The Black Death and Its Consequences

Some Questions...

- What caused the transition in Europe from the medieval to the early-modern period?
- What is the impact of a large demographic shock on...
  - Wages and inequality
  - Minority persecution
  - Trade
  - State formation
  - The urban system

Background on medieval institutions

- Manorial system and serfdom
- Guilds
- Feudal states
- Urban system centered on the mediterranean

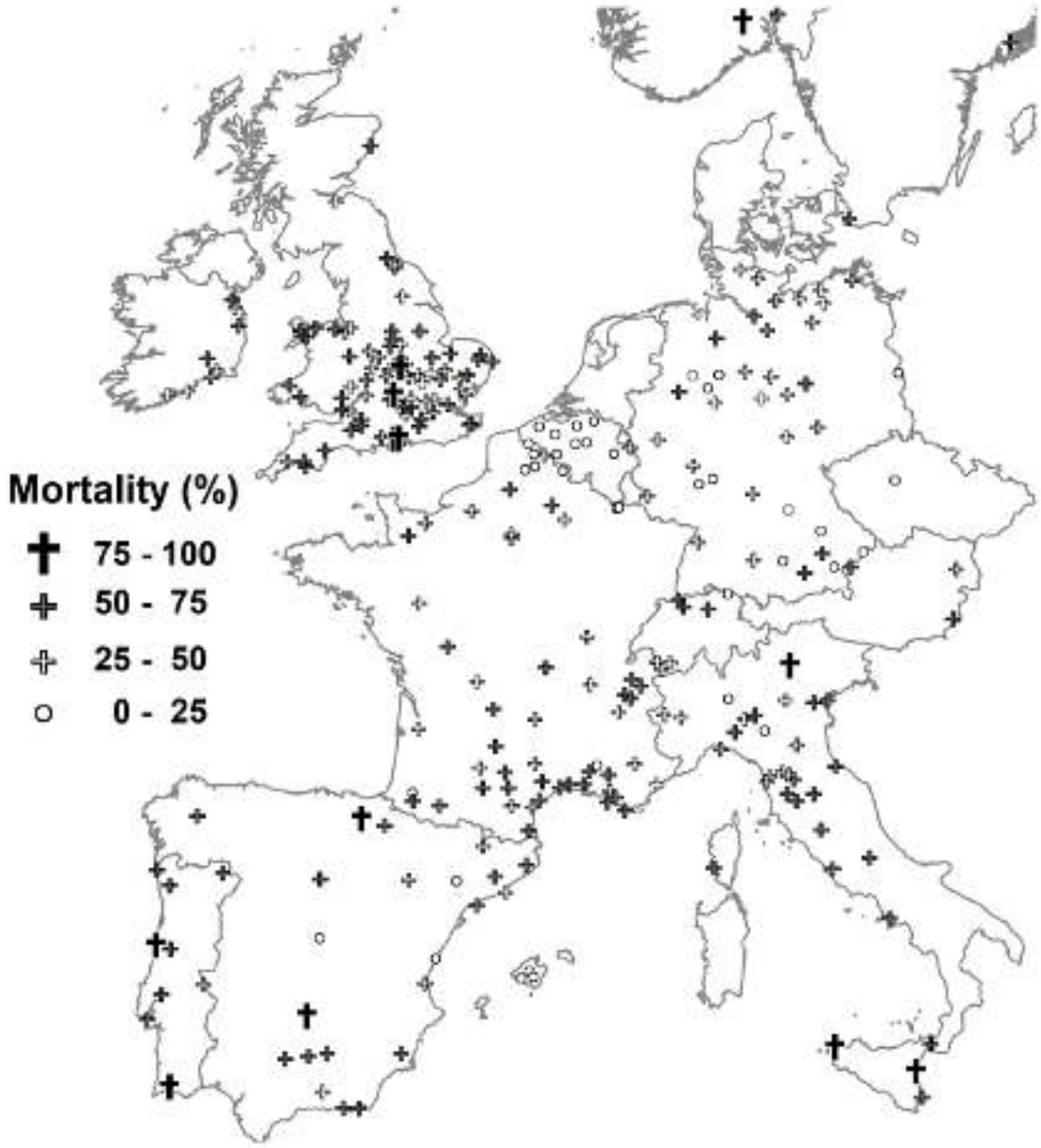
Background on the Black Death: Mortality Rates

Table 1: Overall Mortality by Country, Western Europe, Provisional Estimates

Country	1300 Pop. (m)	Mortality (%)	High Est. (%)	Low Est. (%)
Austria, Czechia & Hungary	10	20		15 (Gottfried*)
Belgium	1.4	22.5	25 (Gottfried)	20 (Gottfried)
England & Scotland	6	55	62.5 (Benedictow)	45 (Gottfried)
France	16	50	60 (Benedictow)	30 (Gottfried)
Germany	13	22.5	25 (Gottfried)	20 (Gottfried)
Italy	12.5	50	55 (Benedictow)	40 (Ziegler)
Netherlands	0.8	32.5	35 (Gottfried)	30 (Gottfried)
Poland	2	25	25 (Gottfried)	
Portugal	1.3	—		
Scandinavia	1.9	55	60 (Benedictow)	50 (Gottfried)
Spain	5.5	50	62.5 (Benedictow)	30 (Gottfried)
Switzerland	0.8			
Western Europe	72.8	38.75		
274 Localities (Pop.-Weighted)		38.90		

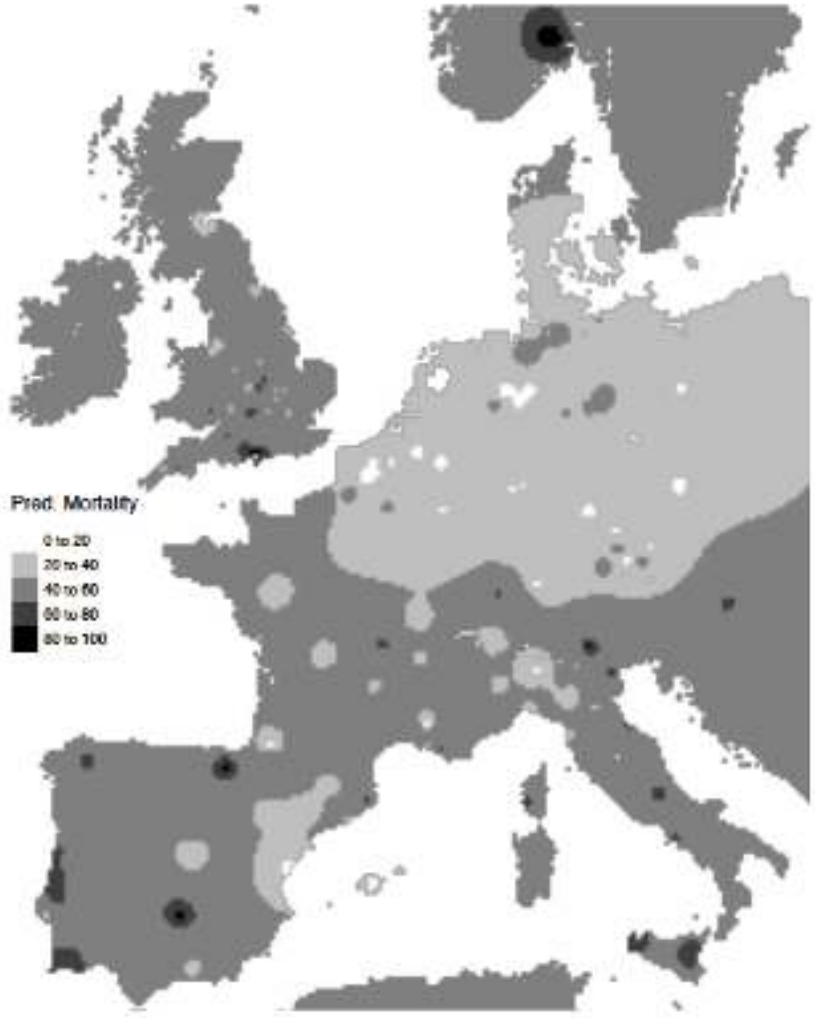
Background on the Black Death: Mortality Rates

Figure 1: Black Death Mortality Rates (%) for 274 Localities in 1347-1352

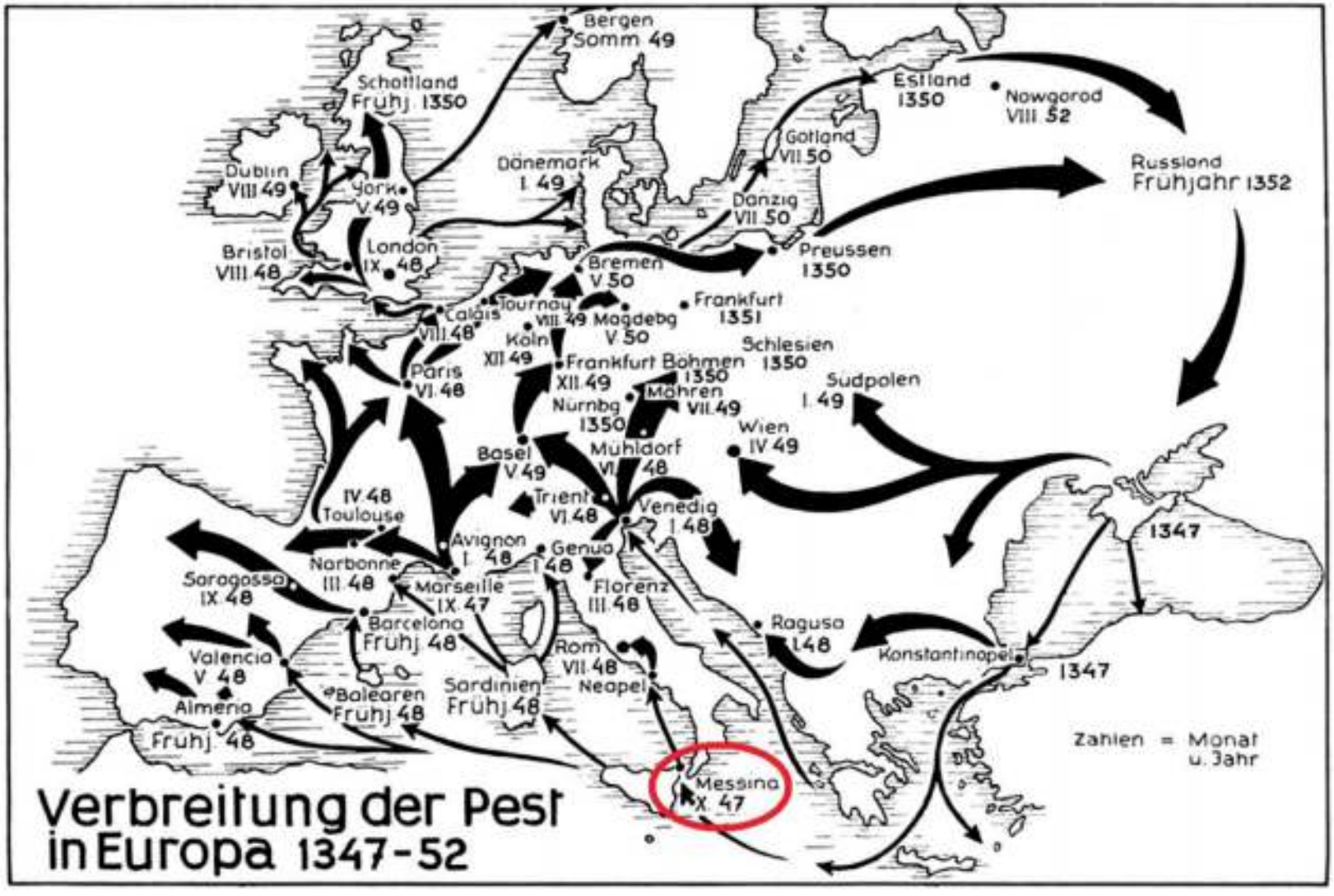


Background on the Black Death: Mortality Rates

Figure 2: Spatially Averaged Black Death Mortality Rates Based on 274 Cities.



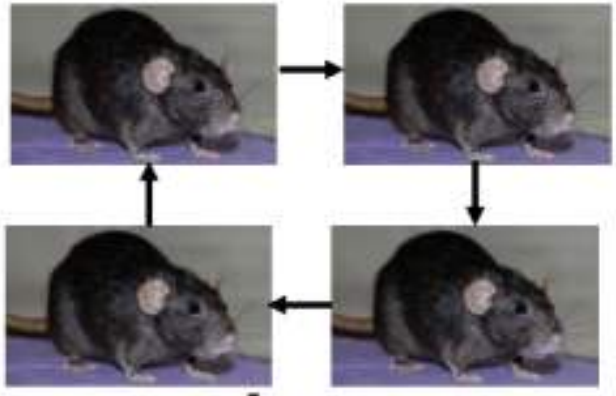
European outbreak in 1347-52. Port of entry: Messina (Oct 1347)



Disease contagion process of the Black Death.

Black rats infected with *Yersinia Pestis* traveling on boats and carts from Asia

They infect European rats that in turn infect other European rats.



Humans infect other humans (**pneumonic plague**) and rats.

Fleas drink rat's blood. Bite humans once rats die (**bubonic plague**).

Symptoms (you die one to seven days after initial infection).

Buboes

Black warts

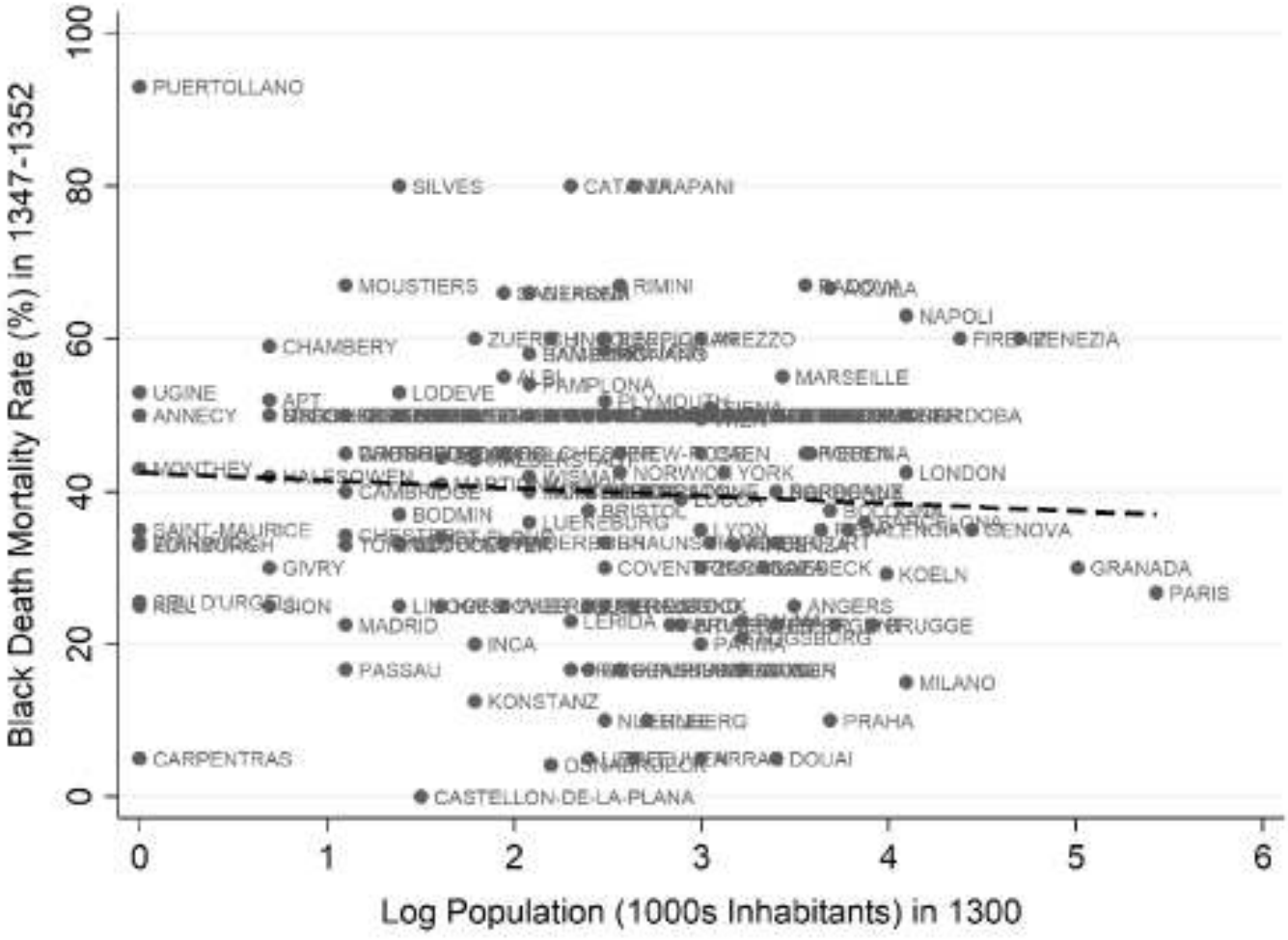
Coughing of blood

Seizures

A Comparatively "Pure" Population Shock.

- Huge Shock
- Acute—plague recurrences tended to be much less deadly (not always!) and spread over following centuries. Also, we can control for these on the extensive margin.
- Only killed people—infrastructure left intact.
- Did not explicitly target a sub-group of the population (e.g. intellectuals or a particular ethnic group).
- No government or international organization sponsored aid in the aftermath.

Mortality Rate Vs. Initial City Population



No correlation between mortality (1347-52) and initial city size. and market access (1300).

What about trade?

Different **travel speeds** for four transport technologies: *seas*, *rivers*, *Roman or medieval roads*, and *porters* (source: Boerner and Severgnini 2014). $\sigma = 3.8$

Black Death Mortality and Market Access

- Market Access for city j is defined as:

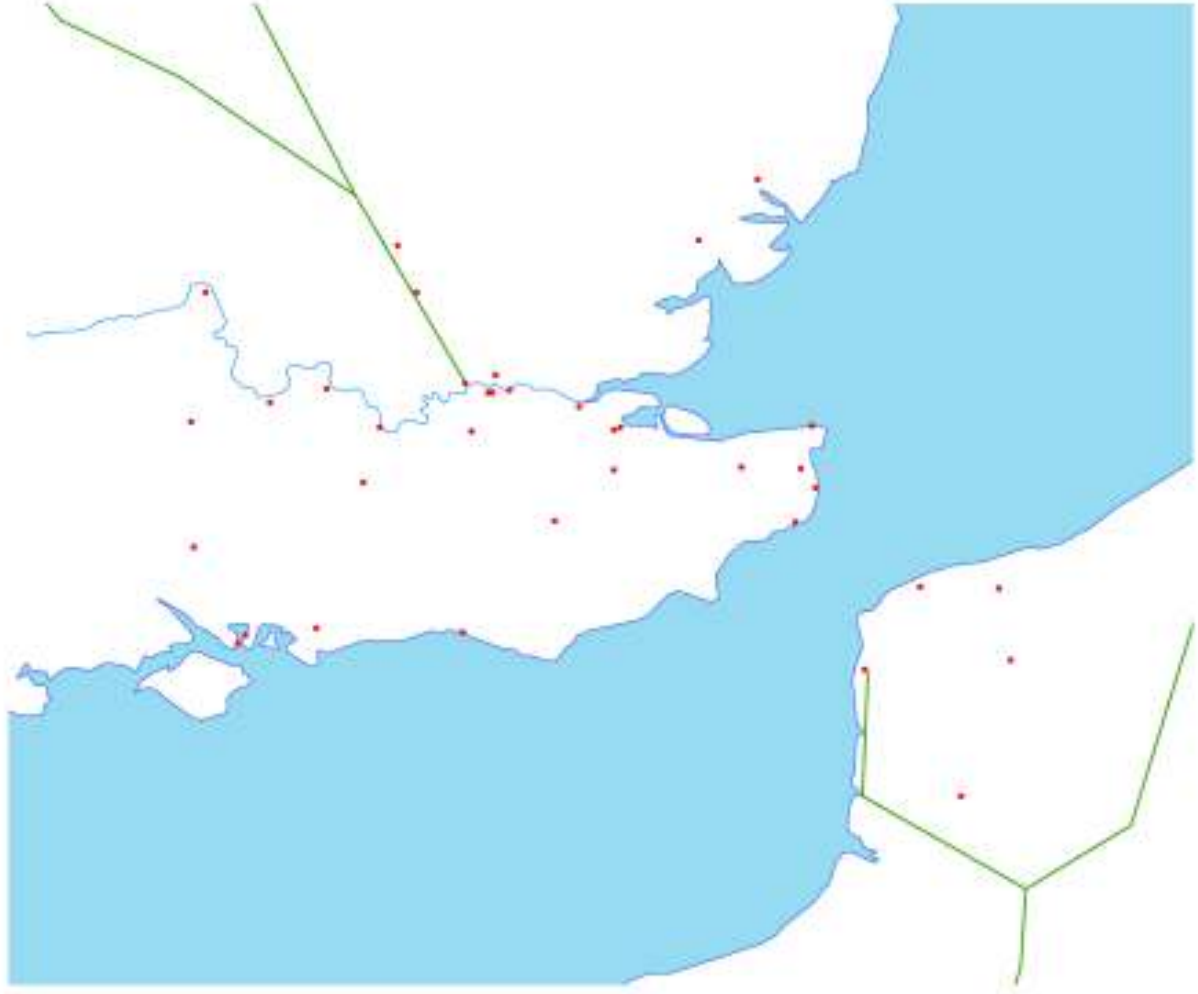
$$MA_j = \sum_{i=j} N_i \tau_{ji}^{-\sigma} \tag{1}$$

- where N_i is the population of city i, τ_{ji} is the cost of travel between cities j and i, and σ is a trade elasticity (from Donaldson & Hornbeck (2015) = 3.8).

- The average cost of transport per km/ton expressed in terms of cereals in the early 20th century was: 8.8 k.g for porters, 3.9 for transportation by cart, 0.99 for river transport, and 0.3-0.4 kg for sea transport (Bairoch, 1990, 141).

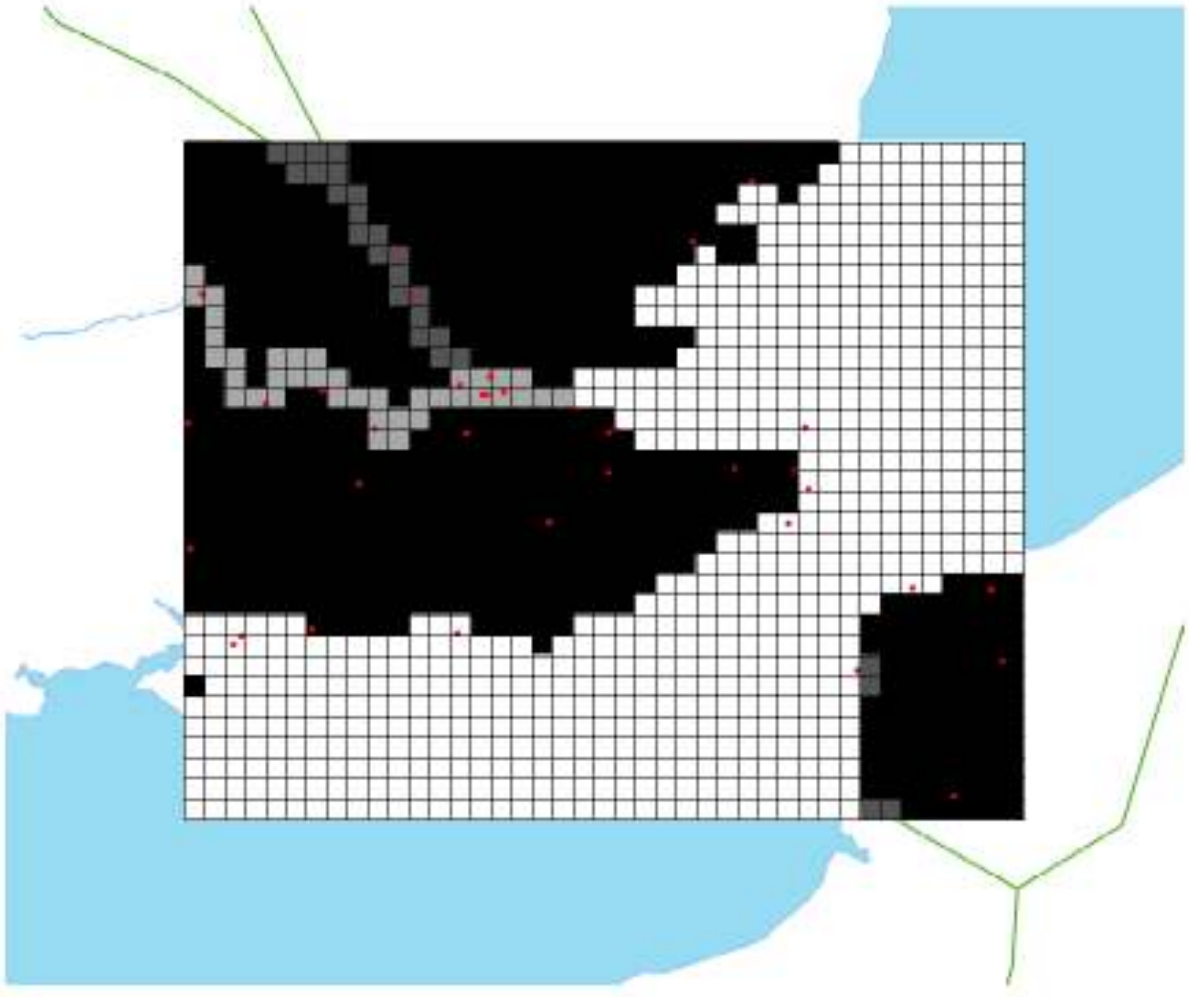
- Where does τ_{ji}, or, 'travel cost' come from?

START WITH VECTOR DATA CONTAINING CITIES, RIVERS, SEAS, AND TRADE ROUTES. . .

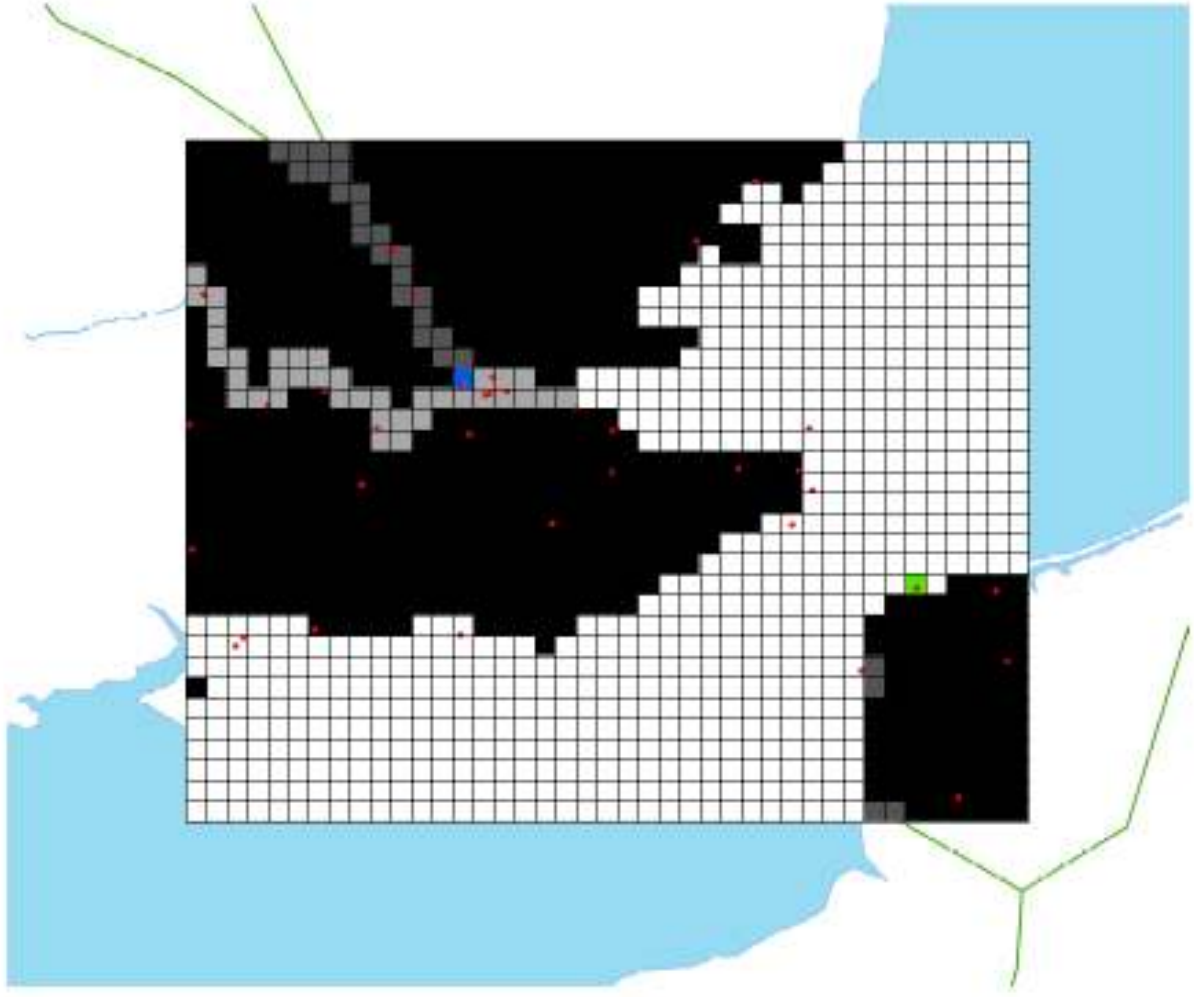


SUPERIMPOSE A 5KM X 5KM GRID...

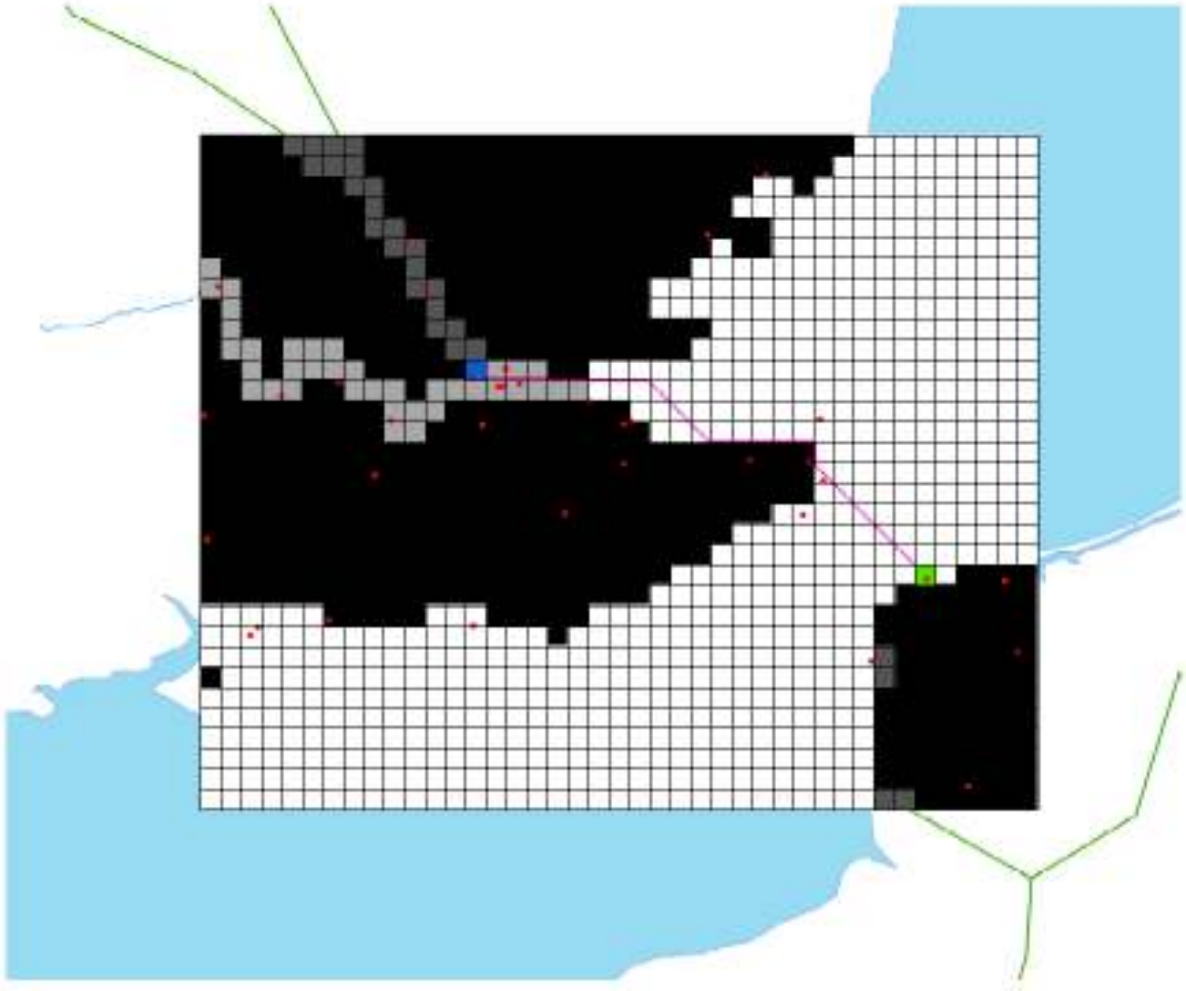
Transform into a raster taking value of least cost transport for each grid. . .



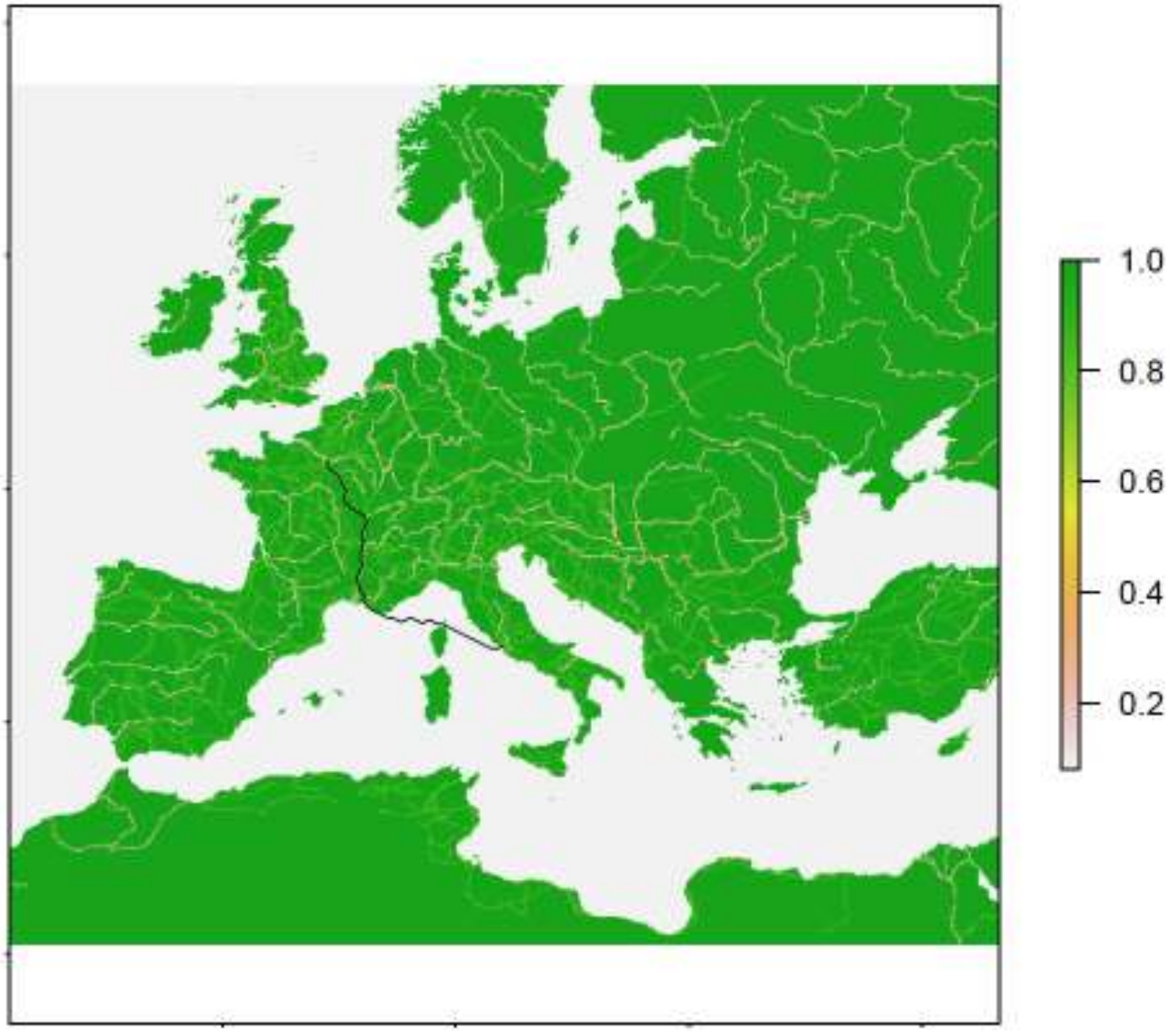
Choose two cities: London and Calais...



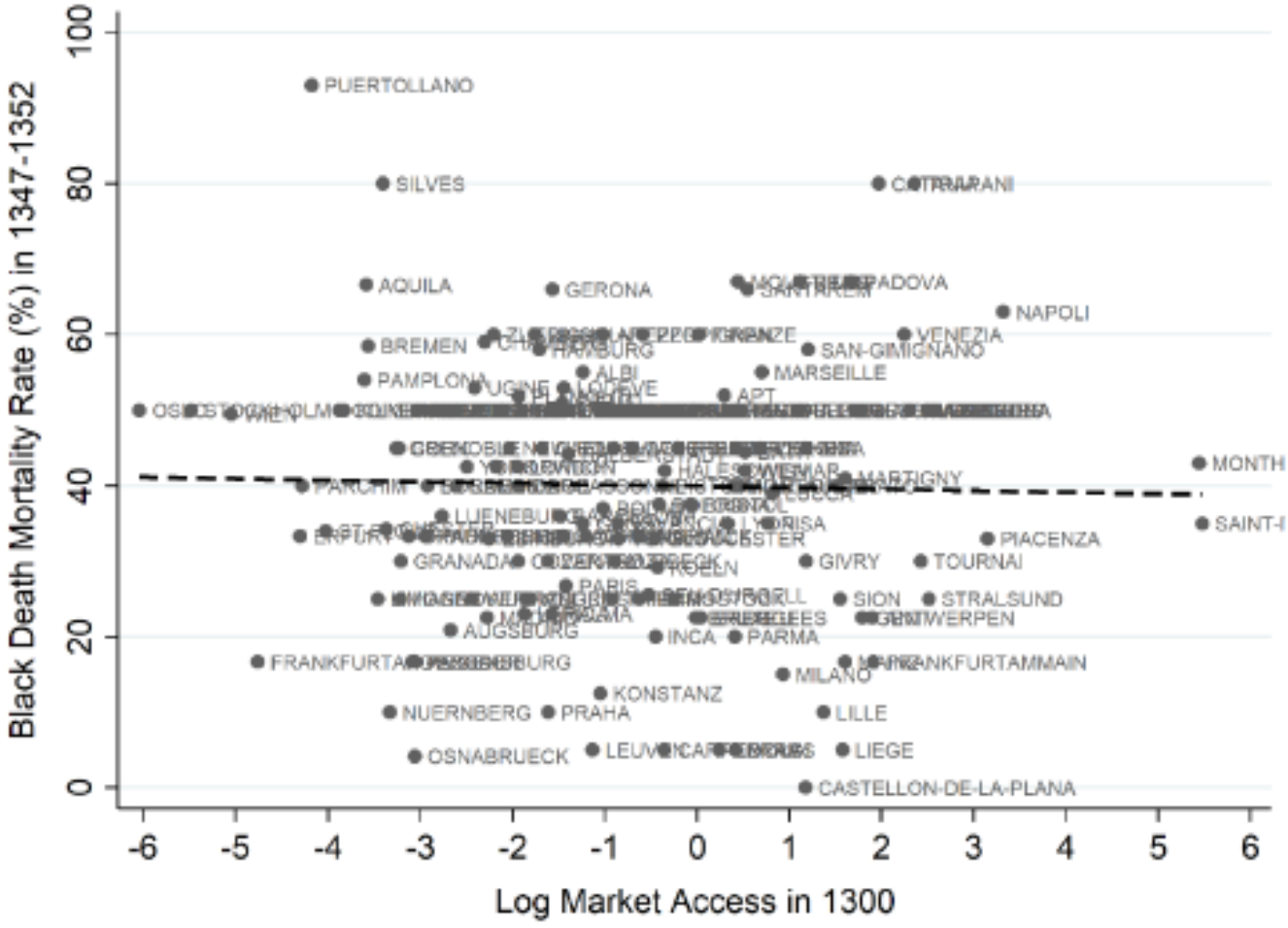
Apply Dijkstra's Algorithm to identify least cost path and cost of taking least cost path (τ)...



RINSE AND REPEAT 1,603,840 TIMES...



Mortality Rate Vs. Initial Market Access

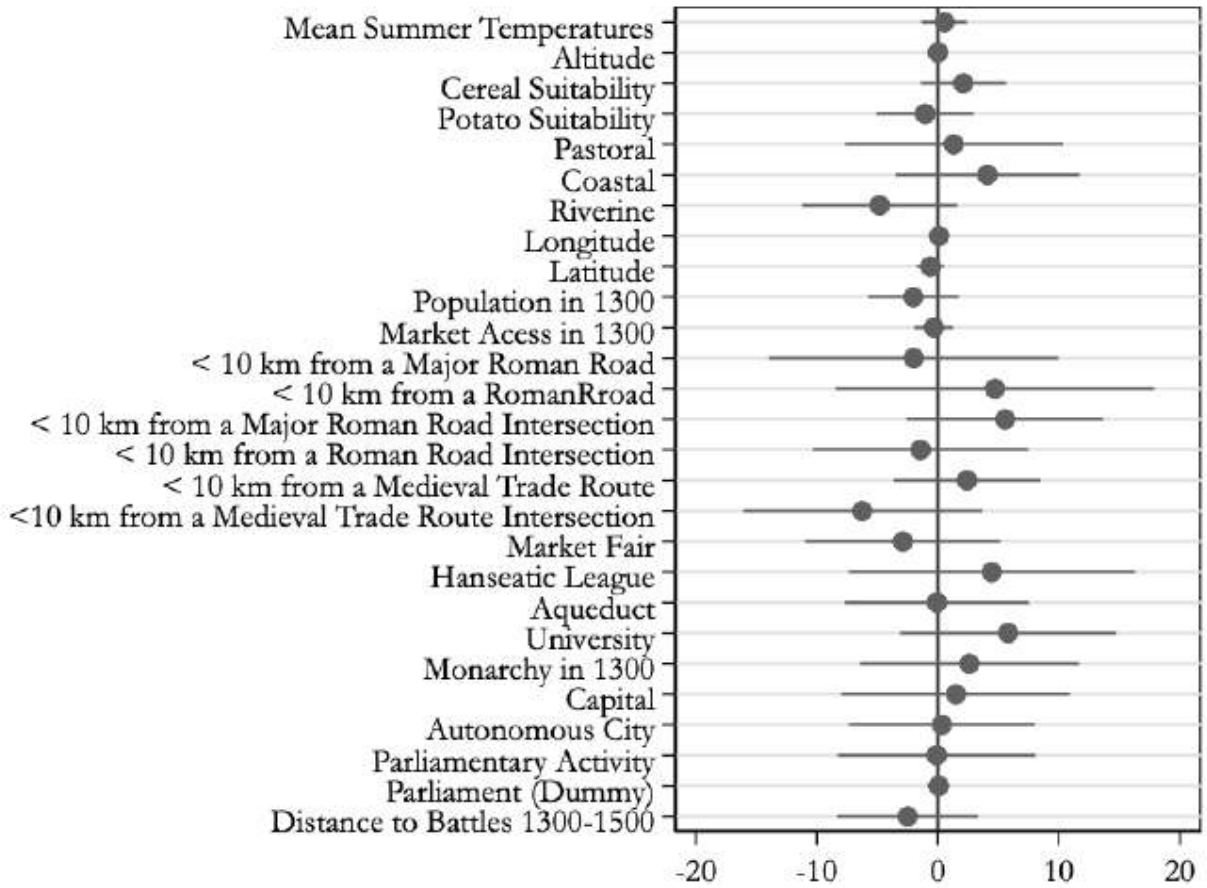


No correlation between mortality (1347-52) and market access (1300).

MORTALITY RATES UNCORRELATED WITH OBSERVABLES

→ Why is this important?

Figure 3: Determinants of Black Death Mortality (1347-1352) for 165 Cities Existing in 1300.



Evidence for the Malthusian Model: English Wages

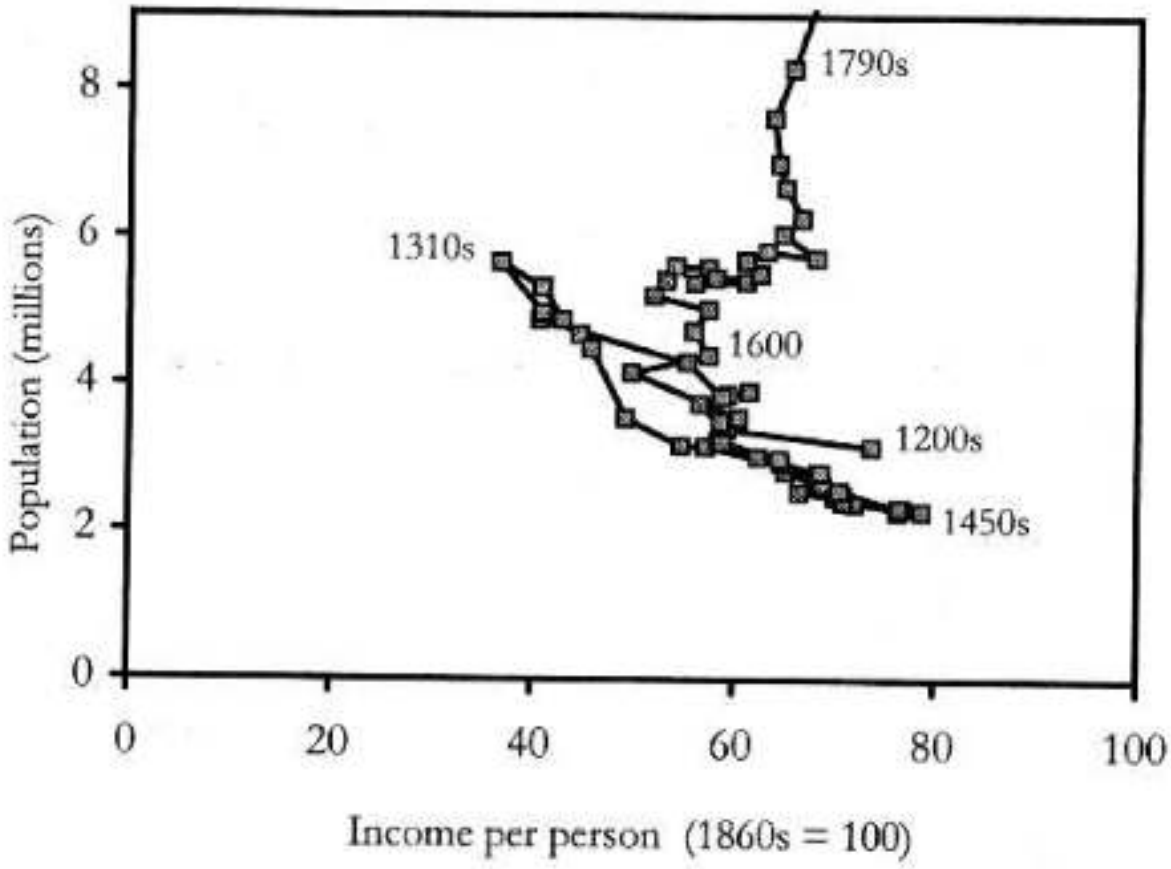
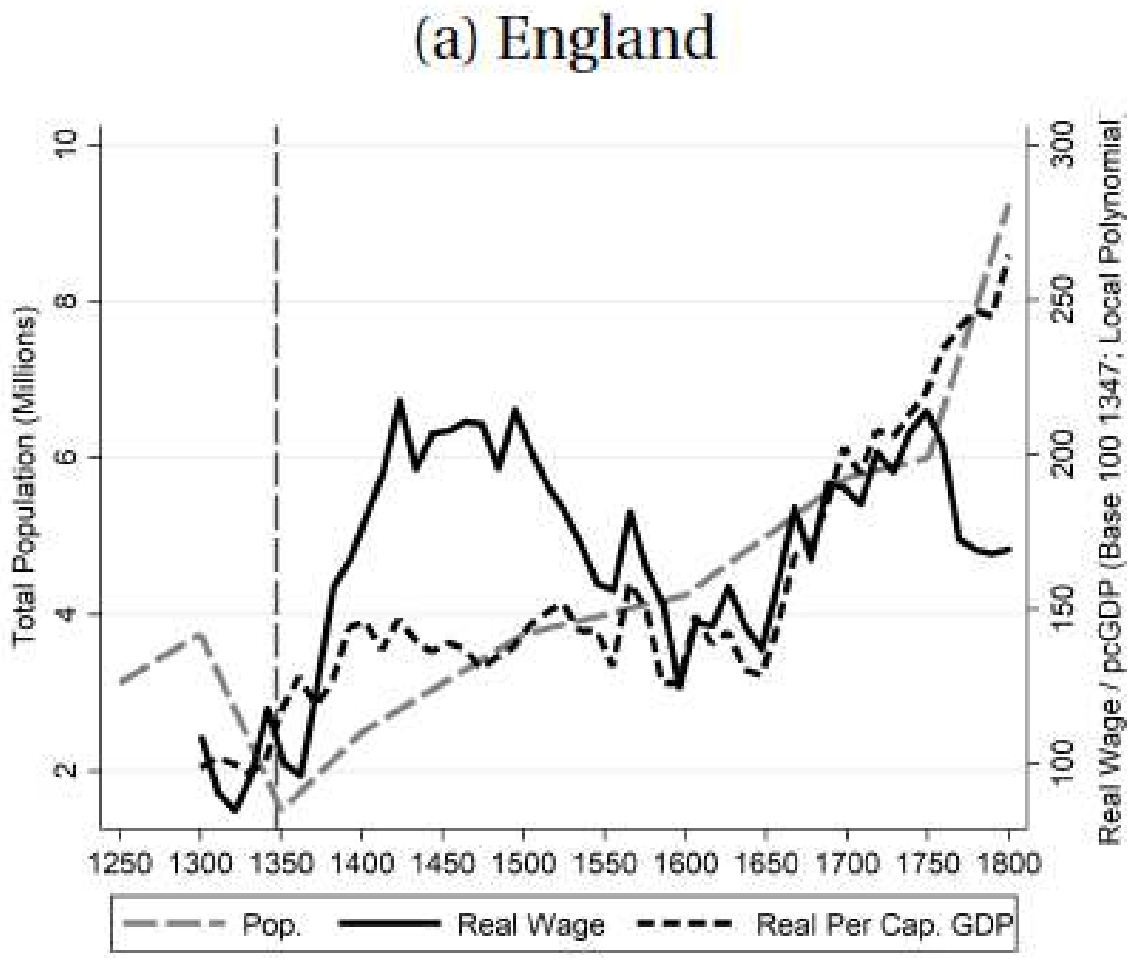
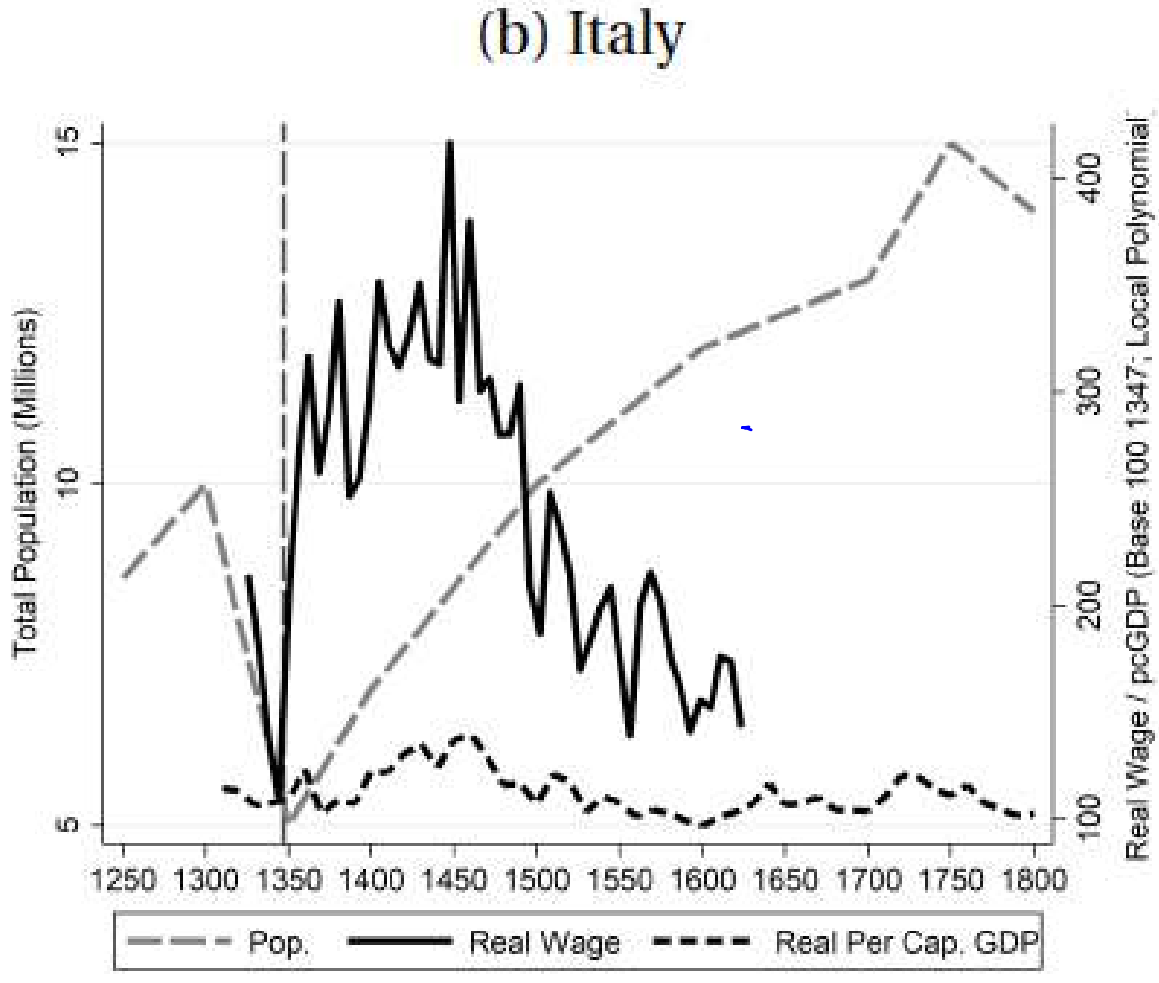


Figure 2.6 Revealed technological advance in England, 1200–1800.

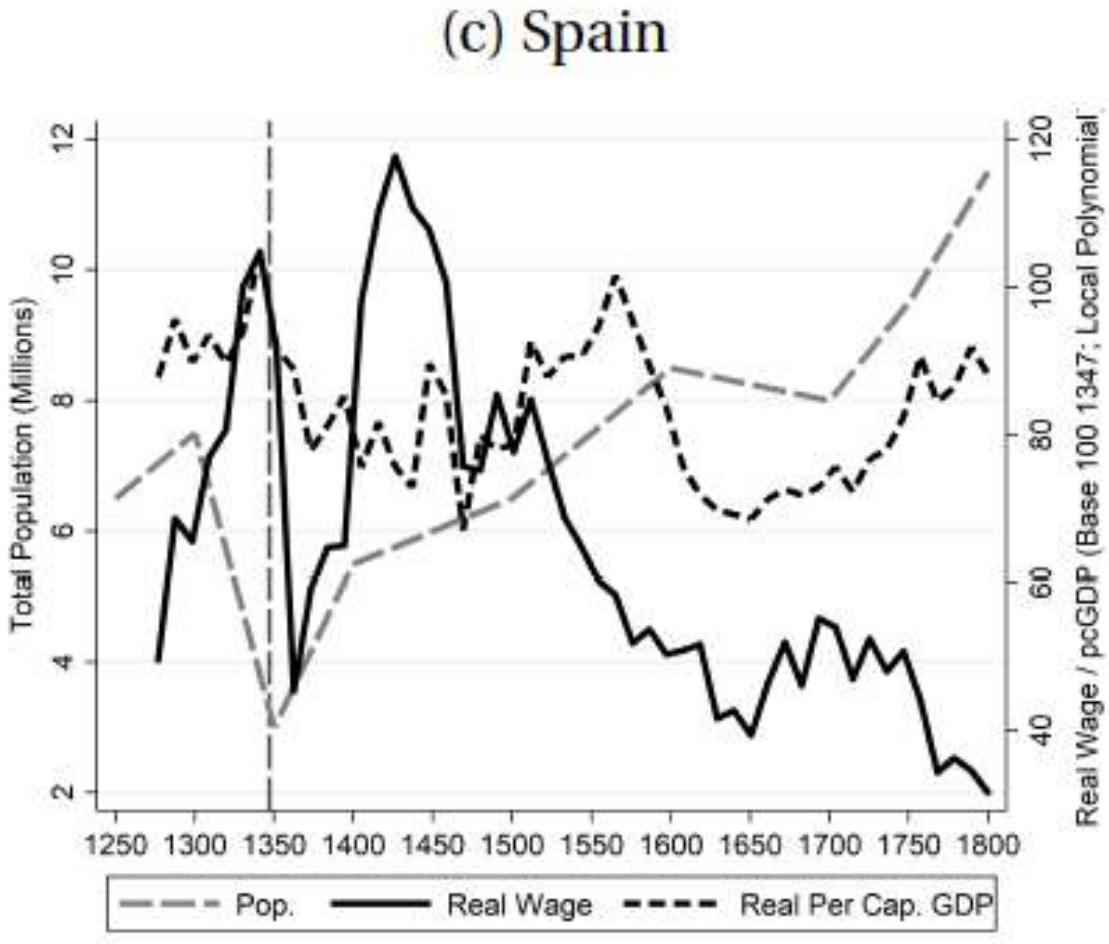
UNSKILLED WAGES IN THE SHORT AND LONG-RUNS: ENGLAND



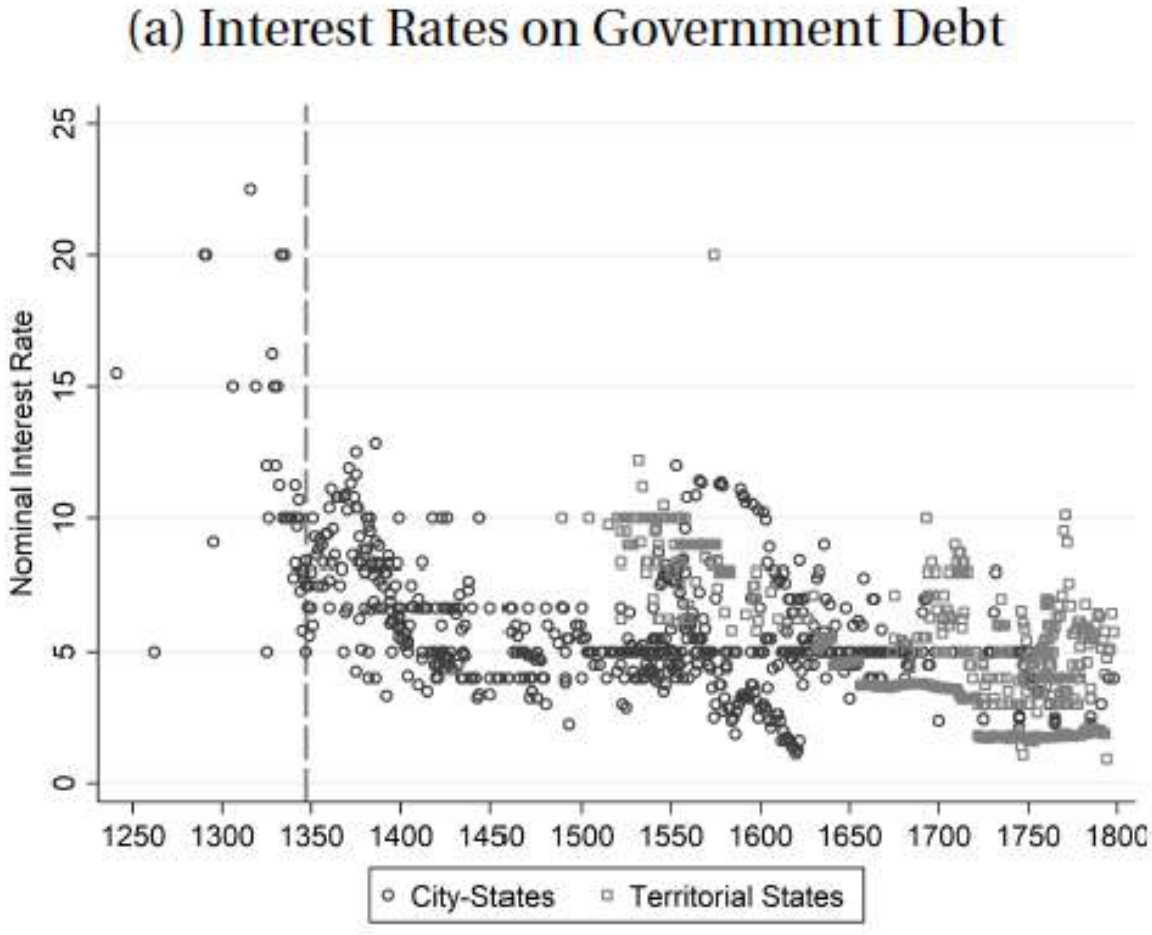
UNSKILLED WAGES IN THE SHORT AND LONG-RUNS: ITALY



UNSKILLED WAGES IN THE SHORT AND LONG-RUNS: SPAIN



INTEREST RATES



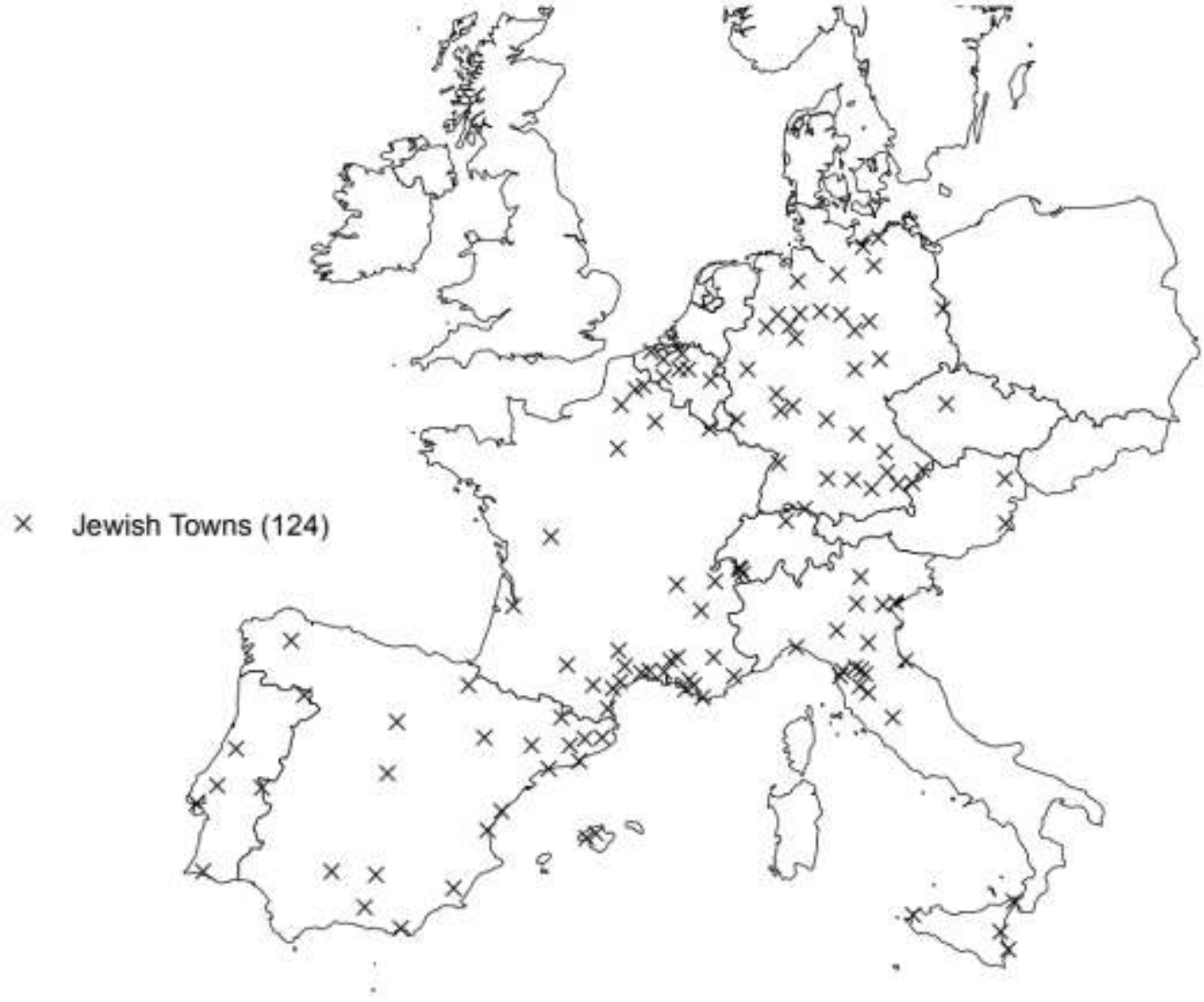
TRADE DISINTERMEDIATION

Panel A: Dep. Var.:	Percentage Change in Total City Population (%) in Period 1300-1400					Dummy if Exists 1400	Log Pop. 1400
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mortality Rate (%)	-0.87*** [0.28]	-1.15*** [0.40]	-1.47** [0.57]	-1.13* [0.62]	-1.27** [0.58]	-0.002*** [0.001]	-0.004*** [0.001]
Unit	City Intensive	State Intensive	State Total	Country Intensive	Country Total	City Extensive	City Extensive
Population	165	68	68	15	15	1,335	1,335
Observations							

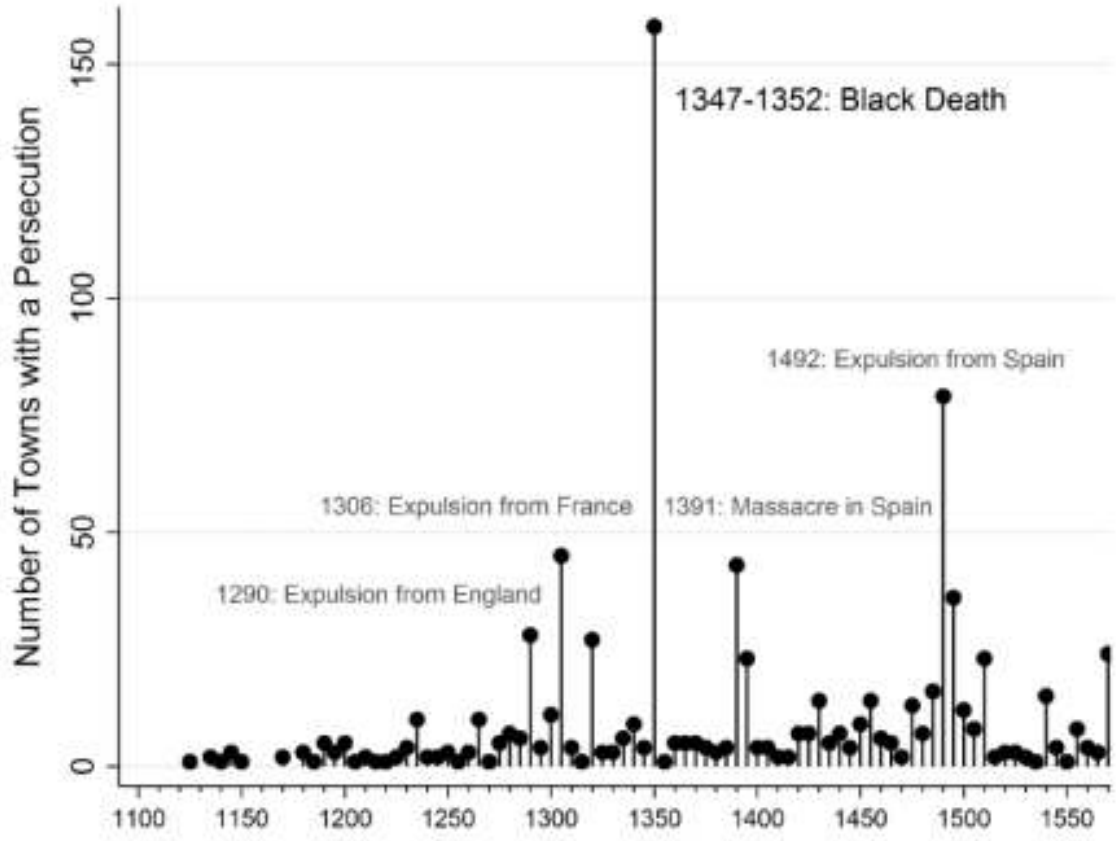
Anti-semitism in Medieval Europe

Illustration showing Jews receiving a charter of privileges from Emperor Henry VII in 1312. *Source*: Codex Baldvini; Koblenz, Municipal Archives.

124 towns of our main sample (≈ 43% of Europe's urban pop.).



Jewish Persecutions, 1100-1600



EMPIRICAL STRATEGY

- **Cross-sectional regressions** (for 124 cities i):

$$Persecution_{i,1347-1352} = \alpha + \beta Mortality_{i,1347-52} + X_i\theta + \epsilon_i$$

- *Persecution*: Dummy if persecution in the studied period.
- *Mortality*: Black Death mortality rate (%) in 1347-1352 (median duration $\approx$ 5 months, so this variable represents the cumulative rate over a period of a few months only).
- X: Set of controls.

BASELINE EFFECT

Strong negative effect of mortality, no long-run effect. 1 SD in mortality associated with a 0.34 SD reduction in likelihood of a persecution.

Table 1: BLACK DEATH MORTALITY RATES AND JEWISH PERSECUTIONS, 1100-1600

Dependent Variable: Dummy if Any Jewish Persecution in Period $[t\text{-}1; t]$:						
	Mortality in 1347-1352		Constant		Obs.	R2
1. $[t\text{-}1; t]$ = [1347-1352]	-0.009***	[0.002]	0.831***	[0.104]	124	0.12
2. $[t\text{-}1; t]$ = [1353-1400]	-0.004*	[0.002]	0.404***	[0.098]	122	0.02
3. $[t\text{-}1; t]$ = [1353-1500]	-0.000	[0.002]	0.640***	[0.099]	124	0.00
4. $[t\text{-}1; t]$ = [1353-1600]	0.000	[0.002]	0.724***	[0.088]	127	0.00

Notes: This table shows the constant α_t and the effect β_t of the Black Death mortality rate (%) in 1347-1352 on a dummy equal to one if there has been any persecution in various periods $[t\text{-}1; t]$, for the towns for which we have mortality data and in which we know that Jews were present in period $[t\text{-}1; t]$. Robust SE's: * p<0.10, ** p<0.05, *** p<0.01. See Web Appendix for data sources.

Mechanisms: Scapegoating vs. Complementarities

- We interact mortality with city characteristics that may affect the respective magnitudes of the **scapegoating** (α) and **complementarities** (β) effects.

$$P_{i,1347-52} = \alpha + \beta \mathrm{M}_{i,1347-52} + \gamma \mathbf{X}_i + \delta \mathrm{M}_{i,1347-52} * \mathbf{X}_i + \varepsilon_i \qquad (1)$$

- If interacted effect of mortality rate and the characteristic (δ) > 0, the scapegoating effect is reinforced.

  Persecution more likely if history of antisemitism or "fake news"
- If interacted effect of mortality rate and the characteristic (δ) < 0, the complementarities effect is reinforced.

  Persecution less likely if important economic role (e.g., finance)
- We also report the significance of the total effect of mortality ($\beta + \delta$) to show if the mechanism shuts down the protective effect.

Mechanisms: Complementarities

Mechanisms: Complementarities

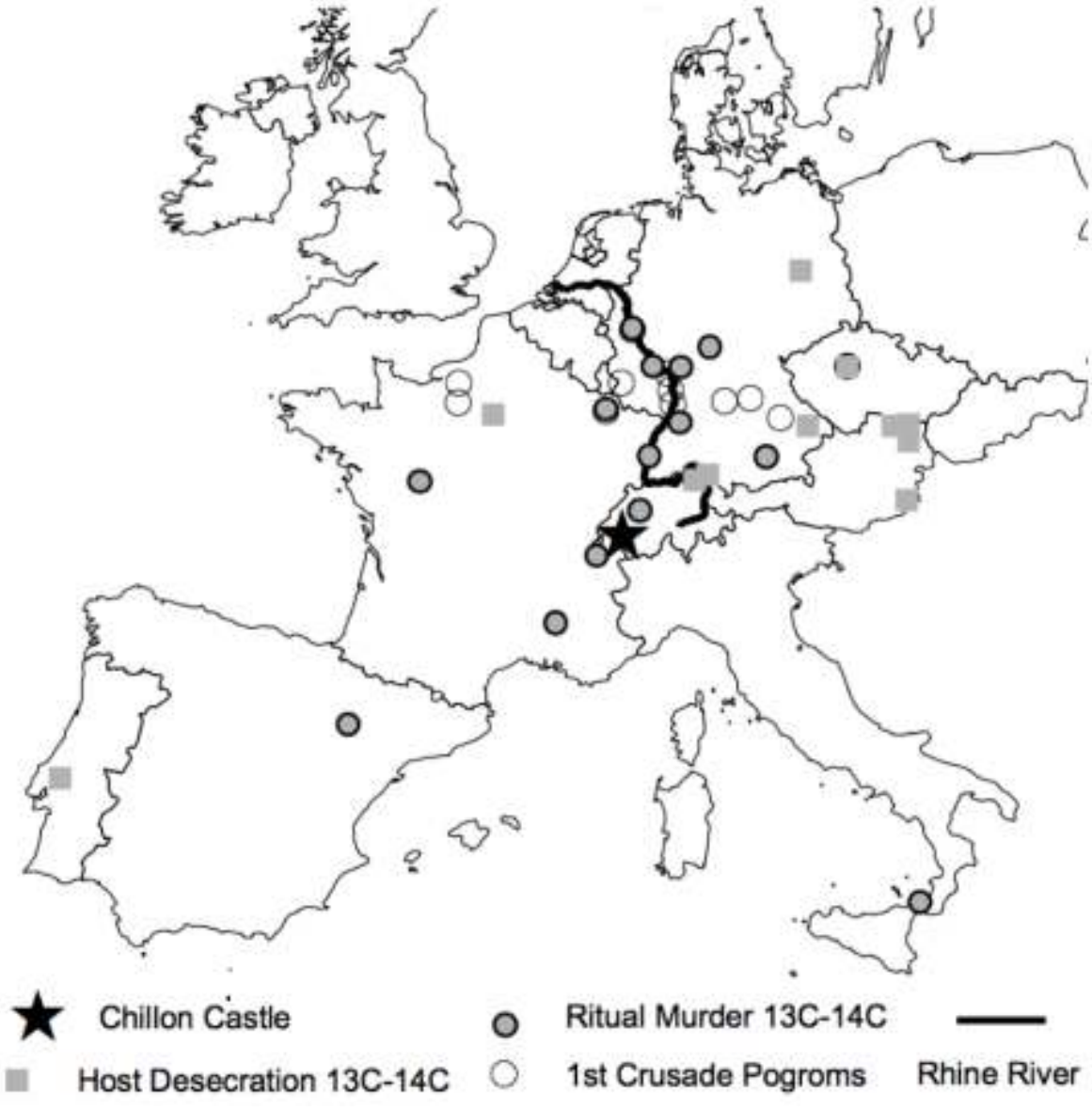
- Stronger negative relationship between plague mortality and persecution in towns where Jews offer specialized economic services:
- **Moneylending services** (papal prohibition on usury, but competition from Cahorsins and "Lombards"):
  - If farther from main financial centers in 14th century.
  - If lend to people in the town (often the only option at all).
- **Trade networks** (merchants relied on credit to fund trade, since costly to move bullion over long distances):
  - Cities close to other cities with a Jewish community.
  - No effects for Hansa cities though (substitute non-Jewish trading network?)

COMPLEMENTARITIES

Dependent Variable: Dummy if Any Jewish Persecution in 1347-1352:

Rows 1-11: Dummy Equal to 1 if:	Effect of: Mortality Rate (β)		Mortality x Dummy (δ)		Sum ($\beta + \delta$)	
1. Close to Major Financial Centers	-0.008***	[0.002]	0.008***	[0.002]	0.000	[0.000]
2. Jews Lend Money in the Town	-0.006*	[0.003]	-0.009**	[0.004]	-0.014***	[0.002]
9. Top 10% Jewish Centrality Index	-0.008***	[0.002]	-0.010**	[0.004]	-0.018***	[0.004]
10. Hanseatic League	-0.009***	[0.002]	0.005	[0.005]	-0.004	[0.004]

Mechanisms: Fake News



Mechanisms: Scapegoating

- Persecute more in towns with **conspiracy theories/fake news**:
  - Proximity to Chillon (origin of rumour that Jews poisoned wells)
  - Proximity to Rhine (spread of rumour)

Les Juifs avaient organisé une conspiration de lepreux pour empoisonner les fontaines

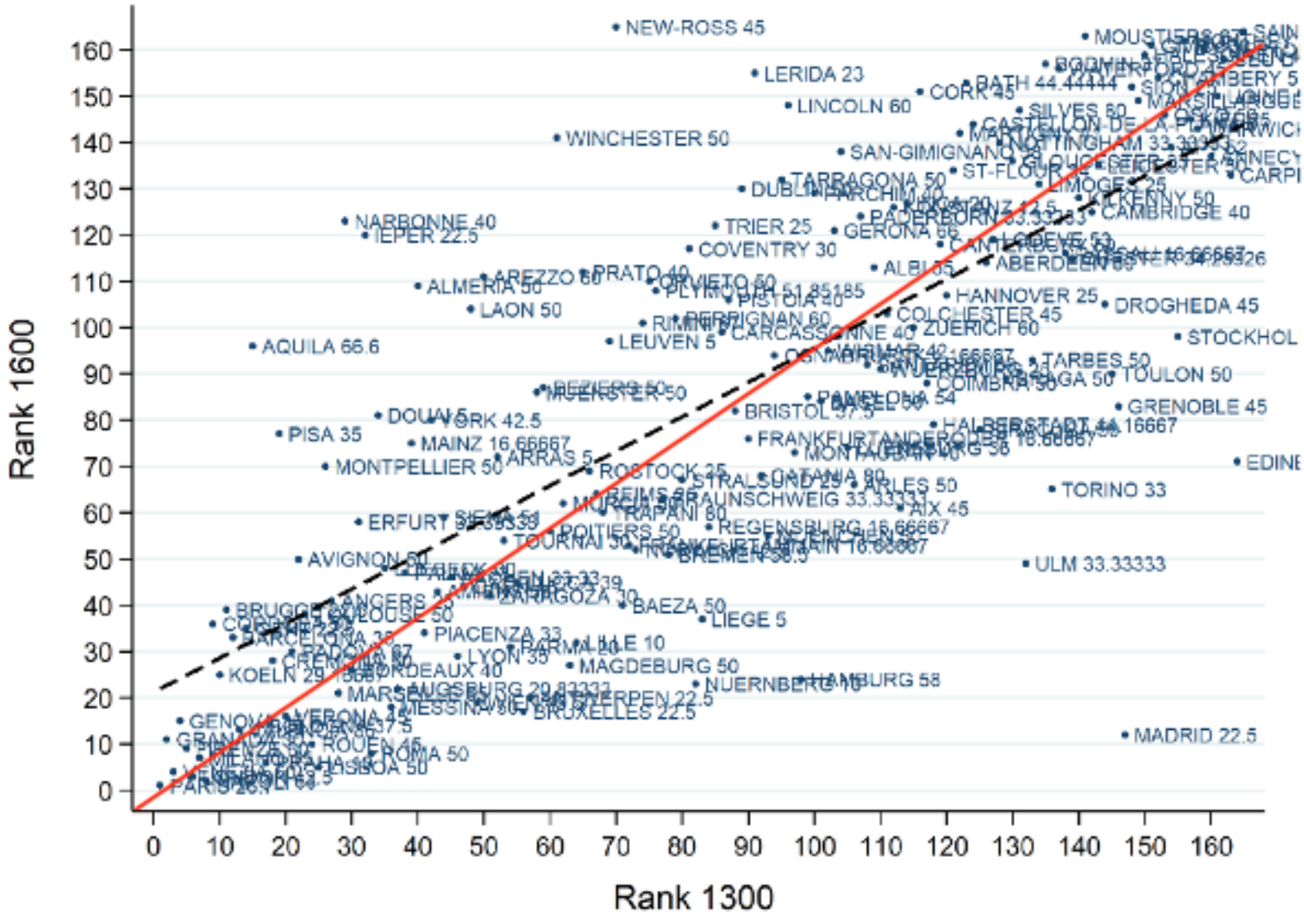
▸ Link to Modern Example

SCAPEGOATING

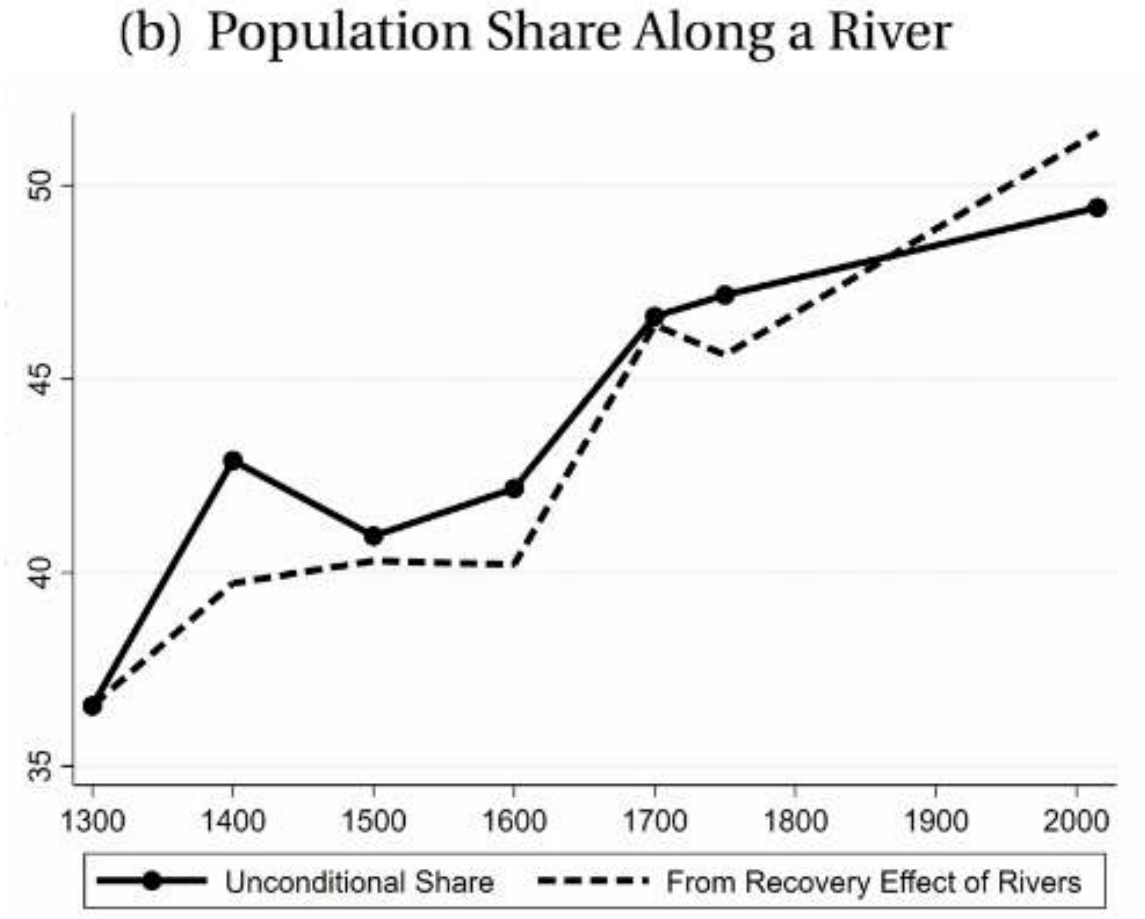
Dependent Variable: Dummy if Any Jewish Persecution in 1347-1352:

Rows 1-17: Dummy Equal to 1 if:	Effect of: Mortality Rate (β)		Mortality x Dummy (δ)		Sum ($\beta + \delta$)	
1. Close to Chillon Castle (Origin of Rumor)	-0.010***	[0.002]	0.016*	[0.009]	0.006	[0.009]
2. Close to Towns Warned by Letter (Path of Rumor)	-0.010***	[0.002]	0.017*	[0.009]	0.007	[0.009]
3. Close to Rhine River (Path of Rumor)	-0.009***	[0.002]	0.017**	[0.007]	0.008	[0.007]

Differential Recovery of Cities



URBAN RESET?


(b) Population Share Along a River
50
45
40
35
1300
1400
1500
1600
1700
1800
1900
2000
Unconditional Share
From Recovery Effect of Rivers

Long-run impact on institutional change

- The Black Death generated a massive change in relative prices.
- The price of unskilled labor rises relative to skilled labor, capital, and land.
- We know this reduced inequality (at least for a couple hundred years).
- But what impact did it have on institutional change (think about the relative bargaining power of unskilled labor relative to owners of the other factors of production).

Craft Guilds

- Craft guilds: early labor institutions, first established between the 12th and 13th centuries
- Formal associations of specialized artisans
- Authority backed by political sanction
- Entrance into a guild was in many places **necessary** to pursue a craft

Types of Craft Guilds

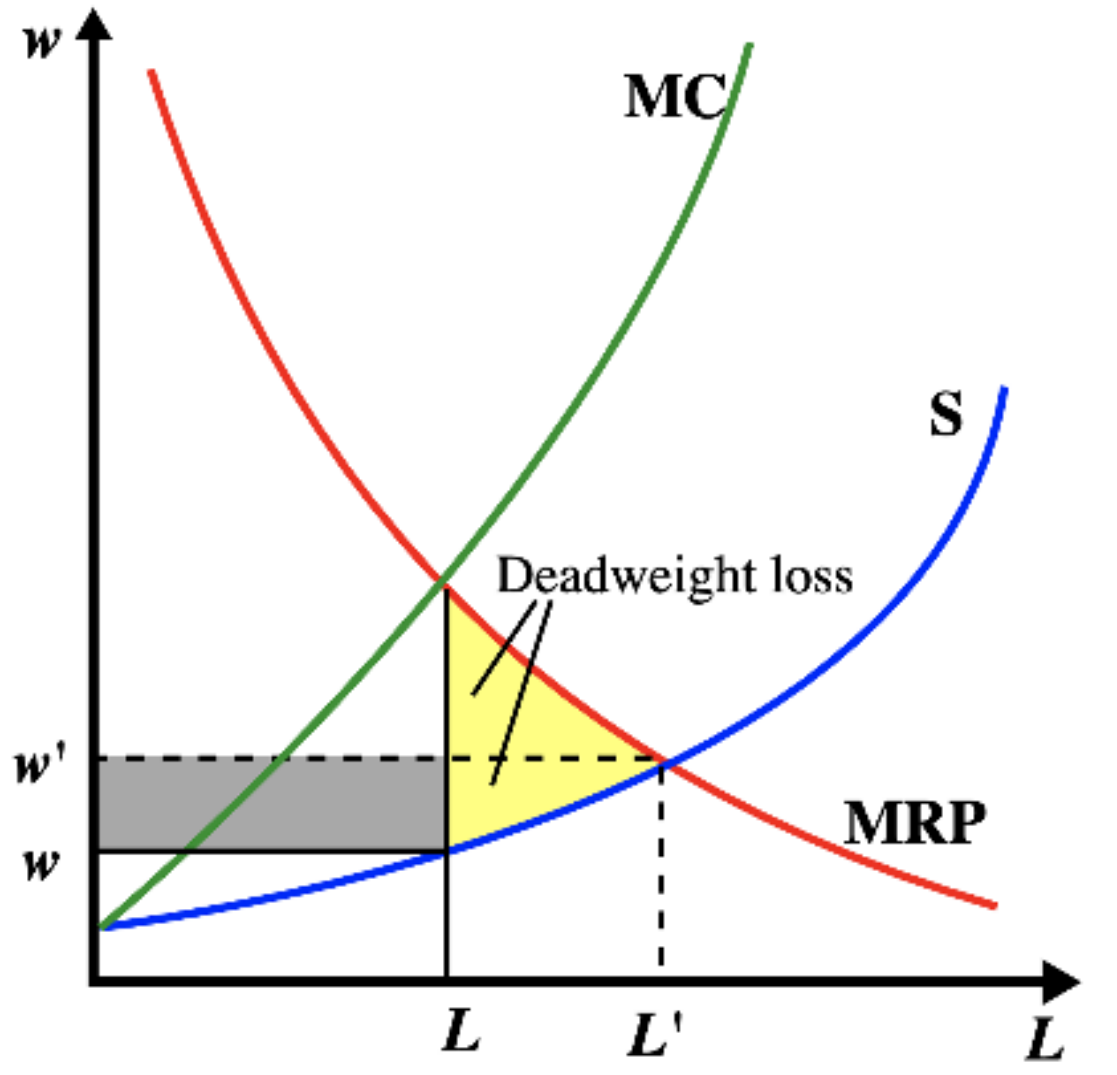
Guilds operated in numerous parts of society

1. Victualers: Bought agricultural commodities and turned them into goods (e.g., bakers, brewers, butchers)
2. Some sold skills and services (clerks, carriage drivers, entertainers)
3. Some made manufactures (smiths, clothmakers, tanners)

Function of Guilds

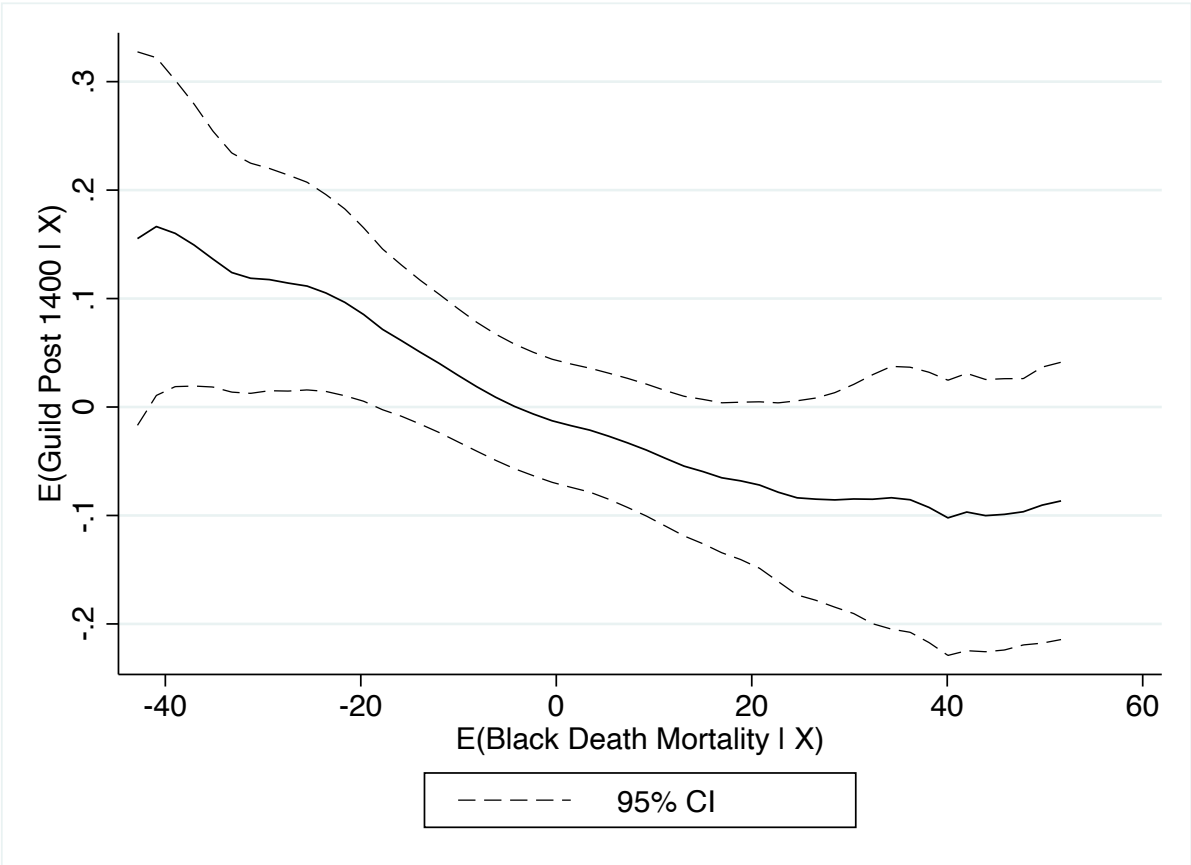
- Traditional story: guilds **colluded** to raise price, cut quantity
- One important mechanism for collusion: restricting entry
  - Restricting number of apprentices
  - Impeding immigration
- Were guilds simply oligopolists trying to cartelize?

Monopsony



GUILDS LESS LIKELY TO BE PRESENT IN PLACES WITH HIGHER BD MORTALITY...

Based on 8,000 observations of guild activity mentioned in primary and secondary sources



Did the Black Death encourage state formation?

- *State Capacity* is widely considered by economic historians and development economists to be a prerequisite for modern growth.
- Consists of legal and fiscal capacity.
- Simple Example 1: Would you rather live in a world of many roving bandits or with a single stationary bandit?
- Simple Example 2: Which society do you think is more open to new ideas or labor mobility: a tribal society or a large hiearchical state?

Did the Black Death encourage state formation?

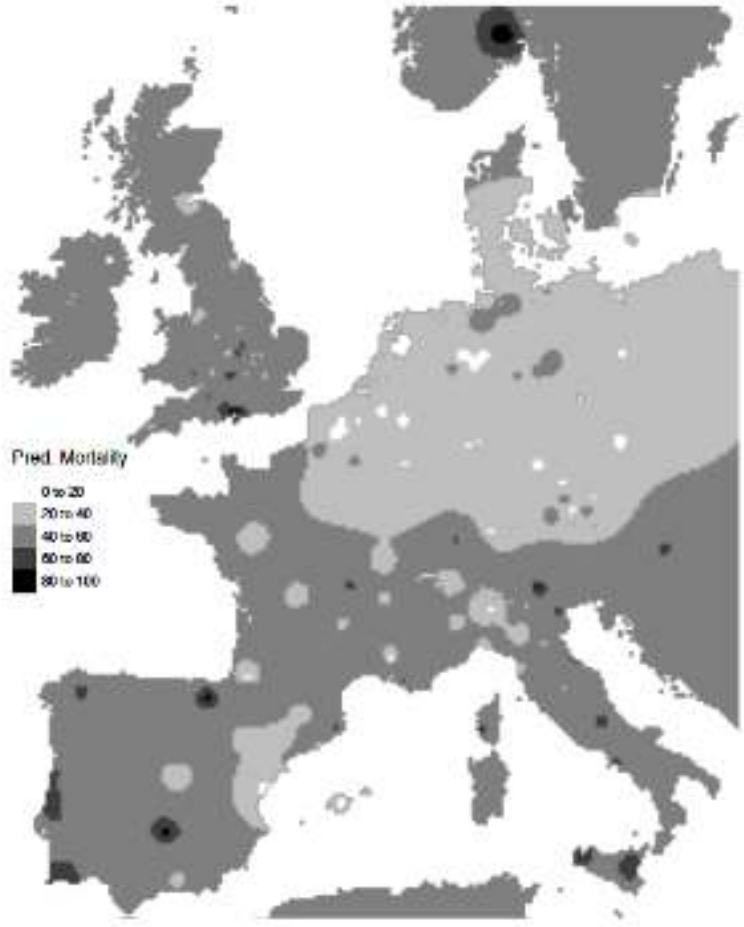
- The idea is that BD $\rightarrow$ increase in relative price of unskilled labor and increased urbanization $\rightarrow$ increased ability of the state to tax and govern.
- This last step could be because elites/nobles are weakened and this opened up space for the state. Could also be because those who are easiest to tax (the non-elites) are becoming more wealthy (though there's an issue here with whether the intensive vs extensive margin dominates).
- First step is to see if there is a correlation between BD mortality rates and increases in state capacity.
- One test of this is whether local variation in BD mortality is correlated with state consolidation.

Combine historical maps of state boundaries with 400km grids and count number of political entities over time...

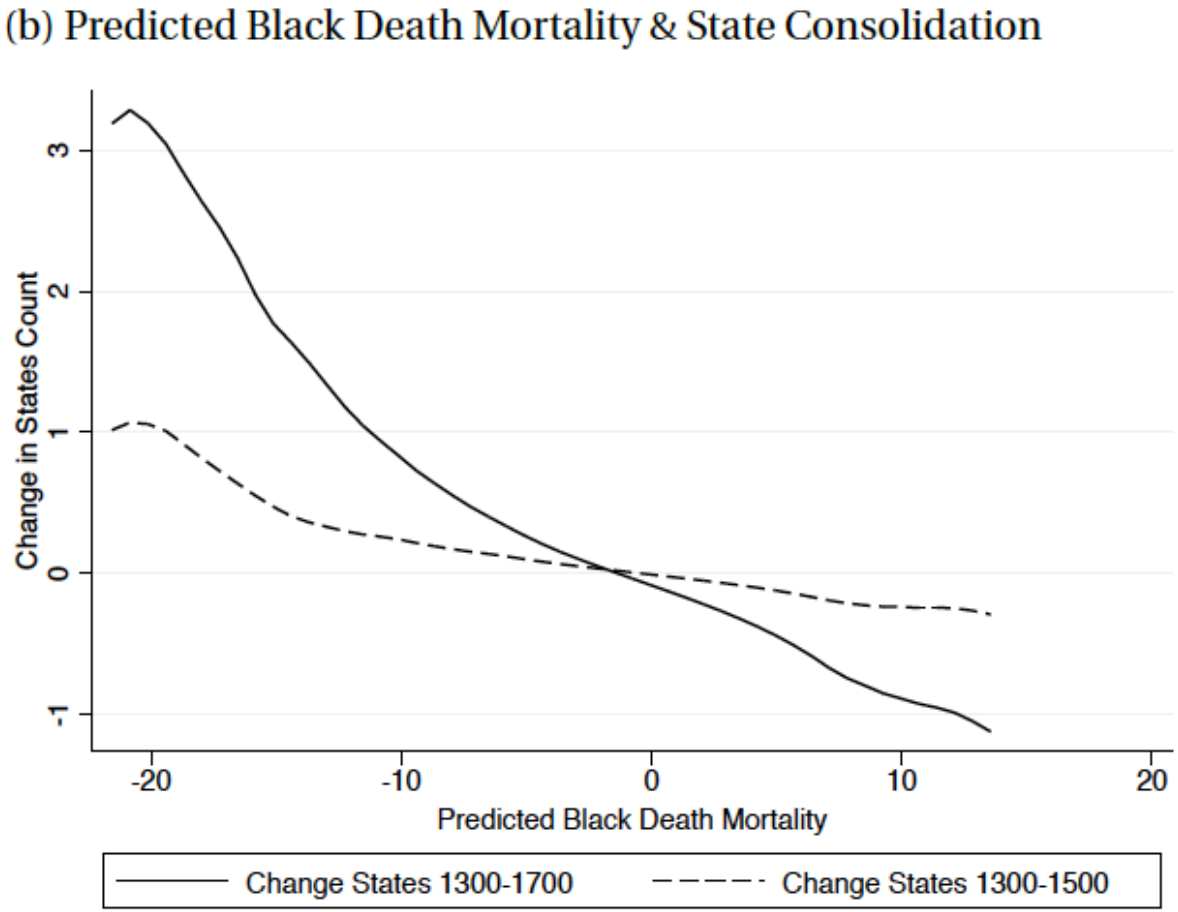
(a) State Boundaries (1300) & 400km Grids

EXTRACT IMPUTED BLACK DEATH MORTALITY INTO THE GIDS. . .

Figure 2: Spatially Averaged Black Death Mortality Rates Based on 274 Cities.



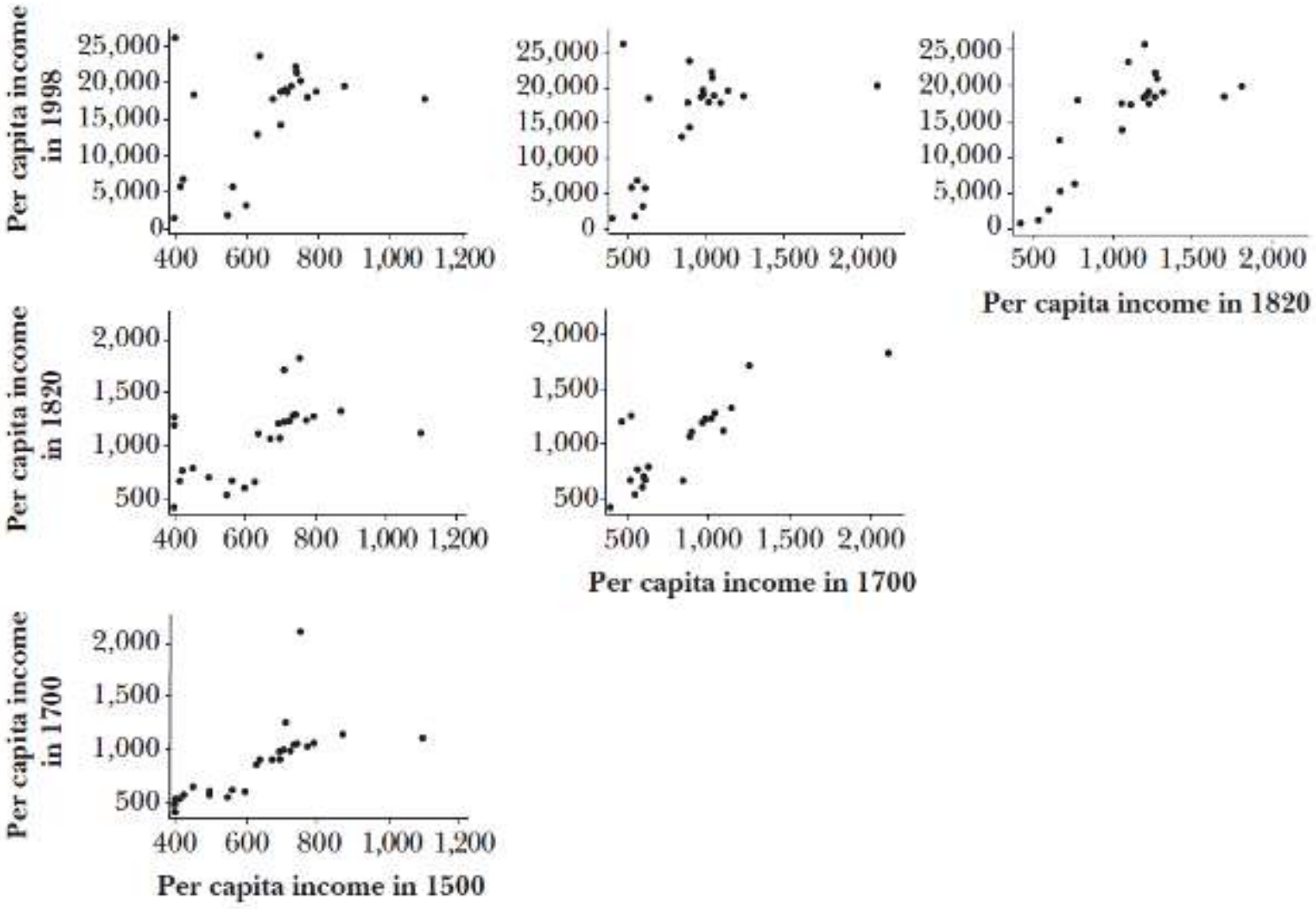
Negative correlation between number of states in grid and Black Death mortality...



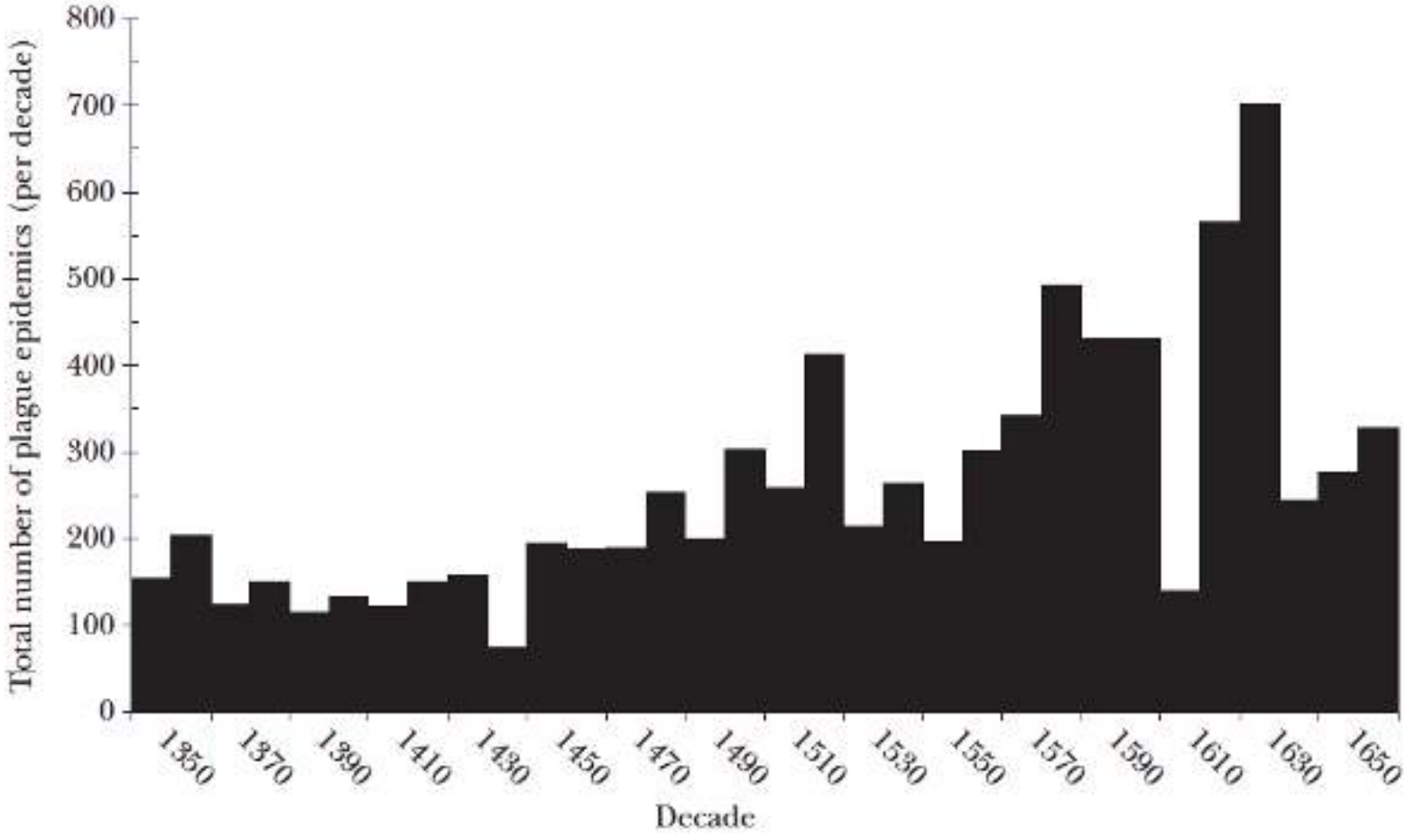
Nico Voigtlander and Hans-Joachim Voth. Gifts of mars: warfare and europe's early rise to riches.

Urbanization rate (percentage of population living in cities with more than 10,000 inhabitants)			*GDP per capita (in 1990 international dollars)*		
Year	*China*	*Europe*	***Year***	*China*	*Europe*
762	3%		**1**	$450	$550
1000		0%	**960**	$450	$422
1120	3.1%		**1300**	$600	$576
1500	3.8%	5.6%			
1650	4%	8.3%	**1700**	$600	$924
1820	3.8%	10%	**1820**	$600	$1,090

Scatterplot of per Capita Incomes in 1500, 1700, 1820, and 1998



Plague Outbreaks in Europe, 1350–1650



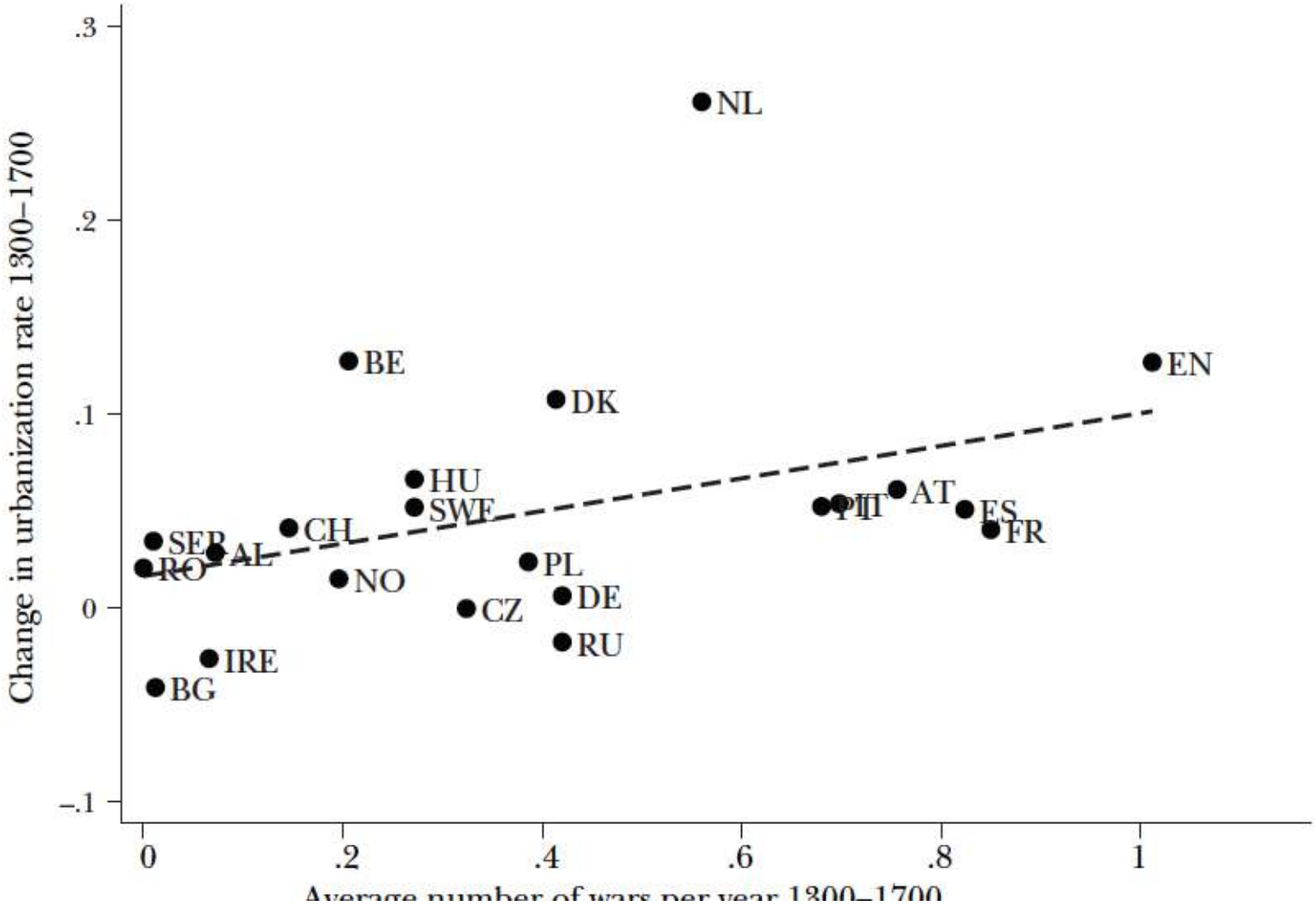
Frequency of War

Century	*Number of wars*	*Average duration (years)*	*Percentage of years under warfare*
16th	34	1.6	95%
17th	29	1.7	94%
18th	17	1.0	78%
19th	20	0.4	40%
20th	15	0.4	53%

Tax Revenues in Europe

Year	*Total tax revenue (tons of silver)*	*Average tax per capita (daily urban wage equivalents)*
1509	214	3.7
1559	456	3.6
1609	1,116	4.9
1659	2,215	5.7
1709	2,667	8.1
1759	3,808	9.9
1789	6,846	12.2

A: Wars and Urbanization, 1300–1700



B: Wars and per capita GDP, 1500–1700