	2.344	(2.186)

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, Bonferroni-adjusted p-values. The overall GRD, $\widehat{\tau}_W(\mathbf{b})$ and $\widehat{\tau}_E(\mathbf{b})$ are obtained by DAPSm. The overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I on Catholic votes. $\widehat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture (absent confounders), $\widehat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\widehat{\tau}_{DIG}$ identifies the ATT of conservative institutions. The Catholic party is *Democrazia Cristiana*. All estimates control for altitude, urban population in 1300, and longitude along the river in the propensity score component of the DAPSm estimator. DIG standard errors are obtained by non-parametric bootstrapping.

Table E.17: GRD and DIG estimates with $w = 1$

Dependent variable	Overall GRD			$\widehat{\tau}_W(\mathbf{b})$			$\widehat{\tau}_E(\mathbf{b})$			$\widehat{\tau}_{DIG} = \widehat{\tau}_W(\mathbf{b}) - \widehat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) votes for the catholic party in year:											
1948	26.712***	(2.028)	212	42.522***	(4.553)	40	42.756***	(1.973)	160	-0.233	(3.174)
1953	23.422***	(1.317)	386	29.958***	(4.088)	40	32.092***	(1.403)	294	-2.135	(3.13)
1958	24.85***	(1.344)	390	31.793***	(3.998)	40	33.502***	(1.407)	296	-1.71	(3.017)
1963	26.663***	(1.276)	402	32.926***	(3.884)	40	34.531***	(1.35)	306	-1.606	(2.844)
1968	26.504***	(1.226)	406	31.969***	(3.538)	40	34.336***	(1.355)	308	-2.367	(2.743)
1972	25.927***	(1.219)	406	32.417***	(3.502)	40	33.74***	(1.353)	308	-1.323	(2.773)
1976	23.913***	(1.147)	406	29.856***	(3.207)	40	30.963***	(1.311)	308	-1.107	(2.476)
1979	24.004***	(1.119)	406	30.258***	(3.379)	40	30.788***	(1.279)	308	-0.53	(2.527)
1983	21.012***	(1.048)	416	28.126***	(3.119)	40	27.01***	(1.158)	316	1.116	(2.389)
1987	21.006***	(1.043)	406	26.743***	(3.318)	40	26.715***	(1.142)	308	0.027	(2.371)
1992	13.042***	(0.861)	406	19.111***	(2.463)	40	16.037***	(0.889)	308	3.074	(2.122)
(%) votes against legalization of:											
Divorce (1972 referendum)	25.099***	(1.148)	416	31.398***	(3.489)	40	29.307***	(1.294)	316	2.09	(2.604)
Abortion (1981 referendum)	22.862***	(0.975)	416	30.615***	(3.091)	40	25.532***	(1.126)	316	5.083	(2.187)

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, Bonferroni-adjusted p-values. The overall GRD, $\widehat{\tau}_W(\mathbf{b})$ and $\widehat{\tau}_E(\mathbf{b})$ are obtained by DAPSm. The overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I on Catholic votes. $\widehat{\tau}_W(\mathbf{b})$ identifies the ATT of conservative culture (absent confounders), $\widehat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\widehat{\tau}_{DIG}$ identifies the ATT of conservative institutions. The Catholic party is *Democrazia Cristiana*. All estimates control for altitude, urban population in 1300, and longitude along the river in the propensity score component of the DAPSm estimator. DIG standard errors are obtained by non-parametric bootstrapping.

E.3 Using Dell as underlying GRD estimator

I replicate results using [Dell \(2010\)](#)'s estimator instead of DAPSm. Since it requires to specify a bandwidth, I replicate the results twice, with bandwidths of 100km and 50km. Within the bandwidth, Dell estimates by OLS the following model:

$$Y_m = \alpha + \gamma_{GRD} T_m + f(lat_m, long_m) + \phi_m + \mathbf{X}'_m \boldsymbol{\beta} + \varepsilon_m$$

Where m indexes municipalities, ϕ_m is a factor variable indicating the closest segment of the river, and $f(lat_m, long_m)$ is a local polynomial. To avoid inconsistency driven by high-order polynomials, I use a quadratic specification for $f(lat_m, long_m)$ ([Gelman and Imbens, 2019](#); [Pei et al., 2018](#)):

$$f(lat_m, long_m) = lat_m + long_m + (lat \times long)_m + lat_m^2 + long_m^2 + (lat^2 \times long)_m + (long^2 \times lat)_m$$

Dell's estimator is not ideal in this setting, where the border is a line, because it suffers from collinearity between longitude terms in the local polynomial and the inclusion of border fixed effects, especially with smaller bandwidths

(as shown below). The intuition is that smaller bandwidths reduce the variance of latitude, which loses predictive power and correlates more strongly with ϕ_m . However, Dell's GRD has the advantage of using all observations within the bandwidth to estimate results. This is particularly useful for two reasons. First, DAPS_m does not select municipalities in the west-most province south of the Po: these were not part of the Papal States and belonged to the Duchy of Parma and Piacenza (i.e. $I = 0$). The DIG estimator assumes the absence of spillovers between south-Po municipalities in the west and east samples: should there be any spillovers, the zero DIG estimates could simply indicate that Papal States also affected areas outside of their domain, rather than a zero effect. Historical evidence is already reassuring this regard. During the Middle Ages, communications and movements between these provinces were not common: in particular the main communication artery, the Roman-built via Emilia, was abandoned after the fall of the Empire (Vth century). Numerous interruptions occurred at the site of bridges: the main one crossed river Secchia, which separated the provinces of Parma and Piacenza from the rest of Emilia. Moreover, from the moment in which they reached their maximum expansion in the XVth century, the Papal States strengthened control of their border (Prodi, 1982).

The Dell estimator allows me to add some quantitative evidence of the absence of spillovers. If present, they should impact more the provinces closer to the Papal States, and, in turn, DAPS_m estimates. The stability of DIG estimates at zero when using Dell's estimator suggests that such spillovers are not a concern. The use of the entire sample with Dell's estimator is also reassuring with respect to the size of the west sub-sample selected by DAPS_m to compute $\hat{\tau}_W(\mathbf{b})$ ($N=40$), which identifies the effect of conservative culture. With such a small sample size, DAPS_m estimates are necessarily more sensitive to outliers. In this sense, note that the 100km Dell bandwidth resemble more closely DAPS_m estimates, where the 75th percentile of distance from the Po is 75km and the maximal distance is greater than 100km.

Table E.18: GRD and DIG using Dell's GRD estimator (bw=100km)

Dependent variable	Overall GRD			$\hat{\tau}_W(\mathbf{b})$			$\hat{\tau}_E(\mathbf{b})$			$\hat{\tau}_{DIG} = \hat{\tau}_W(\mathbf{b}) - \hat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) votes for the catholic party in year:											
1948	29.983***	(2.725)	688	26.305***	(3.816)	612	24.747***	(3.797)	526	1.558	(2.429)
1953	30.569***	(2.316)	733	23.468***	(3.6)	619	29.409***	(3.02)	570	-5.941*	(2.516)
1958	32.545***	(2.328)	736	24.944***	(3.663)	621	31.489***	(3.008)	572	-6.545**	(2.501)
1963	33.508***	(2.212)	742	25.695***	(3.628)	622	32.66***	(2.828)	578	-6.963**	(2.381)
1968	33.316***	(2.185)	743	26.886***	(3.605)	622	31.635***	(2.793)	579	-4.749	(2.351)
1972	31.525***	(2.197)	743	26.167***	(3.664)	622	29.504***	(2.798)	579	-3.337	(2.486)
1976	29.231***	(2.148)	743	24.541***	(3.577)	622	26.666***	(2.736)	579	-2.125	(2.405)
1979	28.837***	(2.131)	743	24.506***	(3.538)	622	25.965***	(2.717)	579	-1.459	(2.268)
1983	26.367***	(2.02)	747	23.262***	(3.412)	622	23.972**	(2.548)	583	-0.71	(2.234)
1987	26.411***	(1.959)	743	23.61***	(3.29)	622	24.126***	(2.484)	579	-0.516	(2.196)
1992	22.365***	(1.57)	743	20.981***	(2.61)	622	21.008***	(1.94)	579	-0.027	(1.685)
(%) votes against legalization of:											
Divorce (1972 referendum)	36.103***	(2.137)	747	33.835***	(3.604)	622	32.98***	(2.684)	583	0.855	(2.594)
Abortion (1981 referendum)	32.932***	(1.794)	747	31.906***	(2.98)	622	31.035***	(2.252)	583	0.871	(2.17)

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$, Bonferroni-adjusted p-values. For each election, the overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I . $\hat{\tau}_W(\mathbf{b})$ identifies the ATT of C , $\hat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\hat{\tau}_{DIG}$ identifies the ATT of I . The Catholic party is *Democrazia Cristiana*. All estimates include as PS covariates altitude, urban population in 1300, and longitude along the river. DIG standard errors are obtained by non-parametric bootstrapping.

Table E.19: GRD and DIG using Dell's GRD estimator (bw=50km)

Dependent variable	Overall GRD			$\hat{\tau}_W(\mathbf{b})$			$\hat{\tau}_E(\mathbf{b})$			$\hat{\tau}_{DIG} = \hat{\tau}_W(\mathbf{b}) - \hat{\tau}_E(\mathbf{b})$	
	ATT	s.e.	N	ATT	s.e.	N	ATT	s.e.	N	DIG	s.e.
(%) votes for the catholic party in year:											
1948	15.863***	(3.327)	355	12.251	(5.211)	314	12.467	(5.4)	234	-0.215	(2.723)
1953	15.92***	(2.998)	362	12.942	(4.758)	320	14.591**	(4.381)	240	-1.648	(2.512)
1958	17.288***	(3.044)	363	11.518	(4.853)	321	16.58***	(4.365)	241	-5.062	(2.553)
1963	18.544***	(2.872)	368	12.895	(4.768)	321	18.311***	(3.806)	246	-5.416	(2.329)
1968	18.1***	(2.869)	369	15.178**	(4.799)	321	17.176***	(3.755)	247	-1.998	(2.369)
1972	18.018***	(2.839)	369	15.889**	(4.752)	321	16.591***	(3.756)	247	-0.702	(2.339)
1976	15.225***	(2.704)	369	12.726*	(4.495)	321	13.145***	(3.545)	247	-0.418	(2.238)
1979	15.235***	(2.635)	369	14.012**	(4.375)	321	12.447***	(3.453)	247	1.565	(2.129)
1983	14.882***	(2.512)	371	13.47**	(4.252)	321	12.339***	(3.265)	249	1.131	(2.068)
1987	15.227***	(2.457)	369	12.09*	(4.091)	321	13.341***	(3.262)	247	-1.251	(2.007)
1992	13.073***	(1.997)	369	8.87	(3.31)	321	11.805***	(2.687)	247	-2.935	(1.609)
(%) votes against legalization of:											
Divorce (1972 referendum)	21.448***	(2.905)	371	20.009***	(4.908)	321	18.641***	(3.72)	249	1.369	(2.64)
Abortion (1981 referendum)	23.566***	(2.343)	371	23.623***	(3.958)	321	21.494***	(2.98)	249	2.129	(2.069)

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$, Bonferroni-adjusted p-values. For each election, the overall GRD is the traditional regression discontinuity estimated at river Po for the entire sample. It identifies the compound effect of C and I . $\hat{\tau}_W(\mathbf{b})$ identifies the ATT of C , $\hat{\tau}_E(\mathbf{b})$ is again a compound effect, and their difference $\hat{\tau}_{DIG}$ identifies the ATT of I . The Catholic party is *Democrazia Cristiana*. All estimates include as PS covariates altitude, urban population in 1300, and longitude along the river. DIG standard errors are obtained by non-parametric bootstrapping.

E.4 Distance-Adjusted-Propensity-Score matching and balance

For all three GRDs (overall, $\tau_W(\mathbf{b})$ and $\tau_E(\mathbf{b})$), this section will show a balance table. For each baseline covariate X in the table, the Absolute Standardized Difference (ASD) is computed in the entire sample and in the matched one as:

$$ASD(X) \equiv \frac{|\bar{X}_T - \bar{X}_C|}{\sqrt{Var_T(X) + Var_C(X)}}$$

Balance tables also report sample size both before and after matching.

E.4.1 Overall sample

Table E.20: Balance table: overall GRD sample

		Pre-match ($N = 923$)			Post-match ($N = 398$)		
		ASD	Mean, (C)	Mean, (T)	ASD	Mean, (C)	Mean, (T)
Baseline Covariates	Minimum altitude (m)	0.064	109.493	126.1	0.433	107.857	32.857
	Maximum altitude (m)	0.091	503.625	599.045	0.45	507.655	181.857
	Urban inhabitants in year 1300	0.036	16950.147	18266.071	0.218	20591.133	30541.872
	River longitude (UTM32N)	0.770	654229.79	713053.039	0.106	697833.241	703912.414
	Distance to river (km)	0.390	46.864	66.462	0.761	61.083	33.096
Outcomes	Votes to DC (%) in 1979	1.397	32.765	57.213	1.506	30.022	54.027
	Votes against abortion (%)	1.491	27.45	49.665	1.613	25.654	48.362
	Votes against divorce (%)	1.380	35.515	59.868	1.507	33.428	58.553

Notes: the overall sample is used to estimate the overall GRD at the Po river. Denoting treated units (north of the Po river) as T and control units as C (south of the river), the Absolute Standardized Difference (ASD) for variable X is computed as:

$$ASD \equiv \frac{|\bar{X}_T - \bar{X}_C|}{\sqrt{Var_T(X) + Var_C(X)}}.$$

E.4.2 West subsample (used to estimate $\tau_W(\mathbf{b})$)

Table E.21: Balance table: West sample

		Pre-match ($N = 769$)			Post-match ($N = 40$)		
		ASD	Mean, (C)	Mean, (T)	ASD	Mean, (C)	Mean, (T)
Baseline Covariates	Minimum altitude (m)	0.254	65.519	126.1	0.227	65.519	35.948
	Maximum altitude (m)	0.235	369.045	599.045	0.333	369.045	169.675
	Urban inhabitants in year 1300	0.198	26103.896	18266.071	0.103	26103.896	22064.935
	River longitude (UTM32N)	0.074	716671.475	713053.039	0.248	716671.475	705190.74
	Distance to river (km)	0.030	64.898	66.462	0.997	64.898	27.531
Outcomes	Votes to DC (%) in 1979	1.866	27.858	57.213	1.683	27.858	54.096
	Votes against abortion (%)	1.726	24.603	49.665	1.785	24.603	49.142
	Votes against divorce (%)	1.672	31.771	59.868	1.706	31.771	59.184

Notes: the overall sample is used to estimate the $\tau_W(\mathbf{b})$ GRD at the Po river. Denoting treated units (north of the Po river) as T and control units as C (south of the river), the Absolute Standardized Difference (ASD) for variable X is computed as:

$$ASD \equiv \frac{|\bar{X}_T - \bar{X}_C|}{\sqrt{Var_T(X) + Var_C(X)}}.$$

E.4.3 East subsample (used to estimate $\tau_E(\mathbf{b})$)

Table E.22: Balance table: East sample

		Pre-match ($N = 736$)			Post-match ($N = 308$)		
		ASD	Mean, (C)	Mean, (T)	ASD	Mean, (C)	Mean, (T)
Baseline Covariates	Minimum altitude (m)	0.073	145.706	126.1	0.219	92.5	39.8
	Maximum altitude (m)	0.014	614.455	599.045	0.118	235.9	151.4
	Urban inhabitants in year 1300	0.274	9411.765	18266.071	0.106	7000	5300
	River longitude (UTM32N)	2.075	602807.225	713053.039	0.14	662531.166	666785.098
	Distance to river (km)	0.781	32.013	66.462	0.248	31.286	24.486
Outcomes	Votes to DC (%) in 1979	1.143	36.806	57.213	1.983	26.958	53.214
	Votes against abortion (%)	1.342	29.795	49.665	2.128	22.53	49.915
	Votes against divorce (%)	1.198	38.598	59.868	1.883	29.547	57.867

Notes: the overall sample is used to estimate the $\tau_E(\mathbf{b})$ GRD at the Po river. Denoting treated units (north of the Po river) as T and control units as C (south of the river), the Absolute Standardized Difference (ASD) for variable X is computed as:

$$ASD \equiv \frac{|\bar{X}_T - \bar{X}_C|}{\sqrt{Var_T(X) + Var_C(X)}}.$$

E.4.4 Balance tables with $w = 0, 1$

Table E.23: Balance table when $w = 0$ (no weight given to propensity scores)

		Pre-match ($N = 923$)			Post-match ($N = 398$)		
		ASD	Mean, (C)	Mean, (T)	ASD	Mean, (C)	Mean, (T)
Baseline Covariates	Minimum altitude (m)	0.064	109.493	126.1	0.546	108.574	21.642
	Maximum altitude (m)	0.091	503.625	599.045	0.607	510.667	117.76
	Urban inhabitants in year 1300	0.036	16950.147	18266.071	0.239	20490.196	31151.961
	River longitude (UTM32N)	0.77	654229.79	713053.039	0.147	697459.028	705958.223
	Distance to river (km)	0.39	46.864	66.462	0.81	61.144	31.916
Outcomes	Votes to DC (%) in 1979	1.397	32.765	57.213	1.537	30.078	53.737
	Votes against abortion (%)	1.491	27.45	49.665	1.613	25.654	48.362
	Votes against divorce (%)	1.380	35.515	59.868	1.507	33.428	58.553

Notes: the overall sample is used to estimate the $\tau_E(\mathbf{b})$ GRD at the Po river. Denoting treated units (north of the Po river) as T and control units as C (south of the river), the Absolute Standardized Difference (ASD) for variable X is computed as:

$$ASD \equiv \frac{|\bar{X}_T - \bar{X}_C|}{\sqrt{Var_T(X) + Var_C(X)}}.$$

Table E.24: Balance table when $w = 1$ (no weight given to geographic distance)

		Pre-match ($N = 923$)			Post-match ($N = 398$)		
		ASD	Mean, (C)	Mean, (T)	ASD	Mean, (C)	Mean, (T)
Baseline Covariates	Minimum altitude (m)	0.064	109.493	126.1	0.048	103.959	114.093
	Maximum altitude (m)	0.091	503.625	599.045	0.196	493.777	689.088
	Urban inhabitants in year 1300	0.036	16950.147	18266.071	0.066	21554.404	24673.575
	River longitude (UTM32N)	0.77	654229.79	713053.039	0.031	701655.038	703408.436
	Distance to river (km)	0.39	46.864	66.462	0.136	62.049	55.599
Outcomes	Votes to DC (%) in 1979	1.397	32.765	57.213	1.547	29.635	54.582
	Votes against abortion (%)	1.491	27.45	49.665	1.531	25.403	48.035
	Votes against divorce (%)	1.38	35.515	59.868	1.511	33.019	58.298

Notes: the overall sample is used to estimate the $\tau_E(\mathbf{b})$ GRD at the Po river. Denoting treated units (north of the Po river) as T and control units as C (south of the river), the Absolute Standardized Difference (ASD) for variable X is computed as:

$$ASD \equiv \frac{|\bar{X}_T - \bar{X}_C|}{\sqrt{Var_T(X) + Var_C(X)}}.$$

F Additional figures

Figure F.6: Catholic votes (%) in 1953

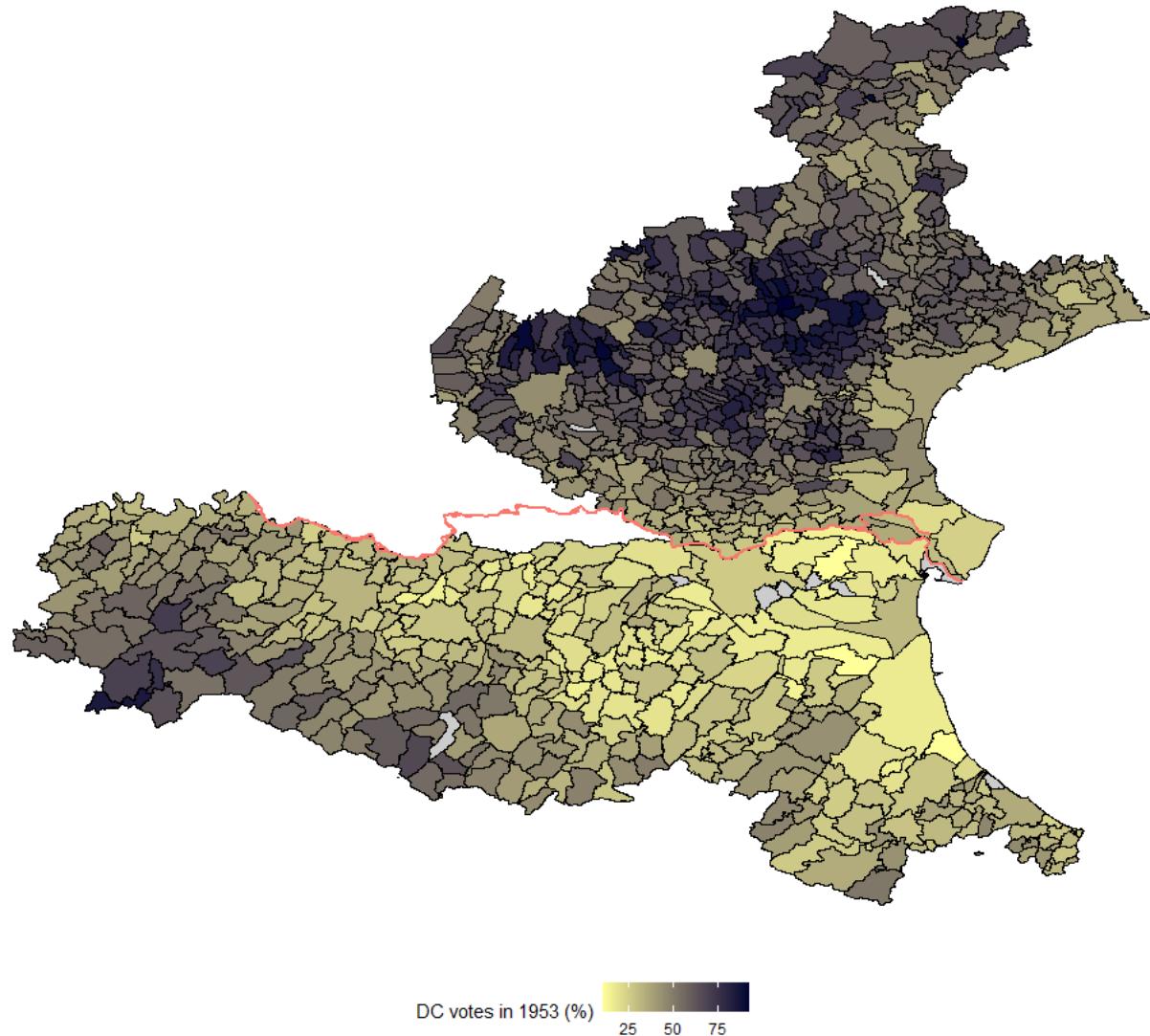


Figure F.7: Catholic votes (%) in 1979, plotting Po and Piave rivers

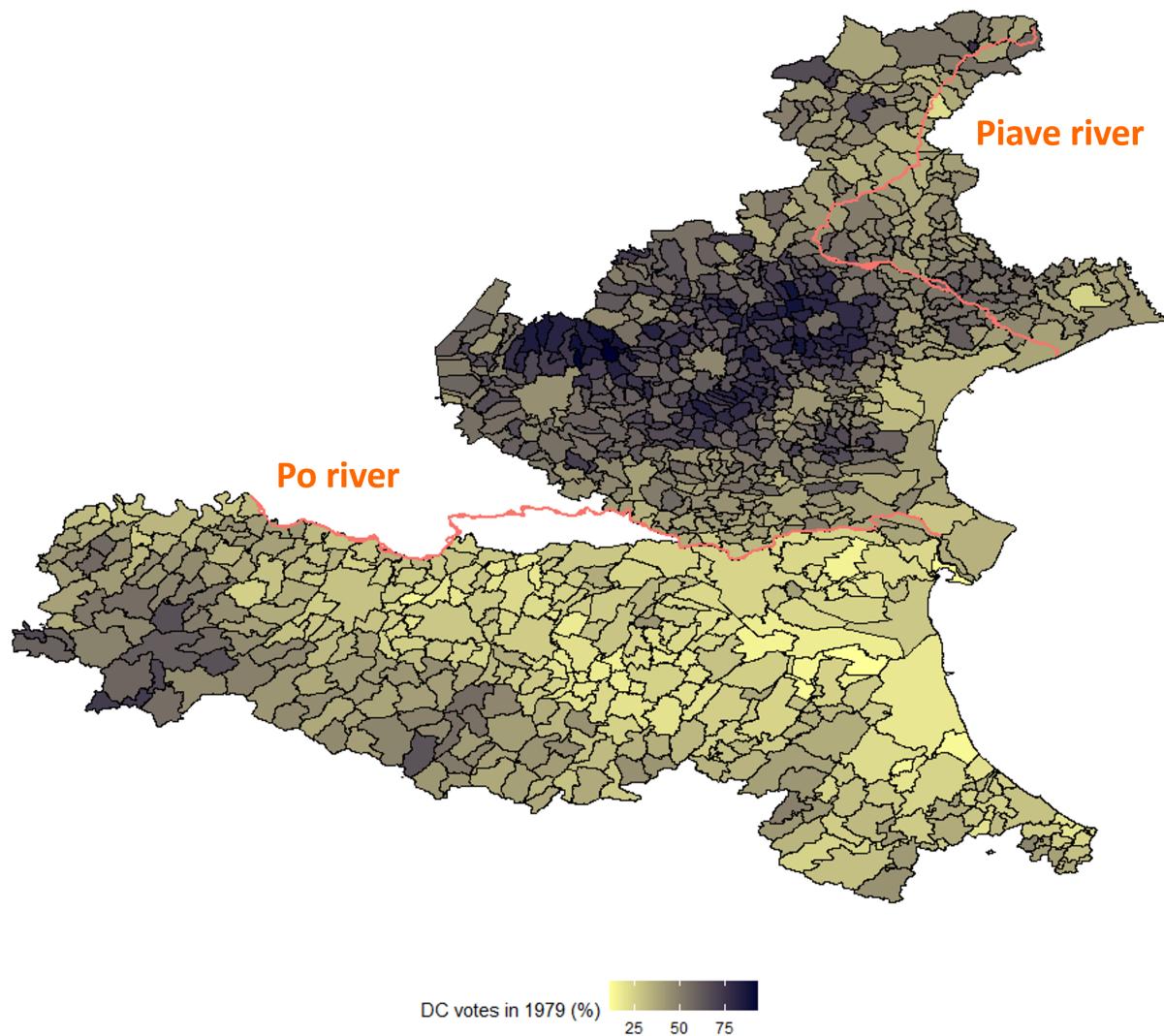


Figure F.8: Catholic votes (%) in 1979, including Mantua

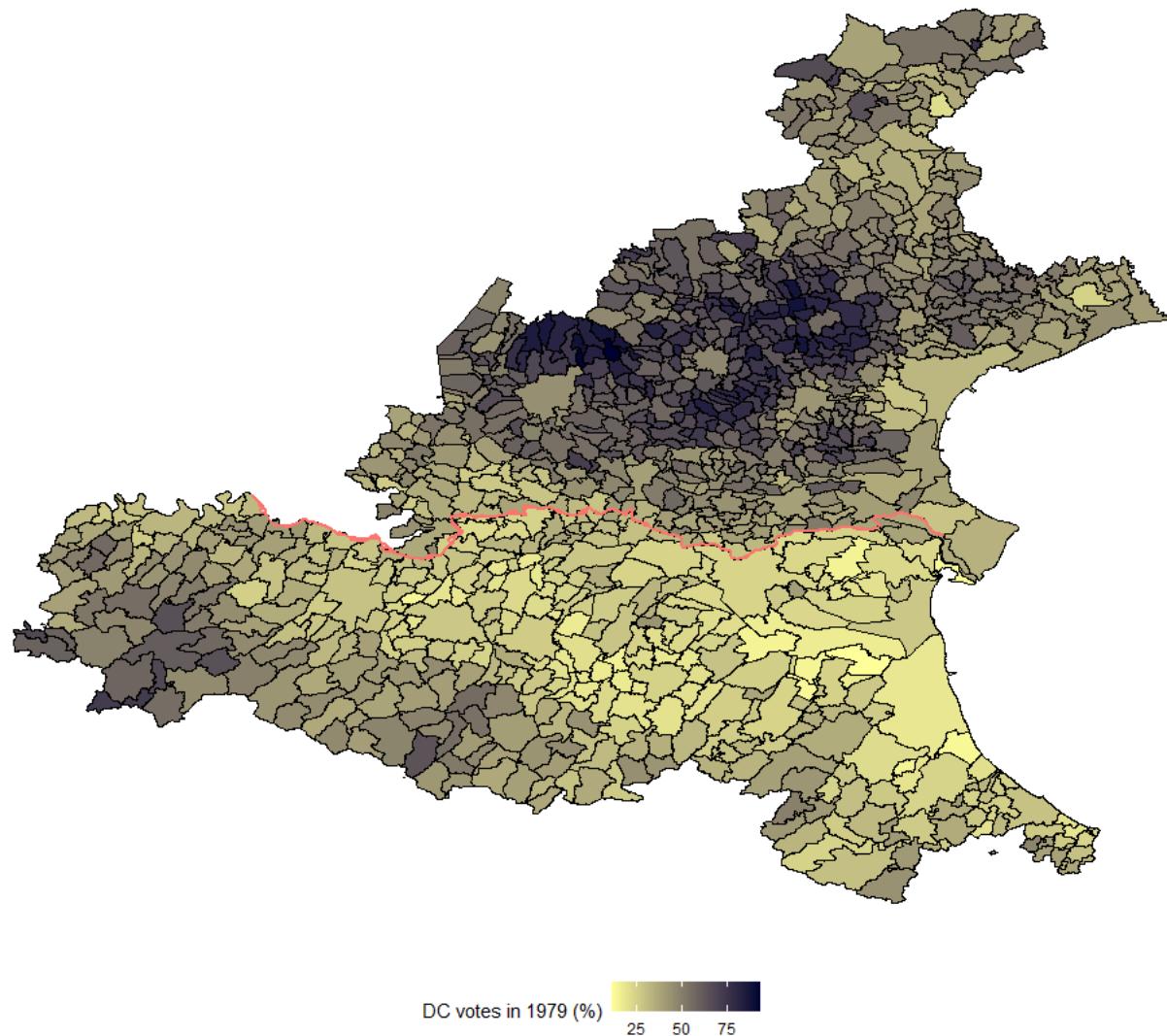


Figure F.9: Average family size in 1953

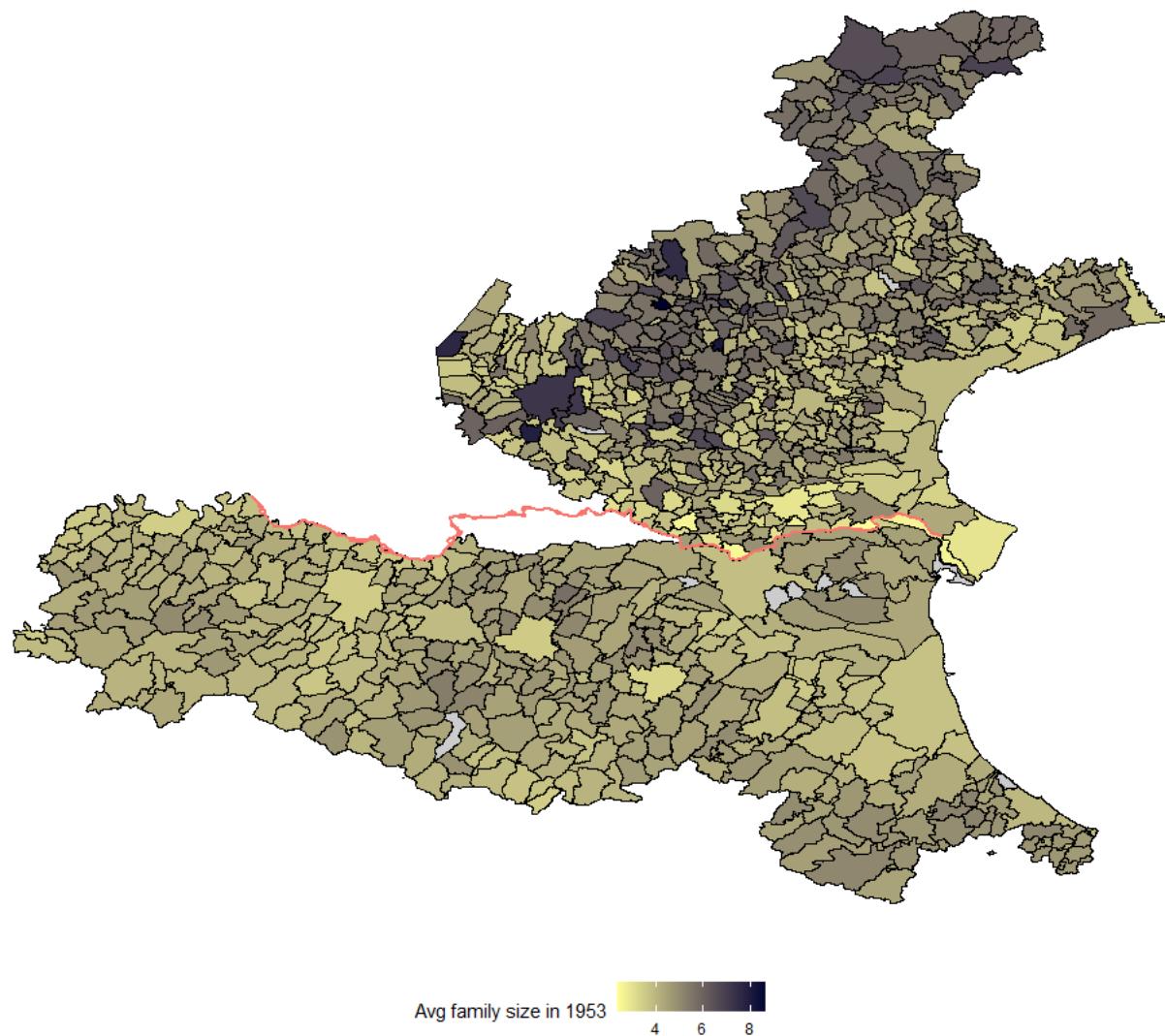


Figure F.10: Average family size in 1971

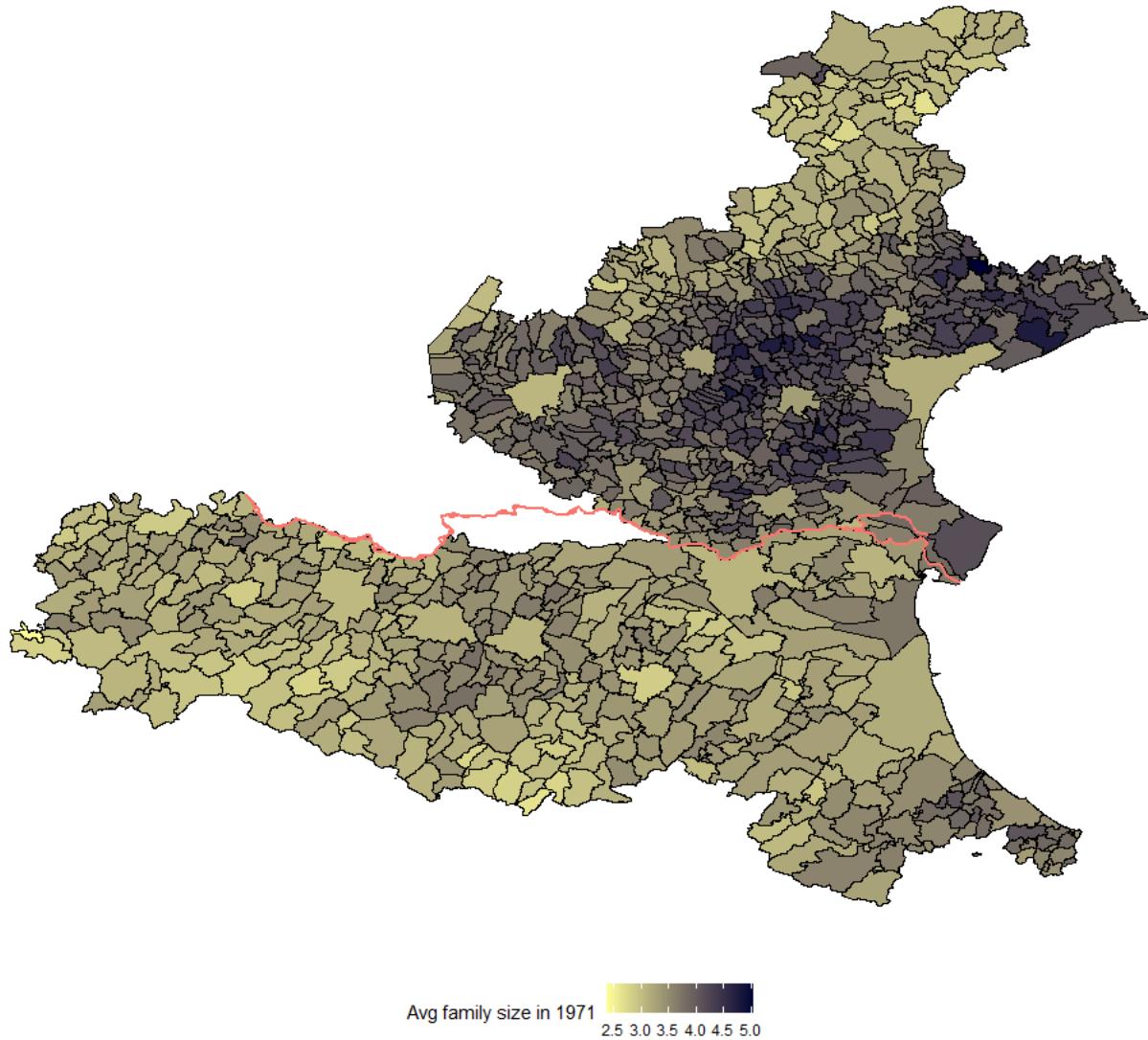


Figure F.11: Maximum altitude (m)

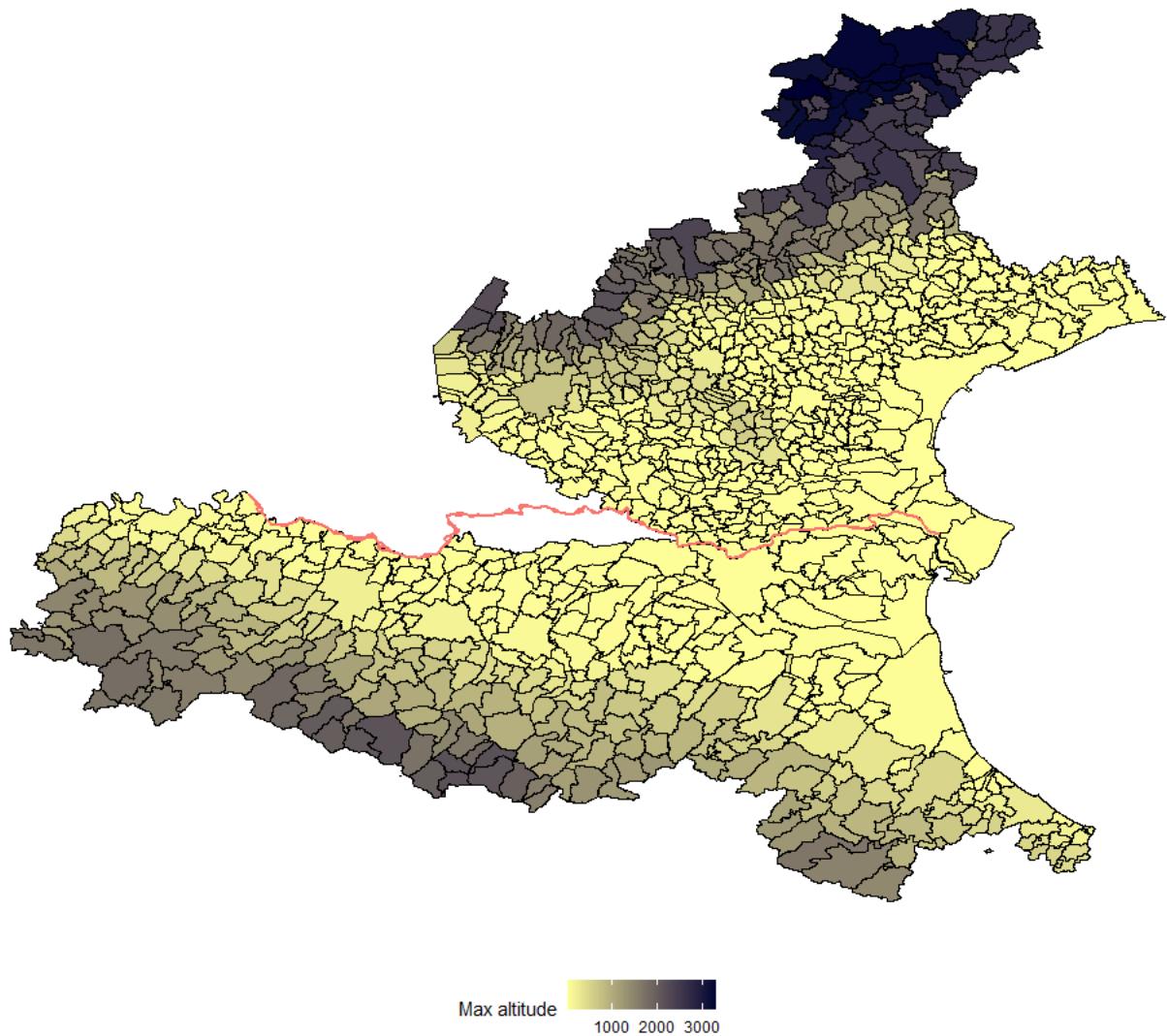


Figure F.12: Number of non-religious NGOs per capita

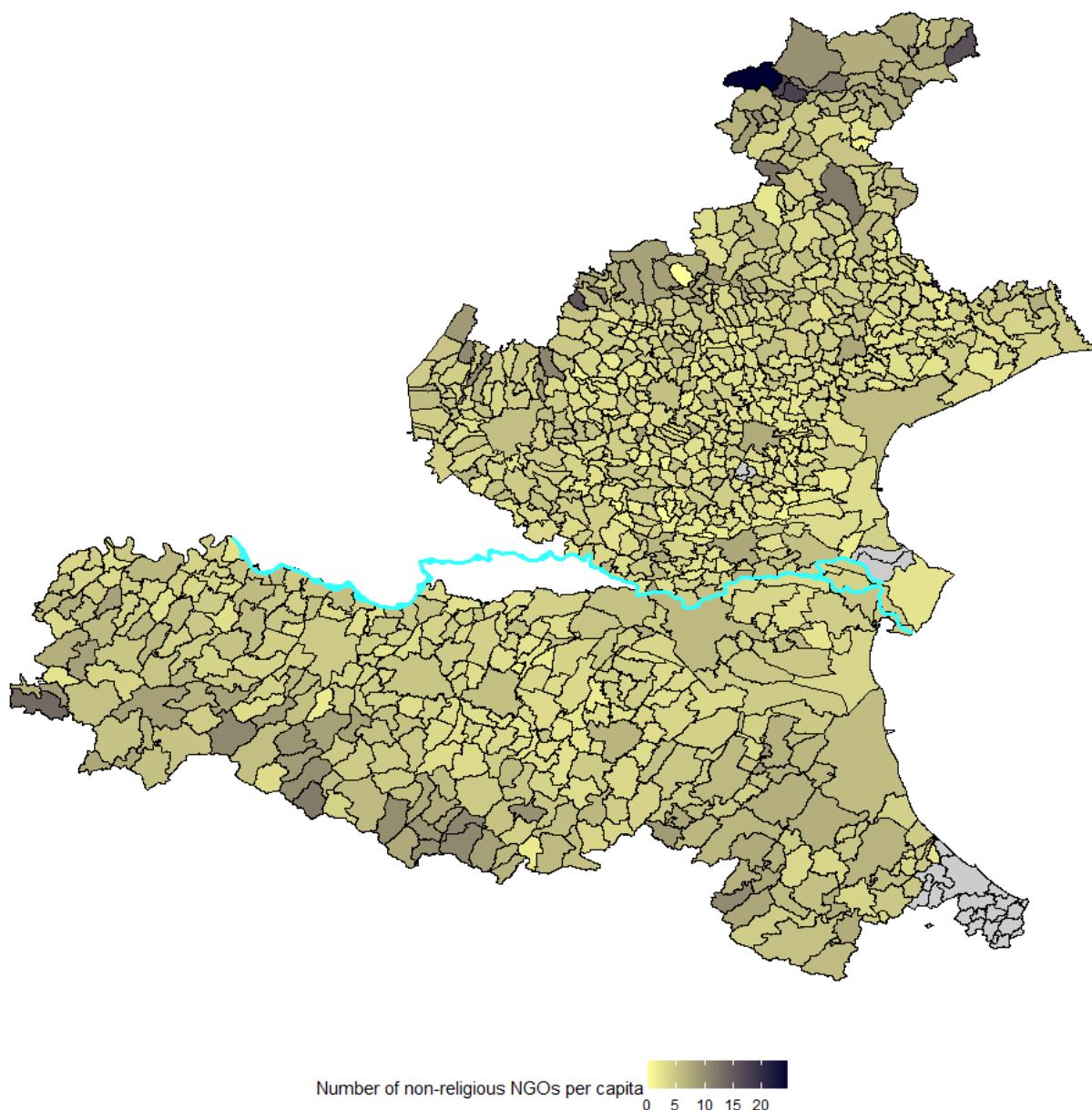


Figure F.13: Presence of organ donation NGO local chapter

