Great Powers and Financial Architecture in Asia Pacific

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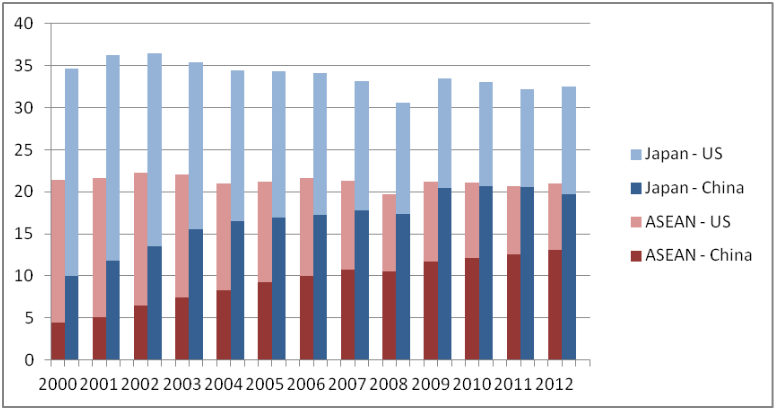
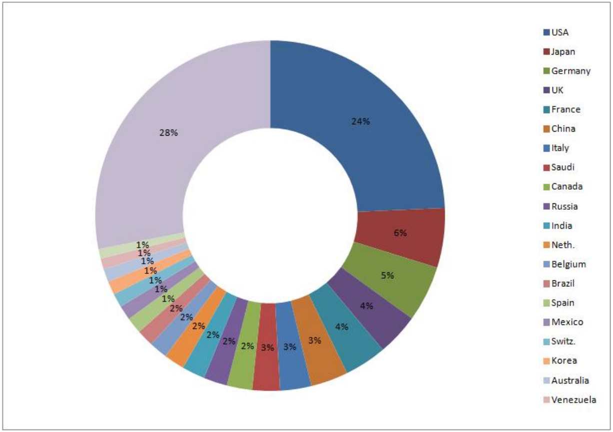
Asia's Trade with US and China



Public Goods Provision

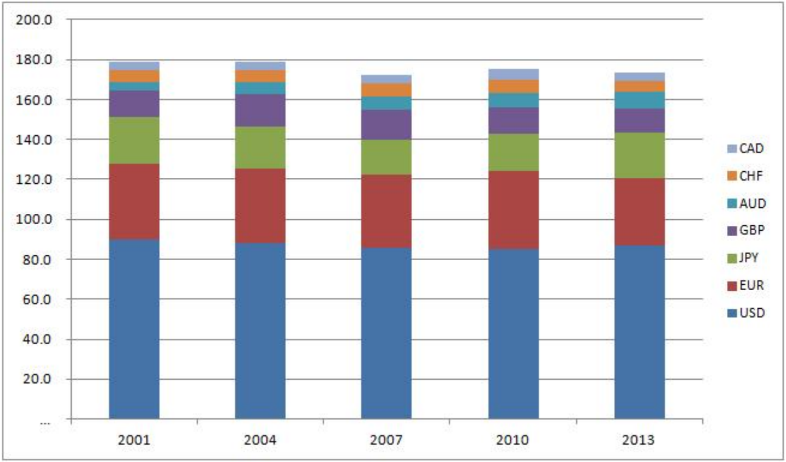
Voting Powers in the Board of Governors



Source: IMF

Public Goods Provision

Currency Distribution of Global Foreign Exchange Market Turnover



Source: BIS Triennial Central Bank Survey

Dynamics within Asia Pacific

Regionalism? Great Power Competition?

- ASEAN Economic Community, TPP, RCEP
- Chiang Mai Initiative, ABMI, AMRO $\Rightarrow$ Asian Monetary Fund?
- ADB, AIIB

The Rise of China

- Public good provision: US no longer capable but China reluctant?
- Implication for the hegemonic structure, particularly to East Asia?

Alesina and Spolaore (1997)

- "On the Number and Size of Nations"
- A unit mass of citizens who pay taxes for public goods provision
- Each public good constitutes a nation
- The utility of an individual depends on the "distance" to the public good

This Paper

- Club good: excludable and non-rival
- Two modes of public good provision
  - A hegemon single-handedly provides the club good
  - A coalition provides club good for its members
- Discrete countries in $\mathbb{R}^2$ (vs a unit mass of citizens on $[0, 1]$)
- Consensus voting (vs. majority voting)
- Non-cooperative and cooperative game

Setting

- N countries $\{\mathbf{x}_1, \mathbf{x}_2, ..., \mathbf{x}_N\}$ represented by N points on $\mathbb{R}^2$.
- Total income of country i:

$$I_i(g) = y_i + g(1 - \alpha_i(g)d_i(g)) - t_i(g)$$

where y_i the endowment
g is the public good
$d_i(g)$ is the distance of i from g
$t_i(g)$ is the fee paid to use g

- g is a fixed type of club good.
- $t_i(g) = t(g)$ for all users of g.
- We assume $\alpha_i(g) = \alpha$.

Setting

Each country faces a discrete maximization problem

$$\underset{g}{\text{maximize}}\ I_i$$

The choice set $\{g\}$ consists of public goods by hegemons or by coalitions.

Hegemons

A hegemon determines the location of public good g.

- A hegemon has income greater than $\bar{k}$
- Under the hegemon H, $d_H(g) = 0$.
- Cost of production is $\bar{k}$. There is no coordination cost for producing g.

Hegemons - Congestion Games

With deterministic hegemons, competition to form hegemonic structure can be analysed using a congestion game $\Gamma = \{S_N, R, A, I\}$ where:

1. The players are N countries in S_N
2. The set of resources $R = \{H_1, H_2, ..., H_n\}$ consisting of n potential hegemons, $n \leq N$.
3. $A = \prod_{i=1}^{N} A_i$ where A_i is the set of strategies for player i. $A_i = \{\emptyset, \mathbb{1}_{H_1}, \mathbb{1}_{H_2}, ..., \mathbb{1}_{H_n}\}$
4. I is the set of incomes in response to the element in A.

Hegemons - Congestion Games

With the explicit form of utility, the exact potential of the game can be defined as:

$$\Phi(a_1, a_2, ..., a_N) = \sum_{i=1}^{N} g_{H^i}(1 - \alpha l_{H^i i}) - \sum_{j=1}^{n} \bar{k} \left(1 + \frac{1}{2} + ... + \frac{1}{n_{H_j}}\right)$$

which satisfies

$$\forall a_i, a_i^{'} \in A_i, \forall a_{-i} \in A_{-i}$$
$$\Phi(a_i, a_{-i}) - \Phi(a_i^{'}, a_{-i}) = I_i(a_i, a_{-i}) - I_i(a_i^{'}, a_{-i})$$

Hegemons - Congestion Games

Well-defined solution concepts

- There exists a Nash equilibrium
- With a finite number of players and finite number of strategies, we can make finite number of “improvement steps” to reach a Nash equilibrium

Coalitions - Hedonic Games

- For S_N, define coalition partition as $\Pi = \{S_1, S_2, ..., S_l\}$ such that S_k's are disjoint and $\bigcup_{i=1}^{l} S_k = S_N$.
- Each $S_k = \{\mathbf{x}_1, \mathbf{x}_2, ..., \mathbf{x}_k\}$ produces public good as a coalition.
  - The location of g

$$\mathbf{x}_g = \frac{\mathbf{x}_1 + \mathbf{x}_2 + ... + \mathbf{x}_k}{k}$$

$$\mathbf{x}_g \text{ minimizes } D = \sum_{j=1}^{k} |\mathbf{x} - \mathbf{x}_j|^2$$

  - Besides $\bar{k}$, S_k incurs a coordination cost, $C(S_k)$, to produce g
- Hedonic property: for each x_i, there is a preference relation $\succeq_i$ over $\{S_\Pi(i)\}$ which depends solely on the membership of the coalitions

Coalitions - Hedonic Games

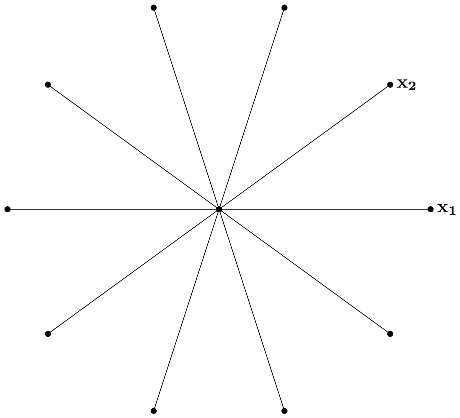
Stability concepts

- Nash stability (Nobody wants to move)
- **Core stability**: Π is core stable if there is no $T \subset S_N$ such that $T \succeq_i S_{\Pi}(i)\ \forall x_i \in T$, with at least one strict preference
- Core stability $\nRightarrow$ Nash stability $\nRightarrow$ Core stability (Bogolmanaia and Jackson (2002))

Coalitions - Hedonic Games

- Sufficient conditions for core stability by Bogolmanaia and Jackson (2002) and Banerjee, Konishi and Sonmez (2001)
- This paper develops a “proposing algorithm” to find the core stable coalition if it exists

Countries on Arcs



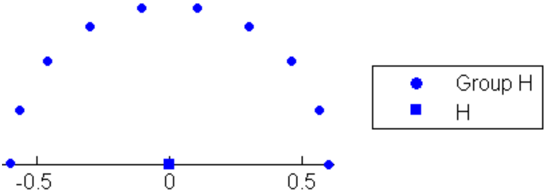
Countries on Arcs

Comparative Statics

- Fix the location of two hegemons
- For a given r, find the range of θ for which different structures arise.

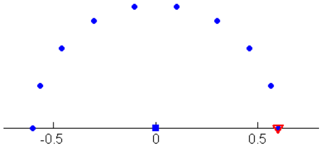
Simulation - One Hegemon

$g = 5, \bar{k} = 7, \alpha = 1, N = 11$

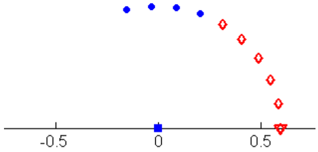


$r = 0.6, \theta = \frac{\pi}{9}$

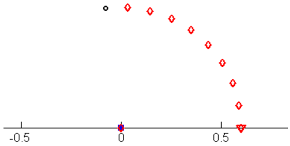
Simulation - Competing Hegemons



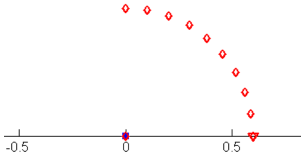
(a) $\theta = \frac{\pi}{9}$



(b) $\theta = \frac{7\pi}{108}$

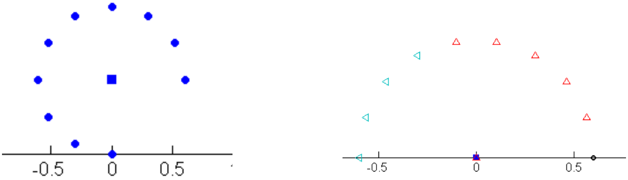


(c) $\theta = \frac{13\pi}{216}$

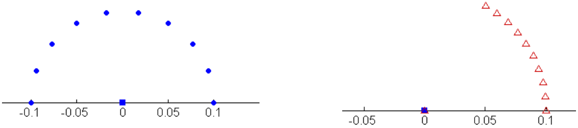


(d) $\theta = \frac{\pi}{18}$

Simulation - Incumbent Hegemon versus Coalitions



$r = 0.8$



$r = 0.1$

Simulation - Hegemons and Coalitions