Income and Wealth Heterogeneity in the Macroeconomy

Per Krusell and Tony Smith (JPE 1998)

Georgetown Macro Reading Group

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Quick Summary

Questions

- What determines wealth inequality in the economy?
- How does heterogeneity affect evolution of aggregate variables?

Answers

- Evaluate two hypotheses of wealth inequality
  - Inequality from accumulated labor market shock: no
  - Inequality from both labor market luck and heterogeneous thrift: yes

- Heterogeneity on aggregate variables
  - In all models evaluated, small effect on capital, investment and GDP
  - In most models evaluated, small effect on consumption
  - But in heterogeneous thrift model, a large effect on consumption

Methodological Contribution

- Develop a method to compute models with heterogeneity
A Recursive Competitive Equilibrium Formulation:

\[
v(k, \epsilon; \Gamma, z) = \max_{\{c, k'\}} \left\{ u(c) + \beta E \left[ v(k', \epsilon'; \Gamma', z' | z, \epsilon) \right] \right\}
\]

s.t.

\[
c + k' = r(\bar{k}, \bar{l}, z) k + w(\bar{k}, \bar{l}, z) \bar{\epsilon} + (1 - \delta) k,
\]

\[
\Gamma' = H(\Gamma, z, z'),
\]

\[
k' \geq 0,
\]

where \( \Gamma \) is the joint distribution on \( (k, \epsilon) \) and

\[
r(\bar{k}, \bar{l}, z) = az \left( \frac{\bar{k}}{\bar{l}} \right)^{\alpha - 1},
\]

\[
w(\bar{k}, \bar{l}, z) = (1 - \alpha) z \left( \frac{\bar{k}}{\bar{l}} \right)^{\alpha}.
\]

Q: How to approximate \( \Gamma \), an infinite-dimensional object?
Solution Method

• Some possible approximation
  • Parameterize $\Gamma$, say normal, Pareto, etc
  • Use other distributional statistics: e.g., percentile
  • *Use moments of distribution: e.g., mean and variance*

• Solution Procedure
  • Replace $\Gamma$ with moments, say $\bar{k}$ and $\text{var}(k)$
  • Conjecture a functional form for $H(\Gamma, z, z')$: say, log-linear
  • Solve the household problem
  • Simulate the economy and get a time series of moments
  • Use simulated data to estimate parameters in $H$
  • Iterate until convergence
Approximate Aggregation

- Approximate aggregation results:

\[
\log k' = 0.095 + 0.962 \log k, \quad R^2 = 0.999998, \\
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\]

- Economic Intuition
  - Rich people hold most of capital stock
  - Rich people has a close to linear saving function (due to good self insurance)

- Interpretation: \textit{Inequality} and aggregate variables
  - Changing wealth inequality and aggregate variables

- Interpretation: \textit{Heterogeneity} and aggregate variables
  - The economy may behave close to \textbf{some} representative-agent economy
  - But not necessarily \textbf{the} representative-agent economy with \textbf{the same} utility and constraint
Can benchmark model match inequality?
- No: the model generates a Gini Coefficient of 0.25

Introduce heterogeneity of discount rate ($\beta$)
- Interpretation: imperfect transmission of genes across generations
- Generates a realistic wealth inequality compared to the data
Effect of heterogeneity on macro aggregates

- small for capital stock, investment and GDP
- For most of cases, small for consumption
- But in stochastic $\beta$ model, the consumption behavior is quite different

Why is consumption behavior quite different?

- Poor people take a big fraction in consumption
- Poor people are not well insured, hence consume differently compared with complete market economy
Discussion

- Economic Question: Determination of inequality?
- Methodology: Other numerical tools?
  - JEDC Special Issue on computation
Firm Heterogeneity and Aggregate Dynamics
The interaction of heterogeneity and economic policy
  - Distributional Effects of economic policy:
  - Economic Policy Determination:
    - Optimal Policy Determination
    - Political process
Examples: Fiscal Policy, Monetary Policy, Labor Policy, Immigration, etc
Question: how difficult on the technical side?