Human Capital Risk, Contract Enforcement, and the Macroeconomy

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General Issue:

- **For many households (the young), human capital is the most important part of total wealth**

- **Human capital is an asset with three characteristics:**
  i) risky (health risk, labor market risk)
  ii) heterogeneous ex-ante returns (young vs old)
  iii) non-pledgeable (bad collateral)

- **Properties i)-iii) imply:**

  high risk-exposure (young) $\Longrightarrow$ little insurance

Intuition

- **Households with high expected human capital returns (young) choose to invest a lot in human capital**
- **These households therefore have high risk exposure and large need for insurance**
- **With complete markets and perfect contract enforcement, these households will borrow and be perfectly insured**
- **With limited enforcement of credit contracts (US bankruptcy law), these households are borrowing constrained and under-insured**

This Paper – Contributions

- **We show analytically that this risk-insurance relationship holds in equilibrium**
- **We establish this risk-insurance pattern in the data on life-insurance**
- **We show that a calibrated macro model can quantitatively match this and other important life-cycle facts**
- **We show that welfare cost of under-insurance of young households is substantial (4% of lifetime consumption)**

This Paper – Additional Contribution

- **Tractable macro model with convex household decision problem**

- **Policy experiment: US reform of consumer bankruptcy regulation**

Literature

- **Limited commitment/contract enforcement: Alvarez and Jermann (2000), Kehoe and Levine (1993), Kocherlakota (1996), Krueger and Perri (2006):**

  i) Exogenous human capital

  ii) Too much consumption insurance

- **Incomplete markets with human capital (Huggett, Ventura, and Yaron, 2011, and Krebs, 2003) and with life-insurance (Hong and Rios-Rull, 2007, 2012)**

Production

$$\mathbf{Y_t = F(K_t, H_t)}$$

Y_t : aggregate output

K_t : aggregate stock of physical capital

H_t : aggregate stock of human capital

Profit maximization:

$$\mathbf{r_{kt} = r_k(\tilde{K}_t)}$$

$$\mathbf{r_{ht} = r_h(\tilde{K}_t)}$$

r_k: rental rate of physical capital

r_h: rental rate of human capital

$\tilde{K}_t = K_t/H_t$: aggregate "capital-to-labor ratio"

Uncertainty

Large number of households of "age" j with

$\mathbf{j = 23, \ldots, 60, pre - retirement, retirement}$

$\mathbf{s_j = (s_{1j}, s_{2j})}$**: household-specific shock at age** j

$\mathbf{s_{1j}}$**: death of an adult household member (widowhood)**

$\mathbf{s_{2j}}$**: all other human capital risk (labor market risk)**

Assumption:

$\mathbf{\{s_{2j}\}}$ **is i.i.d. and** $\mathbf{\{s_{1j}\}}$ **is i.d.**

Preferences

Expected lifetime utility of individual household at age 23:

$$\sum_{j=23}^{60} \beta^{j-23} \sum_{s^j} \ln c_j(s^j) \pi_j(s^j|s_{23}) + \sum_{s_{61}} V_{61}(a_{61}, h_{61}, s_{61}) \pi_{61}(s_{61})$$

V_{61}: value function of households "age" $j = 61$ (pre-retirement stage of life)

$s^j = (s_{23}, \ldots, s_j)$: history of shocks up to age j

Budget Constraint

$$\mathbf{c_j} + \mathbf{x_{hj}} + \sum_{\mathbf{s_{j+1}}} \mathbf{q_j}(\mathbf{s_{j+1}})\mathbf{a_{j+1}}(\mathbf{s_{j+1}}) \;=\; \mathbf{r_h}\,\mathbf{h_j} + \mathbf{a_j}(\mathbf{s_j})$$

$$\mathbf{h_{j+1}} \;=\; (\mathbf{1} - \delta_\mathbf{h} + \eta_\mathbf{1}(\mathbf{s_{1j}}) + \eta_\mathbf{2}(\mathbf{s_{2j}}))\,\mathbf{h_j} \;+\; \phi_\mathbf{j}\,\mathbf{x_{hj}}$$

η_1, η_2**: mortality risk and labor market risk**

$\mathbf{x_{hj}}$**: human capital investment**

$\phi_\mathbf{j}$**: productivity of human capital investment**

$\mathbf{a_{j+1}}(\mathbf{s_{j+1}})$**: quantity of Arrow-security purchased/sold**

Remarks

- **We assume complete markets because we want to focus on one financial friction (limited contract enforcement)**

- **We can add general time-cost of human capital investment (Ben-Porath), but for tractability result we need linearity in x_h and h**

Participation Constraint (Default)

$$\sum_{j=n}^{60} \beta^{j-n} \sum_{s^j|s^n} \ln c_j(s^j)\pi(s^j|s_n) \; + \; \sum_{s_{61}} V_{61}(a_{61}, h_{61}, s_{61})\pi_{61}(s_{61})$$

$$\geq \; V_d(h_n, s_n)$$

$V_d(.)$: value function in case of default

Consequences of default (along the lines of Chapter 7):

i) all debt is cancelled: $a_n = 0$

ii) exclusion from financial markets in the future, $a_j = 0$, until stochastically determined future date

iii) no garnishment of labor income

Remarks

- **The household problem separates into a "consumption-saving" problem and a portfolio problem**

- **I.i.d. human capital shocks imply that labor income follows a log random walk**

Financial Intermediaries

- **no default in equilibrium**

- **perfect competition: insurance companies and credit companies (banks) make zero profit:**

$$\mathbf{q_j}(\mathbf{s_{j+1}}) = \frac{\pi_\mathbf{j}(\mathbf{s_{j+1}})}{\mathbf{1} + \mathbf{r_f}}$$

Calibration

- **Choose age-dependent expected human capital returns to match the life-cycle profile of median earnings (growth)**

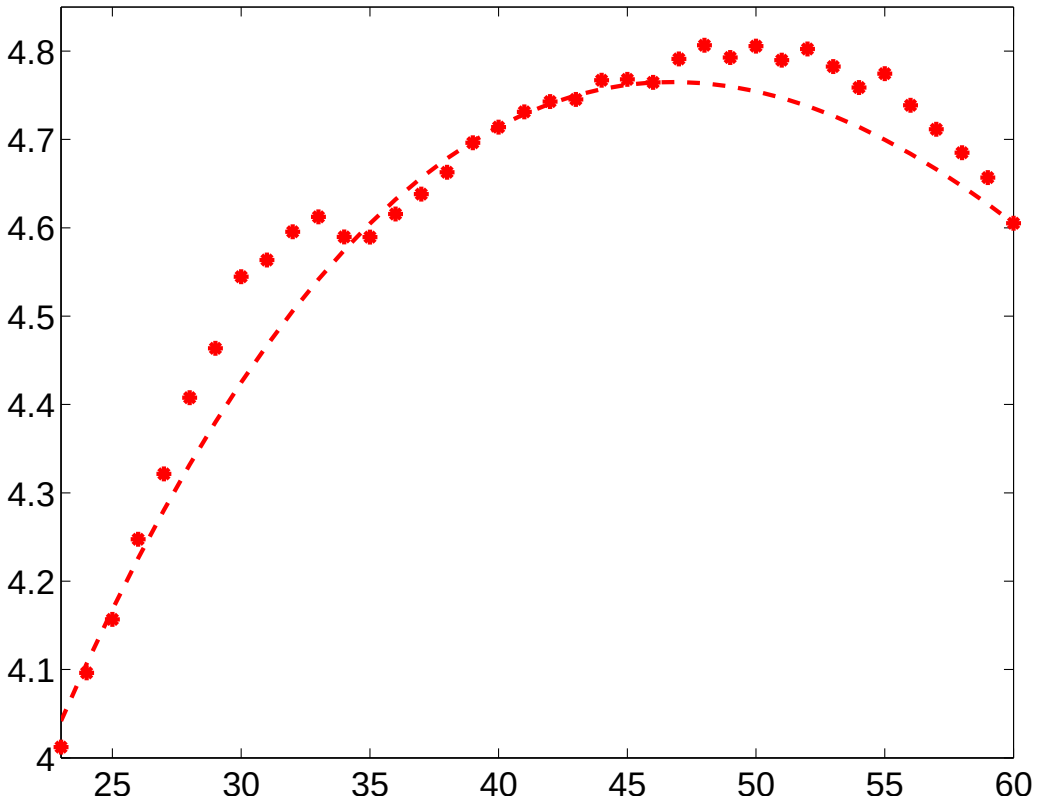
- **Choose human capital risk s_1 to be consistent with empirical evidence on human capital (labor income) loss in the cases of death of an adult family member – consequences of widowhood**

- **Choose human capital risk s_2 so that implied labor income process is consistent with estimates of the empirical literature on labor income risk**

Data: Survey of Consumer Finance

- **Repeated cross-section; every three years**
- **Household-level data**
- **We use data on labor income, net worth (financial wealth), and life insurance**
- **We use surveys 1992-2007**
- **We always compute median value from the data (conditional on age)**

Figure 1: Life-cycle profile of log labor income

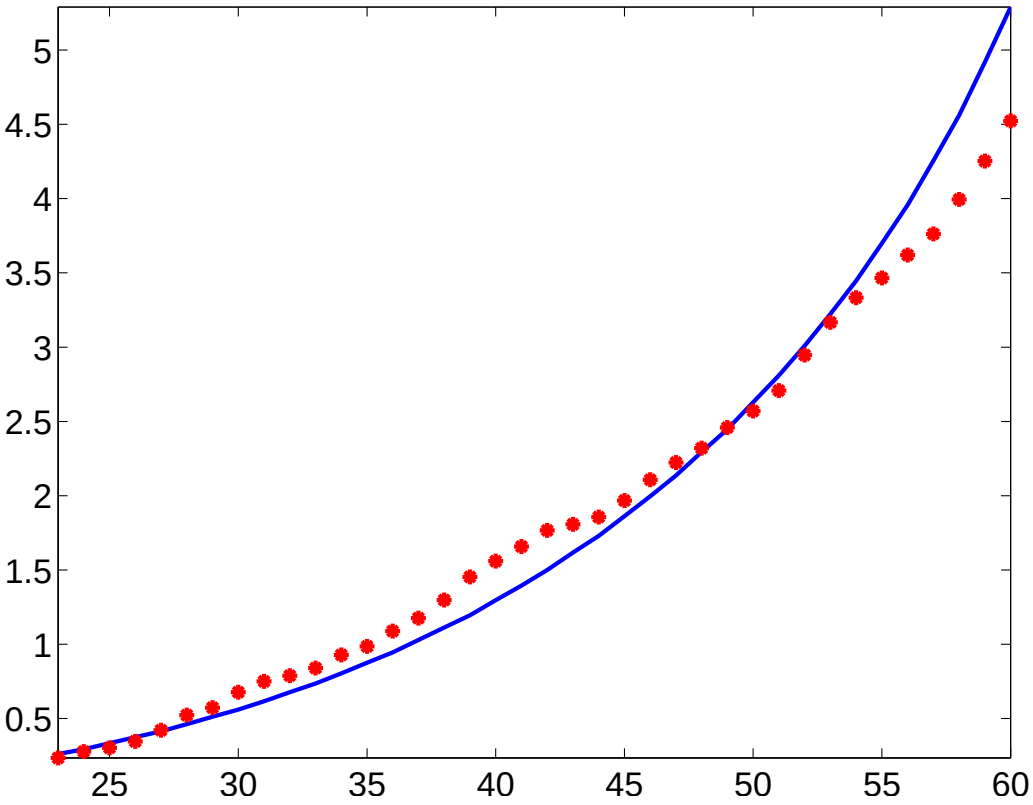


Result 1

The calibrated model provides a good quantitative account of the "observed" human capital choice over the life-cycle

$$\textbf{human capital choice} = \frac{\textbf{net worth}}{\textbf{labor income}}$$

Figure 3: Life-cycle profile of portfolio choice



Insurance Measure

- **Model-based insurance measure**

$$\mathbf{I} = \frac{\textbf{insurance payout}}{\eta(\textbf{bad}) * \textbf{h}}$$

- **Empirical insurance measure**

$$\tilde{\mathbf{I}} = \frac{\textbf{insurance payout}}{\eta(\textbf{bad}) * (\textbf{current earnings}) * \textbf{PVF}}$$

- η(bad): **fraction of household human capital lost when bad shock (death of an adult family member) occurs**

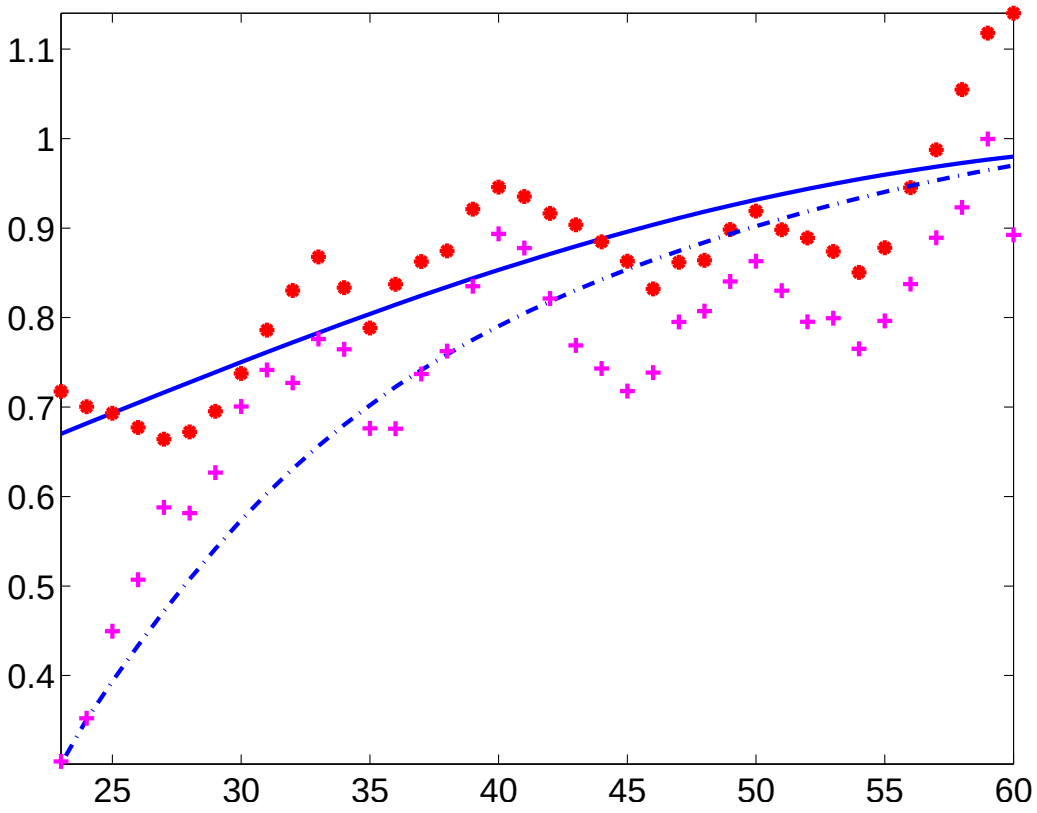
Result 2

- **Both model-based and empirical insurance measure increase with age**

- **The match between basic version of the model and data is good for intensive margin**

- **An extended version of the model with heterogeneity in size of η(bad) and cost of life-insurance purchase also matches the extensive margin well**

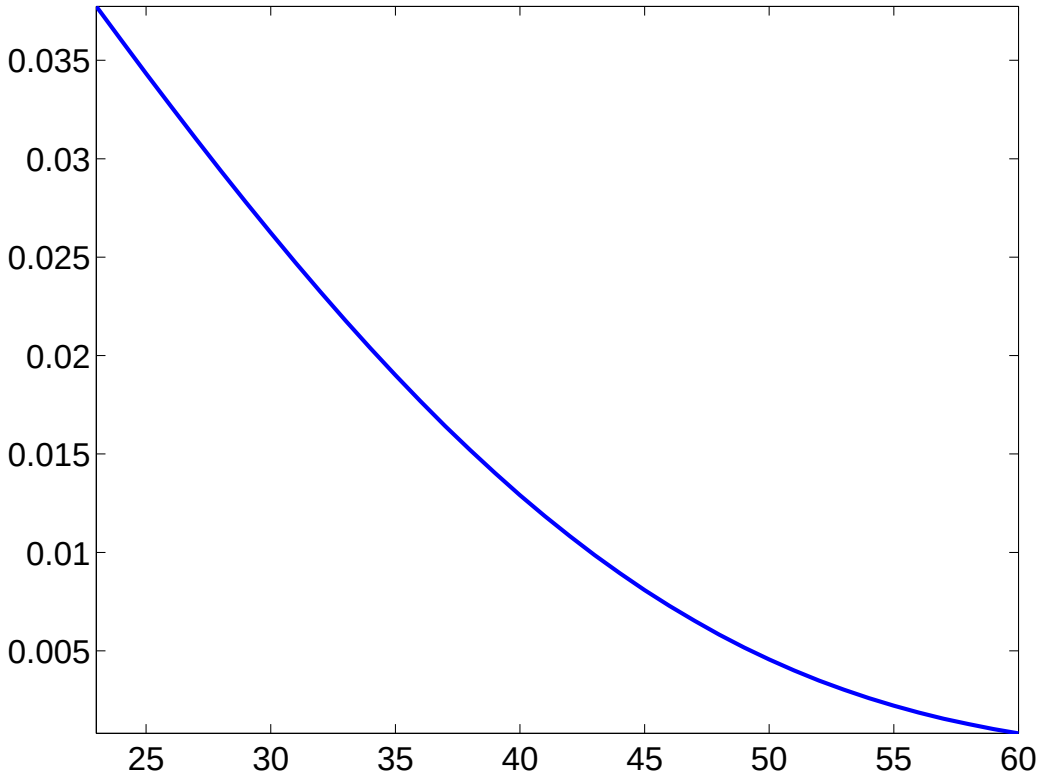
Figure 10: Life-cycle profile of life insurance (extended model)



Result 5

Calibrated model implies substantial welfare costs of under-insurance for the young – equivalent to almost 4 percent of lifetime consumption for 23-old household

Figure 5: Life-cycle profile of welfare cost of under-insurance



Policy Implications

What type of policy reform would lead to a welfare-improving increase in insurance and human capital investment?

- **subsidize credit – but ensure that households in default do not have access to the subsidy (not in paper)**

- **more stringent bankruptcy code – garnish labor income (in paper)**