1 Appendix

The analyses in this paper rely on two data sets. The first set Europe into 100x100km grid cells, spanning the years from 1000 to 1850, for a total of 105,111 cell-year observations. The second comprises all European states, for a total of 31,969 state-year observations (not all observations contain all variables.) Both datasets contain the same variables. This data set builds on several existing sources of data:

Data on fragmentation and territorial boundaries comes Abramson 2017 and historical maps from the Population History GIS Collection, Mosaic Census Collection.

I compiled data on monasteries, bishoprics, and cathedrals from the Digital Atlas of Medieval and Roman Civilizations (darmc.harvard.edu) and augmented these with new data on monasteries and bishoprics, especially in Eastern Europe.

The measure of papal conflict consists of the number of clearly identifiable wars by proxy against papal enemies, papal depositions of secular rulers, political crusades, and attacks either led or financed by the popes directly over a rolling five year period, collected from the Cambridge Medieval History, Brecke 2012, and Dupuy and Dupuy 1993. The measure is the number of conflicts in the grid cell that involved the papacy in the previous five year interval. The measure of secular conflict is from Dincecco and Onorato 2016, who code whether armed conflict occurred in a given site in the preceding 150 years.

Data on urbanization and communes (specifically, the log of the city populations in a given year) comes from Bairoch 1988, Bosker, Buringh, and Van Zanden 2013, and Dincecco and Onorato 2016. Data on parliaments are from Van Zanden, Buringh, and Bosker 2012, and data on primogeniture comes from Kokkonen and Sundell 2014 (I recoded primogeniture into a dummy variable, in keeping with their theory and empirics (Kokkonen and Sundell 2014, 443)). Data on whether a given territory belongs to the Holy Roman Empire is from Cantoni 2012 and Nüsli 2009. Data on the Protestant status of a given territory comes from Cantoni 2012 and Rubin 2014: Cantoni covered the Holy Roman Empire and the measure used here codes whether or not a given grid cell contains a city that was Protestant by 1600. The Rubin protestant measure covers more territory (his analysis includes 753 observations to Cantoni's 370), including Poland, France, and Spain, and codes whether a city over 5,000 inhabitants in a given grid cell was Protestant in 1530, 1560, or 1600.

Needless to say, the usual caveats apply: data reaching back to the 10th century is scarce, and it may be missing systematically thanks to subsequent destruction of documents and archives. It is also unlikely to be fully reliable, as both medieval sources and their secondary collations often rely on post-hoc estimates rather than contemporary data collection.

Table A.1: Variable Summary

	count	mean	sd	min	max
fragmentation (# of states/ cell)	105111	1.825213	2.439251	1	33
papal conflict	105111	.0658161	.311769	0	9
secular conflict	6123	.2531439	.9971887	0	13
parliaments	105111	.4888166	1.355119	0	14
urbanization (Bairoch)	105111	.8271827	2.170538	0	39
urbanization (Bosker et al)	105111	.3199094	.8723096	0	13
communes	6123	.3078556	.8031191	0	9
primogeniture	105111	.7861689	.4100109	0	1
bishoprics	105111	2.218664	4.552118	0	40
HRE	105111	.9292748	.2563665	0	1
protestant (Cantoni)	513	3.491228	3.543317	0	17
protestant (Rubin)	37113	.3212082	1.17791	0	17
Observations	105111				

2 Variable Summary

3 Periodization

The analyses are split into two time periods: 1000-1400 and 1500-1800, to reflect the prevailing periodization for the medieval and early modern eras. These are fuzzy boundaries: nonetheless, they coincide with the peak of papal power, and the Reformation period, as two periods when the papacy played a very different role in European politics.

To further substantiate this break, I used Chow tests this periodization. These confirm the validity of this periodization: We cannot reject the null hypothesis of stable coefficients before 1350 or after 1500 for both the fragmentation and commune regressions, further justifying this break in the analysis. In all subsequent tables, the analysis is split into these two time periods: Medieval (M) and Early Modern (EM).

Below, I include three sets of robustness tests: a) different specifications of the dependent variables and/ or controls, b) different units of analysis, and c) placebo tests.

4 Robustness Tests

The robustness tests in this section use different codings of conflict, urbanization, and Protestantism, and different units of analysis. All main results remain robust: medieval conflict with the papacy is a powerful predictor of state fragmentation. All analyses in the Appendix follow the main analyses in using OLS regressions with two-way fixed year and cell effects, and clustering robust standard errors around grid cells or states, depending on the level of analysis.

Tables A.2 and A.3 use state-level data instead of 100 km x 100k raster data. Table A.2 uses the number of states within a 100km radius of a state centroid as the measure of fragmentation, and Table A.3 uses the number of states within a 250km radius. I use this robustness test because the data on Protestantism (from Cantoni 2012 and Rubin 2014) are measured on the city-level. The state-level data set aggregates these into state-level averages, but the raster data set does not. The Protestantism variable is coded as the share of Protestant cities within the state, using data from Rubin 2014. Once we aggregate the data from the cells into states, the collinearity in Model 6 in Table 1 and Model 4 in Table 2 disappears. As an additional robustness test, I use data from Bairoch 1988 for urbanization, here coded as the number of cities within a state. These include more cities than the Bosker et al 2013 measure that is limited to cities over 5,000 inhabitants, but the results are entirely consistent, with a positive and significant correlation between papal conflict and fragmentation. The results obtained here also hold with the original Bosker measure.

All results of the robustness tests are consistent with the main findings. Papal conflict retains its significant and positive association with state fragmentation in the middle ages, but not in the early modern period, in keeping with the argument of the paper.

Table A.2. Papal Conflict Increases Territorial Fragmentation: State level data, 100km radius around state centroids

	(1)	(2)	(3)	(4)	(5)	(6)
	All	Medieval	Medieval	Early Modern	Early Modern	Early Modern
papal conflict	2.057*	2.311***	1.758*	1.248	-0.344	
	(0.906)	(0.482)	(0.715)	(1.627)	(1.337)	
secular conflicts	3.377*	1.027	-0.538	4.103	4.865*	
	(1.644)	(1.366)	(3.113)	(2.119)	(2.316)	
communes	5.513***		6.854*		-1.628	
	(1.521)		(2.735)		(4.295)	
primogeniture	1.155		3.584		-0.388	
	(2.342)		(3.425)		(2.173)	
parliaments	-0.090*	-0.085	-0.113	0.110	0.132	
	(0.044)	(0.043)	(0.058)	(0.079)	(0.086)	
urbanization	0.010	-0.084	-0.052	-0.063	-0.060	
	(0.028)	(0.142)	(0.104)	(0.048)	(0.047)	
HRE	-0.553	-0.290	-2.863	-2.709	-2.240	
	(1.042)	(0.950)	(1.789)	(1.842)	(1.994)	
protestant	-0.740			0.311	-2.723	
	(2.278)			(1.858)	(1.869)	
Constant	10.454***	10.529***	6.312*	21.723***	18.119***	
	(2.337)	(0.758)	(2.463)	(1.708)	(3.924)	
adj. R^2	0.830	0.839	0.769	0.894	0.841	
N	254	218	58	195	111	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.3. Papal Conflict Increases Territorial Fragmentation: State level data, 250km radius around state centroids

	(1) All	(2) Medieval	(3) Medieval	(4) Medieval	(5) Early Modern	(6) Early Modern
papal conflict	4.502*	7.987***	5.605**	4.176	-3.248	
	(2.205)	(1.796)	(1.651)	(4.354)	(2.946)	
secular conflicts	8.728*	2.500	-1.078	8.393	9.847	
	(3.672)	(5.330)	(3.476)	(4.471)	(4.920)	
communes	17.499***		12.844**		-10.340	
	(4.125)		(4.674)		(8.884)	
primogeniture	-2.566		3.174		-4.400	
	(5.470)		(7.264)		(6.454)	
parliaments	-0.213	-0.195	-0.230	0.343	0.457*	
	(0.125)	(0.171)	(0.151)	(0.217)	(0.209)	
urbanization	-0.028	-0.646	-0.329	-0.187	-0.210	
	(0.099)	(0.525)	(0.341)	(0.127)	(0.106)	
HRE	-2.183	-2.381	-1.125	-7.435	-6.614	
	(2.438)	(3.221)	(3.303)	(4.648)	(5.053)	
protestant	-1.743			0.010	-1.608	
	(6.143)			(4.543)	(4.164)	
constant	45.204***	34.579***	22.564***	75.325***	68.578***	
	(5.382)	(2.453)	(6.361)	(4.279)	(9.641)	
adj. R^2	0.908	0.830	0.842	0.943	0.932	
N	254	218	150	195	111	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5 Placebo Tests

This section presents the results of placebo tests for the fragmentation regressions.

I take a 150 year lead of the papal conflict variable, and regress it on measures of fragmentation. The logic is that papal conflicts should predict contemporary or future fragmentation, but not its *past* values. I run several specifications that include both the medieval and early modern eras. The coefficients on future papal conflict are highly unstable (signs are positive and negative, even within the same eras), and is never statistically significant. The association between the placebo and fragmentation falls out entirely in the medieval period, and shows no association with fragmentation in the early modern. We see the same non-relationship between the placebos and fragmentation when alternative explanations are included.

Tables A.4 and A.5 report the results of the same regressions as in Tables 1 and 2 in the main text, using the same dependent variable (fragmentation), but with a papal conflict lead. To avoid multicollinearity, these specifications use the Rubin protestant variable. Table A.6 reports the results of the same regressions as in Table 3 in the main text, using the same dependent variable (presence of communes) but with a papal conflict lead.

Table A.4. Placebo Test for papal conflict as a determinant of fragmentation, using papal conflict lead of 150 years. See Table 1 in text.

	(1)	(2)	(3)	(4)	(5)	(6)
	All	Medieval	Medieval	Early Modern	Early Modern	Early Modern
papal conflict lead	-0.012	(.)	(.)	-0.009	0.022	0.022
	(0.084)			(0.037)	(0.047)	(0.047)
secular conflict	0.008	0.000	-0.023	0.036	0.030	0.030
	(0.038)	(0.048)	(0.049)	(0.023)	(0.023)	(0.023)
parliaments	-0.189**		-0.135***		-0.117	-0.117
	(0.058)		(0.040)		(0.274)	(0.274)
urbanization	0.026		0.819***		-0.051	-0.051
	(0.065)		(0.185)		(0.048)	(0.048)
HRE	-0.169	-0.221	-0.238	0.435***	0.512***	0.512***
	(0.137)	(0.166)	(0.156)	(0.107)	(0.130)	(0.130)
protestant	0.426**				0.125*	0.125*
	(0.146)				(0.058)	(0.058)
Constant	2.984***	2.028***	1.881***	1.506***	2.870***	2.870***
	(0.128)	(0.040)	(0.053)	(0.039)	(0.469)	(0.469)
adj. R^2	0.830	0.753	0.773	0.968	0.970	0.970
N	2136	1650	1650	3662	1068	1068

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.6 reports the results of placebo tests for Table 3 (communes as a dependent variable), using the 150 year lead on papal conflict as a placebo.

Table A.5. Placebo Test for papal conflict as a determinant of fragmentation, using papal conflict lead of 150 years and alternative explanations. See Table 2 in text.

	(1) All	(2) Medieval	(3) Medieval	(4) Early Modern
papal conflict lead	0.010	(.)	0.020	0.028
	(0.088)		(0.038)	(0.047)
secular conflict	-0.004	-0.048	0.041	0.031
	(0.038)	(0.044)	(0.023)	(0.023)
parliaments	-0.238**	-0.279***	-0.133	-0.117
	(0.078)	(0.063)	(0.155)	(0.275)
urbanization	-0.041	0.344*	-0.062	-0.047
	(0.066)	(0.161)	(0.044)	(0.048)
communes	0.362***	0.676***	-0.001	-0.036
	(0.108)	(0.123)	(0.060)	(0.080)
primogeniture	0.756***	0.335***	0.101***	0.081
	(0.165)	(0.068)	(0.024)	(0.094)
HRE	-0.139	-0.321	0.409***	0.514***
	(0.134)	(0.168)	(0.105)	(0.130)
protestant	0.358*			0.126*
	(0.138)			(0.060)
Constant	2.215***	1.740***	1.519***	2.822***
	(0.172)	(0.065)	(0.084)	(0.486)
adj. R^2	0.837	0.797	0.968	0.970
N	2136	1650	3662	1068

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.6. Placebo Test for papal conflict as a determinant of communes, using papal conflict lead of 150 years and alternative explanations. See Table 3 in text.

	(1) All	(2) Medieval	(3) Medieval	(4) Early Modern	(5) Early Modern
papal conflict lead	-0.04	(.)	(.)	0.02	0.00
	(0.03)			(0.01)	(0.01)
fragmentation	0.07***	0.17***	0.12***	-0.01	0.00
	(0.01)	(0.03)	(0.02)	(0.01)	(0.01)
secular conflict	0.05*	0.04	0.05	0.02	0.02
	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)
bishops	0.03		0.20***		
	(0.05)		(0.06)		
parliaments	0.21***		0.21***		0.10
	(0.06)		(0.05)		(0.08)
urbanization	0.22***		0.51***		0.09**
	(0.05)		(0.07)		(0.03)
Constant	-0.08	-0.11	-0.75***	0.33***	0.24***
	(0.11)	(0.06)	(0.16)	(0.01)	(0.05)
adj. R^2	0.804	0.533	0.702	0.964	0.966
N	6120	1650	1650	3662	3662

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Parallel Trends

The parallel trends assumption is both unprovable and necessary for difference-in-difference designs (and thus two-way fixed effects designs.) I am able to suggest that the parallel trends assumption holds through the beginning of the 13th century, which is when papal efforts intensified. As Møller and Doucette 2021 argue (16ff), 1200 marks a breaking point in the history of European state development, and an enormous intensification of papal efforts. It follows both the Investiture Conflict, and the Gregorian Reforms within the church, and marks a militant new papacy (the treatment) when the newly autonomous and emboldened church launches the systematic campaign against its secular rivals. Figure A.1 shows that the trends in papal conflict in fragmented and unfragmented states prior to the 13th century are parallel to each other.

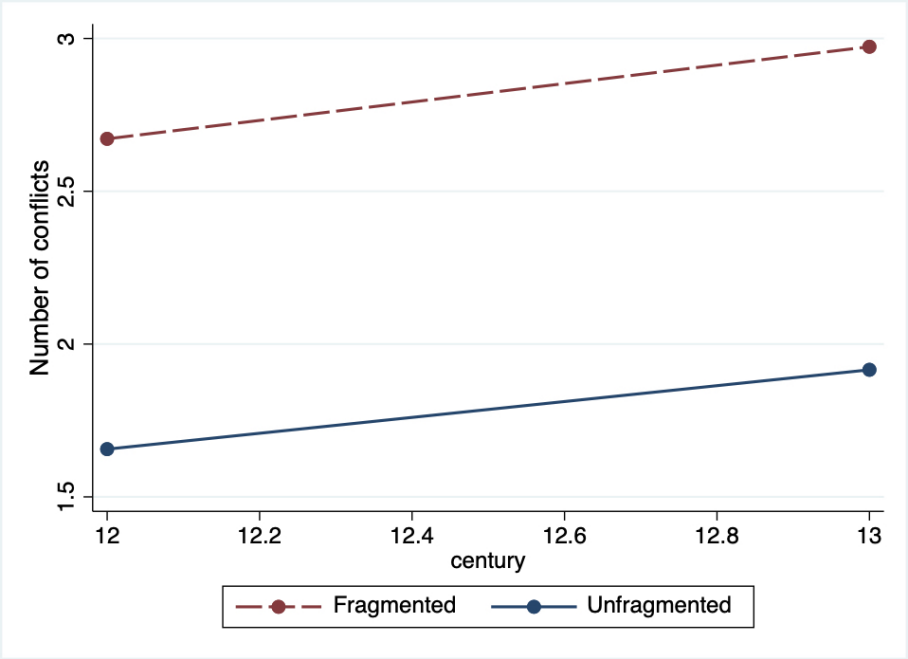

Figure A.1. Papal conflict in fragmented and unfragmented states until the 13th century

7 Mediation Analyses

Since primogeniture and communes were themselves shaped by the papacy, one possibility is that the impact of papal conflict is mediated by primogeniture or communes. I use mediation analysis to examine this possibility (Imai et al 2011.) Given the very strong assumptions necessary for mediation analysis, this less a formal effort to trace causation than a way of showing how primogeniture and commune formation both related to the churchs activity. Table A.7 shows the results, which suggest that primogeniture may have mediated the impact of papal conflict, but communes did not. Primogeniture mediates roughly 33% of the causal effect of papal conflict in the medieval era and 9% in the early modern. In the case of communes in both the medieval and early modern periods, however, the confidence intervals include 0, and thus the mediated effect is unclear.

Table A.7: Primogeniture mediates the impact of papal conflict but communes do not

	(1) Medieval Primogeniture	(2) Early Modern Primogeniture	(3) Medieval Communes	(4) Early Modern Communes
Avg Causal Mediation Effect	.14	.12	-.006	.03
	(.13-.16)	(.11-.14)	(-.05-.04)	(-.19-.26)
Avg Direct Effect	.29	.82	-.17	.44
	(.23-.34)	(.73-.91)	(-.37-.03)	(-.30-1.13)
Total Effect	.43	.95	-.17	-.48
	(.37-.48)	(.85-1.04)	(-.39-.03)	(-.31-1.23)
% of effect mediated	33%	13%	4%	6%
	(30% to 38%)	(12% to14%)	(-25% to 30%)	(-98% to 90%)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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