Center for Economic Research

UNIVERSITÉ DE LYON

ENS DE LYON

Topics in Economic History

Class 2

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8th January 2026

Outline

Shock 1: Famines

1.1 The identification of famines in history
1.2 Temperatures, food riots, and adaptation
1.3 Famine, inequality and conflict

Shock 2: Epidemics

2.1 The main epidemics in history
2.2 The role of health institutions
2.3 The long-term consequences of plagues
2.4 Reminder about economic history

Reproducibility practice

The identification of famines in history

How to identify historical famines?

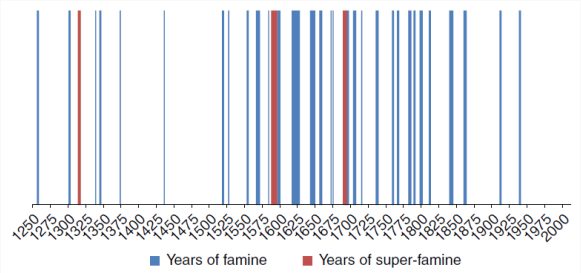


Fig. 1 | Timing of European famines, 1250–2017. Famine years are listed in Supplementary Table 1.

Alfani and Ó Gráda (2018)

- As a rule of thumb, crises that caused an ↗ of at least 50% mortality over the 'normal' pre-crisis level
- Threshold is justified by the consideration that a 50% rise in deaths is enough to prevent the generation born in the year of the crisis from reproducing itself

A widespread (but not universal!) phenomena before 1800

Table 2.3 *Proportion of communities affected by a crisis (rise in burials of at least 50 per cent)*

	Piedmont	Liguria	Lombardy	Emilia-Romagna	Veneto	Tuscany
1586–87	0.0	33.3	37.5	16.7		
1590–93	40.0	**100.0**	**80.0**	**100.0**		
1600–01	9.1	22.2	44.4	**50.0**		
1607–08	33.3	46.2	36.4	42.1	36.4	41.7
1618–22	25.0	**61.1**	20.0	**62.1**	**46.2**	**74.1**
1628–29	47.4	25.0	**56.3**	48.3	**80.0**	44.8
1648–49	38.1	**76.0**	**71.4**	**74.4**	**56.3**	**94.7**
1678–79	**71.8**	**69.6**	**50.0**	45.5	33.3	46.5
1693–95	**73.0**	**61.9**	**77.3**	**78.3**	**56.3**	44.2
1708–09	42.9	**66.7**	30.0	37.8	**50.0**	**55.8**
1716	12.5	16.7	35.0	16.2	18.8	27.9
1724	15.2	14.3	0.0	18.4	12.5	9.5
1764–67	26.5	**66.7**	11.1	**52.6**	6.3	**69.8**
1801	46.7		0.0	44.8		11.8

Notes: Regions with at least half the communities affected are in bold. Piedmont includes Aosta Valley, Veneto includes Trentino Alto Adige and Friuli Venezia Giulia, and Tuscany includes Umbria.
Source: Database Alfani.

Sources: Alfani and Ó Gráda (2017).

A widespread (but not universal!) phenomena before 1800

Table 4.2 *Demographic crises, production deficits and price increases in France, c. 1560–1790*

	Excess mortality	Deficits in baptisms	Deficits in production south	Deficits in production north	High prices Paris	High prices Arles	High prices Toulouse
1573	113	11	50	No data	65	None	58
1587	85	25	20	20	37	13	37
1694	74	None	No data	None	89	3	53
1636	72	None	9	None	1	21	11
1718	48	None	19	32	None	50	62
1652	44	2	4	No data	55	1	41
1631	42	13	23	None	45	28	88
1661	37	None	None	No data	33	None	7
1593	37	9	33	No data	None	52	45
1598	35	14	54	37	17	36	52
1653	35	14	None	No data	55	12	84
1747	35	3	None	None	None	22	22
1710	31	23	None	None	32	None	22
1639	29	7	No data	25	None	None	None
1596	29	6	80	No data	12	8	None
1693	27	26	None	None	53	None	26
1676	23	None	None	No data	None	None	5
1585	22	None	47	None	None	4	8
1709	22	3	No data	No data	108	58	61

Notes: Production deficits and price increases are calculated as deviations from a seven-year moving average.
Sources: Dupâquier (1988); Baehrel (1961); Morineau (1970a); Baulant (1968); Goy (1968; 1982).

Sources: Alfani and Ó Gráda (2017).

Grain prices and crises in Italy

Table 2.5 *Price increases during potential famines years over normal levels*

	North				Centre						South		
Years	Udine	Bassano	Pavia	Modena	Pesaro	Florence	Sansepolcro	Siena	Rome (buying p.)	Rome (fixed p.)	Naples	Bari	Catania
1502–05			62.1	**163.5**		58.5							
1527–29	**175.2**		**221.0**	**301.1**		**271.4**	**202.9**						
1539–40	77.4		**119.6**	71.5		66.5	**167.7**					**122.4**	38.7
1590–93	82.8	**114.0**	**120.6**	**175.9**		96.8	**123.7**	90.9			59.5	**114.5**	59.3
1618–22	31.0	54.4	32.1	55.4		21.4	92.6	67.8			31.0	46.2	13.1
1648–49	**143.6**	**167.0**	**118.8**	**222.9**				**118.8**			**240.7**	**242.2**	
1672	–2.4	11.2	**9.8**	27.7				38.9					
1678–79	27.3	31.0	63.3	39.5				**118.8**			3.2		
1693–95	56.3	71.8		94.1				79.3			37.5		
1708–09	34.0	34.6			20.3			68.7		16.2	61.3		
1743–45	9.5	–26.7			39.1				–1.7	9.8	10.5		
1764–67	60.0	43.2			64.3			63.2	63.3	56.3	63.0		
1779–81	–7.9	–3.8			6.6				40.8	34.5	–1.1		

Note: Increases of 100 per cent or more are in bold.
Sources: Databases Alfani and Strangio.

Sources: Alfani and Ó Gráda (2017).

How to identify historical famines?

Alfani and Ó Gráda (2018, pp. 41-3)

> *At a certain point during the crisis, the price paid for wheat and other cereals on the urban markets is no longer an index of the real possibility of finding food in the cities. To put it bluntly, there is a price, but there is no wheat.*

- Importance of the activities of the public food-provisioning authorities
  - During the 16th c. $\Rightarrow$ decline of the system of *annone*, which controlled the flows of food products in rural areas (a sort of 'monopoly') $\Rightarrow$ food shortages
  - $\Rightarrow$ Use of prices data has some limits $\Rightarrow$ sensitivity of mortality to $\nearrow$ in cereal prices varied considerably over time and across space

$\Longrightarrow$ Agreement on the role of stronger state (Johnson and Koyama 2017), institutions and markets (Epstein 2000), and better poverty relief systems (Dijkman and Leeuwen 2019)

The factors at play

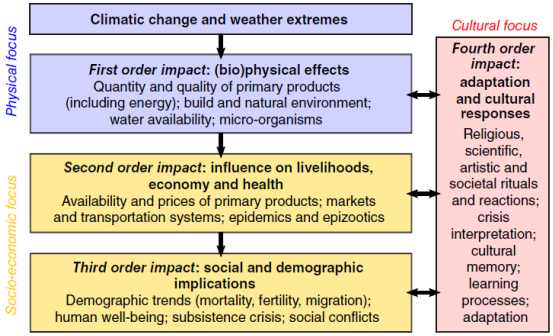


FIGURE 2 A revised schematic model of historical climate–society interactions ranging from first-order effects on biomass production to fourth-order cultural effects with the latter interacting also on all preceding levels

Sources: Ljungqvist, Seim and Huhtamaa (2020).

The factors at play and mitigation

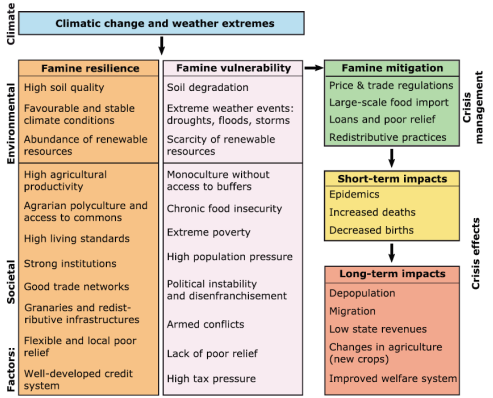


FIGURE 4 Schematic model of the interaction of key environmental and societal factors determining famine risks. We summarize the impact order between climatic shocks, famine resilience and vulnerability, famine mitigation, and short-term and long-term effects as well as impacts of famines on society.

Sources: Ljungqvist, Seim and Collet (2023).

Historical weather data

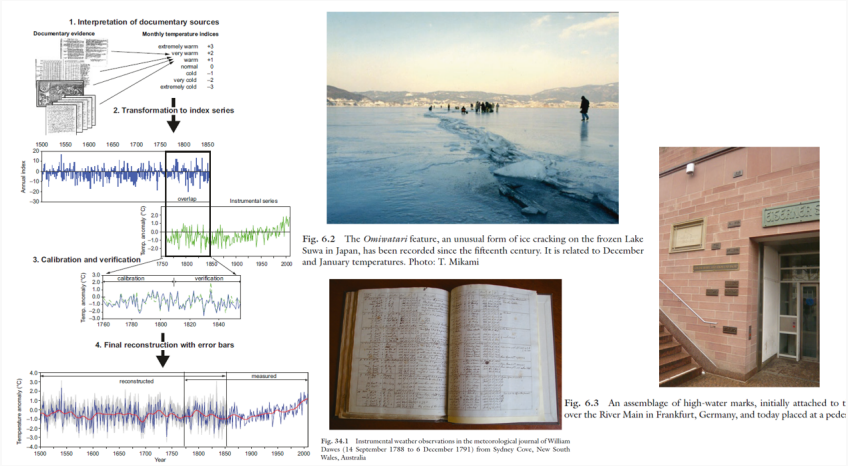


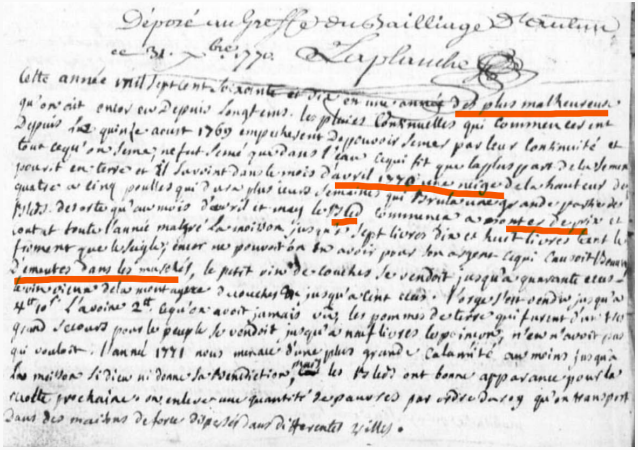
Fig. 6.2 The *Omiwatari* feature, an unusual form of ice cracking on the frozen Lake Suwa in Japan, has been recorded since the fifteenth century. It is related to December and January temperatures. Photo: T. Mikami

Fig. 34.1 Instrumental weather observations in the meteorological journal of William Dawes (14 September 1788 to 6 December 1791) from Sydney Cove, New South Wales, Australia

Fig. 6.3 An assemblage of high-water marks, initially attached to t over the River Main in Frankfurt, Germany, and today placed at a pede

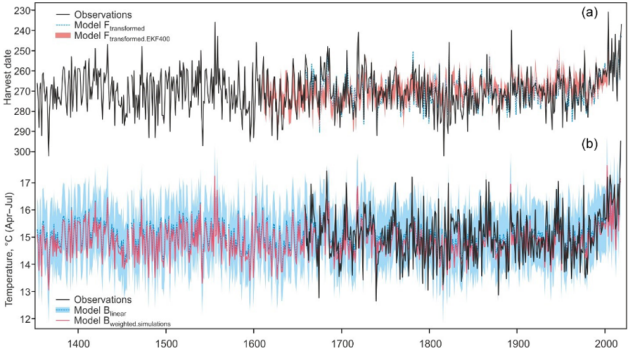
Sources: White et al. (2018).

Sources (1): Parish registers



Sources: Arch. dép. Saóne-et-Loire, 5Mi585 - 1758 1781, Auxy [link].

Sources (2): Grape Harvest Dates (GHD)



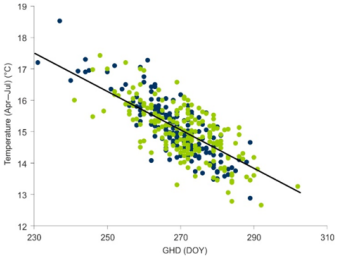


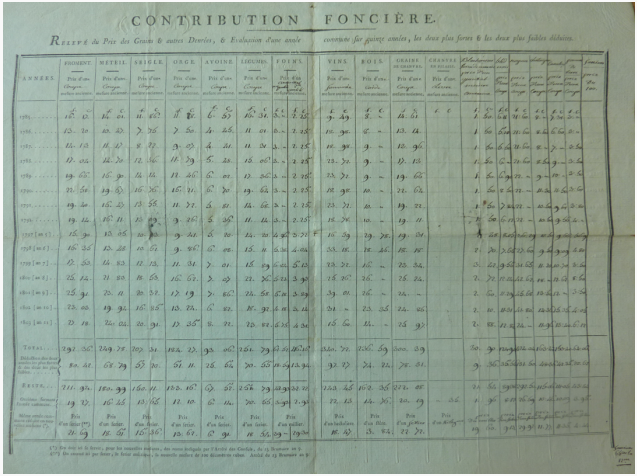
Figure 6. Relation between April-to-July mean temperature (°C) in Paris and Beaune GHDs. Green dots indicate the calibration period, and blue dots the evaluation period. The linear regression line is shown.

Figure 8. **(a)** Harvest dates in observations and modelled from observed and reconstructed (EKF400) temperatures. **(b)** April-to-July mean temperature from observations and reconstructed from models B_{linear} and $B_{\text{weighted.simulations}}$. Blue shading denotes the 95 % prediction interval for B_{linear}.

Sources: Labbé et al. (2019).

Sources (3): Municipal grain prices register

They are not all so clean / easy to read!



CONTRIBUTION FONCIÈRE.

Relevé du Prix des Grains & autres Denrées, & Evaluation d'une année commune sur quinze années, les deux plus fortes & les deux plus faibles déduites.

ANNÉES.	FROMENT. Prix d'un Charge.	METEIL. Prix d'une Charge.	SEIGLE. Prix d'une Charge.	ORGE. Prix d'une Charge.	AVOINE. Prix d'une Charge.	LEGUMS. Prix d'une Charge.	FOINS. Prix d'un Quintal.	VINS. Prix d'une Pinte.	BOIS. Prix d'une Toise.	GRAISE. Prix d'une Livre.	CHANVRE. Prix d'une Livre.	Prix d'un Journalier pour un Jour.	Prix d'un Journalier pour un Jour.	Prix d'un Journalier pour un Jour.	Prix d'un Journalier pour un Jour.	Prix d'un Journalier pour un Jour.	Prix d'un Journalier pour un Jour.
1785																	
1786																	
1787																	
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1793 [an II]																	
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1797 [an VI]																	
1798 [an VII]																	
TOTAUX																	
RESTE																	
	Prix d'un Setier 1785	Prix d'un Setier	Prix d'un Setier	Prix d'un Setier	Prix d'un Setier	Prix d'un Setier	Prix d'un Quintal	Prix d'une Pinte	Prix d'une Toise	Prix d'une Livre	Prix d'une Livre	Prix d'un Journalier	Prix d'un Journalier	Prix d'un Journalier	Prix d'un Journalier	Prix d'un Journalier	Prix d'un Journalier

Sources: Arch. mun. Annecy, HH2, Mercuriales 1629–1789.

Historical weather and grain production: Sweden

Ljungqvist, Christiansen et al. (2023)

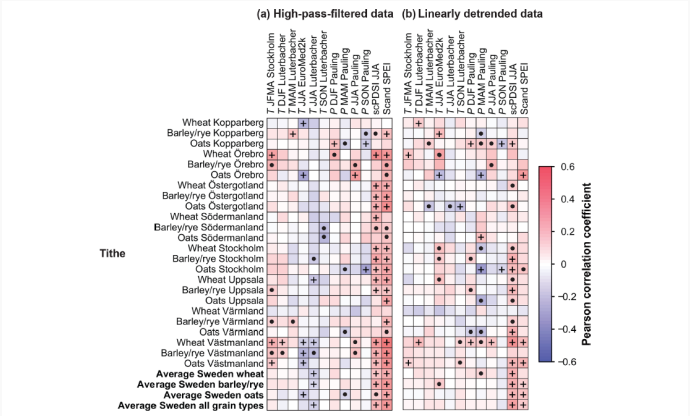


Figure 3. Cross-correlation matrix for Sweden between climate series and grain tithe series at a county level for 10-year high-pass Gaussian filtered data (**a**) and linearly detrended data (**b**), respectively. Correlations significant at the $p = 0.05$ level with a t test are marked with a dot (·). Values that are additionally significant using the phase-scrambling test are marked with a plus sign (+).

Historical weather and grain production: Switzerland

Ljungqvist, Christiansen et al. (2023)

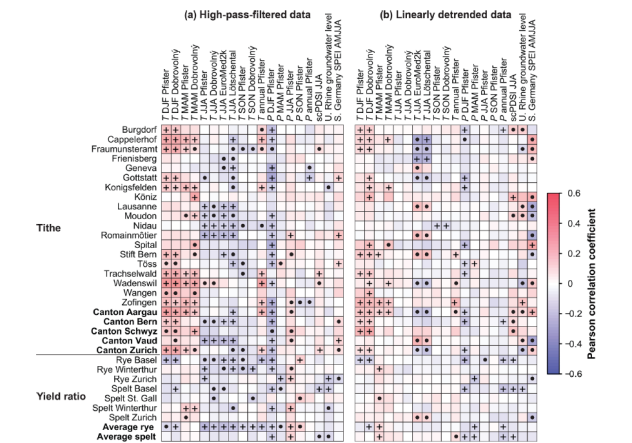


Figure 4. Cross-correlation matrix for Switzerland between climate series and grain tithe and yield ratio series for 10-year high-pass Gaussian filtered data (**a**) and linearly detrended data (**b**), respectively. Correlations significant at the $p = 0.05$ level with a t test are marked with a dot (·). Values that are additionally significant using the phase-scrambling test are marked with a plus sign (+).

Historical weather and grain production: That's complicated!

- Sweden: Strongest and most consistent climate signal recorded in the Swedish grain tithe series is the positive association with summer soil moisture $\Rightarrow$ wetter conditions meaning higher yields and vice versa
  - $+$ Weak negative correlation with summer temperature
- Switzerland: strongest correlation with winter temperature $(+)$ and summer temperature $(-)$, but weak one with soil moisture
- Why ??? About the data from Luterbacher et al. (2004)
  - '[The data] have decreasing skill going back in time, especially prior to the early 18th century'
  - 'They also lack local input data from Sweden during the period covered by the tithe series'
  - For Switzerland, for which we have high-quality local precipitation and temperature data for all seasons, we obtained more significant correlations than for Sweden and Spain

Temperatures, food riots, and adaptation: England

Temperatures, food riots, and adaptation: England

Alexander De Juan and Tim Wegenast (2020). 'Temperatures, Food Riots, and Adaptation: A Long-Term Historical Analysis of England'. *Journal of Peace Research* 57.2, pp. 265–280. DOI: 10.1177/0022343319863474

- Replication data [link]
- Motivation: Adverse environmental conditions can negatively impact agricultural production, increase food prices, threaten people's livelihoods, and trigger social unrest
- Question: what if the effect of extreme weather period on social unrest changes over time? what if people can adapt and reduce their vulnerability?

Temperatures, food riots, and adaptation: England

- Three hypotheses
  - (H1) low yearly temperatures $\nearrow$ the risk of food riot occurrence
  - (H2) the effect of temperature Δ over time
  - (H3) previous exposure to particularly cold years $\searrow$ the effects of subsequent low temperatures on the risk of food riots

- Contributions
  - Lend support to support to literature which documents a relationship weather conditions and unrest $\Rightarrow$ with historical perspective
  - Tentative evidence of adaptation processes over the long term

What do they do?

- Combine gridded yearly temp. with geo-referenced historical food riots (1500-1817)

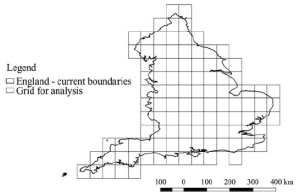


Figure 2. Grid for analysis and location of food riots

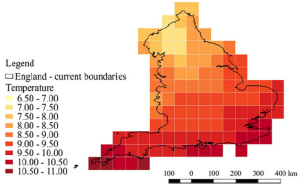


Figure 3. Mean yearly temperatures in 1500 and 1817

Data

- Food riots from Bohstedt (2010)
  - Events involving more than 50 people
  - Collection focus on year know to be 'rebellious' $\Rightarrow$ not a complete sample between 1500 and 1817
  - $\Rightarrow$ dummy showing the occurrence of a riot in a given grid-year
- Weather data from Luterbacher et al. (2004)
  - Focus on temperature because better correlation with yields in England
  - $\Rightarrow$ mean yearly temperatures by grid-cell

$\Longrightarrow$ Estimate a logit and LPM with year + cell FE

Results

Table I. Association between yearly temperatures and riot occurrence

	(1)	(2)	(3)	(4)
	Logit – full sample	*Logit – riot episodes*	*OLS – full sample*	*OLS – riot episodes*
Temperature	–0.010***	–0.027***	–0.012***	–0.025***
	(0.002)	(0.006)	(0.001)	(0.005)
Constant			0.119***	0.234*
			(0.018)	(0.089)
t1, t2, t3	Yes	Yes	Yes	Yes
Time trends	Yes	Yes	Yes	Yes
Observations	27,984	5,456	33,708	6,572
AIC	3,454.785	2,383.549	–54,221.572	–536.617
ll	–1,723.392	–1,187.775	27,116.786	274.309
r2			0.020	0.041

Logit and OLS regressions with standard errors clustered on the grid-cell level; standard errors in parentheses. All models include grid-cell fixed effects. * $p < 0.05$, *** $p < 0.001$.

Warmer weather reduces the likelihood to observe a food riot in any given year. Why?

⇒ They "provide evidence of a negative correlation between temperatures and wheat prices"

Results

- Robustness
  - Placebo by randomizing location of riots
  - Baseline with number of riots instead of dummy variables
  - Alternative measure of climatic conditions (SPDI: soil moisture)
  - Controls for population + presence of church, a proxy for 'strength of local social institutions'
- Further investigate the time-variation of the effect
  - Group data in 20-year period and estimate LPM for each one

(H2) Variations over time?

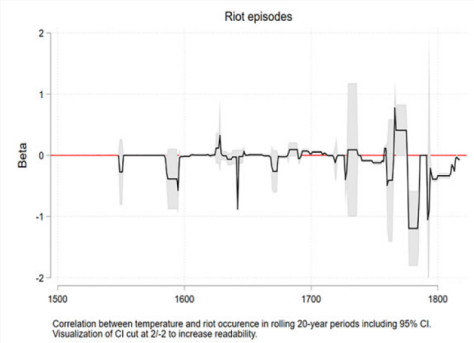


Figure 4. Variation in associations between temperature and riot occurrence over time

- Strongest correlations are observable in the 18th century $\Rightarrow$ (H2) the effect depends on the time period that is being investigated
- Plausible explanations
  - $\nearrow$ in cereal export shipments
  - population growth
  - land enclosures
  - repeated bad (wet) weather conditions $\nearrow$ food prices

Adaption? $\Longrightarrow$ include an interaction var. for # of years with weather 2 SD below cell mean

(H3) Adaptation over time?

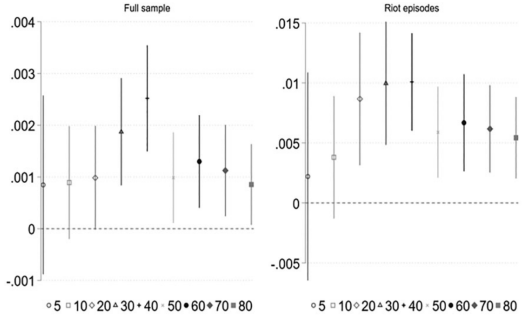


Figure 5. Adaptation with different temporal scopes

Adaption? Stronger after 3-4 decades $\Longrightarrow$ Time to adapt + awareness of climate histories wanes over time and adaptive strategies are abandoned

Some issues

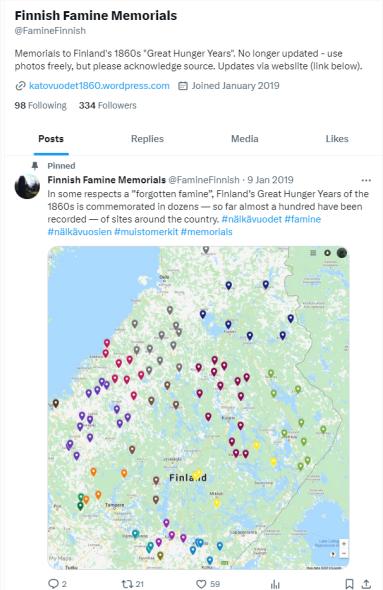
- Grid cell analysis and no Conley SE for spatial autocorrelation $\Rightarrow$ they say they have a low Moran
- Yearly mean of temperatures? $\Rightarrow$ Most of the harvest is happening in JJAS
  - Temp. in Summer or Fall $\nearrow$ risk of riots in Spring and Winter the same year? $\Rightarrow$ 394 / 1001 riots occurred between January and May
- London has 50,000 inhabitants in 1500, but 1 millions in 1800 (2 $\Rightarrow$ 10 %)
  - Is time-invariant cell FE ok?
- An extension? What about the role of the poor relief (the Poor Laws)?
  - Unplished paper by Greif and Iyigun [link] $\rightarrow$ 'Old Poor Law reduced social unrest, thereby encouraging risk-taking and stimulating entrepreneurial activities in England' (p. 18)
  - Look at the excellent paper by Melander and Miotto (2023)!

Famine, inequality and conflict: Finland

Background

- 1860s famine in Finland is one of the last in European history
  - Poor harvest due to wet weather conditions in summer 1866 and freezing temperature in September 1867
  - No proper food relief policy by the government
  - $\approx$ 8.5 % pop died of hunger (up to 20 %)
  - Peak in 1868 with the spread of diseases

$\Longrightarrow$ A good book for background info [link]



What do we know?

- Voutilainen (2022)
  - Substantial proportion of the ↗ mortality due to ↘ in agricultural production, ↘ in incomes, and a ↗ in food prices
  - Adverse effects of food output fluctuations were intensified by ↗ income inequality and ↘ average income

$\Longrightarrow$ What could be the long term consequence of this famine?

Jaakko Meriläinen et al. (2023). 'Famine, inequality, and conflict'. *Journal of the European Economic Association* 21.4, pp. 1478–1509. DOI: 10.1093/jeea/jvac069

Motivation

- Over the 20th century, more than 100 million people perished from famines
- Famine can have large societal impacts, are they sufficient to reshuffle inequality?
  - No according to W. Scheidel
- The effect (of subsequent labour shortage) on local power relations and labour coercion is less clear
- Question: What are the long-term consequences of famines on the distribution of prosperity and power?
  - What is the interplay between inequality, elite power and conflict?

Motivation

- Combination of historical events: Famine 1866-8 and Civil War after gaining independence from Russia in 1917



- Fully fledged conflict between socialist insurgents and conservative Senate-led forces in 1918
  - The conservative government won, but what was the effect for inequality?

Motivation

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Overview of the results

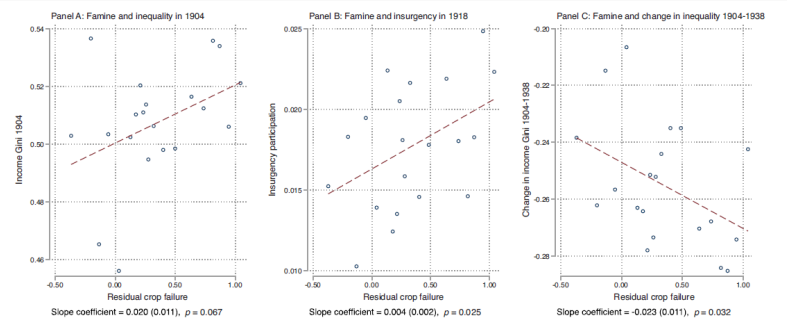
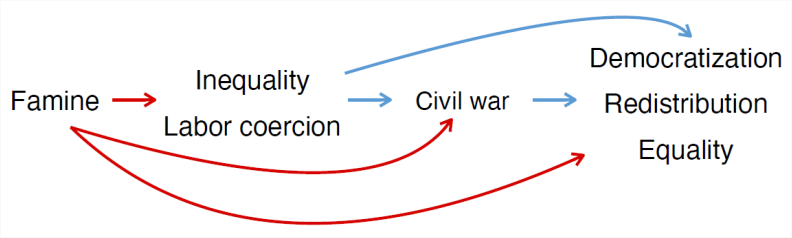


FIGURE 1. Effect of crop failure on inequality and civil war participation. The figures illustrate the effect of crop failure on economic inequality in 1904 (panel A), insurgency participation in 1918 (panel B), and change in economic inequality between 1904 and 1938 (panel C), after netting out baseline controls (latitude, longitude, log distance from Russia, log suitability for rye, log suitability for barley, log elevation, and log population in 1865) and region fixed effects. For further information on our data, see Section 3. Robust standard errors of the slope coefficients are reported in parentheses. Dots are binned averages computed within 20 bins with an equal number of observations.

Overview of the results

- Contribution to the literature on persistence in economic (and political) development
- New evidence on short- and long-run effects of famines
  - Support for the impact on labour shortage and coercion
- Causes of civil wars $\Rightarrow$ pre-conflict inequality is an important drivers
- Origins of the Nordic welfare states $\Rightarrow$ Equality and consensus politics are not historical fundamentals, but outcomes of institutional changes sparked by unrest
  - Support for the idea that institutions are fundamental in shaping the long-run outcomes of countries

What are they doing?



- Use rye crop failure in 1867 as an exogenous driver of inequality. Conditional on rye suitability (covariate balance ✓) ⇒ isolate the causal effect of the famine

- Also explore correlational relationship between inequality, insurgency, and post-civil war redistribution

What are they doing?

TABLE 1. Famine deaths and pre-famine municipal characteristics.

	Mean (1)	$\beta^{Famine\ deaths}$ (2)	No failure (3)	Crop failure (4)	$\beta^{Crop\ failure}$ (5)	Observations (6)
Famine deaths 1866–1868	0.15		0.14	0.18	0.04***	409
	[0.05]		[0.04]	[0.04]	(0.01)	
log(population 1865)	8.06	1.86**	8.24	8.17	−0.10	420
	[0.74]	(0.78)	[0.69]	[0.60]	(0.08)	
Population density 1865	1.57	0.17	1.73	1.84	0.07	420
	[1.92]	(1.52)	[2.01]	[2.18]	(0.28)	
Rainfall	5.96	**−0.90****	6.07	5.92	0.02	451
	[0.42]	(0.46)	[0.38]	[0.34]	(0.04)	
ln(slope)	9.00	0.10	8.99	8.99	−0.00	451
	[0.08]	(0.09)	[0.08]	[0.08]	(0.01)	
Income Gini 1865	0.31	**−0.34****	0.32	0.30	−0.00	349
	[0.12]	(0.15)	[0.11]	[0.10]	(0.01)	
Mean income 1865	14.40	**−26.92****	14.26	13.51	−0.22	349
	[6.58]	(10.48)	[5.99]	[4.24]	(0.64)	
ln(distance to Helsinki)	5.39	1.29**	5.24	5.57	−0.06	451
	[0.65]	(0.55)	[0.65]	[0.57]	(0.06)	
ln(distance to Russia)	5.10	3.96***	4.87	5.22	0.23**	451
	[0.97]	(0.92)	[1.18]	[0.73]	(0.10)	
ln(distance to Turku)	5.26	1.71**	5.14	5.56	0.01	451
	[0.91]	(0.77)	[0.94]	[0.57]	(0.07)	
Latitude	61.98	7.53***	61.51	62.53	−0.03	451
	[1.49]	(1.45)	[1.30]	[1.14]	(0.09)	
Longitude	24.80	−3.32	25.01	25.17	−0.09	451
	[2.70]	(2.77)	[2.88]	[2.70]	(0.33)	
ln(barley suitability)	8.23	**−2.37*****	8.39	8.00	0.06	451
	[0.57]	(0.49)	[0.61]	[0.40]	(0.07)	
ln(cereal suitability)	7.70	−0.08	7.77	7.69	0.02	450
	[0.31]	(0.32)	[0.33]	[0.26]	(0.03)	
ln(rye suitability)	6.63	**−2.19*****	6.81	6.39		451
	[0.50]	(0.49)	[0.46]	[0.41]		

Notes: Column (1) shows the mean of famine deaths and other pre-famine characteristics across municipalities. Column (2) shows the correlation between famine deaths and pre-famine characteristics. Columns (3) and (4) show the famine deaths and pre-famine characteristics by the occurrence of crop failure in 1867. Column (5) shows the correlation of famine deaths and pre-treatment characteristics with crop failure, conditional on rye suitability. Standard deviations and robust standard errors are reported in brackets and parentheses, respectively. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Empirical strategy

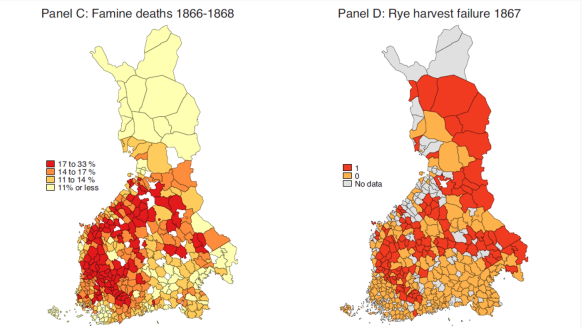


FIGURE 2. Illustration of the famine shock. Panel A shows rye production in Finland as documented famine years 1866–1868 relative to the predicted population. Panel C plots the famine casualties relative to the 1865 population in each municipality. The map in panel D plots the geographical distribution of crop failures.

$$y_m = \alpha + \beta \, \textit{Famine exposure}_m + X_m' \gamma + \epsilon_m \quad (1)$$

Data (1)

Municipality-level

- Number of deaths between 1866 and 1868 relative to the 1865 population
- Information on the quality of the 1867 rye harvest $\Rightarrow$ Dummy $= 1$ if crop failure
- Income table from Official Statistics of Finland in 1865, 1881, 1932, 1935, and 1938
  - number of people in each income tax bracket in a given municipality $\Rightarrow$ Gini
  - Statistics on incomes drawn from Hjelt and Broms (1904) for 1904, but only rural municipalities

Data (2)

Municipality-level

- Coercion $\Rightarrow$ % of tenant farmers, % of terminated tenant contracts, and daily agricultural wages
  - 'Tenant farming was a prevalent form of farming, and the lack of land ownership is often attributed as a sign of labour coercion' (p. 1490)
- All Finnish Civil War casualties (collected by the National Archives)
  - side of the individual, occupation, and the municipality of birth
  - number of casualties per inhabitants in 1910 $\Rightarrow$ assumption on (non-)migration

Results (1)

TABLE 2. Famine's lasting impact on local inequality and labor coercion.

	Income Gini 1904		Land Gini 1910		Tenant farm share		Terminated leases share		Daily wage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A										
Famine deaths per capita	0.305***	0.214**	0.260***	0.253***	1.218***	1.063***	0.062	0.039	−3.970***	−3.437***
	(0.088)	(0.088)	(0.078)	(0.080)	(0.187)	(0.179)	(0.058)	(0.060)	(0.611)	(0.645)
Conley SE	0.106	0.111	0.091	0.082	0.293	0.296	0.065	0.059	0.679	0.622
N	409	409	403	403	403	403	390	390	382	382
R^2	0.214	0.287	0.134	0.233	0.442	0.568	0.274	0.326	0.294	0.390
Outcome mean	0.496	0.496	0.392	0.392	0.464	0.464	0.046	0.046	3.076	3.076
Panel B										
Crop failure	0.018*	0.020*	0.024***	0.021**	0.065***	0.054**	0.006	0.002	−0.178**	−0.078
	(0.011)	(0.011)	(0.009)	(0.008)	(0.023)	(0.022)	(0.007)	(0.007)	(0.078)	(0.073)
Conley SE	0.012	0.011	0.010	0.009	0.029	0.024	0.007	0.006	0.085	0.079
N	328	328	324	324	324	324	314	314	306	306
R^2	0.147	0.241	0.136	0.223	0.464	0.599	0.252	0.318	0.164	0.278
Outcome mean	0.507	0.507	0.396	0.396	0.468	0.468	0.048	0.048	3.011	3.011
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
County FE		✓		✓		✓		✓		✓

Notes: Baseline controls included in all estimations are latitude, longitude, log distance to Russia, log suitability for rye, log suitability for barley, log elevation, and log population in 1865. Robust standard errors are reported in parentheses. Conley standard errors allow for spatial autocorrelation among municipalities that are within 50 kilometers of each other. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$\Longrightarrow$ 'we interpret these results as indicative evidence of an increase in labor coercion.' (p. 1494)

Results (2)

TABLE 3. Effects of the famine on insurgency and pre-conflict discontent.

	Insurgent casualty share		White casualty share		SDP vote share		Workers' association members		Strike participation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A										
Famine deaths per capita	0.107***	0.079***	0.008***	0.009***	1.258***	0.940***	0.199***	0.160**	1.752	1.438
	(0.018)	(0.015)	(0.003)	(0.003)	(0.203)	(0.196)	(0.067)	(0.072)	(1.160)	(1.222)
Conley SE	0.035	0.024	0.003	0.003	0.285	0.267	0.088	0.086	0.845	1.105
N	408	408	408	408	366	366	404	404	409	409
R^2	0.451	0.620	0.113	0.291	0.401	0.496	0.178	0.214	0.015	0.028
Outcome mean	0.016	0.016	0.003	0.003	0.410	0.410	0.056	0.056	0.161	0.161
Panel B										
Crop failure	0.005**	0.004**	0.001	0.000	0.078***	0.054**	0.017**	0.015*	0.274	0.254
	(0.002)	(0.002)	(0.000)	(0.000)	(0.023)	(0.022)	(0.008)	(0.009)	(0.239)	(0.206)
Conley SE	0.003	0.002	0.000	0.000	0.030	0.028	0.008	0.009	0.224	0.182
N	327	327	327	327	297	297	324	324	328	328
R^2	0.415	0.583	0.079	0.229	0.284	0.423	0.174	0.203	0.018	0.036
Outcome mean	0.018	0.018	0.003	0.003	0.443	0.443	0.060	0.060	0.159	0.159
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
County FE		✓		✓		✓		✓		✓

Notes: Baseline controls included in all estimations are latitude, longitude, log distance to Russia, log suitability for rye, log suitability for barley, log elevation, and log population in 1865. Robust standard errors are reported in parentheses. Conley standard errors allow for spatial autocorrelation among municipalities that are within 50 kilometers of each other. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$\Longrightarrow$ In the paper, Fig. 3 shows correlation between inequality (Gini) and casualty share, SDP vote share 1910-7, workers associations members

Results (3): Event study on Δ inequality

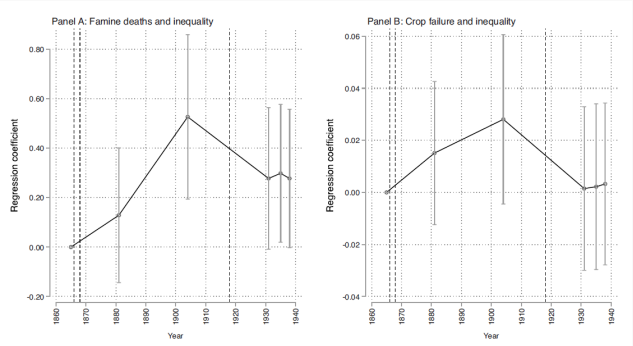


FIGURE 4. Event-study estimates. The figures plot the event-study estimates and their 95% confidence intervals that are constructed using standard errors clustered at the municipality level. We use 1865 as the base year. Estimations include county fixed effects and baseline controls interacted with year fixed effects. The first two vertical lines mark the famine years, and the third vertical line shows the civil war year.

$\Longrightarrow$ In Tab. 4, $\nearrow$ farms created in the 1920s, and $\nearrow$ growth of municipal health care spending

Additional resources

Many more cool reading about famine

- Henn and Huff (2024)
  - Study how the legacies of the 1845-49 Irish Potato Famine affected the decisions of subsequent generations of Irishmen to fight for or against Britain.
- Meng et al. (2015)
  - Rural mortality rates were positively correlated with per capita food production... and a inflexible government procurement policy was necessary for generating this pattern $\Rightarrow$ policy was a quantitatively important contributor to overall famine mortality
- Markevich et al. (2024)
  - Role of human agency in the onset of the Ukrainian famine in the 1930s

The main epidemics in history

The main plagues outbreaks before the 19th century

Table 1. Main plague outbreaks affecting Europe and the Mediterranean

	Regions affected	Victims (millions)	Mortality rate (% of population killed)
540 to 541 (possibly up to ca. 550 in northern Europe)—Justinianic Plague	Europe, Mediterranean	Up to 25 to 50 overall	25 to 50% overall (50% in Egypt and other densely populated areas)
1346 to 1352—Black Death	Europe, Mediterranean, Middle East, central Asia, possibly parts of China and other areas	Up to 50 in Europe and the Mediterranean; unknown elsewhere	35 to 60% in Europe and the Mediterranean; unknown elsewhere
1356 to 1366—*pestis secunda*	Europe, Mediterranean, Middle East	Up to 5 to 10 in Europe and the Mediterranean; unknown elsewhere	15 to 20% in Europe and the Mediterranean; unknown elsewhere
1625 to 1632	Most of central and western Europe (areas spared include most of Spain and central-southern Italy)	Up to 2 in northern Italy; up to 1.15 in France; up to 0.25 in Switzerland; up to 0.16 in the Dutch Republic; unknown elsewhere	30 to 35% in northern Italy, 20 to 25% in Switzerland; 20 to 25% in South Germany, Rhineland and Alsace (up to 40% if also victims of famines and of the Thirty Years' War are included); 8 to 11% in the Dutch Republic; unknown elsewhere
1647 to 1657	Andalusia, Spanish Mediterranean, and central-southern Italy	Up to 1.25 in the Kingdom of Naples; up to 0.5 in Spain; up to 0.33 in France; unknown elsewhere	30 to 43% in the Kingdom of Naples; at least 25% in Andalusia; 15 to 20% in Catalonia; unknown elsewhere

Future plague studies based on biological evidence would do well to pay greater attention to findings from historical research or risk missing the main questions.

Sources: Alfani (2023).

A quick overview

- Alfani and Murphy (2017)
  - 4 main types of epidemics: plague, smallpox, cholera, and influenza
  - No significant sex effect on plague (Black Death, in 17th century England, and 1629-31 Italy)
  - Environmental conditions interacted with human agency to shape epidemics ⇒ Institutions played a crucial role in determining their eventual spread and intensity
  - 1st quarantine procedure for cases of plague: Reggio Emilia in 1374 or in Ragusa in 1377
  - Venice, 1423: first permanent plague ward (*lazzaretti*) was built on a lagoon island
  - Quarantines and other temporary restrictions on the freedom of movement were particularly efficient

⇒ 'Yet we are still far from solving the mystery of the disappearance of plague from Europe [during the 17th c.]' (p. 330)

A quick overview

⇒ 'Yet we are still far from solving the mystery of the disappearance of plague from Europe [during the 17th c.]' (p. 330)

- Environmental factors
- Process of adaptation between human and pathogens
- Human actions and institutional factors
  - Health institutions and plague management
  - Sanitation and hygiene
- Mass selection- and maybe immunization-derived from plagues

The role of health institutions

The role of *lazzaretto* in 17th-century Italy

Guido Alfani, Marco Bonetti et al. (2024). 'Pandemics and Socio-Economic Status. Evidence from the Plague of 1630 in Northern Italy'. *Population Studies* 78.1, pp. 21–42. DOI: 10.1080/00324728.2023.2197412

- Motivation: Biological, socio-economic, and institutional factors shape the individual risk of death during a major pre-industrial epidemic
- Question: Are health institutions always beneficial for the survival of individuals?
  - e.g. greater exposure to other sick people $\searrow$ chances of survival
- Detailed study in the city of Carmagnola (Piedmont) during the 1630 plague
  - Linked all the individuals who entered the *lazzaretto* to the population structure (household, gender, age, and neighbourhood)

The spread of the plague during summer 1630

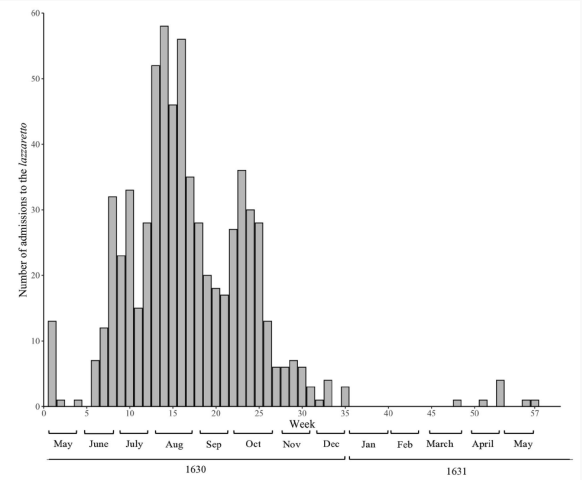


Figure 1 Weekly admissions to the *lazzaretto*: Carmagnola 1630–31
Note: Week 1 begins on 3 May 1630; week 57 ends on 5 June 1631.
Source: See Historical context, data, and methods section; and replication package (Note 3).

Survival rates

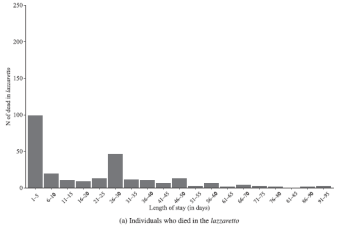


Figure 3 Distribution of length of stay in the *lazzaretto*: Carmagnola 1630–31
Notes: This figure shows the distribution of length of stay of patients who: (a) died; and (b) survived and were discharged from the *lazzaretto*. The bin width is five days. For ease of visualization, we exclude the small fraction of cases who stayed in the *lazzaretto* for more than 100 days (2.4 per cent of patients); these are, however, included in all the subsequent analyses.
Source: As for Figure 1.

- Plague affected both sexes similarly + ↗ adults in a severe way, starting with the 41-50 age group
- Rich individuals (higher fiscal classes) had lower survival rates!
  - Richest groups used their political leverage to avoid treatment in *lazzaretto*
- Poor enjoyed relatively good chances of survival compared with all other strata of society!
  - Better access to food and clean water

Survival rate by age in Nonantola in 1630

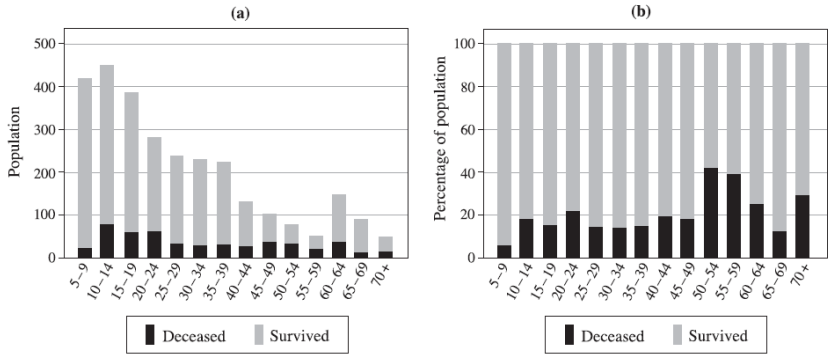


Figure 4 Absolute frequencies (a) and proportions (b) of deaths and survivors by age group, Nonantola, 1630
Source: As for Table 1.

Sources: Alfani and Percoco (2019).

Plague deaths by age and sex in Italy

TABLE 2

PLAGUE DEATHS BY AGE AND SEX DURING THE 1630 EPIDEMIC IN NORTHERN ITALY[a]

	Province of Parma (9 villages)				Nonantola				Carmagnola			
Age[b]	(1) # M	(2) # F	(3) M/F	(4) (M+F)/ Total[d] (Percent)	(1) # M	(2) # F	(3) M/F	(4) (M+F)/ Total[d] (Percent)	(1) # M	(2) # F	(3) M/F	(4) (M+F)/ Total[d] (Percent)
0–4	57	45	1.27		n.a.	n.a.			n.a.	n.a		
5–10[c]	69	71	0.97		30	23	1.30		n.a.	n.a		
11–15	59	62	0.95	16.0	75	47	1.60	18.8	60	87	0.69	18.2
16–20	47	76	0.62	16.2	45	63	0.71	16.6	42	43	0.98	10.5
21–25	34	37	0.92	9.4	20	36	0.56	8.6	43	51	0.84	11.6
26–30	43	53	0.81	12.7	32	27	1.19	9.1	20	26	0.77	5.7
31–35	20	16	1.25	4.7	35	18	1.94	8.2	34	31	1.10	8.0
36–40	28	46	0.61	9.8	29	23	1.26	8.0	38	37	1.03	9.3
41–45	22	27	0.81	6.5	10	19	0.53	4.5	28	31	0.90	7.3
46–50	52	39	1.33	12.0	30	37	0.81	10.3	28	43	0.65	8.8
51–55	13	5	2.60	2.4	9	14	0.64	3.5	25	16	1.56	5.1
56–60	14	24	0.58	5.0	22	25	0.88	7.2	26	23	1.13	6.1
61–65	7	5	1.40	1.6	6	4	1.50	1.5	10	14	0.71	3.0
66–70	6	7	0.86	1.7	14	5	2.80	2.9	18	11	1.64	3.6
71+	11	5	2.20	2.1	2	3	0.67	0.8	16	8	2.00	3.0
Age not reported	38	51	0.75		30	0	—		9	11	0.82	
Total	*520*	*569*	*0.91*		*359*	*344*	*1.04*		*470*	*528*	*0.89*	

Notes:

[a] Carmagnola is a city in the current region of Piedmont, while the rural town of Nonantola and the territory of Parma belong to Emilia-Romagna.

[b] The age bands used in the table reflect the fact that in Nonantola the parish priest did not record the burials of infants under five years of age, while for Carmagnola we have no information for those under 11 years of age.

[c] This age-band is one year longer than the others.

[d] Total for ages 11 and older.

Sources: For Nonantola, books of burials of the Parish Archive of St Michele. For Carmagnola, own elaboration from Abrate (1972). For the villages in the province of Parma, database Manfredini.

The long-term consequences of plagues

Economic and social consequences of plagues

Guido Alfani and Marco Percoco (2019). 'Plague and Long-Term Development: The Lasting Effects of the 1629–30 Epidemic on the Italian Cities'. *The Economic History Review* 72.4, pp. 1175–1201. DOI: 10.1111/ehr.12652

- In Italy, severe epidemics of plague killed 30-5 % of the population ⇒ locally similar in magnitudes to the Black Death
- Literature: The Black Death has yielded significant positive effect for development in Europe
  - Transition to a new steady state, characterised by higher per capita income
  - Reduction in income and wealth inequality
  - Demise of religious institutions in many parts of the continent

Economic and social consequences of plagues

- Literature: The Black Death has yielded significant positive effect for development in Europe
  - Decline of serfdom ($\nearrow$ bargaining power of labourers)
  - Earlier demographic transition during the 19th c. (in German cities)

- Question: Could extreme mortality crises of the 1630s shape long-term development patterns?
  - Cause of relative decline during the 17th century? $\Rightarrow$ Little Divergence

Methodology

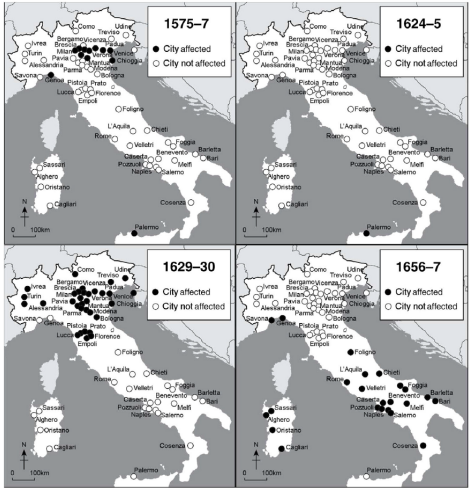


Figure 1. *Territorial coverage of the main Italian plagues of the early modern period [Colour figure can be viewed at wileyonlinelibrary.com]*

Source: See n. 23 for details of the database.

- Set of 56 Italian cities
- Focus on 3 three deadliest plagues affecting Italy (1575-7, 1629-30, and 1656-7)
  - In 1629-30, between 0.87-1.25 million died in the Kingdom of Naples
  - Comparison ⇒ French largest mortality crises in 1693-4: 1.2-1.4 million deads

Table 1. *Urban mortality rates during the early modern plagues*

Plague wave	*N. of cities*	*Median mortality (per 1,000)*	*Mean mortality (per 1,000)*	*Std. dev. (per 1,000)*	*Max. mortality (per 1,000)*	*Min. mortality (per 1,000)*
1575–7[a]	11	220	242	110	444 (Brescia)	79 (Vicenza)
1629–30	32	380	359	177	722[c] (Mantua)	15 (Pistoia)
1629–30[b]	26	400	388	165	722[c] (Mantua)	80 (Ivrea)
1656–7	23	490	419	215	783 (Bari)	51 (Melfi)

Notes: *a* Southern cities are excluded. The only southern Italian city included in the database that was affected by plague in the period is Palermo (with a mortality rate of 40 per 1,000). It has not been included in the table as the Sicilian epidemic was probably totally independent of the one affecting the north.

b Omitting Tuscany, which, for reasons that are not yet entirely clear, was affected in an exceptionally light way by this plague wave. See Alfani, 'Plague in seventeenth century Europe', for a discussion.

c The very high mortality rate experienced by Mantua incorporates the victims of the siege suffered by the city during the plague. Excluding Mantua, the maximum mortality would be that experienced by Verona (615 per 1,000).

Source: See n. 23 for details of the database.

Not a 'plague of the poor'

Mortality rates c. 400 ‰ ⇒ Human capital and productivity

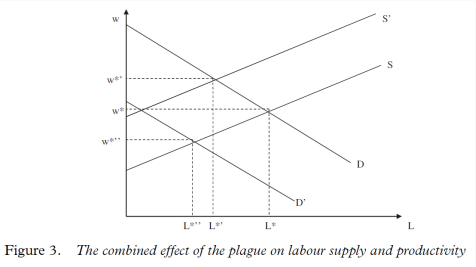


Figure 3. *The combined effect of the plague on labour supply and productivity*

- If low mortality rates ⇒ riches often escape (partly) the plague + abundant unskilled labour in the countryside can fill the gaps in cities

- 1629–30 is different ⇒ large scale impact on both rural and urban areas
  - Knowledge: craftsmen could no longer transmit their expertise
  - Trade networks: In Milan, demands for permits of long-distance trade moved from 337 requests in 1600-29 to 107 afterwards
  - City institutions: In Venice, 17 % of the Great Council died in 1630

Plagues and population growth in Italy

⇒ -20 % cumulative growth rate over the period 1600-1800 for cities affected by the plague

Table 2. *Plague shock and population growth*

Variables	*(1) Growth, 1600–1700*	*(2) Growth, 1600–1750*	*(3) Growth, 1600–1800*
		Panel A	
Log mortality rate of 1630 plague	−0.095**	−0.141**	−0.177**
	(0.038)	(0.058)	(0.081)
Log population in 1600	−0.000	−0.066	−0.146*
	(0.061)	(0.064)	(0.078)
Capital city	0.192	0.203	0.298
	(0.133)	(0.175)	(0.213)
Centre	−0.026	−0.149	−0.331
	(0.110)	(0.133)	(0.208)
South	−0.211	−0.176	−0.291
	(0.133)	(0.198)	(0.331)
Constant	0.387	1.404*	2.471***
	(0.568)	(0.689)	(0.824)
R^2	0.163	0.196	0.282
		Panel B	
Growth, 1600–50	0.566***	0.579***	0.592***
	(0.134)	(0.162)	(0.188)
Log population in 1600	−0.040	−0.090**	−0.176***
	(0.045)	(0.043)	(0.065)
Capital city	0.127*	0.141	0.247*
	(0.072)	(0.093)	(0.129)
Centre	−0.121	−0.010	−0.189
	(0.089)	(0.119)	(0.171)
South	−0.215	−0.058	0.115
	(0.139)	(0.141)	(0.184)
Constant	0.454	1.039**	1.958***
	(0.471)	(0.468)	(0.672)
R^2	0.442	0.466	0.501
Observations	41	41	41

Notes: Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.
Source: See n. 23 for details of the database.

Plagues and urbanisation in Italy

⇒ cities of larger size suffered greater population decline

- In Venice, yearly production of woollen cloths in 1645-9 ↘ 45 % compared to 1625-9
- In Milan, silk production in 1636 = 20 % production of 1606
- Also crisis in linen industries in Florence

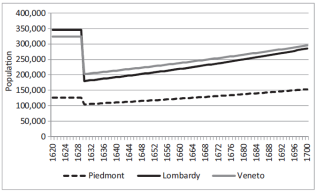


Figure 4. *Size of the urban population in Piedmont, Lombardy, and Veneto, 1620–1700*

Sources: Authors' own elaboration from information provided by Alfani, 'Plague in seventeenth century Europe'; Malanima, 'Urbanisation'; and the database detailed in n. 23. Additional details are provided in the main text.

Table 7. *Urbanization rates in the North and Centre-North of Italy (%, cities >5,000)*

	Piedmont	*Tuscany*	*North*	*Centre-North*
1600	24.5	21.0	20.4	18.4
1700	22.9	19.0	16.1	16.9
Change (%)	−6.5	−11.9	−20.9	−8.2

Note: For Piedmont, the 1600 figure actually relates to 1612 and the 1700 one to 1734.
Sources: Alfani, 'Economic inequality', pp. 1082–3, for Piedmont; Breschi and Malanima, 'Demografia ed economia', for Tuscany; del Panta et al., *La popolazione*, p. 277, for the north; Malanima, 'Urbanisation', p. 103, for the centre–north.

Room for a positive shock on the labour market?

Genoa: no plague; Milan (462 ‰), Florance (137 ‰)

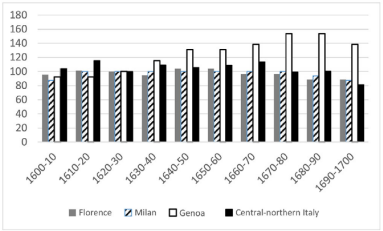


Figure 5. *Real wages of masons in the cities of northern Italy and overall urban and rural real wages in central-northern Italy, 1600–1700 (index based on the average of 1620–30)*
[Colour figure can be viewed at wileyonlinelibrary.com]
Note: We use 11-year periods because this is the format of the information provided by Malanima, *Wages in Italy 1290–1990*.
Sources: For Florence, Milan, and Genoa: Malanima, *Wages in Italy 1290–1990*, pp. 20–1, www.paolomalanima.it (accessed on 18 Oct. 2016). For central-northern Italy: idem, 'When did England overtake Italy?', statistical app.

$\Longrightarrow$ In Milan, wages are flat until 1680 and then decline to 87 % of their 1620-30 level

$\Longrightarrow$ Strong support for the hypothesis that negative productivity shocks prevented the 17th-century plagues from being beneficial to the Italian economies

Conclusion

- Cities affected by the 1629-30 plague sustained a persistent long-term negative effect on the pattern of population growth (at least up to 1800)
- In northern Italy, the plague caused a lasting decline in both the size of the urban population and urbanisation rates
- One should be cautious in generalising about the impact of plague in early modern Europe
- It could differ radically from one region to another and from one epidemic to another!

Reminder about economic history

Reminder about economic history: Read the sources!

[CITATION] Les **hommes** et la **peste** en **France** et dans les **pays européens** et **méditerranéens**

JN Biraben - 1975 - degruyter.com

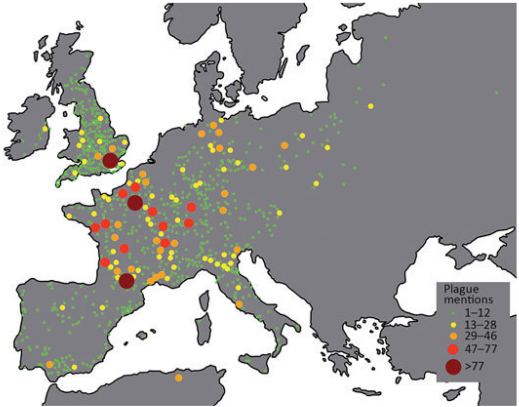
Les **hommes** et la **peste** en **France** et dans les **pays européens** et **méditerranéens** ...

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- Roosen and Curtis (2018)
  - Non-critical use and reproduction of pre-existing data sets can limit our understanding of how infectious diseases evolved!

Plagues in Europe derived from Biraben's data

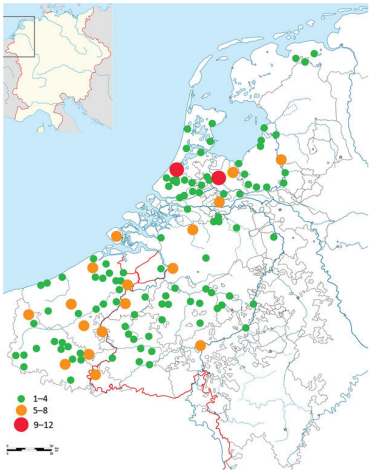
Figure 1



Plague outbreaks in Europe, 1347–1760. Map produced on the basis of data from Biraben (2,3). Map provided courtesy of Yue et al. Navigable rivers facilitated the spread and recurrence of plague in pre-industrial Europe. Sci Rep. 2016;6:34867 (6).

Plagues in the Netherlands derived from archival sources

Figure 3



Plague mentions taken from archival sources, Low Countries, 1348–1500 (*18*). Inset shows location of the Low Countries in western Europe.

Mortality in the Netherlands derived from archival sources

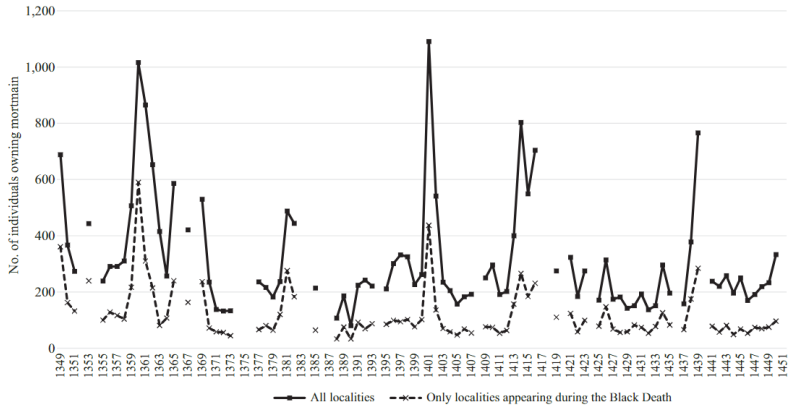


Figure 2. *Annual mortality based on individuals owing mortmain, Hainaut, 1349–1450, adjusted for missing months in a year*

Sources: ADN, B 12122–12226; ARB, I, 004, 17867–73.

The misuse of data (1)

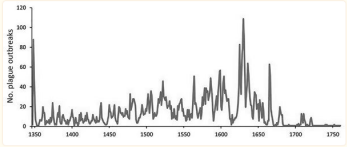


Figure 4

Plague outbreaks in Europe, 1347–1900. Graph produced on the basis of data from Biraben (2,3). Graph provided courtesy of Büntgen U et al. Digitizing historical plague. Clin Infect Dis. 2012;55(11):1586–8 (4). By permission of Oxford University Press.

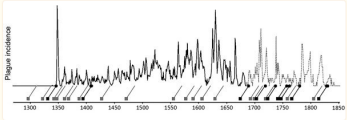


Figure 5

Plague incidences in Europe, 1347–1900. Graph produced on the basis of data from Biraben (2,3). Graph provided courtesy of Schmid BV et al. Climate-driven introduction of the Black Death and successive plague reintroductions into Europe. Proc Natl Acad Sci U S A. 2015;112:3020–5 (5).

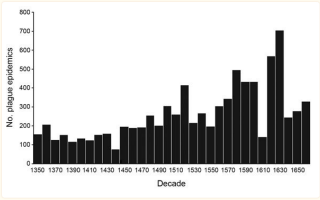


Figure 6

Plague epidemics in Europe, 1350s–1660s. Graph produced on the basis of data from Biraben (2,3). Modified graph provided courtesy of Voigtländer N, Voth H-J. Gifts of Mars: warfare and Europe's rise to riches. J Econ Perspect. 2013;27:165–86 (12).

- Which one is correct?

$\Longrightarrow$ None + these 3 terms are not interchangeable

The misuse of data (2)

- The data represent the availability of sources mentioning plague!
- Sources he was able to find in the timespan of researching his book while working in Paris!
  - Bias 1: France is over-represented
  - Bias 2: Urban center are-represented (Paris = 90; Soissons = 3)
  - Bias 3: 14th century is largely under-represented
  - + low quality of listing original sources + absence of distinction between sources and wording

$\Longrightarrow$ One want to **be careful** before drawing causal inference on urban development, trade routes, institutions, etc.

Additional resources

Many more cool reading about epidemics

- Ambrus et al. (2020)
  - Cholera epidemics in London shaped housing prices in 19th c. Differences still persist today!
- Udale (2023)
  - Individual linkages of households during epidemics. Strong enforcement of quarantine in Bristol, in particular in areas with greater elite oversight and control!
- Bauernschuster et al. (2023)
  - Higher influenza mortality saw a lasting shift towards left-wing parties in Weimar Germany. Rewarding of parties signalling competence in health issues!
  - See also Krieger (2023) $\Rightarrow$ Elites improved access to health services due to pressure exerted by workers' movements in Germany c. 1900

Reproducibility exercise

A first practice on reproducibility

- Choose your paper: England or Finland?
- Create a dedicated replication folder on your computer
  - Remember the 'The Good, the Bad and the Ugly'
- Download the replication from the Data repository
- Try to reproduce column 1 from Table 1 (Table 2 in Finland)
- Think about an extension/robustness and implement it
- Export your results in a HTML table or LaTeX table

Questions?

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