Referee Report

The Demand for Bad Policy when Voters Underappreciate Equilibrium Effects

Yifei Liu

Department of Economics, LMU

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CONTENTS

Question & Motivation

RESEARCH QUESTION

Underappreciate Equilibrium Effects $\xrightarrow{causes}$ Bad Policy Demand

■ Bad Policy:	cannot maximize total utility
■ Equilibrium Effect:	direct + indirect
■ Underappreciate:	underestimate indirect effect

Underestimate Behavioral Changes $\xrightarrow{causes}$ Ineffective Policy (low utility)

Causes for bad policy:

Most blame bad policies on politicians or institutions
(limited electoral accountability[1], ineptitude[2], status quo bias[3], reform delay[4], dynamic inefficiency[5])

↓

Politicians are panderers, not educators[6][7][8]

↓

Why voters prefer bad policies?

↓

Assumption: underestimation behavioral changes causes bad policies[9]
(previous papers haven't demonstrated the causal relationship)

Experimental Design

BASIC SETTING

Game setting:
choose one game to participate + state beliefs on cooperation rates

	C	D
C	$b-c, b-c$	$-c, b$
D	$b, -c$	$0, 0$

Prisoners' Dilemma (PD)

	C	D
C	$b-c-t_C, b-c-t_C$	$-c-t_C, b-t_D$
D	$b-t_D, -c-t_C$	$-t_D, -t_D$

Harmony Games (HG)

Specific numbers: $b = 6, c = 2, t_C = 1, t_D = 4$ over a baseline of 5

	C	D
C	$9, 9$	$3, \underline{11}$
D	$\underline{11}, 3$	$\underline{5}, \underline{5}$

Prisoners' Dilemma (PD)

	C	D
C	$\underline{8}, \underline{8}$	$\underline{2}, 7$
D	$7, \underline{2}$	$1, 1$

Harmony Games (HG)

Expected gain (G) can be decomposed into three terms:

- DE: direct effect of game change
- IS: indirect effect due to the behavioral adjustment by self
- IO: indirect effect due to the behavioral adjustment by opponent

With beliefs

Table: Beliefs on Cooperation Rates

	Prisoners' Dilemma	Harmony Game
Themselves	α	α'
Others	β	β'

Then we can get

$$G = DE + IS + IO = -4 + 2\alpha + \alpha^{'} + 6(\beta^{'} - \beta)$$

where

$$\begin{aligned} DE &= EU(HG|\alpha, \beta) - EU(PD|\alpha, \beta) \\ IS &= EU(HG|\alpha^{'}, \beta) - EU(HG|\alpha, \beta) \\ IO &= EU(HG|\alpha^{'}, \beta^{'}) - EU(HG|\alpha^{'}, \beta) \end{aligned}$$

Based on rational assumption ($\alpha = 0, \alpha^{'} = 1$), if a person chooses HG, then $\underline{G > 0}$, then

$$\beta^{'} - \beta > \frac{4 - 2\alpha - \alpha^{'}}{6} = \frac{1}{2} \tag{1}$$

Two-stage experiment:

- First Stage: play PD for 5 periods
- Second Stage: play one of the games for 5 periods
  (games are chosen in three different ways)

Three ways:

Table: Experiment Design - Treatments

Treatment	Extension
Control	Reverse Control
Random Dictator (RD)	Reverse RD
Majority Once	Majority Repeated

(reverse groups: avoid effect of orders; repeated group: evolution)

Results & Conclusion

Result 1:
The payoffs in Harmony Game is higher than in Prisoners' Dilemma.

Table: Cooperation Rates (CR) and Payoffs in the Two Games

Stage	Type	CR_{PD}	CR_{HG}	$Payoff_{PD}$	$Payoff_{HG}$
	Control	16%	92%		
Stage 2	Reverse Control	30%	93%		
	All	23%	95%	5.91	7.66
Stage 1	All (Period 5)	15.5%	95%	5.62	7.65

RESULT 2

Result 2: The majority prefers Prisoners' Dilemma.

Table: Prisoners' Dilemma Vote Share

	Average	Min	Max
Vote Share	53.60%	50.00%	60.83%

Result 3: The majority underestimates the change of others' behavior.

Table: Average Difference of Cooperation Rates between HG and PD

	Real Difference	
	Control	Reverse Control
Difference	76%	63%

	Believed Difference		
	Random Dictator	Majority Once	Reverse RD
Difference	35%	35%	30%

Additional experiment:

causal relationship between beliefs and preference

- First Stage: same as before
- Additional Section: informed cooperation rates
- Second Stage: same as before (choose game: same as RD)

Two different sets of cooperation rates:

Table: Additional Experiment - Treatments

	Basic	Extension
Group A (17%-83%)	PD-1	HG-1
Group B (50%-50%)	PD-2	HG-2

(Extension: reverse groups)

Result 4: Underestimating changes in others' behavior causes a preference for the Prisoner's Dilemma.

IV method:
IV: *Saw High Difference* ($= 1$ if in Group A; $= 0$ if in Group B)

Table: Instrumenting for Beliefs

First Stage: *Saw High Difference* & Belief Difference		
	(1) No Control Var.	(2) Control Char.
Saw High Difference	15.549***	16.232***
	(5.444)	(5.467)
Second Stage: Belief Difference & Preference for PD		
Belief Difference	-0.022***	-0.022***
	(0.008)	(0.008)

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

CONCLUSION

Underestimate Behavioral Changes $\xrightarrow{\textit{causes}}$ Prisoners' Dilemma Preferred

(Underappreciate Equilibrium Effects) (Bad Policy Demand)

Assessment

CONTRIBUTIONS

1. **Political Economics**
   - New explanation for bad policies
   - Demonstration of a causal relationship
   - New methods for studying political economy (behavioral and experimental economic methods)
2. **Behavioral Economics**
   - Empirical support for χ-cursed equilibrium (based on EU Thoery)

Table: χ-cursed Equilibrium

Probability	Equilibrium	Others' Type (C or D)	Game
$1-\chi$	Bayesian Nash	know probability distribution	HG
χ	Full-cursed	completely ignore	PD

χ: rate of choosing Prisoners' Dilemma (RD / reverse RD)

POINT 1: UTILITY FUNCTION

Additional experiment: 42% participants choose PD when knowing cooperation rates was 83% in HG and 17% in PD (PD-1 and HG-1)

Contradictory to equation (1):

$$\beta' - \beta = 83\% - 17\% = 66\% > 50\%$$

A similar experiment:

1. Game choice
2. Actions (C or D) in the two games
3. Beliefs on others' cooperation rates
4. Game choice (after simulated experience)
5. Game choice (after knowing real cooperation rates: 16% in PD and 92% in HG)

Choice is equivalent to:

$$L_{PD} = (5, 84\%; 11, 16\%)$$
$$L_{HG} = (8, 92\%;\ 2, 8\%)$$

POINT 1: UTILITY FUNCTION

Potential explanation (consistent with data in additional experiment):

overweight small probabilities & underweight large probabilities

Cumulative Prospect Theory (CPT):

$$EU_{HG} = \exp(-\beta(-\ln p)^{\alpha} \times 8^{\alpha} + \exp(-\beta(-\ln(1-p))^{\alpha} \times 2^{\alpha}$$

$$EU_{PD} = \exp(-\beta(-\ln(1-q))^{\alpha} \times 5^{\alpha} + \exp(-\beta(-\ln q)^{\alpha} \times 11^{\alpha}$$

Possible values of α and β:

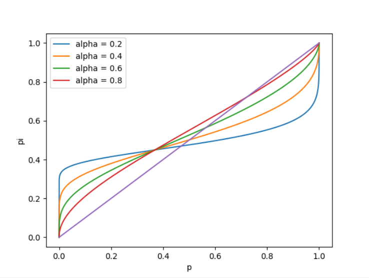


Figure: fixed $\beta = 0.8$

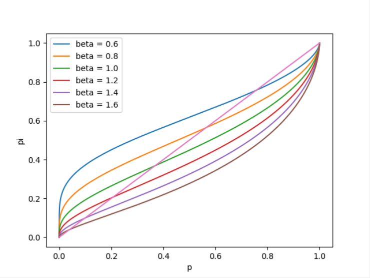


Figure: fixed $\alpha = 0.6$

Assume $p = 90\%$ and $q = 10\%$:

Table: CPT Expected Utility

	Expected Utility	
	90% in HG	10% in PD
$\alpha = 0.6,\ \beta = 0.8$	3.24	3.26
$\alpha = 0.4,\ \beta = 0.8$	1.68	1.81
$\alpha = 0.2,\ \beta = 0.8$	1.37	1.46
$\alpha = 0.6,\ \beta = 0.6$	3.54	3.81
$\alpha = 0.6,\ \beta = 1.0$	2.98	2.84

In most cases,

$$G = EU_{HG} - EU_{PD} < 0$$

However, CPT is complex and α, β are not easy to determine.

Solution: (1) EU Theory; (2) more groups in additional experiment.

POINT 2: PAYOFFS VALUE

Two alternatives (given $p = 10\%$ and $q = 90\%$):

Table: Alternative 1

	C	D
C	$9, 9$	$5, \underline{10}$
D	$\underline{10}, 5$	$\underline{8}, \underline{8}$

Prisoners' Dilemma (PD)

	C	D
C	$\underline{9}, \underline{9}$	$\underline{5}, 6$
D	$6, \underline{5}$	$4, 4$

Harmony Games (HG)

Table: Alternative 2

	C	D
C	$9, 9$	$2, \underline{10}$
D	$\underline{10}, 2$	$\underline{3}, \underline{3}$

Prisoners' Dilemma (PD)

	C	D
C	$\underline{9}, \underline{9}$	$\underline{2}, 8$
D	$8, \underline{2}$	$1, 1$

Harmony Games (HG)

Guess: more prefer PD in Alternative 1 and HG in Alternative 2.
Specific values: important but not mentioned
Solution: explanation

POINT 2: PAYOFFS VALUE

Games containing losses:

	C	D
C	$4, 4$	$-2, \underline{6}$
D	$\underline{6}, -2$	$\underline{0}, \underline{0}$

Prisoners' Dilemma (PD)

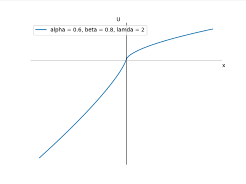
	C	D
C	$\underline{3}, \underline{3}$	$\underline{-3}, 2$
D	$2, \underline{-3}$	$-4, -4$

Harmony Games (HG)

CPT utility function and visualization ($\lambda \geq 1$):

$$EU_{HG} = \exp(-\beta(-\ln p)^{\alpha} \times 3^{\alpha} + \exp(-\beta(-\ln(1-p))^{\alpha} \times (-\lambda)\ 3^{\beta} < 0$$

$$EU_{PD} = \exp(-\beta(-\ln q)^{\alpha} \times 6^{\alpha} > 0$$



Solution: prepayment before participating in the experiment

POINT 2: PAYOFFS VALUE

Unit of payoffs value grows larger:

- $\underline{\beta}$ becomes larger: more risk averse and overweight small probabilities more
- The <u>difference</u> between EU_{HG} and EU_{PD} grows larger

$$Difference = 1000^{\alpha} \times (EU_{PD} - EU_{HG})$$

Solution: additional questions

POINT 3: GAME TYPE

Present bias $(0 < \delta < 1)$:

$$U_t(u) = u_t + \beta \sum_{\tau=t+1}^{T} \delta^{\tau-t} u_\tau$$

Solution: dynamic games (choose D in first period of HG)

POINT 4: CONSISTENCY WITH REALITY

Experiment in reality:

Pigouvian tax: reduce negative externalities

Effect in reality:

- Direct Effect: revenue reduction from taxes
- Indirect Effect: better living environment

Voters in reality:

- Taxed Firms: small share of benefit, full burden of pollution
- The Rest: only benefit

Realistic basis:

- Taxed Firms: negative net profit?
- The Rest: role in the games?

Thank You!

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