Adjusting to Capital Liberalisation

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1 Motivation

- What is the difference between capital liberalisation and trade liberalisation?

- How does the macroeconomic adjustment to capital liberalisation depend upon the underlying conditions?
  - Development of domestic financial system, domestic borrowing constraint
  - Borrowing constraint from foreign lenders

- Focus: theoretical analysis of medium-run adjustment process

2 Model

A small open economy with domestic and international borrowing constraints

- One homogenous goods
- Factor of production: homogenous labour
- Many entrepreneurs, workers, and foreigners

- Production technology of entrepreneur

$$y_{t+1} = a_t l_t$$

y_{t+1}: output; l_t: labour input; a_t: productivity

$$\begin{aligned} a_t &= \alpha \text{ when entrepreneur productive} \\ &= \gamma \text{ when entrepreneur unproductive} \\ \alpha &> \gamma. \end{aligned}$$

- Transition of productivity of an individual entrepreneur:
  $\Pr(a_{t+1} = \alpha | a_t = \alpha) = 1 - \delta$
  $\Pr(a_{t+1} = \gamma | a_t = \gamma) = 1 - n\delta$

- Source of borrowing constraints:
  The home creditor who monitors production from date t can obtain θ fraction of date t+1 output
  The foreign creditor can obtain $\theta^* y_{t+1}$
  At most two creditors on the same project
  Assume $0 \leq \theta^* < \theta < \frac{\gamma}{\alpha}$

- Utility function

  - Entrepreneurs:

$$E_t \left[\sum_{s=t}^{\infty} \beta^{s-t} \log C_s \right], 0 < \beta < 1.$$

    C_s: consumption in date t.

  - Workers:

$$E_t \left[\sum_{s=t}^{\infty} \beta^{s-t} U \left(C_s - v(l_s) \right) \right]$$

    l_s: labour supply,
    $u' > 0$, $u" < 0$, $v' > 0$, $v" > 0$.

  - Foreigners:

$$E_t \left[\sum_{s=t}^{\infty} \frac{1}{(R^*)^{s-t}} C_s \right]$$

    $1 < R^* \leq \beta^{-1}$

Competitive equilibrium

Each entrepreneur

- takes real wage w_t, domestic real gross interest rate R_t, foreign real gross interest rate R^* and initial net worth as given,

- chooses consumption, employment, output, domestic borrowing, and foreign borrowing $\{c_t, l_t, y_{t+1}, b_{t+1}, b^*_{t+1}\}$,

- subject to:
  flow-of-funds constraint:

$$c_t + w_t l_t = y_t - b_t - b^*_t + \frac{b_{t+1}}{R_t} + \frac{b^*_{t+1}}{R^*}$$

  international borrowing constraint:

$$b^*_{t+1} \leq \theta^* y_{t+1}$$

  domestic borrowing constraint:

$$b_{t+1} + b^*_{t+1} \leq \theta y_{t+1}$$

Each worker

- chooses $\{c_t, l_t, b_{t+1}, b^*_{t+1}\}$,

- subject to:
  flow-of-funds constraint:

$$c_t = w_t l_t - b_t - b^*_t + \frac{b_{t+1}}{R_t} + \frac{b^*_{t+1}}{R^*}$$

  borrowing constraints:

$$b_{t+1} \leq 0, b^*_{t+1} \leq 0.$$

The market clears for goods, labour, domestic borrowing and international borrowing.

Related literature

- difference from Kiyotaki (1998):
  labour, international borrowing constraint

- difference from Aghion-Bacchetta-Banajee (2003):
  international borrowing constraint

- difference from Caballero-Krishnamurthy (2001):
  medium-run instead of short-run

3 Autarky Economy: before capital liberalisation

- Labour market

$$L_t + L'_t = L^s(w_t) \tag{1}$$

L_t: employment of productive entrepreneurs;
L'_t: employment of unproductive entrepreneurs;
L^s: labour supply

- Unproductive entrepreneurs

$$R_t \geq \frac{\gamma}{w_t}, \quad = \text{holds if } L'_t > 0 \tag{2}$$
$$> \text{implies } L'_t = 0$$

- Productive entrepreneurs

$$L_t \leq \frac{\beta s_t Z_t}{w_t - \alpha\frac{\theta}{R_t}}, \quad = \quad \text{holds if } \frac{\alpha}{w_t} > R_t \tag{3}$$
$$< \quad \text{implies } \frac{\alpha}{w_t} = R_t.$$

Z_t: total wealth of all entrepreneurs;
s_t: share of productive entrepreneurs' wealth.

- Goods market:

$$w_t L^s(w_t) = \beta Z_t \tag{4}$$

- Excess return of the productive entrepreneurs:

$$x_t = \frac{\frac{\alpha(1-\theta)}{w_t - \alpha\frac{\theta}{R_t}} - R_t}{R_t} = \frac{\alpha - w_t R_t}{w_t R_t - \alpha\theta}. \tag{5}$$

- Wealth accumulation:

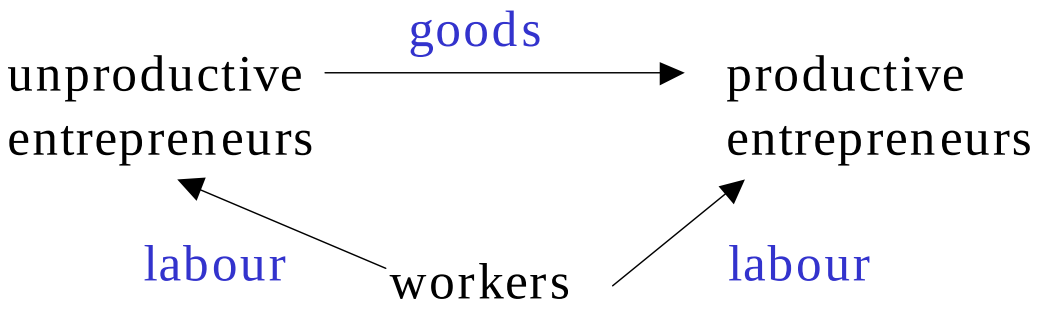
$$Z_{t+1} = (1 + s_t x_t) R_t \beta Z_t \tag{6}$$

- Evolution of share of productive entrepreneurs' wealth:

$$s_{t+1} = \frac{(1-\delta)(1-x_t)s_t + n\delta(1-s_t)}{1 + s_t x_t} \equiv f(s_t, x_t) \tag{7}$$

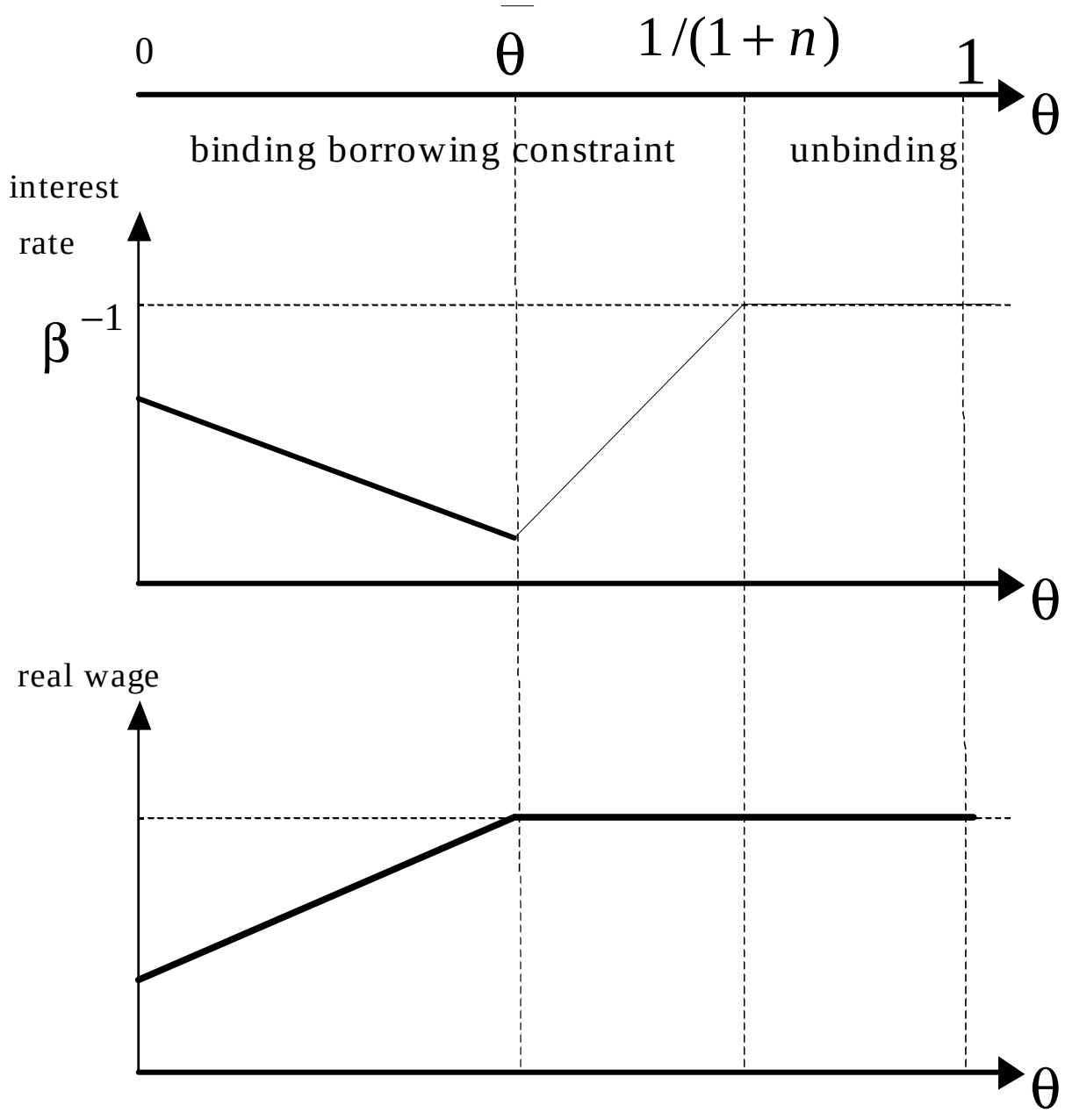
- Recursive equilibrium: Equations (1) - (7) determine $(w_t, R_t, L_t, L'_t, x_t, Z_{t+1}, s_{t+1})$ as a function of (Z_t, s_t)

- Case of inefficient production:
  Under condition $\theta < \bar{\theta} \equiv \frac{\delta}{\frac{\alpha-\gamma}{\gamma}+\delta(1+n)}$, production is inefficient, i.e., $L'_t > 0$.



steady-state autarky equilibrium

degree of development of financial system



4 Adjusting to capital liberalisation

- Unproductive entrepreneurs

$$\begin{aligned} R_t &\geq \max\left\{\frac{\gamma}{w_t}, \frac{\gamma(1-\theta^*)}{w_t - \gamma\frac{\theta^*}{R^*}}\right\} \\ &= \text{holds if } L_t' > 0, \\ &> \text{implies} L_t' = 0 \end{aligned} \tag{8}$$

- Productive entrepreneurs

$$\begin{aligned} L_t &\leq \frac{\beta s_t Z_t}{w_t - \alpha\frac{\theta^*}{R^*} - \alpha\frac{\theta-\theta^*}{R_t}}, \\ &= \text{holds if } \frac{\alpha(1-\theta^*)}{w_t - \alpha\frac{\theta^*}{R^*}} > R_t \\ &< \text{implies } \frac{\alpha(1-\theta^*)}{w_t - \alpha\frac{\theta^*}{R^*}} = R_t \end{aligned} \tag{9}$$

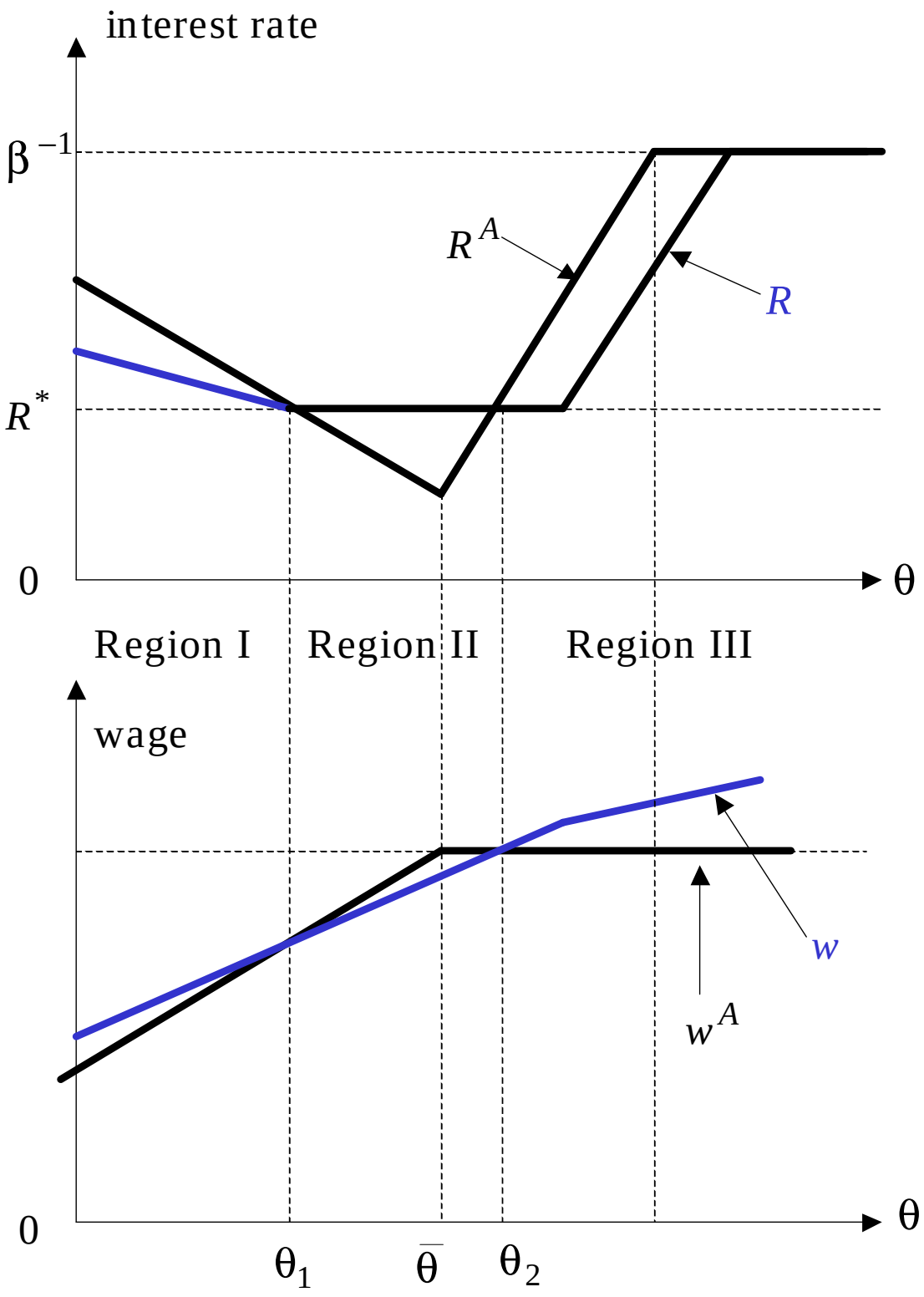
- International capital market

$$\begin{aligned} w_t L^s(w_t) &\leq \beta Z_t + \frac{\theta^*}{R^*}(\alpha L_t + \gamma L'_t), \quad (10) \\ &= \text{holds if } R_t > R^*, \\ &< \text{implies } R_t = R^* \end{aligned}$$

- Excess return of the productive entrepreneurs

$$x_t = \frac{\alpha - w_t R_t + \alpha\theta^* \frac{R_t - R^*}{R^*}}{w_t R_t - \alpha\theta - \alpha\theta^* \frac{R_t - R^*}{R^*}}. \qquad (11)$$

- (1), (6)-(11) determine $(R_t, w_t, L_t, L'_t, x_t, Z_{t+1}, s_{t+1})$ as a function of (Z_t, s_t).


interest rate
β −1
R A
R
R*
0
θ
Region I
Region II
Region III
wage
w
w A
0
θ
θ1
θ̄
θ2

4.1 Region I: $\theta < \theta_1$: severely underdeveloped domestic financial market

Before capital liberalisation:

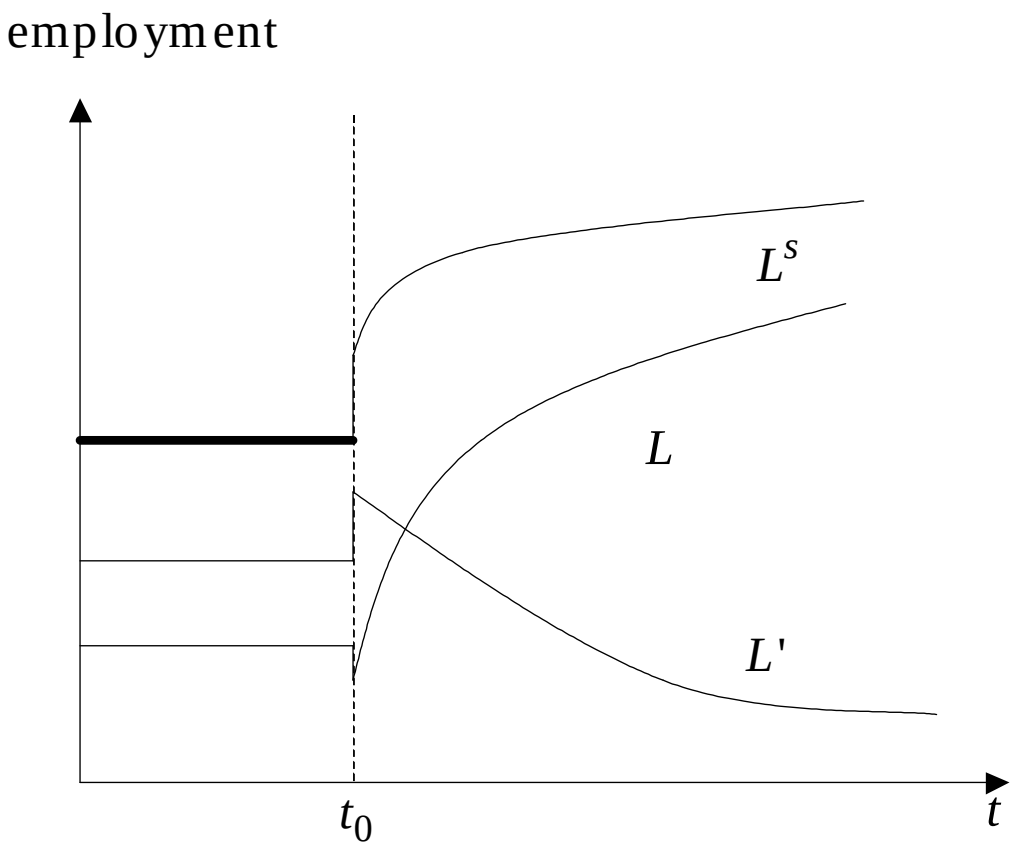
- total wealth of entrepreneurs was low
- low real wage
- rate of return of the unproductive entrepreneurs = domestic interest rate > foreign interest rate

After capital liberalisation:

- capital liberalisation leads to capital inflow
- unproductive entrepreneurs borrow from foreigners and lend to productive entrepreneurs
- wages increase

- Flow of capital

- Employment dynamics



4.2 Region II: $\theta_1 < \theta < \theta_2$: suppressed domestic financial market

Before liberalisation:

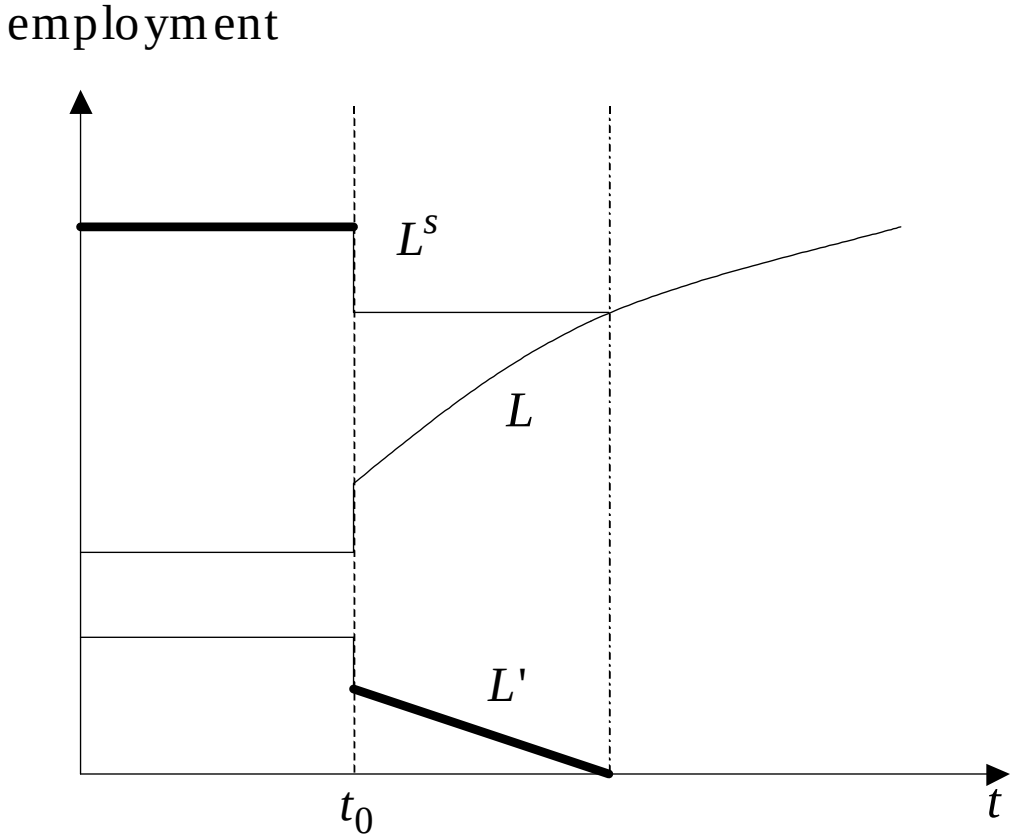
- production is inefficient
- $R^A < R^*$

After liberalisation:

- liberalisation leads to capital outflow: $R = R^*$
- wages decrease

- Flow of capital

- Employment dynamics



4.3 Region III: $\theta > \theta_3$: domestic financial market more developed than foreign

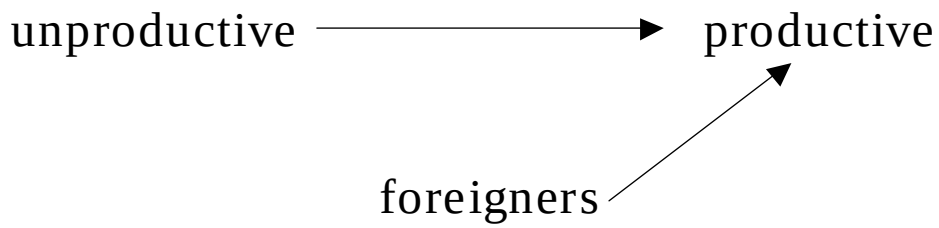
Before liberalisation

- production is efficient
- $R^A > R^*$

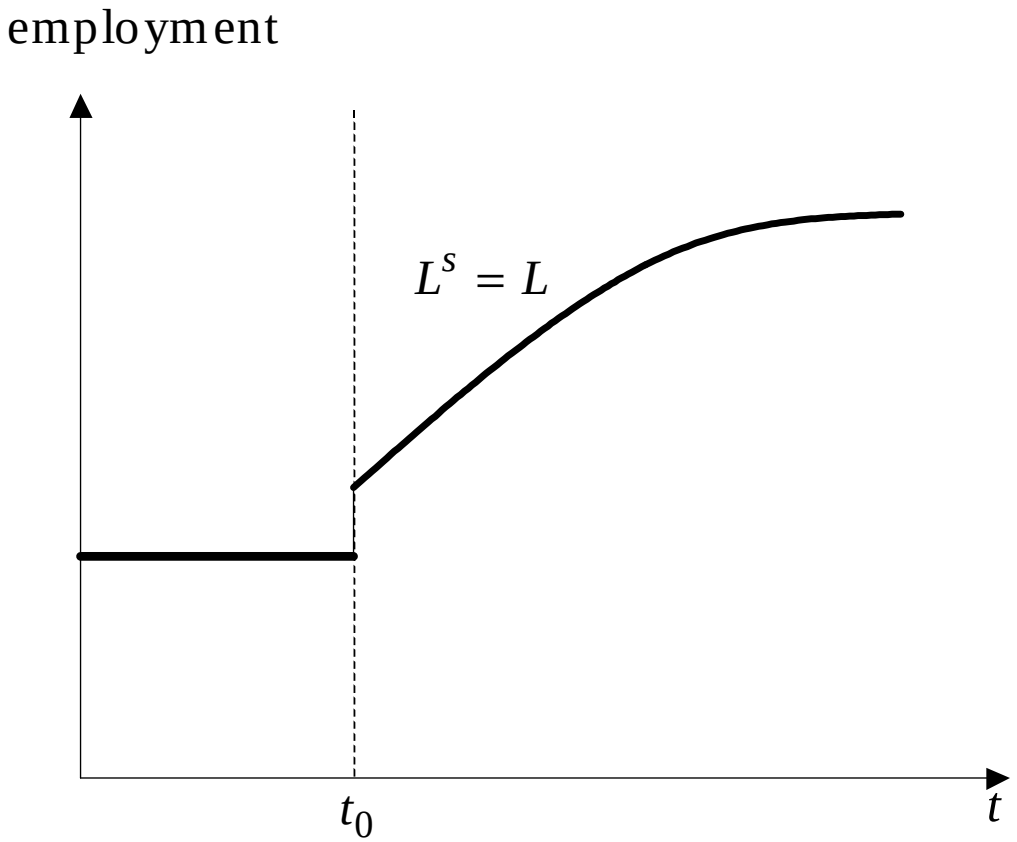
After liberalisation

- capital inflow.

- Flow of capital



- Employment dynamics



5 Conclusion

Before liberalisation:
With underdeveloped domestic financial market, both productive and unproductive entrepreneurs produce

After liberalisation
(I) Severely underdeveloped domestic finance:
unproductive entrepreneurs become financial intermediaries.

(II) Suppressed domestic finance:
International capital market serves as 'catalyst'

(III) Advanced domestic finance:
International capital market becomes ‘feeding friend’