Credit Constraints and Growth in a Global Economy

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Roadmap

- Motivation and Contribution of the paper
- Summarize the paper
  - Theoretical framework and Mechanism
  - Empirical results
- Extension - Ideas on the third year paper

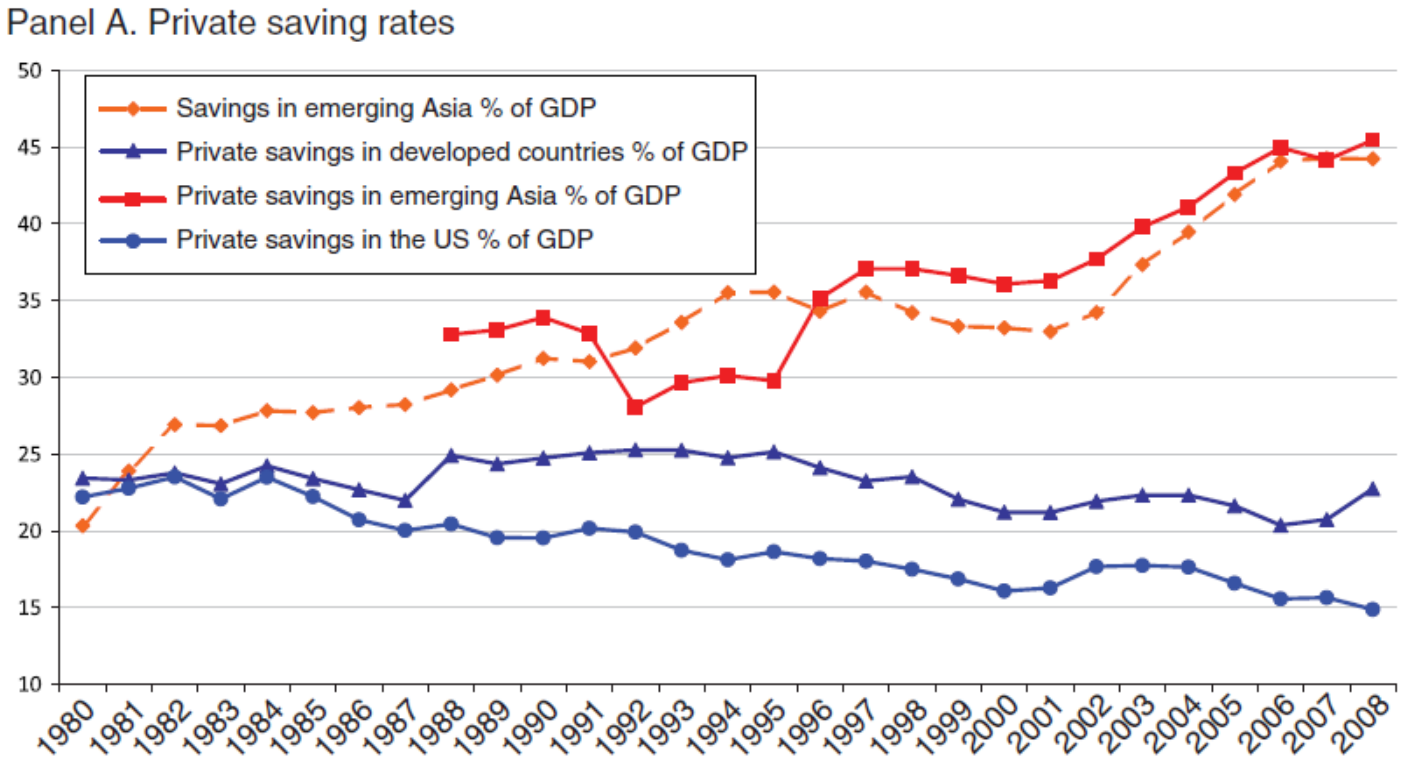
1. Motivation and Contribution

- Three prominent global patterns:

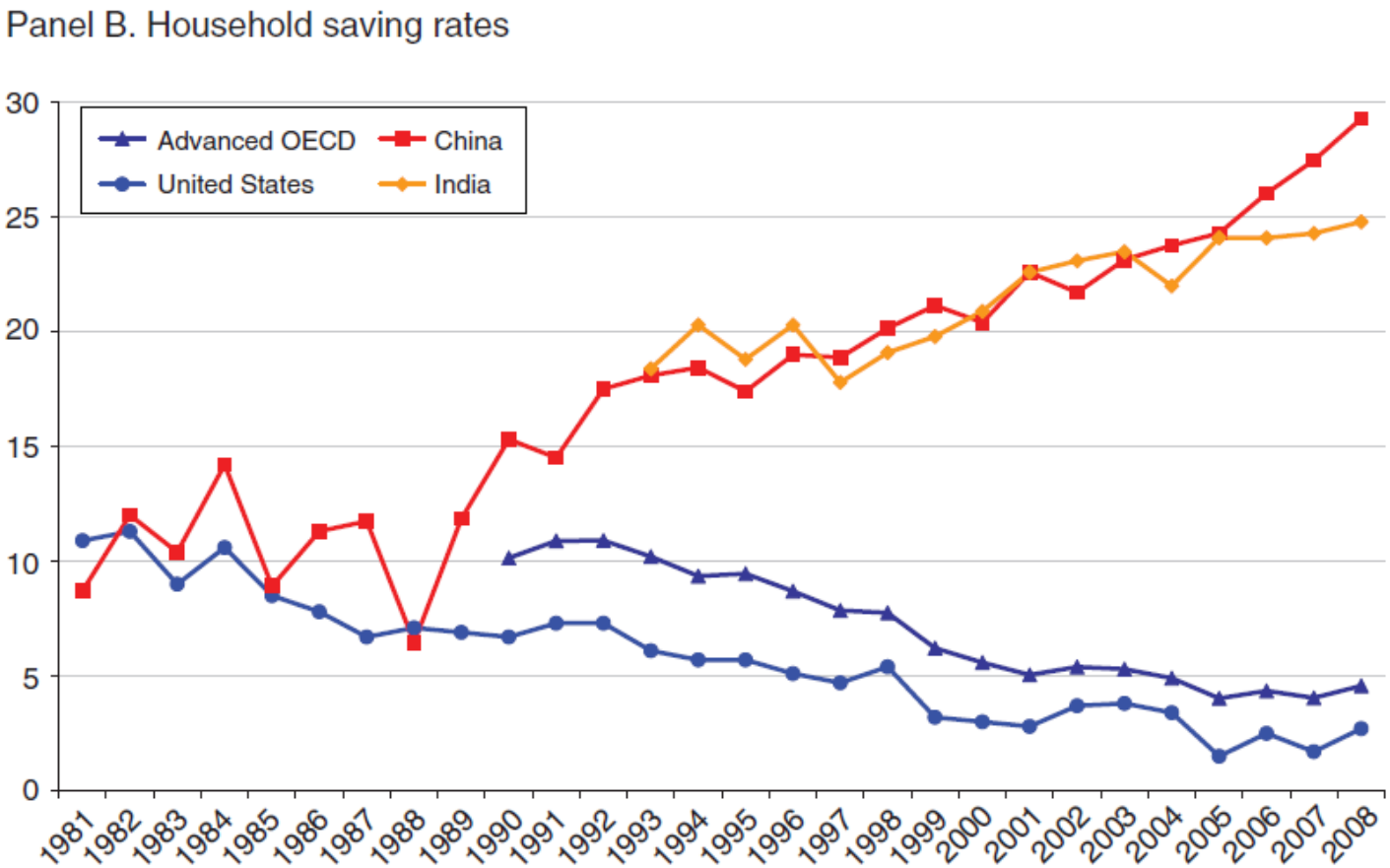
  1. A divergence in savings rates
  2. Capital Outflows from emerging market economies
  3. A fall in the world interest rate

- The existing open-economy growth models do not explain this trend

1. Motivation and Contribution



1. Motivation and Contribution



2. Theory

- Large Open Economies
- Overlapping Generations of consumers who live for three periods.
  $\gamma \in \{y, m, o\}$
- People work when $\gamma = y$ and $\gamma = m$.
  Consume only when $\gamma = o$.

2.1 Production

Gross Output:

$$Y_t^i = \left(K_t^i\right)^{\alpha} \left[A_t^i \left(e_t^i L_{y,t}^i + L_{m,t}^i\right)\right]^{1-\alpha} \tag{1}$$

i: country index, t: time index

K_t^i: aggregate capital stock

$e_t^i L_{y,t}^i + L_{m,t}^i$: total labor input

e_t^i (< 1): relative productivity of young worker

A_t^i: country-specific productivity

2.1 Production

Firm's First Order Conditions

- Wage: $\omega^i_{y,t}=e^i_t(1-\alpha)A^i_t(k^i_t)^\alpha, \quad \omega^i_{m,t}=(1-\alpha)A^i_t(k^i_t)^\alpha$
- Rental Rate: $r^i_{K,t} = \alpha(k^i_t)^{\alpha-1}$

- Gross Rate of Return: $R^i_t = 1-\delta+r^i_{K,t}$
- $A^i_t = (1+g^i_{A,t})A^i_{t-1}$
- $L^i_{y,t} = (1+g^i_{L,t})L^i_{y,t-1}$

2.2 Households

Lifetime Utility:

$$U_t^i = u(c_{y,t}^i) + \beta u(c_{m,t+1}^i) + \beta^2 u(c_{o,t+2}^i) \tag{2}$$

$$u(c) = (c^{1-\frac{1}{\sigma}} - 1)/(1 - \frac{1}{\sigma})$$

Budget Constraints:

$$c_{y,t}^i + a_{y,t+1}^i = \omega_{y,t}^i \tag{3}$$

$$c_{m,t+1}^i + a_{m,t+2}^i = \omega_{m,t+1}^i + R_{t+1}^i a_{y,t+1}^i \tag{4}$$

$$c_{o,t+2}^i = R_{t+2}^i a_{m,t+2}^i \tag{5}$$

2.2 Households

Young Agent's Credit Constraints:

$$a^i_{y,t+1} \geq -\theta^i \frac{\omega^i_{m,t+1}}{R^i_{t+1}} \tag{6}$$

2.2 Households

Assumption1

Credit constraints for the young are binding at all times in all countries

- θ^i is small enough
- the wage profile is steep enough

2.2 Households

The net asset position of the young:

$$a^i_{y,t+1} = -\theta^i \frac{\omega^i_{m,t+1}}{R^i_{t+1}} \tag{7}$$

The net asset position of a middle-aged agent:

$$a^i_{m,t+1} = \frac{1}{1+\beta^{-\sigma}(R^i_{t+1})^{1-\sigma}}(1-\theta^i)\omega^i_{m,t} \tag{8}$$

2.3 Autarky Equilibrium

Market clearing:

$$K^i_{t+1} = L^i_{y,t} a^i_{y,t+1} + L^i_{m,t} a^i_{m,t+1} \tag{9}$$

Law of motion for k^i:

$$(1 + g^i_{A,t+1})(1 + g^i_{yL,t}) \left[1 + e^i_{t+1}(1 + g^i_{L,t+1}) + \theta^i \frac{1-\alpha}{\alpha} \right] k^i_{t+1}$$

$$= \frac{(1-\theta^i)(1-\alpha)}{1 + \beta^{-\sigma} \left[\alpha (k^i_{t+1})^{\alpha-1} \right]^{1-\sigma}} (k^i_t)^\alpha \tag{10}$$

2.3 Autarky Equilibrium

Theorem 1

Suppose that $\delta = 1$. There exists a unique, stable, autarky steady state. All else equal more constrained economies have a higher capital-to-efficient labor ratio ($dk^i/d\theta^i < 0$) and a lower interest rate ($dR^i/d\theta^i > 0$).

US: less-constrained economy, China: more-constrained economy
$\Rightarrow \theta^{US}=\theta_H$ and $\theta^{China}=\theta_L$

- $\theta^{US} > \theta^{China}$
- $(k^*)^{US} < (k^*)^{China}$
- $(R^*)^{US} > (R^*)^{China}$

2.4 Integrated Equilibrium

Financial Integration: $R^i_{t+1} = R_{t+1}$ and $k^i_{t+1} = k_{t+1}$

The capital market equilibrium condition:

$$\sum_i K^i_{t+1} = \sum_i (L^i_{y,t} a^i_{y,t+1} + L^i_{m,t} a^i_{m,t+1}) \tag{11}$$

2.4 Integrated Equilibrium

Proposition 1

Suppose that $\delta = 1$. Let $\theta_L \equiv \min_i\{\theta^i\}$, $\theta_H \equiv \max_i\{\theta^i\}$, with $\theta_L \neq \theta_H$. The steady state world interest rate R satisfies

$$R(\theta_L) < R < R(\theta_H) \tag{12}$$

where $R(\theta)$ denotes the autarky steady state rate for credit constraint parameter θ.

2.3 Autarky Equilibrium

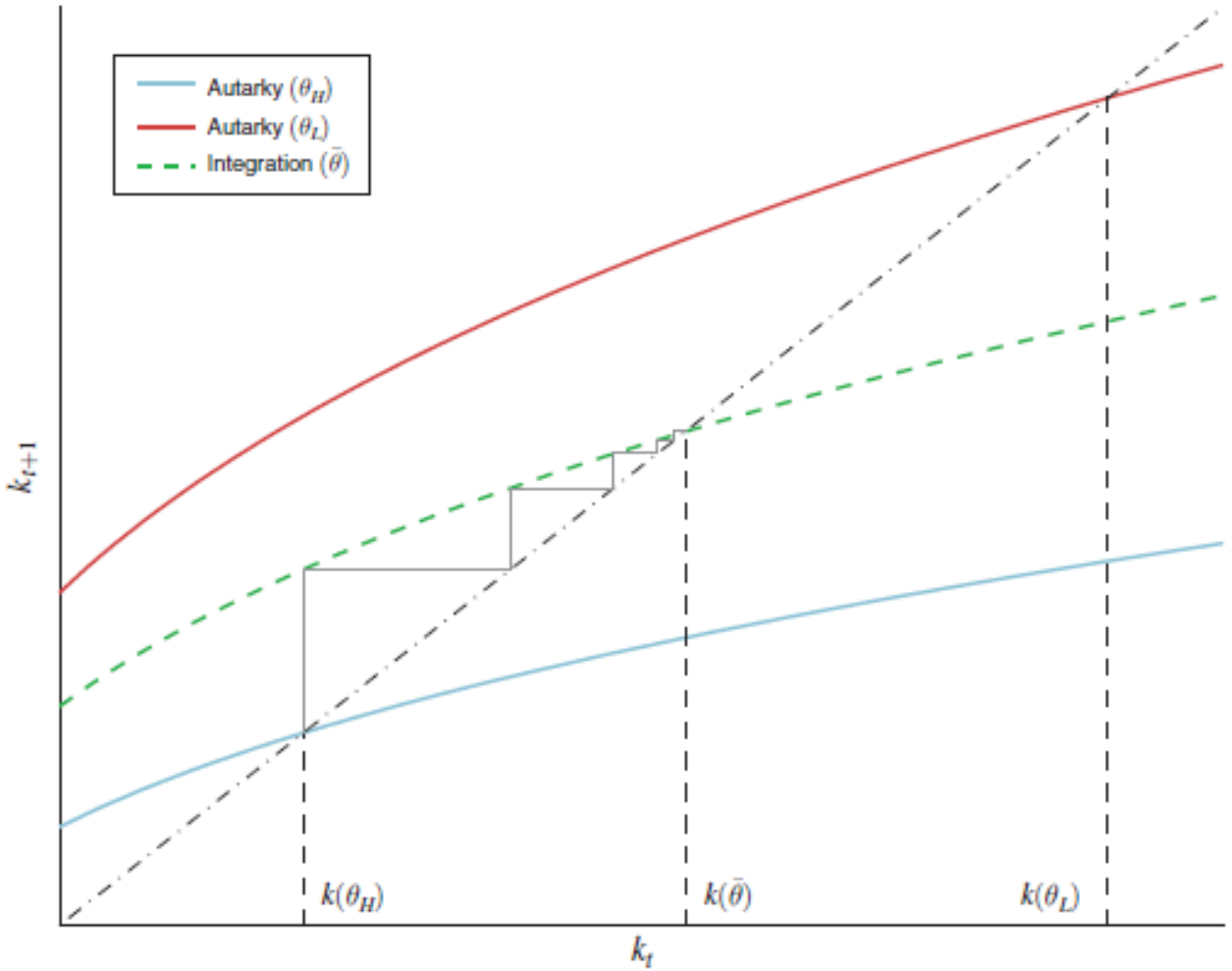


FIGURE 3. LAW OF MOTION AND STEADY STATE: AUTARKY AND INTEGRATION

Notes: Parameter values are $\sigma = 0.5$, $\beta = 0.97$ (annual), $\alpha = 0.28$, $\delta = 10$ percent (annual), $\theta_H = 0.2$, $\theta_L = 0.02$, $g_A = 1.5$ percent (annual), $g_L = 1$ percent, $e = 0.33$. A period lasts 20 years.

2.4 Integrated Equilibrium

What causes a fall in the world interest rate R

- Financial integration

  Credit constraint: $\bar{\theta} \equiv \sum_i \lambda^i \theta^i$ where $\lambda^i \equiv \frac{A_{i,t}(eL^i_{y,t}+L^i_{m,t})}{\sum_j A_{i,t}(eL^i_{y,t}+L^i_{m,t})}$

- A relative expansion of a more constrained economies (ex. China)

2.4 Integrated Equilibrium

Proposition 2

A relative expansion of the more constrained economies (i.e., an increase in the share with λ^i of a country with low θ^i) causes a fall in the world interest rate. A relative expansion of less constrained economies has the opposite effect.

2.5 Saving and Investment

	China (θ_L)	U.S.(θ_H)
Young	saving $\downarrow$	saving $\downarrow\downarrow$
Middle-aged	saving $\uparrow\uparrow$	Saving $\uparrow$

A fall in R $\Rightarrow$ $S_{China} \uparrow$ and $S_{US} \downarrow$

Asymmetric credit constraints (across countries and generations)

$\Rightarrow$ Heterogeneous responses of savings rates

2.5 Saving and Investment

Proposition 3

In an integrated global economy with heterogenous credit constraints, a fall in the world rate of return induces a greater dispersion in saving rates across countries

3. Empirical Results

- U.S. Consumer Expenditure Survey (1986-2008) and National Income and Product Account (NIPA)
- China: Urban Household Survey (1986, 1992-2009)

- Young's (under 25) saving rate over time is markedly different (US: 12.7% decline in savings + China: Savings rises little)
- Savings rate of the middle-aged (35-54) rose by about 15 percentage more in China than in the U.S. (US: 2.3% increase)

4. Conclusion

- Three-period Overlapping Generations type Households' consumption-saving decision with heterogeneous credit constraints
- Mechanism to explain a fall in the world interest rate as well as divergence in saving rates and capital outflows from developing countries
- Consistent with data and global patterns

5. Extension

Ideas on the third year paper:

The effects of decline in trade costs on the trade imbalances under the existence of credit constraints

- Static component: Eaton-Kortum (2002) + Endogenous capital
- Dynamic component: CGJ paper (Three-period OLG type Households' consumption-saving decision)

5. Extension: Household's problem

Household's Max problem

$$U_t^i = \phi_y u(c_{i,y,t}) + \beta\phi_m u(c_{i,m,t+1}) + \beta^2\phi_o u(c_{i,o,t+2}) \tag{13}$$

$$P_{i,t}c_{i,y,t} + a_{i,y,t+1} = w_{i,y,t} \tag{14}$$

$$P_{i,t+1}c_{i,m,t+1} + c_{i,m,t+2} = w_{i,m,t+1} + R_{i,t+1}a_{i,y,t+1} \tag{15}$$

$$P_{i,t+2}c_{i,o,t+2} + c_{i,m,t+2} = R_{i,t+2}a_{i,m,t+2} \tag{16}$$

5. Extension: Household's problem

Euler equations:

$$(c_{i,y,t})^{-\rho} = \beta \frac{\phi_m}{\phi_y} \frac{R_{i,t+1} P_{i,t}}{P_{i,t+1}} (c_{i,m,t+1})^{-\rho} \tag{17}$$

$$(c_{i,m,t+1})^{-\rho} = \beta \frac{\phi_o}{\phi_m} \frac{R_{i,t+2} P_{i,t+1}}{P_{i,t+2}} (c_{i,o,t+2})^{-\rho} \tag{18}$$

5. Extension

Why? Expected Results?

- Household's consumption-saving decision is influenced by 'credit constraints'
- Compare to frictionless market case:

  Over-estimation vs Under-estimation

Thank you