Growing like China

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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

Reallocation: privatization of manufacturing sector

- Many SOE were partially or totally privatized. Inefficient SOE were shut down if unprofitable.
Two observations 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) 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:

$$\left( \frac{S-I}{Y} \right)_{pt} = \beta_0 + \beta_1 \times \Delta EMPL^{PRIV}_{pt} + \epsilon_{pt}$$
### Cross-Province Regressions

<table>
<thead>
<tr>
<th>Dep. Variable</th>
<th>(S-I)/GDP</th>
<th>Growth Rate of GDP p.c.</th>
<th>Growth Rate of VA p.w.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>D.(EMPL^{PRIV})</td>
<td>0.9964**</td>
<td>0.8920*</td>
<td>0.1893***</td>
</tr>
<tr>
<td></td>
<td>(0.4889)</td>
<td>(0.4659)</td>
<td>(0.0603)</td>
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<tr>
<td>D.(EMPL^{NONSOE})</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td></td>
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<tr>
<td>L.(GDP p.c.)</td>
<td>-</td>
<td>6.6268***</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.3952)</td>
<td></td>
</tr>
<tr>
<td>L.(VA p.w.)</td>
<td>-</td>
<td>-</td>
<td>-</td>
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| Year Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs.       | 124 | 124 | 124 | 124 | 112 | 112 |
| R²         | 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
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
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
1. SOEs have significantly lower returns than private firms
2. Private firms face significantly tighter financial constraints
Share of Investments Financed by Bank Loans

The chart shows the share of investments financed by bank loans from 1997 to 2003. The lines represent different sectors:

- Blue line: SOE (State-Owned Enterprises)
- Red line with dots: DPE (Domestic Private Enterprises)
- Green line with diamonds: FE (Foreign Enterprises)

The data indicates a growing trend for all sectors from 1997 to 2003.
Two types 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 a disadvantage in financial markets:

- F-firms have a deep pocket (e.g., owned by 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.
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.
In summary

\[ y_{Et} = (k_{Et})^\alpha (\chi A_t n_{Et})^{1-\alpha} \]

\[ y_{Ft} = (k_{Ft})^\alpha (A_t n_{Ft})^{1-\alpha} \]

where \( A_{t+1} = (1 + z) A_t \) (exogenous technical progress)

(Urban) working population grows at an exogenous rate \( \nu \)
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 \(\zeta^W \equiv \left(1 + \beta^{-\theta} \rho_E^{1-\theta}\right)^{-1}\)
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 return \(R\).
- Foreign bonds yield a gross 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 \(R^l = R / (1 - \zeta)\), where \(\zeta\) is an *iceberg* intermediation cost.
Investments entirely financed by bank loans: \( K_{Ft+1} = I_{Ft} \)

Notation: \( \kappa \equiv K / (AN) \)

No-arbitrage implies \( R^I = \alpha \kappa_F^{\alpha - 1} \), hence,

\[
\kappa_F = \left( \frac{\alpha}{R^I} \right)^{\frac{1}{1-\alpha}}
\]

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 $\psi$ of the output without being caught
- Manager’s incentive constraint requires $m \geq \psi y_E$
- The optimal contract implies

\[
\mathbb{E}_t (k_{Et}) = \max_{n_{Et}, m_t} \left\{ (k_{Et})^\alpha (\chi A_t n_{Et})^{1-\alpha} - w_t n_{Et} - m_t \right\}
\]

s.t.

\[
m_t \geq \psi (k_{Et})^\alpha (\chi A_t n_{Et})^{1-\alpha} \quad \text{(IC)}
\]
\[
m_t \geq w_t. \quad \text{(PC)}
\]
The solution yields

\[ n_{Et} = (1 - \psi)^{\frac{1}{\alpha}} \chi^{\frac{1-\alpha}{\alpha}} \left( \frac{R^l}{\alpha} \right)^{\frac{1}{1-\alpha}} \times \frac{k_{Et}}{A_t} \]

\[ y_{Et} = (1 - \psi)^{\frac{1-\alpha}{\alpha}} \frac{R^l}{\alpha} \times k_{Et} \]

\[ m_t = \psi \times y_{Et} \]

Thus, the value of the firm is

\[ \Xi_t (k_{Et}) = \alpha (1 - \psi) \times y_{Et} = (1 - \psi)^{\frac{1}{\alpha}} \chi^{\frac{1-\alpha}{\alpha}} R^l \times k_{Et} \]

\[ \equiv \rho_E \]

Note: the entrepreneurial rate of return, \( \rho_E \), is constant
RESULT 1: Capital-labor (and capital-output) ratios are constant

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

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

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

RESULT 2: Growth Rate of Entrepreneurial Capital is constant

- Entrepreneurial savings are the driving force of the transition

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

- 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)
RESULT 3: Output and Employment Dynamics

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

\[
N_{Et} = \frac{K_{Et}}{\chi A_t \kappa_E}
\]

\[
N_{Ft} = N_t - \frac{K_{Et}}{\chi A_t \kappa_E}
\]

\[
Y_{Et} = \kappa_E^{\alpha - 1} \times K_{Et}
\]

\[
Y_{Ft} = \kappa_F^\alpha \times (A_t N_{Ft})
\]

\[
\rho_t = \frac{K_{Et}}{K_{Et} + \kappa_F A_t N_{Ft}} \times \rho_E + \frac{\kappa_F A_t N_{Ft}}{K_{Et} + \kappa_F A_t N_{Ft}} \times \rho_F
\]
Analysis
equilibrium dynamics during the transition

- E sector share of employment
- Annualized return on capital
- Wage rate per efficiency unit
- Output per efficiency unit

Growing like China
Analysis

Result 4: Foreign Asset Position

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

\[
K_{Ft+1} + B_t = \zeta \times w_t N_t
\]

\[
B_t = \zeta \times (w_t N_t) \uparrow - K_{Ft+1} \downarrow
\]

\[
= \left( \left( \frac{1 - \alpha}{1 + z} \kappa_F^\alpha - \kappa_F \right) + \kappa_F \frac{N_{E,t}}{N_t} \right) \times A_t N_t
\]

- 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

**Aggregate savings rate: S/Y**

![Graph showing the aggregate savings rate (S/Y) over time.](image)

**Ratio of net foreign assets to GDP (annualized)**

![Graph showing the ratio of net foreign assets to GDP over time.](image)
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 $\zeta$ falls over time

$\zeta(t) \downarrow \Rightarrow \kappa_F \uparrow \Rightarrow$ Wages increase due to capital deepening

Higher wages $\Rightarrow \kappa_E \uparrow$ (capital deepening also in E firms)
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 \( \delta \):

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

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:

\[
\sum_{t=1}^{T} R^{-t} c_t = \sum_{t=1}^{J} R^{-t} w_t
\]
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 $\eta$ of capital income

This borrowing constraint implies a return on equity of

$$\frac{R_t^l \rho_E t}{R_t^l - \eta \rho_E t} > \rho_E t$$
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\%
- $\zeta = 7\% \rightarrow$ match average return on capital 1993-2000
- Set $\{\zeta_t\}_{t=2000}^{2020}$ 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
Outcomes (non-calibrated observations)

- 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

Summary of Findings

- 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)
Four alternative parameterizations (BLUE = benchmark):

1. RED: No financial development ($\xi_t$ constant)
2. GREEN: No borrowing for entrepreneurs ($\eta = 0$) and $\xi$ constant
3. BLACK: log preferences
4. Low TFP advantage (1.8 instead of 2.2)
   - quantitatively similar to log case (BLACK)
Calibrated Economy
Numerical Results: Robustness
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
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?