Growing like China

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Introduction
China 1992-2010

- Fast convergence in GDP pc and TFP
- Strong reallocation across urban and rural sector, but also within the urban sector
- Important role of manufacturing sector (export)
- No tendency for the rate of return to capital to fall in spite of a very high investment rate
- Wage growth below productivity growth. Growing inequality
- High saving rates (total 50%, household 28%)
- Large foreign surplus→ reserves up from 20 billion in 1992 to 2.4 trillion USD today

Introduction

Foreign Reserves and Difference between Deposits and Loans
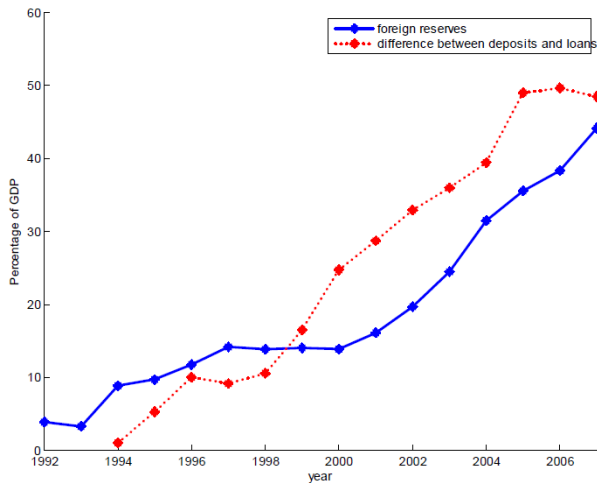
Introduction
The Foreign Surplus Puzzle

- *Prima facie*, the observation of a large capital inflow is at odd with the prediction of a neoclassical growth model:
  - Capital should flow *into* China
    where it commands a higher return
- "Capital Allocation Puzzle" (Gourichas and Jeanne 2009)

Introduction

- Privatization started in 1992.
- Many SOE were partially or totally privatized
  Inefficient SOE were shut down if unprofitable
- Since 1997 the process underwent acceleration.
  Fast growth of Domestic Provate Enterprises.
  Formal endorsement of the Communist Party of China

Introduction

Structural Change from State-Owned Enterprises (SOE) to Private Enterprises
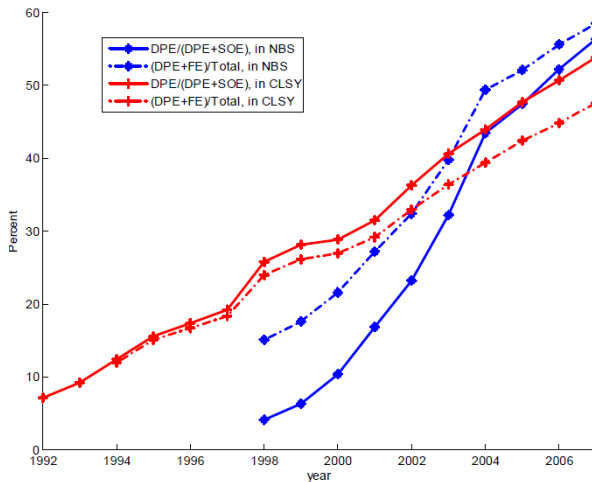
Introduction
Structural Change and Foreign Surplus: Is There a Link?

- Two obervations link reallocation to foreign imbalance:
  1. Timing coincides with the fast build up of foreign surplus.
  2. Across provinces, the saving gap (S-I) correlates positively with (level and growth of)s private employment shares
- Panel of 31 provinces with observations from 2001 to 2007
  - Private employment share is DPE share in manufacturing
  - Savings S is provincial GDP minus private and government consumption
- Run the following regression

$$\left(\frac{S-I}{Y}\right)_{pt} = \beta_0 + \beta_1 \times \Delta EMPL_{pt}^{PRIV} + \varepsilon_{pt}$$

Introduction

Cross-Province Regressions

Dep. Variable	(S-I)/GDP		Growth Rate of GDP p.c.		Growth Rate of VA p.w.	
	(1)	(2)	(3)	(4)	(5)	(6)
D.(EMPL^{PRIV})	0.9964**	0.8920*	0.1893***	0.1903***	-	-
	(0.4889)	(0.4659)	(0.0603)	(0.0610)		
D.(EMPL^{NONSOE})	-	-	-	-	1.4257***	1.5973***
					(0.4785)	(0.3572)
L.(GDP p.c.)	-	6.6268***	-	-0.0646	-	-
		(2.3952)		(0.2136)		
L.(VA p.w.)	-	-	-	-	-	0.1283***
						(0.0152)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	124	124	124	124	112	112
R^2	0.0424	0.1984	0.2252	0.2258	0.2104	0.2577

DEPENDENT VARS.: (S-I)/GDP*100 = provincial ratio of net surplus over GDP. I=aggregate investment, S=GDP-C-G, GDP p.c. = real provincial GDP per capita. VA p.w. is the industry value-added per worker (10 thousand RMB).
REGESSORS: EMPL^{PRIV} = DPE/(DPE+SOE)*100,   EMPL^{NONSOE} = (1-SOE/Total)*100,   D.(.) = difference,   L.(.) = one-period lag

Preview
Building Blocks

- **Key Assumptions**:
  1. Different rates of return across firms
      (e.g., private sector vs. state-owned enterprises "SOE")
  2. *Asymmetric* financial market imperfections
      (limited access of private firms to external financing)
  3. Agency problems within firms

- **Main Predictions**:
  1. *Gradual* labor and capital reallocation within manufacturing
      (decline of SOE and expansion of private firms)
  2. Non-decreasing returns to investments, low wage growth
  3. Accumulation of a foreign surplus
  4. Cross-regional correlation between
      net surplus and DPE employment share
  5. Private firms grow mostly in labor-intensive sectors

Preview
Two version of the models

1. Tractable version (2-period OLG) to illustrate the mechanism
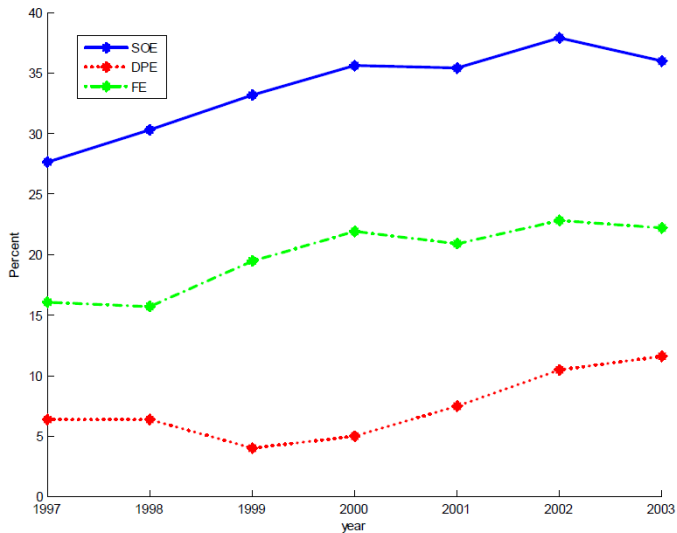2. T-period "Auerbach-Kotlikoff" OLG model
   for quantitative assessment

Evidence for the Key Assumptions

1. SOEs have significantly lower returns than private firms
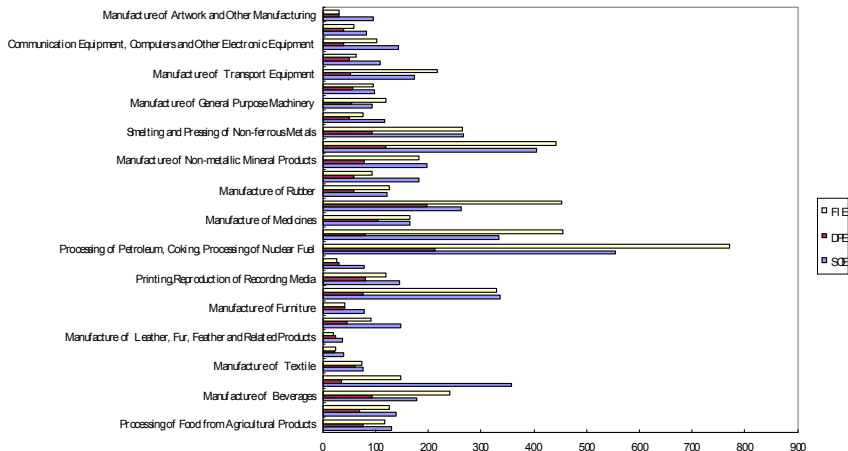2. Private firms face significantly tighter financial constraints

Preview

Share of Investments Financed by Bank Loans

Preview
Capital-Labor Ratios: within Industry by Ownership

Environment
Production Sectors

- Two type of firms, E-firms (*entrepreneurial*) and F-firms (*financially integrated*)
- E-firms and F-firms produce identical goods, but differ in technology and access to capital markets
- E-firms have higher TFP but are at disadvantage in financial markets:
  - F-firms have a deep pocket (e.g., owned by the intermediaries)
  - Entrepreneurs' returns are non-verifiable: they *can only* pledge a fraction of their profit cash-flow
- In *this presentation*: entrepreneurs *cannot* borrow at all and must finance investments out of their personal savings

Environment
Microfoundations to differences in rates of return (for example...)

- Two modes of production: Either the firm delegates decision authority to its manager, or it retains direct control
- Delegation leads to higher total factor productivity (see, e.g., AALVZ 2007)
- However, delegation raises an agency problem: managers can divert the firm's output for his own use
- Entrepreneurs have special skills, but no deep pocket
- Entrepreneurs are good at monitoring: in E-firms managers can "only" steal a share $\psi < 1$ of output
- E-firms choose the more productive technology
- Credit constraints keep alive F firms

Environment

Technology

- In summary

$$y_{Et} \;\; = \;\; (k_{Et})^{\alpha} \left(\chi A_t n_{Et} \right)^{1-\alpha}$$

$$y_{Ft} \;\; = \;\; (k_{Ft})^{\alpha} \left(A_t n_{Ft} \right)^{1-\alpha}$$

where $A_{t+1} = (1 + z) A_t$ (exogenous technical progress)
- (Urban) working population grows at an exogenous rate ν

Environment

Households

- OLG of two-period lived agents, who work in the first period and live off savings in the second period
- Preferences

$$U_t = \frac{(c_{1t})^{1-\frac{1}{\theta}} - 1}{1 - \frac{1}{\theta}} + \beta \frac{(c_{2t+1})^{1-\frac{1}{\theta}} - 1}{1 - \frac{1}{\theta}}$$

- Young workers earn a wage (w) and invest their savings in bank deposits paying gross returns R
  - Workers' saving rate is $\zeta^W \equiv \left(1 + \beta^{-\theta} R^{1-\theta}\right)^{-1}$
- Young entrepreneurs earn a managerial compensation (m) and can invest savings in deposits, but also in their *own* business
  - Entrepreneurs' saving rate is $\zeta^W \equiv \left(1 + \beta^{-\theta} \rho_E^{1-\theta}\right)^{-1}$

Environment

Banks

- Competitive banks collect deposits and hold portfolios of loans to domestic F-firms (I_t^F) and foreign bonds (B_t)
- Domestic loans yield a gross a return R
- Foreign bonds yield a gross a return R^W
- No-arbitrage: $R^W = R$
- There are intermediation costs for lending to firms
  - For banks to receive R firms must pay a gross return $R^I = R / (1 - \xi)$, where ξ is an *iceberg* intermediation cost

Analysis
F-firms (neoclassical)

- Investments entirely financed by bank loans: $K_{Ft+1} = I_{Ft}$
- Notation: $\kappa \equiv K / (AN)$
- No-arbitrage implies $R^l = \alpha \kappa_F^{\alpha-1}$, hence,

$$\kappa_F = \left(\frac{\alpha}{R^l} \right)^{\frac{1}{1-\alpha}}$$

- Wages equal the marginal product of labor: $w_t = (1 - \alpha) \kappa_F^\alpha A_t$

Analysis
E-firms (i)

- Recall:
  - E-firms are owned by old entrepreneurs
    and run by young *managers*
  - moral hazard problem:
    managers can steal share ψ of the output without being caught
- Manager's incentive constraint requires $m \geq \psi y_E$
- The optimal contract implies

$$
\Xi_t\left(k_{Et}\right) = \max_{n_{Et}, m_t} \left\{ \left(k_{Et}\right)^\alpha \left(\chi A_t n_{Et}\right)^{1-\alpha} - w_t n_{Et} - m_t \right\}
$$
$$
\text{s.t.}
$$
$$
m_t \geq \psi \left(k_{Et}\right)^\alpha \left(\chi A_t n_{Et}\right)^{1-\alpha} \qquad \text{(IC)}
$$
$$
m_t \geq w_t. \qquad \text{(PC)}
$$

- The solution yields

$$
\begin{aligned}
n_{Et} &= (1-\psi)^{\frac{1}{\alpha}} \chi^{\frac{1-\alpha}{\alpha}} \left(\frac{R^I}{\alpha}\right)^{\frac{1}{1-\alpha}} \times \frac{k_{Et}}{A_t} \\
y_{Et} &= ((1-\psi)\chi)^{\frac{1-\alpha}{\alpha}} \frac{R^I}{\alpha} \times k_{Et} \\
m_t &= \psi \times y_{Et}
\end{aligned}
$$

- Thus, the value of the firm is

$$
\Xi_t(k_{Et}) = \alpha(1-\psi) \times y_{Et} = \underbrace{(1-\psi)^{\frac{1}{\alpha}} (\chi)^{\frac{1-\alpha}{\alpha}} R^I}_{\equiv \rho_E} \times k_{Et}
$$

- Note: the entrepreneurial rate of return, ρ_E, is constant

Analysis

- If $\chi > (1 - \psi)^{-\frac{1}{1-\alpha}}$ (else, entrepreneurs do not invest in own business), then

$$\kappa_F = \left(\frac{\alpha}{R^l} \right)^{\frac{1}{1-\alpha}}$$

$$\kappa_E = \left((1 - \psi) \, \chi \right)^{-\frac{1}{\alpha}} \times \left(\frac{\alpha}{R^l} \right)^{\frac{1}{1-\alpha}} < \kappa_F$$

Analysis

- Entrepreneurial savings are the driving force of the transition

$$\frac{K_{Et+1}}{K_{Et}} = \frac{\zeta^E \times M_t}{K_{Et}} = \zeta^E \psi \left((1-\psi) \chi \right)^{\frac{1-\alpha}{\alpha}} \frac{R^l}{\alpha}$$

- Thus, the E sector features AK equilibrium dynamics
- Intuition: the "labor reserve" in the F sector keeps wages per efficiency units are constant
  (Lewis 1954, Ventura 1997)

Analysis
RESULT 3: Output and Employment Dynamics

- Conditional on K_{Et} and A_t (predetermined at t)

$$N_{Et} = \frac{K_{Et}}{\chi A_t \kappa_E} \qquad N_{Ft} = N_t - \frac{K_{Et}}{\chi A_t \kappa_E}$$

$$Y_{Et} = \kappa_E^{\alpha-1} \times K_{Et} \qquad Y_{Ft} = \kappa_F^{\alpha} \times (A_t N_{Ft})$$

$$\rho_t = \frac{K_{Et}}{K_{Et} + \kappa_F A_t N_{Ft}} \times \rho_E + \frac{\kappa_F A_t N_{Ft}}{K_{Et} + \kappa_F A_t N_{Ft}} \times \rho_F$$

Analysis
Equilibrium Dynamics During the Transition
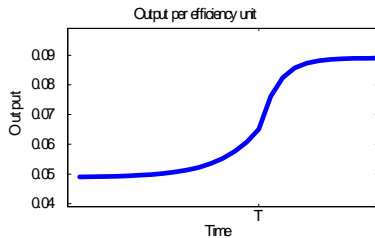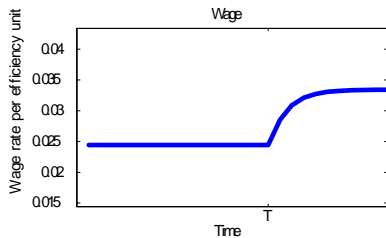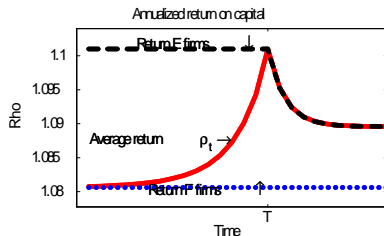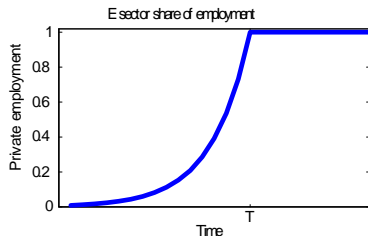
Analysis

- The difference between worker's savings and the investments of F sector determines the foreign balance
- From the balance sheets of the bank sector,

$$\underbrace{K_{Ft+1} + B_t}_{\text{ASSETS}} = \underbrace{\zeta \times w_t N_t}_{\text{DEPOSITS}}$$

$$
\begin{aligned}
B_t &= \zeta \times (w_t N_t) \uparrow - K_{Ft+1} \downarrow \\
&= \left(\left(\zeta \frac{1-\alpha}{1+z} \kappa_F^\alpha - \kappa_F \right) + \kappa_F \frac{N_{E,t}}{N_t} \right) \times A_t N_t
\end{aligned}
$$

- As the F sector shrinks, while wage income grows, the economy accumulates a surplus
- Note: for entrepreneurs, $S = I$.

Analysis

Equilibrium Dynamics: Saving Rate and Foreign Assets
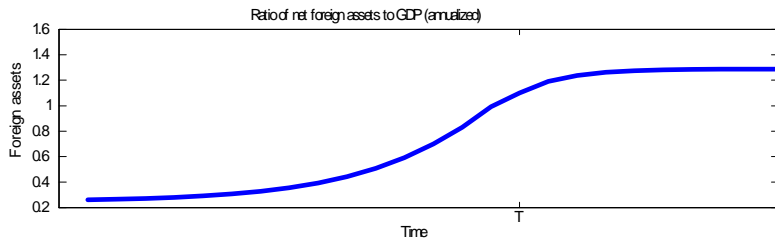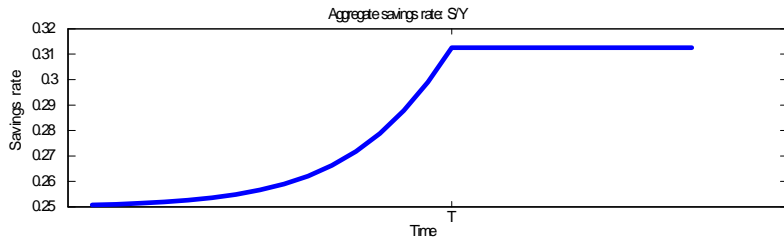
- Domestic Investment-GDP ratio fall during the transition
- Why? Recall that investments at t equal capital at $t + 1$
- Every worker who is shifted from F to E sector works with less capital
- Therefore, the total domestic investment falls (relative to GDP) during the transition

- The problem arises from a composition effect
- It can be offset by K/Y increasing within E and F firms
- Financial development:
  - The iceberg intermediation cost ξ falls over time
- $\xi(t) \downarrow \Rightarrow \kappa_F \uparrow \Rightarrow$ Wages increase due to capital deepening
- Higher wages $\Rightarrow \kappa_E \uparrow$ (capital deepening also in E firms)

Calibrated Economy
A T-period Auerbach-Kotlikoff Version of the OLG Model

- Can a calibrated version of the model account for the macro facts of China 1992-2007?
- Consider a T-period model.
- Capital depreciates at rate δ:

$$K_{t+1} = (1 - \delta) K_t + I_t$$

- Preferences:

$$U_t = \sum_{t=1}^{T} \beta^t \frac{(c_t)^{1-\frac{1}{\theta}} - 1}{1 - \frac{1}{\theta}}$$

- Workers retire at age J. Their budget constraint is:

$$\sum_{t=1}^{T} R^{-t} c_t = \sum_{t=1}^{J} R^{-t} w_t$$

Calibrated Economy
Entrepreneurs in the Auerbach-Kotlikoff version

- Young entrepreneurs work as managers for half life
- Managers deposit savings in banks and accumulated wealth that is invested in the own business when they become entrepreneurs
- Entrepreneurs can borrow from banks. But loan repayment cannot exceed a fraction η of capital income
- This borrowing constraint implies a return on equity of

$$\frac{R_t^l \rho_{Et}}{R_t^l - \eta \rho_{Et}} > \rho_{Et}$$

Calibrated Economy

Parameters Set Exogenously

- Agents live for 50 years. Workers retire after 30 years
- Capital share $\alpha = 0.5$
- Depreciation rate $\delta = 10\%$
- Bank deposit rate $R = R = 1.0175$
- (Urban) population growth rate $\nu = 3\%$
- Intertemporal elasticity of substitution $\theta = 2$

Calibrated Economy

Parameters Set Endogenously

- $\beta = 0.996 \rightarrow$ match 1998-2005 average total savings rate
- $\chi = 4.8$ and $\psi = 0.45 \rightarrow$ match the RoR gap $\rho_E - \rho_F = 9\%$ and the relative capital-output ratio $\frac{K_F}{Y_F} = 2.65 \times \frac{K_E}{Y_E}$
- $z = 3.8\% \rightarrow$ match urban GDP growth of 11.2%
- $\xi = 7\% \rightarrow$ match average return on capital 1993-2000
- Set $\{\xi_t\}_{t=2000}^{2020}$ to fit aggregate investment dynamics
- $\eta = 0.86 \rightarrow$ entrepreneurs' debt-to-equity ratio is 100%
- Initial conditions for $K_{E,0} \rightarrow$: match the average DPE employment share during 1998-2005.

Calibrated Economy

- Average investment rate
- Speed of transition from F-firms to E-firms
- Speed of accumulation of foreign surplus
- Aggregate TFP growth
- Wage growth

Calibrated Economy
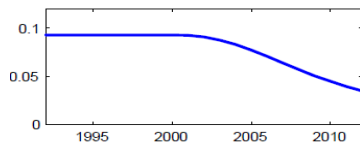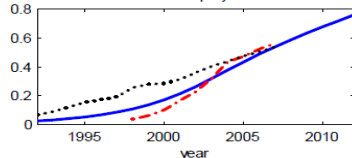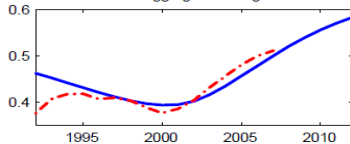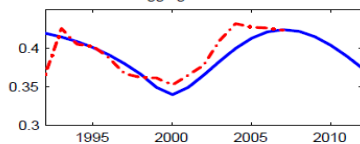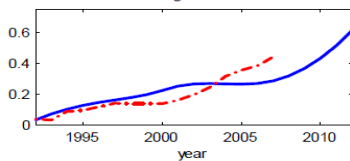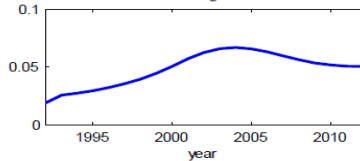
Calibrated Economy

- Broadly in line with Chinese quantitative facts
- Average wage growth is 5%,
  in line with empirical wage growth for low-skilled workers
- Average TFP growth 1998-2005 is 5.9%.
  Empirical estimates for manufacturing is $6.1\% - 7.7\%$
- 70% of TFP growth is due to reallocation
  - High end of empirical estimates:
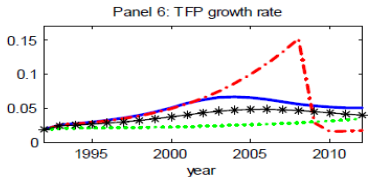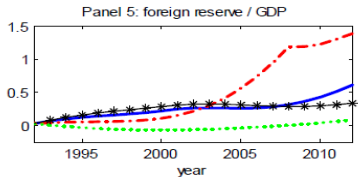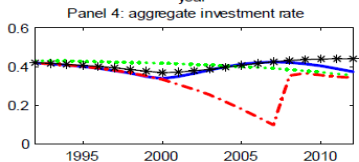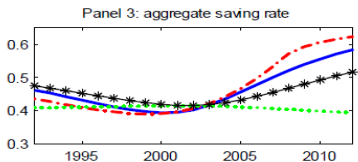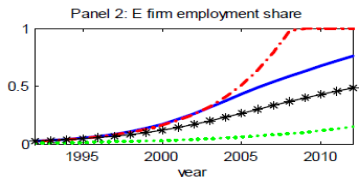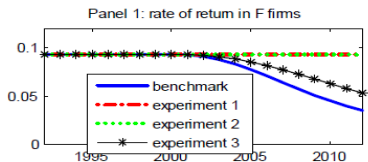   42-67% (Brandt, Van Biesebroeck, and Zhang, 2009)

Calibrated Economy

Robustness

- Four alternative parameterizations (BLUE = benchmark):
  1. RED: No financial development (ξ_t constant)
  2. GREEN: No borrowing for entrepreneurs ($\eta = 0$) and ξ constant
  3. BLACK: log preferences
  4. Low TFP advantage (1.8 instead of 2.2)
     – quantitatively similar to log case (BLACK)

Calibrated Economy

Conclusions

- A simple model of economic transition
- Theory consistent with a number of
  stylized facts of the Chinese transition"

- Foreign imbalance may not be due to undervaluation of Yuan

Paul Krugman, New York Times, March 14 2010

Today, China is adding more than $30 billion a month to its $2.4 trillion hoard of reserves. . . . This is the most distortionary exchange rate policy any major nation has ever followed. And it's a policy that seriously damages the rest of the world. . . . China, by engineering an unwarranted trade surplus, is in effect imposing an anti-stimulus on these economies. . . . So how should we respond? . . . At this point, it's hard to see China changing its policies unless faced with the threat of ... a surcharge (on imports of), say, 25 percent.

TRADE SANCTIONS: ARE WE SURE?