

A Game-Theoretic Model of Transactions Within and Between Collectivist Communities Without Third-Party Enforcement

Ke-young Chu
Kyung Hee University, Seoul, Korea

Perspectives on Economic Growth and Development

- Neoclassical economics (NE)

economic growth =

factor accumulation and technical progress

- New institutional economics (NIE)

economic growth =

expansions in exchange, specialization, and production,
development of formal and informal institutions (rules of the game), and
reduction in transaction costs

3 stages of institutional development

1. Intra-community transactions (without *formal* 3rd-party enforcement)
2. Inter-community transactions (*without* 3rd-party enforcement)
3. *Anonymous* transactions over a wide area (with *formal* 3rd-party enforcement)

Stage-2 Transaction Institutions: Examples

- In history
 - Medieval inter-city transactions: community responsibility system
- In the present world
 - Group loans (e.g., Shanxi loans in China, Grameen Bank operation in Bangladesh)
 - Institutional or contractual engineering
 - Store chains
 - Korean chaebol-bank relations
 - International lending

Stage-2 Institutions: Issues and Existing Studies

- Issues
 - How do stage-2 institutions (S2Is) allow agents to achieve mutual cooperation without 3rd-party enforcement between changing players?
 - What role can S2Is play in the building of efficient institutions?
- Existing studies: game models, collective punishment
 - Empirical studies (e.g., Karlan, Besley): intra-community cohesion/altruism
 - Theoretical studies (e.g., Kandori, Greif): self-regarding agents
- Problems in existing studies
 - Empirical studies stress intra-group inter-personal ties, but theoretical studies do not (no explicit role of collectivist values).
 - Theoretical studies do not adequately explain the robustness of stage-2 institutions. Empirical studies do, but rely on an ad hoc, exogenous introduction of ostracism
 - Neither offers a coherent analytical framework that integrates inter-community and intra-community transactions.

A Model of Stage-2 Transactions (1): Playground and Games

- Playground—an economic world: X, Y, and other communities
 - Opportunities
 - *numerous* chances to play *defection-inducing* games, but
 - *rare* chances to play *cooperation-inducing* games
 - Agents' search for opportunities to broaden mutually-beneficial transactions encounter diminishing returns.
- Games of complete information
 - Players play
 - repeated *intra*-community PD games with *fixed* players, but
 - Repeated *inter*-community PD games with *changing* players in *fixed* communities
 - Benefits that
 - each inter-community game offers = large, but
 - intra-community games offer = very large in sum, = small individually

A Model of Stage-2 Transactions (2): Players and Punishment Rules

- Players: collectivist (group-oriented) agents
 - Inter-personal utility spill-over
 - Perceived payoff for $x_i = \sum_j \lambda_{ji} k_{ji}$ (k_{ji} = payoffs; λ_{ji} = weights, $\sum_j \lambda_{ji} = 1$)
 - 2-player, 2-action case
 - Material benefits for x_i and x_j = c, b ,
 - Perceived benefit (utility) for x_i = $\lambda c + (1 - \lambda)b$
 - Group-orientation (e.g., Hamilton Rule, Fehr)
 - Insiders: fellow community members $0.5 < \lambda < 1$
 - Outsiders: members of other communities $\lambda = 1$
- Collectivist social norms: mass retaliation and ostracism
 - Collectivist trigger strategy: a defection of a member of a community triggers *permanent* defections in all future rounds of the inter-community PD games
 - Ostracism: All community members *permanently* ostracize their own community member for a defection in a round of an inter-community game.

Mutual Cooperation Equilibrium in a Repeated Intra-Community Game Between 2 Fixed Collectivist Players

Symmetric material payoffs

	Player x_j	
Player x_i	<u>C</u>	<u>D</u>
C	a, a	b, c
D	c, b	d, d

Perceived payoffs for x_i

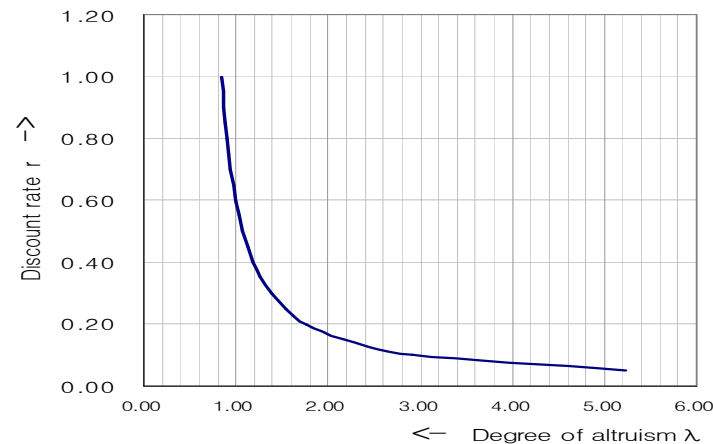
	Player x_j	
Player x_i	<u>C</u>	<u>D</u>
C	a	$\lambda b + (1-\lambda)c$
D	$\lambda c + (1-\lambda)b$	d

Condition for mutual cooperation

$$CC_{\text{intra}(0 \sim \infty)}(i) > DC_{\text{intra}(0)}(i) + DD_{\text{intra}(1 \sim \infty)}(i)$$

with each $j = 1, 2, \dots, J$ ($i \neq j$)

$$r < (a-d) / [\lambda(c-b) - (a-b)]$$



A General Equilibrium Under Stage-2 Transactions Rules: An Overview

Intra-community games for each i

$$CC_{\text{intra}(0 \sim \infty)} > DC_{\text{intra}(0)} + DD_{\text{intra}(1 \sim \infty)} \quad \text{for each } j \ (i \neq j)$$

Inter-community games for each i

Mass retaliation and ostracism imply that,

x_i , when defects in a round (for $t=0$) of an inter-community game, must defect in all intra-community games (for $t=0$).

Let the sum of all intra-community inequalities for i be:

$$CC_{\text{intra}(0 \sim \infty)} > DC_{\text{intra}(0)} + DD_{\text{intra}(1 \sim \infty)} \rightarrow CC_{\text{intra}(0 \sim \infty)} - \{DC_{\text{intra}(0)} + DD_{\text{intra}(1 \sim \infty)}\} = A$$

Then, x_i 's condition for cooperation will be:

$$CC_{\text{inter}(0 \sim \infty)} + CC_{\text{intra}(0 \sim \infty)} > DC_{\text{inter}(0)} + DD_{\text{inter}(1 \sim \infty)} + DC_{\text{intra}(0)} + DD_{\text{intra}(1 \sim \infty)}$$

$$CC_{\text{inter}(0 \sim \infty)} > DC_{\text{inter}(0)} + DD_{\text{inter}(1 \sim \infty)} - [CC_{\text{intra}(0 \sim \infty)} - \{DC_{\text{intra}(0)} + DD_{\text{intra}(1 \sim \infty)}\}]$$

$$CC_{\text{inter}(0 \sim \infty)} > DC_{\text{inter}(0)} + DD_{\text{inter}(1 \sim \infty)} - A, \text{ where } A > 0$$

Meaning, Nature, and Role of A

$$CC_{inter(0 \sim \infty)} > DC_{inter(0)} + DD_{inter(1 \sim \infty)} - A \quad (A > 0)$$
$$A = CC_{intra(0 \sim \infty)} - \{DC_{intra(0)} + DD_{intra(1 \sim \infty)}\}$$

- Meaning for x_i
 - discounted present value of the future stream of net payoffs (a–d) from mutual cooperation with fellow community members
 - member's share of social capital
- Nature
 - x_i 's share of the community's social capital
 - collateral deposited with the community
- Role
 - mutual cooperation in inter–community games under *weaker* conditions than in the absence of social capital
 - *collectivist* social norms (mass retaliation, ostracism) are essential elements

Efficiency Implications, Limitations, and Other Examples of Stage-2 Transactions

- Efficiency implications: Stage-2 institutions allow agents to expand exchange without 3rd-party rules.
- Limitations: Communities must be relatively small; a large community would engender moral hazards.
- Other examples that mimic stage-2 institutions
 - chain stores (Akerlof): contractual engineering (brand names)
 - chaebol: financial engineering (cross ownership, cross guarantees)
 - International lending: country risks?

Analytical Features

- The model shows
 - conditions for mutual-cooperation equilibriums in inter-community transactions by building on a micro-foundation.
 - that a simple aggregation of the behavior of representative individuals yields a *quantitatively* misleading conclusion.
- The aggregation problem for modeling games between collectivist agents resemble the problem of
 - group selection vs.
 - kin selection.

Possible Extensions

- Cooperation and conflicts
 - Contrary to the world dealt with in the model, members of some collectivist groups are in severe inter-group conflicts.
 - In this case, collectivist values promote mutual defection inter-community equilibriums. How? Role of collectivist social norms?
 - Some societies have successfully used *hybrid political groups* to solve inter-group conflicts:
 - Cleisthenes Constitution in Athens
 - U.S. Senate
 - Group Representation Constituencies in Singapore
- Development of institutions
 - Stage-2 social norms *have evolved over time.*
 - Hybrid political groups *have been introduced through institutional engineering.* Role of institutional entrepreneur as strong reciprocators?
 - What lessons can be learn from these two roads to inter-group cooperation?