

Institutions, Incentives and Behavior: Essays in Public Economics and Mechanism Design

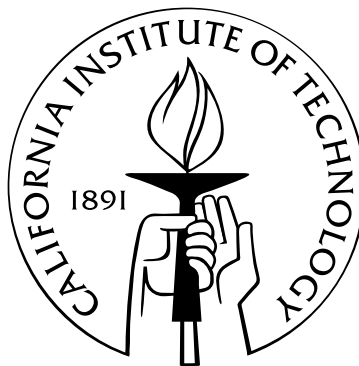
Thesis by

Paul J. Healy

In Partial Fulfillment of the Requirements

for the Degree of

Doctor of Philosophy



California Institute of Technology

Pasadena, California

2005

(Submitted May 17, 2005)

© 2005

Paul J. Healy

All Rights Reserved

For Meredith

Acknowledgements

I wish to thank John Ledyard for his support, funding, and encouragement. I am also indebted to Colin Camerer, Preston McAfee, and Federico Echenique for their helpful comments and frequent guidance. I am particularly grateful to John Ledyard and Charlie Plott (and the EEPS Lab at Caltech) for funding the two sets of experiments presented. Ken Binmore's energy and encouragement have had a very positive impact on my work, and for that, I thank him. Many people have contributed to my research through innumerable stimulating conversations, including (but not limited to) Kim Border, Matt Jackson, Tom Palfrey, David Grether, Simon Wilkie, Tim Cason, Ivana Komunjer, Chris Chambers, and Ernst Fehr. This work has also benefitted from research support provided by the ARCS Foundation. Finally, I am grateful for the research assistance provided by Isa Hafalir, Joel Grus, and Basit Kahn, each of whom assisted in running the experiments presented in Chapter 4.

Abstract

The economic outcomes realized by a society are a function of the institutions put in place, the incentives they create, and the behavior of agents in the face of those incentives. Selecting the appropriate institutions for a given economy is particularly important in the domain of public economics, where individual incentives are often inconsistent with efficiency. Three major concerns in institutional design are addressed. First, do agents select the equilibrium strategies at which efficient allocations obtain? Second, does the repeated game nature of a long-lived institution impact behavior? Third, what degree of coercion is necessary for a planner to guarantee that the allocation selected by a mechanism can be enforced? Answering these questions helps to understand which institutions are most appropriate in various environments. In Chapter 2, five public goods mechanisms are experimentally tested in a repeated game environment. Behavior is well approximated by a model in which agents best respond to an average of recently observed data. This model provides various sufficient conditions a mechanism must satisfy for play to converge to an efficient equilibrium. In Chapter 3, it is assumed that the designer of a one-shot mechanism must allow agents a ‘no trade’ option in which they are free to contribute nothing but enjoy the public good produced by others’ contributions. It is shown that a large set of

economies exist in which there is some agent at every allocation who prefers this option. Even in economies where this is not true, it becomes true as the economy is replicated, making it impossible to implement any allocation except the endowment in large economies.

In the final chapter, a model of group reputations is developed to explain why moral hazard problems are significant in some laboratory experiments and less significant in others. If firms believe that either all workers are selfish or all workers are reciprocal, then selfish workers may have an incentive to develop a ‘group reputation’ of being reciprocal for a fixed number of periods in order to extract higher wages. As predicted, only in those experiments in which this incentive is sufficiently large is the moral hazard problem mitigated.

Contents

Acknowledgements	iv
Abstract	v
Contents	vii
List of Figures	xi
List of Tables	xiii
1 Introduction	1
2 Learning Dynamics for Mechanism Design	8
2.1 Previous Experiments	11
2.2 Setup and Environment	14
2.2.1 A Best Response Model of Behavior	16
2.3 Experimental Design	22
2.4 The Mechanisms	26
2.4.1 Voluntary Contribution Mechanism	27
2.4.2 Proportional Tax Mechanism	28

2.4.3	Groves-Ledyard Mechanism	29
2.4.4	Walker Mechanism	30
2.4.5	Continuous VCG (cVCG) Mechanism	31
2.5	Results	34
2.5.1	Calibrating the Parameter k	34
2.5.2	Best Response in non-VCG Mechanisms	37
2.5.3	Comparison of Best Response and Equilibrium Models	38
2.5.4	Best Response in the cVCG Mechanism	51
2.5.5	Frequency of Revelation	51
2.5.6	Misrevelation & Weakly Dominated Best Responses	53
2.5.7	Testing Theoretical Predictions of the Model	55
2.5.8	Efficiency & Public Good Levels	59
2.5.9	Open Questions	62
2.6	Conclusion	63
2.7	Appendix	64
3	Equilibrium Participation in Public Goods Allocations	69
3.1	Relation to Previous Literature	71
3.2	Notation & Definitions	74
3.2.1	Environments	74
3.2.2	Mechanisms	77
3.2.3	Implementation	78
3.2.4	The Participation Decision	78

3.3	Properties of Equilibrium Participation Allocations	83
3.4	Quasi-Concave Economies	88
3.4.1	Necessary and Sufficient Conditions	88
3.4.2	Quasi-Linear Preferences	91
3.5	Equilibrium Participation in Large Economies	92
3.6	Conclusion	95
3.7	Appendix	97
4	Group Reputations & Stereotypes as Contract Enforcement Devices	103
4.1	The Gift-Exchange Market	106
4.1.1	Stage Game Equilibrium	107
4.1.2	Three Specifications	108
4.1.3	Treatment 1: High MRS Ratio, Anonymous IDs (HRA)	109
4.1.4	Treatment 2: High MRS Ratio, Public IDs (HRP)	111
4.1.5	Treatment 3: Low MRS Ratio, Public IDs (LRP)	111
4.2	Experimental Design	112
4.3	Experimental Results	114
4.4	A Reputation Model With Stereotypes	122
4.4.1	The Basic Framework	123
4.4.2	The Model With Stereotypes	127
4.4.3	Application to Previous Experiments	133
4.5	Conclusion	136
4.6	Appendix	137

A Experiment Instructions	143
A.1 Instructions from Chapter 2	143
A.2 Instructions from Chapter 4	154
Bibliography	171

List of Figures

2.1	Model errors in the Voluntary Contribution mechanism	39
2.2	Model errors in the Proportional Taxation mechanism	41
2.3	Model errors in the Groves-Ledyard mechanism	42
2.4	Model errors in the Walker mechanism	43
2.5	Simulated power of the permutation test	45
2.6	Tests of model accuracy in the Voluntary Contribution mechanism . .	46
2.7	Tests of model accuracy in the Proportional Tax mechanism	47
2.8	Tests of model accuracy in the Groves-Ledyard mechanism	48
2.9	Tests of model accuracy in the Walker mechanism	49
2.10	Accuracy of the best response model in the dominant strategy mechanism	54
2.11	Time series of model accuracy in the dominant strategy mechanism . .	56
2.12	Public good levels and efficiency levels for each mechanism	60
3.1	The induced participation games from Example 3.5	80
3.2	Graphical examples of equilibrium participation and the point $z^{(-i)}$. .	81
3.3	Example of allocations satisfying equilibrium participation for one agent	83
3.4	A graphical example demonstrating necessary and sufficient conditions for equilibrium participation	90

3.5	Equilibrium participation with quasilinear preferences	93
4.1	Isoprofit lines for workers and firms across two designs	110
4.2	Data from sessions S1 and S2	115
4.3	Data from sessions S3 and S4	116
4.4	Data from session S5	117
4.5	The mini-games analyzed in the stereotyping model	125
4.6	Strategy pairs and beliefs that support a reputation equilibrium with stereotyping: Current experiments	132
4.7	Strategy pairs and beliefs that support a reputation equilibrium with stereotyping: Previous experiments	135
A.1	Record Sheet: Buyers, HRA and HRP Treatments	167
A.2	Record Sheet: Sellers, HRA and HRP Treatments	168
A.3	Record Sheet: Buyers, LRP Treatment	169
A.4	Record Sheet: Sellers, LRP Treatment	170