Consumption and Labor Supply with Partial Insurance: An Analytical Framework

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Conference in Honor of Thomas Sargent and Christopher Sims

Federal Reserve Bank of Minneapolis, May 4-5 2012

Measurement of risk sharing

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Three broad questions:

1. Fraction of individual shocks that transmits to consumption
2. Insurability of the recent increase in U.S. inequality
3. Life-cycle shocks vs. initial conditions in determining inequality

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Two complementary approaches:

1. Structural model $\Rightarrow$ risk sharing as equilibrium outcome

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1. Structural model $\Rightarrow$ risk sharing as equilibrium outcome
   - Sensitive to assumed market structure and insurance channels
2. Quantify overall risk sharing from data $\Rightarrow$ agnostic about sources
   - Requires long, high-quality panel data on (c, y)

Our approach

1. Structural equilibrium model with non-contingent bond, labor supply, and redistributive taxation

2. Flexible financial market structure that does not hardwire agents' access to insurance

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Labor supply data informative about risk-sharing

- Like c, h react differently to insurable vs. uninsurable shocks to w

ECONOMIC ENVIRONMENT

Demographics and preferences

- Demographics: perpetual youth – constant survival probability δ
- Preferences over sequences of consumption and hours worked:

$$\mathbb{E}_b \sum_{t=b}^{\infty} (\beta\delta)^{t-b} u(c_t, h_t; \varphi)$$

$$u\left(c_t, h_t; \varphi\right) = \frac{c_t^{1-\gamma} - 1}{1-\gamma} - \exp(\varphi) \frac{h_t^{1+\sigma}}{1+\sigma}$$

where $\varphi \sim F_{\varphi,b}$ is distaste for work relative to consumption

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$$\begin{aligned}
\alpha_t &= \alpha_{t-1} + \omega_t \quad \text{with} \quad \omega_t \sim F_{\omega,t} \\
\varepsilon_t &= \kappa_t + \theta_t \quad \text{with} \quad \theta_t \sim F_{\theta,t} \\
\kappa_t &= \kappa_{t-1} + \eta_t \quad \text{with} \quad \eta_t \sim F_{\eta,t}
\end{aligned}$$

At labor market entry, agents draw $\alpha^0 \sim F_{\alpha^0,b}$ and $\kappa^0 \sim F_{\kappa^0,b}$

Private risk-sharing

1. Non-state-contingent bond traded in zero net supply

2. Insurance claims traded against shocks to ε only

   - Implements other (residual) insurance arrangements: financial markets, family, etc.

   - Alternative interpretation: foreseeable fluctuations in wages

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Partial insurance: between bond economy and complete markets

- $\frac{var(\alpha_t)}{var(\log(w_t))} \to 0$: complete markets economy
- $\frac{var(\varepsilon_t)}{var(\log(w_t))} \to 0$: bond economy

Government

- Government: runs a progressive tax/transfer scheme
  - Device for redistribution and financing of expenditures
  - Two-parameter function maps pre-government earnings $(y_t = w_t h_t)$ to disposable earnings ($\tilde{y}_t$)

$$\tilde{y}_t = \lambda y_t^{1-\tau}$$

τ measure the degree of progressivity

EQUILIBRIUM

Equilibrium

- In equilibrium, there is no bond trade among households
- Sharp dichotomy between shocks:
  - ε_t perfectly insured
  - α_t uninsured privately, but smoothed through labor supply and progressive taxation

Link to Constantinides and Duffie (1996)

- (i) CRRA, (ii) zero initial wealth, (iii) zero net wealth, (iv) unit root shocks to log disposable income $\Rightarrow$ no bond-trade equilibrium

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- Our environment micro-founds unit root disposable income:

    1. Primitive exogenous process: wages
    2. Labor supply: exogenous wages $\rightarrow$ endogenous earnings
    3. Non-linear taxation: pre-tax earnings $\rightarrow$ after-tax earnings
    4. Private risk-sharing: earnings $\rightarrow$ post-trade disposable income
    5. No bond-trade: disposable income = consumption

Hours worked

$$\log h_t^a(\varphi, \alpha, \varepsilon) \quad = \quad -\hat{\varphi} + \left(\frac{1-\gamma}{\widehat{\sigma}+\gamma}\right)\alpha + \frac{1}{\widehat{\sigma}}\,\varepsilon + \mathcal{H}_t^a$$

where $\hat{\varphi} \equiv \frac{\varphi}{\widehat{\sigma}+\gamma}$ and $\frac{1}{\widehat{\sigma}} \equiv \frac{1-\tau}{\sigma+\tau}$

- Hours worked decrease in effort cost $\widehat{\varphi}$
- Response to ε proportional to tax-modified Frisch elasticity
- Response to α depends on γ which controls wealth effect

Consumption

$$\log c_t^a(\varphi, \alpha) \quad = \quad -(1-\tau)\cdot\hat{\varphi} + (1-\tau)\cdot\left(\frac{1+\widehat{\sigma}}{\widehat{\sigma}+\gamma}\right)\alpha + \mathcal{C}_t^a$$

- Independent of the insurable shock ε
- Heterogeneity in $\hat{\varphi}$ compressed by tax progressivity
- Response to α mediated by labor supply and tax progressivity
- Random walk, displays excess smoothness relative to PIH

IDENTIFICATION AND ESTIMATION

Data, identification, and estimation

Parameters

- Time invariant: preference parameters and measurement error
- Time varying: life-cycle shocks and cohort effects in productivity

Moments

- Cross-sectional (co-)variances of (w, h, c), conditional on age/time

Data

- CEX (1980-2006) and PSID (1967-2006)

Identification

- Yes, even without consumption data (with external estimate of $v_{\mu y}$)

ANSWERS TO THE THREE QUESTIONS

Pass-through coefficient

- Pass-through from permanent wage shocks to consumption:

$$\phi_t^{w,c} \equiv \frac{cov(\Delta \log c_t, \omega_t + \eta_t)}{var(\omega_t + \eta_t)}$$

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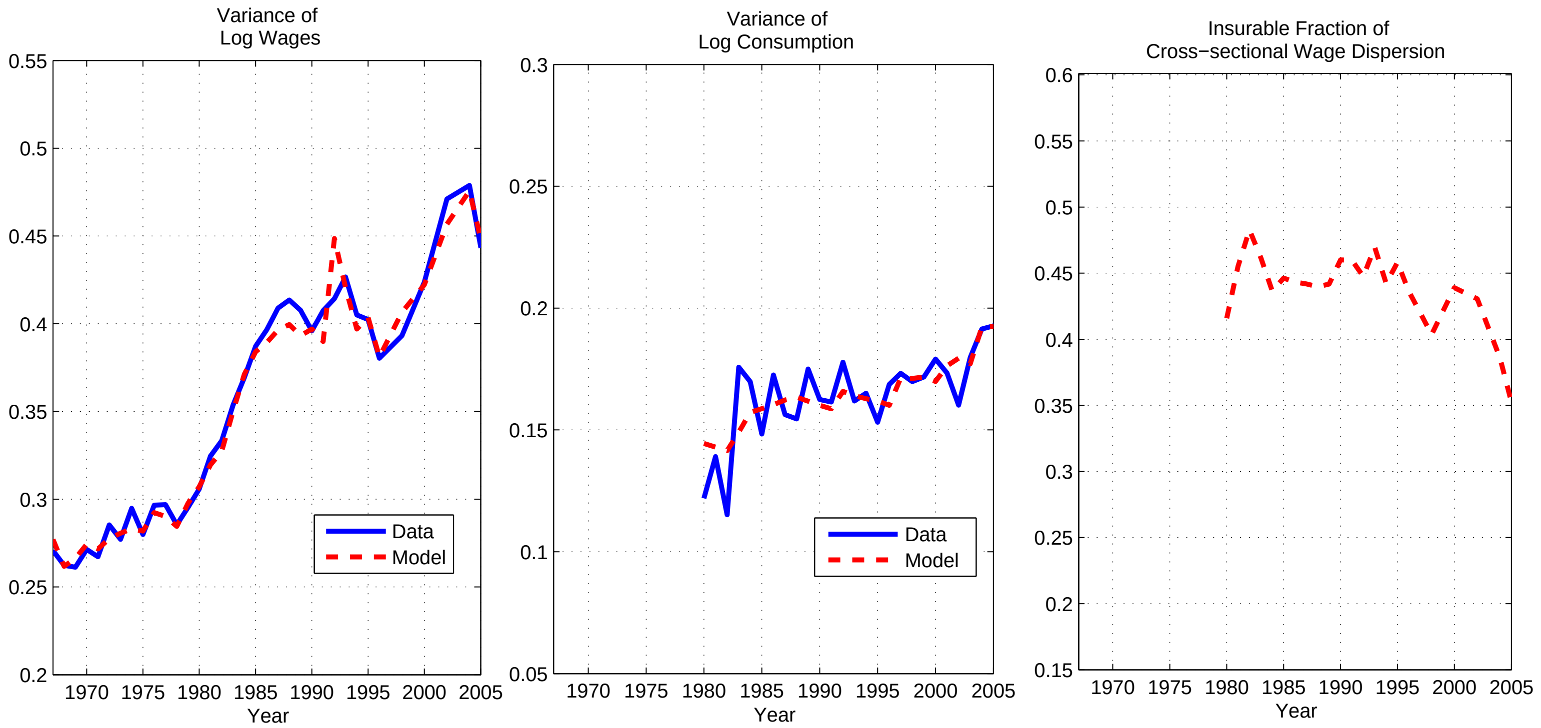
- Pass-through from permanent wage shocks to consumption:

$$\phi_t^{w,c} \equiv \frac{cov(\Delta \log c_t, \omega_t + \eta_t)}{var(\omega_t + \eta_t)} = (1-\tau) \cdot \frac{1+\widehat{\sigma}}{\widehat{\sigma}+\gamma} \cdot \frac{v_{\omega t}}{v_{\omega t} + v_{\eta t}}$$

  - progressive taxation $(\tau = 0.27)$ $\rightarrow$ 0.73
  - labor supply $(\gamma = 1.5, \widehat{\sigma} = 2.6)$ $\rightarrow$ 0.87
  - private insurance $(v_\omega = 0.007, v_\eta = 0.004)$ $\rightarrow$ 0.63

- Overall, we estimate: $\phi_t^{w,c} =$ **0.40**

Risk-sharing over time



$$\Delta var_t(\log w) \quad = \quad \Delta var_t(\alpha) + \Delta var_t(\varepsilon)$$

$$\Delta var_t(\log c) \quad = \quad (1-\tau)^2 \left(\frac{1+\widehat{\sigma}}{\widehat{\sigma}+\gamma} \right)^2 \Delta var_t(\alpha)$$

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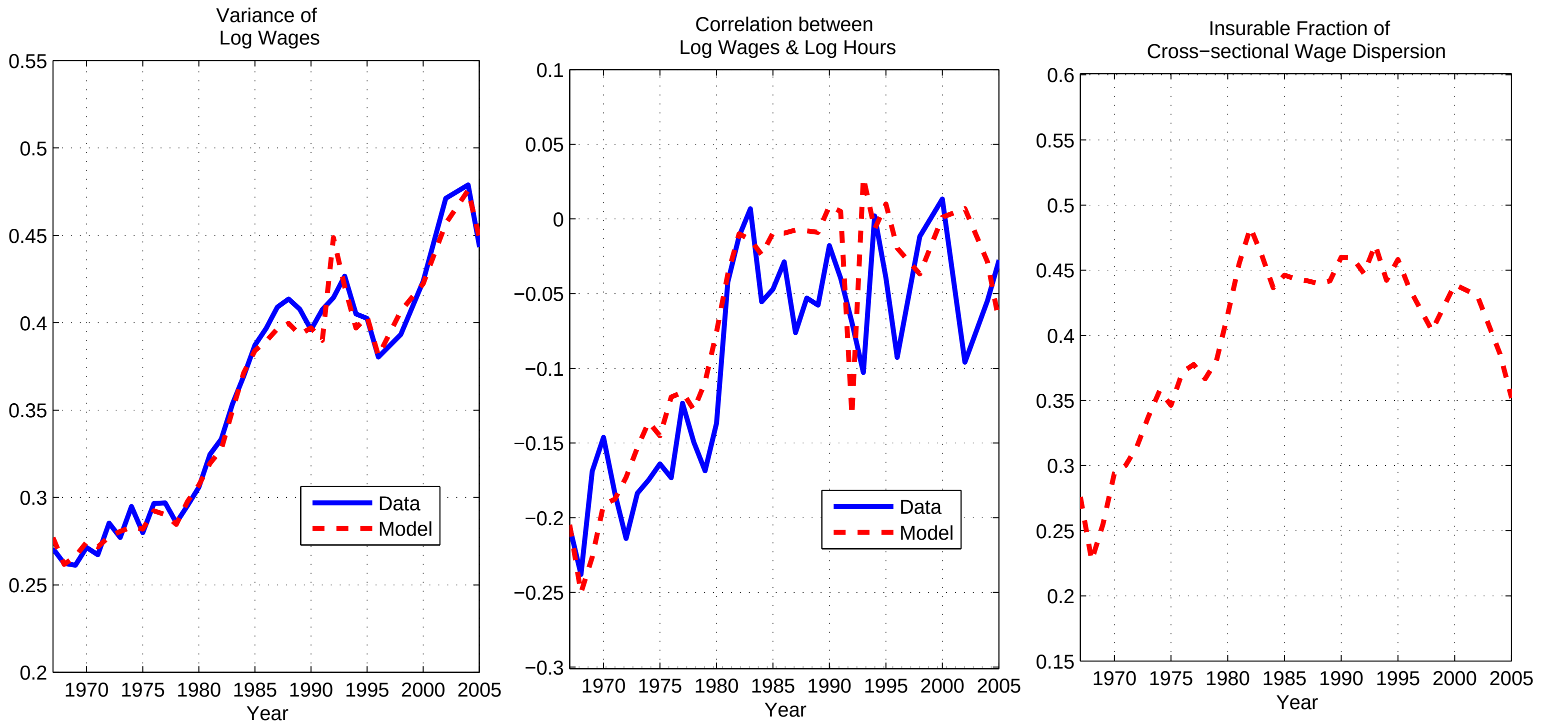

$$\Delta var_t(\log w) \quad = \quad \Delta var_t(\alpha) + \Delta var_t(\varepsilon)$$

$$\Delta cov_t(\log w, \log h) \quad = \quad \left(\frac{1-\gamma}{\widehat{\sigma}+\gamma}\right)\Delta var_t(\alpha) + \frac{1}{\widehat{\sigma}}\Delta var_t(\varepsilon)$$

Lifecycle inequality decomposition

	Total Variance of Logs	Percent Contribution to Total Variance			
		Initial Heterogeneity		Life-Cycle	Measurement
		Preferences	Productivity	Shocks	Error
W	0.35	0	40	50	10
H	0.11	46	6	15	33
C	0.16	17	30	20	33

All components are orthogonal $\Rightarrow$ decomposition is unique

Why preference heter. is a source of inequality

$$cov_t(\log w, \log h) \quad = \quad \left(\frac{1-\gamma}{\widehat{\sigma}+\gamma}\right) var_t(\alpha) + \frac{1}{\widehat{\sigma}} var_t(\varepsilon) - v_{\mu h} \quad < 0$$

$$cov_t(\log h, \log c) \quad = \quad (1-\tau) var_t(\hat{\varphi}) + \frac{(1-\tau)(1+\widehat{\sigma})(1-\gamma)}{(\widehat{\sigma}+\gamma)^2} var_t(\alpha) \quad > 0$$

$$\gamma = 1.5 \quad \Rightarrow \quad var_t(\hat{\varphi}) > 0$$