Intergenerational sustainability dilemma and a potential solution: Future ahead and back mechanism

Shibly Shahrier, Ph.D., Researcher, Research Institute for Humanity and Nature, Kyoto, Japan

The flow of the presentation

The flow of the presentation: Research Issues

- ▶ How the individual social preferences/level of prosociality change with the ongoing modernization of societies under the market economy and democracy?
- ▶ How this change affects human decision for intergenerational sustainability?
- ▶ How to maintain intergenerational stainability when societies are becoming modernized?

Research issue- i: Social preference and the ongoing modernization of societies

Research issue- ii: Change in social preference, modernization and intergenerational sustainability

Research issue- iii: New mechanism for maintaining intergenerational sustainability

Research issue- i: Social preference and ongoing modernization of societies

Motivation

- Culture-gene coevolutionary theory: Change in culture brings about a change in human behavior (Boyd and Richerson, 1985, Dawkins, 2006, Henrich et al., 2005, Henrich, 2004, Richerson and Boyd, 2008).

- Societies in the developing countries of Asia and Africa are becoming urbanized and modernized at a faster speed (American Association for the Advancement of Science, 2016, Wigginton et al., 2016, McDonnell and MacGregor-Fors, 2016).

- Ongoing modernization of competitive societies can be considered as a change in culture.

Open questions

No study exists regarding human social preference in relation to ongoing modernization of competitive societies.

Question 1
How does the ongoing modernization of competitive societies affect human social preference?

Hypothesis

Figure: *"competition for survival and success"* as a cultural trait or meme, its propagation and more competitive people.
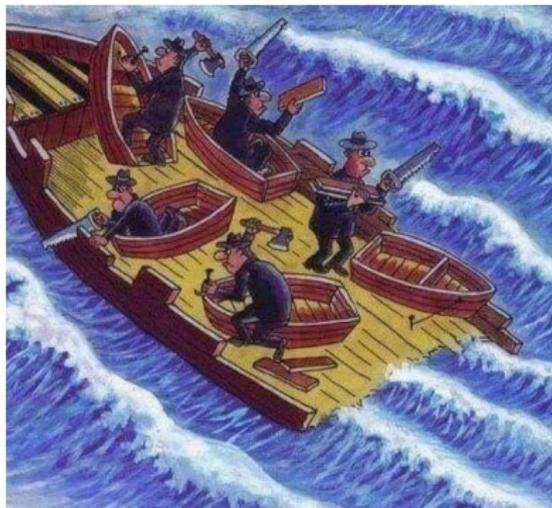
Methodologies

Methodology- i: Experimental treatments

- To include the treatment of ongoing modernization,
  - we conducted survey-experiments in three different regions:
  - Urban areas (modernized), Dhaka
  - Semi-urban areas (transitional), Bogra
  - Rural areas (less-modernized), Dacope.
- To measure individual social preference or choices for the level of competition and cooperation, we use a game of social value orientation (hereafter, SVO) (Van Lange et al., 1997, 2007).

Methodology- ii: The Study Regions

Methodology- iii: Social value orientation game

- ▶ Option 1: You receive 500, and the other receives 100.
- ▶ Option 2: You receive 500, and the other receives 500.
- ▶ Option 3: You receive 560, and the other receives 300.
- ▶ Three orientations: Competitive, Prosocial and Individualistic
- ▶ The complete game consists of such nine questions, each of which consists of three options as introduced above.
- ▶ when at least 6 of 9 of the person's choices are consistent with one of the orientations, he/she is categorized as that orientation.

Methodology- iv: Calculation of the payoff from the game

- **Your choice**

		A	B	C			A	B	C
1.	You get	480	540	480	6.	You get	500	500	570
	Other gets	80	280	480		Other gets	500	100	300
2.	You get	560	500	500	7.	You get	510	560	510
	Other gets	300	500	100		Other gets	510	300	110
3.	You get	520	520	580	8.	You get	550	500	500
	Other gets	520	120	320		Other gets	300	100	500
4.	You get	500	560	490	9.	You get	480	490	540
	Other gets	100	300	490		Other gets	100	490	300
5.	You get	560	500	490					
	Other gets	300	500	90					

- **Your random pair's choice**

		A	B	C			A	B	C
1.	You get	480	540	480	6.	You get	500	500	570
	Other gets	80	280	480		Other gets	500	100	300
2.	You get	560	500	500	7.	You get	510	560	510
	Other gets	300	500	100		Other gets	510	300	110
3.	You get	520	520	580	8.	You get	550	500	500
	Other gets	520	120	320		Other gets	300	100	500
4.	You get	500	560	490	9.	You get	480	490	540
	Other gets	100	300	490		Other gets	100	490	300
5.	You get	560	500	490					
	Other gets	300	500	90					

Empirical results

Result- i: Summary statistics of the three value orientations with respect to study region

Table: Percentage of each social value orientation by study region

	Competitive	Individualistic	Unidentified	Prosocial
Dhaka	32.34	30.84	19.16	17.66
Bogra	23.65	22.46	31.74	22.16
Dacope	17.66	32.63	15.27	34.43
Overall	24.55	28.64	22.06	24.75

Concluding remarks

- The ongoing modernization of competitive societies is a crucial determinant of SVOs.
- Individuals in highly modernized societies survive, achieve, or succeed by competing.
- The idea of "competition for survival and success" as a cultural trait.
- shift from "cooperation for survival and success" to "competition for survival and success."
- Issues require cooperation such as intergenerational sustainability will pose more danger.

Research issue- ii: Change in social preference, modernization and intergenerational sustainability

Motivation

- Intergenerational sustainability is pivotal for the survival of human society, global ecosystem, and genes.
- intergenerational sustainability is unique due to its unidirectional nature.
- competition cannot ensure the most efficient allocation of resources in some cases.
- Saijo (2015) hypothesized that competition and market negatively affects intergenerational sustainability.
- Shahrier et al. (2016) find that with ongoing modernization of competitive societies, the number of proself people increases.

Literature review

- Sherstyuk et al. (2016): Dynamic externality game, infinitely lived decision makers versus multiple generations:
  - Multiple generations setting makes dynamic externalities more challenging.
  - Intergenerational learning and history may be positive or negative.
- Hauser et al. (2014): The laboratory experiment of intergenerational goods game, unregulated versus median voting:
  - Voting or democracy promotes intergenerational sustainability.
- Kamijo et al. (2017) design and implement a laboratory experiment of intergenerational sustainability dilemma game:
  - imaginary future generation improves intergenerational sustainability.

Open questions

Question 2

How does the ongoing modernization of competitive societies affect intergenerational sustainability?

- ▶ The determinants of intergenerational sustainability:
  - ▶ Actions of the previous generations
  - ▶ Social preference.

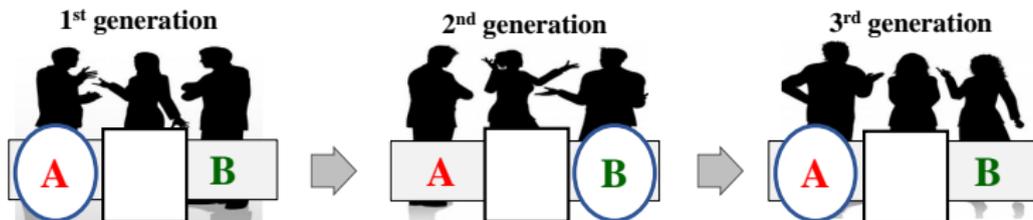# Methodology

Methodology-i: Experimental sessions and treatment

- Intergenerational sustainability dilemma game (hereafter, ISDG)
  - Treatment: Rural (less-modernized)
  - Control: Urban (Modernized)
  - experimental sessions, rural = 14, and, urban = 14.
  - In each session = 6 generations, in each generation = 3 subjects.
  - Payment: Experimental money = USD 5.12 on an average.
  - Randomization, anonymity across generations, and outgroup setting.

Methodology-ii: Decisions in the game

► Two decisions
  ► "AB game" (Choice between 'A' and 'B'): A = X; B = X - 300.
  ► "Split game": split the money among the generation members (Initial endowment = 300 points).
  ► The more point you get the more money you earn.
  ► Determining generation membership: The chip you picked indicates the following type of information:

  G3-2.

How the decision of a generation affects subsequent generations?

1st generation **2nd generation** **3rd generation**

A   B   A   B   A   B   ...

When members of a generation choose option A, the payoff of the next generation on option A and B reduces by 300.

A. 600
B. 300

A. 900
B. 600

A. 900
B. 600

A. 1200
B. 900

If they choose option B, no change in the next generation's payoff.

A. 1200
B. 900

A. 900
B. 600

A. 1200
B. 900

...
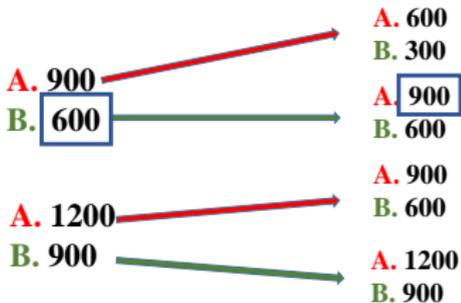
Methodology-iii: First mechanism to maintain intergenerational sustainability

- Imaginary future generation (hereafter, IFG)
  - The minister of future: Assigning a member in each generation as a representative of the subsequent generations.
  - 7 sessions in urban and 7 sessions in rural.

Results

Result-i: Percentage of choices

Table: percentage of group choice A and B

	A	B	Overall
Urban	70.24	29.76	100
Rural	20.24	79.76	100

Result-ii: With and without IFG in urban and rural

Table: Percentage of group choice *A* and *B* between the urban and rural areas with and without imaginary future generations (IFG)

| | Urban | | Rural | |
	with IFG	without IFG	with IFG	without IFG
A	69.05	71.43	14.29	26.19
B	30.95	29.57	85.71	73.81
Subtotal	100	100	100	100

Result-iii: Prosocial member per generation

Table: Distributions in the number of prosocial members per generation between the urban and rural areas

Number of prosocial members in one generation	Number of generations	
	Urban	Rural
0	53	12
1	15	34
2	12	34
3	4	4
Subtotal	84	84

Concluding remarks

▶ As societies become more modernized under market and democracy, intergenerational sustainability tends to be more threatened.

▶ More prosocial people in each generation enhances the intergenerational sustainability.

▶ More prosocial people in rural areas, generations choose more intergenerational sustainability.

▶ IFG fails to improve intergenerational sustainability.

Research issue- iii: New mechanism for maintaining intergenerational sustainability

The new mechanism: Future ahead and back mechanism (hereafter, FAB)

- ▶ The mechanism:
    - ▶ Step one: You are a member of the next generation, request your previous generation to choose one between A and B.
    - ▶ Step two: In the second stage, you will take the decision from your actual position.
    - ▶ If both the decisions are the same, you are done.
    - ▶ Step three: If the two are not the same, majority voting will determine the final decision.
    - ▶ We implemented ISDG with FAB only in a highly modernized society (8 sessions and 48 groups).
    - ▶ Individual interview: individual choice before and after group discussion.

Results

Result- i: Choices under each treatment

Table: Frequency and percentage of generations' choices of options *A* and *B* in Basic ISDG, ISDG with IFG and ISDG with FAB

	A	B	Overall
Basic ISDG	29 (69.05 %)	13 (30.95 %)	42 (100 %)
ISDG with IFG	30 (71.43 %)	12 (29.57 %)	42 (100 %)
ISDG with FAB	7 (14.58 %)	41 (85.42 %)	48 (100 %)

Result- ii: Prosocial member and choices under each treatment

Table: Distributions in the number of prosocial members per generation and percentage of choice B under each treatment

# of prosocial members in one generation	Percentage of choice B			Overall
	Basic	IFG	FAB	
0	11.54% $\left(\approx \frac{3}{26}\right)$	3.85% $\left(\approx \frac{1}{27}\right)$	80.00% $\left(= \frac{12}{15}\right)$	23.53% $\left(\approx \frac{16}{68}\right)$
1	14.29% $\left(\approx \frac{1}{7}\right)$	50.00% $\left(= \frac{4}{8}\right)$	76.00% $\left(= \frac{19}{25}\right)$	60.00% $\left(= \frac{24}{40}\right)$
2	100.00% $\left(= \frac{7}{7}\right)$	100.00% $\left(= \frac{5}{5}\right)$	100.00% $\left(= \frac{8}{8}\right)$	100.00% $\left(= \frac{20}{20}\right)$
3	100.00% $\left(= \frac{2}{2}\right)$	100.00% $\left(= \frac{2}{2}\right)$	-	100.00% $\left(= \frac{4}{4}\right)$
Subtotal	30.95% $\left(\approx \frac{13}{42}\right)$	29.57% $\left(\approx \frac{12}{42}\right)$	85.42% $\left(\approx \frac{41}{48}\right)$	50.00% $\left(= \frac{66}{132}\right)$

Result- ii: SVO and opinion change

Table: Social value orientations and individual opinion changes by percentage in ISDG with FAB

Social value orientation	Individual opinion change				Subtotal
	BB	AA	AB	BA	
Competitive	$0.00\%\left(\approx \frac{0}{33}\right)$	$45.45\%\ (\approx \frac{15}{33})$	$54.55\%\ (\approx \frac{18}{33})$	-	$100.00\%\left(\approx \frac{33}{33}\right)$
Prosocial	$82.93\%\left(\approx \frac{34}{41}\right)$	$4.88\%\ (\approx \frac{2}{41})$	$12.20\%\ (\approx \frac{5}{41})$	-	$100.00\%\left(\approx \frac{41}{41}\right)$
Individualistic	$5.36\%\left(\approx \frac{3}{56}\right)$	$23.21\%\ (\approx \frac{13}{56})$	$71.43\%\ (\approx \frac{40}{56})$	-	$100.00\%\left(\approx \frac{56}{56}\right)$
Unidentified	$7.14\%\left(\approx \frac{1}{14}\right)$	$35.71\%\ (\approx \frac{5}{14})$	$57.14\%\ (\approx \frac{8}{14})$	-	$100.00\%\left(\approx \frac{14}{14}\right)$
Overall	$26.39\%\left(\approx \frac{38}{144}\right)$	$24.31\%\left(\approx \frac{35}{144}\right)$	$49.31\%\left(\approx \frac{71}{144}\right)$	-	$100.00\%\left(\approx \frac{144}{144}\right)$

Concluding remarks

- ▶ FAB is successful to maintain intergenerational sustainability in highly modernized societies.
- ▶ Memory of role-playing and more logic-based reasoning.
- ▶ It can be used to solve the public goods problems with inter-temporal nature.

American Association for the Advancement of Science (2016). Rise of the city. *Science*, 352:906–907.

Boyd, R. and Richerson, P. J. (1985). *Culture and the evolutionary process*. University of Chicago press.

Dawkins, R. (2006). *The selfish gene*. Oxford university press.

Hauser, O. P., Rand, D. G., Peysakhovich, A., and Nowak, M. A. (2014). Cooperating with the future. *Nature*, 511:220–223.

Henrich, J. (2004). Cultural group selection, coevolutionary processes and large-scale cooperation. *Journal of economic behavior and organization*, 53:3–35.

Henrich, J., Boyd, R., Bowles, S., Camerer, C. F., Fehr, E., Gintis, H., McElreath, R., Alvard, M., Barr, A., Ensminger, J., Heinrich, N. S., Hill, K., Gil-White, F., Gurven, M., Marlowe, F. W., Patton, J. Q., and Tracer, D. (2005). "Economic man" in cross-cultural perspective: Behavioral experiments in 15 small-scale societies. *Behavioral and brain sciences*, 28:795–855.

Kamijo, Y., Komiya, A., Mifune, N., and Saijo, T. (2017). Negotiating with the future: Incorporating imaginary future generations into negotiations. 12:409–420.

McDonnell, M. J. and MacGregor-Fors, I. (2016). The ecological future of cities. *Science*, 352:936–938.

Richerson, P. J. and Boyd, R. (2008). *Not by genes alone: How culture transformed human evolution*. University of Chicago press.

Saijo, T. (2015). *Future design*. Keisoshobo publication Ltd.

Shahrier, S., Kotani, K., and Kakinaka, M. (2016). Social value orientation and capitalism in societies. *Plos One*, forthcoming.

Sherstyuk, K., Tarui, N., Ravago, M. L. V., and Saijo, T. (2016). Intergenerational games with dynamic externalities and climate change experiments. 3:247–281.

Van Lange, P. A., Bekkers, R., Shuyt, T. N., and Vugt, M. V. (2007). From games to giving: Social value orientation predicts donation to noble causes. *Basic and applied social psychology*, 29:375–384.

Van Lange, P. A., De Bruin, E. M., Otten, W., and Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: Theory and preliminary evidence. *Journal of personality and social psychology*, 73:733–746.

Wigginton, N. S., Uppenbrink, J. F., Wible, B., and Malakoff, D. (2016). Cities are the future. *Science*, 352:904–905.