Online Appendix

Set Apart: Feudalism, Family Structure, and the Origins of Low Social Capital

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A Descriptive Statistics, Additional Confounders, and Robustness Checks

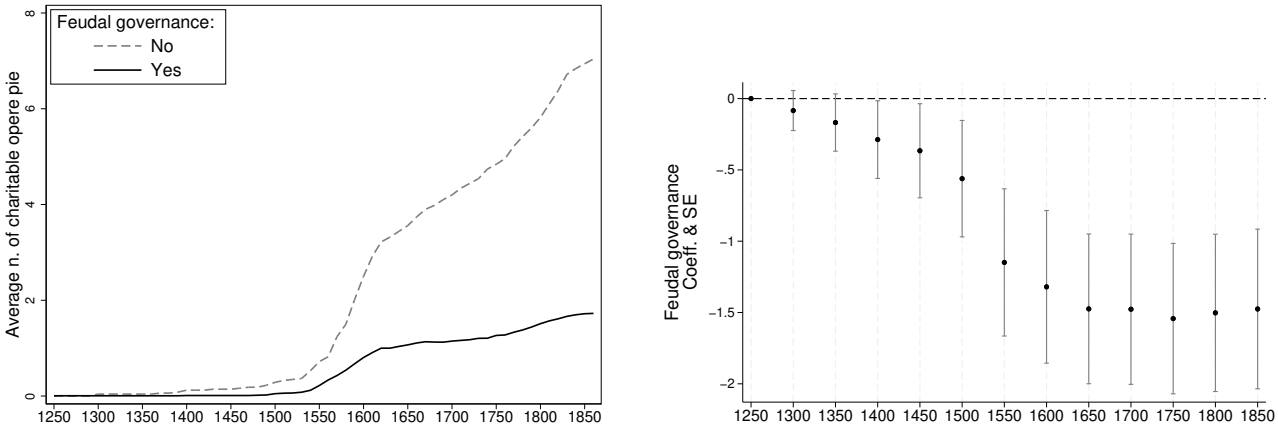
In this Section, we discuss further descriptive statistics, additional factors that could confound our analysis, and a series of robustness exercises.

Given that the census of opere pie – which we digitized to construct historical proxies for social capital – also reports the foundation year of most organizations, we can reconstruct how the stock of opere pie observed in 1861 accumulated over time. Figure A.1 documents this dynamics.

The left panel plots the (cumulative) average number of charitable opere pie in feudal and non-feudal municipalities at ten-year intervals from 1250 onward. Both series start from zero and rise gradually, but growth is significantly steeper in nonfeudal areas, indicating a faster accumulation of social capital where feudal institutions were absent.

The right panel presents point estimates and 95% confidence intervals from a panel regression of the (log) number of charitable opere pie (measured every fifty years) on an indicator for feudal governance interacted with time dummies. The specification includes province-specific linear time trends to absorb (linear) dynamics of observable and unobservable factors that evolve similarly within provinces – such as population growth, climatic variation, or administrative structures – and standard errors are clustered at the fiefdom level. The divergence between feudal and nonfeudal municipalities emerges around 1400 (approximately when Spanish rule began in Sicily) and widens steadily until stabilizing in the seventeenth century.

Figure A.1: Accumulation of Social Capital Over Time



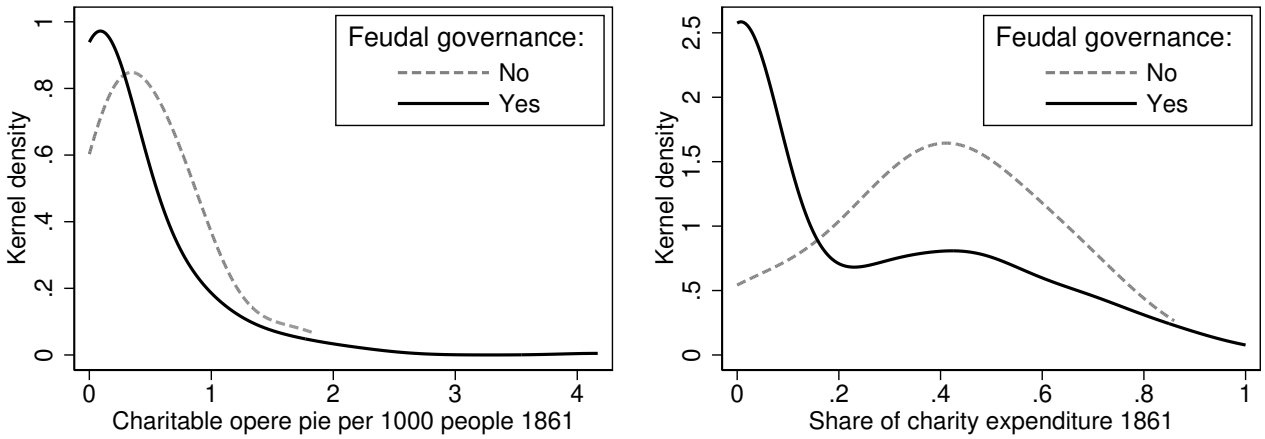
Notes: The left panel plots the time series of the n. of charitable opere pie existing in feudal e nonfeudal municipalities every 10-years (among those surviving until 1861). The right panel plots the point estimates and 95% confidence intervals of regressing the (log) n. of charitable opere pie (every 50-years) on feudal governance $\times$ time dummies.

Table A.1 reports descriptive statistics for the main variables used in the analysis. First, our main

proxies for historical social capital show that on average the number of charitable opere pie in 1861 was 0.33 (per 1,000 people) and the share of charity expenditure was 41% of the total, at municipal level. As for the main explanatory variables, 85% of Sicilian municipalities experienced feudalism at any time between the Norman conquest and feudalism's abolition. The table also displays descriptive statistics for the control variables used in our regressions.

Figure A.2 shows the k-density for our proxies of historical social capital, distinguishing between the different types of governance: in both cases, the density shifts to the right as we move from feudalism to towns with no feudal experience. This descriptive evidence suggests that the feudal period left a strong legacy on the development of Sicily's social capital, already before Italy's unification.

Figure A.2: Distribution of Historical Social Capital



Notes: The left panel shows the k-density of opere pie (per 1,000 people) in 1861, by feudal governance. The right panel shows the k-density of share of charity expenditure in 1861, by feudal governance.

Because feudal governance was not randomly assigned across Sicilian municipalities, a natural concern is that geographic or economic factors may have simultaneously influenced both feudal institutions and the development of social capital. To mitigate this concern, our empirical strategy progressively conditions on a rich set of geographic and socio-economic covariates, as well as province-level fixed-effects. Table A.2 and Table A.3 replicate Table 1, progressively adding controls and showing their coefficients.

Specifically, Table A.2 uses the (log) number of charitable opere pie (per 1,000 people) as outcome. As highlighted in Section 4.1, the experience of feudal institutions negatively affected the accumulation of social capital (column 1). Column 2 includes only the basic geographical controls: elevation, distance from Palermo, access to a postal road, and a coastal dummy. Only elevation enters positively and significantly, suggesting that higher-altitude municipalities hosted slightly more charitable opere

Table A.1: Summary Statistics

Variable	Obs	Mean	Std dev	Median	1st perc	99th perc
Measures of social capital:						
Charitable opere pie pc 1861	328	0.33	0.50	0.15	0	2.05
Share of expenses for charity purpose	328	0.41	0.36	0.40	0	0.99
Mutual aid societies pc 1880	328	0.042	0.11	0	0	0.55
Feudal experience:						
Feudal governance	328	0.85	0.36	1	0	1
Baseline controls:						
Elevation (meters a.s.l.)	323	416.1	277.5	420	4	1147
Distance from Palermo	323	107.6	58.2	110	5	217
Access to a postal road	323	0.52	0.50	1	0	1
Coastal town	328	0.30	0.46	0	0	1
Source of irrigation	319	0.41	0.49	0	0	1
Temperatures variability	328	5.21	0.12	5.25	4.88	5.39
Precipitations variability	328	47.1	5.34	46.2	36.3	57.4
Malaria prevalence	328	0.39	0.34	0.31	0	1
Economic controls:						
Cultivated land	323	0.97	0.079	1.00	0.65	1
Grain crops	323	0.51	0.23	0.53	0.079	0.97
Citrus groves	323	0.0064	0.014	0.0011	0	0.056
Vineyards	323	0.097	0.12	0.059	0	0.61
Olive groves	323	0.037	0.061	0.012	0	0.29
Sulfur mine	323	0.11	0.32	0	0	1
Urban rent per ha	323	1.61	4.36	0.80	0	11.9
Rural rent per ha	323	6.72	4.60	5.50	1.55	25.3
Population density 1861	323	27009.5	85134.4	1899.2	1.82	507684.4
Measure of family structure:						
Family size 1861	327	4.04	0.54	3.98	2.68	6.30
Co-resident families 1861	327	1.07	0.21	1.01	1	2.10
SNu Index 1861	327	-9.9e-10	1.00	0.21	-4.47	1.51

pie, maybe reflecting greater need for local cooperation in isolated or defensible areas. Column 3 adds a dummy for access to a permanent source of irrigation. Consistent with the idea that the need to organize communal irrigation fosters collective solidarity in agricultural societies, the variable is positive and significant (Buggle, 2020; Naghavi and Shaeyan, 2024). Then, column 4 introduces historical climatic volatility – measured as the standard deviation of temperatures and precipitations during the growing season between 1500 and 1800 – to account for communities developing social ties as a mechanism to cope with climatic uncertainty (Buggle and Durante, 2021). Higher temperature variability is negatively and weakly associated with charitable activity, suggesting that this channel is not very prominent. Column 5 further controls for malaria prevalence, given that the pervasive presence of this disease might influence agricultural organization and settlement patterns (Buonanno, Esposito, and Gulino, 2020; Mariella, 2022). The malaria coefficient is negative but insignificant.

Column 6 adds the first set of economic controls: the share of cultivated land and the distribution of land across major crops (grains, citrus, vineyards, and olive groves). These variables capture the dominance of extensive grain production in feudal areas versus more diversified agricultural economies elsewhere. None of these variables seem to predict social capital. Column 6 also includes a dummy for the presence of sulfur mines – the main non-agricultural economic activity in nineteenth-century Sicily (Buonanno, Durante, Prarolo, and Vanin, 2015). Sulfur extraction areas show slightly lower social capital. Finally, it also account for local economic conditions and wealth, by including the urban and rural rent per hectare as self-declared in the *Riveli*. Both coefficients are small and insignificant. Then, column 7 introduces population density to account for demographic and settlement differences, but it does not predict social capital accumulation. Finally, columns 8 also adds province fixed-effects to further account for other factors, observed and unobserved, that vary only across provinces.

Across all specifications, the coefficient on feudal governance remains negative, statistically significant, and economically large, suggesting that the observed relationship is not driven by other geographic, environmental, or economic characteristics. Throughout the analysis we label 'Baseline controls' those introduces in columns 2 to 5, and 'Economic controls' those additionally included in columns 6 and 7.

Table A.3 replicates the structure of the previous table, but uses as dependent variable the share of charity expenditure. Controls are progressively added across columns as before. In column 2, after including the baseline geographical controls, only access to a postal road is positively and significantly associated with charitable expenditures, suggesting that better-connected municipalities – those closer to main communication routes – tended to display a stronger cooperative nature. Then, when including economic controls in column 6, only the presence of a sulfur mine shows a negative and significant coefficient, while urban rent per hectare is positive but weakly significant. This might indicate that municipalities with higher urban wealth levels devoted relatively more resources to charitable activi-

Table A.2: Feudal Institutions Hampered Social Capital Accumulation (1) – All Controls

Dependent Variable:	Charitable opere pie pc 1861							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feudal governance	-0.663***	-0.644***	-0.650***	-0.669***	-0.665***	-0.709***	-0.735***	-0.686***
	(0.128)	(0.134)	(0.140)	(0.132)	(0.131)	(0.137)	(0.139)	(0.142)
Elevation (meters a.s.l.)		0.130**	0.115**	0.138**	0.132**	0.156**	0.153**	0.159***
		(0.054)	(0.054)	(0.057)	(0.057)	(0.060)	(0.059)	(0.060)
Distance from Palermo		-0.055	-0.064	-0.072	-0.069	-0.024	-0.021	0.046
		(0.064)	(0.063)	(0.067)	(0.068)	(0.076)	(0.075)	(0.127)
Access to a postal road		0.177	0.151	0.123	0.136	0.108	0.100	0.089
		(0.121)	(0.121)	(0.119)	(0.119)	(0.120)	(0.122)	(0.128)
Coastal town		0.179	0.199	0.193	0.190	0.208	0.219	0.167
		(0.168)	(0.171)	(0.157)	(0.155)	(0.164)	(0.162)	(0.154)
Source of irrigation			0.379***	0.362***	0.362***	0.337***	0.344***	0.351***
			(0.112)	(0.112)	(0.113)	(0.113)	(0.115)	(0.113)
Temperatures variability				-1.112**	-1.053*	-0.898	-0.873	0.369
				(0.562)	(0.569)	(0.578)	(0.577)	(0.816)
Precipitations variability				-0.000	-0.002	-0.015	-0.014	-0.007
				(0.011)	(0.012)	(0.013)	(0.013)	(0.019)
Malaria prevalence					-0.111	-0.132	-0.130	-0.075
					(0.158)	(0.152)	(0.152)	(0.157)
Cultivated land						-0.186	0.001	-0.003
						(0.869)	(0.866)	(0.834)
Grain crops						0.003	-0.012	-0.137
						(0.328)	(0.330)	(0.350)
Citrus groves						-2.491	-2.203	-0.828
						(5.005)	(4.944)	(4.722)
Vineyards						-0.447	-0.345	-0.462
						(0.630)	(0.646)	(0.710)
Olive groves						-1.343	-1.116	-1.015
						(1.193)	(1.256)	(1.293)
Sulfur mine						-0.396**	-0.401**	-0.188
						(0.154)	(0.154)	(0.163)
Urban rent per ha						0.007	0.008	0.008
						(0.007)	(0.008)	(0.008)
Rural rent per ha						0.034	0.031	0.033
						(0.027)	(0.027)	(0.027)
Population density							-0.000*	-0.000
							(0.000)	(0.000)
Province FE								✓
R^2	0.06	0.09	0.13	0.15	0.15	0.17	0.17	0.21
Observations	328	323	315	315	315	315	315	315

Notes: Standard errors (clustered at the fiefdom level) in parentheses.

ties, whereas areas specialized in sulfur extraction – an industry often characterized by inequality and labor exploitation – displayed lower levels of collective solidarity.

A remaining concern is that, despite conditioning on an extensive set of municipality-level characteristics and province fixed effects, feudal and nonfeudal municipalities might still differ along dimensions unrelated to political governance yet relevant for the historical accumulation of social capital. We therefore discuss here additional confounding factors.

First, we investigate whether the fact that one-third of feudal municipalities were established as 'foundation villages' during the Spanish colonization program could drive our results. These fiefdoms were founded in unpopulated land when the feudal landlords obtained a *licentia populandi*, and thus populated attracting residents from nearby municipalities. If the decision to migrate to the newly founded feudal town was correlated with pre-existing social capital, the estimates would be biased. In particular, if low social capital individuals self-selected themselves for migrating to foundation villages, the estimates would be upward biased. Table A.4 replicates the baseline specification excluding foundation villages. Reassuringly, the results hold across all specifications.

Next, a recent economics literature has demonstrated that the occurrence of a severe earthquake has an impact on local social capital, both in the short- (Bai and Li, 2021) and in the long-run (Buonanno, Plevani, and Puca, 2023). Directly hit individuals or those living in earthquake-prone regions may develop mutual solidarity as a mechanism to cope with the shock. Since Sicily is one of Italy's most earthquake-prone regions, one could wonder whether this mechanism drives our results. Specifically, in 1693, the southeastern part of the island, known to as 'Val di Noto,' was hit by a severe earthquake that reached an estimated maximum intensity of XI (Extreme) on the Mercalli intensity scale (MCS), and is regarded as the most powerful earthquake ever recorded in Italian history (Guidoboni, Ferrari, Mariotti, Comastri, Tarabusi, Sgatoni, and Valensise, 2018). Thus, we use the Catalogue of Strong Italian Earthquakes (Guidoboni et al., 2018) to identify the municipalities most heavily affected by the 1693 earthquake. In Table A.5 we re-estimate the baseline model excluding the severely-hit municipalities. Results hold.

Taken together these evidences limit the scope for alternative confounding factors in explaining away our results.

A remaining concern is that feudal lords may have strategically targeted areas with already low levels of social capital. We address this possibility both historically and empirically. Historically, it would require Norman elites to possess reliable information about local social capital and sufficient discretion to allocate territories accordingly – an interpretation which seems implausible based on existing historiography. Empirically, we exploit pre-feudal variation stemming from the Arab conquest of Sicily. We adopt an ITT approach and we digitize a map of the Arabic conquest of Sicily from Ahmad (1977). The left panel of Figure A.3 shows the original map, highlighting the territorial divi-

Table A.3: Feudal Institutions Hampered Social Capital Accumulation (2) – All Controls

Dependent Variable:	Share of charity expenditure 1861							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feudal governance	-0.164***	-0.144***	-0.145***	-0.148***	-0.146***	-0.150***	-0.158***	-0.150***
	(0.033)	(0.034)	(0.034)	(0.034)	(0.035)	(0.034)	(0.034)	(0.035)
Elevation (meters a.s.l.)		0.016	0.013	0.014	0.011	0.021	0.020	0.014
		(0.014)	(0.014)	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)
Distance from Palermo		0.004	0.003	0.005	0.006	0.025	0.026	-0.033
		(0.019)	(0.019)	(0.020)	(0.020)	(0.023)	(0.023)	(0.037)
Access to a postal road		0.073**	0.069**	0.063**	0.070**	0.059*	0.057*	0.054*
		(0.029)	(0.031)	(0.032)	(0.032)	(0.032)	(0.033)	(0.032)
Coastal town		0.001	-0.000	-0.000	-0.002	0.006	0.009	0.001
		(0.035)	(0.036)	(0.035)	(0.034)	(0.035)	(0.035)	(0.038)
Source of irrigation			0.052	0.049	0.049	0.049	0.052	0.058*
			(0.035)	(0.034)	(0.035)	(0.035)	(0.035)	(0.034)
Temperatures variability				-0.118	-0.088	-0.072	-0.065	-0.065
				(0.133)	(0.137)	(0.148)	(0.148)	(0.243)
Precipitations variability				-0.002	-0.003	-0.006*	-0.006*	-0.005
				(0.003)	(0.003)	(0.004)	(0.004)	(0.006)
Malaria prevalence					-0.057	-0.051	-0.051	-0.068
					(0.049)	(0.051)	(0.051)	(0.055)
Cultivated land						0.112	0.167	0.089
						(0.270)	(0.273)	(0.266)
Grain crops						-0.034	-0.039	0.076
						(0.103)	(0.104)	(0.110)
Citrus groves						-1.427	-1.342	-1.472
						(1.432)	(1.437)	(1.421)
Vineyards						0.123	0.153	0.289
						(0.211)	(0.217)	(0.233)
Olive groves						-0.347	-0.280	-0.169
						(0.303)	(0.310)	(0.345)
Sulfur mine						-0.099**	-0.100**	0.018
						(0.045)	(0.045)	(0.054)
Urban rent per ha						0.006**	0.006**	0.005*
						(0.002)	(0.002)	(0.003)
Rural rent per ha						0.006	0.005	0.001
						(0.008)	(0.008)	(0.008)
Population density							-0.000**	-0.000**
							(0.000)	(0.000)
Province FE								✓
R^2	0.05	0.06	0.07	0.08	0.08	0.12	0.13	0.18
Observations	328	323	315	315	315	315	315	315

Notes: Standard errors (clustered at the fiefdom level) in parentheses.

Table A.4: Feudal Institutions and Historical Social Capital – Excluding Foundation Villages

Dependent Variable:	Charitable opere pie pc 1861				Share of charity expenditure 1861			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feudal governance	-0.467***	-0.472***	-0.561***	-0.537***	-0.111***	-0.099***	-0.113***	-0.114***
	(0.140)	(0.142)	(0.157)	(0.159)	(0.034)	(0.037)	(0.036)	(0.036)
Baseline controls		✓	✓	✓		✓	✓	✓
Economic controls			✓	✓			✓	✓
Province FE				✓				✓
R^2	0.04	0.18	0.22	0.26	0.03	0.09	0.14	0.18
Observations	232	226	226	226	232	226	226	226

Notes: Baseline controls include the (log) elevation, the (log) distance from Palermo, a dummy for being located on the coast, a dummy for having access to a postal road, a dummy for having access to irrigation, the standard deviation of average temperatures and precipitations during spring and summer between 1500 and 1800 (at grid-cell level), and the share of municipal land infested by malaria. Economic controls include the share of land devoted to agriculture, the share of land devoted to grains, to vineyard, to citrus, and to olive groves, a dummy for the presence of a sulfur mine, the rural and urban rent per hectar, and the population density. Standard errors (clustered at the fiefdom level) in parentheses.

Table A.5: Feudal Institutions and Historical Social Capital – Excluding Places Hit by 1693 Earthquake

Dependent Variable:	Charitable opere pie pc 1861				Share of charity expenditure 1861			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feudal governance	-0.745***	-0.684***	-0.719***	-0.668***	-0.168***	-0.131***	-0.133***	-0.132***
	(0.133)	(0.140)	(0.149)	(0.156)	(0.035)	(0.036)	(0.035)	(0.036)
Baseline controls		✓	✓	✓		✓	✓	✓
Economic controls			✓	✓			✓	✓
Province FE				✓				✓
R^2	0.08	0.15	0.16	0.18	0.05	0.08	0.11	0.15
Observations	275	271	271	271	275	271	271	271

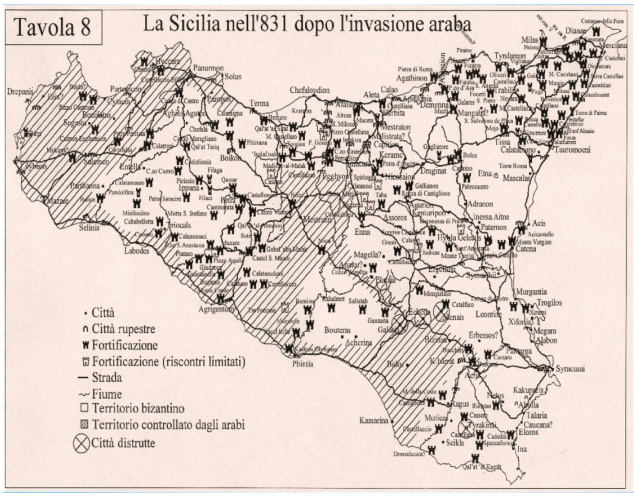
Notes: Baseline controls include the (log) elevation, the (log) distance from Palermo, a dummy for being located on the coast, a dummy for having access to a postal road, a dummy for having access to irrigation, the standard deviation of average temperatures and precipitations during spring and summer between 1500 and 1800 (at grid-cell level), and the share of municipal land infested by malaria. Economic controls include the share of land devoted to agriculture, the share of land devoted to grains, to vineyard, to citrus, and to olive groves, a dummy for the presence of a sulfur mine, the rural and urban rent per hectar, and the population density. Standard errors (clustered at the fiefdom level) in parentheses.

sion of Sicily between Arabs and Byzantines during the Muslim conquest. The right panel, instead, shows the digitized version of the map: using Qgis the areas corresponding to Arab-controlled territories have been geo-referenced (and colored in gray in the figure) and overlapped with municipalities

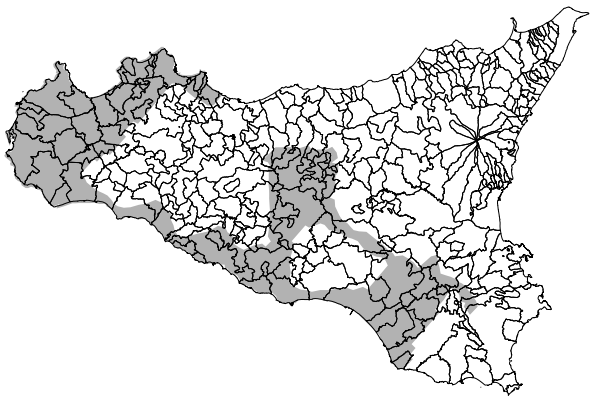
borders.[1] As shown in Table 4, Arab presence is uncorrelated with subsequent feudal governance, suggesting that pre-existing differences in social capital did not drive feudalization.

Figure A.3: Sicily under Arabic Domination

Map of Arabic invasion of Sicily



Overlapping Arab-ruled territory and municipalities



Notes: The left panel shows the map of the Arabic invasion of Sicily taken from Ahmad (1977). The right panel shows the digitized version of the map where the geo-referenced Arab-controlled territories (in gray) are overlapped with municipalities' borders.

From now on, we describe a series of robustness checks. As the dependent variables could be noisier for smaller towns, Table A.6 employs the weighted least-squared method, using as weights the population living in each municipality in 1861: our main results hold.

Recall that one of our proxies for historical social capital is a count variable, namely the number of charitable opere pie (per 1,000) people, which assumes value zero in many of the sampled municipalities. Our baseline model accounts for it by using $\log(\text{opere pie pc}_{ip} + 0.1)$ as dependent variable. Table A.7 uses alternative model specifications to deal with the large number of zeros. First, it uses as outcome an indicator for at least one active charitable opera pia in 1861 (columns 1-2). Then, it applies the inverse hyperbolic sine (IHS) transformation to the dependent variable (columns 3-4). This means transforming the variable into $\log\left(\text{opere pie pc}_{ip} + \sqrt{\text{opere pie pc}_{ip}^2 + 1}\right)$ instead of $\log(\text{opere pie pc}_{ip} + 0.1)$. Lastly, it estimates the zero-inflated Poisson model in case our variable showed an excessive number of zeros with respect to what predicted by the Poisson distribution (columns 5-6).[2] In this specification, it uses the municipal population in 1861 and the number of

[1] We classify a municipality as Arab-controlled if at least 90% of its surface area lies within the gray region.

[2] To interpret the coefficients of interest as elasticities, the specification uses the number of opere pie (per 1,000 people) in levels as dependent variable.

Table A.6: Feudal Institutions and Historical Social Capital – Weighted Models

Dependent Variable:	Charitable opere pie pc 1861				Share of charity expenditure 1861			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feudal governance	-0.465***	-0.493***	-0.571***	-0.511***	-0.176***	-0.086***	-0.104***	-0.096***
	(0.161)	(0.114)	(0.114)	(0.114)	(0.041)	(0.032)	(0.027)	(0.028)
Baseline controls		✓	✓	✓		✓	✓	✓
Economic controls			✓	✓			✓	✓
Province FE				✓				✓
R^2	0.07	0.23	0.28	0.33	0.13	0.17	0.26	0.31
Observations	328	315	315	315	328	315	315	315

Notes: All regressions are weighted by population in 1861. Baseline controls include the (log) elevation, the (log) distance from Palermo, a dummy for being located on the coast, a dummy for having access to a postal road, a dummy for having access to irrigation, the standard deviation of average temperatures and precipitations during spring and summer between 1500 and 1800 (at grid-cell level), and the share of municipal land infested by malaria. Economic controls include the share of land devoted to agriculture, the share of land devoted to grains, to vineyard, to citrus, and to olive groves, a dummy for the presence of a sulfur mine, the rural and urban rent per hectar, and the population density. Standard errors (clustered at the fiefdom level) in parentheses.

monasteries to predict the excessive number of zeros, meaning the absence of private forms of collective trust and solidarity. Coefficients stay negative and statistically significant across all specifications thus confirming our baseline results.

Next, we check whether our findings are robust to different standard error corrections. Figure A.4 reports the coefficients and 90% confidence intervals resulting from different models. It also shows the baseline estimates (columns 4 and 8 of Table 1) for comparison as the first coefficients. Then, it (i) allows for heteroskedasticity in the variance-covariance matrix, (ii) clusters at the *comarca*[3] level, allowing for correlation across municipalities in the same comarca, (iii) clusters at the comarca $\times$ province level, allowing for correlation across municipalities in the same comarca $\times$ province, (iv) corrects standard errors for spatial correlation using Conley (1999) with different distance cutoffs to allow for spatial correlation among neighboring municipalities (the cutoffs are 10km, 20km, 40km, 60km). The plot shows that the effect remains significant across all the alternative standard-error corrections.

Finally, we use an alternative proxy for historical social capital, namely the number of mutual aid societies in 1880. They spread after the Italian unification, following the Rattazzi Law, which marked the decline of opere pie and represented "the first embryo of an associative process" (Trigilia, 1981)

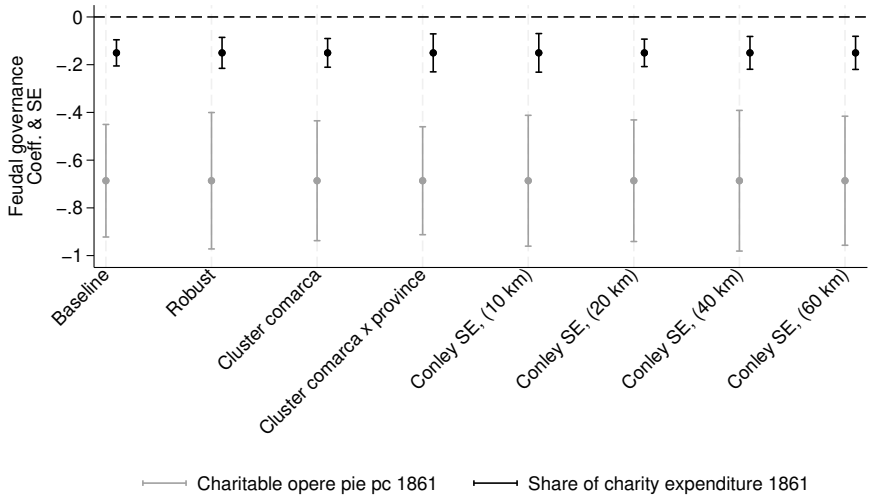
[3]The system of comarche represented the sub-provincial administrative division in place in Sicily during the feudal period. It was established by the Spanish viceroy of Sicily in 1583 as a first attempt to administratively organize the island. Each comarca included a nonfeudal city and the feudal cities located around it (Militello, 2008)

Table A.7: Feudal Institutions and Historical Social Capital – Alternative Models

Dependent Variable:	Charitable opere pie pc 1861					
	Dummy if at least one		IHS		ZIP	
	(1)	(2)	(3)	(4)	(5)	(6)
Feudal governance	-0.387***	-0.351***	-0.185***	-0.221***	-0.511***	-0.607***
	(0.057)	(0.065)	(0.055)	(0.061)	(0.180)	(0.186)
Baseline controls		✓		✓		✓
Economic controls		✓		✓		✓
Province FE		✓		✓		✓
R^2	0.08	0.22	0.03	0.18		
Observations	328	315	328	315	320	315

Notes: Baseline controls include the (log) elevation, the (log) distance from Palermo, a dummy for being located on the coast, a dummy for having access to a postal road, a dummy for having access to irrigation, the standard deviation of average temperatures and precipitations during spring and summer between 1500 and 1800 (at grid-cell level), and the share of municipal land infested by malaria. Economic controls include the share of land devoted to agriculture, the share of land devoted to grains, to vineyard, to citrus, and to olive groves, a dummy for the presence of a sulfur mine, the rural and urban rent per hectar, and the population density. Standard errors (clustered at the fiefdom level) in parentheses.

Figure A.4: Alternative Standard Errors Corrections



Notes: The figure plots the coefficients of feudal governance that result from running the baseline model using the (log) n. of charitable opere pie (per 1,000 people) or the share of charity expenditure as dependent variables. The bars represent the 90 percent confidence intervals associated with different corrections of the standard errors.

in late 19th century Italy. In Table A.8 we re-estimate equation 1 using this alternative outcome as proxies for historical social capital. Coefficients are negative and statistically significant across all specifications. Although this alternative measure of historical social capital support our findings, we prefer not to use it as our primary outcome. This is because the mutual aid societies developed in the late 19th century, contemporaneously with the rise of the Sicilian Mafia and with other national-level policies, which could potentially confound our results.

Table A.8: Feudal Institutions and Other Proxy for Historical Social Capital

Dependent Variable:	Mutual aid societies pc 1880			
	(1)	(2)	(3)	(4)
Feudal governance	-0.166**	-0.175**	-0.164**	-0.174**
	(0.073)	(0.069)	(0.072)	(0.071)
Baseline controls		✓	✓	✓
Economic controls			✓	✓
Province FE				✓
R^2	0.02	0.05	0.07	0.12
Observations	328	315	315	315

Notes: Baseline controls include the (log) elevation, the (log) distance from Palermo, a dummy for being located on the coast, a dummy for having access to a postal road, a dummy for having access to irrigation, the standard deviation of average temperatures and precipitations during spring and summer between 1500 and 1800 (at grid-cell level), and the share of municipal land infested by malaria. Economic controls include the share of land devoted to agriculture, the share of land devoted to grains, to vineyard, to citrus, and to olive groves, a dummy for the presence of a sulfur mine, the rural and urban rent per hectar, and the population density. Standard errors (clustered at the fiefdom level) in parentheses.

Another concern could be that our proxies for social capital are instead capturing local religiosity. While opere pie were sometimes inspired by religious sentiments, our main outcomes are intentionally defined in a stricter way to emphasize the social capital dimension and Table 5 shows that a proxy for local religiosity – i.e., the number of churches – neither differs systematically between feudal and nonfeudal municipalities nor correlates with our measures of social capital, suggesting that broad religious intensity is unlikely to drive our results.

Nevertheless, because some might view *religious-only* opere pie and share of *religious* expenditure as alternative indicators of religiosity, Table A.9 replicates our baseline regressions using these variables as outcomes. The results indicate that feudal municipalities historically hosted significantly fewer religious opere pie, but the share of religious expenditures does not differ in a statistically meaningful way across governance regimes. This contrast is informative: establishing *any* opera pia – whether charitable or religious – required a minimum level of social capital, thus feudal governance hampered the extensive margin dimension no matter the purpose of the organization. Note that the magnitude of

the coefficients is significantly smaller than in our baseline. Then, the fact that feudal and nonfeudal municipalities devote similar shares of expenditure to religious activities implies broadly comparable levels of religious engagement. Thus, these results reinforce the conclusion that our main findings are not capturing a difference in local religiosity but rather in social capital.

Table A.9: Feudal Institutions and Religious Charity

Dependent Variable:	Religious opere pie pc 1861				Share of religious expenditure 1861			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feudal governance	-0.544***	-0.578***	-0.550***	-0.535***	0.003	0.002	0.006	0.001
	(0.152)	(0.144)	(0.156)	(0.154)	(0.030)	(0.034)	(0.038)	(0.036)
Baseline controls		✓	✓	✓		✓	✓	✓
Economic controls			✓	✓			✓	✓
Province FE				✓				✓
R^2	0.03	0.10	0.11	0.22	0.00	0.05	0.09	0.17
Observations	328	315	315	315	328	315	315	315

Notes: Baseline controls include the (log) elevation, the (log) distance from Palermo, a dummy for being located on the coast, a dummy for having access to a postal road, a dummy for having access to irrigation, the standard deviation of average temperatures and precipitations during spring and summer between 1500 and 1800 (at grid-cell level), and the share of municipal land infested by malaria. Economic controls include the share of land devoted to agriculture, the share of land devoted to grains, to vineyard, to citrus, and to olive groves, a dummy for the presence of a sulfur mine, the rural and urban rent per hectar, and population density. Standard errors (clustered at the fiefdom level) in parentheses.

To conclude, our analysis aims to uncover the influence of historical feudal institutions on the accumulation of social capital in Sicily, through shaping smaller and more nuclear families.

A growing literature, however, emphasizes the role of marriage regulations imposed by the Catholic Church in the Middle Ages in dismantling extended kinship structures across Europe. We therefore empirically assess the plausibility of this alternative explanation within the Sicilian context. In Table A.10, we first examine whether the local intensity of religious presence – proxied by church density – is associated with family structure. We find no statistically significant relationship between church density and any of our family-structure indicators. We then replicate the full-control specifications of Table 6, adding church density as an additional control to assess the robustness of the estimated effects of historical feudal governance. Including this variable leaves both the magnitude and statistical significance of the feudal governance coefficients virtually unchanged. Taken together, these results suggest that local variation in exposure to Catholic Church marriage regulations is unlikely to account for the patterns we document or to overturn our main findings.

Given that Sicily remains one of Italy's lowest–social capital regions today, one may reasonably

Table A.10: Feudal Institutions, not Catholic Church Regulations, Shaped Family Structure

Dependent Variable:	Family size 1861		Co-resident families 1861		SNu Index 1861	
	(1)	(2)	(3)	(4)	(5)	(6)
Churches pc 1799	-0.008	-0.009	-0.006	-0.007	0.053	0.064
	(0.010)	(0.010)	(0.016)	(0.016)	(0.105)	(0.097)
Feudal governance		-0.059***		-0.056**		0.564***
		(0.023)		(0.024)		(0.163)
Baseline controls	✓	✓	✓	✓	✓	✓
Economic controls	✓	✓	✓	✓	✓	✓
Province FE	✓	✓	✓	✓	✓	✓
R^2	0.13	0.15	0.34	0.36	0.34	0.37
Observations	308	308	308	308	308	308

Notes: Baseline controls include the (log) elevation, the (log) distance from Palermo, a dummy for being located on the coast, a dummy for having access to a postal road, a dummy for having access to irrigation, the standard deviation of average temperatures and precipitations during spring and summer between 1500 and 1800 (at grid-cell level), and the share of municipal land infested by malaria. Economic controls include the share of land devoted to agriculture, the share of land devoted to grains, to vineyard, to citrus, and to olive groves, a dummy for the presence of a sulfur mine, the rural and urban rent per hectar, and the population density. Standard errors (clustered at the fiefdom level) in parentheses.

ask whether other forces – arising after the abolition of feudalism – also contributed to shaping the long-run trajectory of civic life. Table A.11 addresses this concern by examining contemporary social capital, measured as the (log) number of nonprofit organizations active in each municipality in 2011.[4]

Columns 1–4 show that the historical feudal governance continues to hamper social capital accumulation today, even when controlling for our baseline and economic covariates, and province fixed effects. However, this negative relationship might be confounded by the rise of the Sicilian Mafia. The Mafia originated in the late nineteenth century, when the weakness of the post-feudal and newly unified Italian state created widespread demand for private protection (Bandiera, 2003). Landowners increasingly relied on armed groups operating outside state authority (Coluccello, 2016). Scholars in economics has traced its emergence to a range of additional factors, including the profitability of export-oriented citrus cultivation (Dimico, Isopi, and Olsson, 2017), the strategic importance of sulfur mining (Buonanno et al., 2015), the repression of the Peasant Fasci movement (Acemoglu, De Feo, and De Luca, 2020), and the coercive enforcement of military conscription (Marciante, 2025).

To account for this potential confounder, columns 5–8 of Table A.11 augment the specifications with a measure of Mafia presence in 1900s. Reassuringly, the estimated effect of feudalism remains negative, statistically significant, and very similar in magnitude to the baseline results. At the same

[4]Current municipalities, that were historically more fragmented, are mapped to their 1860 boundaries.

time, early Mafia presence does not predict contemporary levels of local social capital. Taken together, these findings suggest that the long-term low levels of social capital in historically feudal municipalities cannot be attributed to the subsequent rise of organized crime and instead reflects the enduring legacy of feudal institutions.

Table A.11: Feudal Institutions and Today's Social Capital Controlling for Mafia

Dependent Variable:	Noprofit organizations pc 2011							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feudal governance	-0.161***	-0.195***	-0.163**	-0.160**	-0.159***	-0.195***	-0.163**	-0.160**
	(0.058)	(0.066)	(0.071)	(0.073)	(0.058)	(0.066)	(0.071)	(0.072)
Mafia 1900					-0.064	-0.014	0.007	-0.003
					(0.050)	(0.057)	(0.061)	(0.071)
Baseline controls		✓	✓	✓		✓	✓	✓
Economic controls			✓	✓			✓	✓
Province FE				✓				✓
R^2	0.02	0.08	0.13	0.15	0.03	0.08	0.13	0.15
Observations	326	313	313	313	326	313	313	313

Notes: Baseline controls include the (log) elevation, the (log) distance from Palermo, a dummy for being located on the coast, a dummy for having access to a postal road, a dummy for having access to irrigation, the standard deviation of average temperatures and precipitations during spring and summer between 1500 and 1800 (at grid-cell level), and the share of municipal land infested by malaria. Economic controls include the share of land devoted to agriculture, the share of land devoted to grains, to vineyard, to citrus, and to olive groves, a dummy for the presence of a sulfur mine, the rural and urban rent per hectar, and the population density in 2011. Standard errors (clustered at the fiefdom level) in parentheses.

B Data: Description and sources

The variables used in this paper are measured at the municipality-level, considering the topography of Sicily before the Italian unification in 1860. In particular, we consider municipalities listed in the 1830s Bourbon Cadastre as reported in Mortillaro (1854), which recorded the existence of 348 municipalities. For 17 municipalities, we could not find information on their feudal vs. nonfeudal regime and for 3 municipalities, data on 1861 population are missing. The sample is, thus, reduced to 328.

B.1 Measures of social capital

Charitable opere pie pc 1861

Charitable opere pie pc 1861 is the (log) number of opere pie per 1,000 people in 1861 having *exclusively* a charity purpose. In particular, this is computed as $\log(\text{opere pie (per 1,000 people)} + 0.1)$. Source: *Statistica del Regno d'Italia. Le Opere Pie nel 1861. Compartimento della Sicilia* (1873).

Share of charity expenditure 1861

Share of charity expenditure 1861 is the ratio between expenses for charity activities and total expenses, across all opere pie (excluding only lending ones). Source: *Statistica del Regno d'Italia. Le Opere Pie nel 1861. Compartimento della Sicilia* (1873).

Mutual aid societies 1880

Mutual aid societies 1880 is the (log) number of mutual aid societies per 1,000 people measured in 1880. In particular, this is computed as $\log(\text{mutual aid societies (per 1,000 people)} + 0.1)$. Source: *Elenco delle Società di Mutuo Soccorso* (1898).

B.2 Feudal experience

Feudal governance

Feudal governance is a dummy equal to one if the municipalities was historically under feudal rule. Source: *I Fasti di Sicilia* (1820), *Dizionario storico-araldico della Sicilia* (1871), *L'Italia - Sicilia* (2005), and Porrello and Fazio (2021).

B.3 Measures of family structure

Family size 1861

Family size is the (log) average dimension of families in each municipality in 1861. Source: *Statistica del Regno d'Italia. Popolazione Censimento Generale (31 Dicembre 1861)* (1864).

Co-resident families 1861

Co-resident families is the (log) number of families sharing the same house in each municipality in 1861. Source: *Statistica del Regno d'Italia. Popolazione Censimento Generale (31 Dicembre 1861)* (1864).

SNu Index 1861

SNu Index is the (std) mean of the (std) family size and the (std) co-resident families in each municipality in 1861. Source: *Statistica del Regno d'Italia. Popolazione Censimento Generale (31 Dicembre 1861)* (1864).

B.4 Baseline controls

Elevation (meters a.s.l.), Coastal Town

Elevation (meters a.s.l.) is the (log) elevation of the town centre in meters above sea level. Coastal town is a dummy for being located on the coast. Source: *Comuniverso*.

Distance from Palermo

Distance from Palermo is the (log) postal distance from the municipality to the capital, Palermo. Source: Lo Jacono (1856) as reported in Acemoglu et al. (2020).

Access to a postal road

Access to a postal road is a dummy equal to one if the municipality had access to one of the postal roads. Source: Cary (1799) as reported in Acemoglu et al. (2020).

Source of irrigation

Source of irrigation is a dummy equal to one if the municipality had access to a source of irrigation, e.g., a river. Source: *Dizionario Geografico del Regno di Sicilia* (1799).

Temperature variability, Precipitation variability

Temperature variability and precipitation variability are the standard deviations of average temperatures and precipitations during the growing season (spring and summer) between 1500 and 1800. Data are available at the cell level. Each ESTPR grid cell covers 0.5° (approximately 56 km at the equator). For municipalities spanning multiple cells, we assign a weighted average based on land area. Source: *European Seasonal Temperature and Precipitation Reconstructions* (Luterbacher, Dietrich, Xoplaki, Grosjean, and Wanner, 2004; Pauling, Luterbacher, Casty, and Wanner, 2006).

Malaria prevalence

Malaria prevalence is the share of municipal land infested by malaria, as digitized from the map of senator Torelli. Source: Mariella (2022).

B.5 Economic controls

Cultivated land, Grain crops, Vineyard, Olive groves

Cultivated land is the share of municipal land devoted to agriculture in 1830s. Grain crops is the share of municipal land devoted to grains' production in 1830s. Vineyard is the share of municipal land devoted to vineyards in 1830s. Olive groves is the share of municipal land devoted to olive groves in 1830s. The agricultural use of land is based on the *riveli*, declarations made by the landlords to the Royal commission in 1815 and updated in the 1830s. Source: Mortillaro (1854) as reported in Acemoglu et al. (2020).

Sulfur mine

Sulfur mine is a dummy equal to one if a sulfur mine was part of the municipal territory. Source: Buonanno et al. (2015).

Rural rent per ha, Urban rent per ha

Rural rent and urban rent per ha is the ratio between municipal agricultural/urban wealth declared in the *Rively* and surface in hectar. Source: Mortillaro (1854) as reported in Acemoglu et al. (2020).

Population density

Population density is the ratio between population in 1861 and municipal surface not devoted to agriculture (in hectars). Source: *Comuni e loro popolazione ai Censimenti dal 1861 al 1951* (1960) and Mortillaro (1854).

B.6 Additional variables

Churches pc 1799

Churches pc 1799 is the (log) number of churches (per 1,000 people in 1799. In particular, this is computed as $\log(\text{churches (per 1,000 people)} + 0.1)$. Source: *Dizionario Geografico del Regno di Sicilia* (1799).

Religious opere pie pc 1861

Religious opere pie pc 1861 is the (log) number of opere pie per 1,000 people in 1861 having *exclusively* a religious purpose. In particular, this is computed as $\log(\text{opere pie (per 1,000 people)} + 0.1)$. Source: *Statistica del Regno d'Italia. Le Opere Pie nel 1861. Compartimento della Sicilia* (1873).

Share of religious expenditure 1861

Share of religious expenditure 1861 is the ratio between expenses for religious activities and total expenses, across all opere pie (excluding only lending ones). Source: *Statistica del Regno d'Italia. Le Opere Pie nel 1861. Compartimento della Sicilia* (1873).

Noprofit organizations pc 2011

Noprofit organizations pc in 2011 is the (log) number of noprofit organizations per 1,000 people operating in Sicily in 2011 (excluding church-based voluntary associations). Source: Italian Census (*Censimento Industria e Servizi* (2011)).
Digitized data are available at http://dati-censimentoindustriaeservizi.istat.it.

Mafia 1900

Mafia 1900 a dummy equal to one if Mafia presence was reported in the municipality in 1900. Source: Cutrera (1900) as reported in Acemoglu et al. (2020).

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