

Optimal Provision OF Regional Public Goods
in Asia and the Pacific
Asian Development Bank
December 14, 2017

Field Experimental Approach to Voluntary Contribution to Public Goods: Social Capital as Regional Public Goods

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Outline

1. Regional public goods,
social capital and PD game
2. Social capital as a driver of
PG provision
3. Measuring social capital and
public goods game
4. Social capital as a source of
regional public goods

Regional Public Goods (RPG)

- **Public goods**: goods characterized by non-rivalry (joint use) or non-excludability (non-alienability)
- **Global public goods**: An unlimited number of people can use jointly
- **Local public goods**: limited usage to a particular group, e.g., a village
- **Regional public goods** are located in-between, involving **multiple-countries**
 - **Positive spillovers**
 - Trade facilitation and FTAs/RTAs
 - Coordinated cross-border transport and power infrastructure
 - Coordinated monetary policies
 - **Negative externalities**
 - Climate change mitigation and adaptation (clean energy and environmental protection)
 - Coordinated disaster prevention and response (flood control such as riparian and watershed management; satellite-based monitoring system; epidemics control)
 - Security (regional peacekeeping; anti-corruption and good governance)
 - Human and drug trafficking
 - Anti-money laundering

Attributes of:	Embodied in:	
	Physical goods	Humans
Private goods	Private physical capital = alienable/tradable goods <i>e.g., machines & factories</i>	Private human capital = personal work skills & patentable knowledge
Local public goods	Social overhead capital <div style="border: 1px dashed black; padding: 5px; margin: 5px;"> Local infrastructure: <i>e.g., village roads, local schools & municipal drainage systems</i> </div>	Social (relation) capital = informal social relationships
Global public goods	<div style="border: 1px dashed black; padding: 5px; margin: 5px;"> Global infrastructure: <i>e.g., lighthouses & national highways</i> </div>	Global human/social capital non-patentable scientific knowledge, formal institutions, cultural values & ideologies

Regional Public Goods

Figure 1. Classifications of capital

Source: Hayami (2009) *JDS*

Regional Public Goods (RPG)

Table 1 Regional public goods: typology and examples

Aggregation technology	Pure public good	Impure public good	Club	Joint products
<i>Summation</i> : Overall level of public good equals the sum of countries' contributions.	Cleansing a local ecosystem	Treatment of diseased patients	Regional parks	Preserving rain forests
<i>Weighted sum</i> : Overall level of public good equals a weighted sum of countries' contributions.	Curbing the spread of an infectious disease	Reducing acid rain	Power network	Eliminating insurgency
<i>Weakest link</i> : Smallest contribution determines the good's aggregate level.	Maintaining the integrity of a network	Surveillance of regional disease outbreak	Air-traffic control	Security intelligence
<i>Weaker link</i> : Smallest contribution has the greatest influence on the good's aggregate level, followed by the second smallest contribution, and so on.	Applying prophylactic measures against a regional disease	Inhibiting the spread of an agricultural pest	Transportation infrastructure	Internet connectivity
<i>Threshold</i> : Benefits from the public good only arise once the cumulative quantity of the good surpasses a certain level.	Regional flood control	Fire suppression in a region	Crisis-management teams	Regional peacekeeping
<i>Best shot</i> : Largest contribution determines the good's aggregate level.	Curing a region-specific disease	Geoclimatic-specific research findings	Satellite-launch facility (Alcântara)	Remote sensing of hurricanes
<i>Better shot</i> : Largest contribution has the greatest influence on the good's aggregate level, followed by the second largest contribution, and so on.	Discovering effective vaccine	Cleaning up an oil spill	Biohazard facility	Bioprospecting

Source) Sandler (2006), Table 1.

Contribution to PG

- Public goods (PG) contribution in N person PD games
 - **Examples**: Free trade regime (against tariff war); Int'l policy coordination (against competitive devaluation/against natural & biological disasters/grab race); Resource management (against tragedy of commons/pollution control); Tax payment
 - A **market failure** model: *Laissez faire* leads to suboptimal outcome

		Player (Country) B	
		C	D
Player (Country) A	C	4, 4	-1, 5
	D	5, -1	0, 0

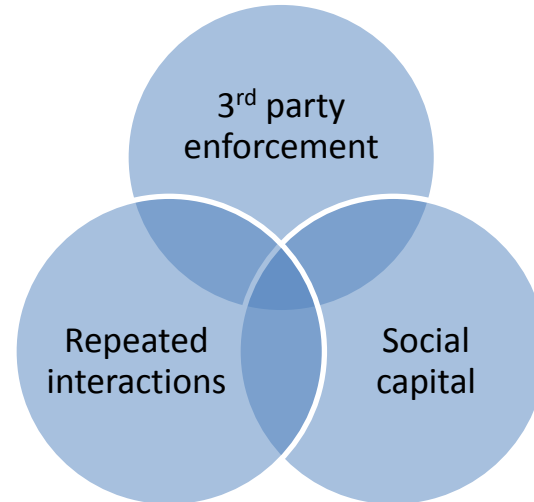
Social optimum (points to 4, 4)

Nash equilibrium (points to 0, 0)

Contribution to PG: How?

1. Third party enforcement

- Rules set by the government
 - Lindahl Equilibrium
 - Groves Clark mechanism
 - Groves Ledyard mechanism
- But government failures



2. Repeated interactions, facilitating self-enforcing cooperation

- Long-term bilateral relationship
- Summit meetings (Robert Putnam); regional forum; community norm (Michi Kandori)
- International organizations with multilateral long-term relationship in fostering supply of PG (Sandler, 2006)

3. Social capital

- Other-regarding preferences (or repeated interactions *a la* Kandori)
- How can we facilitate social capital accumulation? - “Artifacts” such as infrastructure and institution can glue people (countries) together

The Trinity of Market, State, and Community

- **SC complements** market transactions and the government's public goods provisions (Hayami, 1989, 2009, *JDS*; Bowles and Gintis, 2002 *EJ*)



Source) Hayami (2009)

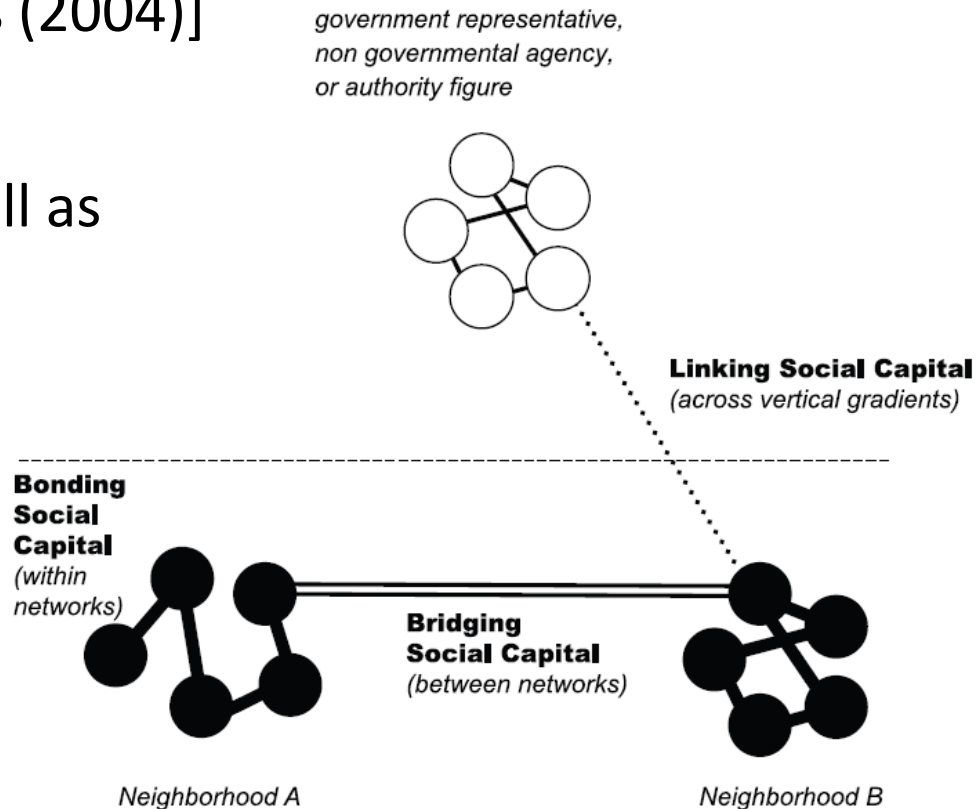
Figure 2. The community, the market, and the state in the economic system

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Social Capital (SC)

- The informal forms of institutions and organizations based on social relationships, networks and associations that create shared knowledge, mutual trust, social norms, and unwritten rules [Durlauf and Fafchamps (2004)]
- Network within/across rural communities and firms as well as SNS (FB etc)
- Plays an important role in supplying and maintaining regional PG
- Three modes:
 - Bonding SC
 - Bridging SC
 - Linking SC



SC

- Extensive studies on SC in political science, sociology, public health, and economics.
 - Political science: Robert Putnam
 - Sociology: James Coleman
 - Economics: Glenn Loury
 - Public Health: Ichiro Kawachi and S. V. Subramanian
- Mancur Olson: “Dark side” of SC-- SC can generate negative impacts.
- Dasgupta, Partha and I. Serageldin, eds., (1999), Social Capital: A Multifaceted Perspective World Bank.
 - Kenneth Arrow, Robert Solow, and Elinor Ostrom criticized the ambiguity of definition of SC although they all agree the importance of “trust” in real life.
 - Ken Arrow: To be called “capital,” (a) extension in time; (b) deliberate sacrifice in the present for future benefit; and (c) alienability (transferability of property rights) are needed. SC does not meet these, especially (b).

SC and Growth

- Barro regression using a subjective question on SC (*GSS trust*) by Knack and Keefer (1997)

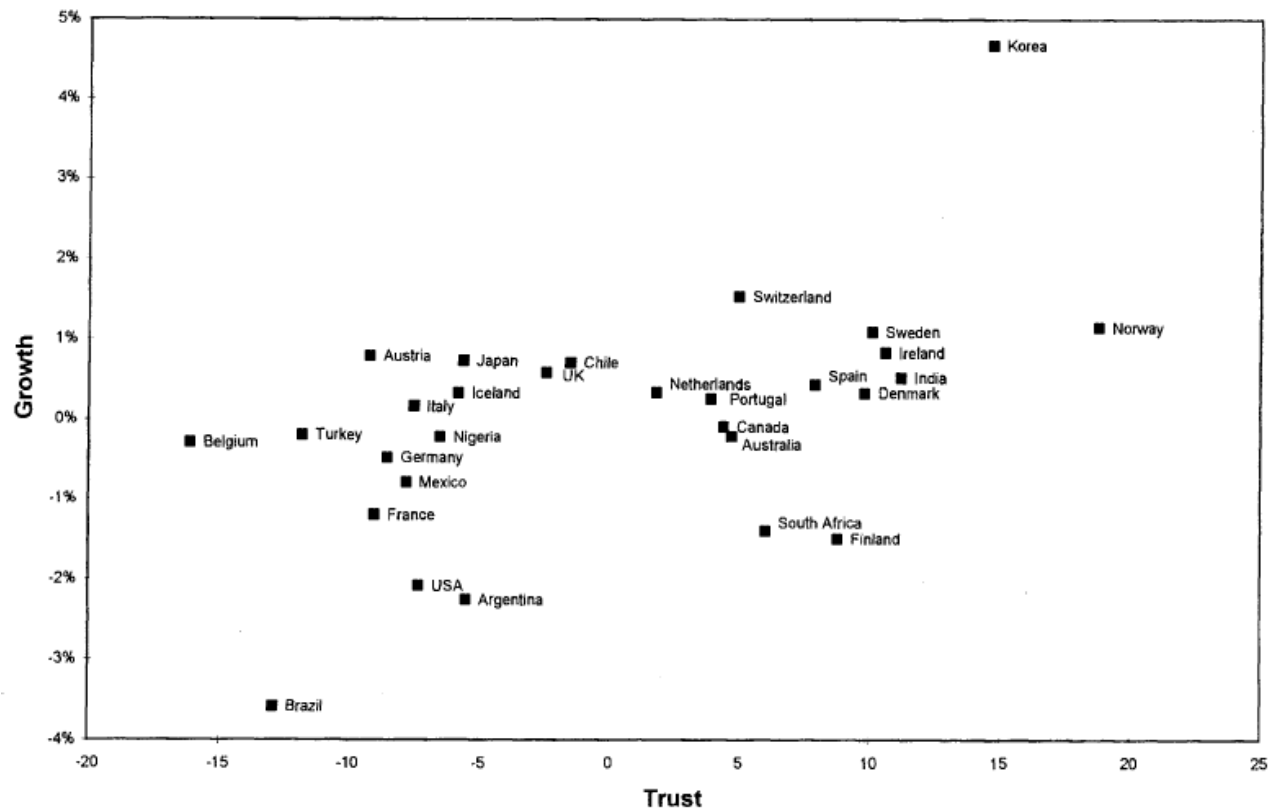


FIGURE II
Partial Regression Plot: Growth(1980–1992) and Trust

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Measuring SC?

I) Subjective assessments/response:

- Attitudinal measures
 - GSS (trust, fair, and help)
- Behavioral measures
- Participation measures

II) Proxy variables

- Ex) # of blood donations & crime rate

III) Lab or Artefactual Field Experiments

- Monetary-incentivized

Survey question	Mean
<i>Attitudinal Measures of Trust:</i>	
Most people can be trusted	0.313
Most people try to be fair	0.333
Most people try to be helpful	0.313
You can't trust strangers anymore	0.521
I am trustworthy	0.917
<i>Behavioral Measures of Trust:</i>	
Often leave door unlocked	0.438
Ever loan money to strangers	0.188
Often loan money to friends	0.646
Ever victim of a crime	0.313
Never lie to parents, friends, etc.	0.596
<i>Participation measures</i>	
Hours volunteering in an average week	5.598
Hours volunteering in the last week	1.792
Number of voluntary groups	2.479
Attend religious services (times per month)	1.77
Ever volunteer for a political campaign	0.149
Voted in 2002	0.521
Number of friends	6.304

Source) Anderson et al. (2004)

III) Lab and Artefactual Field Experiments

- A field experiment is defined as a scientific method to experimentally examine the effect of an (policy) intervention in the real world rather than in the laboratory.
- Largely speaking, there are three categories of field experiments: artificial, framed, and natural field experiments.
 - Fig. 1 of Levitt and List (2009) shows three field experiments in the middle:

S.D. Levitt, J.A. List / European Economic Review 53 (2009) 1–18

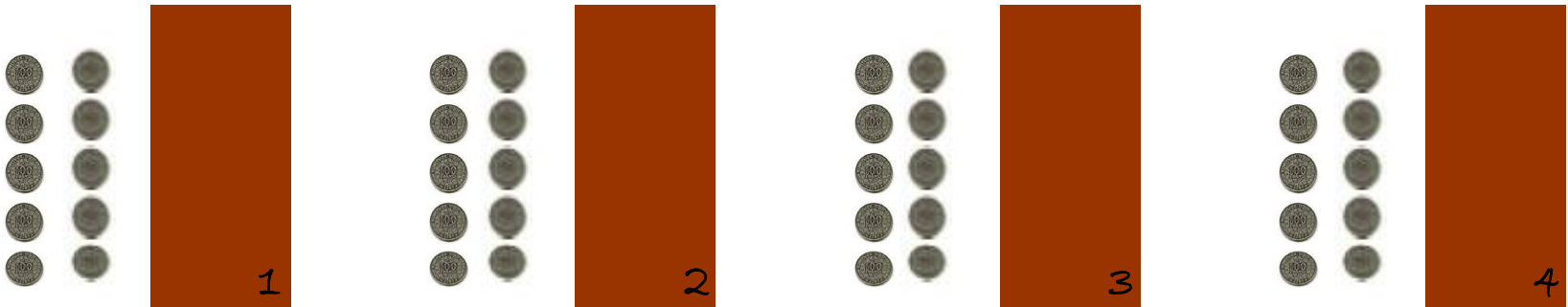
	Controlled Data			Naturally-Occurring Data
Lab	AFE	FFE	NFE	NE, PSM, IV, STR

III) Lab and Artefactual Field Experiments

- ❑ Dictator Game to elicit altruism
- ❑ Trust game to elicit trust and trustworthiness
- ❑ Public goods game to elicit voluntary cooperation
- ❑ Ultimatum game to elicit guilt aversion and envy aversion
- ❑ Other games:
 - ❑ Risk game to elicit risk aversion
 - ❑ Time preference game to elicit time discounting rate

Public Goods Game (PGG)

- Initially, each participant receives 10 coins of 10 PHP to put into the public pot.



- Then decides *secretly* how much to keep and how much to contribute to the pot (public goods).
- Total amount put in the pot will be doubled.
- Then equally divided back to each participant.

PGG

π_i = Total payoff of a person i

- Y_i = contribution amount by a person i

- Values:

- $E = 100$ PHP

- $\rho = 2$

- $N = 4$

$$\pi_i = (E - Y_i) + \frac{\rho}{N} \sum_{i=1}^N Y_i$$

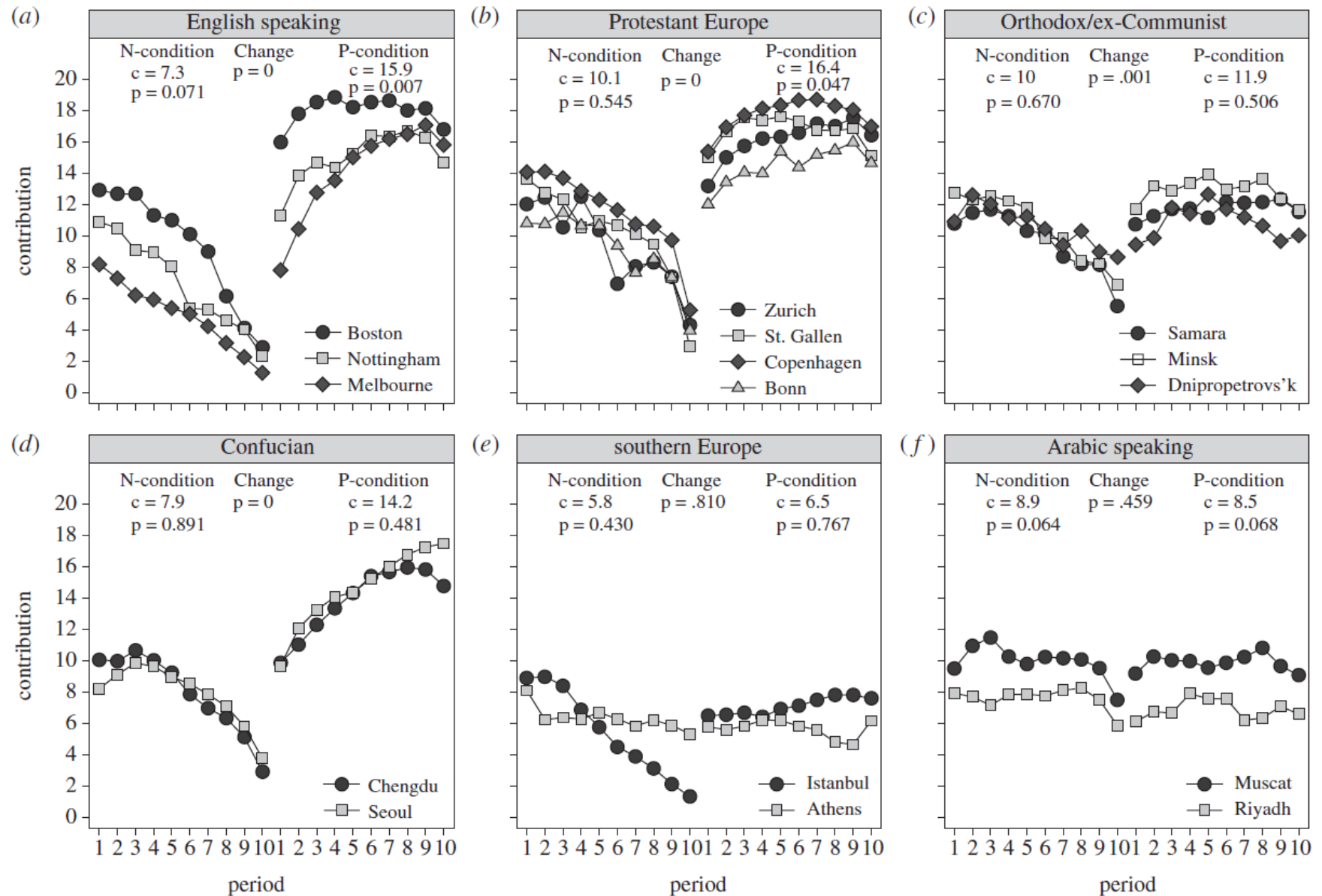
- $\partial \pi_i / \partial Y_i = -1 + (\rho/N) < 0$ when $1 < \rho < N$.

- Nash equilibrium: $Y_i = 0 \forall i$, so $\pi_i > 0$ shows voluntary reciprocal cooperation**

Table 1. Cooperation in developing countries

Game	Study	Location	Students	Mean cooperation
VCM	Andreoni (1995)	United States	Yes	33% of endowment
VCM	List (2004)	United States	No	32% of endowment – young
			No	43% of endowment – old
VCM	Barr (2001)	Zimbabwe	No	48% of endowment, 52% ^a
VCM	Barr and Kinsey (2002)	Zimbabwe	No	53% of endowment – women
		Zimbabwe	No	48% of endowment – men
VCM	Carpenter et al. (2004a)	Vietnam	No	72% of endowment, 76% ^a
		Thailand	No	61% of endowment, 73% ^a
VCM	Ensminger (2000)	Kenya	No	58% of endowment
VCM	Gaechter et al. (2004)	Russia	Yes	44% of endowment
		Russia	No	52% of endowment
VCM	Henrich and Smith (2004)	Peru	No	23% of endowment
		Chile-Mapuche	No	33% of endowment
		Chile-Huinca	No	58% of endowment
VCM	Karlan (2005)	Peru	No	81% of endowment ^b

Source) Cardenas and Carpenter (2008)



GSS and PGG

- PGG can be implementable only with smaller number of subjects. Do we have a **good proxy**?
- Anderson et al. (2004) *AER*: a total of 48 students were recruited from undergraduate classes at the College of William and Mary to participate in **public goods (PG) game**
 - Frequently employed measures of social capital are significant determinants of contribution levels in a canonical **PG experiment**

TABLE 1—SURVEY RESPONSES REGARDING TRUST AND TOKENS CONTRIBUTED IN A PUBLIC-GOODS EXPERIMENT

Survey question	Mean	Marginal effect
<i>Attitudinal Measures of Trust:</i>		
Most people can be trusted	0.313	0.697 (2.63)
Most people try to be fair	0.333	0.588 (3.36)
Most people try to be helpful	0.313	−0.918 (3.71)
You can't trust strangers anymore	0.521	−1.791 (5.96)
I am trustworthy	0.917	−1.036 (4.21)
<i>Behavioral Measures of Trust:</i>		
Often leave door unlocked	0.438	−1.200 (5.65)
Ever loan money to strangers	0.188	0.935 (3.91)
Often loan money to friends	0.646	−0.789 (1.77)
Ever victim of a crime	0.313	−1.607 (4.48)
Never lie to parents, friends, etc.	0.596	0.866 (3.89)

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SC as RPG

1. Existing literature on cross-border (cross country/cross-cultural) public goods

- Heterogeneities in PG contribution across countries/ethnicities/cultures (Gatcher et al, 2010)
- High levels of country/ethnic diversity lead to low levels of public goods provision (Castroab, 2008; Cadsby et al., 2006)/

2. Specific mechanisms to stimulate contribution?

- Enforcement devices (punishment opportunities)
- Enabling “artifacts”
 - Alexander and Fotini (2011) *Science*: Sanctions succeed only in integrated institutional environments.
 - Habyarimana et al. (2007) *APSR*: By comparing “preferences,” “technology,” and “strategy selection” mechanisms, a technology mechanism is important among co-ethnics

SC as RPG: Measurement?

Empirical strategy: To identify **causal** relationship from access to “**artifacts (A)**” to **RPG contribution (RPG)** capture by SC:

$$Y = f(RPG),$$
$$RPG = g(A),$$

where Y is a set of outcomes, e.g., trade, growth, poverty reduction etc..

Data:

- Artifacts = access to infrastructure, treaties, agreements, institutions
- RPG = GSS trust and related proxies for regional public goods supply

Relevant Data Sets

- Asian Barometer
- World Values Survey
- Demographic and Health Surveys
- Economist Intelligence Unit
- European Social Survey
- International Country Risk Guide
- International Social Survey
- London School of Economics Annual Civil Society Yearbook

* Some of these data sets can be accessed through “Indices of Social Development”

Asian Barometer Survey

- The **Asian Barometer Survey (ABS)** is an applied research program that aims to gauge public opinion on issues such as political values, democracy, and governance across Asia.
- **Country coverage:**
 - South Asia: (1) India; (2) Bangladesh; (3) Nepal; (4) Pakistan; (5) Sri Lanka
 - East Asia: (6) Taipei, China; (7) People's Republic of China; (8) Japan; (9) Republic of Korea; (10) Mongolia; (11) Hong Kong, China; (12) Philippines; (13) Thailand; (14) Indonesia; (15) Singapore; (16) Malaysia; (17) Viet Nam; (18) Cambodia; (19) Myanmar
- **Year coverage:** 2001–2016
- A model Asian Barometer Survey has a sample size of **1200 respondents**, which allows a minimum confidence interval of plus or minus 3 percent at 95 percent probability.

World Values Survey

- The **World Values Survey (WVS)** is a global research project that explores people's values and beliefs, how they change over time, and what social and political impact they have. Thousands of political scientists, sociologists, social psychologists, anthropologists, and economists have used these data to analyze such topics as economic development, democratization, religion, gender equality, social capital, and subjective well-being.
- Country coverage: nearly 100 countries which contain almost 90% of the world's population
- **Year coverage:** 1981–2014
- Minimum sample size – i.e., the number of completed interviews which are included into the national data-set in most countries – is **1200**.

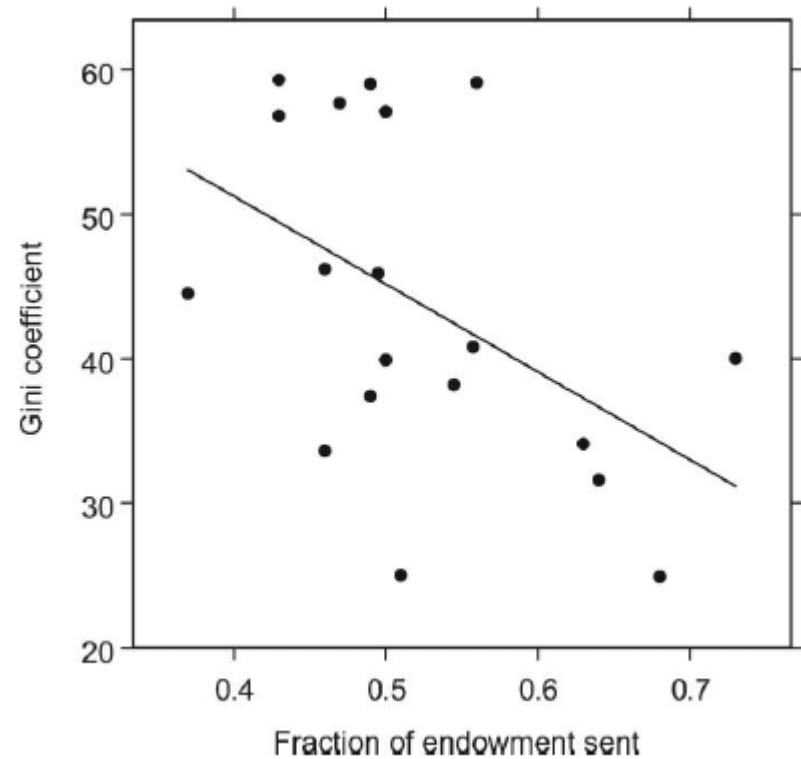
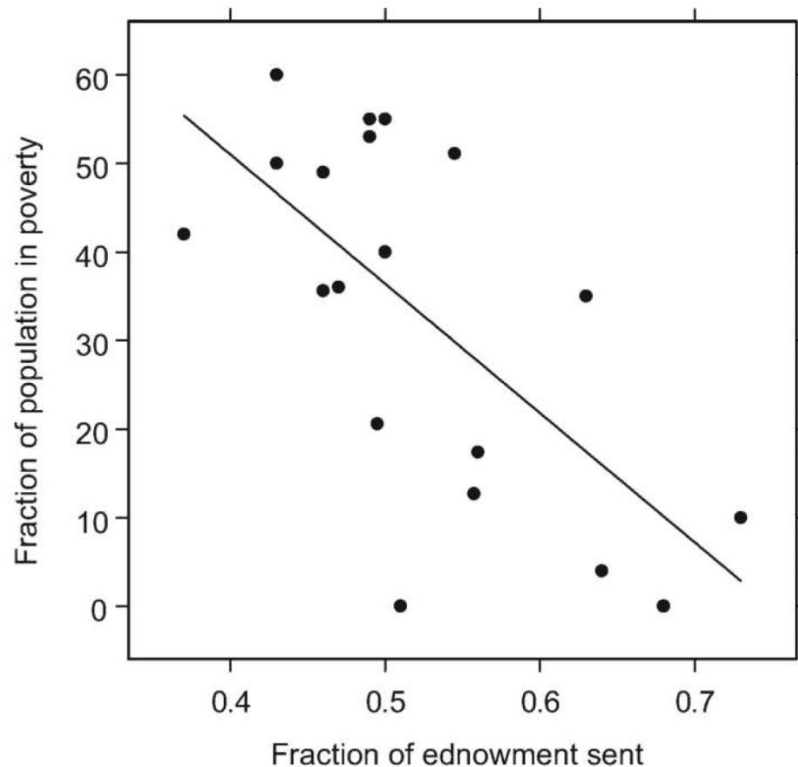
Remarks

1. How to overcome **PD**, i.e., a market failure (and government failure)?
2. **Third party** enforcement by treaties
3. **Repeated interactions** by regional forum
4. Nurturing **social capital** by “artifacts” e.g., infrastructure and institution
5. Methodologically, “**field experiments**” very powerful and insightful (e.g., PGG)
6. **Social capital** as a source of **regional public goods**, quantifiable using large-scale socio-economic data sets

- Appendix

SC Captured by “Trust” in Trust Game and Poverty and Inequality

* Trust game is an experiment based on a PD game



Source) Cardenas and Carpenter (2009) *JDS*

Social Rate of Returns to SC

- Ishise and Sawada (2009) estimate social rate of returns to SC:
 - Low in high income countries, “dark side”
 - High in low income countries, complementing market and government failures-“Trinity” of market, state, and communities

H. Ishise, Y. Sawada/Journal of Macroeconomics 31 (2009) 376–393

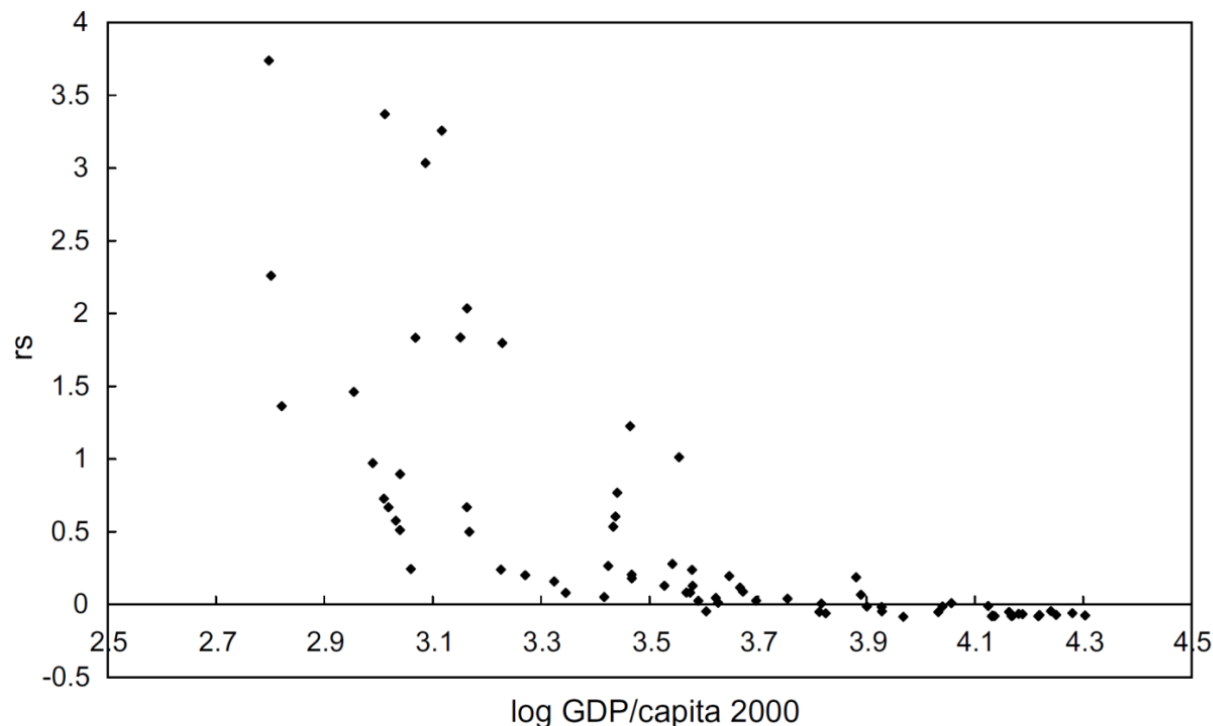


Fig. 6. Log of GDP per capita (2000) and return to social capital (NEWS).