Supplementary Information to

The Long Run Effects of Religious Persecution: Evidence from the Spanish Inquisition

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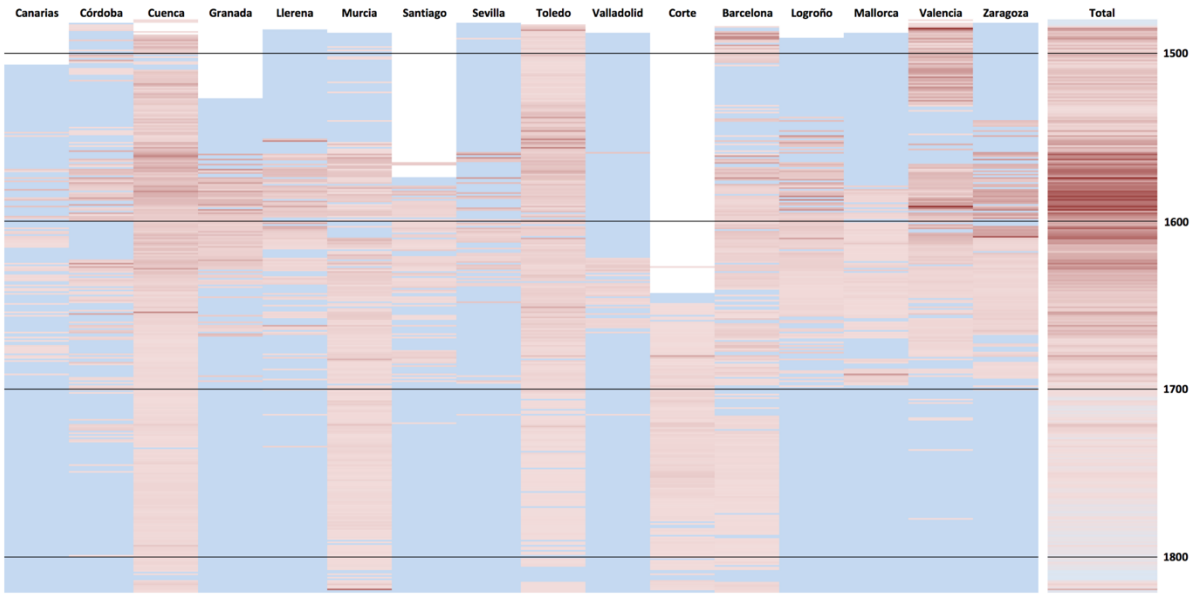
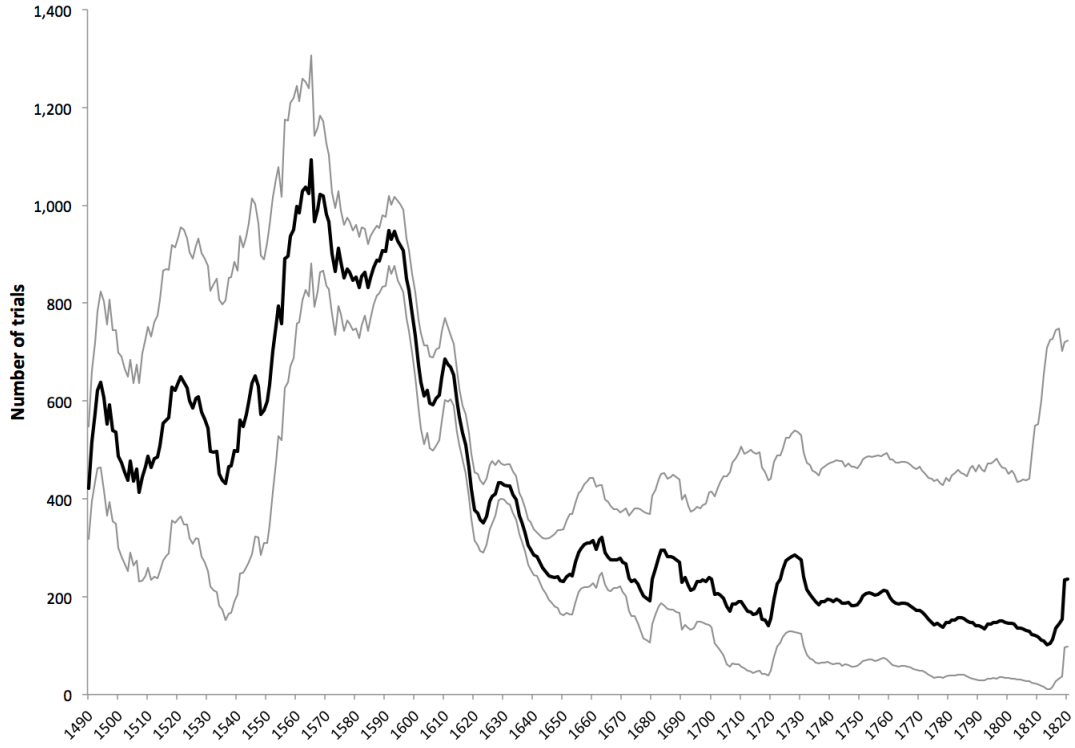
Appendix A: Additional Figures and Tables

Figure A.1: Data density heatmap



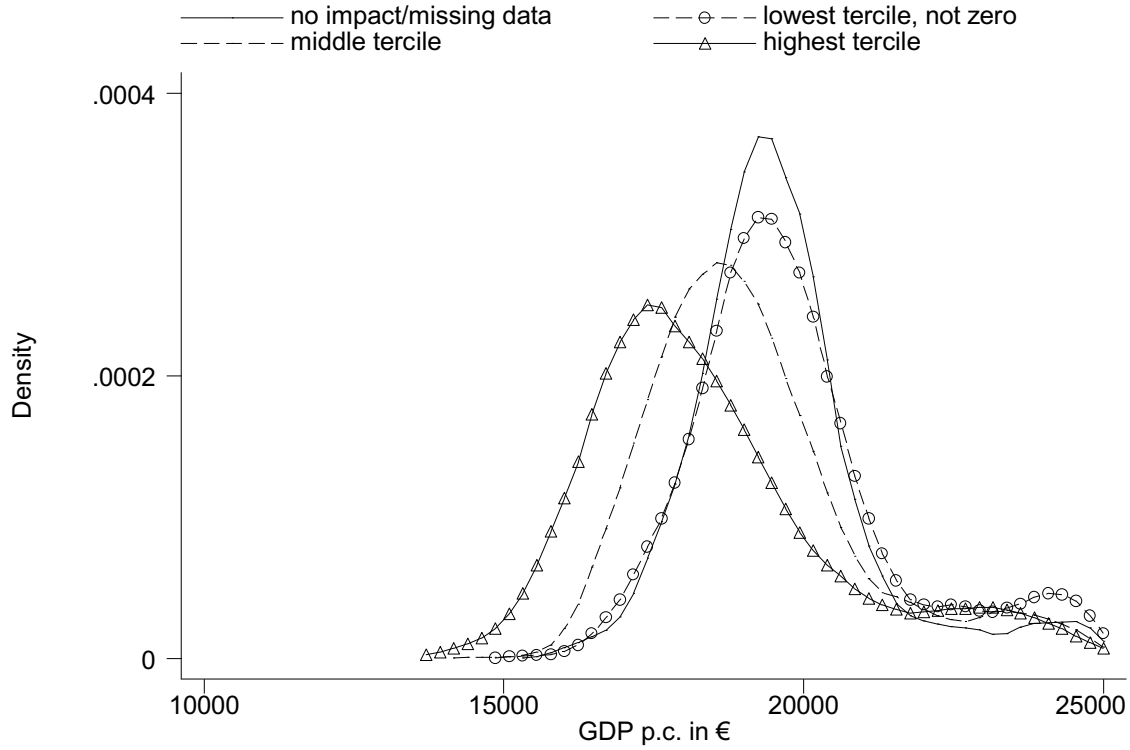
Note: each column represents a territorial Inquisition tribunal. The vertical dimension represents time, with century changes marked as horizontal black lines. White coloring means that the tribunal had not yet been established. Blue coloring represents years with zero cases or no data available (the data does not allow for distinguishing between the two situations). Red coloring represents years with cases available, with darker coloring indicating a higher concentration of cases.

Figure A.2: Estimate of total trials per year (10 year moving average) and 95% confidence intervals



Note: The black line represents the estimate of the number of cases obtained from the regression approach described in the main text. The grey lines represent 95% confidence intervals. The asymmetric disposition of the confidence bands towards the end of the period is the result of the large amount of missing data combined with the fact that the number of cases cannot be lower than the actual observed amount.

Figure A.3: Trial frequency and economic performance



Note: Dependent variable is the nightlight-based estimate of municipal GDP per capita, in 1,000s of € p.a. High impact means an annual number of cases above the median.

Figure A.4: Inquisitorial intensity and hospital presence in 1750

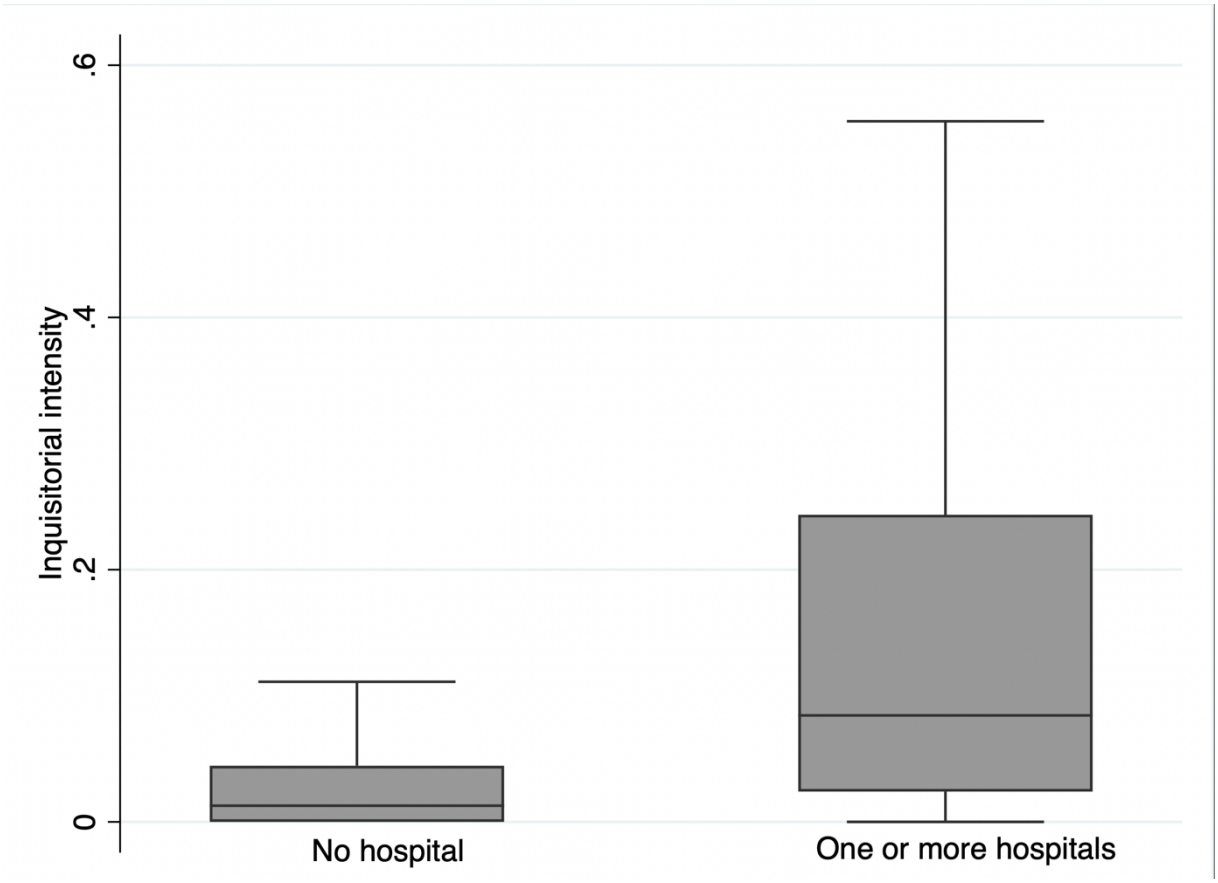


Table A.1: Economic performance and inquisitorial intensity

	(1)	(2)	(3)	(4)	(5)
inquisitorial intensity	-0.336*** (-7.81)	-0.303*** (-7.56)	-0.352*** (-8.11)	-0.266*** (-6.76)	-0.396*** (-9.58)
Population	✓	✓	✓	✓	✓
Geographic		✓	✓	✓	✓
Socioeconomic			✓	✓	✓
Regional FE				✓	✓
No trib. cities					✓
N	8005	7995	2228	2228	2214
R^2	0.039	0.268	0.401	0.477	0.491

Note: Dependent variable is the nightlight-based estimate of municipal GDP per capita. All regressors and controls as in Table 1. t-statistics in parentheses: * p<.1, ** p<.05, *** p<.01

Table A.2: Economic performance and trial frequency

	(1)	(2)	(3)	(4)	(5)
trial frequency	-0.0091 (-1.25)	-0.0823 (-1.28)	-0.0110* (-1.69)	-0.00706 (-1.48)	-0.0714*** (-4.00)
Population	✓	✓	✓	✓	✓
Geographic		✓	✓	✓	✓
Socioeconomic			✓	✓	✓
Regional FE				✓	✓
No trib. cities					✓
N	8005	7995	2228	2228	2214
R^2	0.004	0.240	0.353	0.451	0.469

Note: Dependent variable is the nightlight-based estimate of log GDP per capita. All controls and specifications as in Table A.1. t-statistics in parentheses: * p<.1, ** p<.05, *** p<.01

Table A.3: Alternative measures of economic performance

	(1)	(2)	(3)	(4)	(5)
	Log of mean light level	Mean light level	INE GDP measure	INE GDP measure	INE GDP measure
inquisitorial intensity	-1.950***	-46.07***	-0.381***	-0.137***	-0.0491
	(-9.04)	(-10.61)	(-8.11)	(-4.22)	(-1.19)
Population	✓	✓	✓	✓	✓
Geographic	✓	✓		✓	✓
Socioeconomic	✓	✓		✓	✓
Regional FE	✓	✓			✓
No trib. cities	✓	✓			✓
N	2182	2214	2866	1654	1640
R^2	0.685	0.678	0.184	0.645	0.691

Note: Dependent variables are: col (1): log of nighttime luminosity, averaged over the municipal territory. col (2): level of nighttime luminosity, averaged over the municipal territory; cols. (3-5): income-tax-based GDP measure for municipalities with population > 1,000, from the Instituto Nacional de Estadísticas. All controls as in Table A.1. t-statistics in parentheses: * p<.1, ** p<.05, *** p<.01

Table A.4: Religiosity and inquisitorial intensity

	(1)	(2)	(3)	(4)	(5)
inquisitorial intensity	1.032***	0.809***	0.607***	0.359***	0.445***
	(12.06)	(10.53)	(8.23)	(5.42)	(4.83)
Population	✓	✓	✓	✓	✓
Geographic		✓	✓	✓	✓
Socioeconomic			✓	✓	✓
Regional FE				✓	✓
No trib. cities					✓
N	2758	2758	2205	2205	2191
R^2	0.184	0.304	0.352	0.429	0.429

Note: Dependent variable is the average number of times survey respondents from a given municipality attended religious services in the previous week. All other controls and specifications as in Table A.1. t statistics in parentheses: * p<.1, ** p<.05, *** p<.01

Table A.5: Religiosity and trial frequency

	(1)	(2)	(3)	(4)	(5)
Trial frequency	0.0642*** (3.26)	0.0537*** (3.54)	0.0341*** (2.96)	0.0227*** (2.99)	0.104*** (4.22)
Population	✓	✓	✓	✓	✓
Geographic		✓	✓	✓	✓
Socioeconomic			✓	✓	✓
Regional FE				✓	✓
No trib. cities					✓
N	2758	2758	2205	2205	2191
R^2	0.167	0.294	0.344	0.427	0.428

Note: Dependent variable is the average number of times survey respondents from a given municipality attended religious services in the previous week. All other controls and specifications as in Table A.1. t-statistics in parentheses: * p<.1, ** p<.05, *** p<.01

Table A.6: Education and inquisitorial intensity

	(1)	(2)	(3)	(4)	(5)
inquisitorial intensity	-0.137*** (-5.94)	-0.0509*** (-2.61)	-0.0483*** (-2.74)	-0.0390* (-1.93)	-0.0535** (-2.33)
Population	✓	✓	✓	✓	✓
Geographic		✓	✓	✓	✓
Socioeconomic			✓	✓	✓
Regional FE				✓	✓
No trib. cities					✓
N	8001	8001	2229	2229	2215
R^2	0.137	0.338	0.499	0.574	0.572

Note: Dependent variable is the share of the municipal population holding a high school or higher degree as of the 2011 census. All other controls and specifications as in Table A.1. t statistics in parentheses: * p<.1, ** p<.05, *** p<.01

Table A.7: Education and trial frequency

	(1) High school+	(2) High school only	(3) High school+ Pop <30,000
inquisitorial intensity	-0.0008 (-0.14)	-0.0116** (-2.16)	-0.0209** (-2.02)
Population	✓	✓	✓
Geographic	✓	✓	✓
Socioeconomic	✓	✓	✓
Regional FE	✓	✓	✓
No trib. cities	✓	✓	✓
N	2191	2191	1978
R^2	0.573	0.493	0.561

Note: Dependent variable in cols. 1 and 3 is the share of the municipal population with a high school degree or higher. Dependent variable in col. 2 is the share of the population with a high school degree only. The regression in col. 3 is restricted to municipalities with a population of less than 30,000. All controls as in Table A.1.
t-statistics in parentheses; * p < .1, ** p < .05, *** p < .01

Table A.8: Trust and inquisitorial intensity

	(1)	(2)	(3)	(4)	(5)
Inquisitorial intensity	-0.214** (-2.46)	-0.242*** (-2.65)	-0.198** (-2.08)	-0.273*** (-2.70)	-0.400*** (-2.80)
Population	✓	✓	✓	✓	✓
Geographic		✓	✓	✓	✓
Socioeconomic			✓	✓	✓
Regional FE				✓	✓
No trib. cities					✓
N	1142	1142	990	990	976
R^2	0.003	0.011	0.020	0.049	0.050

Note: Dependent variable is average standardized trust in the municipality, calculated from the CIS barometer surveys. All controls and specifications as in Table A.1.

Table A.9: Trust and trial frequency

	(1)	(2)	(3)	(4)	(5)
Trial frequency	-0.0033 (-0.62)	-0.00611 (-1.06)	-0.00231 (-0.40)	-0.00663 (-0.98)	-0.0734*** (-2.25)
Population	✓	✓	✓	✓	✓
Geographic		✓	✓	✓	✓
Socioeconomic			✓	✓	✓
Regional FE				✓	✓
No trib. cities					✓
N	1142	1142	990	990	976
R^2	0.000	0.007	0.018	0.045	0.047

Note: Dependent variable is average standardized trust in the municipality, calculated from the CIS barometer surveys. All controls and specifications as in Table A.1. t-statistics in parentheses; * p < .1, ** p < .05, *** p < .01

Table A.10: Moran's *I*

Variable	**Statistic**	**distance threshold**			
		100	200	300	400
log GDP per capita	Moran's I	0.057	0.009	-0.006	-0.004
	p-value	0.000	0.000	0.000	0.000
religiosity	Moran's I	0.011	-0.002	-0.000	-0.002
	p-value	0.000	0.274	0.615	0.097
share higher education	Moran's I	0.021	0.004	-0.004	-0.002
	p-value	0.000	0.011	0.000	0.010
standardized trust	Moran's I	-0.009	-0.004	-0.005	-0.002
	p-value	0.182	0.347	0.075	0.671

Note: We calculate Moran's I based on the STATA routine *moransi*, using the residuals of specification (5) in Tables A.1 (GDP), A.4 (religiosity), A.6 (education), and A.8 (trust).

Table A.11: Standard errors corrected for spatial dependence

Variable	**distance threshold**			
	100	200	300	400
log GDP per capita	-0.447***	-0.447***	-0.447***	-0.447***
	(-8.19)	(-6.96)	(-6.51)	(-11.28)
religiosity	0.626***	0.626***	0.626***	0.626***
	(4.28)	(3.43)	(3.36)	(3.98)
share higher education	-0.0821**	-0.0821*	-0.0821*	-0.0821*
	(-2.17)	(-1.68)	(-1.86)	(-1.79)
standardized trust	-0.410***	-0.410***	-0.410***	-0.410***
	(-3.13)	(-5.58)	(-4.02)	(-3.35)

Note: We calculate corrected standard errors using the *acreg* routine in STATA, based on (*65*), using specification (5) in Tables A.1 (GDP), A.4 (religiosity), A.6 (education), and A.8 (trust) (latitude and longitude controls excluded).

Table A.12: Hospitals, historical population, and inquisitorial intensity

	(1)	(2)	(3)	(4)	(5)	(6)
Hospitals	0.069***	0.0422***	0.0447***	0.0366***	0.0256***	
	(7.22)	(3.35)	(3.74)	(4.60)	(3.85)	
1528 Population		0.0474***	0.0423***	0.0459***	0.0377***	0.0193***
		(7.31)	(6.61)	(7.30)	(9.10)	(14.20)
Geographic			✓	✓	✓	✓
Tribunal FE				✓	✓	✓
No trib. cities					✓	✓
N	716	402	402	402	395	2672
R^2	0.333	0.365	0.425	0.544	0.467	0.312

Note: Dependent variable is inquisitorial intensity in the municipality. 1528 population is the log of the number of households reported in the 1528 *Censo de los Pecheros*. t-statistics in parentheses; * p < .1, ** p < .05, *** p < .01

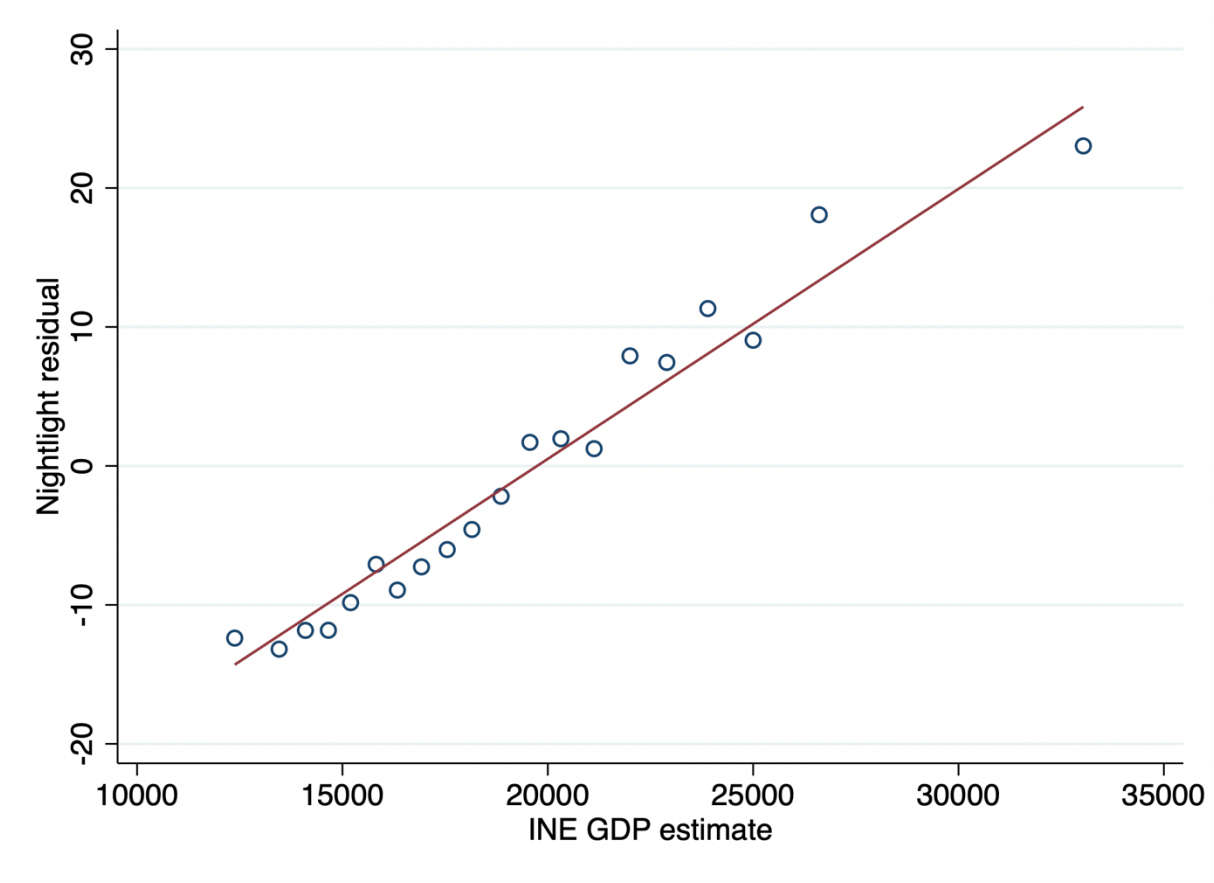
Appendix B: Nightlight as an Indicator of Spanish Local GDP

The Spanish National Instituted for Statistics (INE) publishes an estimate of municipal GDP per capita based on personal income tax (IRPF) receipts, calibrated to actual measures of provincial GDP. As discussed in the text, this data is only available for municipalities above a population threshold of 1,000. This excludes 75% of all Spanish municipalities, and captures none of the small locales where we would expect cultural transmission mechanisms to operate strongly. Local income tax data will also be affected by tax evasion and differences in the geographical location of value-added activity vs personal consumption.

We therefore adopt a nightlight-based procedure to estimate local GDP, using the co-movement of nightlight and the INE GDP data in the aggregate to translate nightlight values into estimates of GDP in euro. Our procedure is as follows:

1. We obtain NOAA 2013 nightlight raster data and overlay it on a shapefile of Spanish municipalities. For each municipality, we calculate the median nightlight value.
2. We regress median nightlight on the log of municipal population. We use the residual of this regression as our indicator of municipal GDP. These residuals – the part of nightlight not explained by greater population – show a strong relationship with the INE estimate, as shown in Figure B.1.

Figure B.1: Nightlight-based GDP indicator and INE estimates

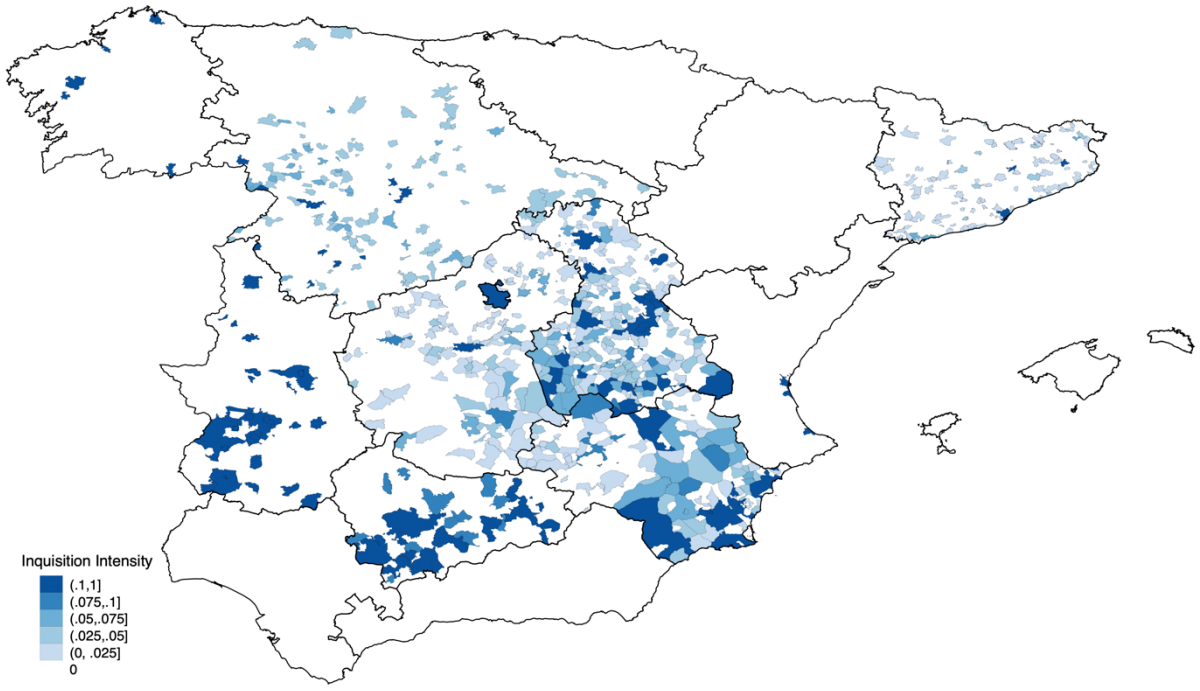


3. To estimate municipal-level GDP, we regress nightlight residuals on the INE GDP measure over their shared domain. We then use the coefficients from this regression to convert the nightlight residuals for each municipality, obtained in step (2), into a euro-denominated GDP estimate.

Appendix C: Impact of missing data after 1700

As evident from Figure A.1, the density of our data is highest in the period between 1540 and 1700, where we can rely on the *relaciones de causas*, the annual summaries of trials that each tribunal was required to send to the Supreme Council of the Inquisition in Madrid. The discontinuation of this practice in 1700 means that data after that time has to be gleaned from surviving records from the archives of the tribunals themselves. Only the archives from the Toledo and Cuenca tribunals have survived in reasonably complete form. We have partial records from Córdoba, Valladolid, Murcia, Llerena, Barcelona, and Madrid (Tribunal de Corte), with the remainder lost. Figure C.1 shows the geographical distribution of inquisitorial intensity after 1700 based on surviving data.

Figure C.1: Inquisitorial intensity after 1700



Both of our treatment variables are adjusted to account for the number of years with surviving data. Since the preservation or destruction of individual tribunal archives may be correlated with local attitudes towards the Inquisition and with our outcome variables, it is nonetheless prudent to explore whether the surviving data from after 1700 might be biasing our results.

Table C.1 is divided in four panels. The top panel reproduces the main result from table 1 in the text, which we include here for ease of comparison. In second place we recalculate inquisitorial intensity excluding all data after 1700, and use it as our treatment variable instead. Coefficients and significance are largely unaffected. In the third panel we turn the tables around: what if we used only data from after 1700 to calculate inquisitorial intensity? The effects on income and religiosity are much diminished, while those on education and trust disappear altogether. This is the opposite of what would be expected if post-1700 data was driving the results. In the fourth panel we exclude municipalities with post-1700 data from the sample altogether. The coefficients and significance levels remain very close to the baseline specification. All in all, these increasingly stringent tests all but rule out the possibility that survival bias from post-1700 data might be driving our results.

Table C.1: Robustness analysis

	log GDP p.c.	Religiosity	Education	Trust
Baseline inquisitorial Intensity (Table 1)	-0.396*** (-9.58)	0.445*** (4.83)	-0.0535** (-2.33)	-0.400*** (-2.80)
N	2214	2191	2215	976
Pre-1700 inquisitorial intensity	-0.391*** (-10.06)	0.421*** (4.70)	-0.0554** (-2.51)	-0.371*** (-2.66)
N	2214	2191	2215	976
Post-1700 inquisitorial intensity	-0.166*** (-4.03)	0.195** (2.06)	0.00989 (0.53)	-0.175 (-1.01)
N	1683	1667	1684	752
Exclude municipalities with post-1700 data	-0.364*** (-8.58)	0.448*** (4.53)	-0.0560** (-2.24)	-0.436*** (-2.78)
N	1929	1907	1930	803
Population	✓	✓	✓	✓
Geographic	✓	✓	✓	✓
Socioeconomic	✓	✓	✓	✓
Regional FE	✓	✓	✓	✓
No trib. cities	✓	✓	✓	✓

t statistics in parentheses; * $p < .1$, ** $p < .05$, *** $p < .01$

Appendix D: Expulsion of the Moriscos, inquisitorial intensity, and income per capita

In 1609, Spain forcibly expelled its remaining population of Muslim converts, known as 'moriscos', with prominent involvement of the Inquisition. This exodus caused major suffering, and had important economic consequences. We use the data on the share of the population expelled for the Kingdom of Valencia, as compiled by Chaney and Hornbeck (*52*). This allows us to check whether we are simply picking up the same effects as earlier studies. Table D.1 reproduces our baseline and full-control specifications for income per capita for the region of Valencia in columns (1) and (3). It then adds the proportion of moriscos in the pre-expulsion population as a control in columns (2) and (4). Controlling for morisco population makes the coefficients on inquisitorial intensity slightly larger, though the full specification is only marginally significant as a result of the small sample size. The positive coefficients on the proportion of moriscos are consistent with Chaney and Hornbeck's finding that a higher proportion of moriscos in the population is associated with higher GDP per capita today.

Table D.1: Inquisition intensity, GDP per capita, and Morisco presence in Valencia

	(1) Basic	(2) Basic	(3) All controls	(4) All controls
Inquisitorial intensity	-0.283***	-0.319***	-0.147	-0.180*
	(-2.34)	(-2.26)	(-1.50)	(-1.75)
Proportion of moriscos in the population		0.0743***		0.0378***
		(6.93)		(2.83)
N	652	652	238	238
R^2	0.093	0.169	0.683	0.693

t statistics in parentheses; * $p < .1$, ** $p < .05$, *** $p < .01$

Appendix E: Pre-Inquisition Religiosity

We construct measures of pre-Inquisition religiosity based on the Spanish Biographical Dictionary (*Diccionario Biográfico Español)* maintained by the Royal Academy for History, a collection of over 50,000 biographies of notable individuals who lived in territories under Spanish control between the seventh century B.C. and modern times.[1] We proceed in four steps:

1. We first identify 4,711 individuals who died prior to 1480, the year of the establishment of the Inquisition, and scrape their biographies from the online DBE database.

2. We identify a total of 142 different religious occupations, and retain the records associated with them. This yields 906 biographies.

3. We geo-code the location where the influence of religious individuals was likely to have been greater. This is typically the place of death. If not reported, we use place of birth. In the absence of either, we parse the text of the biography for relevant geographical indicators. We end up with 565 biographies georeferenced to a modern-day municipality.

4. We use the resulting data to calculate a density function ("heatmap") of religious individuals. The density function is the standard quartic kernel used by GIS applications, with an optimal bandwidth of approximately 80km. Results are robust to any bandwidth between 50 and 400 km.

Appendix F: Inquisitorial intensity and Carlism

[1] http://dbe.rah.es/

To study the relationship between Inquisitorial intensity and the Carlist movement, we digitize municipal-level data on the number of prominent Carlist supporters and activists in Catalonia between 1868 and 1876 reported by Toledano González (*78*). We also code a dummy variable indicating the presence of a Carlist community organization ("cercle") in a municipality, using data from the Catalan Encyclopaedia (*79*). Cercles acted as recruiting and training offices for Carlist supporters, as well as providing a venue for socializing and recreation. Data on cercles is available for Catalonia, Valencia, and the Balearic Islands.

Table F.1 shows regressions of the share of Carlist supporters and of the presence of cercles on inquisitorial intensity. Columns (1) and (3) show the two-way relationship controlling only for population. Columns (2) and (4) add geographic controls and exclude tribunal heads. Column (4) also adds regional fixed effects. We do not add socioeconomic controls, as none are available at the municipal level for 1860.

The effects implied by the results in Table F.1 are large. Using the full specifications, a one standard deviation increase in our measure of inquisitorial intensity is associated with a 43% increase in the share of prominent Carlists in the population, and with a 12% increase in the probability of observing a Carlist community organization in the municipality.

Table F.1: Inquisitorial intensity and Carlism

	(1) Share of Carlists	(2) Share of Carlists	(3) Cercles	(4) Cercles
Inquisitorial intensity	0.0398 (1.50)	0.110*** (2.84)	1.271*** (5.38)	2.005*** (7.03)
Population	✓	✓	✓	✓
Geographic		✓		✓
Regional FE				✓
No trib. cities		✓		✓
N	944	942	1553	1548
R^2	0.005	0.037	0.151	0.080

t statistics in parentheses; * $p < .1$, ** $p < .05$, *** $p < .01$

Appendix G: Data and Replication

The analysis dataset and replication package for this article is available at:

Drelichman, Mauricio, Vidal-Robert, Jordi, and Voth, Hans-Joachim. Replication: The Long Run Effects of Religious Persecution: Evidence from the Spanish Inquisition. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2021-06-26. https://doi.org/10.3886/E143781V1

Additional data sources:

Nightlight raster data
National Centers for Environmental Information, National Oceanic and Atmospheric Administration (NOAA) Version 4 DMSP-OLS Nighttime Lights Time Series, https://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html (F182013), last accessed July 26, 2021.

Religious services attendance, share of population with higher education, share of population with secondary education, trust measure, percentage of population married, percentage of population that identifies as middle or upper class, average municipal age:
"Barómetro" surveys of the Centre for Sociological Research (Centro de Investigaciones Sociológicas, Madrid) between 2000 and 2015.
http://www.cis.es/cis/opencm/ES/11_barometros/index.jsp
Individual survey responses accessed on site on October 2015 under confidentiality agreement. Municipal-level aggregations are reproduced in replication dataset.

Religious figures
Individual biographies from Real Academia de la Historia, *Diccionario Biográfico Electrónico*, http://dbe.rah.es/, accessed 2020-2021 [various dates].