Social Insurance, Information Revelation and Lack of Commitment

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Conference in honor of Robert E. Lucas

How to design the optimal social insurance system?

- Modern public finance approach builds on work of Atkeson-Lucas, Green, Phelan-Townsend...
- Standard approach: benevolent social planner (government) with full commitment
- General feature: the more information the government knows about agents, the better outcomes it achieves

More information is always better!

How to design the optimal social insurance system?

- A major concern: what if government cannot commit to insurance scheme?
  - more information now increases incentive to re-optimize
- How to design of social insurance when policymaker lacks commitment?

This paper

- A version of Atkeson-Lucas (1992) set up
  - agents receive privately observed idiosyncratic shocks
  - transmit information about those shocks to the gov't
  - benevolent gov't provides consumption allocations
- Key friction: the government cannot commit
  - we study Pareto frontier of PBEs

Main results

- **Recursive formulation:** all past info can be summarized with continuation utility v
  - generalizes Atkeson-Lucas
  - much harder to obtain without commitment
- **Key object:** complementarity between v and information
  - does knowing more about high v agents saves more or less resources than knowing more about low v agents?
- **Efficient information revelation**: agents with higher v reveal more precise info about their shock
  - positive complementarity
- Insurance often rationed: provided with prob < 1

Plan

1. Simple 2 period model
2. Dynamic model with iid shocks

Simplified model

- Continuum of agents with preferences

$$\theta \frac{c_1^{1-\rho}}{1-\rho} + \frac{c_2^{1-\rho}}{1-\rho}$$

- θ is a privately observed shock $\theta \in \Theta$
- 1 unit of per capita endowment in each period
- Each agent is a member of a group $i = 1, ..., I$ for some $I \geq 1$
    - group i has measure ψ_i of agents

Politics

- Insurance is provided by a benevolent Utilitarian politician who lacks commitment
- Game has 3 stages
  1. Politician makes promises how to allocate consumption
  2. Agents report information to the politician
  3. Politician can break promise and re-optimize at a cost $\Upsilon > 0$
- We focus on the Pareto frontier of the set of PBE
  - strategies that maximize weighted lifetime utility of each group
  - corresponds closely to infinitely repeated game
  - probabilistic voting: groups that care more about economic platform get higher weight in election politics

Politics formally

- Variable: $u = \frac{c^{1-\rho}}{1-\rho}$, $C(u) = [((1-\rho)u)]^{1/(1-\rho)}$
- Message space M

Game

1. Politician's promises $u_{i,t}^{pr} : M \to \mathbb{R}$
2. Agents report: $\sigma_i : \Theta \to \Delta(M)$
   - σ^{in} is *fully informative* if can invert m to θ
   - σ^{un} is *uninformative* if agents babble
3. Final allocations: $u_{i,t} : M \to \mathbb{R}$.
   - feasibility
   - cost paid if $u_{i,t} - u_{i,t}^{pr} \neq 0$ for a positive measure of agents

Solve model backward

- Best allocation for politician **after** agents play $\{\sigma_i\}_i$:

$$\max_{\{u_i\}} \sum_{i=1}^{I} \psi_i \mathbb{E}_{\sigma_i} [\theta u_{i,1} + u_{i,2}]$$
$$\text{s.t. feasibility}$$

- For given λ^w define

$$W(\sigma) \equiv \max_u \mathbb{E}_\sigma [\theta u - \lambda^w C(u)]$$

Pareto frontier of PBEs

Proposition: each point on the Pareto frontier $\mathbf{v} = (v_1, ..., v_I)$ associated with multipliers $\hat{\beta}, \chi, \lambda^w$ such that optimal strategies solve

$$\min_{\{(u_{i,1}, u_{i,2}, \sigma_i)\}_i} \sum_i \psi_i \left\{ \mathbb{E}_{\sigma_i} \left[C(u_{i,1}) + \hat{\beta} C(u_{i,2}) \right] + \chi W(\sigma_i) \right\}$$

subject to

$$\mathbb{E}_{\sigma_i} [\theta u_{i,1} + u_{i,2}] \geq \mathbb{E}_{\sigma'} [\theta u_{i,1} + u_{i,2}] \text{ for all } i, \sigma'$$

$$\mathbb{E}_{\sigma_i} [\theta u_{i,1} + u_{i,2}] = v_i \text{ for all } i$$

Infinite cost of deviation

- Suppose cost of breaking promises is infinite $\Longrightarrow \chi = 0$
- Generalized Atkeson-Lucas:

$$\kappa\left(v,\sigma\right) \equiv \min_{u_1,u_2,\sigma} \mathbb{E}_{\sigma_i}\left[C\left(u_1\right)+\hat{\beta}C\left(u_2\right)\right]$$

subject to

$$\mathbb{E}_{\sigma}\left[\theta u_1 + u_2\right] \geq \mathbb{E}_{\sigma'}\left[\theta u_1 + u_2\right] \text{ for all } \sigma'$$

$$\mathbb{E}_{\sigma}\left[\theta u_1 + u_2\right] = v$$

- Optimal reporting strategy

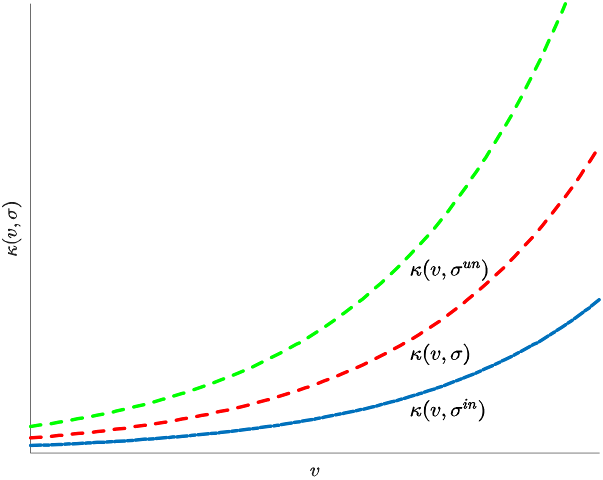
$$\min_{\sigma} \kappa\left(v,\sigma\right)$$

Order reporting strategies

- CES preferences: $\kappa(v, \sigma) = d(\sigma)\, C(v)$
- Define *informativeness* as $\sigma'' \succeq \sigma'$ iff $d(\sigma'') \leq d(\sigma')$
  - completes Blackwell's informativeness
- Complementarity of informativeness and utility:

$$\sigma'' \succeq \sigma' \implies \frac{d}{dv}\left[\kappa(v, \sigma') - \kappa(v, \sigma'')\right] \geq 0$$

How do costs depend on info?



Finite cost of deviation

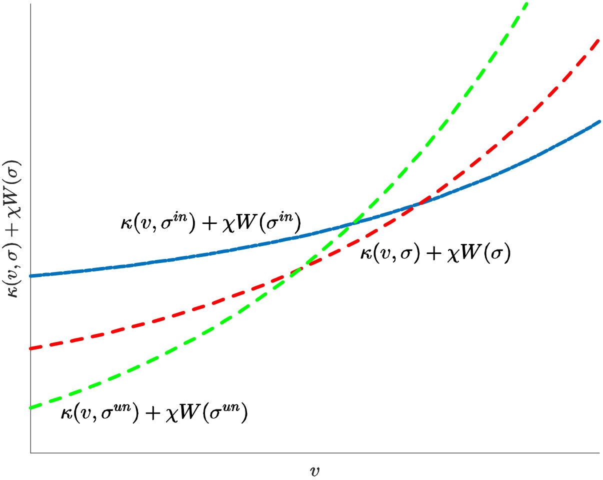
- Suppose cost of breaking promises is not too high $\Longrightarrow \chi > 0$
- Optimal reporting strategy

$$\min_{\sigma} \kappa(v, \sigma) + \chi W(\sigma)$$

- Trade off: better information decreases cost of insurance but increases incentives to deviate

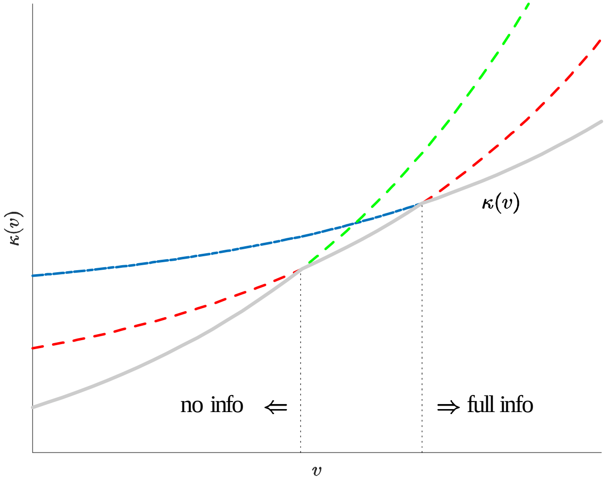
$$\begin{aligned} \kappa\left(v, \sigma^{in}\right) &\leq \kappa(v, \sigma) \leq \kappa\left(v, \sigma^{un}\right) \\ W\left(\sigma^{in}\right) &\geq W(\sigma) \geq W\left(\sigma^{un}\right) \end{aligned}$$

Trade off



$\kappa(v, \sigma^{in}) + \chi W(\sigma^{in})$
$\kappa(v, \sigma) + \chi W(\sigma)$
$\kappa(v, \sigma^{un}) + \chi W(\sigma^{un})$
$\kappa(v, \sigma) + \chi W(\sigma)$
v

Optimal info



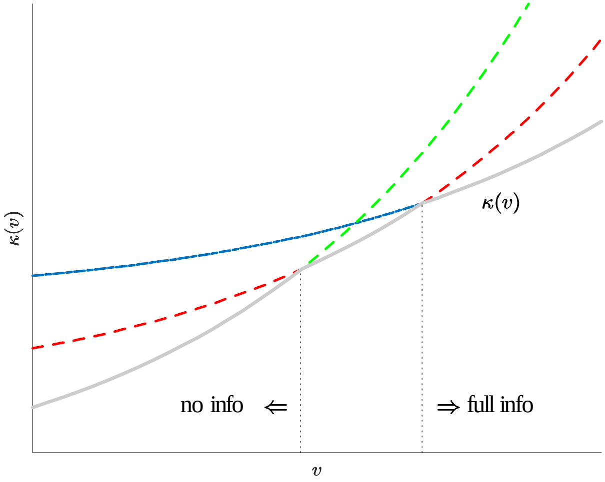
Optimal info revelation

Theorem
If $v_i \geq v_j$ *then* $\sigma_i^* \succeq \sigma_j^*$.

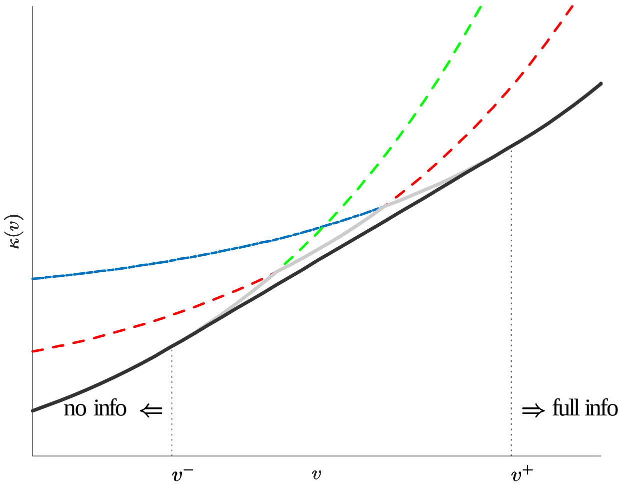
Key force: complementarity between informativeness and promised utility

Same result holds if agents and gov't can use a mediator for communication a-la Myerson

Optimal info without public randomization



Optimal info with public randomization



Rationing

- Conditioning strategies on sunspot improves welfare
- **Proposition**: Suppose $\rho = 1$ and strategies can depend on sunspot. Then agents play only σ^{in} and σ^{un}

- Interpretation: rationing of insurance
  - gov't provides second-best insurance access to which is rationed
  - rationing is non-trivial as long as Υ is not too high
  - holds even with $I = 1$

Full Model

Model

- Preferences

$$\sum_{t=0}^{\infty} \beta^t \theta_t U(c_t)$$

- $\theta \in \Theta$ is the taste shock
  - Θ is finite
  - θ is iid, $\pi(\theta)$ is probability of θ
- Total endowment in each period is 1
- Each individual belongs to a family v from distribution ψ

Timing of the game

- Agents observe their types θ_t and report $m_t \in M$
- Government allocates utility u_t to agents as a function of history of reports, sunspots, and initial promise v

Equilibrium

- *Perfect Bayesian Equilibrium*: agents and government play their best responses after all histories, allocations are feasible, government's beliefs satisfy Bayes rule

- *Best PBE*: maximizes the sum of the utility of all the agents subject to delivering at least v to agent v

- *Worst PBE*: agents play σ^{un}

Recursive formulation

- For simplicity: assume ψ is an invariant distribution
  - pins down $\zeta, \hat{\beta}, \lambda^w$
- Recursive problem:

$$\kappa(v, \sigma) = \min_{u,w} \mathbb{E}_\sigma \left[\zeta C(u) - \theta u + \hat{\beta} k(w)\right]$$

subject to

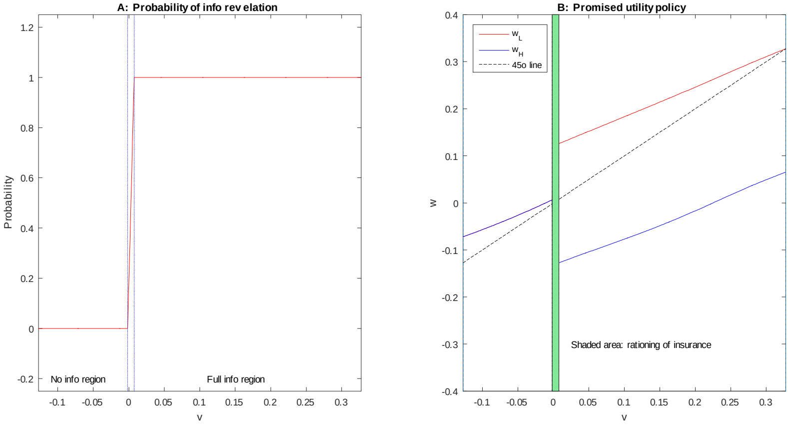
$$\mathbb{E}_\sigma [\theta u + \beta w] \geq \mathbb{E}_{\sigma'} [\theta u + \beta w] \text{ for all } \sigma'$$

$$\mathbb{E}_\sigma [\theta u + \beta w] = v$$

- Optimal amount of info revelation for given v

$$k(v) = \min_\sigma \mathbb{E}\left[\kappa(v, \sigma) + \chi W(\sigma)\right]$$

Policy functions with two shocks



Persistent shocks

- Markov shocks $\Longrightarrow \pi\left(\theta|\theta^{-}\right)$
- State variables: prior **p** and vector of promises **v**

$$v_i = \mathbb{E}_\sigma\left[\theta u + \beta w|\theta_i^-\right]$$

- Bellman equation

$$k\left(\mathbf{v},\mathbf{p}\right) = \min_{u,w,\sigma}\sum p_i \mathbb{E}_\sigma\left[\zeta C\left(u\right) - \theta u + \hat{\beta} k\left(\mathbf{w},\mathbf{p}'\right)|\theta_{\hat{\imath}}^-\right] + \chi W\left(\sigma,\mathbf{p}\right)$$

subject to IC, PK, and Bayes' rule

- Direct generalization of Fernandes-Phelan

Conclusion

- Social insurance without commitment
  - recursive formulation
  - characterization
- Main insight: more information is revealed by agents who accumulated higher promised utility
  - had more “good” shocks in the past
- Endogenous lower bound on promised utility

  no provision of incentives for low v