Group Insurance against Common Shocks

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Introduction: Explaining low demand for index insurance

- Possible explanations : poor product, complex product, psychological biases, other insurance strategies (savings, credit)...
- Interlinked transactions : informal insurance (Clarke and Dercon, 2009), productive activities $\longrightarrow$ externalities

- Solution : offering insurance at the group level ?

- On the offer side : scaling up to cover fixed costs, low transaction costs,
- On the demand side : internalize some externalities ?

Introduction: Explaining low demand for index insurance

- Build a simple model to study the demand for insurance against common shocks,
- Identify generic reasons why individual demand may be low...
- and the conditions for group insurance to rise demand.

Focus on cooperatives, village communities : groups of interlinked individuals.

Introduction: Results

Two different kinds of problems with individual insurance :

- A coordination problem : insurance against a common shock can have a negative value if other community members are not insured,
- A free-riding problem : insurance exerts a positive externality on other community members.

Group insurance can achieve coordination and group willingness to pay may be higher than the sum of the individual willingnesses to pay.

Introduction: Results

Coordination : intuition

- Statistical properties of the stochastic vector of correlated revenues $(w_1, w_2, ..., w_N)$: if you replace one w_i by its mean value $\hat{w}$, you do not decrease the risk associated to the distribution of the whole vector.
- If risk-averse individuals care about the whole vector and not only their own revenue (which may occur in groups of interlinked individuals) they may find insurance unprofitable.

Introduction: Results

Free-riding : intuition

- Statistical properties of aggregate wealth : if you replace one w_i by its mean value $\hat{w}$, you decrease the risk associated to the distribution of the aggregate wealth.
- If risk-averse individuals care about the aggregate wealth in the group, insurance decisions exert a positive externality.

Model: indirect utilities

The community :

- We consider a group of N individuals.
- Each individual is endowed with a wealth w_i.
- The aggregate wealth in the group is $W = \sum_{i=1}^{N} w_i$.
- The individual preferences are supposed to be given by the von Neumann - Morgenstern utility function

$$u_i(w_i, W) \tag{1}$$

Model: indirect utilities

Indirect utilities depend on own wealth and aggregate wealth.

Hypothesis made to capture interactions among community members.

Rationale : equilibrium utilities of a public-good provision game played by community members.

Types of cooperatives : cost-sharing cooperatives, collective asset cooperatives.

Model: Symmetric setting

For simplicity we restrict attention to settings where :

- Individual preferences are given by $u_i(w_i, W)$,
- Individual wealths are ex ante identical : $w_i = w$ with w a stochastic variable distributed according to g, with expectation operator E_g and mean value $\hat{w}$.

Individuals are ex ante similar in terms of wealth and mutual insurance is perfectly achieved within the group.

Coordination: statistical properties

Consider the stochastic variable $(w_1, w_2, ..., w_N)$ where $w_i = w$ a stochastic variable distributed according to g.

- The distribution of $(\hat{w}, ..., \hat{w}, w_i, \hat{w}, ..., \hat{w})$ is a mean-preserving spread of the distribution of $(\hat{w}, ..., \hat{w}, \hat{w}, \hat{w}, ..., \hat{w})$,
- But the distribution of $(w_1, ..., w_i, ..., w_N)$ is not a mean-preserving spread of the distribution of $(w_1, ..., w_{i-1}, \hat{w}, w_{i+1}, ..., w_N)$

If we denote by W_k the stochastic aggregate wealth when k individuals replace their stochastic wealth w by its mean value $\hat{w}$, we have:

- The distribution of W_k is a mean-preserving spread of the distribution of W_{k+1}.

Coordination: statistical properties

We can deduce from these properties that :

- Insurance against common shocks is valuable to risk averse individuals if all other group members are insured,
- Insurance may not be valuable for individuals that care about the whole wealth profile even if they are risk averse : this occurs in particular when no other group member is insured.
- If individuals care only about aggregate wealth, insurance is valuable.

There is potentially a coordination problem when preferences are given by $u_i(w_i, W)$.

Coordination: Negative value of insurance

Relevant example :

$$u_i(w_i, W) = w_i^{\alpha_i} W^{\beta_i},$$

Individual wealth is given by w distributed on $\{0, \bar{w}\}$ with probabilities $\{p, 1-p\}$.

Individuals can simultaneously choose to replace their stochastic wealth w by its mean value $\hat{w}$ (for free).

There is an equilibrium of that game in which all individuals choose to take insurance but...

Proposition

For N large enough there is an equilibrium of the insurance game in which nobody takes insurance.

Coordination: sufficient conditions

Intuition : when the two arguments (w_i and W) of the utility function are complements, an individual prefers to be rich when the other are rich and poor when they are poor rather than poor when they are rich and rich when they are poor (by the mere definition of complementarity).

ASSUMPTION 3 : For each i, the indirect utility function $u_i(w_i, W)$ is increasing and strictly concave in the first argument , increasing in the second argument, differentiable and such that for all w_i,

$$\lim_{W \to +\infty} \frac{\partial u_i}{\partial w_i}(w_i, W) = +\infty.$$

Coordination: sufficient conditions

Sufficient condition for insurance to have a negative value :

Proposition

Suppose the indirect utility functions of individuals satisfy ASSUMPTION 3, *then insurance against a common shock can have a negative value for all individuals.*

Coordination: sufficient conditions

Remarks:

- Multiplicity of Pareto-ranked equilibria because the equilibrium in which everybody takes insurance Pareto dominates the one in which nobody takes insurance.
- No reasons a priori to focus exclusively on the Pareto-dominant equilibrium (Harsanyi-Selten (1988)).
- Group insurance can solve the coordination problem by reducing the number of alternatives.

Externalities and free-riding: externalities

Suppose individuals in the group manage to solve the coordination problem and anticipate that they will all take insurance.

Group insurance might still be beneficial if insurance decisions exert externalities.

Remember the following statistical property (already mentionned) : the distribution of W_k is a mean preserving spread of the distribution of W_{k+1}. Therefore, free insurance exert a positive externality when individuals care about W and are risk averse.

Externalities and free-riding: free-riding

Here, we are interested in the risk premium : the maximal amount an individual is ready to pay for full insurance. We consider a group of N identical individuals. When insurance is offered at the group level and the price is equally shared, the risk premium c^g solves

$$E_g u(w, Nw) = u(\hat{w} - c^g, N(\hat{w} - c^g)) \tag{2}$$

When insurance is offered at the individual level, the risk premium c^i solves

$$E_g u\left(w, w + (N-1)(\hat{w} - c^i)\right) = u(\hat{w} - c^i, N(\hat{w} - c^i)) \tag{3}$$

Externalities and free-riding: free-riding

Proposition

Suppose that individual utility functions are given by

$$u_i(w_i, W) = \log(w_i) + a\log(W) \tag{4}$$

then $c^i < c^g$, the group willingness to pay for insurance is higher than the sum of the individual willingnesses to pay.

The same result holds if utilities are given by

$$u_i(W) = \log(W), \quad \text{or } u_i(W) = W^\alpha, \alpha < 1.$$

Externalities and free-riding: free-riding

Numerical example :
Individual utility is given by $u(W) = \log(W)$, there are $N = 3$ individuals in the group and the individual wealth w takes value on $\{1, 2\}$ with probabilities $\{0,5; 0,5\}$.
In that case we can compute $c^g \approx 0,0858$ and $c^i \approx 0,0283$.
The group willingness to pay is three times the sum of the individual willingnesses to pay.

Externalities and free-riding: free-riding

Remark:

- Group insurance increases demand because it modifies the counterfactual : if insurance is refused nobody is insured ; while in the individual insurance case, if individual i refuses insurance, all others stay insured.

Concluding Remarks

- Insurance against common shocks raises coordination and free-riding issues,
- Group insurance may rise demand in groups of interlinked individuals (for instance cooperatives),
- Group insurance : negociated at the group level (to solve coordination), no option to sign individual contracts (to avoid free-riding).