Equilibrium Selection of Public Good Provision Mechanisms

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Abstract

It is well known that using a lottery is more efficient than a VCM for public good provision. However, we observe coexistence of these two mechanisms in reality. Why is this? This paper develops a model to study an equilibrium selection of public good provision mechanisms, under evolutionary settings, when both the VCM and the lottery are available at the same time. First, three absorbing states are described: where all agents use the VCM, where all agents use the lottery, and where both mechanisms co-exist. Then, we find the long-run outcomes.

Keywords: Public good provision, VCM, Lottery, Equilibrium selection

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Introduction

Studies on public good provision mechanisms have been well documented, with main efforts on looking for a mechanism that generates the most efficient public good provision. As suggested by many studies (e.g. Morgan, 2000; Morgan and Sefton, 2000; Lange, List and Price, 2007; Corazzini, Faravelli, and Stanca, 2010), lottery provides higher level of public good than the voluntary contribution mechanism (VCM). This raises several important questions: (1) Why do we observe the coexistence of the two mechanisms in reality? (2) Under what conditions can one expect the more efficient public good provision mechanism to prevail?

In this study, following the studies on evolution of conventions (e.g. Anwar 2002; Bhaskar and Vega-Redond 2004; Blume and Temzelides 2003; Dieckmann 1999; Young 1993, 1998), a model is developed to address the above questions. It is assumed that two public good provision mechanisms (the VCM and the lottery), each one on a different island, are available to a finite number of risk neutral agents. First, agents choose the mechanism. Then, they choose their contribution levels in this mechanism.

Two different settings are examined. In one setting, we assume that the initial wealth in the common pool in the VCM and the fixed prize in the lottery are exogenously determined. In the other setting, the initial wealth in the common pool in the VCM and the prize in the lottery are financed by agents in the form of island entry tax. Under both settings, we also consider cases where some agents are locked to either the lottery or the VCM island and are not allowed to move. This constraint may arise when agents are immobile.

The major findings are summarized as follows. First, we described the absorbing states in which
only one of the two mechanisms will prevail, and the characteristics of related parameters are discussed. It is revealed that even if the lottery is more efficient than the VCM in terms of public good provision, it does not necessarily prevail in equilibrium selection under all circumstances. This implies that the dynamic process will not necessarily lead to the selection of the more efficient public good provision mechanism.

Second, we also described the absorbing states in which both public good provision mechanisms co-exist. We demonstrate how the co-existence of different public good provision mechanisms can arise as a result of constraints on the initial wealth in common pools, the marginal per-capita effect of the public goods, and the island entry tax rates, as well as the number of immobile agents.

Third, the introduction of the island entry tax makes the group-size matters more than other initial conditions. This is because the expected agents’ payoffs increase as the number of agents in the same island increases. Thus, an agent’s choice of an island becomes important in that it not only affects the agent’s own pay-off, but also affects the pay-offs of other agents. It turns out that there exists a “tipping point” for each island that makes one of the mechanisms to prevail as soon as the number of agents in it exceeds the “tipping point”.

Forth, with the present of immobile agents, the choice of mobile agents will be affected. The “tipping points” exist when agents made participating decision only based on the number of immobile agents in each island. If the number of immobile agents in one island exceeds the “tipping point”, then all the mobile agents will move to that island, regardless of what other initial conditions are. However, if there are restrictions on agents' mobility, the coexistence of two mechanisms can be observed.

The time schedule

1) We consider a population of N risk neutral agents with the same preferences. Agent's utility (pay-off) is determined by the consumption of private wealth \(z_i\), and a pure public good \(G_i\)\(^4\).

\(^4\) Two different specifications of pay-off \(\pi_i\) will be considered here. 1) \(\pi_i = z_i + \alpha G_i\), in which \(\alpha\) is considered as the multiplier indicating the marginal effect of the public good to each agent. \(0 < \alpha < 1\). 2) \(\pi_i = z_i + \frac{\beta}{N} G_i\), in which the marginal effect of the public good depends on the number of agents. \(1 < \beta < N\).
2) There are two islands. On the VCM island, the public good is financed and provided through the voluntary contribution mechanism. On the lottery island, the public good is financed and provided through the lottery. Agents choose which island to join. The number of agents in the VCM island is denoted by $N_1$, and the number of agents in the lottery island is denoted by $N_2$, where $N_1 + N_2 = N$.

3) At the beginning of each round, agents choose the island they wish to go, simultaneously and independently, based on their observation of the following information: the initial wealth in the common pool of each island, the marginal per-capita effect of public good, the entry tax rates (only in cases with entry tax), and the number of immobile agents bounded to each island (only in cases with immobile agents). The choice is made to maximize agents’ own expected payoff.

4) After choosing whether they go to the VCM or the lottery island, agents simultaneously contribute part of their private wealth to the common pool of the island they chose. The agents' pay-offs are realized at the end of each round.

5) When a new round starts, mobile agents move to the island that gives them higher expected payoff. Agents myopically adjust to last periods' configuration, expecting the state in the previous period to repeat itself. We assume that if indifferent, mobile agents choose an island at random.

6) Equilibrium is reached when agents in the VCM island have no incentive to move to the lottery island, while the agents in the lottery island have no incentive to switch to the VCM island.

**Summary of findings**

First, three absorbing states are described: where all agents use the VCM, where all agents use the lottery, and where both mechanisms co-exist.

Second, we find stochastically stable states, or the long-run predictions if agents can make mistakes.
References


