Free savings vs constrained efficiency: Theoretical and quantitative explorations

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The background

- Ayiagari/Bewley (AB) economies: agents subject to idiosyncratic income risk, can only trade a non-contingent bond: a leading model for quantitative heterogenous agents macro-analysis
- Equilibria useful to understand key distributional data (wealth, consumption) but..

The background

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- Equilibria useful to understand key distributional data (wealth, consumption) but..
- Equilibria in general not efficient
- Lead to normative questions i.e can we design policies to improve risk allocation

Normative analysis in AB economies

Key inefficiency is the lack of insurance markets. Whether and how much better insurance can be provided to individuals depend on the details of the environment

Two polar cases

- Exogenously missing markets. Solutions:
  - Introduce markets
  - Government contingent transfers
  - Distort saving (Aiyagari, Davila et. al)

    Potentially large welfare gains
- Private info and private saving. Solutions:
  - Nothing can be done (Cole and Kocherlakota)

The Fahri and Werning agenda

Start with AB equilibrium and individual skills are private info,

- One possibility is to go from equilibria to Constrained Efficient Pareto Optima, in which planner dictates consumption and effort subject to IC constraints
- CEPO are hard to compute with general skill processes
- FW instead propose to go from equilibria to allocations in which planner perturb consumption, s.t. leaving effort unchanged (Partial reform)

The contributions

- Show that partial reforms can be computed in a simple fashion. Can be done for general stochastic process for skills, no need to know ELS. Can be computed starting from arbitrary equilibrium allocations (not only AB)
- Characterize restrictions that partially reformed allocations satisfy (Inverse Euler Equations with CRRA, Golden Ratios with EZ prefs)
- Evaluate welfare gains of partial reform
- Bring New Dynamic Public Finance closer to the data

Outline

- The FW approach in a toy model
- General considerations

The perturbation game

- Start from any competitive equilibrium allocation (which is always incentive compatible)
- Perturb it in a way such that incentive compatibility is preserved (i.e. effort is unchanged). This is the key step and it is shown to depend crucially on preferences
- Solve for the optimal perturbation
- Evaluate the new perturbed allocation relative to the initial equilibrium

A toy model

Two periods, continuum of agents small open economy

- Utility

$$\log(c_0) + \beta \mathbb{E} \log c_1 + v(n)$$

- Budget and borrowing constraint

$$\begin{aligned} c_0 &= \theta_0 - a \\ c_1 &= \theta n + Ra \\ a &\geq 0 \end{aligned}$$

- Shocks (Geometric random walk)

$$\theta_0 = 1, \log \theta \to N(-\sigma/2, \sigma^2)$$

- Interest rate

$$R = \frac{1}{\beta \mathbb{E}(\theta^{-1})}$$

Equilibrium

Equilibrium allocation is $a = 0, c_i = \theta_i, n = \bar{n}$,

To see this simply check the Euler equation using $c_i = y_i$

$$1 \geq \beta R \mathbb{E}(\theta^{-1})$$

which is satisfied for the given $R = \frac{1}{\beta \mathbb{E}(\theta^{-1})}$

- Here individuals do not smooth income risk at all
- How can a planner improve the risk allocation over this equilibrium, *without altering the incentive compatibility of the original equilibrium*?

Consider the following variations (in utility space)

$$u(\theta_0) + \beta\Delta,\ u(\theta) - \Delta,\ \text{for every } \theta$$

it leaves unchanged utility each agent receives in each possible realization and thus preserves effort incentives. Then solve

$$\begin{aligned} & \min_{\Delta} \exp(u(y_0) + \beta\Delta) + \frac{1}{R}\mathbb{E}(\exp(u(\theta) - \Delta)) \\ \equiv\ & \min_{\Delta} \tilde{c}_0 + \frac{1}{R}\mathbb{E}(\tilde{c}_1) \end{aligned}$$

to obtain the familiar IEE

$$\tilde{c}_0 = \frac{1}{\beta R}\mathbb{E}(\tilde{c}_1) \rightarrow \frac{1}{1/\tilde{c}_0} = \frac{1}{\beta R}\mathbb{E}(\frac{1}{1/\tilde{c}_1})$$

and the optimal choice is

$$\Delta = \frac{\sigma^2}{1+\beta}$$

Characteristics of the new allocation

- Free saving is not allowed (the IEE holds thus the EE does not hold)
- Consumption is frontloaded

This might seem counterintuitive
By frontloading the planner achieves a redistribution from the unlucky to the unlucky, and thus a more efficient distribution of resources

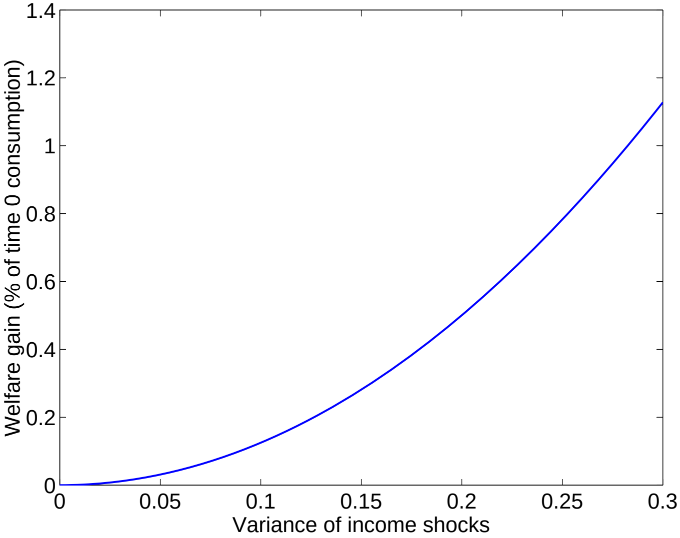
Welfare gains

It is easy to compute the resource costs necessary to deliver the equilibrium and the perturbed allocation.

$$
\begin{aligned}
C_{AB}(\sigma) &= 1+\beta\sigma^2 \\
C_{FW}(\sigma) &= (1+\beta)\exp\left(\frac{\beta}{1+\beta}\sigma^2\right)
\end{aligned}
$$

Since they deliver the same utility the ratio $\frac{C_{AB}(\sigma)}{C_{FW}(\sigma)}$ is a measure of the welfare gains from the FW perturbation

Welfare gains



How to interpret them?

In simple toy model, not very meaningful. But FW find them to be small in GE calibrated model. There are two reasons for this

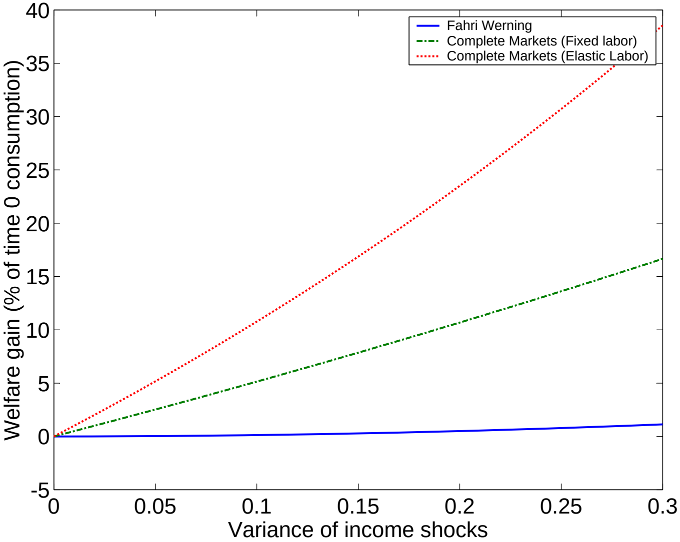
- If shocks are not very persistent (Aiyagari benchmark calibration, $\rho = 0.6$) then, in steady state, individuals insure shock fairly well with a buffer stock and thus there is not much risk to start with.
- Even if shocks are persistent the welfare gain are hard to obtain because they involve shifting aggregate consumption, and this expensive to do with a curved technology (as opposed to the linear technology of the small open economy case)

Lessons

Partial reform helps improve risk sharing, but

- Informational friction still prevent a great deal of risk sharing (in a model)
- (Unconstrained) optimal allocation of effort can also lead to significant additional gains

Welfare gains in three setups



How big is consumption risk in the data?

- This line of research makes us think more seriously of how big is consumption risk in the data (i.e. income risk that cannot be shared), which is not the same think as consumption variance
- AB model suggest that is large (almost as big as income risk)
- Evidence from the joint distribution of consumption and income is much less conclusive.