Capital Flows and Asset Prices

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1 Introduction

After liberalizing international transaction of financial assets, many countries experience large swings in capital flows, asset prices, and aggregate production

e.g. Latin America from the late 1970s, Nordic countries in the late 80s and early 90s, East Asia in the 90s

Prasad, Rogoff, Wei and Kose (2003), Obstfeld and Taylor (2004):

No robust relationship between liberalization and growth

Benefits with strong institution, and costs outweigh with weak institution

General Features of financial crisis (Reinhart-Rogoff)

1. Varieties of financial crisis

banking crises: failures and/or government bailouts of major financial institutions

debt crises: defaults on external and domestic government debts

inflation crises: annual inflation rate of 20% or more

currency crisis: annual depreciation rate of 15% or more against the key currency

2. Early warning signs of financial crisis

asset price inflation, in particular real estate price

credit boom: rise of leverage rate or debt-income ratio

capital inflows, or current account deficit

slowing down of economic growth rate

3. Average of major financial crisis of advanced and emerging market economies after WWII

real GDP falls by 9.3% in 2 years

equity price falls by 56% in 3.4 years

unemployment rate rises by 7% in 4.8 years

housing price falls by 35% in 6 years

government debt is almost doubled in 3 years, mainly due to fall in tax revenue

Then

Quick recovery: output, working capital investment, stock price

Slow recovery: credit, fixed capital investment, real estate price

Legacy: government debs

In this presentation, we ask

How does the adjustment to capital account liberalization depend upon the development of domestic financial system?

Why may the economy with underdeveloped financial system be vulnerable to shocks to foreign and domestic credits?

Approach:

$$\text{lenders} \quad \xrightarrow{\textit{present goods}} \quad \text{borrowers}$$

$$\text{(unproductive)} \quad \xleftarrow[\textit{promise of future goods}]{} \quad \text{(productive)}$$

Borrowers may not keep their promises $\Rightarrow$ use collateral

total assets $>$ collateral for domestic loan

$>$ collateral for international loan

value of fixed assets $\quad \rightleftarrows \quad$ domestic and foreign credits

2 Model

A small open economy

One homogeneous goods and land

Many entrepreneurs and foreigners

Preference

$$\begin{aligned} \text{entrepreneur} &: E_0\left[\sum_{t=0}^{\infty}\beta^t \ln c_t\right] \\ \text{foreigner} &: E_0\left[\sum_{t=0}^{\infty}(1/r^*)^t c_t\right], \quad 1 < r^* < \frac{1}{\beta} \end{aligned}$$

At date t: Entrepreneur A uses k_t land and m_t material goods to start production

Agent B lends and monitors (lead creditor)

Agent C lends and does not monitor (outside creditors)

At date t+1: output $y_{t+1} = a_t \left(\frac{k_t}{\kappa}\right)^{\kappa} \left(\frac{m_t}{1-\kappa}\right)^{1-\kappa} = a_t F(k_t, m_t)$, if A finishes

$$y_{t+1} = \theta a_t F(k_t, m_t), \text{ if B finishes}$$

$$y_{t+1} = 0, \text{ if C finishes}$$

Only single home agent can be the monitor of each segment of project

Productivity of each entrepreneur:

$$a_t = \begin{cases} \alpha, & \text{if the entrepreneur is productive} \\ \gamma, & \text{if he is unproductive} \end{cases}$$

Idiosyncratic productivity transition:

$$\text{Prob}\left(a_{t+1} = \gamma \mid a_t = \alpha\right) = \delta,\ \text{Prob}\left(a_{t+1} = \alpha \mid a_t = \gamma\right) = n\delta$$

In Competitive Economy, the entrepreneur (borrower) can walk away from production and debt. No reputation

$\Rightarrow$ Fixed asset (land) becomes collateral for domestic and foreign resalable credits

θ fraction of output from the present project becomes collateral for domestic bilateral credit

Each entrepreneur takes prices (q_t, r_t, r^*) and initial net worth as given, and chooses quantities $(c_t, k_t, m_t, y_{t+1}, b_{t+1}, b^*_{t+1})$, subject to the flow-of-funds constraint:

$$c_t \; + \; q_t \left(k_t - k_{t-1}\right) + m_t = y_t - b_t - b^*_t \; + \; \frac{b_{t+1}}{r_t} + \frac{b^*_{t+1}}{r^*}$$

and the international and domestic borrowing constraints:

$$\begin{aligned} b^*_{t+1} \quad &\leq \quad q_{t+1} k_t \\ b_{t+1} + b^*_{t+1} \quad &\leq \quad \theta y_{t+1} + q_{t+1} k_t \end{aligned}$$

The markets clear for goods, land, and domestic and international credits

θ and κ : parameter of domestic financial development

κ : share of asset used as collateral for resalable credit

Equilibrium:$(q_t, u_t, r_t, K_t, K'_t, M_t, M'_t, Z_t, s_t, x_t, Z_{t+1}, s_{t+1})$ that satisfies

(1) $u_t = q_t - q_{t+1}/r^*$

(2) $u_t K_t$: $M_t = \kappa$: $1 - \kappa = u_t K'_t$: M'_t : factor demand

(3) $K_t + K'_t = \overline{K}$: land market

(4) $\gamma / u_t^\kappa \leq r_t$: unproductive entrepreneur, $=$ holds if $K'_t > 0$

(5) $u_t K_t + M_t \leq \frac{\beta s_t Z_t}{1-(\theta\alpha/r_t u_t^\kappa)}$, $=$ holds if $\alpha/u_t^\kappa > r_t$

(6) $Z_t = Y_t + Y'_t + q_t\overline{K} - B^*_t - B^{*\prime}_t$: total wealth

(7) $s_t = (Y_t + q_t K_t - B^*_t)/Z_t$: share of net worth of productive

(8) $u_t\overline{K} + M_t + M_t' \leq \beta Z_t$, $=$ holds if $r_t > r^*$

(9) $x_t = \left[\frac{1-\theta}{(u_t^{\kappa}/\alpha)-(\theta/r_t)} - r_t\right]/r_t$: excess rate of return of productive

(10) $Z_{t+1} = r_t\left(1 + x_t s_t\right)\beta Z_t$

(11) $s_{t+1} = \frac{(1-\delta)(1+x_t)s_t+n\delta(1-s_t)}{1+s_t x_t} \equiv f\left(s_t, x_t\right)$

- Under financial autarky, if domestic borrowing constraint is tight $\theta < \overline{\theta}(\kappa)$, then the unproductive entrepreneurs produce themselves.

  $\overline{\theta}'(\kappa) < 0$

- For numerical examples, we use full model with labor:

$$\begin{aligned} y_{t+1} &\leq a_t \left(\frac{k_t}{\kappa}\right)^{\kappa} \left(\frac{l_t}{\lambda}\right)^{\lambda} \left(\frac{m_t}{1-\kappa-\lambda}\right)^{1-\kappa-\lambda} \\ L_t^s &= \overline{L} w_t^{\eta} \end{aligned}$$

  $\beta = 0.92$, $\kappa = 0.03$, $\lambda = 0.12$, $\alpha = 1.1$, $\gamma = 1.05$, $\delta = 0.15$, $n = 0.1$, $\eta = 3$

Figure 1: Steady-state interest rate under autarky

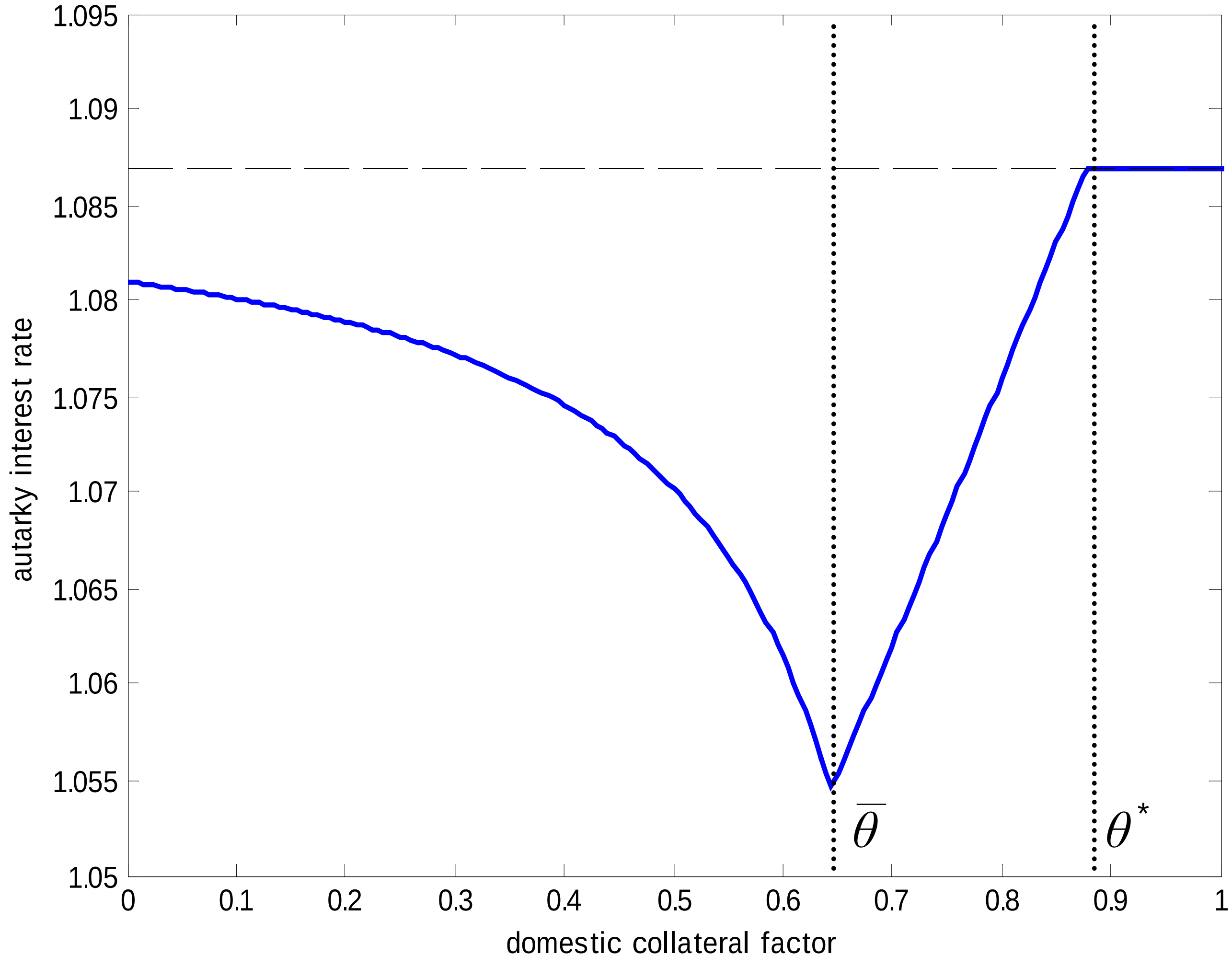
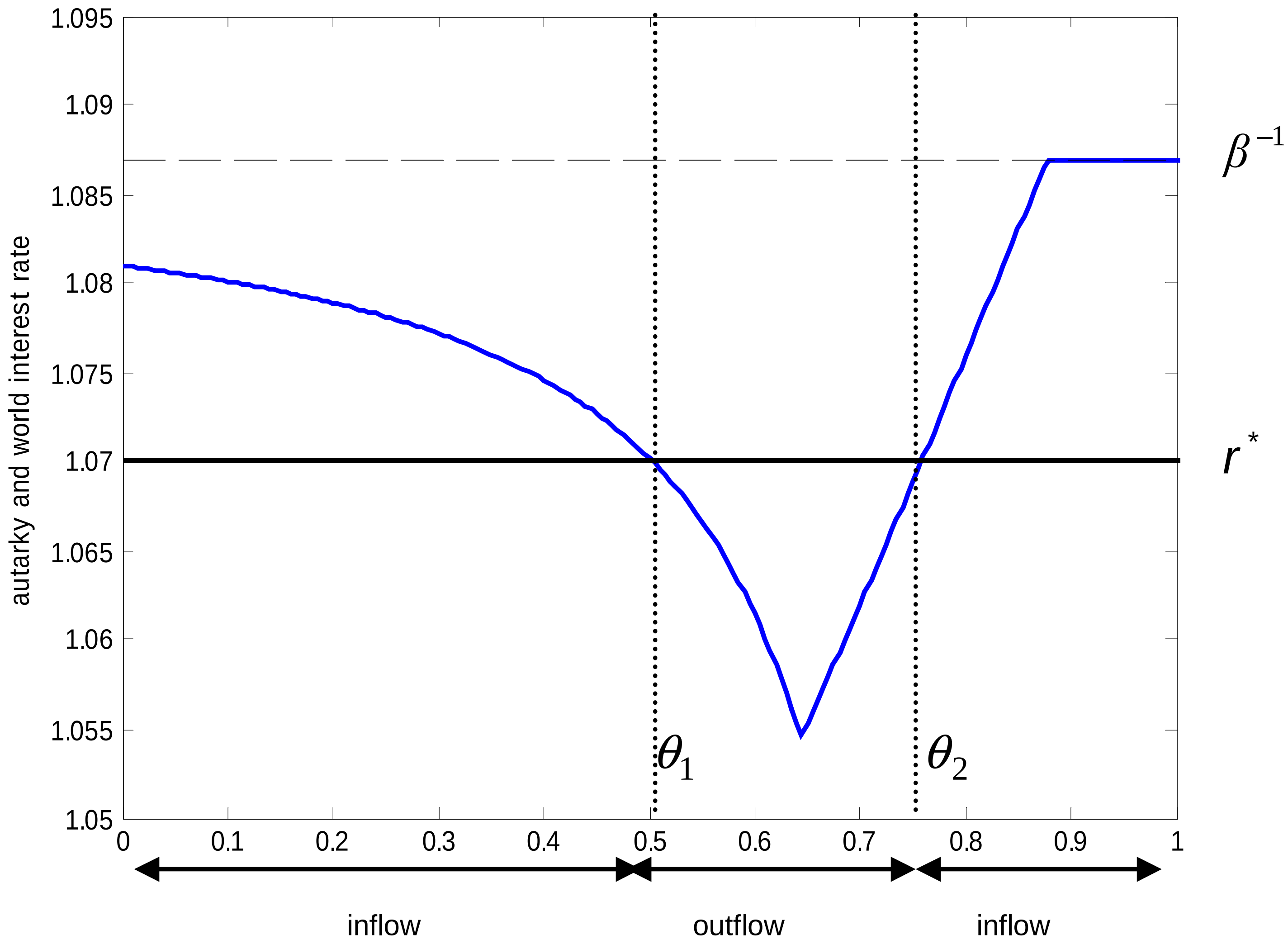


Figure 2: Capital flows after liberalisation



3 Capital Account Liberalization

- Region I, $\theta < \theta_1$: Factor price suppression

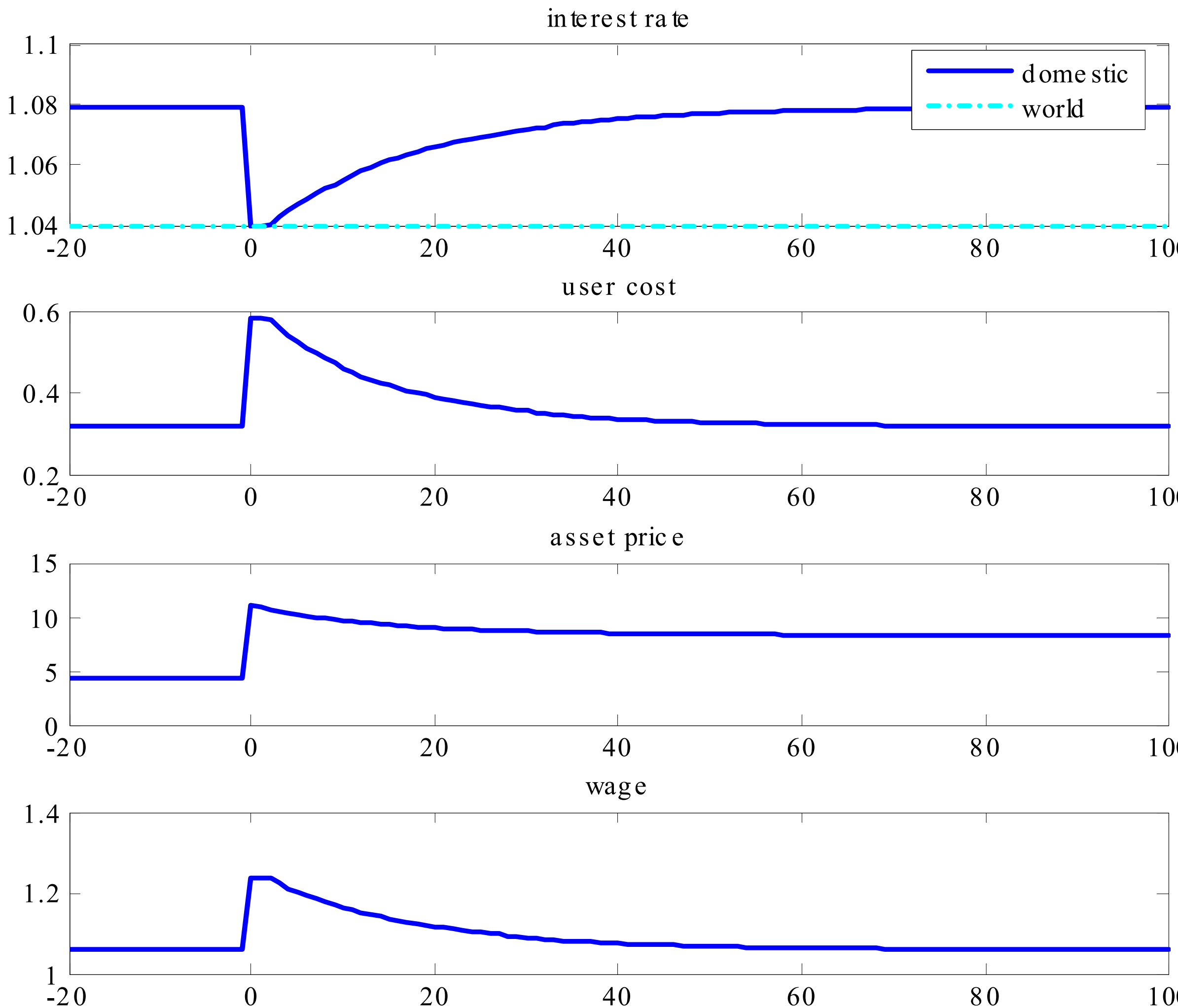
Before liberalization, $r^A > r^*$ $\Rightarrow$ liberalization causes capital inflow

$$
\begin{tikzcd}
\text{unproductive} \arrow[r] & \text{productive} \\
\text{foreigners} \arrow[u] \arrow[ur] &
\end{tikzcd}
$$

$\Rightarrow$ initial boom with land price hike and credit expansion

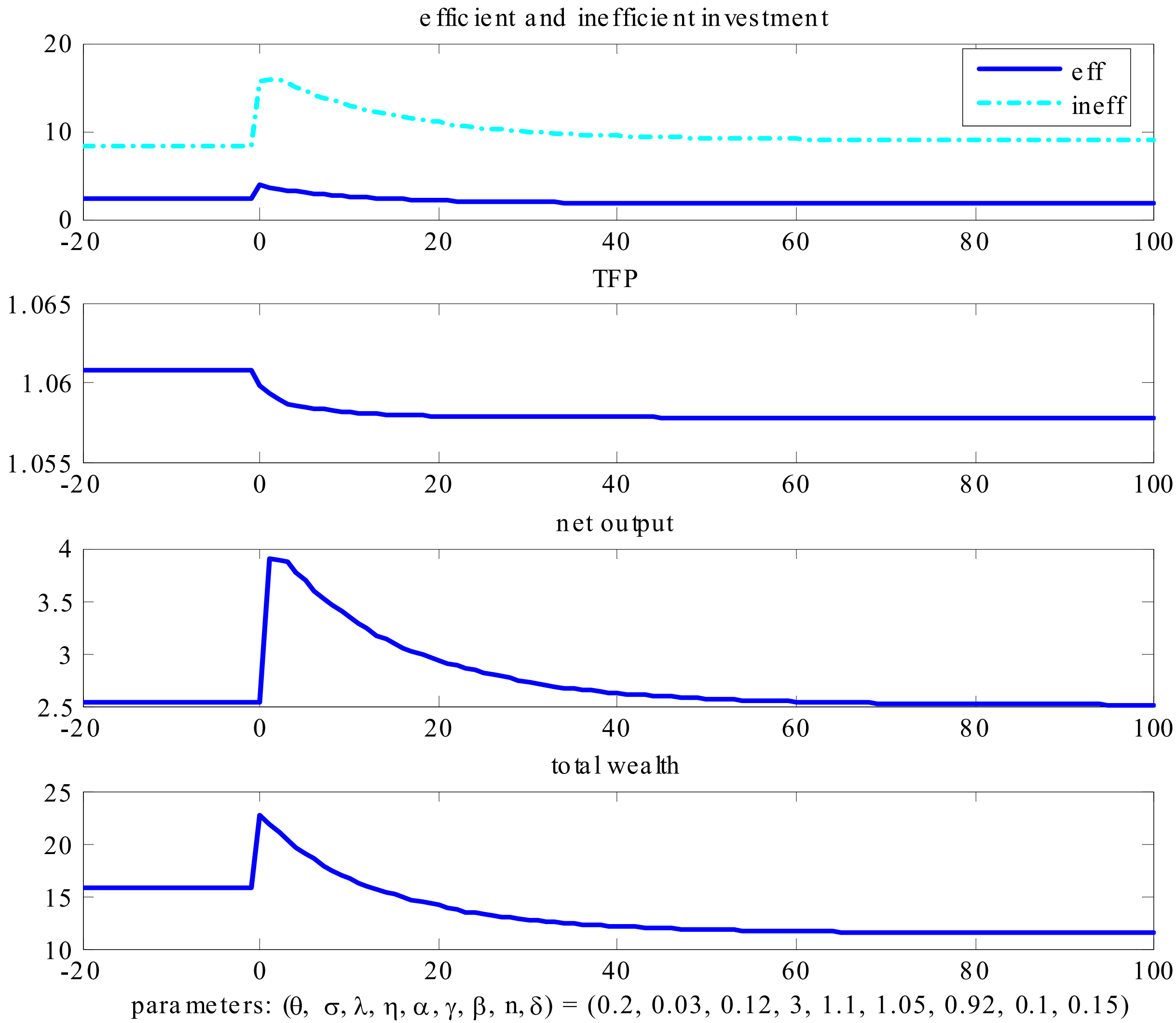
$\Rightarrow$ boom is not sustainable

Figure 3-1: dynamics after liberalisation: capital inflow (low theta)



parameters: $(\theta, \sigma, \lambda, \eta, \alpha, \gamma, \beta, n, \delta) = (0.2, 0.03, 0.12, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$

Figure 3-2: dynamics after liberalisation: capital inflow (low theta)



- Region II, $\theta_1 < \theta < \theta_2$: Interest rate suppression

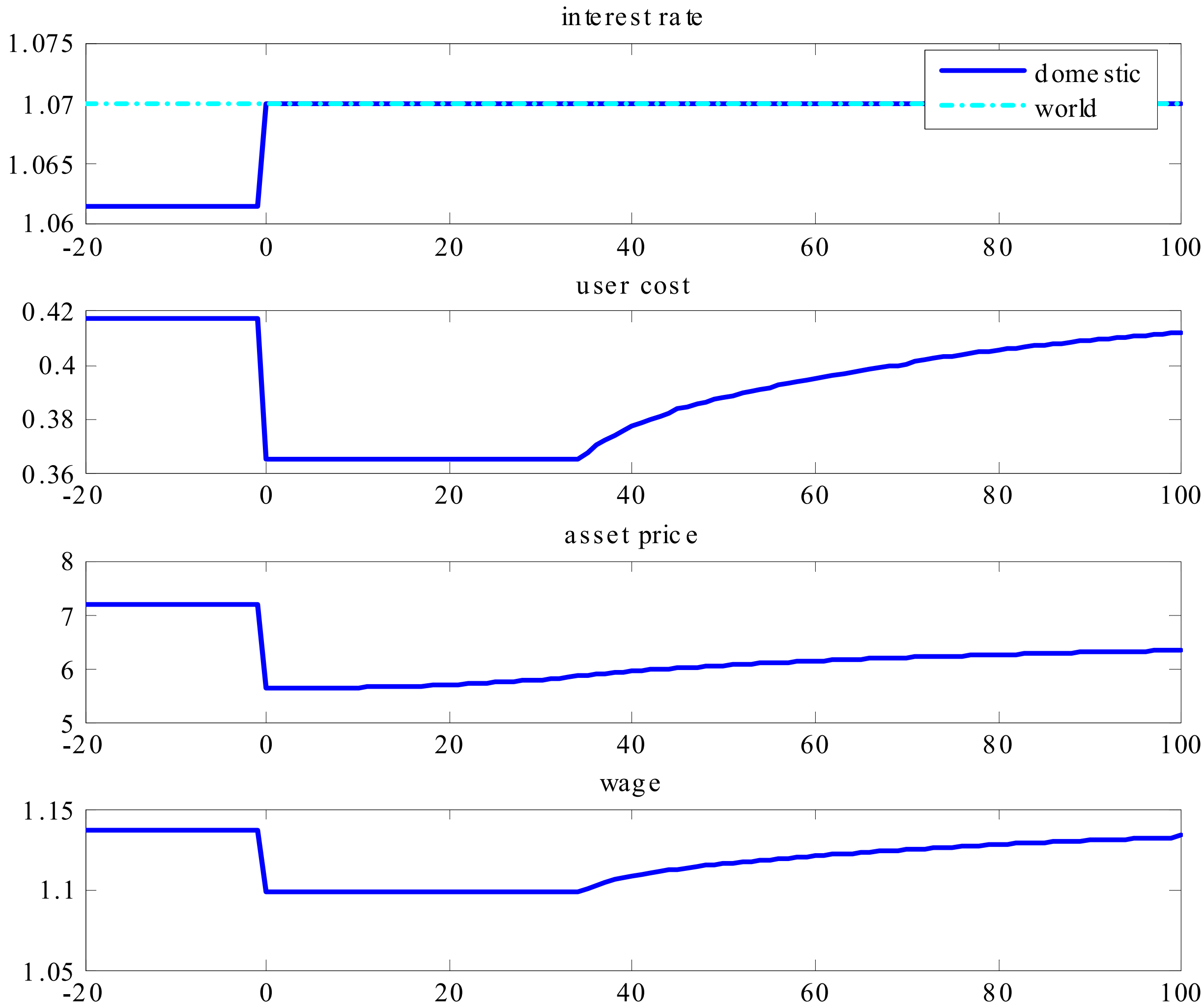
Before liberalization, $r^A < r^* \Rightarrow$ liberalization causes capital outflow

$$\begin{array}{ccc} \text{unproductive} & \longrightarrow & \text{productive} \\ & \searrow & \\ & & \text{foreigners} \end{array}$$

$\Rightarrow$ land price, credit, TFP and output decrease initially

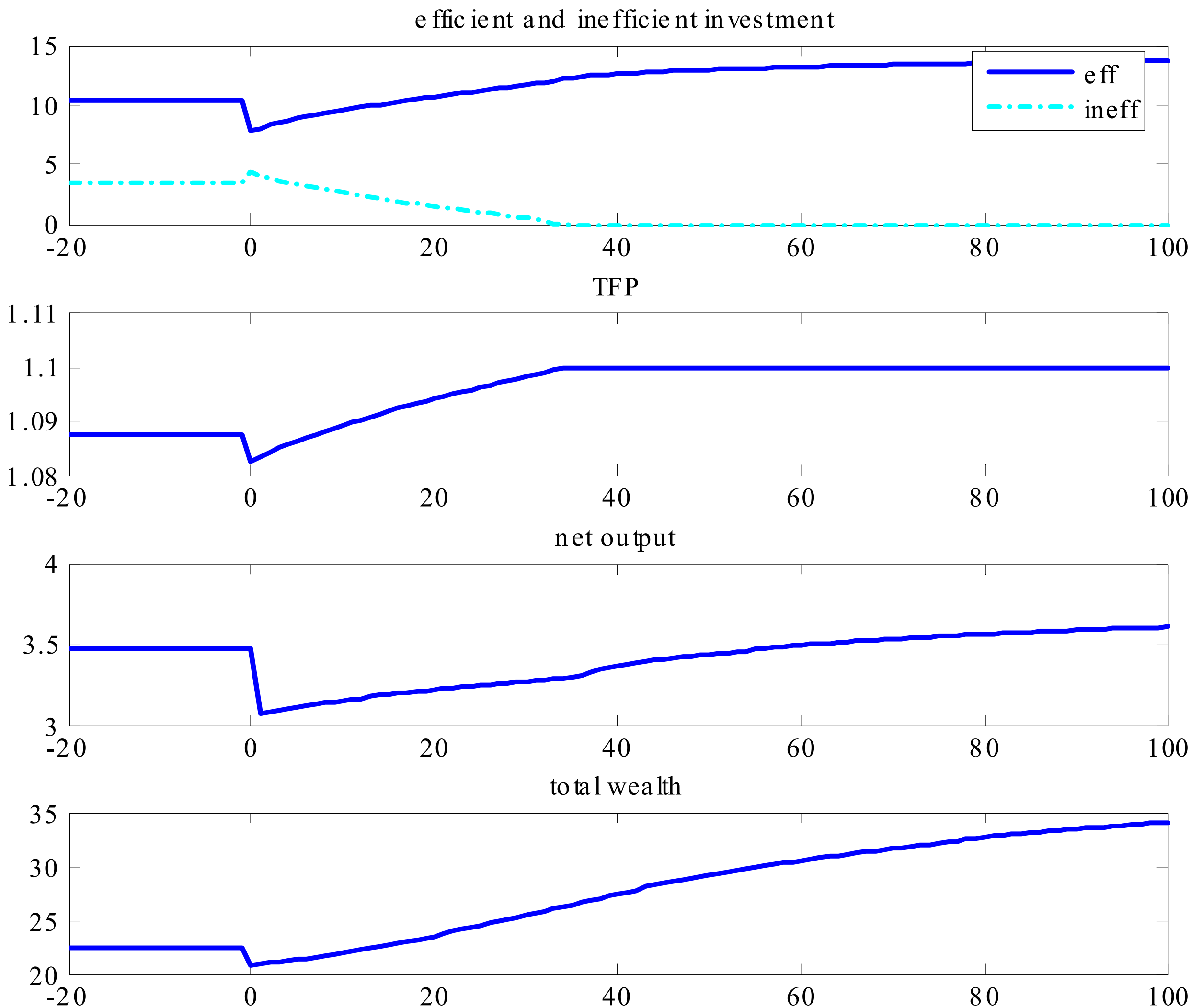
$\Rightarrow$ international capital market act as "catalyst"

Figure 5-1: dynamics after liberalisation: capital outflow



parameters: $(\theta, \sigma, \lambda, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.03, 0.12, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$

Figure 5-2: dynamics after liberalisation: capital outlow



parameters: $(\theta, \sigma, \lambda, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.03, 0.12, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$

- Region III, $\theta > \theta_2$: More advanced financial system

Before liberalization, $r^A > r^*$ $\Rightarrow$ liberalization causes capital inflow

$$
\begin{array}{ccc}
\text{unproductive} & \longrightarrow & \text{productive} \\
 & \nearrow & \\
\text{foreigners} & &
\end{array}
$$

$\Rightarrow$ boom with land price hike and credit expansion

$\Rightarrow$ boom is sustainable

- Welfare

$$\begin{aligned} c_t &= (1-\beta)z_t = (1-\beta)\beta^{t-1}\tilde{r}_0\tilde{r}_1\cdots\tilde{r}_{t-1}z_0 \\ \text{entrepreneurs} &: \quad E_0\left[\sum_{t=0}^{\infty}\beta^t \ln c_t\right] \\ \text{workers} &: \quad E_0\left[\sum_{t=0}^{\infty}\beta^t (c_t - v(l_t))\right] \end{aligned}$$

	P's z	P's $\tilde{r}$	P's EU	U's z	U's $\tilde{r}$	U's EU	Worker
Region I	0.53	-0.27	0.27	0.32	-0.27	0.05	5.14
Region II	-0.30	0.09	-0.20	-0.02	0.09	0.07	-0.12

4 Shocks to foreign and domestic credits in Region I

- Foreign interest rate rises

$\Rightarrow$ land price falls

$\Rightarrow$ domestic and foreign credit contract

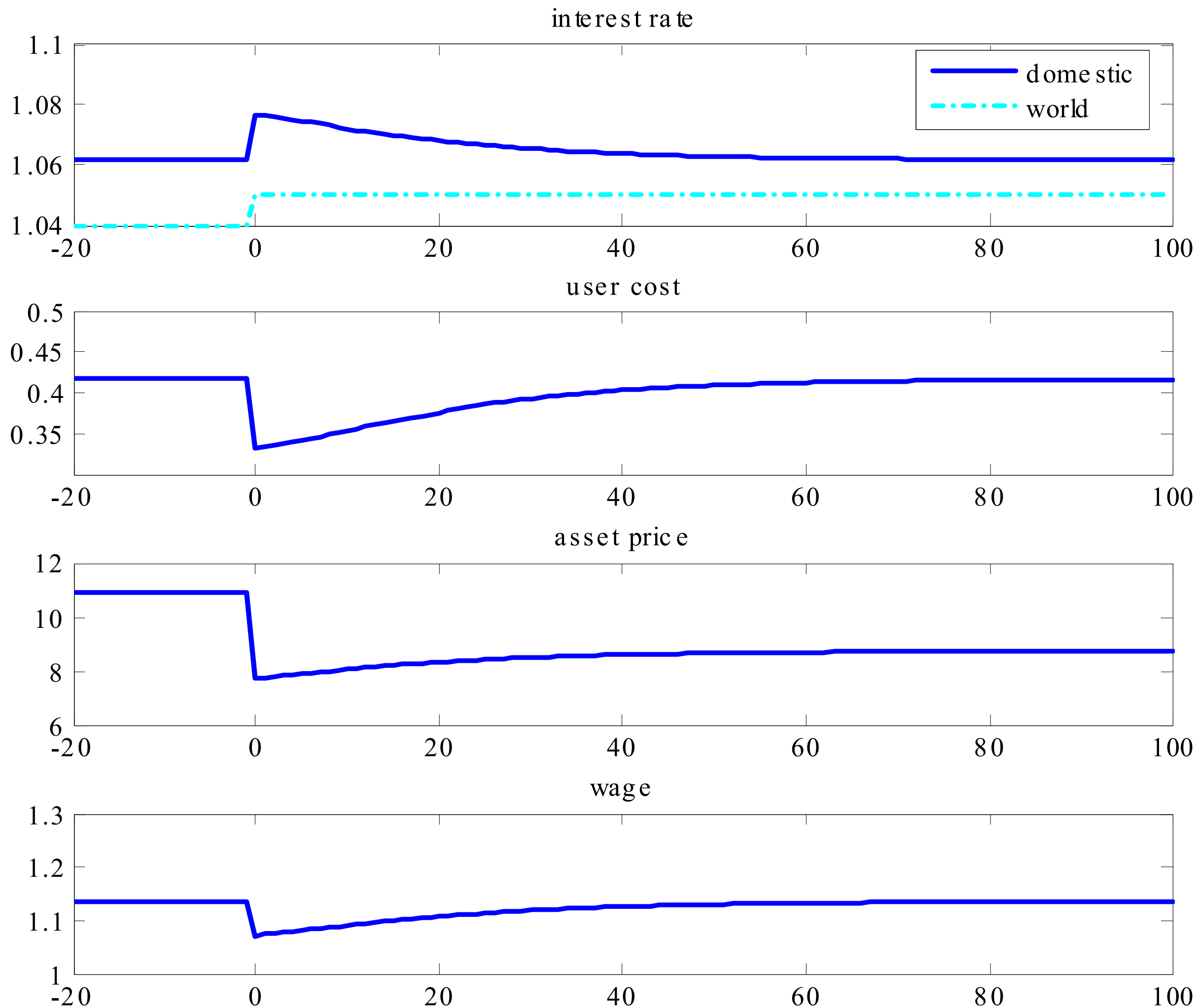
$\Rightarrow$ domestic interest rate rises more than foreign rate

$\Rightarrow$ TFP and output decrease initially

$\Longrightarrow$ share of net worth of productive agents will recover

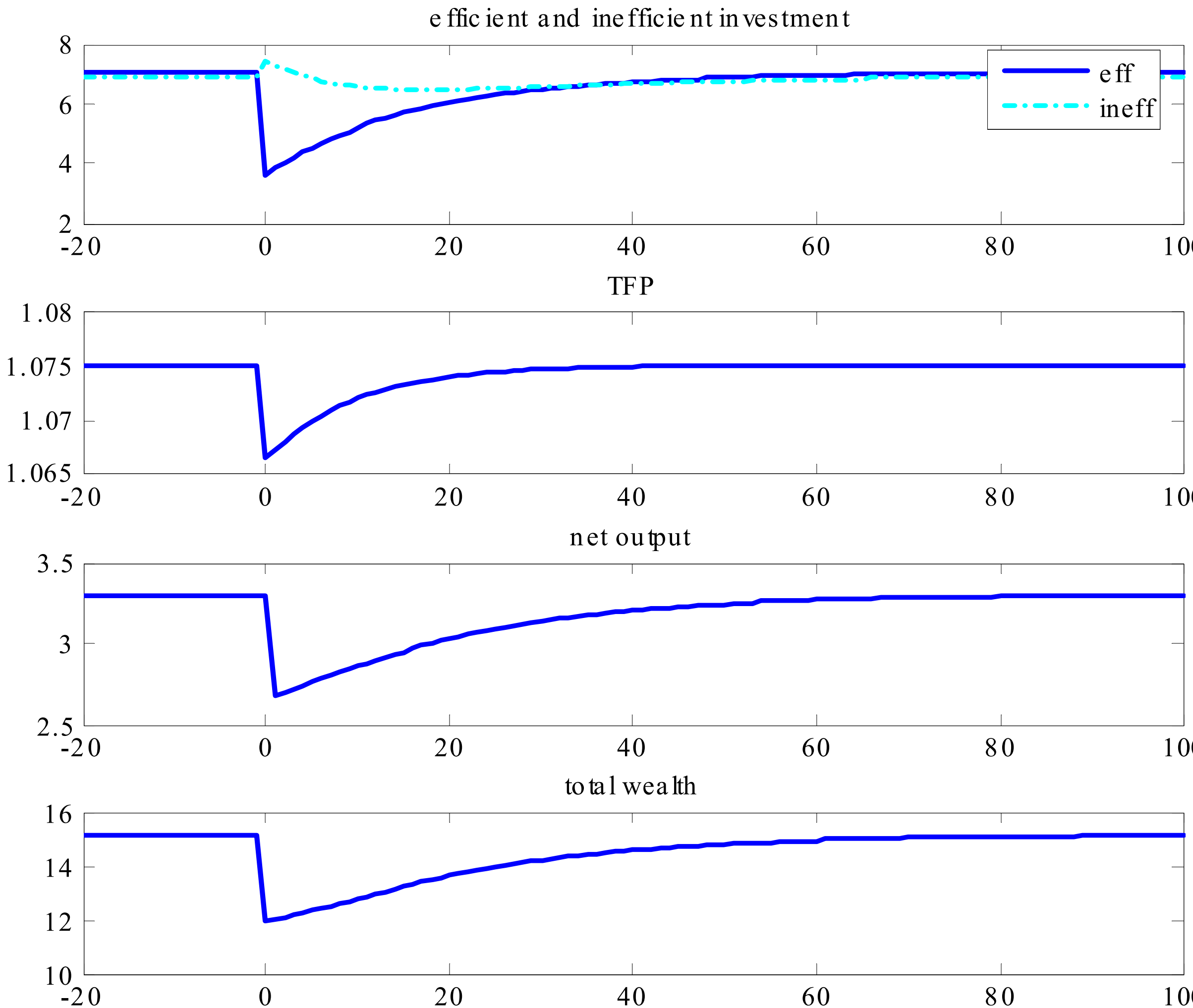
$\Longrightarrow$ TFP and output will recover, while land price will not

Figure 7-1: dynamics after shock to world interest rate



parameters: $(\theta_{old}, \theta_{new}, \sigma, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.6, 0.03, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$

Figure 7-2: dynamics after shock to world interest rate



parameters: $(\theta_{old}, \theta_{new}, \sigma, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.6, 0.03, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$

- Domestic collateral tightened

$\Rightarrow$ land price falls

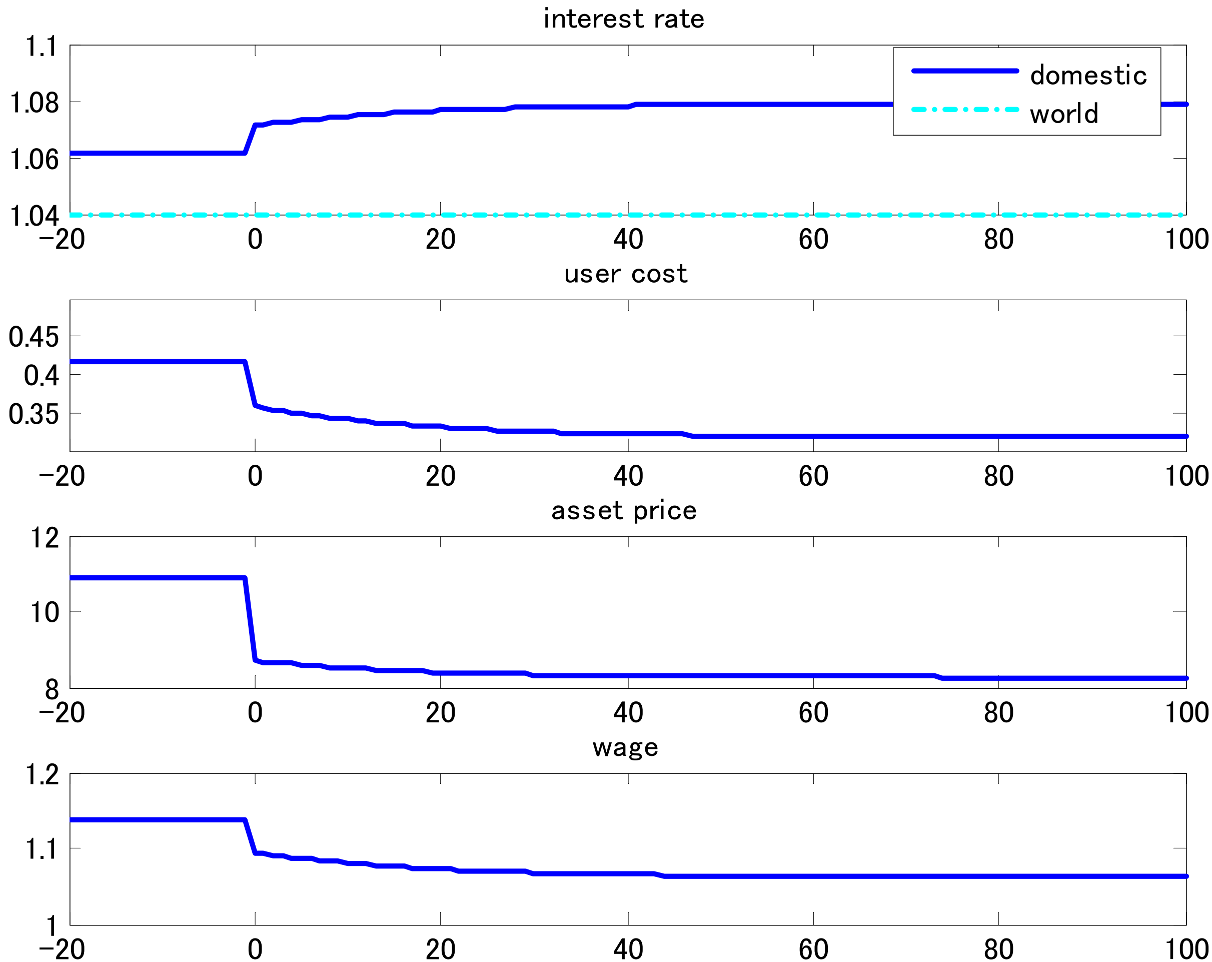
$\Rightarrow$ foreign credit tightened (capital outflow)

$\Rightarrow$ TFP and output decrease

$\Longrightarrow$ share of net worth of productive agents will not recover

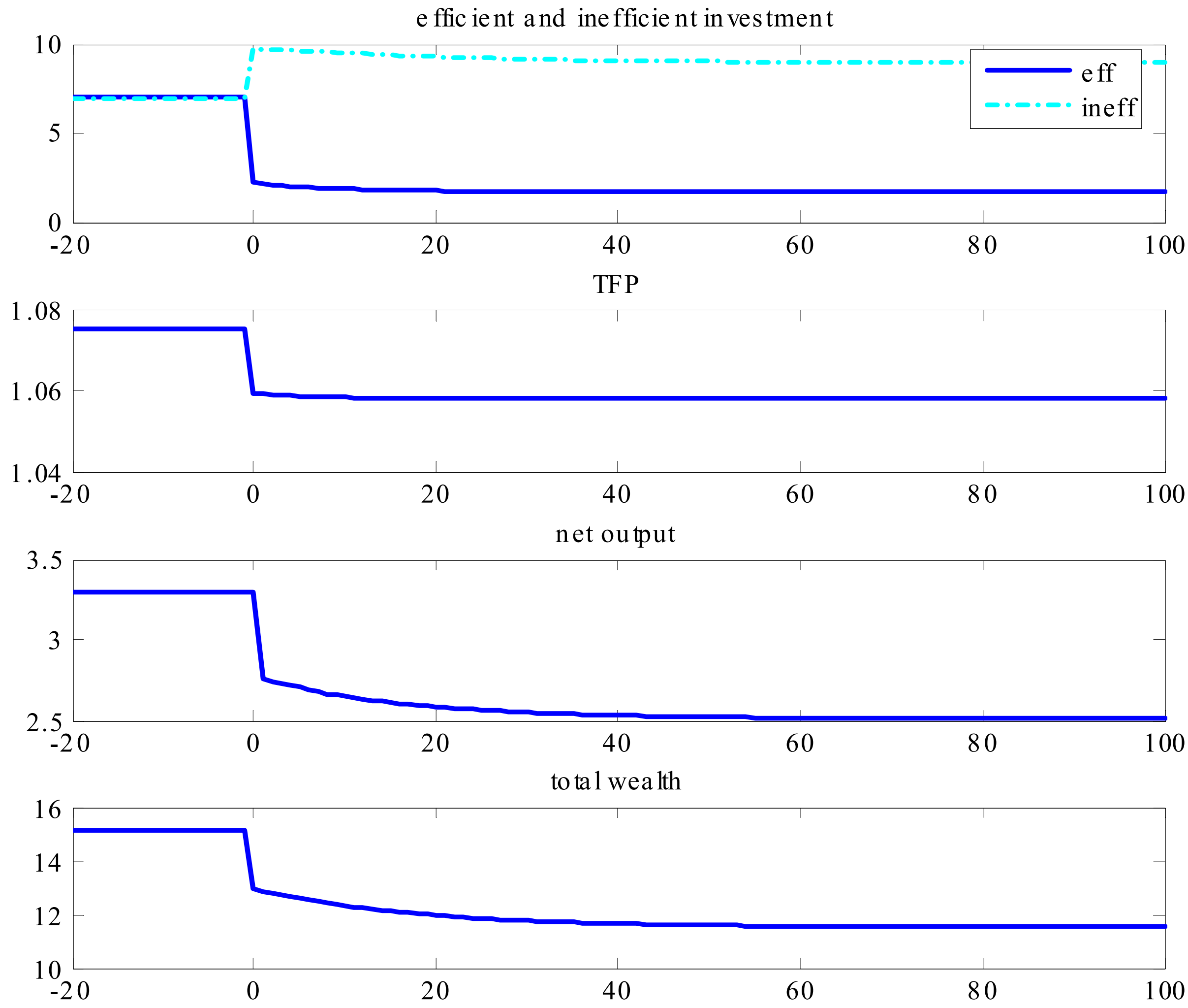
$\Longrightarrow$ land price, TFP and output continue to stagnate

Figure 6-1: dynamics after shock to theta



parameters: (θ_{old}, θ_{new}, σ, η, α, γ, β, n, δ) = (0.6, 0.2, 0.03, 3, 1.1, 1.05, 0.92, 0.1, 0.15)

Figure 6-2: dynamics after shock to theta



parameters: $(\theta_{old}, \theta_{new}, \sigma, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.2, 0.03, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$

5 Conclusion

Before liberalization:

With underdeveloped domestic financial system, unproductive agents produce $\Rightarrow$ low TFP

$\Rightarrow$ low factor price

$\Rightarrow$ low interest rate of savers

After capital account liberalization:

Adjustment depends upon the degree of development of domestic institution relative to the rest of the world

Effect of capital account liberalization on output

Domestic collateral\	Short-run	Long-run
Low	$Expansionary$	$Mixed$
Medium	$Contractionary$	$Expansionary$
High	$Expansionary$	$Expansionary$

The economy with low domestic collateral is vulnerable to shocks to domestic and foreign credit

	Short-run	Long-run
foreign interest rate $\Uparrow$	$Contractionary$	$Recovery$
domestic collateral $\Downarrow$	$Contractionary$	$Contractionary$