Conflict, Evolution, Hegemony, and the Power of the State

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Introduction

- game theory: many possible equilibria
- interpretation: many possible stable social norms or institutions
- observation: there is a wide array of different institutions both across space and time
- political systems: from relatively autocratic (exclusive) to democratic (inclusive)

Evolutionary Game Theory

- can evolutionary game theory tell us about the relative likelihood of institutions?
- Individual evolution (Kandori, Mailath and Rob, Young, Ellison) – risk dominance
- But isn't evolution driven by competition between groups? Between societies with different institutions?
- Intuition: efficiency
- Nature of competition between groups over resources?

Resource Competition

- competition through voluntary migration (Ely and some others)
  - efficiency
  - no particular tendency towards large or hegemonic states
- historically institutional success has not been through voluntary immigration into the arms of welcoming neighbors
- people and institutions have generally spread through invasion and conflict – Carthaginians did not emigrate to Rome
- institutional change most often in the aftermath of the disruption caused by warfare and other conflicts
- which institutions are likely to be long-lived when evolution is driven by conflict?

Institutions and State Power

- U.S. institutions – low taxes, high output
- U.S.S.R. Institutions – high taxes, low output
- both generate substantial state power
- we model this trade-off through a theory of why state officials choose to invest in state power rather than keeping the money (swords rather than jewelry)
- our answer: they need the swords to collect the taxes to pay for their jewelry – the external use of state power largely incidental

institutional issue: can state power be used to collect taxes?

- in democracy many checks and balances
- in autocracy few

model institutional differences by ability to use state power to collect taxes

A Static Example

state officials (and their clients) $i = O$, choose state power $a^O \in [0, 1]$, collusive group, moves first

producers $i = P$, choose effort $a^P \in [0, 1]$, representative individual, move second

institutions described by exclusiveness parameter $\chi \in [0, 1]$, fixed in short run, but subject to evolutionary pressures

tax power: $b = \chi a^O$

tax rate: $\overline{\tau} \equiv \min\{1, \tau b\}$

$\tau > 1$ a technological parameter

Preferences and Equilibrium

producers $c(a^P)$ cost of effort

$u^P = (1 - \overline{\tau})a^P - c(a^P) + \xi^P a^O < c < 1$

ξ^P measures usefulness of state power in providing public goods

state officials residual claimants

$u^O = \overline{\tau} a^P - a^O + \xi^P a^O$

can be negative for simplicity, $\xi^O < 1$

action profile (a^P, a^O) an *equilibrium* = Stackelberg equilibrium

Producer Optimal Tax Revenue and Profits

(with quadratic effort cost) tax power: $b = \chi a^O$

tax-revenue function

$$G(b) = \tau b \left[1 - \frac{\overline{\tau}}{1-c}\right]$$

profit function of producers

$$\Pi(b) = G(b) + \frac{1-c}{2}\left[1 - \frac{\overline{\tau}}{1-c}\right]^2$$

welfare $W(b) = u^P + u^O$

generalize quadratic case to “properness”

Institutions, State Power and Welfare

Theorem: *In a proper economy there is a unique equilibrium level of state power $a^O(\chi)$, and it is single peaked in χ; so there is a unique argmax $\chi_2 > 0$. There is a unique welfare maximizing level of exclusivity χ_1, and $\chi_1 \leq \chi_2$. There is a $\overline{\xi} \geq 1$ such that if $\xi^P + \xi^O \leq \overline{\xi}$ then $\chi_1 < \chi_2$.*

state power maximization leads to greater exclusiveness than welfare maximization

Theorem: *in a proper economy profits $\Pi(\chi a^O(\chi))$ are decreasing in χ, while tax revenues $G(\chi a^O(\chi))$, tax power $\chi a^O(\chi)$, and the utility of state officials $u^O(\chi, a^O(\chi))$ are all increasing in χ. For $\chi \geq \chi_1$ producer utility is decreasing in χ and if $\xi^P + \xi^O < 1$ so is welfare. If $\xi^P + \xi^O \geq 1$ the welfare is decreasing for $\chi_1 \leq \chi \leq \chi_2$.*

greater exclusiveness means higher extractiveness in the sense of Acemoglu and Robinson

Dynamics with Two Societies

two societies $j = 1, 2$ characterized by χ_j, a_j^O, a_j^P

indicator variable $b_j = 1$ if society is in equilibrium, 0 otherwise

for the purposes of this example: both societies are in equilibrium, both are proper economies and they differ only in their exclusiveness χ_j and the equilibrium satisfies $a_j^O > 0$ and $a_1^O < a_2^O$

societies compete over an integral number L units of land; constant returns to scale in land

L_{jt} land controlled by society j at time t where $L_{1t} + L_{2t} = L$

society active if it has a positive amount of land

a state has a hegemony at j if $L_j = L$

Markovian Dynamics

state variable L_{1t}

transition probabilities determined by conflict resolution function

conflict may result in one of the two societies losing a unit of land to the other: $|L_{jt+1} - L_{jt}| \leq 1$, loss of a unit of land called *disruption*

conflict resolution probabilities depends on power of the two societies, amount of land held, strength of outside forces a_0 and the chance of success in the face of overwhelming odds ϵ (similar to the mutation rate)

probability of disruption (loss by j) $\pi_j(b_j, a_j^O, L_j, a_{-j}^O, L_{-j}, a_0)[\epsilon]$

basic assumption of monotonicity: (weakly) decreasing in a_j, L_j and increasing in a_{-j}, L_{-j}, a_0

Nature of the Parameters

L_{jt} endogenous, a^O_{jt} a characteristic of institutions subject to evolutionary selection

ϵ, a_0 exogenous

we think of ϵ as small and relatively constant over time and space

outside forces a_0 vary over time and space: represent enemies who are protected by asymmetrical geographical barriers

English channel not a barrier given English and Roman technology in Julius Caeser's time

post 1500 period naval technology and standing navies favored strongly the short coastline of England over the long coastline of continental Europe

Conflict Resolution

if $L_{-j} > 0$ then $\pi_j = p$ with $0 < p < 1/2$

conflict between opponents of “similar size” may easily lead one or the other to lose land

example: Alsace-Lorraine in 1871, 1918 shifting from France to Germany and back

conflict against overwhelming odds is different:

but by contrast on December 2, 1913 when the shoemaker Karl Blank laughed at German soldiers he was beaten and paralyzed, and indeed more substantial protests of up to 3,000 people had no consequence for German control over Alsace-Lorraine

Hegemonic Case

when $L_j = L$ then $\pi_j = p\epsilon^{\max\{0, a_j^O - a_0\}}$

the exponent $\rho_j = \max\{0, a_j^O - a_0\}$ is called *resistance*

how many rebels needed to have (limited) success: a measure of how overwhelming the odds are

(implicitly resistance is zero if opponents have some land)

outside forces strong or many black swans $\pi_j = p$

role of outside forces: Battle of Yorktown 1781

> 8,000 French and 11,000 U.S. soldiers with the support of a French naval fleet defeat British forces

if the state is very weak, it doesn't take much: on June 14, 1846 thirty three people took over the Mexican garrison of Sonoma and declared the California Republic; it was annexed by the U.S. 26 days later; there were roughly 500 U.S. soldiers in the general vicinity of California

Markov Analysis

$\epsilon > 0$ all states are positively recurrent so a unique stationary probability distribution representing the frequency with which each state occurs

a simple birth-death chain, ergodic probabilities can be explicitly computed and the frequency of society j having a hegemony is

$$\sigma_j = \frac{1}{1 + (L-2)\epsilon^{\rho - j} + \epsilon^{\rho - j - \rho_j}}.$$

Theorem: *If* $a_0 \geq a^O$ *or* $\epsilon = 1$ *the stationary distribution over states is uniform. If* $a_0 < a^O$ *then* $\sigma_2 \to 1$ *and* $\sigma_1 \to 0$.

with strong outsiders there is no tendency towards hegemony, with weak outsiders there is and it is a hegemony of the stronger state

Generalized Model

an arbitrary finite list of societies $j = 1, \ldots, M$ that may or may not be in equilibrium

a unit of land that lost is gained by a society chosen randomly according to the function $\lambda(k|j, L_t) > 0$ for $k \neq j$ and $\lambda(j|j, L_t) = 0$

more general conflict resolution function

Assumptions About Conflict

in terms of resistance r_j (rather than probability)

- an unstable society $b_j = 0$ has zero resistance (intentional or learning dynamic – if incentive constraints are not satisfied people try new things)

for stable societies $b_j = 1$

- symmetry $r_j(a_j^O, L_j, a_{-j}^O, L_{-j}, a_0)$ independent of j (names of the societies do not matter)
- monotone and when resistance is non-zero strictly monotone
- an appreciable chance of losing land to a superior opponent:

  lowest resistance (weakest) active society has zero resistance
- better to face divided opponents than unified

Stationary Distribution

the stationary distribution is denoted $\mu(\epsilon)$

Theorem: *For $\epsilon > 0$ there is a unique $\mu(\epsilon)$ and it places positive weight on all states. As $\epsilon \to 0$ there is a unique limit μ. There exists an a_0^* such that if $\max_{j,b_j=1} a_j^O < a_0^*$ then μ places positive weight on all states. If $\max_{j,b_j=1} a_j^O \geq a_0^*$ then μ places weight only on hegemonic states j that have maximal equilibrium state power*

$$a_j^O = \max_{j',b_{j'}=1} a_{j'}^O$$

generalizes result from two society birth-death example: with strong outsiders there is no tendency towards hegemony, with weak outsiders there is and it is a hegemony of the strongest **equilibrium**

Some Facts About Hegemony

- China: 2,234 years from 221 BCE – hegemony 72% of time, five interregna
- Egypt: 1,617 years from 2686 BCE - hegemony 87% of time, two interregna
- Persia: 1,201 years from 550 BCE - hegemony 84% of time, two interregna
- England: 947 years from 1066 CE - hegemony 100% of time
- Roman Empire: 422 years from 27 BCE - hegemony 100% of time
- Eastern Roman Empire: 429 years from 395 CE – 100%
- Caliphate: 444 years from 814 CE – 100%
- Ottoman Empire: 304 years from 1517 CE – 100%

Remark: in 0 CE 90% of world population in Eurasia/North Africa

Exceptions

- India
- continental Europe post Roman Empire

evolutionary theory: more outside influence, less hegemony

- Europe: Scandinavia 5%, England 8%
- India: Central Asia 5%
- China: Mongolia less than 0.5%

Hegemonic Transitions

assume hereafter that ϵ is small and look at transitions between different hegemonic states

the *fall* of a hegemony is time at which the hegemony is lost and another hegemony is reached without returning to the original hegemony

Length of Transitions

Theorem: *The expected length of time for a hegemony to be reached is bounded independent of* ϵ*. When* $\max_{j,b_j=1} a_j^O \geq a_0^*$ *the expected amount of time before hegemony falls grows without bound as* $\epsilon \to 0$*.*

Should not expect much difference in the time between hegemonies in different regions – the regions where hegemony is more common should have longer lasting hegemonies, but not less time for hegemony to be reached.

Historical Facts About Transitions

average time to hegemony from end of previous hegemony

- China (220 CE to present): 153 years
- Egypt (2160 BCE to 1069 BCE): 102 years
- Persia (550 BCE to 651 CE): 145 years
- Western Europe (295 CE to present): 366 years
- India (320 CE to present): 209 years

Strong Hegemonies

a hegemony is *strong* if it has positive resistance when it has lost a single unit of land

Theorem: *As* $\epsilon \to 0$ *the number of times a strong hegemony will lose land before it falls grows without bound.*

true in China during the period during which we have good data during the century prior to the fall of the Ching hegemony in 1911

many failed attempts at revolution, most notably

- Boxer rebellion in 1899
- Dungan revolt in 1862 – lasted 15 years and involved loss of control in a number of provinces

in each case hegemony was restored.

Types of Transitions

Theorem: *As* $\epsilon \to 0$ *the probability that the path between hegemonies is a least resistance path approaches one.*

The next step is to analyze what least resistance paths between hegemonies look like.

Zealots

assume $\max_{j,b_j=1} a_j^O \geq a_0^*$ and ϵ small (so hegemonies commonplace)

assume $\max_j a_j^O > \max_{j,b_j=1} a_j^O$

k that achieves the max called *zealots*

- zealots by definition do not satisfy incentive constraints
- the “ethos of the warrior/revolutionary”
- could be deviant preferences
- essential point is that while they are strong, zealots are not stable – they do not form societies that last

assume hereafter that there are zealots

Role of Zealots in Transitions

Theorem: *As* $\epsilon \to 0$ *when a hegemony loses an amount of land* $L\_ > 1$ *the land with probability approaching one the land is taken by zealots and the process is monotone (zealots never lose any land along the path)*

Facts About Zealots

groups that overcame strong hegemonies (where we have data)

- Sun Yat Sen's revolutionaries
- Mongolian groups that overcame other Chinese dynasties
- Huns led by Attila

All have been willing to sacrifice material comfort for the cause (institutional change or conquest). This idealism rarely lasted even a generation.

All have been well-organized and efficient

Revolts and invasions against strong hegemonies are generally either repressed and or unchecked and succeed.

Least ResistancePaths

- begin with zealots gaining land
- after a threshold is reached there is a warring states period in which the hegemony no longer has positive resistance

we refer to the beginning of the warring states period as the *collapse* of the hegemony

Theorem: *The expected length of time for a hegemony to collapse is bounded independent of* ϵ.

it should not depend on the duration of the hegemony that collapsed

Where we have recent and fairly accurate data collapses brutally fast:

- Ching hegemony established in 1644 CE (and institutions that lasted since 605 CE) swept permanently away in 1911 in well less than a year, and less time even than the fall of the very short lived hegemonies established by Napoleon or Hitler.

Transition to Hegemony

Theorem: *With zealots the probability of reaching any particular hegemony is bounded away from zero independent of* ϵ.

the *least resistance* of a hegemony is the resistance of the least resistance path to another hegemony: it is a measure of the strength of the hegemonic institutions relative to outside forces

no particular tendency to reach any type of hegemony, weak or strong

Facts About the Emergence of Hegemonic Institutions

short lived hegemonies

- Alexander – weak institutions
- Napolean – strong outside forces
- Hitler – strong outside forces
- Soviet Union – weak institutions and strong outside forces

long lived hegemonies where zealots initiated a hegemony

- various Mongol invaders of China – adopted Chinese institutions

the theory says following the warring states period anything can happen: and it does

Conclusion

The theory says that if we start from the observation that institutions tend to evolve through conflict between societies, rather than, say, through peaceful competition for resources, then other things should also be true:

- persistent hegemony and extractiveness in circumstances where outside forces are weak
- time to hegemony largely independent of circumstances
- fall of strong hegemonies due to “perfect storm” following many failed revolts