Economic Experiments and Public Policy

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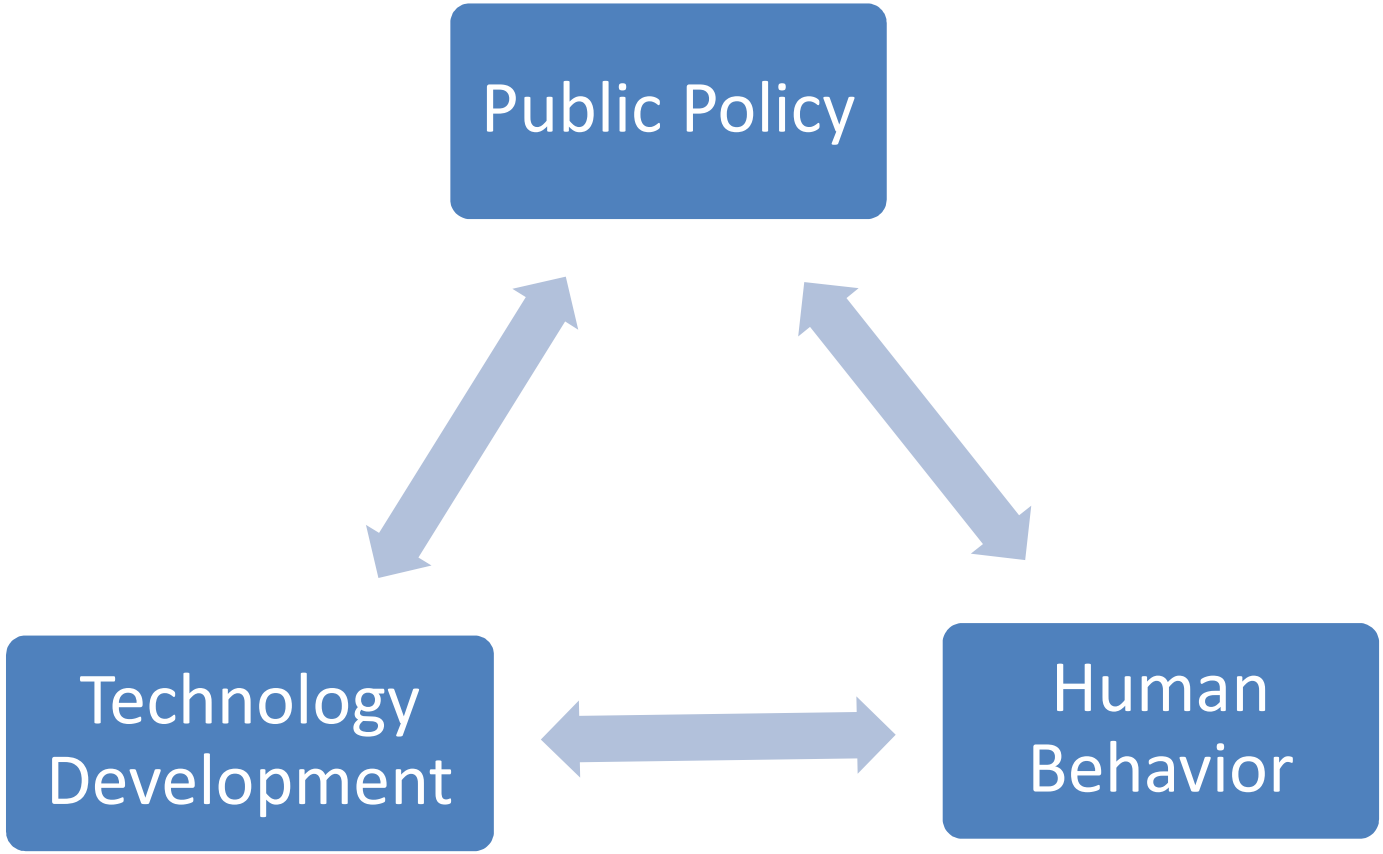
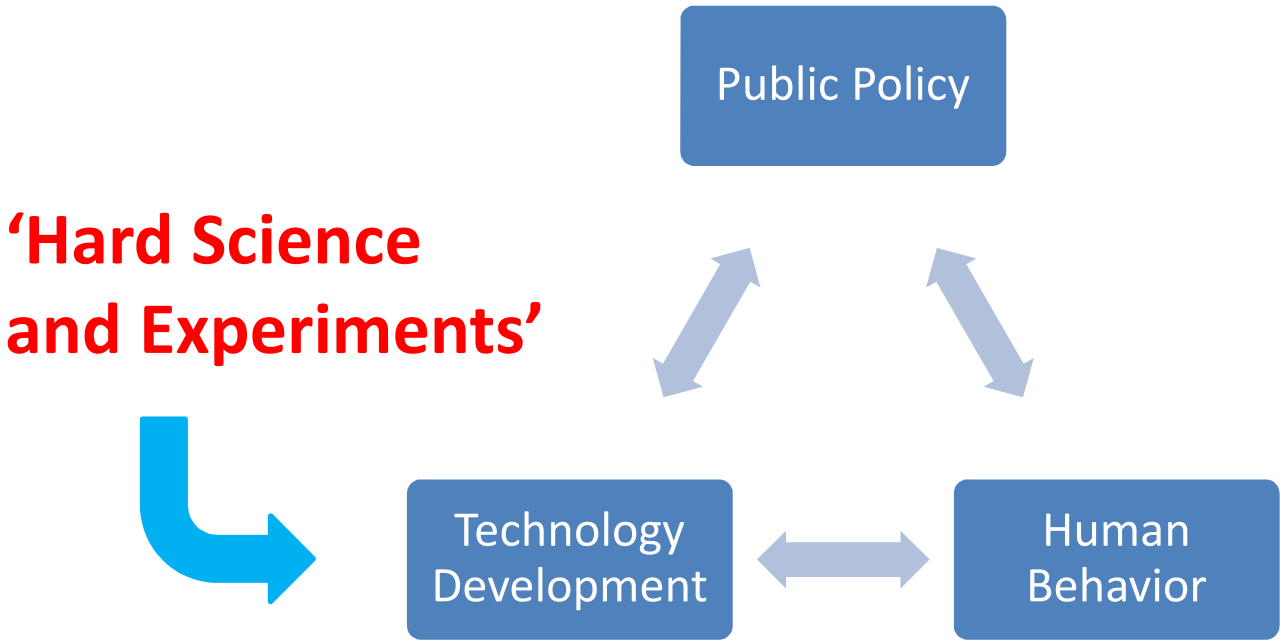
Tripartite for Economic Development



Need for Experiments



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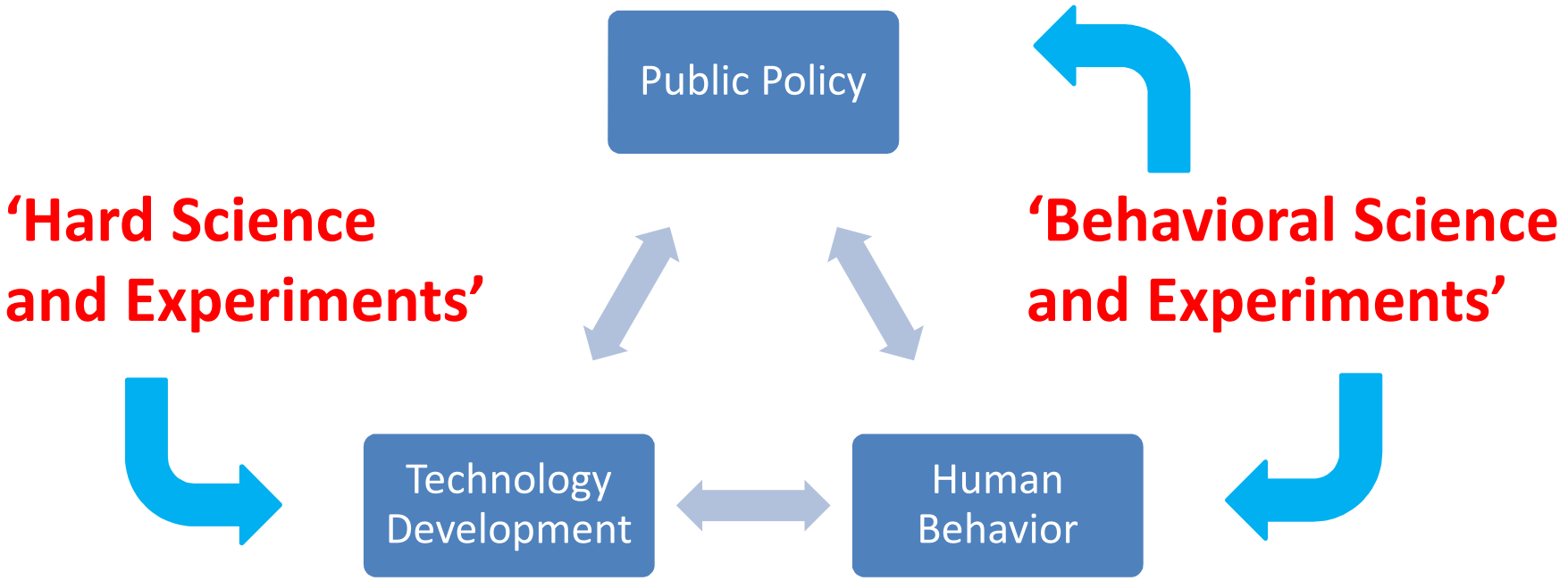


Experiments in Econmics

1. Large-scale social experiments (see, Hausman and Wise, 1985)

   - Public policy program evaluation from late 1960s in Europe and USA
   - Employment programs, electricity pricing, housing allowances, etc.
   - Mostly testing incremental changes to existing programs

2. Experiments in Development Economics (see, Banerjee and Duflo, 2009)

   - Rapid growth in the use of randomized experiments in low-income countries

➢ These two largely aim to speak to policymakers.

Experiments in Econmics

3. Field experiments (see, Levitt and List, 2009)

   - Typically on a smaller scale than large-scale social experiments
   - Randomization on naturally occurring populations in naturally occurring settings

4. Lab experiments (see, Kagel and Roth, 1995)

   - Most controlled experiments with convenience samples

➢ These two largely aim to test economic theory and develop new measurements

Two Fundamental Problems

➢ Identification

- Challenge in causal inference: treatment effects, confounded by selection
- Golden rule: **Randomization**

➢ Measurement

- Understanding mechanisms of treatment effects often relies on measurement of unobservables
- No scientific advance without good measurements

Skills for Good Experimenters

- Engineering / Plumbing
  - Roth (2002); Duflo (2017)
  - 예) 긴급재난지원 및 소멸성 지역화폐
- Knowledge
  - Institutions, incentives, and behavioral factors (pre-intervention studies are needed)
  - Theory and econometrics
- Perseverance
  - Coordination with counterparties (bureaucrats, citizens, civic organizations, practitioners, etc.)

Policy Tools in Mind

- Incentives
  - Tax; subsidy; constraints; etc.
- Information
  - Information campaign; public communication; etc.
- Nudges
  - Inexpensive tools for behavioral change: default option; salience; framing; etc.

Application 1: Education Intervention & Decision Making

H. Kim, S. Choi, B. Kim, and C. Pop-Eleches (2018; Science)

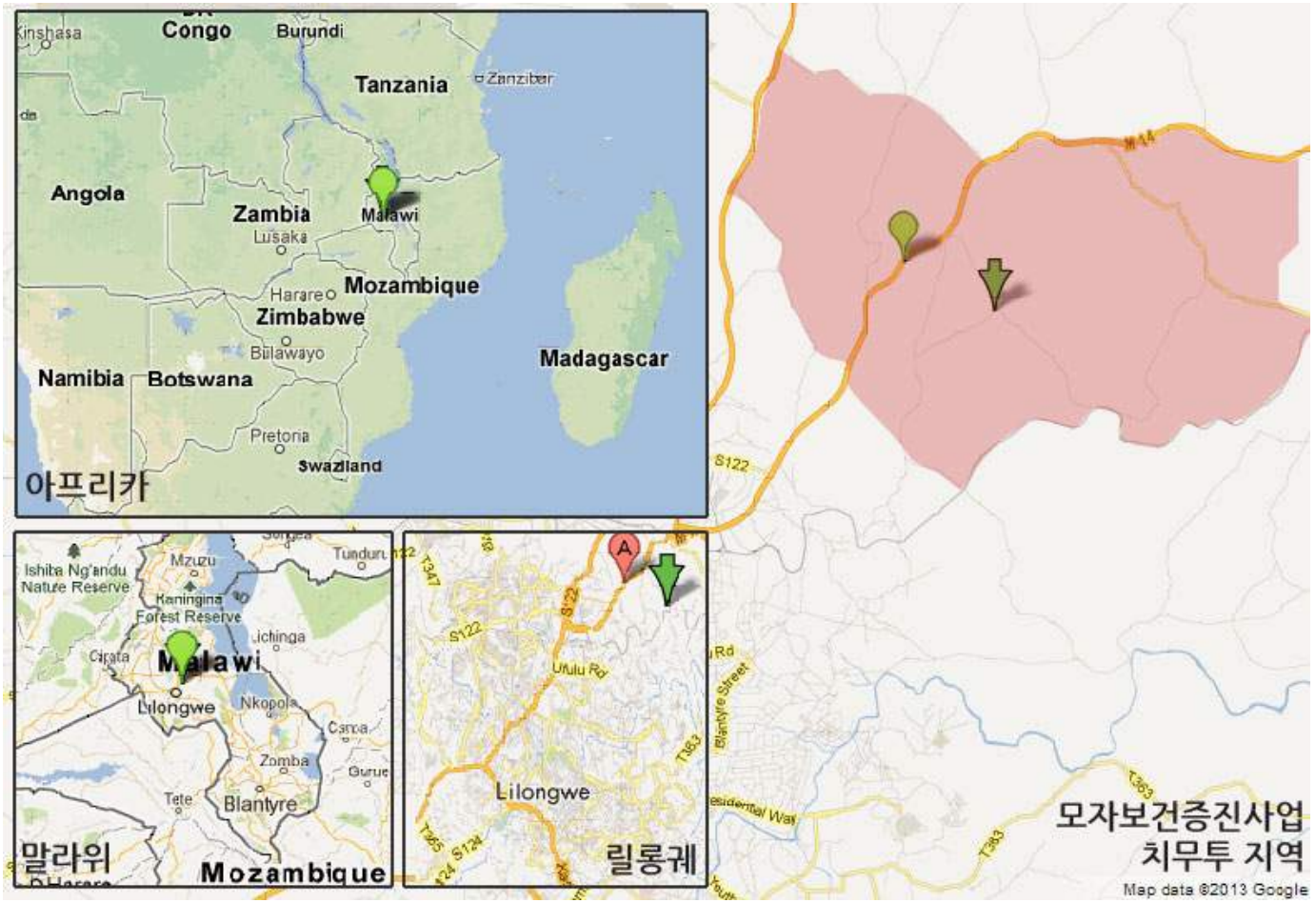
Introduction

- Schooling has been shown to influence a wide range of outcomes.
  - Financial returns in the labor market (e.g., Becker, 1964; Heckman et al., 2006)
  - Non-pecuniary benefits such as health, crime, marriage, and parenting (e.g., Oreopoulous and Salvanes, 2011)
- One little-explored hypothesis is that education improves people's decision-making abilities and leads them to make better decisions across domains.
- However, it is challenging to establish the causal impacts of education on qualities of decision making.

Introduction

- The paper reports the causal impacts of education support on the quality of economic decision making by combining
  - a randomized controlled trial of providing financial support for education to about 2,400 students;
  - laboratory experiments of measuring rationality in risk and time domains
- We use revealed preference analysis and an experimental tool to measure economic rationality at the individual level (Choi et al., 2007; Choi et al., 2014).

Education Support Program



Four districts of rural Lilongwe in Malawi

Education Support Program

- Randomized intervention on female education support in four districts of rural Lilongwe in Malawi.
  - Malawi is one of the least developed countries: GDP per capita in 2015 of US $382
  - 2,812 secondary female students in 9^{th} and 10^{th} grades
  - 33 public schools and 124 classrooms
  - Classroom-level randomization in the academic year 2011-2012
  - One-year tuition support and monthly tuition fees (total $70 per person)
- Baseline survey (2011-2); admin data and follow-up (2013); main follow-up (2015-6) – 2,424 students

Baseline Survey and Balance Check

		Relative to control		
	Mean control	Treatment	p-value: Coeffs. 0	Observations
	(1)	(2)	(3)	(4)
Height (cm)	156	0.146	0.507	2,800
	[5.78]	(0.314)		
Weigth (kg)	51.3	0.116	0.678	2,803
	[7.32]	(0.481)		
Age (years)	15.3	-0.007	0.899	2,812
	[1.51]	(0.186)		
Orphan	0.047	-0.008	0.277	2,808
	[0.213]	(0.008)		
Top 3 Ethnicity Groups	0.769	-0.011	0.506	2,812
	[0.422]	(0.031)		
Muslim	0.068	-0.004	0.689	2,810
	[0.252]	(0.012)		
Father's Tertiary Education	0.204	0.01	0.517	2,812
	[0.403]	(0.029)		
Mother's Tertiary Education	0.098	-0.001	0.911	2,812
	[0.298]	(0.018)		
Father's White Collar Job	0.266	-0.001	0.960	2,812
	[0.442]	(0.028)		
Mother's White Collar Job	0.111	-0.007	0.550	2,812
	[0.314]	(0.018)		
Household Assets (0 - 16)	7.72	-0.194	0.137	2,812
	[3.499]	(0.487)		
School Type (Conventional School)	0.176	0.107	0.000	2,812
	[0.381]	(0.101)		

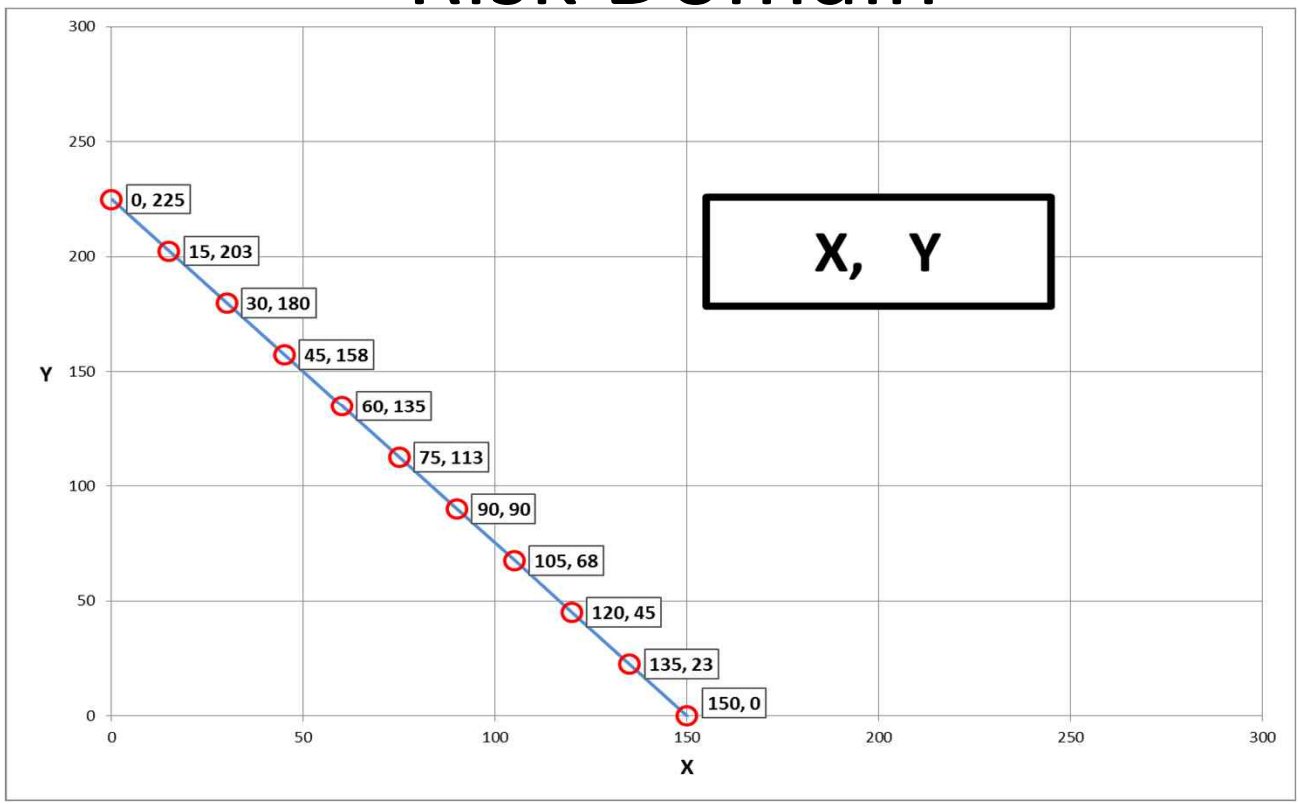
Direct Impacts on Education Outcomes

Sources:	Short-term FU Survey	Short-term FU Survey	Administrative Data	Administrative Data	Long-term FU Survey
Variables:	Absence Self-reported (2013)	Dropout Self-reported (2013)	Took JCE (2012-2013)	Pass JCE (2012-2013)	Total years of Education (2015-2016)
	(1)	(2)	(3)	(4)	(5)
Panel A: Overall sample					
Treated	-1.612***	-0.034	0.055**	0.086**	0.103
	(0.397)	(0.026)	(0.023)	(0.033)	(0.076)
Control group mean	4.01	0.112	0.789	0.597	11.5
Number of observations	1,851	1,929	2,808	2,808	2,420
Panel B: Baseline 9th graders					
Treated	-1.498***	-0.083**	0.123***	0.141***	0.147
	(0.343)	(0.039)	(0.040)	(0.049)	(0.119)
Control group mean	3.53	0.135	0.624	0.509	11.3
Number of observations	855	889	1,220	1,220	1,051
Panel C: Baseline 10th graders					
Treated	-1.761**	-0.004	-0.004	0.043	0.058
	(0.703)	(0.033)	(0.021)	(0.040)	(0.098)
Control group mean	4.28	0.099	0.888	0.649	11.6
Number of observations	996	1,040	1,588	1,588	1,369

Takeaway Points

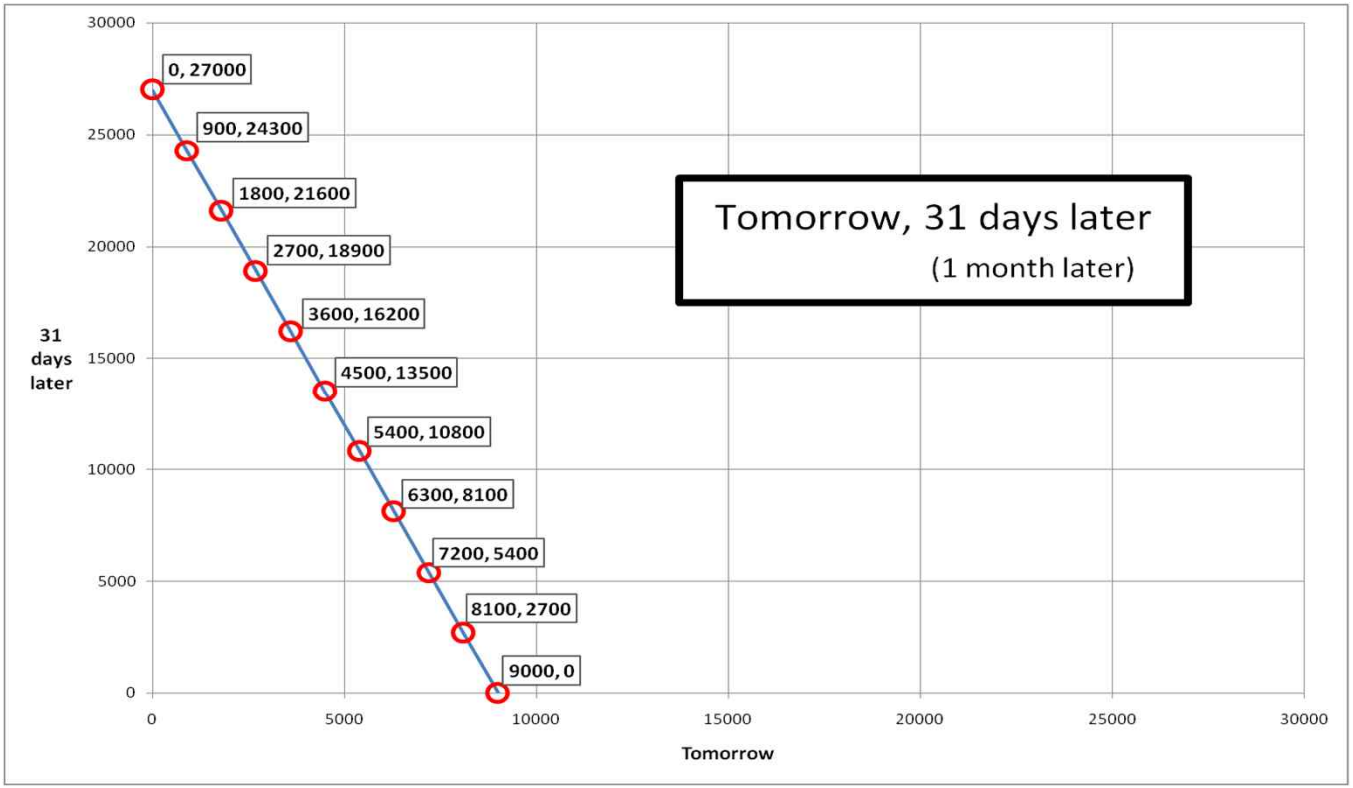
- The randomized intervention on financial support for education has a direct impact on various education outcomes.
  - The likelihood of dropping out is 3.4% lower in the treatment group.
  - Students in the treatment group are 5.5% more likely to take and 8.6% more likely to pass the JCE.
  - The intervention affects mainly the 9^{th} graders.
- Therefore, the impact of the intervention on rationality, if any, may be mediated through its effect on education outcomes.

Experiments to Measure Rationality: Risk Domain



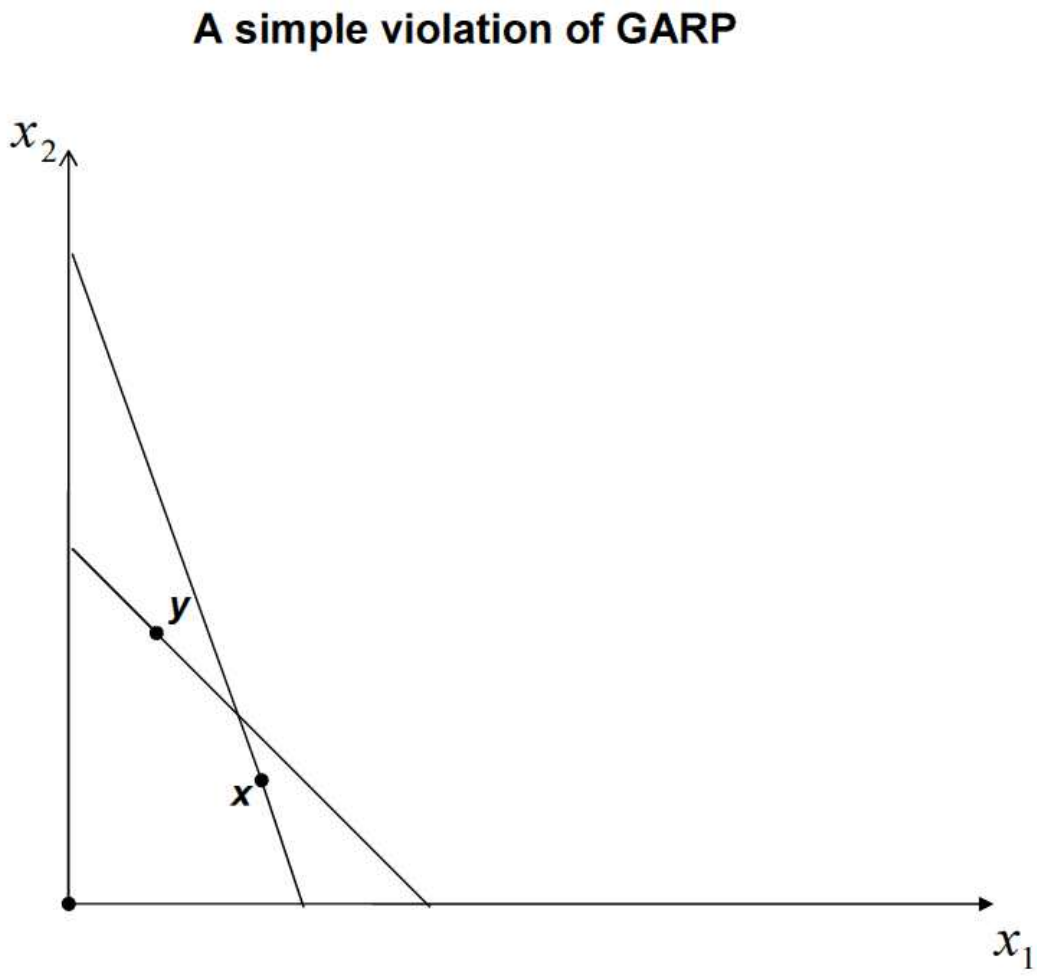
- Discretized with 11 options along a budget line
- 20 decisions with price variations
- One decision is randomly chosen for payment at the end of the study

Experiments to Measure Rationality: Time Domain

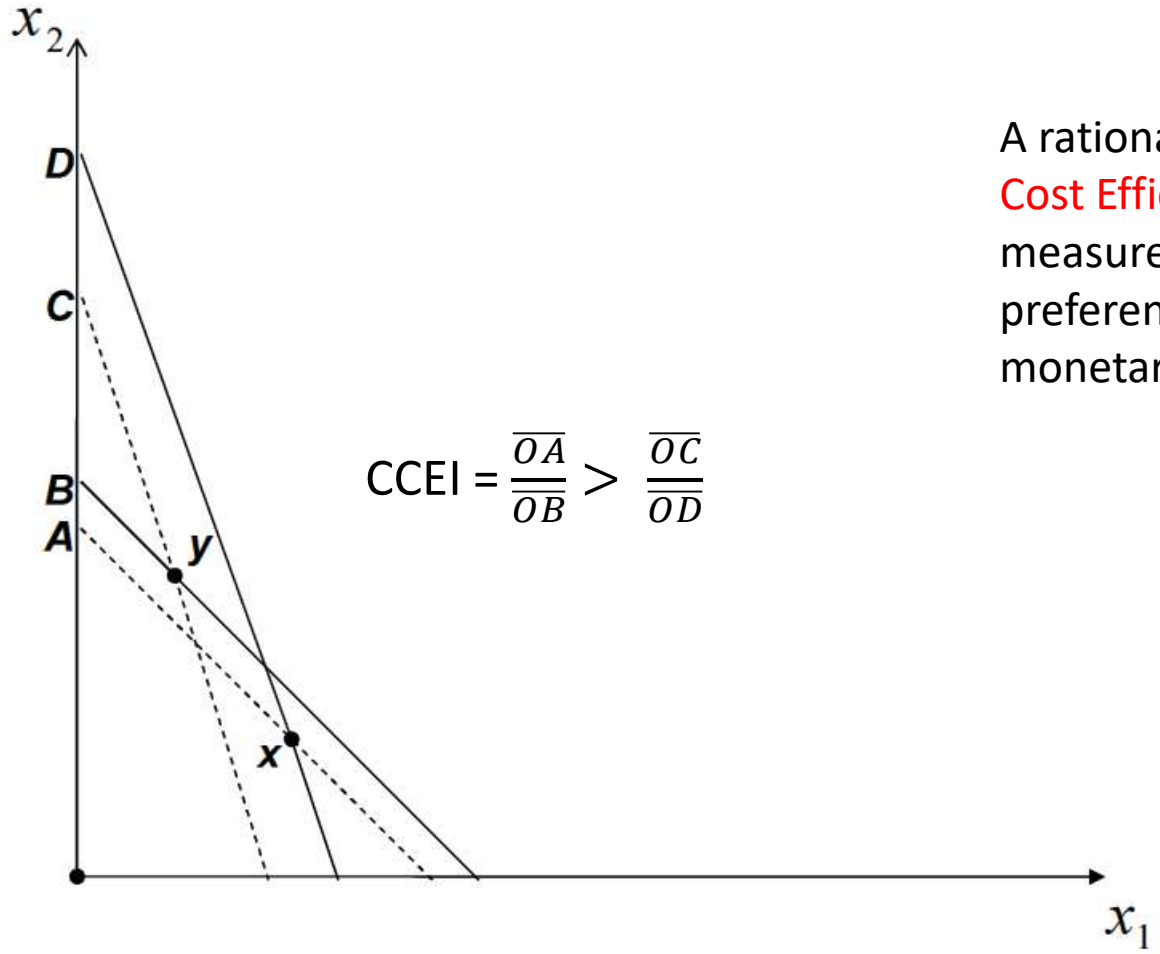


- Near time frame: Tomorrow vs. 31 days later
- Distant time frame: 1 year later vs. 1 year and 30 days later
- 15 decisions in each time frame

A Simple Violation of Rationality



Computing a Rationality Index



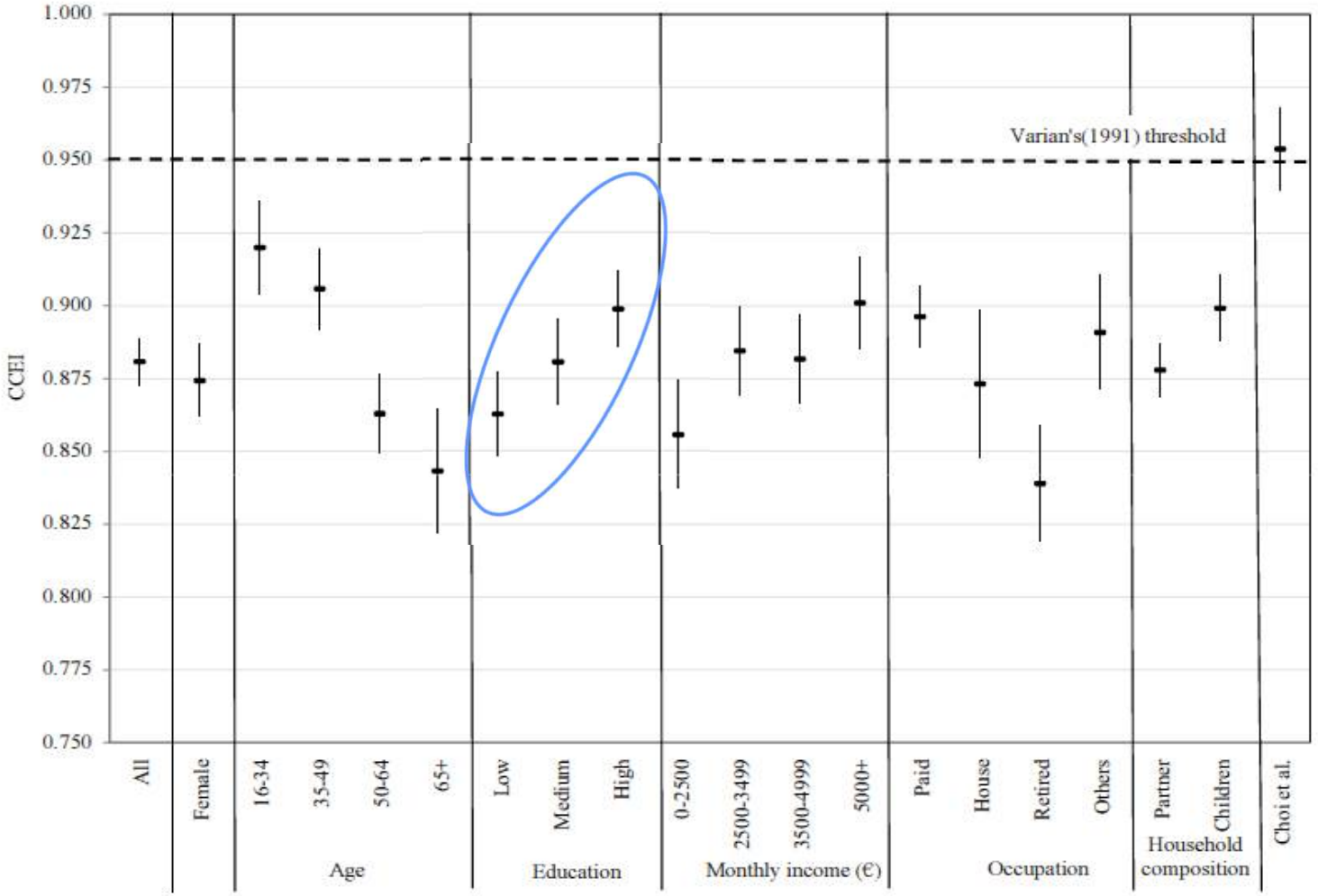
$$\text{CCEI} = \frac{\overline{OA}}{\overline{OB}} > \frac{\overline{OC}}{\overline{OD}}$$

A rationality index, called Critical Cost Efficiency Index (CCEI), measures the extent of revealed preference violations in terms of monetary costs.

Correlates of CCEI in Risk Domain

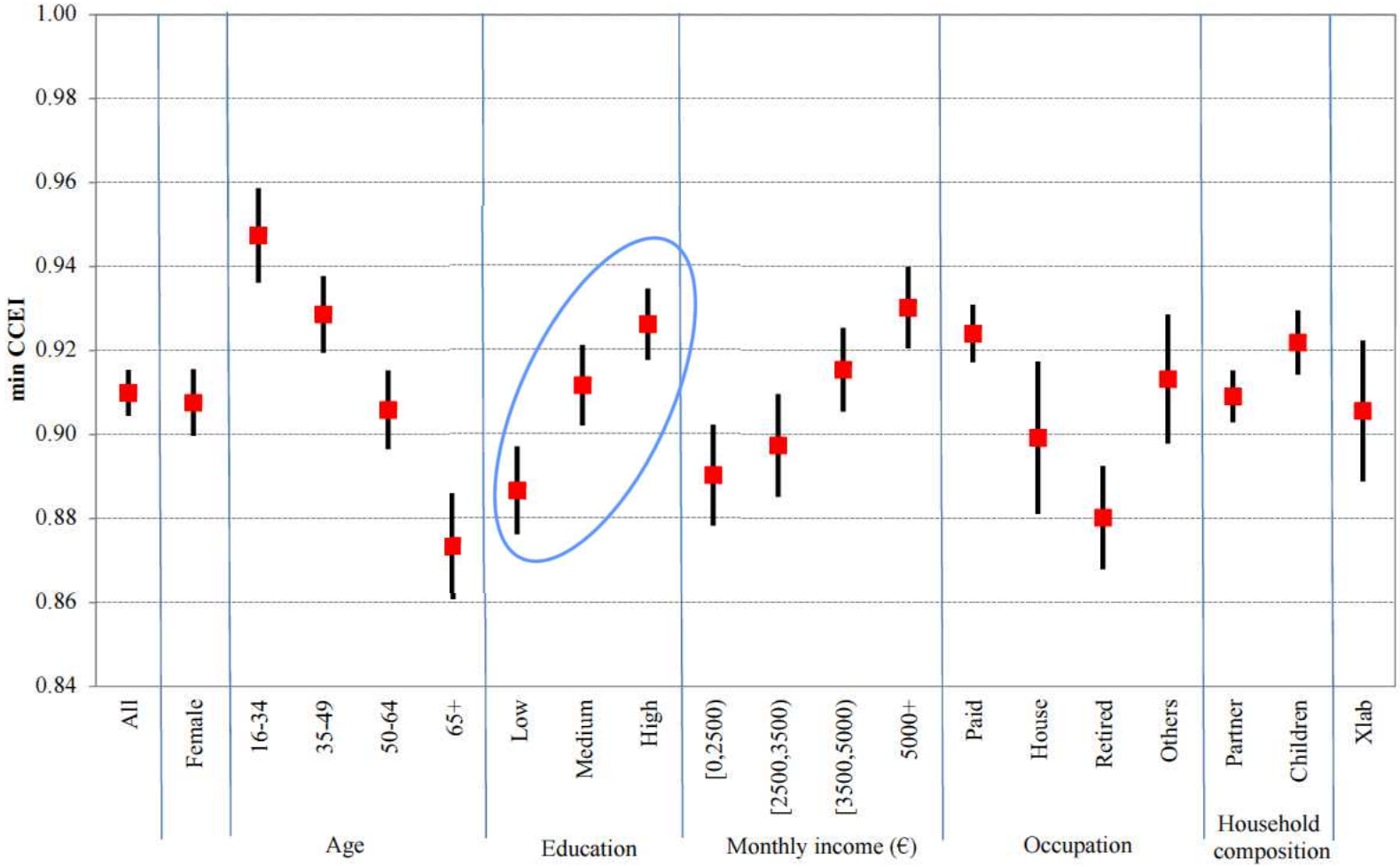
Choi et al. (2014, AER)

Figure 1. Mean CCEI scores

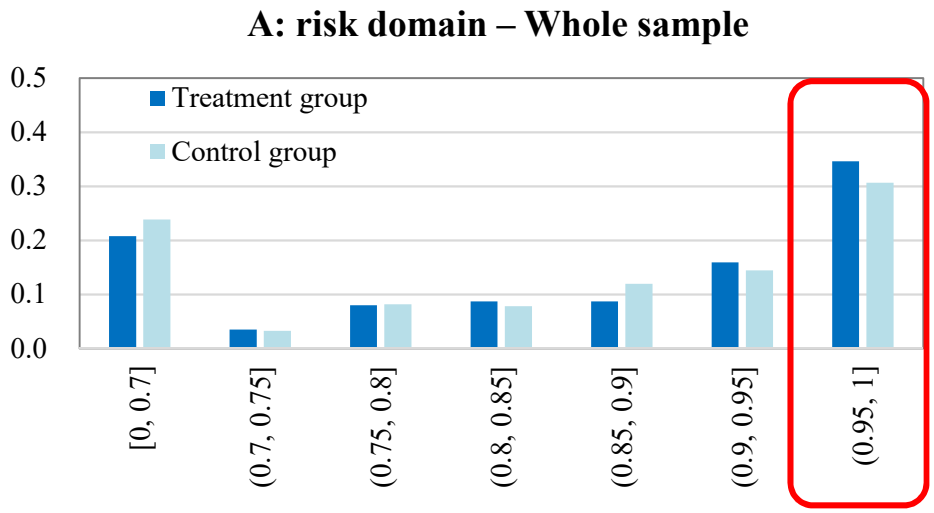


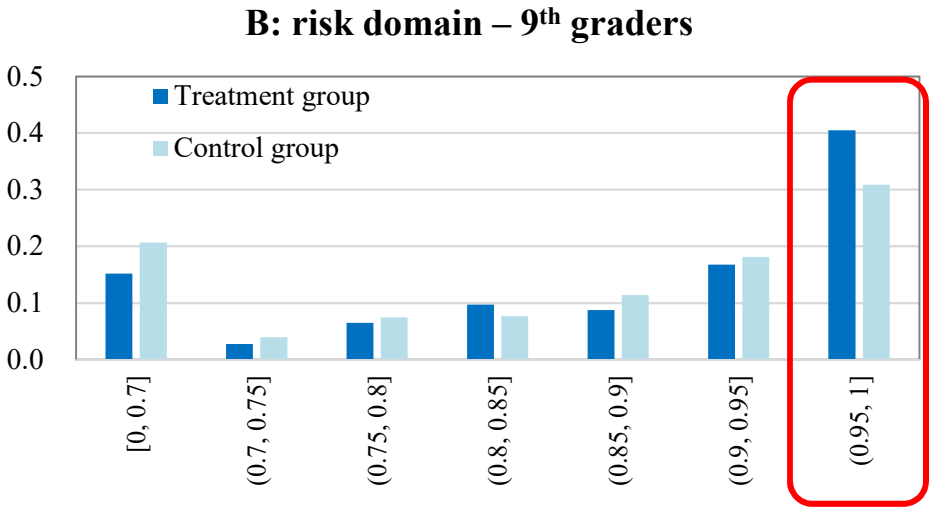
Correlates of CCEI in Time Domain

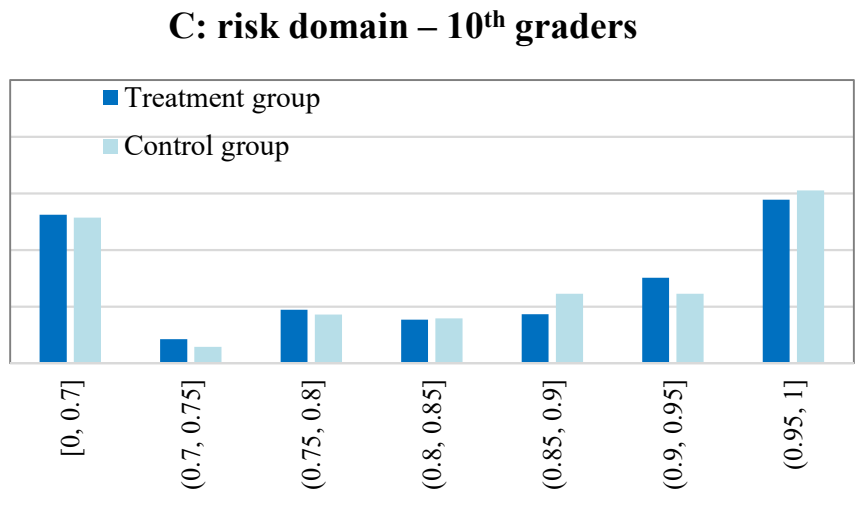
Choi et al. (2020)



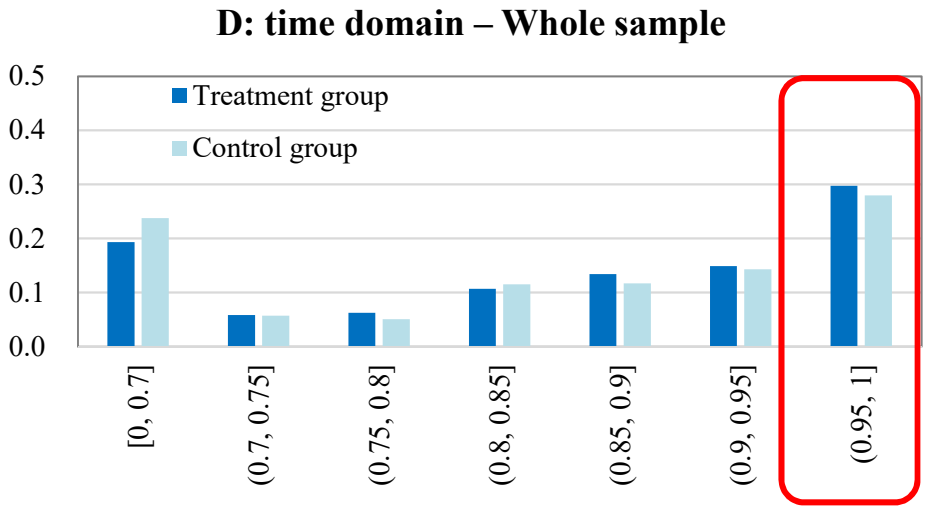
Distributions of CCEI: Risk Domain

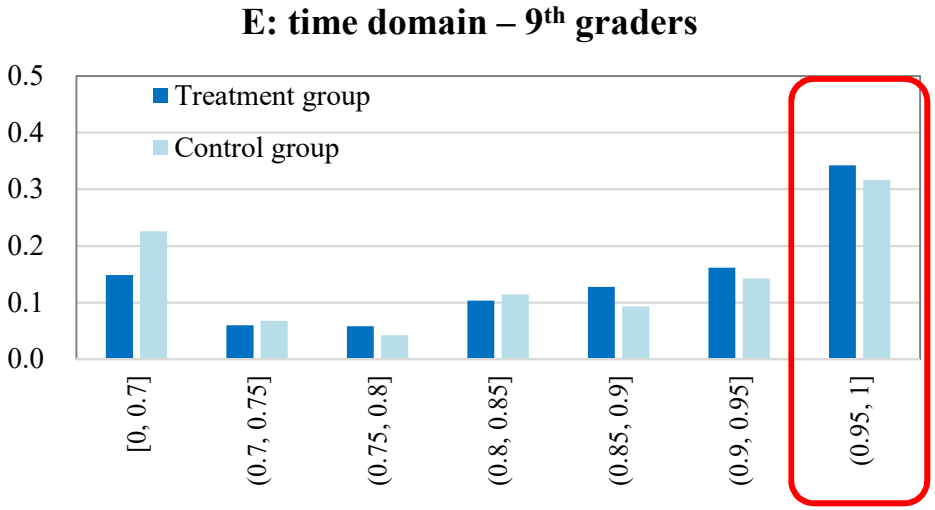


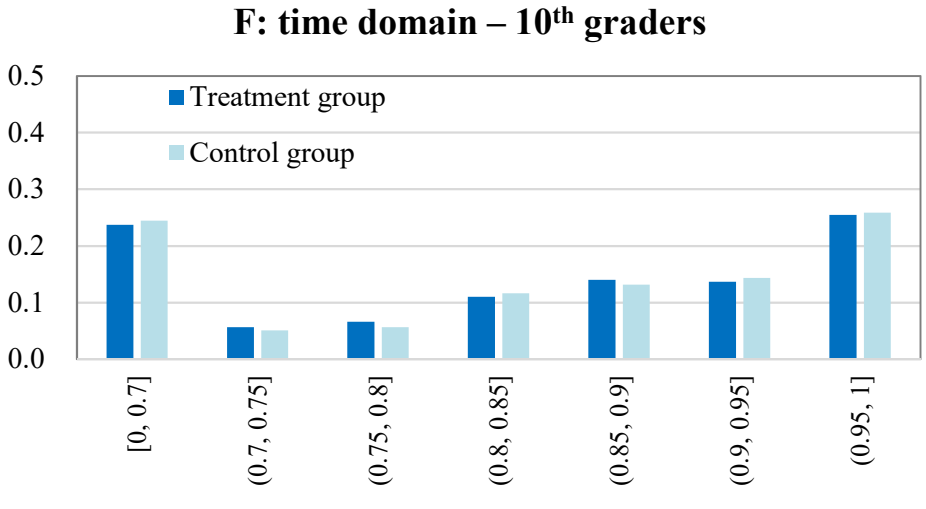




Distributions of CCEI: Time Domain







Treatment Effects on Economic Rationality

	(1)	(2)	(3)	(4)	(5)	(7)	(8)
Panel A. CCEI from risk domain							
Panel A1. Overall sample							
Difference	0.012	0.013	0.012	0.014	0.005	0.008	0.004
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Panel A2. Baseline 9th graders							
Difference	0.032***	0.032***	0.031***	0.034***	0.022**	0.025***	0.019*
	(0.011)	(0.010)	(0.011)	(0.011)	(0.010)	(0.009)	(0.010)
Panel A3 Baseline 10th graders							
Difference	-0.003	-0.003	-0.003	-0.003	-0.009	-0.005	-0.008
	(0.012)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Panel B. CCEI from time domain							
Panel B1. Overall sample							
Difference	0.013*	0.014**	0.014**	0.015**	0.009	0.012*	0.008
	(0.007)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)
Panel B2. Baseline 9th graders							
Difference	0.027**	0.031***	0.030***	0.032***	0.023***	0.026***	0.022***
	(0.011)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Panel B3 Baseline 10th graders							
Difference	0.002	0.003	0.003	0.002	-0.002	0.002	-0.001
	(0.010)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)
Basic controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Risk preference	No	No	Yes	No	No	No	Yes
Time preference	No	No	No	Yes	No	No	Yes
Cognitive abilities	No	No	No	No	Yes	No	Yes
Personality	No	No	No	No	No	Yes	Yes

Application 2: Community Development & Competition Effects

S. Choi, M. Y. Dong, B. Kim, T. Kim, and H.-S. Yang (2020)

Introduction

- Community-driven (rural) development (CDD) approaches have been widely used as a key strategy to reduce poverty in low-income countries.

- As of early 2019, there are 199 active CDD projects in 78 countries totaling about $20 billion (source: World Bank).

Introduction

- KOICA provided massive financial support to five Southeast Asian countries between 2014 and 2019, to implement the Korean CDD model (Saemaul Undong; SMU).

- Myanmar and Cambodia were selected for program evaluation.

  - 100 villages in Myanmar and 30 villages in Cambodia
  - Total budget: $22 million in Myanmar and $8 million in Cambodia

Saemaul Undong in the Two Countries

Myanmar

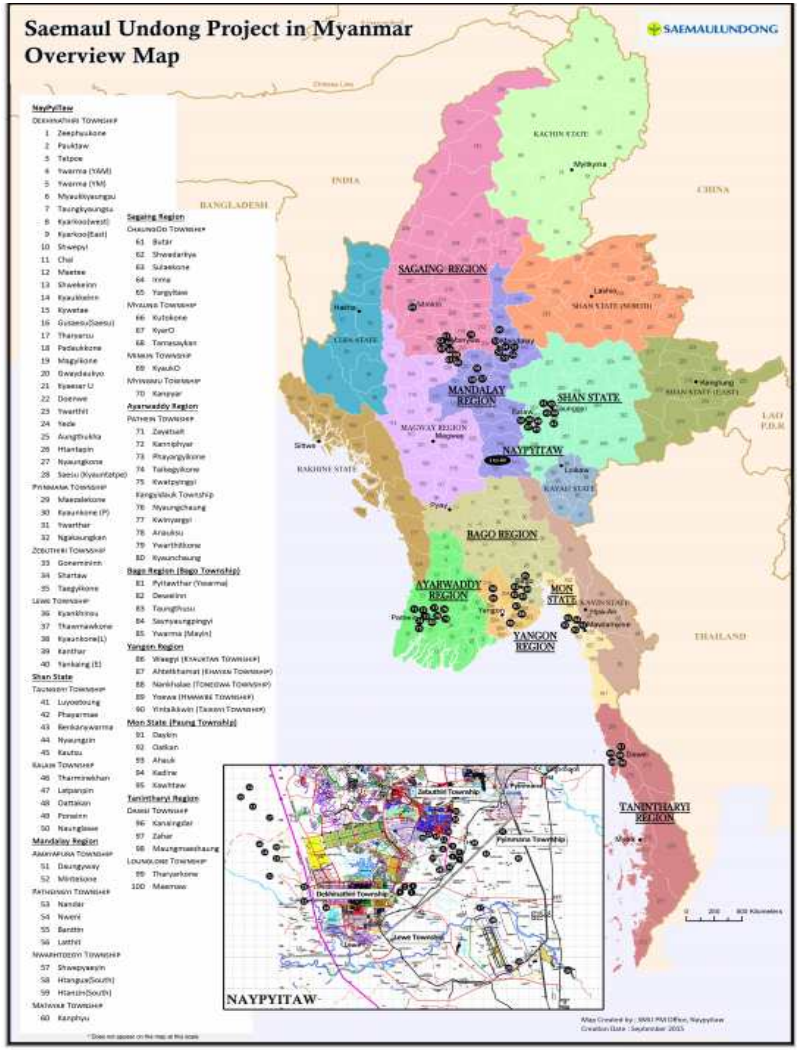
- 100 SMU villages across 9 regions/ states

Region / State	Village
NayPhyTaw	40
Ayarwaddy Region	10
Mandalay Region	10
Sagaing Region	10
Shan State	10
Bago Region	5
Mon State	5
Tanintharyi Region	5
Yangon Region	5
Total	100

Cambodia

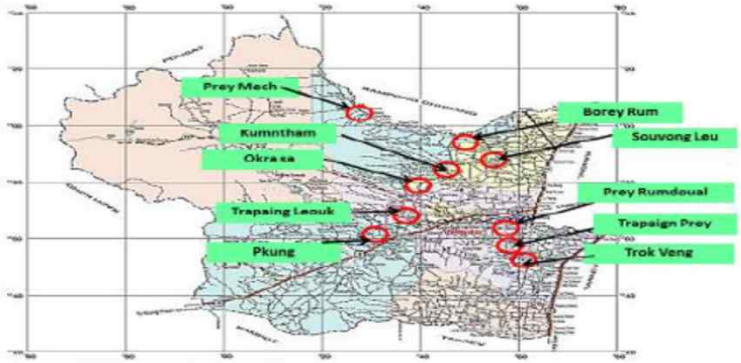
- 30 SMU villages in 3 provinces

Provinces	Village
Kampong Speu	10
Takeo	10
Tboung Khmum	10
Total	30



3 SMU provinces in Cambodia

10 villages in Kampong Speu



Saemaul Undong in the Two Countries

- The SMU villages were evaluated every year according to the following objectives

  1) living environment improvement

  2) Income generation

  3) Capacity building

SMU Projects: Improvement of living environment

Activities

Evaluation criteria

- % of project work completed in a year based on an original plan
- Villagers' monetary and labor contribution
- Villagers' land and materials contributions
- No. of participating households
- …

SMU Projects: Income generation

Activities

Evaluation criteria

- Income generating activities
- Fund increment by means of interest
- No. of microfinance participant households
- Adoption of new business and technologies
- …

SMU Projects: Capacity building

Activities

Evaluation criteria

- No. of meeting
- No. of technical/educational training
- No. of trainee
- No. of villagers visiting other advance villages
- No. of public information on projects
- …

Competition-based Village Funding

Myanmar

Year	Rank	Cash Transfer ($)	No. Village	Total Transfer ($)
2016 (1st year)	-	20,000	100	2,000,000
2017 (2nd year)	A	40,000	30	1,200,000
	B	30,000	40	1,200,000
	C	20,000	30	600,000
2018 (3rd year)	A	40,000	30	1,200,000
	B	30,000	40	1,200,000
	C	20,000	30	600,000
2019	A	20,000	30	600,000
	B	10,000	40	400,000
	C	0	30	0
Total				9,000,000

Competition-based Village Funding

Cambodia

Year	Rank	Cash transfer ($)	No. of villages	Total transfer ($)
2016	-	20,000	30	600,000
2017	A	40,000	5	200,000
	B	30,000	8	240,000
	C	20,000	17	340,000
2018	A	80,000	5	400,000
	B	45,000	8	360,000
	C	12,000	17	204,000
Total				2,344,000

Which Villages Perform Better?

- In the beginning of the SMU projects, we collected basic characteristics of randomly sampled households (5,496 in Myanmar & 911 in Cambodia) and their self-reported social capital.

➢ Does a village with higher level of social capital perform better?

First-year Performance of Myanmar and Cambodian Villages

	(1)	(2)	(3)	(5)	(6)	(7)
	A-Ranked Village			C-Ranked Village		
Panel A:						
Trust Index	0.175***	0.174**	0.200***	-0.157**	-0.163**	-0.177**
	(0.0658)	(0.0680)	(0.0762)	(0.0667)	(0.0689)	(0.0774)
Basic Controls	No	Yes	Yes	No	Yes	Yes
Socio-Economic Status	No	No	Yes	No	No	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130	130	130	130	130	130
Panel B:						
Collective action index	0.251***	0.252***	0.259***	-0.216**	-0.228**	-0.224**
	(0.0884)	(0.0880)	(0.0946)	(0.0897)	(0.0894)	(0.0962)
Basic Controls	No	Yes	Yes	No	Yes	Yes
Socio-Economic Status	No	No	Yes	No	No	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130	130	130	130	130	130
Panel C:						
Social cohesion index	0.0949	0.135	0.120	-0.119	-0.201**	-0.215**
	(0.0898)	(0.0947)	(0.103)	(0.0902)	(0.0946)	(0.103)
Basic Controls	No	Yes	Yes	No	Yes	Yes
Socio-Economic Status	No	No	Yes	No	No	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130	130	130	130	130	130

Village Performance in the First Two Years

	(1)	(2)	(3)	(5)	(6)	(7)
	AA-Ranked Village			CC-Ranked Village		
Panel A:						
Trust Index	0.125**	0.136**	0.162**	-0.139**	-0.146**	-0.141**
	(0.0554)	(0.0581)	(0.0656)	(0.0545)	(0.0574)	(0.0621)
Basic Controls	No	Yes	Yes	No	Yes	Yes
Socio-Economic Status	No	No	Yes	No	No	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130	130	130	130	130	130
Panel B:						
Collective action index	0.149**	0.171**	0.192**	-0.276***	-0.290***	-0.275***
	(0.0749)	(0.0758)	(0.0819)	(0.0711)	(0.0721)	(0.0748)
Basic Controls	No	Yes	Yes	No	Yes	Yes
Socio-Economic Status	No	No	Yes	No	No	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130	130	130	130	130	130
Panel C:						
Social cohesion index	0.147*	0.194**	0.221**	-0.190***	-0.243***	-0.259***
	(0.0742)	(0.0793)	(0.0868)	(0.0725)	(0.0776)	(0.0806)
Basic Controls	No	Yes	Yes	No	Yes	Yes
Socio-Economic Status	No	No	Yes	No	No	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130	130	130	130	130	130

Takeaway & Question

- Social capital indices—trust, collective action, and social cohesion—are positively associated with successful implementation of the CDD projects.

- It lends support to the notion that solving collective action problems is a key to rural development.

Question: What is the role of inter-village competition in solving collective action problems?

Limits in the SMU Implementation

- Due to political and other reasons, the SMU villages in Myanmar and Cambodia were not randomly selected.

- Like other CDD projects, the SMU projects are a comprehensive package with a variety of components for rural development.

  – It poses a challenge to disentangling differential roles of components in solving collection action problems and developing rural communities.

Our Approach

- We focus on one component of the CDD projects in Myanmar and Cambodia

  - Inter-village competition for funding

- We design incentivized, controlled lab-in-the-field experiments mimicking real problems of collective actions in rural villages.

- (Within-village RCT) We assign randomly village members to experimental tasks with or without inter-village competition.

Data collection

1. Myanmar

   - 100 SMU villages + 50 non-SMU villages (adjacent to SMU villages)
   - Sampling about **8500 households** representative of the village population

2. Cambodia

   - 30 SMU villages + 30 non-SMU villages (adjacent to SMU villages)
   - Sampling about **3500 households** representative of the village population

Two Collective Action Problems

1. Public goods provision
   - Most common in communities
   - Incentives of free-riding

2. Joint investment and risk reduction
   - Joint venture pursued by wealth-constrained individuals
   - Avoidance of taking risk, driven by pessimistic beliefs

Two Experimental Tasks

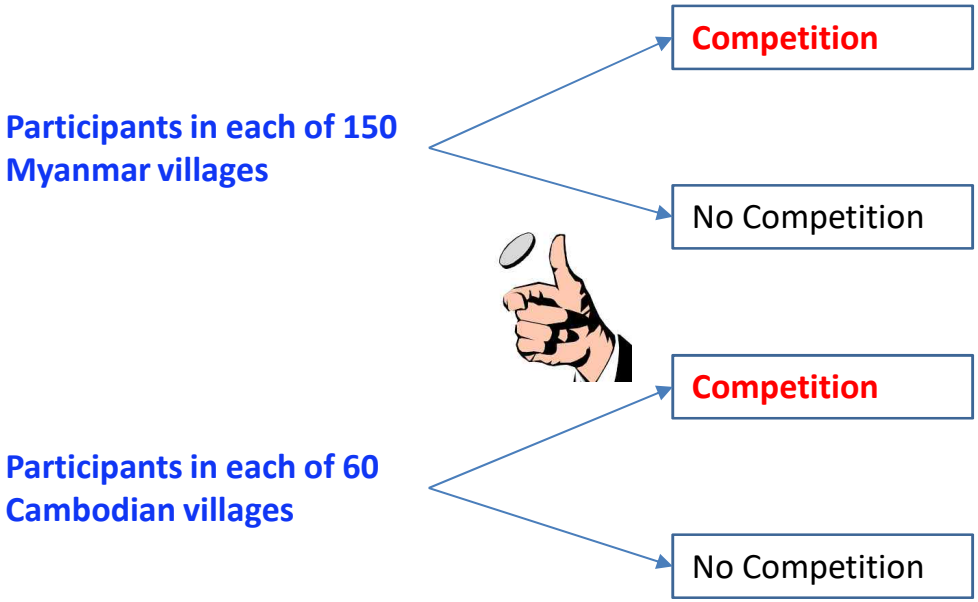
1. Village Donation Game
   - Individuals are asked to choose between private consumption and contribution to village fund for community.
   - It intends to capture problems of providing public goods in villages.

2. Joint Investment Game
   - Individuals are asked to invest between a safe option and a risky joint project whose probability of success depends on the number of individuals investing in the project.
   - It intends to capture problems of investing in a risky, socially efficient joint project.

Village Donation Game

(1500 Myanmar Kyat ≈ 1 USD)

Random Assignment: Village Donation Game



Village Donation Game
with Inter-Village Competition

Myanmar
150 villages (100 SMU + 50 non-SMU)

Ranked by average donation	Bonus (Kyat)
Top 50 villages	100,000
Next 50 villages	50,000
Bottom 50	0

Cambodia
60 villages (30 SMU + 30 non-SMU)

Ranked by average donation	Bonus (Riel)
Top 20 villages	250,000
Next 20 villages	125,000
Bottom 20	0

Village Donation Game
without inter-village competition

- In order to control for potential income effects, we also give random bonuses to villages.

Myanmar
150 villages (100 SMU + 50 non-SMU)

Random bonus	Bonus (Kyat)
50 villages	100,000
50 villages	50,000
50 villages	0

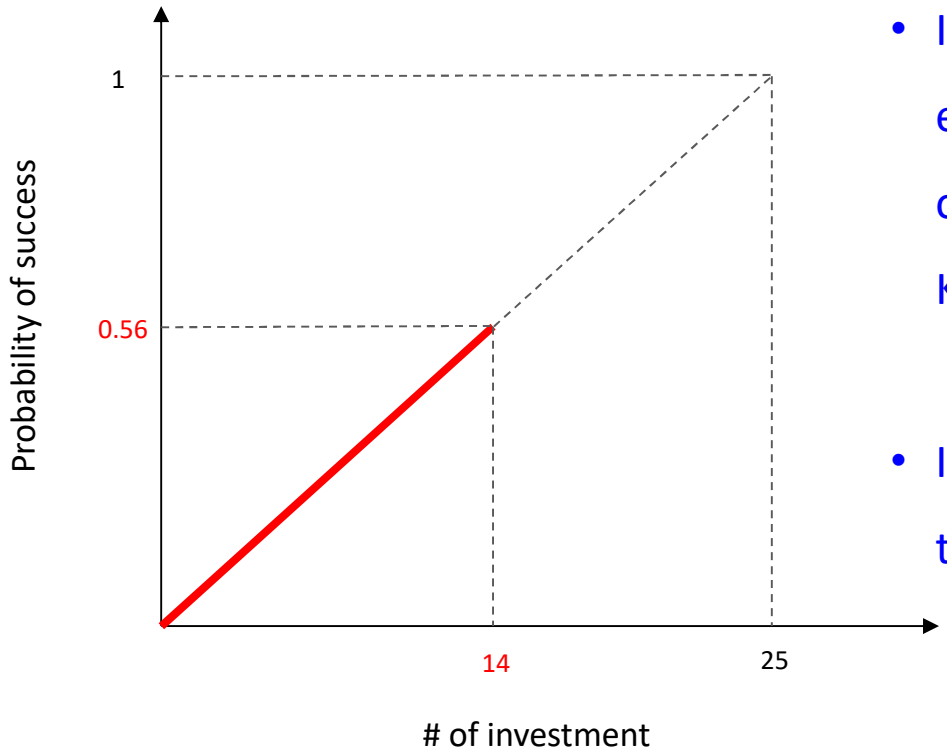
Cambodia
60 villages (30 SMU + 30 non-SMU)

Random bonus	Bonus (Riel)
20 villages	250,000
20 villages	125,000
20 villages	0

Joint Investment Game

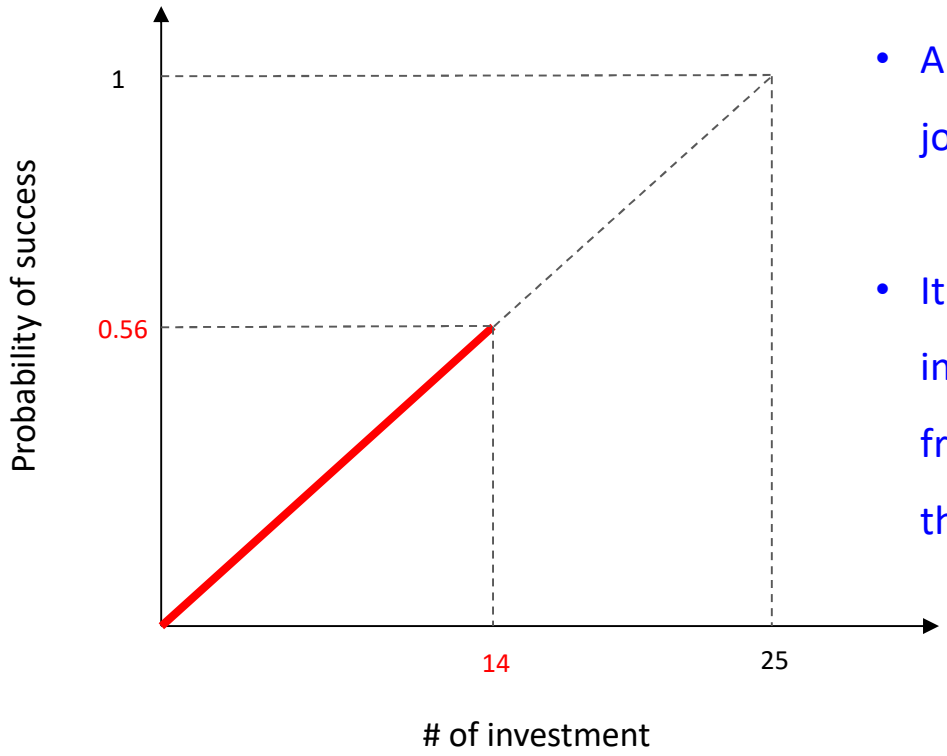
- 14 members in a village are randomly assigned to form a group.
- Every individual is given an endowment (2,000 Kyat in Myanmar / 5,000 Riel in Cambodia) for personal consumption (safe option).
- They are invited for an opportunity of investing this endowment in a risk joint project.
- The probability of the joint project succeeding depends on the number of investment.

Probability of Success: Joint Investment Game



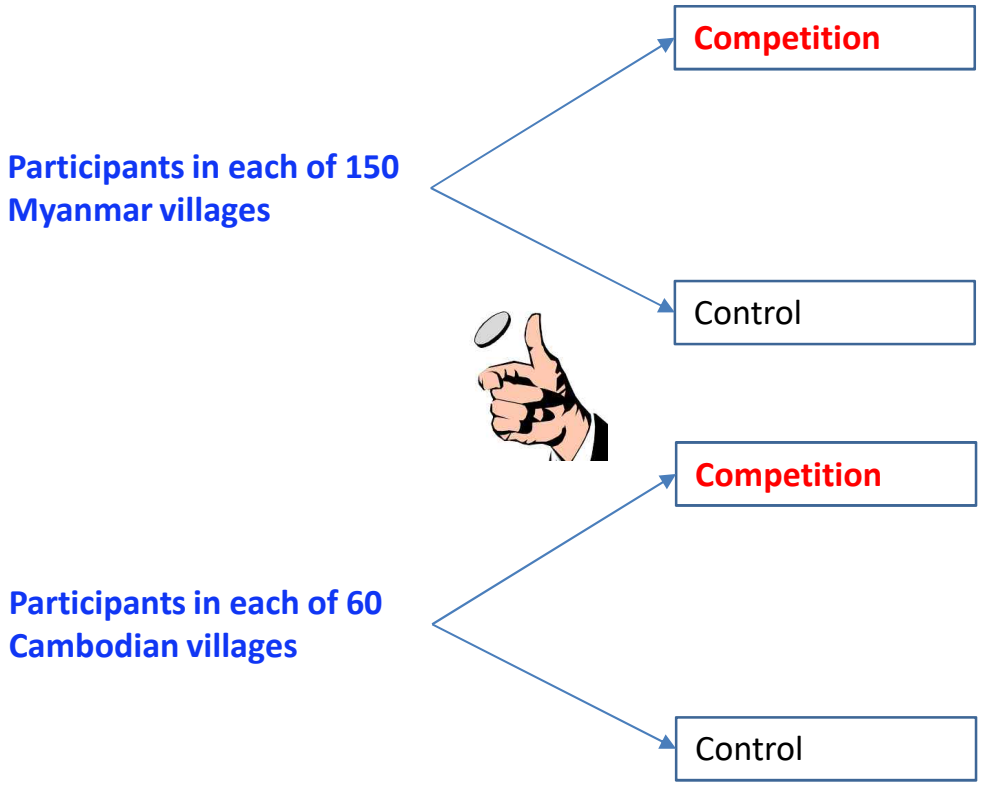
- If the joint project succeeds, each investor receives twice of the endowment (4,000 Kyat / 10,000 Riel)
- If it fails, each investor loses the endowment.

Probability of Success: Joint Investment Game



- All 14 individuals investing in a joint project is socially efficient.
- It is a collective action problem: individuals may be discouraged from cooperating and joining in the investment.

Random Assignment:
Joint Investment Game



Joint Investment Game
with inter-village competition

- Individuals in this group compete in the following scheme

Myanmar
150 villages (100 SMU + 50 non-SMU)

Ranked by # of joint investment	Bonus (Kyat)
Top 50 villages	100,000
Next 50 villages	50,000
Bottom 50	0

Cambodia
60 villages (30 SMU + 30 non-SMU)

Ranked by # of joint investment	Bonus (Riel)
Top 20 villages	250,000
Next 20 villages	125,000
Bottom 20	0

Treatment Effects

1. Average treatment effects

$$Y_{ijr} = \beta_0 + \beta_1 Competition + X'_{ijr}\,\gamma + \delta_r + \varepsilon_{ijr}$$

2. Heterogeneous treatment effects: SMU vs. non-SMU

$$Y_{ijr} = \beta_0 + \beta_1 Competition + \beta_2 SMU + \beta_3 (Competition \times SMU) + X'_{ijr}\,\gamma + \delta_r + \varepsilon_{ijr}$$

Balance Test
Village Donation Game

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Myanmar			**Cambodia**			**Total**	
	Control	Competition	T-Test	Control	Competition	T-Test	Control	Competition	T-Test
Female-Headed	0.531	0.534	0.002	0.455	0.472	0.017	0.510	0.516	0.006
	[0.013]	[0.013]	(0.010)	[0.012]	[0.012]	(0.017)	[0.011]	[0.010]	(0.009)
Married	0.763	0.776	0.012	0.741	0.743	0.002	0.757	0.766	0.009
	[0.008]	[0.008]	(0.009)	[0.011]	[0.011]	(0.015)	[0.006]	[0.006]	(0.007)
Education	0.294	0.313	0.018*	0.319	0.319	0.000	0.301	0.315	0.013
	[0.015]	[0.014]	(0.009)	[0.011]	[0.011]	(0.016)	[0.012]	[0.011]	(0.008)
Ethnicity	0.866	0.864	-0.002	0.903	0.906	0.002	0.877	0.876	-0.001
	[0.026]	[0.026]	(0.007)	[0.007]	[0.007]	(0.010)	[0.021]	[0.021]	(0.006)
Buddhist	0.971	0.973	0.002	0.898	0.899	0.001	0.950	0.952	0.001
	[0.009]	[0.008]	(0.003)	[0.007]	[0.007]	(0.010)	[0.012]	[0.012]	(0.003)
Own land	0.463	0.473	0.010	0.754	0.749	-0.004	0.546	0.551	0.005
	[0.018]	[0.018]	(0.010)	[0.011]	[0.011]	(0.014)	[0.018]	[0.017]	(0.009)
Length of residency	0.436	0.431	-0.005	0.486	0.493	0.006	0.450	0.448	-0.001
	[0.012]	[0.012]	(0.010)	[0.012]	[0.012]	(0.017)	[0.010]	[0.010]	(0.009)
Employed	0.581	0.587	0.006	0.129	0.130	0.001	0.453	0.458	0.005
	[0.016]	[0.016]	(0.010)	[0.008]	[0.008]	(0.011)	[0.018]	[0.019]	(0.009)
Farmer	0.301	0.310	0.009	0.531	0.526	-0.005	0.366	0.371	0.005
	[0.015]	[0.016]	(0.009)	[0.012]	[0.012]	(0.017)	[0.015]	[0.016]	(0.008)
Asset Index	-0.010	0.010	0.020	0.032	-0.032	-0.064	0.002	-0.002	-0.003
	[0.072]	[0.070]	(0.035)	[0.038]	[0.036]	(0.052)	[0.057]	[0.054]	(0.029)

Balance Test
Joint Investment Game

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Myanmar			**Cambodia**			**Total**	
	Control	Competition	T-Test	Control	Competition	T-Test	Control	Competition	T-Test
Variable	Mean/SE	Mean/SE	Coefficient/SE	Mean/SE	Mean/SE	Coefficient/SE	Mean/SE	Mean/SE	Coefficient/SE
Female-Headed	0.491	0.490	-0.000	0.477	0.455	-0.022	0.487	0.480	-0.007
	[0.014]	[0.016]	(0.013)	[0.017]	[0.021]	(0.021)	[0.011]	[0.013]	(0.011)
Married	0.790	0.791	0.001	0.733	0.749	0.016	0.773	0.779	0.006
	[0.008]	[0.010]	(0.010)	[0.010]	[0.016]	(0.018)	[0.007]	[0.009]	(0.009)
Education	0.299	0.311	0.012	0.319	0.294	-0.025	0.305	0.306	0.001
	[0.012]	[0.016]	(0.012)	[0.019]	[0.019]	(0.019)	[0.010]	[0.013]	(0.010)
Ethnicity	0.835	0.841	0.006	0.904	0.905	0.000	0.855	0.859	0.004
	[0.028]	[0.026]	(0.009)	[0.036]	[0.036]	(0.012)	[0.022]	[0.021]	(0.007)
Buddhist	0.979	0.972	-0.006	0.898	0.895	-0.003	0.956	0.950	-0.005
	[0.010]	[0.010]	(0.004)	[0.036]	[0.036]	(0.012)	[0.013]	[0.013]	(0.004)
Own land	0.497	0.515	0.018	0.748	0.743	-0.004	0.569	0.580	0.011
	[0.018]	[0.019]	(0.013)	[0.022]	[0.025]	(0.018)	[0.016]	[0.017]	(0.011)
Length of residency	0.478	0.469	-0.009	0.509	0.465	-0.043**	0.487	0.468	-0.019*
	[0.013]	[0.015]	(0.013)	[0.016]	[0.022]	(0.021)	[0.010]	[0.012]	(0.011)
Employed	0.621	0.634	0.013	0.121	0.122	0.000	0.478	0.488	0.010
	[0.015]	[0.019]	(0.013)	[0.011]	[0.013]	(0.013)	[0.019]	[0.021]	(0.011)
Farmer	0.124	0.133	0.009	0.532	0.526	-0.005	0.241	0.245	0.004
	[0.010]	[0.011]	(0.008)	[0.026]	[0.028]	(0.021)	[0.016]	[0.017]	(0.009)
Asset Index	-0.005	0.014	0.018	-0.010	-0.023	-0.012	-0.006	0.003	0.009
	[0.066]	[0.074]	(0.044)	[0.077]	[0.086]	(0.063)	[0.052]	[0.058]	(0.036)

Competition Effects
Village Donation Game

	(1)	(2)	(3)	(4)	(5)	(6)
	Percentage Donated					
	Myanmar		Cambodia		Total	
Competition	0.003	0.002	0.002	-0.010	0.003	-0.002
	(0.007)	(0.015)	(0.006)	(0.008)	(0.005)	(0.009)
SMU		0.147***		0.040*		0.115***
		(0.026)		(0.020)		(0.019)
Competition * SMU		0.001		0.030**		0.010
		(0.016)		(0.012)		(0.011)
Observations	8,515	8,515	3,355	3,355	11,870	11,870
R-squared	0.082	0.132	0.108	0.121	0.509	0.531
Mean of dependent variable	0.755	0.655	0.225	0.205	0.605	0.492

- Limited impact of competition in Myanmar due to strong giving culture
- In Cambodia, strong competition impacts

Competition Effects
Joint Investment Game

	(1)	(2)	(3)	(4)	(5)	(6)
	Decided to Invest					
	Myanmar		Cambodia		Total	
Competition	0.009	-0.012	0.046*	0.002	0.018**	-0.009
	(0.007)	(0.016)	(0.023)	(0.028)	(0.008)	(0.013)
SMU		0.019*		0.114***		0.048***
		(0.010)		(0.038)		(0.012)
Competition * SMU		0.034*		0.075*		0.043**
		(0.017)		(0.044)		(0.017)
Observations	8,371	8,371	3,355	3,355	11,726	11,726
R-squared	0.013	0.017	0.089	0.104	0.254	0.260
Mean of dependent variable	0.945	0.933	0.516	0.452	0.822	0.752

- Some effect of competition in both countries

Why No Competition Effects in Myanmar?

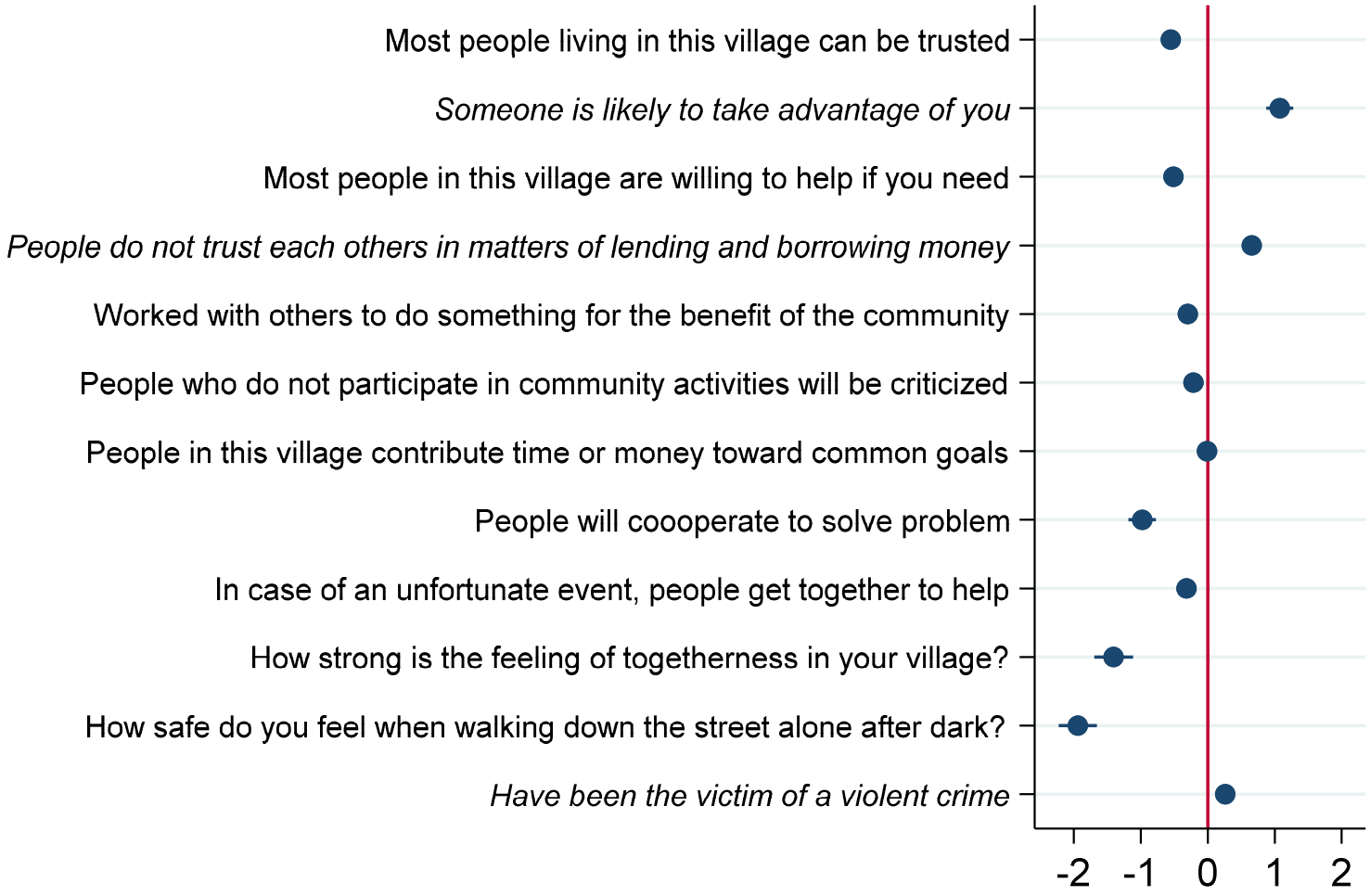
- According to the World Giving Index (WGI; ranking 140 countries according to how charitable they are),

	2017 rank	2016 rank	2015 rank	2014 rank
Myanmar	1	1	1	1
USA	5	2	2	1
UK	11	8	6	7
Philippines	54	47	64	60
Cambodia	134	98	100	108

- Probably no room for the competition effect in Myanmar because of the very high contribution rate even in the control group?

- Heterogeneous giving cultures between Cambodia and Myanmar

Baseline Social Capital
Myanmar vs. Cambodia



Application 3:
Project-Based Learning

S. Choi, B. Kim, E. Lee, J. Lee, M. Park, Y. Park, and E. Shin

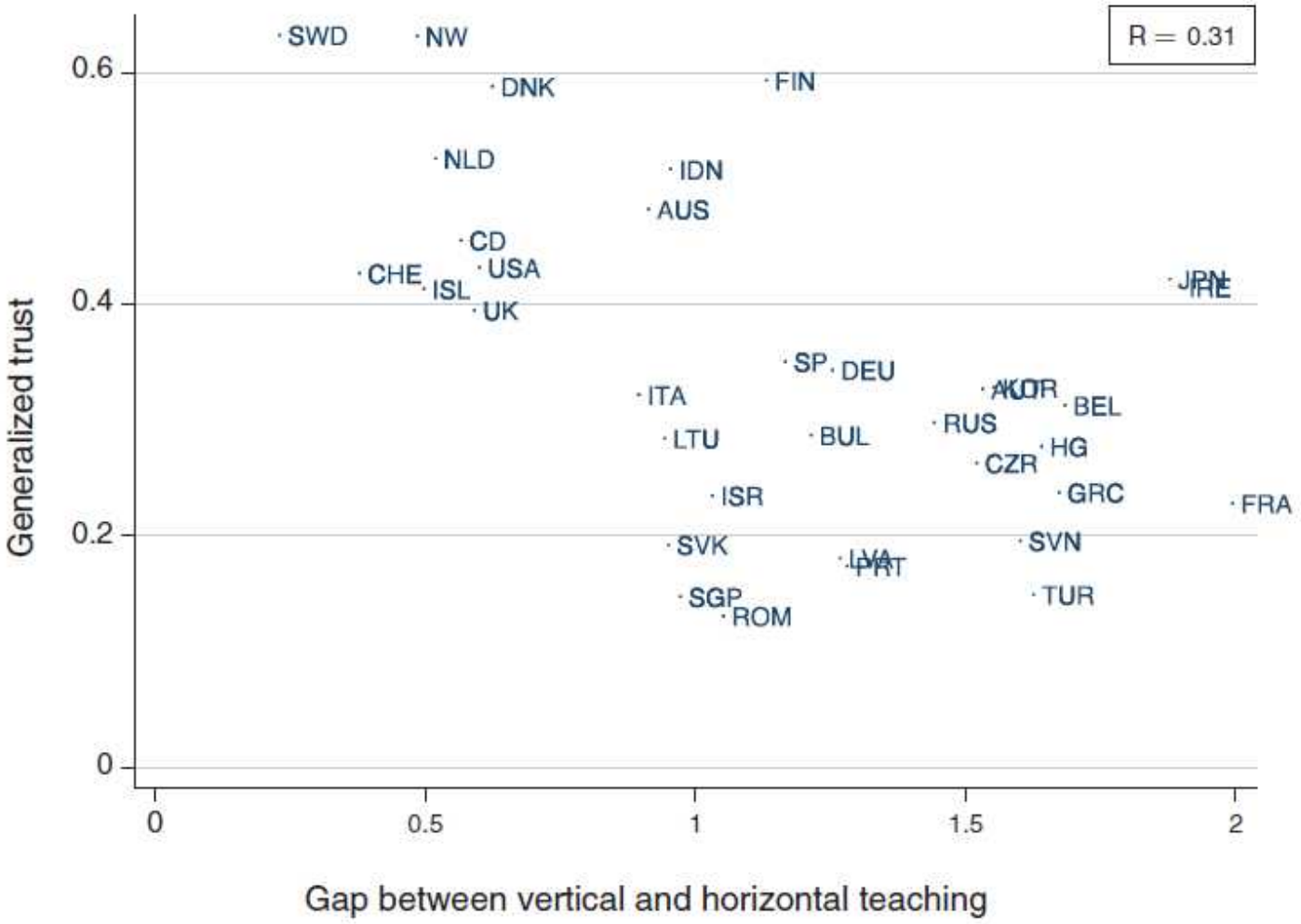
Teaching Methods

Vertical teaching	Horizontal teaching
● Teachers primarily lecture, students take notes or read textbooks, and teachers ask students questions.	● Students work in groups, do projects together, and ask teachers questions.
● The central relationship in the classroom is between the teacher and the student.	● The central relationship in the classroom is among students.

Vertical Teaching

Horizontal Teaching

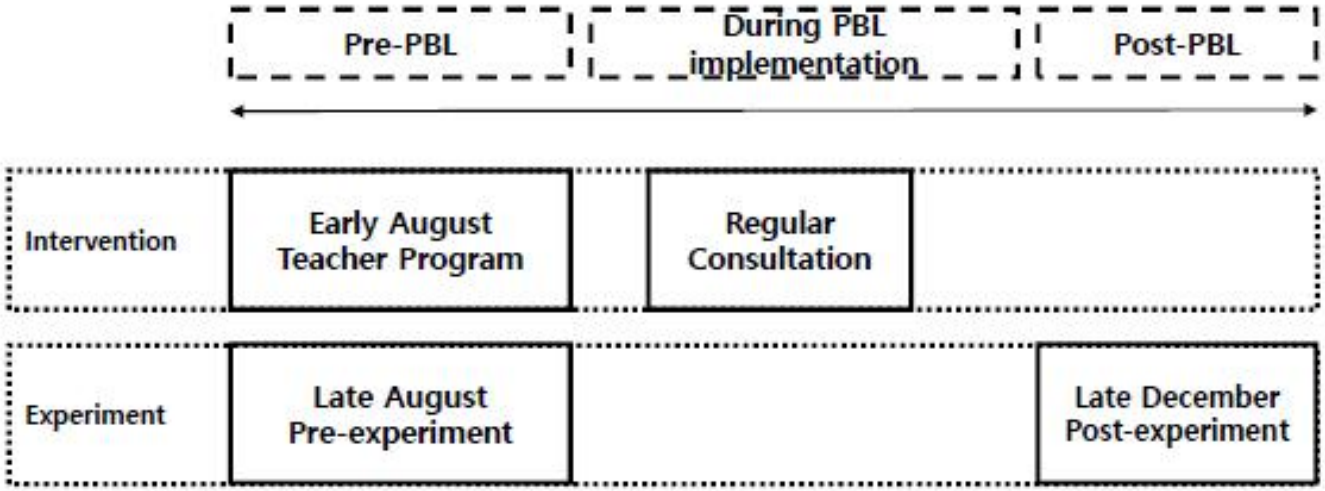
Teaching Practices and Social Capital: Algan et al. (2013)



Project-based Learning Program in Daegu

- Quasi-experimental intervention on the semester-long practices of a horizontal teaching method, project-based learning (PBL)

  - Fall term 2015: 7th graders in 2 treatment schools vs. 3 control schools
  - Fall term 2016: 7th graders in 6 treatment schools vs. 6 control schools



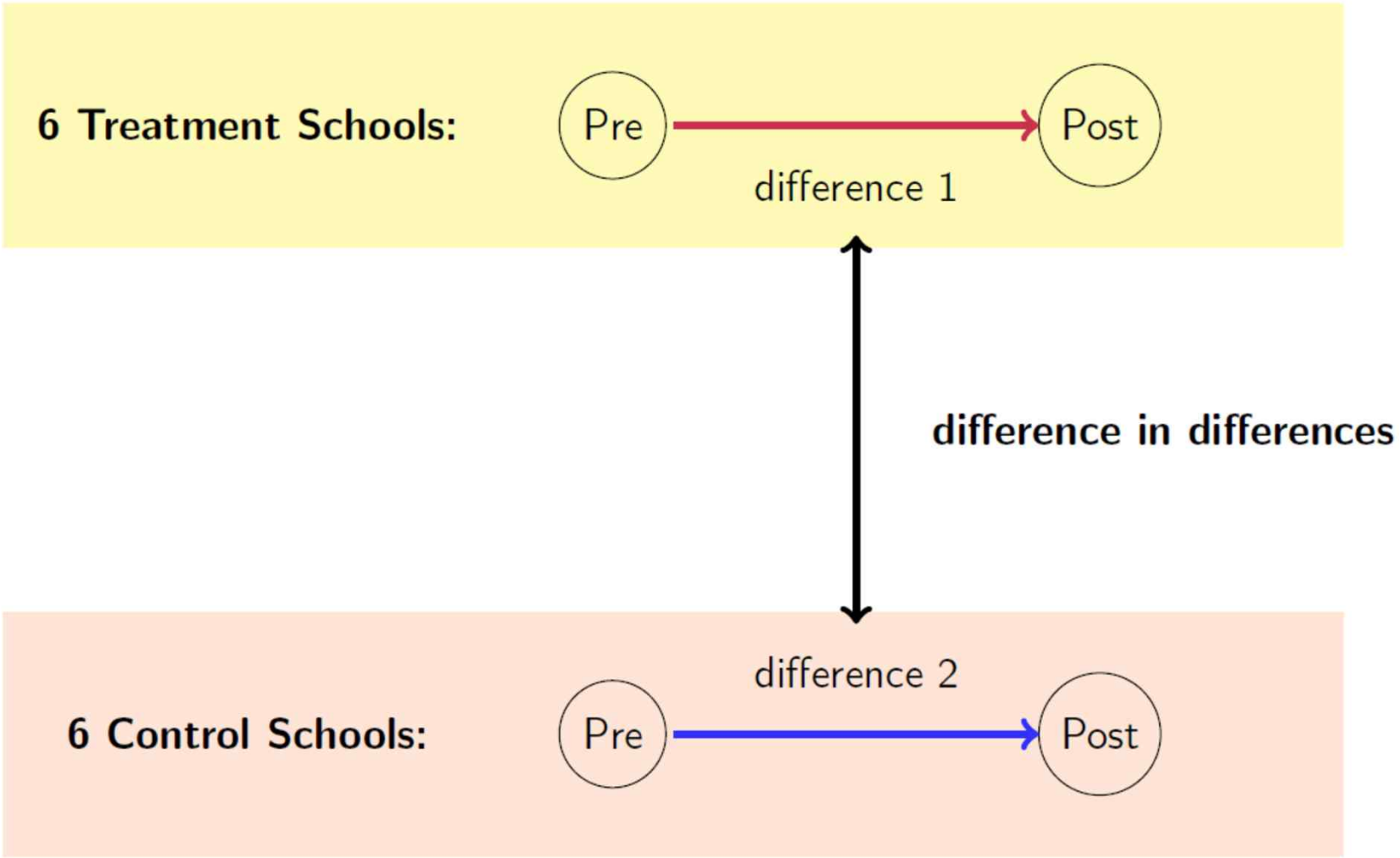
Schools in PBL 2015

Within a 2 km radius in the downtown area of Daegu city

Project-based Learning Program in Daegu

- 2015/6년 8월: 실험학교의 전체 교사를 대상으로 3일간 PBL 교사연수
- 2015/6년 8월말: 기초조사 (학생, 학부모)
  - 학생: 행동실험(1교시), 학업성취도(2교시), 비인지능력(3교시)
  - 학부모: 소득, 교육수준 등 배경변인
- 2015/6년 2학기: 실험학교 1학년 담당 교사들을 대상으로 PBL 수업 컨설팅
  - 격주 간격으로 온라인 및 오프라인 컨설팅 실시
- 2015/6년 12월말: 기말조사 (학생, 학부모, 교사)
  - 학생: 행동실험(1교시), 학업성취도(2교시), 비인지능력(3교시)
  - 학부모: 소득, 교육수준 등 배경변인
  - 교사: 자기효능감

Evaluation by Difference in Differences



PBL이 학업성취도에 미친 영향

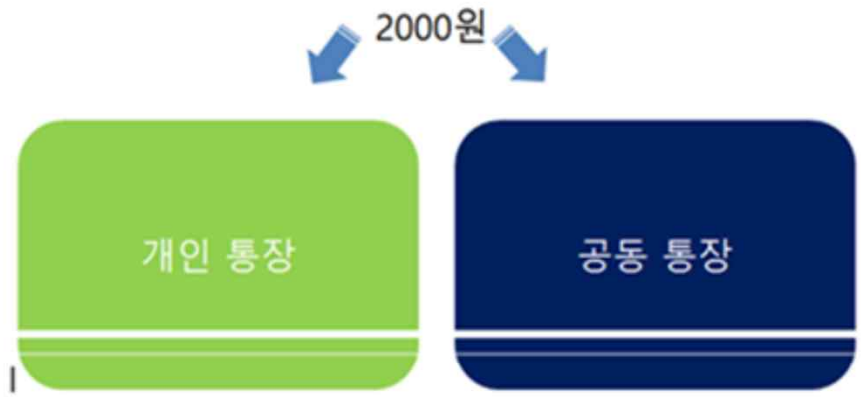
<표 5-2> 프로젝트 학습이 학업성취도에 미친 영향(이중차분 분석)

종속변수	국어	수학	영어	과학	종합
	(1)	(2)	(3)	(4)	(5)
학기 말	-0.046 (0.085)	-0.002 (0.084)	0.092 (0.082)	0.016 (0.082)	0.031 (0.082)
실험학교	0.073 (0.089)	0.194** (0.088)	0.377*** (0.089)	0.121 (0.085)	0.257*** (0.089)
학기 말 x 실험학교	**0.248** (0.118)**	**0.003 (0.115)**	-0.136 **(0.119)**	**0.060 (0.112)**	**0.043 (0.115)**
성별	-0.178** (0.073)	0.007 (0.072)	-0.010 (0.076)	0.087 (0.071)	-0.022 (0.072)
로그 가구소득	0.171*** (0.059)	0.262*** (0.058)	0.290*** (0.059)	0.238*** (0.060)	0.326*** (0.060)
엄마 교육수준	0.132*** (0.032)	0.162*** (0.030)	0.131*** (0.032)	0.141*** (0.030)	0.190*** (0.031)
학급 정원	-0.012 (0.018)	-0.028 (0.017)	-0.063*** (0.018)	-0.044*** (0.016)	-0.048*** (0.017)
남녀공학	-0.052 (0.108)	0.187* (0.106)	0.357*** (0.108)	0.230** (0.103)	0.249** (0.106)
상수항	-0.999* (0.553)	-1.512*** (0.530)	-0.876 (0.550)	-0.988* (0.514)	-1.502*** (0.540)
관측 수	1,131	1,131	1,131	1,131	1,131

주: 관측 수는 국어, 수학, 영어, 과학 4과목 모두 데이터가 있는 경우로 한정하였음. 계수는 통제학교의 평균과 표준편차를 기준으로 표준화(normalized)하였음. 괄호 안의 숫자는 화이트 표준오차(robust standard errors)임. 개인수준, 학급수준, 학교수준 통제변수로 성별(여자=0, 남자=1), 로그가구소득, 엄마 교육수준, 학급 정원, 남녀공학 여부를 통제하였음. ***, ** 및 *은 추정치가 각각 1%, 5% 및 10% 수준에서 유의함을 표시함.

Public Goods Game in 2015

여러분은 받은 2000원을 개인통장과 공동통장에 나누어 넣어야 합니다.



아래의 표에서 개인통장과 공동통장에 각각 얼마를 넣고 싶은지 선택해주세요. (한 칸만 선택해 주세요)

개인통장	0원	200원	400원	600원	800원	1000원	1200원	1400원	1600원	1800원	2000원
공동통장	2000원	1800원	1600원	1400원	1200원	1000원	800원	600원	400원	200원	0원
선택				○							

$$Payoff_i = x_i + 0.1\sum_{j=i}^{N} y_j$$

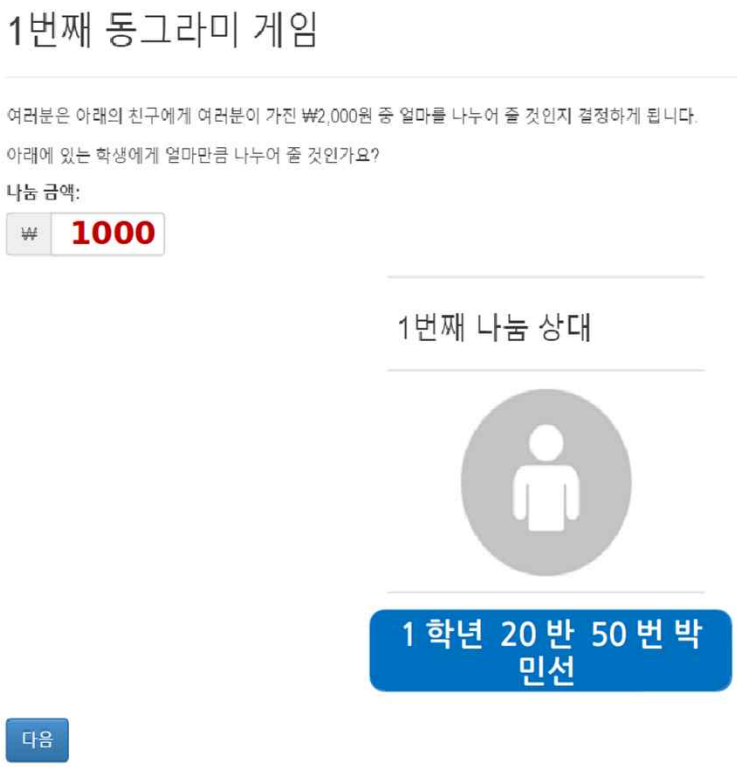
PBL Effects on Cooperation 2015

Outcome variable:	Share of investment in public account					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. School 1 and 2 vs. control schools						
PBL program	0.082**	0.085**	0.084**	0.084**	0.082**	0.088***
	(0.032)	(0.033)	(0.033)	(0.033)	(0.032)	(0.030)
Post	-0.163***	-0.152***	-0.153***	-0.141***	-0.133***	-0.037
	(0.025)	(0.028)	(0.027)	(0.029)	(0.027)	(0.026)
Observations	1,220	1,220	1,220	1,220	1,220	1,220
Adjusted R-squared	0.117	0.119	0.120	0.120	0.136	0.297
Panel B. School 1 vs. control schools						
PBL program	0.122***	0.122***	0.121***	0.120***	0.114**	0.122***
	(0.042)	(0.044)	(0.044)	(0.044)	(0.044)	(0.037)
Post	-0.150***	-0.148***	-0.150***	-0.140***	-0.130***	-0.044
	(0.027)	(0.030)	(0.030)	(0.033)	(0.030)	(0.028)
Observations	848	848	848	848	848	848
Adjusted R-squared	0.138	0.140	0.140	0.139	0.156	0.280
Panel C. School 2 vs. control schools						
PBL program	0.060**	0.064**	0.065**	0.065**	0.063**	0.066**
	(0.029)	(0.031)	(0.031)	(0.031)	(0.030)	(0.029)
Post	-0.176***	-0.162***	-0.163***	-0.155***	-0.146***	-0.044
	(0.025)	(0.028)	(0.028)	(0.030)	(0.027)	(0.026)
Observations	998	998	998	998	998	998
Adjusted R-squared	0.125	0.126	0.127	0.126	0.147	0.324
Demographic controls	x	o	o	o	o	o
Friendship network	x	x	o	o	o	o
Cognitive skills	x	x	x	o	o	o
Personalities	x	x	x	x	o	o
Giving preferences	x	x	x	x	x	o

Friendship Survey in 2016

- Each student is asked to choose (maximally) 10 close friends in the same year cohort of the school.
- Friends are also classified by what activities they share.

Dictator Game in 2016



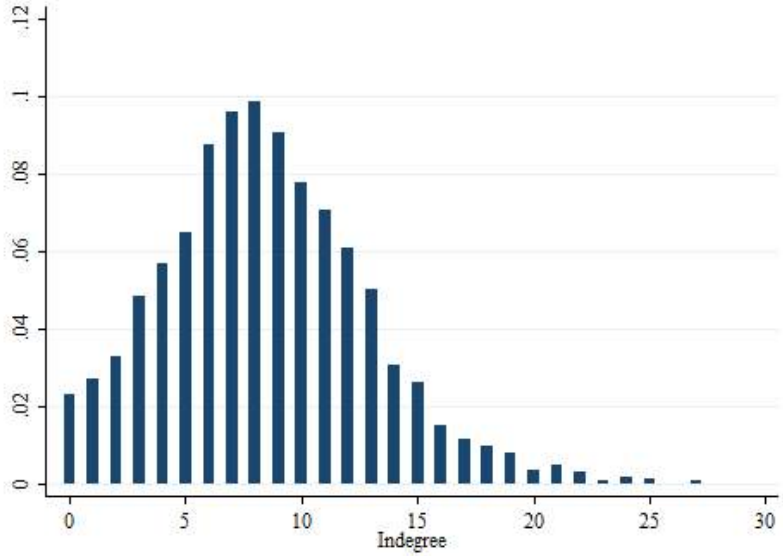
- Each subject participates in 10 rounds of decisions with randomly matched partners.
- Divide 2000 KRW between herself and a partner.
- Subjects know the identity of their partners.

Summary of Friendship Data

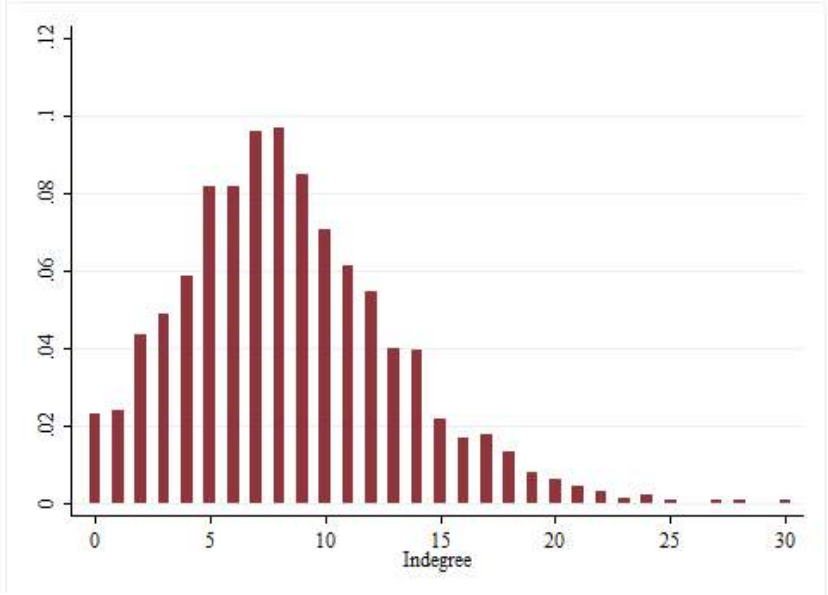
Indegree Distributions

Before PBL intervention

Control schools

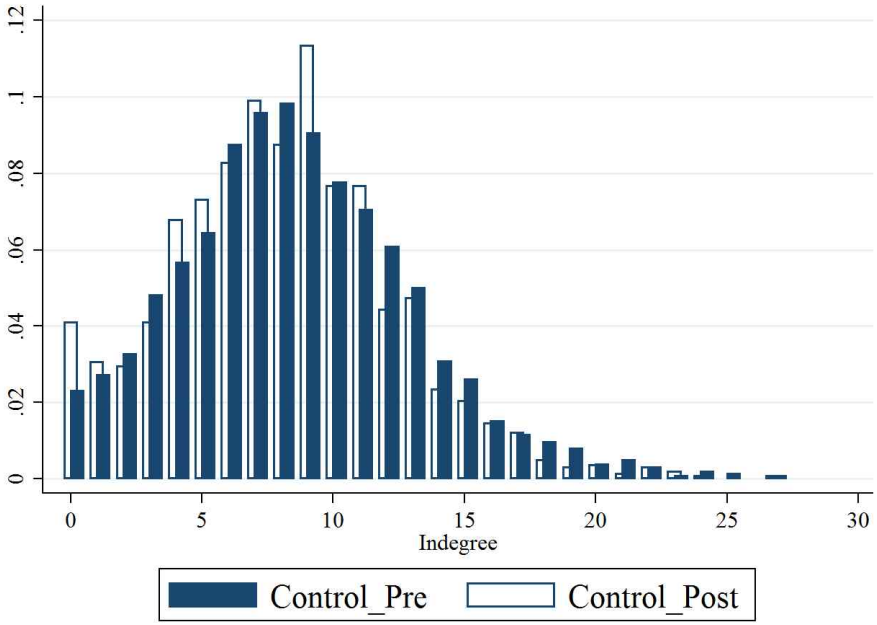


Treatment schools

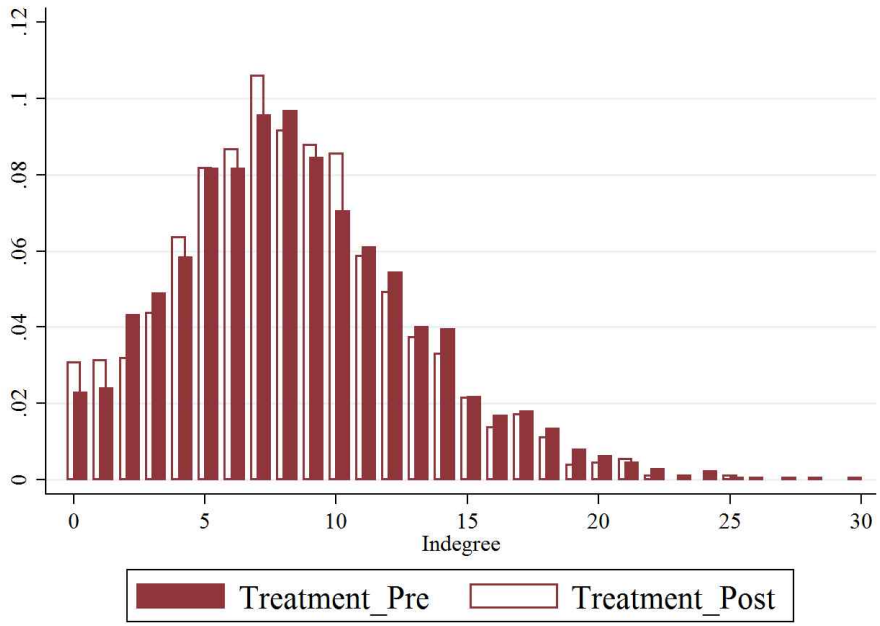


Indegree Distributions

Control schools



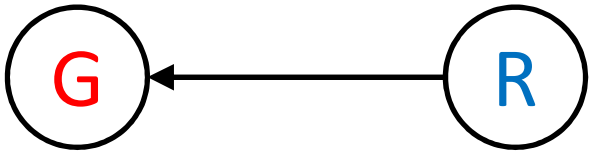
Treatment schools



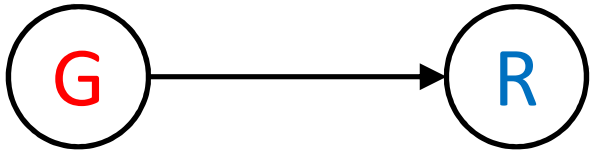
Dyadic Relationship

Null (83%)

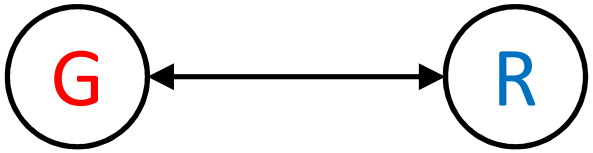
R only (5%)



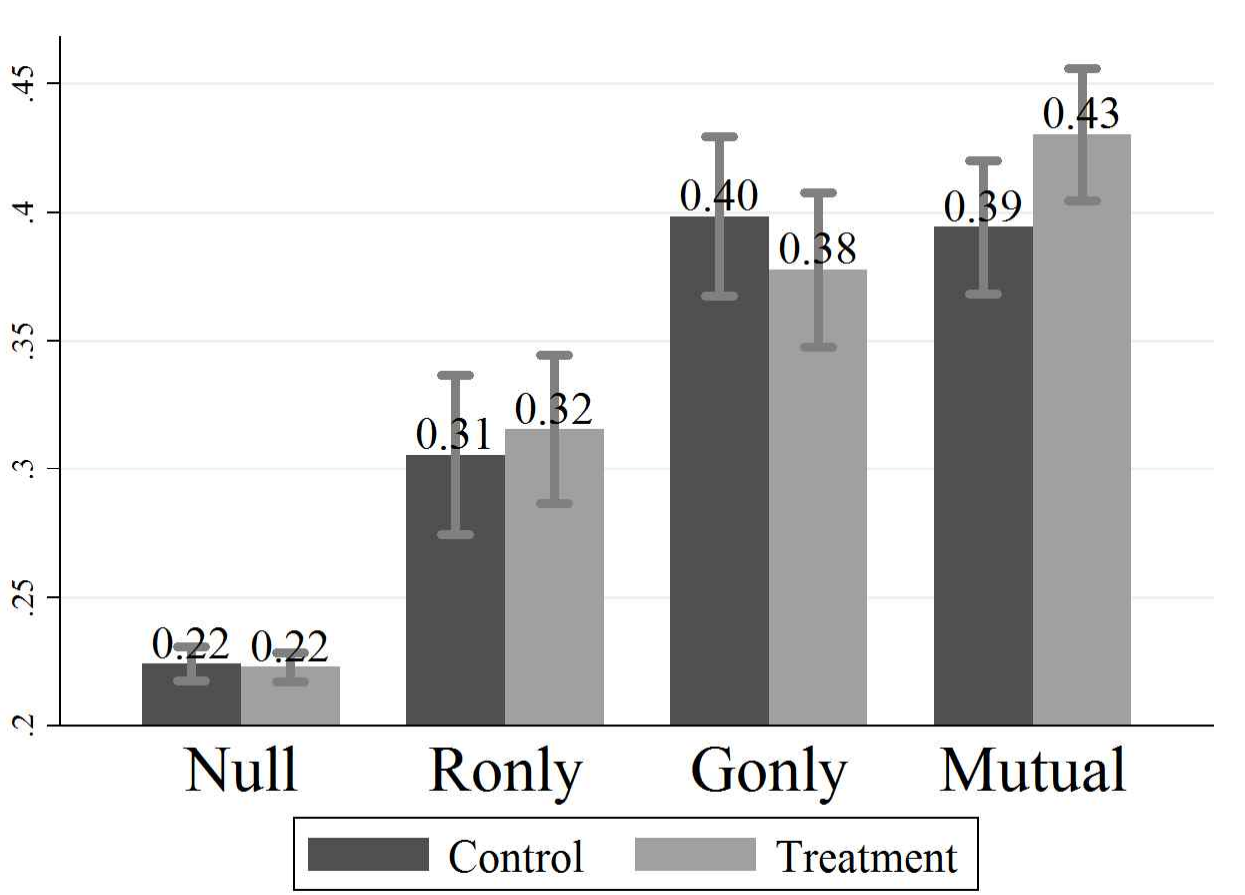
G only (5%)



Mutual (7%)

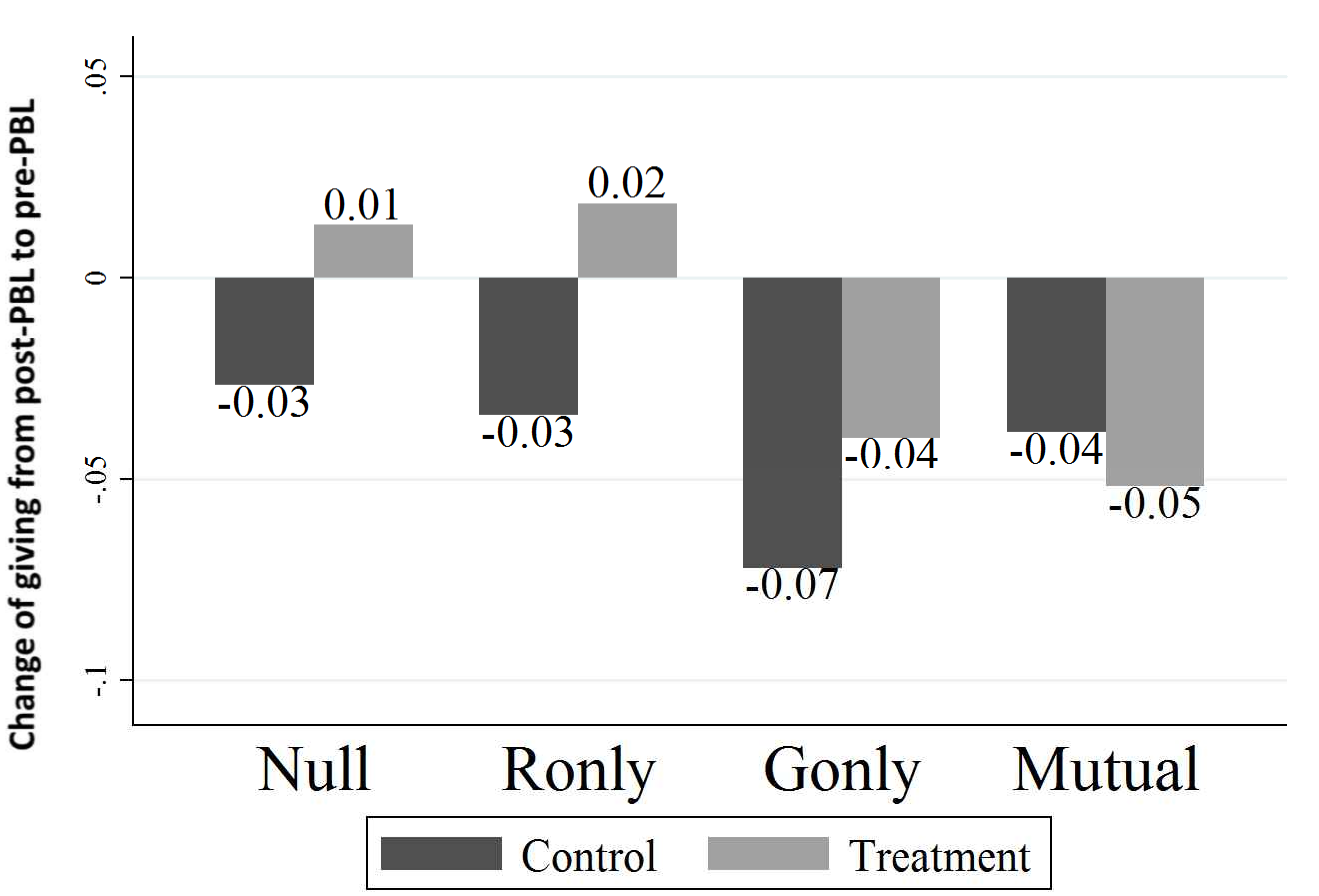


Giving Behavior before PBL



- The value of friendship in giving increases in social relation.
- Prior to the PBL intervention, there is no difference.

PBL Impacts on Giving Behavior



- The difference-in-differences estimates of the PBL impacts on giving are about 4% (Null) and 5% (R only).

PBL Impacts on Giving Behavior

Giving fraction	Model (1)	Model (2)
TimexTreatment	0.0366***	
	(0.0119)	
NullxTimexTreatment		0.0412***
		(0.0119)
RonlyxTimexTreatment		0.0519**
		(0.0218)
GonlyxTimexTreatment		-0.0123
		(0.0206)
MutualxTimexTreatment		0.00605
		(0.0198)
School	yes	yes
Period	yes	yes
Constant	0.236***	0.261***
	(0.0197)	(0.0202)
Observations	29,246	29,246
R-squared	0.069	0.027

(Unimplemented) Application 4: 농식품 바우처 지원사업

Introduction

- 계층 간 영양불균형 완화 및 취약계층을 위한 식품지원제도
  - Supplemental Nutrition Assistance Program (SNAP) in the USA
  - Healthy Start in the UK
- 한국도 다양한 취약계층 지원제도 도입
  - 영양플러스 사업 (영유아, 임산부, 출산부, 수유부)
  - 농식품 바우처 제도: 경제적 취약계층 대상

Existing Policy Tools

- 기존 정책 도구
  - 금전적 인센티브
    - 저소득층에게 지원되는 금전적 인센티브의 증가는 저소득층의 신선식품 구매를 증가시킬 수 있음.
  - 정보 제공
    - 신선식품 섭취의 장점에 대한 홍보는 저소득층의 신선식품 구매를 유도할 수 있음.

Loss Aversion

- 손실 회피 (Loss aversion)
  - Reference point를 기준으로 이득(gain)보다 손실(loss)에 대해 더 크게 반응하는 행태.

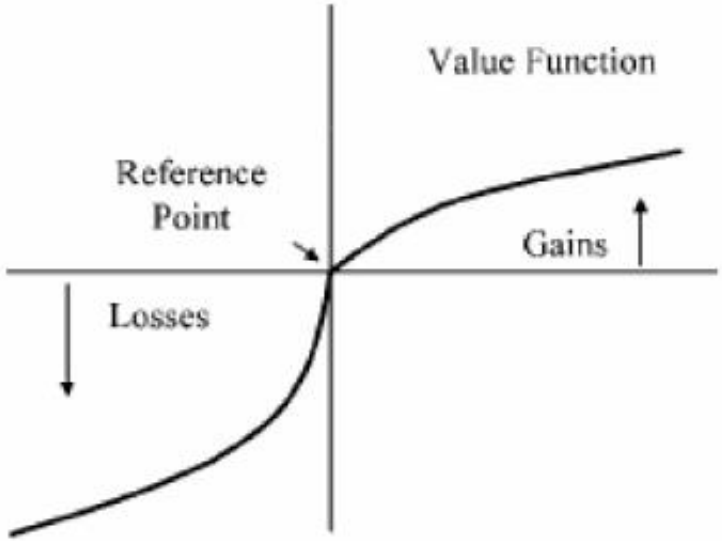


FIGURE II
Prospect Theory

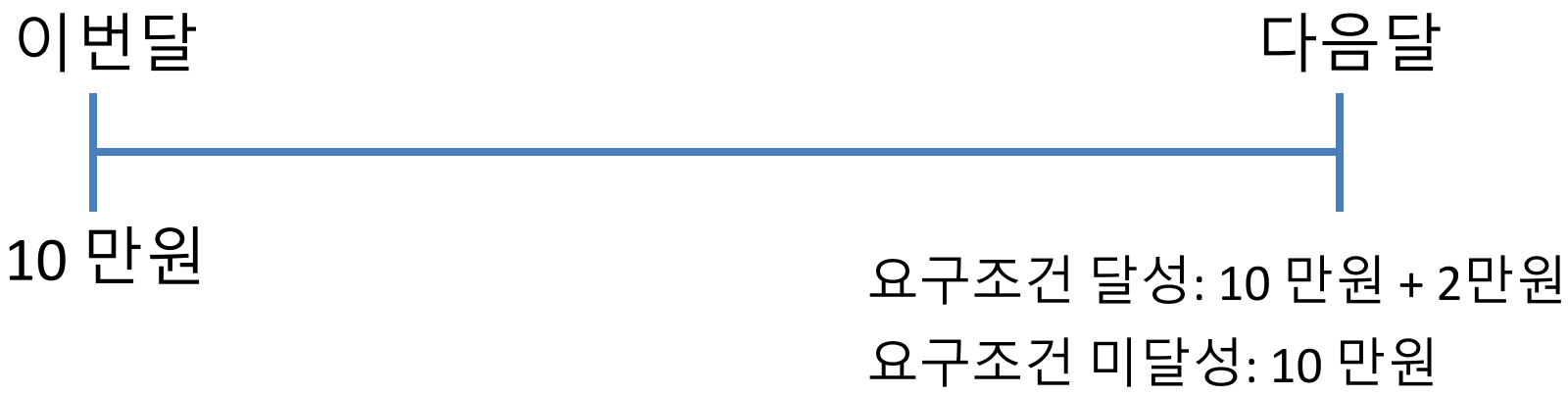
Behavioral Change Policy Using Loss Aversion

- Unconditional financial support: 대부분의 기존 정책
- Conditional financial support
  - **Gain framing**: 일정 요구조건 이상을 충족시키면 보너스 지급
  - **Loss framing**: 일정 요구조건 이상을 충족시키지 못하면 지원 금액 삭감
  - 위의 각 지원 방식에서 동일 조건 달성 시 지원금 규모는 같음.

Behavioral Change Policy Using Loss Aversion

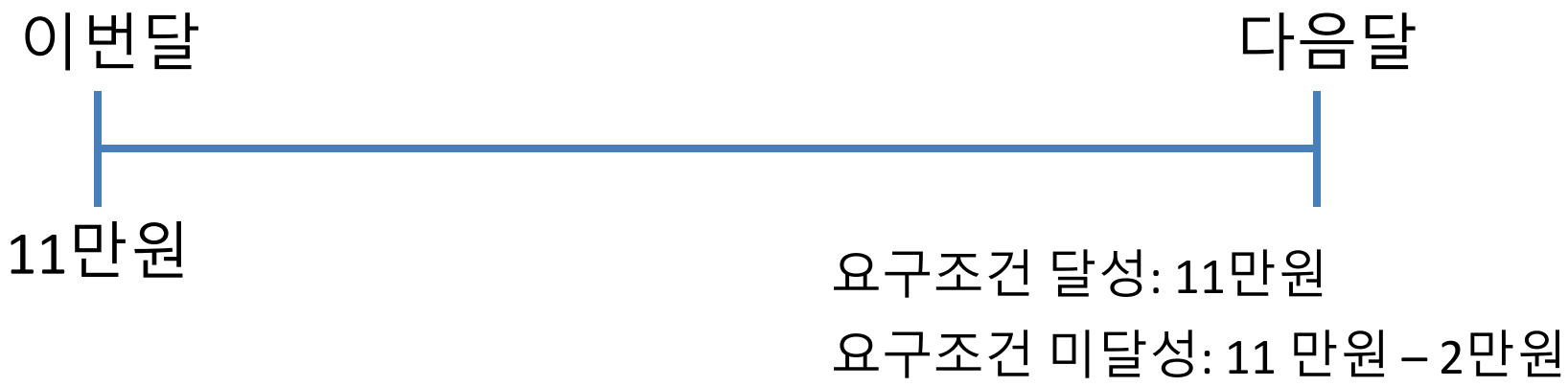
- 요구조건: 식료품 지원금액 중 70% 이상을 신선식품 구매에 사용
- 인센티브: 요구조건 달성 시 다음 달 지원금 2만원 추가 지원

  – **Gain framing**: 일정 요구조건 이상을 충족시키면 보너스 지급



Behavioral Change Policy Using Loss Aversion

- 요구조건: 식료품 지원금액 중 70% 이상을 신선식품 구매에 사용
- 인센티브: 요구조건 미 달성 시 다음 달 지원금 2만원 삭감
  - **Loss framing**: 일정 요구조건 이상을 충족시키지 못하면 지원 금액 삭감



선행연구: Loss Aversion

- Fryer et al. (2012)의 Teacher Incentives policy
  - 선생님들이 제공하는 교육서비스의 질은 사회적 비용과 학생들의 삶에 큰 영향을 미치게 됨.
  - 따라서, 선생님들에게 적절한 인센티브를 주어 양질의 교육을 이끌어낼 수 있다면 학생들의 삶을 크게 개선시킬 수 있을 것임.
  - Fryer et al. (2012)은 Loss aversion을 활용한 정책을 Chicago Heights 9개 학교, 150명의 선생님과 3,200명의 학생들을 대상으로 진행함.

선행연구: Loss Aversion

- Fryer et al. (2012)의 Teacher Incentives policy

<**기존의 인센티브 제공 방식 (Gain treatment)**>

– 학생들의 성과(공인된 기초 학력평가 시험)에 기반하여 금전적 인센티브를 제공

선행연구: Loss Aversion

- Fryer et al. (2012)의 Teacher Incentives policy

<**손실회피 기반 인센티브 제공 방식 (Loss treatment)**>

  - 정책 시행 시 인센티브 평균 기대값에 해당하는 금액을 미리 제공
  - 학생들의 성과(공인된 기초 학력평가 시험)여부에 따라 그 금액의 일부 또는 전부를 반환하는 방식으로 설계

선행연구: Loss Aversion

- Fryer et al. (2012)의 Teacher Incentives policy

  - 연구 결과 Gain treatment 그룹의 성과에 비해 Loss treatment 그룹이 0.200 이상 일부는 0.398 표준편차에 해당하는 학생들의 성적 향상이 나타났음.

  - 워싱턴 포스트 (Washington Post)는 이들의 연구를 보도하며 Loss treatment 그룹 학생의 생애소득 (Lifetime earning) 증가가 $37,180와 $77,740 사이가 될 것이라고 추정함.

Concluding Remarks

- Growing opportunities of using economic experiments in policy evaluation.
- Many tools of policy interventions:
  - Incentives; information; nudges
- Both practical and scientific values of collaboration among academic scholars, policy-makers and practitioners.