Unified China and Divided Europe

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Unified China, Divided Europe
Introduction

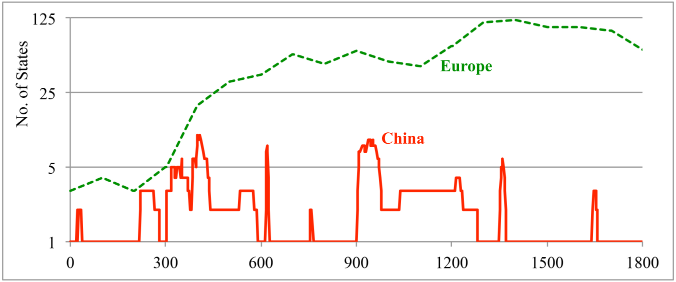
China, 1616

Europe, 1600

UNIFIED CHINA, DIVIDED EUROPE

INTRODUCTION

Figure: Number of States in China and Europe



Sources: Nussli (2011)

Europe politically more fragmented than China

1. Causes?
2. Consequences?

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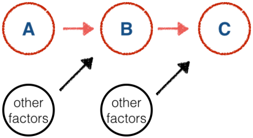
HYPOTHESIS: CAUSES & CONSEQUENCES OF CENTRALIZATION & FRAGMENTATION

A. **Geography**
Eurasian geography poses different challenges to China & Europe

B. **Political Outcome**
Empire a stable outcome in China but not in Europe
(We do not study how states emerge, but whether they are sustainable)

C. **Economic Outcome**
China: Faster growth, but periodic crises;
Europe: Slower but more robust pop. growth

We hypothesize that

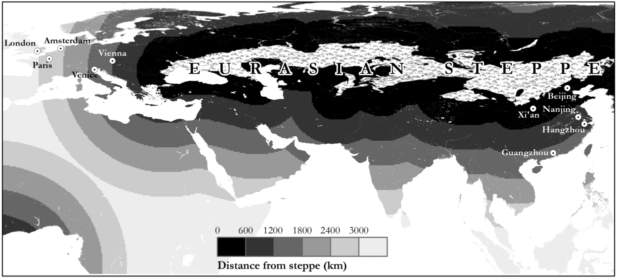


HYPOTHESIS
INTRODUCTION

CHINA	EUROPE
A. Due to geography, external threat: (a) severe (b) from one direction	**A.** Due to geography, external threats: (a) less severe (b) from several directions
B. Small states less likely to survive (due to resource constraint)	**B.** Empire less likely to survive (due to inefficiencies in multitasking)
C. Low extraction ⇒ Faster growth during peacetime Low fiscal-military capacity ⇒ Vulnerable to periodic shocks ⇒ Start-stop growth	**C.** High extraction ⇒ Slower growth during peacetime "Wasteful spending" offered extra protection ⇒ Less vulnerable to periodic shocks ⇒ Growth more continuous/ Fewer reversals

Exposure to the Eurasian Steppe

Historical Building Block



- Climate-driven invasions from the Steppe (Bai and Kung 2011)
- China more exposed
  - Guangzhou almost as close to steppe as Vienna
- Steppe threat unlike typical interstate competition
  - Nomads mobile (*congzhi ru boying*); property "had legs" (*bu xiu kuizou*); Steppe as a "highway of grass"
  - Steppe could not be converted to farmland
  - Hence threat permanent and unresolvable

Figure: Fragile ecological conditions

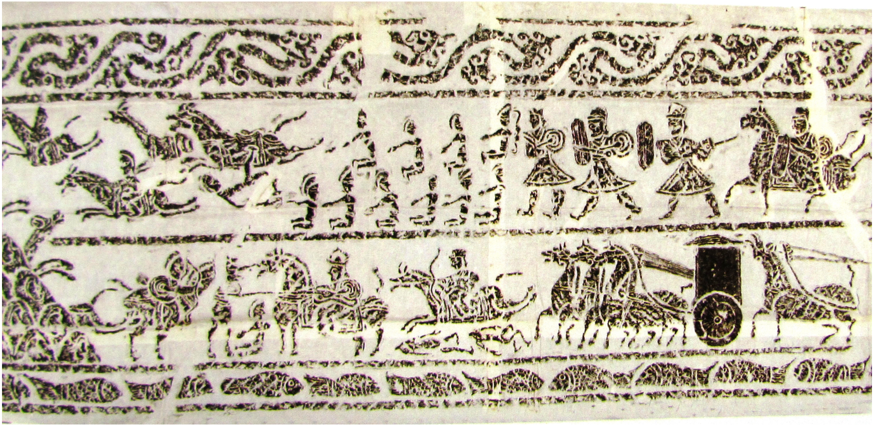
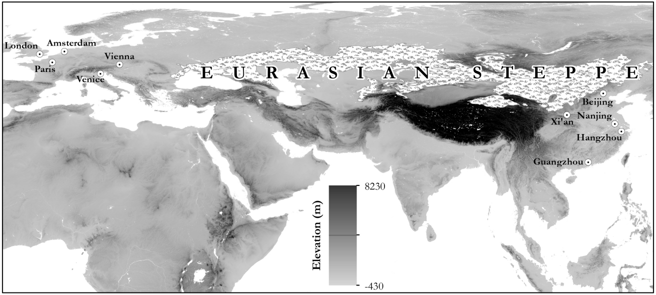


Figure: Han dynasty stone carving on war with the nomads (circa A.D. 150)

Exposure to Other Parts of Eurasia

Historical Building Block



- Otherwise China relatively isolated from foreign invasion
  - Himalayas shielded China
  - Before the Opium War, all invasions from the North
- Europe faced threats from multiple directions
  - East: Maygars (8th-9th c.), Mongols (13-14th c.)
  - North: German tribes (3rd-5th c.), Vikings (8th-11th c.)
  - South: Arabs (7th-11th c.), Turks (14th-17th c.)

Literature Review

Introduction

Causes of China's frequent unification

- Role of steppe nomads in driving state formation in ancient China (Lattimore, 1940; Huang, 1988; Lieberman, 2009; Turchin, 2009; Ma, 2012; Deng, 2012)

  We emphasize the importance that the external threats confronting China happened to be unidirectional (no major threats from other fronts)

- Yellow river? (Wittfogel 1957)
- Culture and ideology; logographic writing system; imperial exam system; topography (Elvin 1973; Diamond 1997; Lieberman 2009)

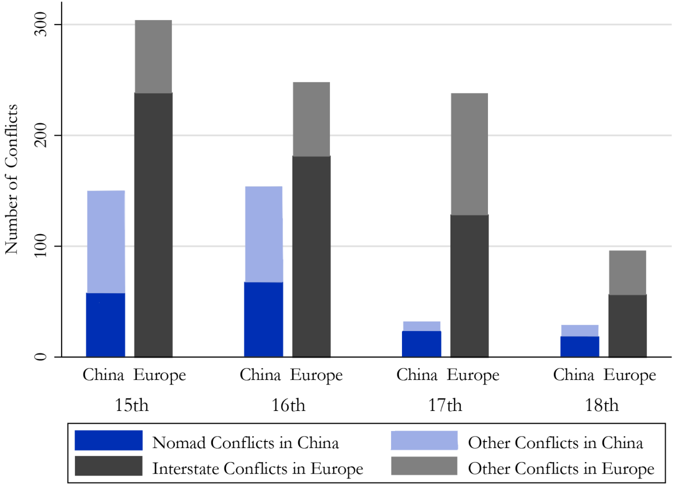
Consequences of Europe's fragmentation

- Classic literature attributes Europe's economic success to political fragmentation, which promoted competition and innovation (Montesquieu 1748; Jones 1981; Diamond 1997; Mokyr 1990; Landes 1998)

  China's Ruggedness

  We highlight another mechanism (periodic population collapses) that likely hampered China's LR growth

Importance of Nomadic Wars in Chinese History



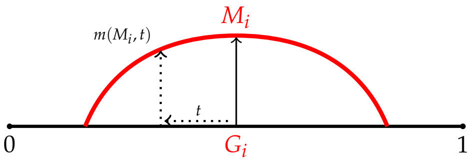
Source: Brecke (1999)

Linear Continent
Model

- Consider a linear continent on $[0,1]$.
- Individuals uniformly distributed over $[0,1]$
- Each individual generates taxable output y

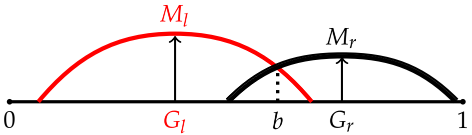
- Continent subdivided into $s \in \{0,1,2,3,...\}$ connected, mutually exclusive intervals
- Each interval ruled by a regime
- For ease of illustration, we focus on:
    - $s = 1$ (Political Centralization; Empire)
    - $s = 2$ (Political Fragmentation; Interstate Competition)
- We take the value of s as given and consider whether it is viable

Investment in Military Good
Model



- Each regime may invest in a military good M from a location G (i.e. capital city)
- Effectiveness of the military deteriorates over distance. If a place is t distance away from the location of provision, i's **military strength** on that location is given by $\max\{m(M_i, t, \beta), 0\}$ which satisfies the following properties:
  1. (Monotonicity) $m_1 > 0$, $m_2 < 0$, $m_3 \leq 0$ (equality *if and only if* $t = 0$);
  2. (Distance effect) $m_{22} < 0$, $m_{12} \leq 0$;
  3. (Effect of Parameter β) $m_{33} \leq 0$, $m_{13} \leq 0$, $m_{23} \leq 0$.
- Cost of providing M units of military goods: $c(M_i, \theta)$, where $c(0, \theta) = 0$, $c_1 > 0$, $c_{11} > 0$, $c_2 > 0$, and $c_{12} > 0$.

Border Formation
Model



- Regime l controls $[0, b]$ and regime r controls $[b, 1]$.
- Border $b\left(G_l, G_r, M_l, M_r, \beta\right)$ depends on the regimes' capital city locations (G_l and G_r) and military investments (M_l and M_r).
- Border $b\left(G_l, G_r, M_l, M_r, \beta\right)$ satisfies assumptions of monotoncity, concavity and symmetry.

- Continent faces external threat, either *one-sided* or *multi-sided*
- Threat causes gross damage $\lambda(\Lambda, t)$ at point t distance away from frontier where, $\lambda(\Lambda, 0) = \Lambda$, $\lambda_1 > 0$, $\lambda_2 < 0$.

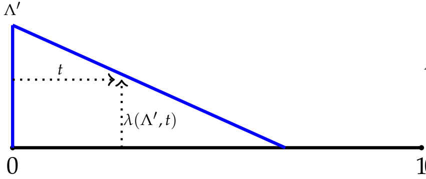


Figure: A severe, one-sided threat.

Figure: A smaller, two-sided threat.

EXTERNAL THREAT
MODEL

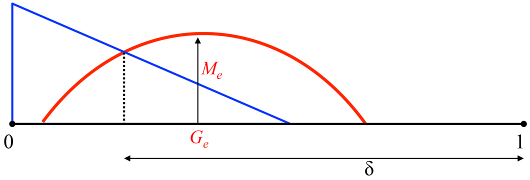
Protection

- Let $\kappa_i(x) = \lambda(\Lambda, x) - m(M_i, |G_i - x|, \beta)$ denote the **net damage** of the external threat at x (controlled by regime i).
- A location $x \in [0, 1]$ is **protected** by regime i from the external threat originating from 0 if there exists $0 \leq \hat{x} \leq x$ such that $\kappa_i(\hat{x}) \leq 0$.
- A location $x \in [0, 1]$ is **protected** by regime i from the external threat originating from 1 if there exists $x \leq \hat{x} \leq 1$ such that $\kappa_i(\hat{x}) \leq 0$.
- Let $\mathbb{D}_i = \{x \in [0, 1] : x \text{ is protected by regime } i\}$.

External Threat

Model

Rebellion



- If less than δ fraction of the continent is protected, then a revolution occurs and all regimes in the continent receive negative payoffs.

Two-Stage Decision Process

Model

Under an empire, the net revenue of regime e is

$$V_e = \begin{cases} y - c\left(M_e\right) & \text{if } |\mathbb{D}_e| \geq \delta, \\ -\infty & \text{otherwise,} \end{cases}$$

Two-Stage Decision Process

Model

Under interstate competition, the net revenues of regimes l and r are given by:

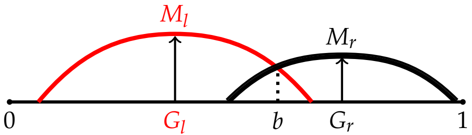
$$V_l = \begin{cases} by - c(M_l) & \text{if } b > 0,\ |\mathbb{D}_l| + |\mathbb{D}_r| \geq \delta \text{ and } G_l \leq G_r, \\ -\infty & \text{otherwise,} \end{cases}$$

and

$$V_r = \begin{cases} (1-b)\,y - c(M_r) & \text{if } b < 1,\ |\mathbb{D}_l| + |\mathbb{D}_r| \geq \delta \text{ and } G_l \leq G_r, \\ -\infty & \text{otherwise,} \end{cases}$$

Two-Stage Decision Process

Model



Regime i makes two decisions sequentially:

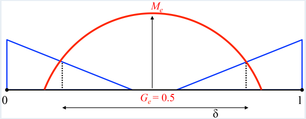
1. Location of capital city, $0 \leq G_i \leq 1$
2. Level of military investment, $M_i \geq 0$

Subgame-perfect equilibrium solution concept.

Proposition 1 (**Empire**)

When the threat is multi-sided:

1. *If* $\Lambda \leq \Lambda_I$, *the regime locates the capital city at* $G_e \in [0,1]$, *makes zero military investment, and* $\hat{\delta} \geq \delta$;
2. *There exists* $\Lambda_{II} > \Lambda_I$ *such that if* $\Lambda > \Lambda_{II}$, *the regime locates the capital city at the center of the continent, spends a non-zero amount on the military to confront the threat emanating from both frontiers, and* $\hat{\delta} = \delta$;
3. *If* $\Lambda_I < \Lambda \leq \Lambda_{II}$, *the regime locates the capital city closer to one frontier than the other, invests a non-zero amount on the military to confront the threat emanating from the frontier that its capital city is closer to, and* $\hat{\delta} = \delta$;



When the threat is one-sided:

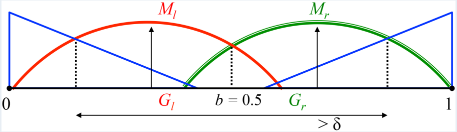
4. *There exists* $\bar{\Lambda}_I$ *such that for all* $\Lambda \leq \bar{\Lambda}_I$, *such that military investment is zero:* $M_e^* = 0$, $G_e^* \in [0,1]$, *and* $\hat{\delta} \geq \delta$;

5. *] If* $\Lambda > \bar{\Lambda}_I$, $G_e^* = 1 - \delta$, *military investment is positive* $M_e^* > 0$, *and* $\hat{\delta} = \delta$.

Proposition 2 (**Interstate Competition**)

When the threat is multi-sided:

1. *If $\Lambda \leq \Lambda_{III}$, the equilibrium outcome is same as the case when $\Lambda = 0$, and $\hat{\delta} \geq \delta$.*



2. *Otherwise, the revolution constraints are binding, and $\hat{\delta} = \delta$.*

Note: $\hat{\delta}$ denotes fraction of continent adequately protected;

$$\Lambda_{III} = \frac{\alpha(1-\delta)}{2} - \frac{1}{4}\beta\delta^2 + \max\{\frac{\beta\delta}{2}(\frac{y}{4\beta^2\theta})^{1/3} + 1 - \frac{\beta}{4}, \frac{\beta\delta}{2} + \frac{3}{4}(\frac{y^2}{4^2\beta\theta^2})^{1/3}\}.$$

Results

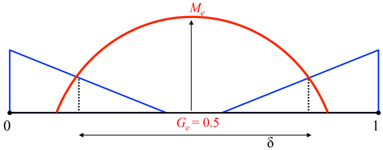


Figure: Empire.

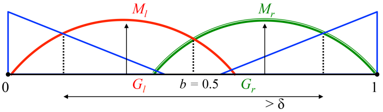


Figure: Interstate Competition.

- An Empire never protects more than δ of population.
- Interstate competition may protect more than δ because competition induces 'over-investment' in the military.

Corollary 1 (**Wastefulness of interstate competition**)

In the absence of external threats, interstate competition is wasteful.

Corollary 2

When external threats are significant, interstate competition adequately protects a weakly bigger interval of the continent than an empire does.

A regime is (fiscally) **viable** if its equilibrium net revenue is non-negative.

Proposition 3

*(**Viability**)*

1. *Under a one-sided threat,* $V_e^* > V_l^* + V_r^*$;
2. *Under a two-sided threat, when* $\Lambda \geq \Lambda_{II}$ *and* β *is sufficiently large,* $V_e^* < V_l^* + V_r^*$.

When $S = 1$ and regime e is nonviable, political centralization is not a **stable** outcome. Even if an empire emerges, it cannot last.

When $S = 2$ and if one or both regimes are nonviable, political fragmentation will be unstable

Proposition 3 gives rise to:

Corollary 3

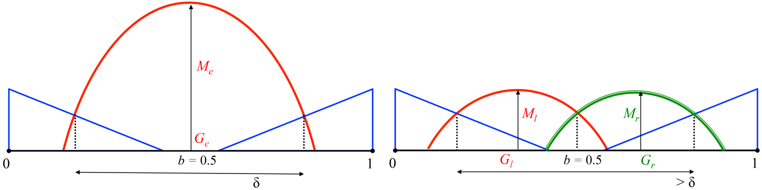
When the external threat is one-sided and severe, political centralization is more likely to be viable than political fragmentation.

⇒ China more likely to be politically centralized.

Corollary 4

When the external threat is moderate and multi-sided, political centralization is less likely to be viable than political fragmentation if θ is high.

⇒ Europe more likely to be politically fragmented.



Taxation and Public Good Provision
Model

- Previously, we take level of taxation as exogenous; Regime(s) extracts the entire taxable output y
- Previously, an individual (at $x < 0.5$) does not engage in revolution if

$$\underbrace{m(M_i, t)}_{\text{military protection received}} - - \underbrace{\lambda(\Lambda, t)}_{\text{gross damage from threat}} \geq 0$$

- Suppose regime can ease revolution constraint by granting a tax reimbursement $R \geq 0$, and the individual is contented if

$$\underbrace{R_i}_{\text{tax reimbursement}} + \underbrace{m(M_i, |G_i - x|, \beta)}_{\text{military protection}} - \underbrace{\lambda(\Lambda, x)}_{\text{damage from threat}} \geq 0.$$

- Now, effective level of taxation becomes $y - R$

Taxation and Public Good Provision

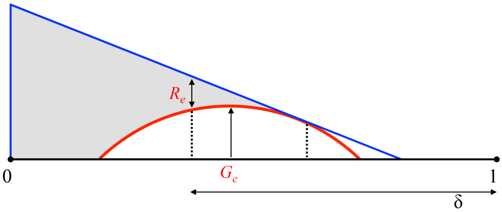
Model

Under political fragmentation (multi-sided, moderate threat),

- Revolution constraint does not bind $\Rightarrow R_F = 0 \Rightarrow$ Effective level of taxation $= y$

Under empire (one-sided, severe threat),

- Revolution constraint binds $\Rightarrow R_E > 0 \Rightarrow$ Effective level of taxation $= y - R_E < y$



Corollary 5

Taxation is weakly lower under political centralization than under political fragmentation.

Population Growth
Model

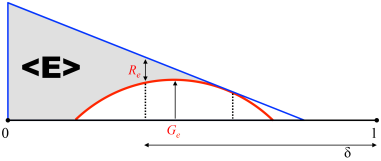
- Exogenous threat realized with some probability
- Each individual lives for one period; supplies $\underline{y} + y$, where $\underline{y}$ is not taxable
- For individual x under regime i, disposable income is $\bar{y} = \underline{y} + R_i - \kappa_i(x)$
- Each individual seeks to maximize utility $c^{1-\gamma} n^{\gamma}$ subject to budget constraint $\rho n + c \leq \bar{y}$, where c : consumption, n : # of children

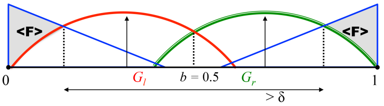
If Shock Not Realized:

- Population growth is $N_E = \frac{\gamma}{\rho} \cdot (\underline{y} + R_E)$ under empire and $N_F = \frac{\gamma}{\rho} \cdot (\underline{y})$ under fragmentation.
- Hence $N_E > N_F$.

Population Growth

Model





If Shock is Realized:

$$N_E = \frac{\gamma}{\rho} \cdot \left\{ (\underline{y} + R_e) - \underbrace{\int_{x \notin \mathbb{D}_e} \lambda(\Lambda_E, x) - [m(M_i, G_i - x)] dx}_{\text{Area}\langle E \rangle} \right\};$$

$$N_F = \frac{\gamma}{\rho} \cdot \left\{ \underline{y} - \underbrace{2 \cdot \int_{x<b, x \notin \mathbb{D}_l} \lambda(\Lambda_F, x) - [m(M_i, G_i - x)] dx}_{\text{Area}\langle F \rangle} \right\},$$

$N_E < N_F$ likely because

- $\Lambda_E > \Lambda_F$
- Empire protects a smaller interval of continent
- [Multi-sided shocks unlikely to arrive simultaneously]

Population Growth
Model

Corollary 6

- *If external threat is not realized, population grows faster under political centralization.*
- *If the external threat is realized, a population contraction is more likely under political centralization than under political fragmentation.*

China should be subjected to more fluctuations in population & economic development.

Empirical Analysis

Within China Evidence

- Bai and Kung (2011) show that nomadic incursions into China proper were correlated with exogenous variations in rainfall as climatic disasters such as droughts often triggered subsistence crises that drove the inhabitants of the ecologically fragile steppe to invade their settled neighbors for food.
- We use the same data as Bai and Kung (2011).
- Drawing from Wei (2011) and Wilkinson (2012), we add two variables:
  1. a dummy variable that takes the value of 0 if China was politically unified in a given decade and 1 otherwise (*Fragmentation*);
  2. a log variable that counts the average number of regimes in China proper in a given decade (*#Regime*).

Empirical Analysis

Data

Table: List of Variables and Summary Statistics

Variable		Description	mean
Fragmentation	y_{1t}	=1 if more than 1 regime ruled China proper in decade t	0.41
#Regimes	y_{2t}	Average number of regimes in China proper in decade t (log)	0.39
1-5 Nomadic attacks	x_t	Frequency of attacks initiated by the nomads in decade t	2.53
1-5 Lower precipitation	z_{1t}	Share of years with records of drought disasters on the Central Plain in decade t	0.50
Higher precipitation	z_{2t}	Share of years with records of Yellow River levee breaches in decade t	0.18
1-5 Snow disasters	w_{1t}	Share of years with records of heavy snow on the Central Plain in decade t	0.12
Low temperature disasters	w_{2t}	Share of years with records of low-temperature calamities (e.g., frost) on the Central Plain in decade t	0.16
Temperature	w_{3t}	Average temperature in decade t	9.46
1-5 Nomadic conquest 1	w_{4t}	=1 if the Central Plain was governed by the nomads (317–589)	0.13
Nomadic conquest 2	w_{5t}	=1 if the Central Plain was governed by the nomads (1126–1368)	0.12
Nomadic conquest 3	w_{6t}	=1 if the Central Plain was governed by the nomads (1644–1839)	0.10
1-5 Time trend	w_{7t}	Decade: -22–183 (219 B.C.–1839)	80.5

Empirical Analysis

Baseline Estimation

We employ a simple autoregressive distributed lag (ADL) model:

$$y_t = \phi_0 + \sum_{i=1}^{p} \phi_i y_{t-i} + \sum_{i=0}^{q} \mu_i x_{t-i} + \epsilon_t \,, \tag{1}$$

where the dependent variable y_t is alternated between the dummy variable *Fragmentation* and *#Regime*, the logarithm of the number of regimes in China proper in decade t. The explanatory variable x_t is the number of nomadic incursions into China proper in decade t.

We find that the AIC is minimized when $p = 3$ and $q = 1$.

We expect $\mu_0 + \mu_1 + \mu_2 + ... + \mu_q < 0$.

Empirical Analysis

Baseline Estimation

Results

- We find that the nomadic invasion variable and its lagged value are both statistically significant, but they carry opposite signs:
- An additional nomadic attack in decade t is associated with a 1.2% increase in the probability of politically fragmentation in China in the same decade, but an attack in the previous decade (at $t-1$) is associated with a larger 1.96% decrease in the probability of politically fragmentation in decade t.
- In line with Corollary 3, the relationship between nomadic invasions and political fragmentation is negative in the long run: each additional nomadic attack is associated with a decrease in the probability of politically fragmentation in China—or an increase in the probability of political unification—of 6.3% ($= \frac{0.012-0.0196}{1-0.906+0.283-0.256}$).

Table: Baseline Estimation: ADL Model

	(a)	(b)
Dependent variable:	Unification	Unification
Unification: Lag 1	0.906***	0.875***
	(0.0651)	(0.0668)
Unification: Lag 2	-0.283***	-0.277***
	(0.0843)	(0.0837)
Unification: Lag 3	0.256***	0.202***
	(0.0630)	(0.0648)
Nomadic attacks	-0.0120**	-0.0108*
	(0.00605)	(0.00628)
Nomadic attacks: Lag 1	0.0196***	0.0182***
	(0.00604)	(0.00621)
Additional controls	No	Yes
Observations	203	203
R-squared	0.743	0.765
AIC	0.122	0.141

Empirical Analysis

Including Controls

As a robustness check we introduce the control variables as used in Bai and Kung (2011) into our estimation equation, which now becomes:

$$y_t = \phi_0 + \sum_{i=1}^{p} \phi_i y_{t-i} + \sum_{i=0}^{q} \mu_i x_{t-i} + \sum_{i=0}^{q} \psi_i^1 z_{1t-i} \sum_{i=0}^{q} \psi_i^2 z_{2t-i} + \pi W_t + \epsilon_t \quad (2)$$

where z_{1t} and z_{2t} are rainfall variables measuring droughts and floods and W_t is a vector of seven other climatic and historical control variables

We obtain similar coefficients.

Empirical Analysis

VAR Estimation

Following Bai and Kung (2011), we also implement the following vector autoregression (VAR) which models the simultaneity of our dependent and main explanatory variables explicitly

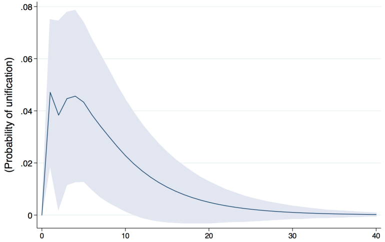
$$\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} \phi_0 \\ \mu_0 \end{bmatrix} + \begin{pmatrix} \phi_1^1 & \mu_1^1 \\ \phi_1^2 & \mu_1^2 \end{pmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{pmatrix} \phi_2^1 & \mu_2^1 \\ \phi_2^2 & \mu_2^2 \end{pmatrix} \begin{bmatrix} y_{t-2} \\ x_{t-2} \end{bmatrix} + + \begin{pmatrix} \phi_3^1 & \mu_3^1 \\ \phi_3^2 & \mu_3^2 \end{pmatrix} \begin{bmatrix} y_{t-3} \\ x_{t-3} \end{bmatrix} + \begin{pmatrix} \psi_0^1 & \psi_0^2 \\ \psi_0^1 & \psi_0^2 \end{pmatrix} \begin{bmatrix} z_{1t} \\ z_{2t} \end{bmatrix} + \Pi W_t + \begin{bmatrix} \epsilon_{t-1} \\ \epsilon_{t-2} \end{bmatrix}, \quad (3)$$

where y_t is, respectively, *Fragmentation* and *#Regime*.

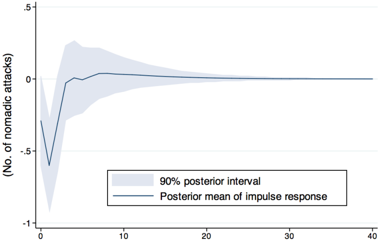
The coefficient estimate of Lag-1 nomadic attack is -0.0176 in column (a1), compared with -0.0196 in column (a) of the previous table, and -0.0130 in column (b1), compared with -0.0137 in column (b) of the previous table.

Table: Robustness Checks: VAR Model

Dependent variable:	(a) Unification	(b) Nomadic attacks
Unification: Lag 1	0.893***	-2.075***
	(0.0665)	(0.733)
Unification: Lag 2	-0.317***	1.631*
	(0.0848)	(0.935)
Unification: Lag 3	0.225***	0.377
	(0.0656)	(0.723)
Nomadic attacks: Lag 1	0.0176***	0.321***
	(0.00626)	(0.0690)
Nomadic attacks: Lag 2	-0.00701	0.257***
	(0.00657)	(0.0724)
Nomadic attacks: Lag 3	0.00602	-0.0108
	(0.00638)	(0.0703)
Additional controls	Yes	Yes
Observations	203	203



(a) Impulse response of unification to nomadic attacks



(b) Impulse response of nomadic attacks to unification

Figure: Estimated impulse responses

Effect of a one standard deviation increase in nomadic attacks is economically and statistically significant and persists for 10 periods.

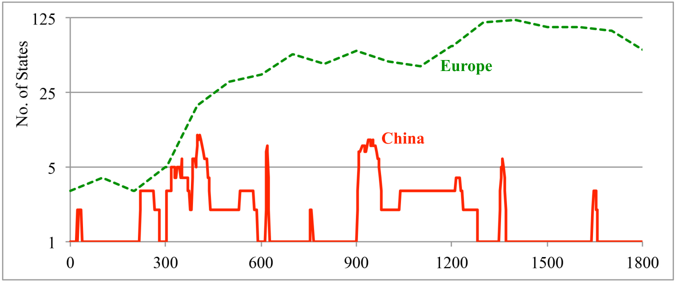
Effect of political unification on nomadic attacks is much smaller and does not persist.

Corollaries 3 & 4: Empire, or not?

Historical Discussion

- Europe politically more fragmented than China

Figure: Number of States in China and Europe



Sources: Nussli (2011), Wei (2007)

Corollaries 3 & 4: Empire, or not?

Historical Discussion

- After the Roman empire fell, all subsequent attempts to build long-lasting empires in Europe failed.
- The most successful subsequent attempt to build a European-wide polity was the creation of a Frankish empire by the Carolingians. The Carolingian dynasty was established by Pippin III (r. 752–768) and under the reign of Charlemagne (r. 768-814) came to control an empire that spanned France, parts of Spain and much of Italy, Germany and central Europe (Collins, 1998; McKitterick, 2008; Costambeys et al., 2011).
- Consistent with our model, the Carolingian empire was not long-lasting. It went into decline as the successors of Charlemagne struggled to deal with the **multisided** external threats posed by the Magyars, the Vikings, and the Muslims from different fronts.

Empire, or not?

Historical Discussion

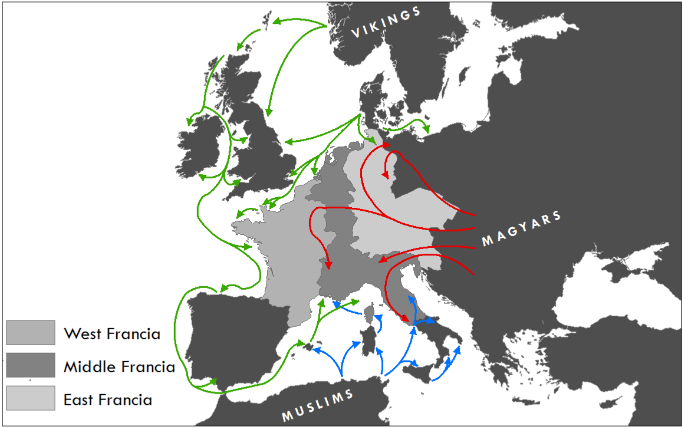


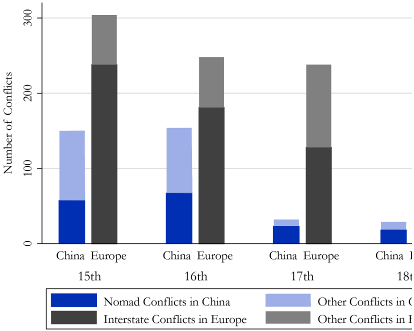
Figure: Viking, Magyar, and Muslim Invasions of Western Europe in the Ninth and Tenth Centuries; The Carolingian Empire after the partition of AD 843.

Corollaries 1 and 2: Wars Before Mid-1800s

Historical Evidence

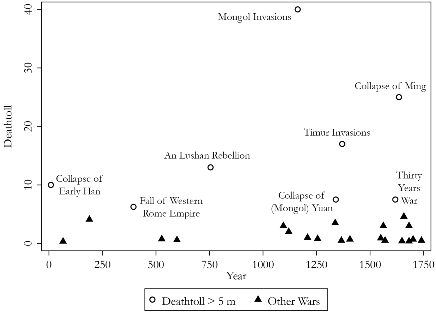
- Higher frequency of wars in Europe
- China observed some of the most violent wars

Figure: Number of Violent Conflicts



Source: Brecke (1999)

Figure: Largest Wars By No. of Deaths



Source: White (2011)

Corollary 3: Location of capital city

Historical Discussion

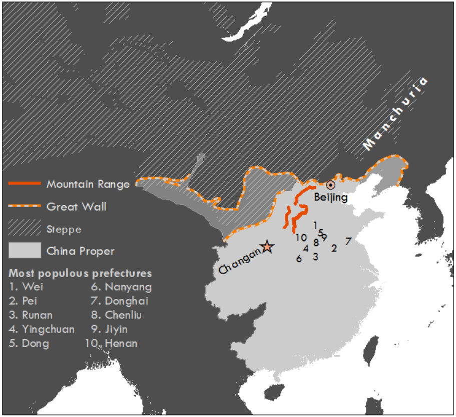
Our model predicts that large empires will locate their capitals in response to the threat of external invasion

- China's capital city was located in its northern or northwestern frontier instead of the Central Plain or Lower Yangzi Delta. For the 1,418 years between 221 BC and 1911 when China proper was unified rule, Beijing and Changan (modern day Xi-an) served as its national capital for 634 years and 553 years respectively, or together 8.4 years out of every 10 years (Wilkinson, 2012).
- Changan was capital city of the unified dynasties of Qin (221–206 BC), Former Han and Xin (202 BC–23AD), Sui (581–618), and Tang (618–907)
- During the Han dynasty, 4% of the population, lived in Guanzhong but the Guandong region in central-eastern China was home to 60 percent of the empire's subjects.
- When the external threat shifted the semi-nomadic lands of Manchuria, Beijing replaced Changan as the new political center. Huang Zongxi (1610–1695) likened making Beijing the national capital to having the emperor guard the outer gate of his empire (Huang, 1993).

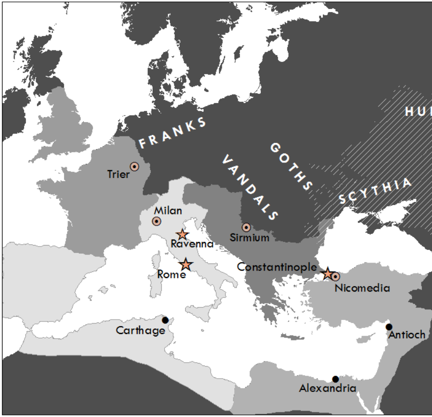
Corollary 3: Location of capital city

Historical Evidence

- Beijing and Changan as China's preeminent capital centers
- The Roman Empire's relocation of its capital from Rome to Constantinople



(a) Han Dynasty (206 BC–220 AD)



(b) Roman Empire, Tetrarchy, circa 300 AD

Corollary 3: Location of capital city

Historical Discussion

Our model predicts that large empires will locate their capitals in response to the threat of external invasion

- After 200 CE. Rome faced more serious external threats.
- Rome remains largest city but capitals of various emperors move to Milan, Trier, Sirmium, and Nicomedia.
- These were not the largest cities (Alexandria, Antioch and Carthage) but they were close to the frontier.
- Eventually capital is moved to Byzantium, renamed Constantinople. This was a small town but extremely well located in terms of defending both the Danube and the Eastern frontier.

Corollary 6: Level of Taxation

Historical Discussion

Table: Per capita tax revenues in grams of silver

	1700	1750	1780
England	91.9	109.1	172.3
France	43.5	48.7	77.6
Dutch Republic	210.6	189.4	228.2
Spain	28.6	46.2	59.0
European Average	52.1	58.0 (27%)	77.3
China	10.4	11.8 (6%)	10.2

Sources: Karaman and Pamuk (2013); Sng (2011)

Parenthesis: Per capita tax as percentage of "bare-bone" subsistence (Allen et al. 2011).

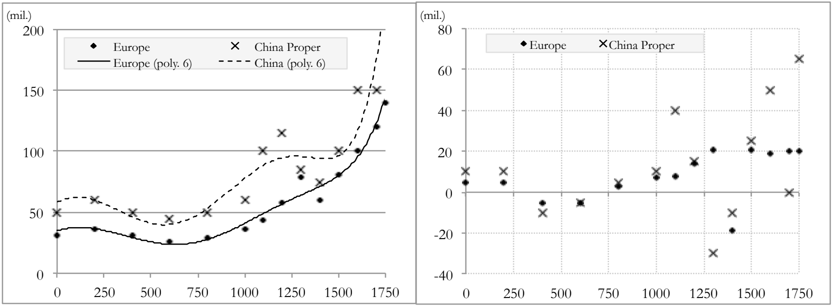
	Number of Soldiers	% of Population
Britain	79,000	1.2%
France	183,000	0.7 %
Dutch Republic	45,000 (1750s)[a]	2%
Spain	109,000 (1750s)	1.2%
Austria	190,000 (1778)	1.06%
Prussia	133,000 (1751)[b]	3.5%
Russia	408,000 (1780)	1.7 %
Saxony	23,000 (1750s)	—
Bavaria	15,000 (1750s)	—
Hanover	37,283 (1750s)[c]	—
Piedmont	45,000 (1750s)	—
Sweden	35,000 (1756)[d]	2%
European total/average	1,252,000	1.67%
China	800,000	0.37%

[a] During earlier periods Dutch military strength was greater. The Dutch army was 93,000 in 1690.
[b] By 1786 Prussian army was 190,000.
[c] Size of Hanoverian army fluctuated from 19,000 to 49,000 during the eighteenth century (Sichart, 1898).
[d] The Swedish army was much larger in earlier periods: 100,000 in 1710 (Kennedy, 1987).

Corollary 7: Population Growth

Historical Discussion

Figure: Population Estimates in China and Europe (McEvedy and Jones 1978)



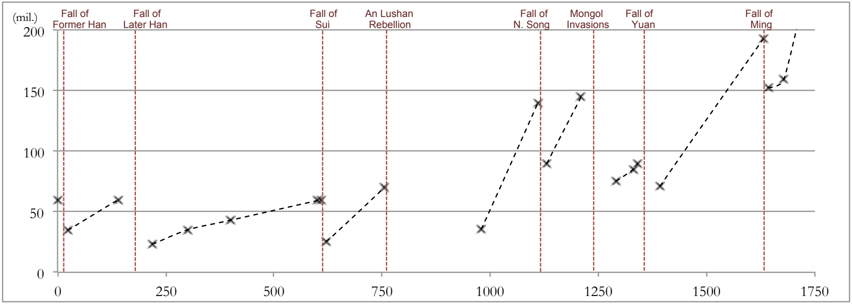
- Population growth more continuous in Europe; more cyclical in China
- Growth spurts more pronounced in China than in Europe

Corollary 7: Population Growth

Historical Discussion

- The McEvedy and Jones data is artificially smooth. It underestimates population volatility in China.

Figure: Estimated population levels and major political crises in China (Cao 2000)



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- Start-stop nature of China's growth might have diminished its chances of escaping the Malthusian trap.
- "China came within a hair's breadth of industrializing in the fourteenth century" but lost its technological lead after the Mongol invasions (Jones

Conclusion

- Chinese growth fragile: invasions & political crises caused severe population loss & damage.
- Europe's polycentric system more robust.
- Literature emphasize the importance of political fragmentation on European growth:
    - Greater innovation (Mokyr ,1990);
    - More support for merchants (Rosenberg and Birdzell, 1986);
    - Political representation (Hall, 1985);
    - State capacity (Gennaioli and Voth, 2011);
    - Reliance on cities rather than clans (Greif and Tabellini, 2012);
    - Rise of bourgeois values in north-west Europe (McCloskey, 2010).
- Future work to investigate complementarities between these arguments & this paper.

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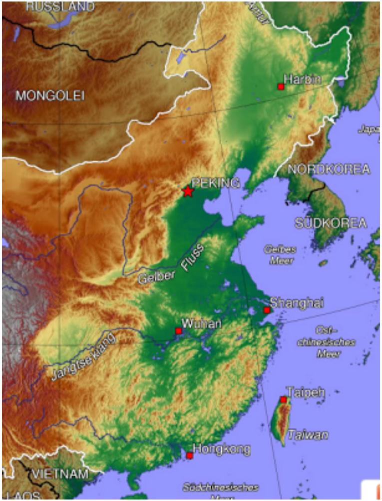

Figure: Topographical Map of China

Figure: valley in the countryside of Fujian

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